

FEDERAL AID IN SPORT FISH RESTORATION

Chinook Salmon Remote Sport Release

by  
Paul Novak  
F-22-R-1  
Volume 1, Number 10

Alaska Department of Fish and Game  
Division of Fisheries Rehabilitation,  
Enhancement and Development

Don W. Collinsworth  
Commissioner

S. A. Moberly  
Director

P.O. Box 3-2000  
Juneau, AK 99803

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Volume 1, Number 10

RESEARCH PROJECT SEGMENT

State: Alaska

Project No.: F-22-R

Study No.: 1

Study Title: CHINOOK SALMON  
REMOTE SPORT  
RELEASE

Cooperator: Paul Novak

Period Covered: July 1, 1985 to June 30, 1986

ABSTRACT

Chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), zero-check smolts were transported from Deer Mountain Hatchery in Ketchikan to several sites on Prince of Wales Island for short-term marine rearing. Local volunteers provided labor for culturing the fish in net pens for 16 days. The average fish weight at the start of the project (4.56 g) was more than doubled at release (9.78 g). Project sites were selected using biological criteria and user group needs. Returning adults will contribute to terminal sport fisheries at both sites. Remote-site release is being tested as a method of dispersing hatchery production.

Key Words: zero-check, chinook salmon, *Oncorhynchus tshawytscha*, rearing, southern southeast Alaska, FRED, sport fisheries, imprint.

INTRODUCTION

Following short-term marine net-pen rearing and imprinting, approximately 140,000 zero-check chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), smolts were released at Craig and Thorne Bay on Prince of Wales Island (Figure 1).

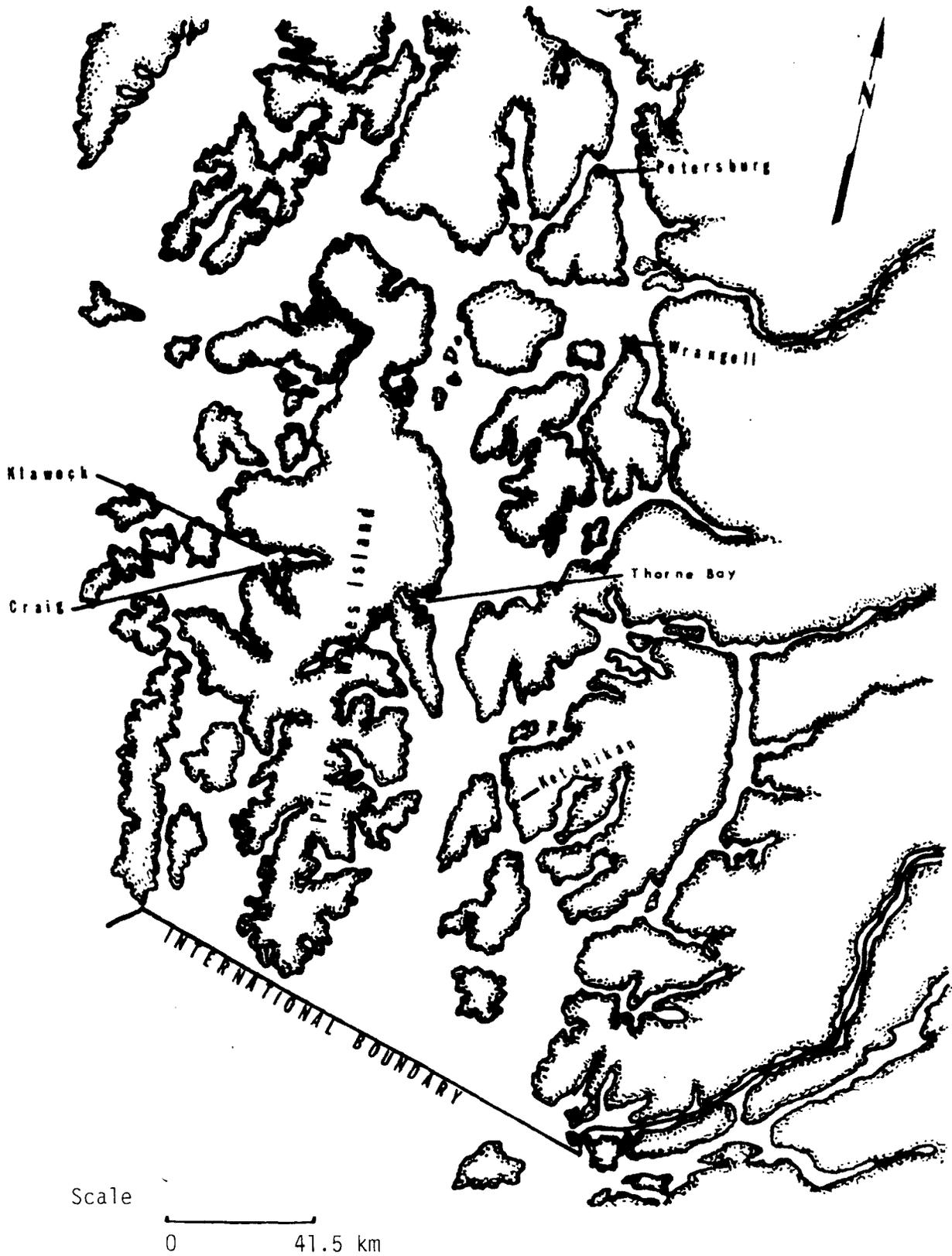


Figure 1. Location of project activities, 1986.

