

**Preliminary Results of the
Fish Population Assessment
Summer 2001**

of

**Unnamed Tributary of Mohun Creek
(locally known as Coho Creek)**

prepared for the

**Campbell River and District
Fish and Wildlife Association**

and

**Quinsam Fish Hatchery
Fisheries and Oceans Canada**

By

Lance Stewardson



Mainstream Biological Consulting
2520 Soderholm Court
Campbell River, BC. V9W 8E3
(250) 923-0432
mainstreambio@telus.net

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Table of Contents

| | |
|---|------------|
| Table of Contents | ii |
| List of Tables, Photos and Figures | iii |
| 1.0 Introduction | 1 |
| 2.0 Methods | 4 |
| 2.1 SITE CHARACTERISTICS..... | 4 |
| 2.2 FISH COLLECTION AND PROCESSING | 4 |
| 3.0 Results | 6 |
| 3.1 SITE CHARACTERISTICS..... | 6 |
| 3.2 FISH DATA | 6 |
| 4.0 Discussion | 9 |
| 5.0 Further Sampling | 10 |
| 6.0 References | 11 |

List of Tables, Photos and Figures

| | |
|--|---|
| Table 1. Site characteristics measured during the summer fish population assessment. | 6 |
| Table 2: Average lengths and weights for coho and cutthroat. | 7 |
| Table 3: Fish densities for each sample site. | 7 |
| Photo 1: A 95 mm cutthroat from Site 1 in the Plexiglas box. | 8 |
| Photo 2: A near average coho at 56 mm and 2.9 g from Site 11 | 8 |
| Figure 1. The Coho Creek watershed and reach breaks determined during the WRP Overview and Level 1 Habitat Assessment (Stewardson M.C., 2000). | 3 |

1.0 Introduction

A fish population assessment was conducted for an unnamed tributary of Mohun Creek (locally known as Coho Creek) from July 2 – July 5, 2001. There were three objectives of the survey. The first was to determine if coho salmon fry (*Oncorhynchus kisutch*) from naturally spawning adults were present prior the out-planting of hatchery fry. The second objective was to measure coho and cutthroat (*O. clarki*) lengths and weights in order to allow for growth rate study. The final objective was to obtain information on fish population size to calculate densities and to determine the current levels of habitat utilization.

A Watershed Restoration Program (WRP) Overview and Level 1 Fish Habitat Assessment (Stewardson, M.C., 2000) of Coho Creek had identified a lack of large woody debris (LWD) within this system. The low level of LWD has resulted in a lack of pool formation therefore reducing the habitat diversity. The current study, funded by the Campbell River and District Fish and Wildlife Association (CRFW) and Fisheries Renewal British Columbia (FsRBC), was undertaken to identify the current fish population levels, as well as, survival and growth rates within the reduced habitat. Information from this study will be used to help in future stocking and restoration decisions.

The procedures for habitat measurements taken during this study are outlined in the Resource Inventory Committee Reconnaissance (1:20000) Fish and Fish Habitat Inventory: Standards and Procedures (Anonymous, 1998). Fish collection procedures used are outlined in the Urban Salmon Habitat Program Assessment Procedures For Vancouver Island (Michalski T.A. et al. 2000).

This report is a preliminary report as further sampling and data analysis will occur during the fall of 2001 and the spring of 2002. Calculations of survival and growth rates will not be done until after the fall and spring sampling.

This report has five main sections. The first (2.0 Methods) outlines the methods used in the field and the types of data gathered. Any deviations from the recommended procedures in the manuals mentioned above are described in this section. The second section (3.0 Results) contains site information, average fish length and weights, as well

as density calculations for both coho fry and cutthroat. The fourth section (4.0 Discussion) discusses fish densities with respect to carrying capacity, while the final section (5.0 Further Sampling) outlines plans regarding future sampling and data gathering.

Figure 1. The Coho Creek watershed and reach breaks determined during the WRP Overview and Level 1 Habitat Assessment (Stewardson M.C., 2000).