Community residents cooperated by providing rearing-site accommodations and labor for fish culture operations.

Adult returns are expected to contribute to terminal-area sport fisheries at each location. Culture of the fish by a diverse group of people had a positive educational impact on the community; school children, community administrators, housewives, commercial fishermen, loggers, and government workers were a few of the "hands-on" contributors who made this first year's operation successful. At the Thorne Bay pen site, over 150 people visited and/or contributed to the care of the fish. Progress bulletins authored by a community reporter were posted at various community gathering areas to keep everyone advised on how "their" fish were progressing.

#### RECOMMENDATIONS

1. Continue remote site releases of zero-check chinook salmon to provide information on annual variability of returns from this project.
2. Use automatic feeders in future remote net-pen rearing projects.
3. Grade hatchery fish used in rearing projects at remote sites and to remove small fish that are less likely to be osmocompetent in salt water.

#### OBJECTIVES

1. Incubate and rear approximately 150,000 zero-check chinook salmon fry for release at two or three remote sites.

2. Tag representative groups of all chinook salmon released from remote sites by spring 1986.
3. Set up net pens and other necessary rearing equipment prior to fish transport in June 1986.
4. Transport groups of at least 50,000 chinook salmon fry to remote sites for rearing and release; work with volunteer groups that will rear fish at remote sites.
5. Provide approximately 2 weeks of marine rearing at remote sites and release approximately 50,000 healthy chinook salmon fry at each site.

#### MATERIALS AND METHODS

Chinook salmon eggs were taken from the Unuk River broodstock in 1985; the eggs were incubated at Deer Mountain Hatchery using Heath<sup>®</sup> incubators (stacked) and standard techniques of the Fisheries Rehabilitation, Enhancement and Development (FRED) Division. By using chilled incubation water, we delayed emergence and ponding until 19 December 1985.

At ponding, the average fry weight was 0.4 g. On a diet of Alaska Dry Pellet (ADP), they grew to an average of 4.6 g by the end of freshwater rearing on 19 June 1986. The fish were taken off feed 24 and 48 hours prior to transport to Crab Bay and Thorne Bay, respectively.

During the freshwater rearing period, a representative number of fish from each group were coded-wire tagged.

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<sup>®</sup> Mention of commercial products or trade names does not constitute endorsement by ADF&G, FRED Division.

Blood sodium analysis, using the saltwater challenge technique, was applied to the project fish to determine osmocompetency (Clarke and Blackburn 1977).

For transport of fish to the Prince of Wales Island sites, standard fiberglass tanks were fitted with aerators and bottled-oxygen life support systems (Piper et al. 1982). The vehicles carrying the tanks were loaded on the state ferry M/V Aurora and transported to the Hollis terminal on Prince of Wales Island. The vehicles were driven from Hollis to the Crab Bay site, and at the Phillips Cold Storage dock, the fish were put into a hexagonal floating Tess<sup>®</sup> net pen (10-m diameter x 3-m deep). The pen was moored at the cold storage and later moved to the Phillips Cold Storage boat dock for final placement on 22 June 1986. This pen was fitted with a fish feeder developed by Sweeney Enterprises, Inc. of Boerne, TX; it was electronically set to distribute feed each daylight hour. The amount of feed and duration of each feeding period was adjustable.

The Thorne Bay group of fish was transported using methods similar to the Crab Bay group, except the trip was longer. The Tess pen was set up prior to delivery and moved to the Westflight Airlines dock in Thorne Bay. Fish were delivered from the transport tanks to the floating pen using the tank delivery line. The loaded pen was moved to a deep break-water and secured for the evening. After hand-feeding at this site for 1 day while a gale force storm blew its course, a commercial troller slowly (2½ hours) towed the pen to the feeding site in Thorne Bay. The local volunteer in charge of the rearing operation was Jeannie McFarland; she hand-fed the fish, picked mortalities, kept records, computed feed rations, kept the net clean, and served as teacher and tour guide.

During rearing, length/weight data were collected after 5 or 6 days of feeding. At the end of the rearing program, fish

at both sites were weighed. A final blood sodium sample was collected and a fish quality autopsy index (Goede 1985) was completed for the Thorne Bay group (Appendix A). A Yellow Springs Instrument<sup>®</sup> (Model 330) was used to collect salinity and water temperature data. Hand thermometers were used to collect daily surface water temperatures. Both groups of fish were released in the evening on 7 July 1986. The pens and associated equipment were dismantled, cleaned, and stored at the Klawock Hatchery. Alaska Dry Pellet feed was used as the diet during this project.

## RESULTS

### Freshwater Culture

Deer Mountain Hatchery produced 139,839 zero-check chinook salmon smolts for the Thorne Bay and Crab Bay project sites. The freshwater rearing period extended over 183 days.

### Coded-Wire Tagging

Between 28 May and 10 June 1986, a tagging crew tagged 35,142 chinook salmon pre-smolts with coded micro-wire. The tag codes by project release site are provided in Table 1.

Tagging time to complete this task was 43.5 hours and involved four personnel. A tagging rate of 941 fish/hour produced a tag retention rate of 94% for the 3-g presmolts.

Saltwater challenge tests were applied to the fish on three different trial times to test their osmocompetency as related to blood sodium levels. Two of the tests were run on the group prior to transport as an indicator of condition suitability, while the third test represented marine rearing condition of the smolts. The results are found in Table 2.

Table 1. Coded-wire tag summary for Thorne Bay and Crab Bay project releases in 1986.

Release site	Tag code	Number valid tags	Number of untagged represented
Thorne Bay	3B-09-04	20,055	48,309
Crab Bay-	3B-05-14	7,212	26,953
Craig	3B-05-15	<u>7,785</u>	<u>29,435</u>
		35,142	104,697

Table 2. Saltwater challenge tests and associated blood sodium levels, 1986.

Date	Salinity (PPT)	Blood Na <sup>+</sup> range (m mol/l)	$\bar{x}$ Na <sup>+</sup> (m mol/l) <sup>2/</sup>
5/30/86	24	158.1 - 168.8	163.6
6/17/86	26	168.2 - 186.8	177.9
6/27/86 <sup>1/</sup>	30	180.5 - 199.9	188.7

<sup>1/</sup> Crab Bay rearing pen sample.

<sup>2/</sup> Orion 1020 blood sodium analyzer.

### Vaccination

Between 20 and 28 May all of the Deer Mountain Hatchery stocks scheduled for release were vaccinated for *Vibrio anquillarum*. They were immersed in Biovax<sup>®</sup>, (Biomed Research Laboratories, Seattle, Washington) for 20 seconds (Wood 1974).

### Transport of Fish

Salt (3%) was added to the transport water to reduce the effects of stress. Fish-loading densities were maintained at approximately 0.14 kg/liter. Normal densities for chinook salmon of this size is 0.14 kg/liter (Piper et al. 1982); it is also related to water temperature. Deer Mountain Hatchery water temperature was 9.8°C at both loadings. The transport water temperature was chilled with ice and ranged between 8.4° and 8.9°C. Crab Bay and Thorne Bay receiving water temperature was 13.0° and 13.7°C, respectively. Dissolved-oxygen (DO) levels were monitored. The DO levels were above 9ppm; most readings were near saturation levels.

The loading and transport time for the Crab Bay fish was 6.25 hours, while the Thorne Bay fish had 8 hours of handling time. Mortalities were not evident at unloading, as all fish were dumped through a 6-inch pipeline to the rearing pen. Mortalities associated with transports were tallied and are provided in Appendix B.

### Crab Bay Short-Term Rearing

Chinook salmon were delivered to Crab Bay on 20 June 1986; the 77,520 smolts appeared to be in salinity shock on the morning of 21 June 1986. An extremely high tide pushed by

30- to 40-knot winds broke up the freshwater lens and changed the salinity profile monitored earlier in the year. Salinities from the surface to the 30-ft level had been monitored at 24 and were as low as 16 in the top 6 inches. After the storm, salinities ranged between 26 to 30 from surface to bottom and many fish were dying and sinking to the bottom. Because additional shock may have exacerbated the mortalities, we decided not to disturb the fish by raising the net. Instead, mortalities were collected by skimming the "floaters" off the surface with a long-handled wire-mesh skimmer. On 23 June the net was raised to facilitate removal of "sinker" mortalities. Tagged and untagged mortality ratios were recorded. A total of 6,045 mortalities were counted, representing an 8% loss. Tagged mortalities represented 2,539 fish, or 42% of the dead fish; untagged fish represented 3,506, or 58% of the dead fish. A release of 71,475 live fish resulted.

An automatic fish feeder<sup>1</sup> was placed on the Tess pen frame. It was equipped with a timer that controlled the duration of the feeding period and a variable throw setting; both features allowed complete flexibility in daylight hourly feedings. The feeding rate was reduced over the first 5 days, as the fish were not aggressively feeding and appeared to be in a state of shock. By 26 June the fish health had improved, so a full ration of feed was scheduled for 27 June. Based upon prior pen-feeding results at Thomas Basin, a ration consisting of 7% of the body weight was fed daily. Hourly feedings coincided with the daylight period; as many as 19 feedings were made between 0400 and 2200 h.