2.0 Methods

The Watershed Restoration Program Overview and Level 1 Fish Habitat Assessment (Stewardson M.C., 2000) identified fifteen reaches of Coho Creek. The first eleven reaches were found to contain the best fish habitat, with Reaches 8 and 9 having the highest quality anadromous spawning habitat. Reaches 12 through 15 were found to have habitat of lesser quality and were therefore not included in this fish population assessment. Reaches 1 through 11 were therefore selected as the sample reaches for this assessment. (Figure 1)

One representative sample site was identified within each of the lower eleven reaches of Coho Creek. Each of these sites contained a pool and associated riffle complex. Prior to sampling the site was isolated by the use of two mesh stop nets. One net was placed at the downstream end of the site and the second net was placed at the upstream end. The nets spanned the entire wetted channel and served as a barrier to fish entering or leaving the site while sampling occurred. The lower end of each site was located with a hand held GPS and marked in the field.

2.1 Site Characteristics

The measurements in each of the eleven sample sites were gathered according to the methods outlined in the Resource Inventory Committee Reconnaissance (1:20000) Fish and Fish Habitat Inventory: Standards and Procedures (Anonymous, 1998). A brief description of those methods and any deviations from the recommended procedures follows.

Site length and wetted widths (ww) were measured with a nylon tape and recorded to the nearest centimeter (cm). A wooden staff marked with 1 cm increments was used to record both average depths and maximum pool depths. Water temperature was measured within each site using an alcohol thermometer. The pH and conductivity of the water were measured using a Hanna stick meter. A photo of each site was also taken.

2.2 Fish Collection and Processing

The fish collection procedures used are outlined in the Urban Salmon Habitat Program Assessment Procedures For Vancouver Island (Michalski T.A. et al.). Those

procedures are briefly outlined below. Any deviations from the recommended procedures are also discussed.

Fish sampling in each isolated sample site took place with a Smith-Root backpack electroshocker (Model 12A). A two pass electroshocking method was used with the electroshocker set at 400V, with a frequency of 80Hz and amplitude of 6 ms.. The electroshocking effort for each pass was recorded (seconds). Due to the high sediment transport of Coho Creek both electroshocking passes were conducted working upstream. Fish were netted and placed in a bucket of water that was oxygenated with a battery-powered air pump. As the fish from the first electroshocking pass were being identified, measured and weighed, a second pass was made.

Captured salmonids were individually removed from the holding bucket and placed in a Plexiglas box filled with water that had been zeroed on a battery powered digital scale and contained an embedded ruler (Photo 1). A weight in grams (g) was taken to the nearest tenth of a gram. The fish were then identified to species when possible and measured to the nearest millimeter (fork length). Many small trout (26- 65 mm) could not be identified to species.

No rainbow trout (*O. mykiss*) were identified during this survey and only two rainbow trout were captured in the previous assessment (Stewardson M.C. 2000). As these individuals were captured in the lower portion of Reach 1 they were assumed to have entered the Coho Creek from Mohun Creek. Therefore, all trout captured during this assessment were assumed to be juvenile cutthroat trout. Sticklebacks and sculpins were measured with a ruler (total length) to the nearest millimeter, but were not weighed. The fish were then placed in an oxygenated recovery bucket until all the fish had been processed at which time they were released back into the creek.

During fish processing, a representative selection of fish were photographed. Scale samples were also taken from 14 coho for use in age analysis.

3.0 Results

3.1 Site Characteristics

Of the 11 sample sites selected, seven contained a shallow scour pool and riffle (Sites 1,2,3,6,7,10 and 11). Four of the sites had large undercut banks and high levels of LWD (Sites 4,5,8 and 9). The substrate in the lowest two sample sites consisted of fines. Pockets of small gravel began to appear in Sites 3 and 4, however gravel did not become the dominant streambed material until Sites 8 and 9. Sites 10 and 11 both had a cobble / gravel substrate composition. Sites 2, 4, 6, and 8 were all situated in open grassy areas, while all other sites were under mixed forest canopy cover. Table 1 contains a summary of site data for each site in the first 11 reaches of Coho Creek.