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<sup>1</sup> Built by Sweeney Enterprises, Inc.

Growth summaries indicate the average weight at release was 9.7 g, while the average length was 89 mm; length ranged between 63 and 111 mm (Table 3).

Food conversion for the Crab Bay fish was 0.5. A total of 347 kg of ADP (3/32-inch) was fed, producing a weight gain of 694.8 kg.

The Crab Bay chinook salmon smolts were sampled for length/weight data and released at approximately 2200 h. Release was accomplished by taking down the side apron and relaxing the walls on three sides of the pen. The weighted corners were raised; this in effect, crowded the fish toward the relaxed side, forcing them to swim out of the pen.

#### Thorne Bay Short-Term Rearing

Some 68,364 chinook salmon smolts were delivered to the Thorne Bay net pen on 22 June 1986; the pen was moored at the breakwater. At 0400 h on 23 June, it was slowly (2.5 hours) moved to the permanent rearing site at McFarland's Floatel, located 3.2 km from the breakwater. The fish had been hand-fed on the previous day and were in good condition. Approximately 200 mortalities resulting from the truck transport were observed on the bottom of the pen during towing. After securing the net pen to the house float, Jeannie McFarland began the feeding regimen: one-hour intervals through the normal daylight hours of 0400 h to 2100 h. Over a 16-day period, an average of 13 feedings per day were made. The daily amount of feed was adjusted by calculating weight gained and using a feed rate of 7% of body weight per day. Hand feeding allowed for adjustments in the amount fed each time, according to feeding behavior; the normal amount ranged between 1.3 and 3.6 kg; the  $\bar{x}$  feed amount was 2.5 kg.

Mortalities were collected as they floated to the surface; the number of tagged and untagged fish were recorded. A total of 295 fish died, representing only a 0.4% mortality. Tagged mortalities represented 177 fish, or 60% of the dead fish; untagged mortalities were 118 fish, or 40% of the dead fish. A release of 68,364 live fish resulted.

Growth summaries indicate the average weight at release was 9.8 g; while the average length was 90 mm, lengths ranged between 69 and 109 mm (Table 4). Food conversion for the Thorne Bay group of fish was 1.6. A total of 520 kg of ADP (3/32-inch) formula was fed for a weight gain of 324 kg.

Table 3. Condition factors<sup>1</sup> for the Crab Bay fish.

Date	$\bar{x}$ Fork length (mm)	$\bar{x}$ weight (g)	K factor
6/19/86	72.86	4.07	1.1
6/17/86	77.93	6.50	1.4
7/7/86	89.16	9.73	1.4

$$^1 K = \frac{W \times 10}{L^3}$$

Table 4. Condition factors for Thorne Bay fish.

Date	$\bar{x}$ Fork length (mm)	$\bar{x}$ weight (g)	K factor
6/19/86	72.86	4.07	1.1
6/27/86	75.20	5.68	1.3
7/7/86	90.47	9.84	1.3

On the 7 July release date, the smolts were sampled for length/weight data and released at 1100 h. Release from the pen was accomplished in a manner similar to the Crab Bay site. The released fish were observed feeding in McFarland cove for 2 days.

A record of water temperatures and salinities at both remote short-term rearing sites is presented in Appendix C.

#### DISCUSSION

The first year of the chinook salmon remote rearing project went extremely well. Community involvement at Thorne Bay went far beyond expectations.

Initially, our plan was to use two or three project sites and release 50,000 smolts at each site. Because only 139,839 smolts were available, we made the decision to culture 68,364 fish at Thorne Bay and 71,475 fish at Crab Bay. Both sites surpassed the 50,000 fish/site minimum. Other objectives including tagging, transport, and release were all met or exceeded.

The fish health at Crab Bay was questionable for the first 5 days of rearing; salinity shock was the suspected cause. Mortality rates at Crab Bay (8%) were higher than Thorne Bay (0.4%) but still well within acceptable levels. Average size of dead fish at Crab Bay on 27 June was 65 mm (range, 52-75 mm). Length data indicate the average size at 78 mm (range, 71-88 mm). Therefore, mostly small fish were dying; this was probably due to lack of osmocompetency.

Growth was similar at the two sites, resulting in the release of fish having average weights of 9.7 and 9.8 g from Crab Bay and Thorne Bay, respectively. Food conversion

rates at the two sites were very different; the conversion rate of 0.5 at Crab Bay is somewhat suspect. Several factors including the weight bias caused by the mortality of smaller fish early in the saltwater rearing period may have resulted in an overestimation of the weight gained. Other factors influencing the apparent conversion factor of 0.5 may have been natural foods available and the loss of dead fish before they were counted; these factors would have caused an overestimation of weight and survival percentages. The food conversion rate for the Thorne Bay fish was considered to be in the normal range. It may have been higher than it would have been had there not been so much human traffic around the net pen. The 151 visitors may have caused enough agitation to have affected the conversion rate; i.e., possibly a significant amount of food was converted to swimming energy. The health of the fish at Thorne Bay was generally far superior to those at Crab Bay. The smaller fish at Thorne Bay did not suffer increased mortality, so the final average size was not biased by the larger fish. This may influence survival rates, because the smaller fish released may have been more susceptible to predation. On the other hand, the apparently better average health of the Thorne Bay group may positively influence survival.

## REFERENCES

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- Goede, Ron. 1985. Autopsy Classification. Utah State Division of Wildlife Resources, Fisheries Experiment Station. Logan, Utah.
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- Wood, James W. 1974. Diseases of Pacific Salmon Their Prevention and Treatment, 2nd edition. State of Washington, Department of Fisheries Hatchery Division. p.78.

APPENDIX A

ANATOMY IDENTIFICATION

- Length: Fork length in millimeters (tip of snout to fork of tail)
- Weight: Weight in grams
- K<sub>fl</sub>: =  $\frac{W \times 10^5}{L^3}$
- Fins: 0 - normal, healthy fin  
1 - frayed, damage probably reversible  
2 - eroded, less than 1/3 of fin gone  
3 - severely eroded, more than 1/3 of fin gone  
4 - fin missing or severely misshapen
- Decaling: Percent of decaling, 0 to 100
- Operculum: Normal (N), shortened - gill fringe visible (1), 25% or more missing - large amount of gill visible (2)
- Eyes: Normal (N), Exophthalmia (E1, E2), Hemorrhagic (H1, H2), Blind (B1, B2), Missing (M1, M2)
- Gills: Normal (N), Frayed (F), Clubbed (C), Marginate (M), Pale (P)
- Pseudobranchs: Normal (N), Swollen (S), Swollen & Inflamed (S & I), Inflamed (I)
- Thymus: No hemorrhage (0), mild hemorrhage (1), severe hemorrhage (2)
- Mesenteric Fat: Internal body fat expressed with regard to amount present:  
Caecal Fat:  
0 - none  
+1 - less than 50% of each caecum is covered  
+2 - 50% of each caecum is covered  
+3 - more than 50% of each caecum is covered  
+4 - pyloric caeca completely covered by large amount of fat.  
Visceral Fat:  
A - 50% or less of available body cavity occupied by fat  
B - more than 50% of available body cavity occupied by fat  
C - visceral fat produces externally noticeable bulge in whole fish
- Spleen: Black (B), Red (R), Granular (G), Nodular (Nod), Enlarged (E)
- Hind Gut: No inflammation (0), mild inflammation (1), severe inflammation (2)
- Kidney: Normal (N), Swollen (S), Mottled (M), Granular (G),
- Liver: A - Normal, firm, red color  
B - Pale  
C - Fatty liver, coffee-cream color, greasy to feel  
D - Nodules in liver  
E - Focal discoloration  
F - Slight general discoloration  
G - Hemorrhage
- Gall Bladder: Normal (N), Enlarged (E), Slightly discolored (D<sub>1</sub>), Very dark color (D<sub>2</sub>)
- Mesentery: No inflammation (0), mild inflammation (1), severe inflammation (2)
- Blood: Hematocrit: Volume of red blood cells (erythrocytes) expressed as percent of total blood volume. Centrifuged 5 minutes  
Leucocrit: Volume of white blood cells (leucocytes) expressed as percent of total blood volume.  
Plasma Refraction: Amount of protein and triglycerides in plasma, expressed as gram percent. Determined with hand refractometer.

FISH AUTOPSIES

Date July 7, 1986

Reason for Sample Pre-Release

Location/Species Thorne Bay - Chinook

Group Remote Pen Rearing Project

Sample No. 1

Investigator (s) Novak/Denton

Samp No.	Fork Lgth. mm	Wt. gm	K fl	Fins	% Descal.	Operc.	Eye	Gill	Psbr	Thym	Fat	Spl	Hind Gut	Kid	Liv	GB	Mes	Hem	Leuc	Ser Ref	
1	90	44 Samples $\bar{x}$ 9.84 gm.	x k - 1.23	0	0	N	N	N	N	N	1A	R	N	N	B	N	N	-	-	-	
2	72			0	0	N	N	N	N	N	N	0A	R	N	N	A	N	N	-	-	-
3	92			0	0	N	N	N	N	S1	+1	1B	R	N	N	A	N	N	-	-	-
4	88			0	0	N	N	N	N	N	N	0A	R	N	N	A	N	N	-	-	-
5	107			0	0	N	N	N	N	S	N	1C	R	N	N	A	N	N	-	-	-
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OVER FOR REMARKS



APPENDIX B



Brood Yr. 1985  
Species King  
Origin Ketchikan Creek  
Lot No. 85-1 & 2 RR  
Stock Summer