Table 1. Site characteristics measured during the summer fish population assessment.

| Site # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|----------------------------|------|------|------|------|------|------|------|------|------|------|------|
| Avg wetted width (m) | 3.16 | 2.51 | 3.85 | 3.10 | 4.55 | 3.70 | 3.79 | 4.28 | 2.74 | 2.90 | 2.67 |
| Length (m) | 23.2 | 19.1 | 14.0 | 21.0 | 23.2 | 13.3 | 26.5 | 19.2 | 17.5 | 5.6 | 7.5 |
| Avg Depth (m) | 0.18 | 0.34 | 0.13 | 0.29 | 0.28 | 0.17 | 0.25 | 0.32 | 0.21 | 0.18 | 0.17 |
| Max Pool Depth (m) | 0.48 | 0.44 | 0.75 | 0.94 | 0.77 | 0.50 | 0.63 | 1.02 | 0.51 | 0.40 | 0.37 |
| Temp (C) | 13.5 | 14.0 | 14.0 | 13.0 | 13.5 | 14.5 | 12.0 | 12.5 | 12.0 | 10.0 | 11.0 |
| pH | 7.4 | 6.7 | 6.9 | 7.2 | 7 | 7 | 7.6 | 7.6 | 7.6 | 7.6 | 7.6 |
| Conductivity (μ S/cm) | 60 | 60 | 70 | 70 | 70 | 70 | 80 | 80 | 80 | 60 | 70 |

Temperature in the 11 sites ranged from 10 to 14.5 degrees Celsius and averaged 12.7 degrees. The pH averaged 7.2 with Site 2 having the lowest value of 6.7 and Sites 7 through 11 all measuring 7.6. Conductivity ranged from 60 to 80 μ S/cm and averaged 70 μ S/cm.

3.2 Fish Data

Data for both coho and cutthroat lengths and weights is presented in Table 2. In the 11 sites sampled, the average coho was 57 mm long and weighed 2.8 g (Photo 2). The average cutthroat, in the same 11 sample sites, was 47 mm long and weighed 2.1g.

Table 2: Average lengths and weights for coho and cutthroat.

| Site # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|
| Total coho (n) | 8 | 4 | 0 | 9 | 5 | 6 | 29 | 38 | 7 | 4 | 3 |
| Avg Length (mm) | 57.8 | 58.0 | 0.0 | 55.0 | 57.0 | 53.3 | 55.2 | 50.4 | 58.7 | 61.8 | 62.7 |
| Avg Weight (g) | 2.9 | 2.5 | 0.0 | 2.2 | 2.0 | 1.9 | 2.4 | 1.7 | 2.9 | 3.0 | 3.6 |
| Total cutthroat (n) | 9 | 11 | 26 | 34 | 15 | 38 | 71 | 30 | 15 | 7 | 13 |
| Avg Length (mm) | 58.1 | 45.5 | 41.7 | 37.9 | 46.9 | 46.1 | 38.5 | 41.9 | 50.1 | 68.7 | 45.2 |
| Avg Weight (g) | 3.3 | 1.8 | 1.3 | 1.0 | 2.2 | 1.6 | 0.9 | 1.6 | 2.3 | 4.8 | 1.8 |
| Total Fish (n) | 18 | 45 | 32 | 73 | 54 | 68 | 102 | 79 | 23 | 11 | 17 |

Fish densities for each sample site are presented in Table 3. The greatest density of coho fry ($0.5 / \text{m}^2$) was found in Site 8, which was identified as the best anadromous spawning habitat in the system (Stewardson M.C., 2000). Cutthroat density was greatest in Sites 6 and 7, with densities of 0.8 and 0.7 fish per square meter respectively. Total fish density, which includes sculpins and stickleback, was at or above 1.0 fish per square meter in Sites 4, 6, 7 and 8.