Form No: Fish Shipping Form

(Check one)  Eggs  Rearing  Imprinting  Release

I. GENERAL INFORMATION AND PLANTING DATA

Facility Deer Mountain Hatchery  
Trip No. \_\_\_\_\_ Page No. \_\_\_\_\_ Using Division FRED  
(Water Stocked)  
Trip Date 7/ 7/ 86 Destination Thorne Bay  
Type Water W Region I Community Thorne Bay  
Plant  Transfer  Lot 85-1 & 2 RR  
Brood year, Species, Origin  
Age Smolt Type Marks CW/AD Code No. 3B-09-04  
Avg.Wt: (No./lb) 46 (Cm ea.) 9.84  
Avg.Lt: (in.) \_\_\_\_\_ (Cm.) 89.8mm  
Total Wt: (lbs) 435.14 (kg.) 197.34  
NUMBER STOCKED (Live) 20,055 MORTALITIES 143  
Condition Good Disease History White Spot  
Receiving  
Water Temp: Hatchery N/A °C Water 13.7 °C  
Tank Start N/A °C Tank End N/A °C  
Weather & Estuarine Conditions at Destination \_\_\_\_\_  
Good - Sunny 60 to 65° temp.

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[ : : : : : ] (Update) [ : ]  
(ChT No.) [ : : : : : ]

Start of End of  
Dissolved Oxygen: Haul N/A (mg/l) Haul N/A (mg/l)  
Salinity at Release Site 25 ppm (g/l)  
Method of Transporting:  
 Aircraft Tanks  Bags/Boxes  Skiffs/Boats  
 Direct Release  Flatbed Tanks  Carriers  
 Pickup Tanks  Trailer Tanks  Other

Comments: Released fish from net rearing pens after 18 days rearing/imprinting time.

II. ADDITIONAL TRANSFER DATA

Receiving Supervisor P. Novak Date Received  / /  Time \_\_\_\_\_ Pond/Pen No. TB-1

III. ADDITIONAL TRIP DATA

Depart Time \_\_\_\_\_ Time Planted \_\_\_\_\_ Vehicle No. \_\_\_\_\_ Mileage \_\_\_\_\_ Cost/mi \_\_\_\_\_  
Load Time \_\_\_\_\_ Trip Time \_\_\_\_\_ Aircraft:  Cost/hr \_\_\_\_\_ Time \_\_\_\_\_  
(No. men \_\_\_\_\_) (No. pen \_\_\_\_\_) Ferry:  Cost \_\_\_\_\_ Barge:  Cost \_\_\_\_\_  
Oxygen Used \_\_\_\_\_  
Transportation Supervisor \_\_\_\_\_

IV. Remarks

Fish and Game  
Division of F.R.E.D

STANDARD PRODUCTION DATA FORMS

Form 8a: Fish Shipping Form

Brood Yr. 1985  
Species King  
Origin Ketchikan Creek  
Lot No. 85-1 & 2- RR  
Stock Summer

(Check one)  Eggs  Rearing  Imprinting  Release

I. GENERAL INFORMATION AND PLANTING DATA

Facility Deer Mountain Hatchery  
Trip No. \_\_\_\_\_ Page No. \_\_\_\_\_ Using Division FRED  
(Water Stocked)

Trip Date 7 / 7 / 86 Destination Thorne Bay  
Type Water \_\_\_\_\_ Region \_\_\_\_\_ Community Thorne Bay  
Plant  Transfer  Lot 85-1 & 2-RR

Age Smolt Type Marks AD Brood year, Species, Origin  
Code No. None  
Avg.Wt: (No./lb) 46 (Gm ea.) 9.84  
Avg.Lt: (In.) \_\_\_\_\_ (Cm.) 89.8 mm  
Total Wt: (lbs) 181.39 (kg.) 8.226  
NUMBER STOCKED (Live) 836 MORTALITIES 34  
Condition Good Disease History White Spot

Receiving  
Water Temp: Hatchery N/A °C Water 13.7 °C  
Tank Start N/A °C Tank End N/A °C

Weather & Estuarine Conditions at Destination \_\_\_\_\_  
Good - sunny 60 to 65° air temp.

Start of End of  
Dissolved Oxygen: Haul N/A (mg/l) Haul N/A (mg/l)  
Salinity at Release Site 25 ppm (g/l)

Method of Transporting:  
 Aircraft Tanks  Bags/Boxes  Skiffs/Boats  
 Direct Release  Flatbed Tanks  Carriers  
 Pickup Tanks  Trailer Tanks  Other

Comments: Released from net pens after 18 days rearing/imprinting time.

II. ADDITIONAL TRANSFER DATA

Receiving Supervisor P. Novak Date Received  / / Time \_\_\_\_\_ Pond/Pen No. TB-1

III. ADDITIONAL TRIP DATA

Depart Time \_\_\_\_\_ Time Planted \_\_\_\_\_ Vehicle No. \_\_\_\_\_ Mileage \_\_\_\_\_ Cost/mi \_\_\_\_\_  
Load Time \_\_\_\_\_ Trip Time \_\_\_\_\_ Aircraft:  Cost/hr \_\_\_\_\_ Time \_\_\_\_\_  
(No. men \_\_\_\_\_) (No. men \_\_\_\_\_) Ferry:  Cost \_\_\_\_\_ Barge:  Cost \_\_\_\_\_  
Oxygen Used \_\_\_\_\_  
Transportation Supervisor \_\_\_\_\_

IV. Remarks

[1:1:N] [2] [ : : : : ]  
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(CWT No.) [ : : : : ]



Form No: Fish Shipping Form

Brood Yr. 1985  
Species King  
Origin Ketchikan Creek  
Lot No. 85-1 & 2 RP  
Stock Summer

(Check one)  Eggs  Rearing  Imprinting  Release

I. GENERAL INFORMATION AND PLANTING DATA

Facility Deer Mountain Hatchery  
Trip No. \_\_\_\_\_ Page No. \_\_\_\_\_ Using Division FRED  
(Water Stocked)  
Trip Date 7 / 7 / 86 Destination Craig  
Type Water W Region I Community Craig  
Plant  Transfer  Lot 85- 1 & 2 RR  
Brood year, Species, Origin  
Age Smolt Type Marks CW/AD Code No. 3B-05-14  
Avg.Wt: (No./lb) 47 (Gm ea.) 9.73  
Avg.Lt: (In.) \_\_\_\_\_ (Cm.) 89.16 mm  
Total Wt: (lbs) 154.73 (kg.) 70.17  
NUMBER STOCKED (Live) 7212 MORTALITIES 1136  
Condition Good Disease History White Spot  
Receiving  
Water Temp: Hatchery N/A °C Water 13.0 °C  
Tank Start N/A °C Tank End N/A °C  
Weather & Estuarine Conditions at Destination \_\_\_\_\_  
Good - sunny 60 to 65° Temp.

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Start of End of  
Dissolved Oxygen: Haul N/A (mg/l) Haul N/A (mg/l)  
Salinity at Release Site 20 surface to 30.6 (g/l)  
Method of Transporting:  
 Aircraft Tanks  Bags/Boxes  Skiffs/Boats  
 Direct Release  Flatbed Tanks  Carriers  
 Pickup Tanks  Trailer Tanks  Other

Comments: Released fish from net rearing pens after 18 days rearing/imprinting time.

II. ADDITIONAL TRANSFER DATA

Receiving Supervisor P. Novak Date Received     /     /     Time \_\_\_\_\_ Pond/Pen No. CC-1

III. ADDITIONAL TRIP DATA

Depart Time \_\_\_\_\_ Time Planted \_\_\_\_\_ Vehicle No. \_\_\_\_\_ Mileage \_\_\_\_\_ Cost/mi \_\_\_\_\_  
Load Time \_\_\_\_\_ Trip Time \_\_\_\_\_ Aircraft:  Cost/hr \_\_\_\_\_ Time \_\_\_\_\_  
(No. men \_\_\_\_\_) (No. men \_\_\_\_\_) Ferry:  Cost \_\_\_\_\_ Barge:  Cost \_\_\_\_\_  
Oxygen Used \_\_\_\_\_  
Transportation Supervisor \_\_\_\_\_

IV. Remarks

Form No: Fish Shipping Form

Brood Yr. 1985  
Species King  
Origin Ketchikan Creek  
Lot No. 85-1 & 2 RR  
Stock Summer

(Check one)  Eggs  Rearing  Imprinting  Release

I. GENERAL INFORMATION AND PLANTING DATA

Facility Deer Mountain Hatchery  
Trip No. \_\_\_\_\_ Page No. \_\_\_\_\_ Using Division FRED  
(Water Stocked)

Trip Date 7 / 7 / 86 Destination Craig  
Type Water W Region I Community Craig  
Plant  Transfer  Lot 85- 1 & 2 RR

Brood year, Species, Origin  
Age Smolt Type Marks CW/AD Code No. 3B-05-15

Avg.Wt: (No./lb) 47 (Cm ea.) 9.73

Avg.Lt: (In.) \_\_\_\_\_ (Cm.) 89.16 mm

Total Wt: (lbs) 168.96 (kg.) 76.62

NUMBER STOCKED (Live) 7875 MORTALITIES 1241

Condition Good Disease History White Spot  
Receiving

Water Temp: Hatchery N/A °C Water 13.0 °C  
Tank Start N/A °C Tank End N/A °C

Weather & Estuarine Conditions at Destination \_\_\_\_\_  
Good - sunny 60 to 65° temp.