Table 3: Fish densities for each sample site.

| Site # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO/ m^2 | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 | 0.1 | 0.3 | 0.5 | 0.1 | 0.2 | 0.1 |
| CT/ m^2 | 0.1 | 0.2 | 0.5 | 0.5 | 0.1 | 0.8 | 0.7 | 0.4 | 0.3 | 0.4 | 0.6 |
| Total Fish/ m^2 | 0.2 | 0.9 | 0.6 | 1.1 | 0.5 | 1.4 | 1.0 | 1.0 | 0.5 | 0.7 | 0.8 |

Lamprey (*Lampetra sp.*) were abundant in all sample sites, but were not captured. Threespine stickleback (*Gasterosteus aculeatus*) were common in the lower 5 sites, but were not found in Sites 9, 10 and 11. Stickleback were most abundant in Sites 2, 4 and 5, making up 64% of the fish caught in Site 2, 36% in Site 4 and 54% in Site 5.

Fish densities may be higher than calculated as not all fish in each site were caught. This is mainly true of sites with large undercut banks (Sites 4,5, 8 and 9) and those with abundant LWD. Cover provided by these structures resulted in areas where fish could avoid the field created by the electroshocker and made it difficult to observe and capture all fish in the site.

Photo 1: A 95 mm cutthroat from Site 1 in the Plexiglas box.

Photo 2: A near average coho at 56 mm and 2.9 g from Site 11

4.0 Discussion

Fish, and coho densities in particular, in Coho Creek are well below what are considered optimum levels. F.K. Sandercock (in Groot C. and Margolis L., 1991) reports optimum levels of 2.9 fish per square meter for 49 mm long coho and 1.3 fish per square meter for four-month-old fry. The Department of Fisheries and Oceans, Quinsam Hatchery, reports recommended coho stocking levels of 0.5 (high gradient habitat) to 2.0 grams (low gradient habitat) per square meter, and 2.0 coho fry per square meter from various existing studies (pers. comm. Shannon Anderson. July, 2001). It is unlikely that current stocking of Coho Creek increases coho or total fish densities above these levels. However, this will have to be confirmed when stocked fry distribution is assessed and densities are recalculated.

The presence of coho fry in Coho Creek prior to the hatchery out-planting on July 6, 2001 (2500 marked coho fry) indicates that adult coho are returning to the system to spawn naturally. The large number of small cutthroat trout (26 to 60 mm) throughout the creek indicates that the population of cutthroat is also spawning in the system. Juvenile locations and densities suggest that the cutthroat are spawning in the pockets of small gravel found in Reaches 2 through 11, while coho spawning is concentrated in Reach 8. The wide spread distribution of juveniles of both species makes it improbable that these fish have migrated into the system from Mohun Creek. Also, the culverts at the lower Iron River Main crossing are significant obstacles to the upstream migration of juvenile fish.

An estimate of overall coho and cutthroat population was obtained using site densities and wetted widths combined with reach lengths previously reported by M.C. Stewardson (2000). It was assumed that the average wetted width of each site was representative of the wetted width of the entire reach. The coho population in the first 11 reaches was estimated at approximately 1600 fish, while the cutthroat population over the same area was estimated at approximately 6100 fish.

5.0 Further Sampling

Further sampling of Coho Creek will occur during the fall of 2001 and spring of 2002. Growth rates of both stocked and naturally reproducing coho will be assessed at these times. In addition, survival rates and relative abundance of both populations will be investigated. The distribution of the 2500 marked hatchery fry (stocked at the lower culvert on July 6, 2001) will also be studied.

Additional data to be gathered includes water quality parameters, to be tested in August and November 2001, as well as February and April 2002. A water sample will be sent for laboratory analysis in November 2001 and a temperature logger has been placed in the creek to collect data throughout the year.

Age analysis of the 14 coho scale samples will be completed.

6.0 References

- Anonymous. 1998 (April). Reconnaissance (1:20000) Fish and Fish Habitat Inventory: Standards and Procedures. Unpublished report prepared for the Resource Inventory Committee by the BC Ministry of Fisheries, Fisheries Inventory Section. Version 1.1.
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