Start of End of  
Dissolved Oxygen: Haul N/A (mg/l) Haul N/A (mg/l)  
Salinity at Release Site 20 surface to 30.6 (g/l)

Method of Transporting:  
 Aircraft Tanks  Bags/Boxes  Skiffs/Boats  
 Direct Release  Flatbed Tanks  Carriers  
 Pickup Tanks  Trailer Tanks  Other

Comments: Released fish from net rearing pens after 18 days rearing/imprinting time.

II. ADDITIONAL TRANSFER DATA

Receiving Supervisor P. Novak Date Received     /     /     Time \_\_\_\_\_ Pond/Pen No. CC-1

III. ADDITIONAL TRIP DATA

Depart Time \_\_\_\_\_ Time Planted \_\_\_\_\_ Vehicle No. \_\_\_\_\_ Mileage \_\_\_\_\_ Cost/mi \_\_\_\_\_  
Load Time \_\_\_\_\_ Trip Time \_\_\_\_\_ Aircraft:  Cost/hr \_\_\_\_\_ Time \_\_\_\_\_  
(No. men \_\_\_\_\_) (No. men \_\_\_\_\_) Ferry:  Cost \_\_\_\_\_ Barge:  Cost \_\_\_\_\_  
Oxygen Used \_\_\_\_\_  
Transportation Supervisor \_\_\_\_\_

IV. Remarks

Form No: Fish Shipping Form

Brood Yr. 1985  
Species King  
Origin Ketchikan Creek  
Lot No. 85-1 & 2 RP  
Stock Summer

(Check one)  Eggs  Rearing  Imprinting  Release

I. GENERAL INFORMATION AND PLANTING DATA

Facility Deer Mountain Hatchery  
Trip No. \_\_\_\_\_ Page No. \_\_\_\_\_ Using Division FRED  
(Water Stocked)

Trip Date 7 / 7 / 86 Destination Craig  
Type Water W Region I Community Craig  
Plant  Transfer  Lot 85-1 & 2 RR

Brood year, Species, Origin  
Age Smolt Type Marks None Code No. None  
Avg.Wt: (No./lb) 47 (Cm ea.) 9.73  
Avg.Lt: (in.) \_\_\_\_\_ (Cm.) 89.16 mm  
Total Wt: (lbs) 1187.42 (kg.) 538.614  
NUMBER STOCKED (Live) 55,356 MORTALITIES 3,506  
Condition Good Disease History White Spot

Receiving  
Water Temp: Hatchery N/A °C Water 13.0 °C  
Tank Start N/A °C Tank End N/A °C

Weather & Estuarine Conditions at Destination  
Good - sunny 60 to 65° temp.

Start of End of  
Dissolved Oxygen: Haul N/A (mg/l) Haul N/A (mg/l)  
Salinity at Release Site 20 surface to 30.6 (g/l)

Method of Transporting:  
 Aircraft Tanks  Bags/Boxes  Skiffs/Boats  
 Direct Release  Flatbed Tanks  Carriers  
 Pickup Tanks  Trailer Tanks  Other

Comments: Released fish from net rearing pens after 18 days rearing/imprinting time.

II. ADDITIONAL TRANSFER DATA

Receiving Supervisor P. Novak Date Received     /     /     Time \_\_\_\_\_ Pond/Pen No. CC-1

III. ADDITIONAL TRIP DATA

Depart Time \_\_\_\_\_ Time Planted \_\_\_\_\_ Vehicle No. \_\_\_\_\_ Mileage \_\_\_\_\_ Cost/mi \_\_\_\_\_  
Load Time \_\_\_\_\_ Trip Time \_\_\_\_\_ Aircraft:  Cost/hr \_\_\_\_\_ Time \_\_\_\_\_  
(No. men \_\_\_\_\_) (No. men \_\_\_\_\_) Ferry:  Cost \_\_\_\_\_ Barge:  Cost \_\_\_\_\_  
Oxygen Used \_\_\_\_\_  
Transportation Supervisor \_\_\_\_\_

IV. Remarks

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APPENDIX C

Appendix Table C-1. Thorne Bay water quality.

Date	Water Temp(C)	Salinity (%)
6/22	12.6 - Surface	
6/23	12.6 - S	
6/24	12.6 - S	
6/25	9.9 - S	
6/26	10.4 - S	
6/27	11.5 - S	25
6/28	12.6 - S	
6/29		
6/30	12.1 - S	
7/1	12.1 - S	
7/2	12.6 - S	
7/3	12.6 - S	
7/4	15.0 - S	
7/5	12.6 - S	
7/6	13.7 - S	
7/7	12.1 - S	21
	12.6 - 6'	22

Appendix Table C-2. Crab Bay water quality.

Date	Water Temp(C)	Salinity (%)
6/21	12.7 - Surface	26
		26.5 - 6'
6/27	13.9 - S	29.5
		12.8 - 6' 30.6
6/28	12.8 - S	
7/5	15.0 - S	
7/6	19.0 - S	
7/7	13.0 - S	