DRAFT

2001 Beach Seine

Final Report

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2. INTRODUCTION

The Beach Seine Survey project is a study of the juvenile salmonids distribution and their uses of the foreshore. It was first developed to compliment the previous studies done on the intertidal foreshores around Kaien Island and in Prince Rupert and Port Edward Harbours. In 1996, **J.O. Thomas and Associates** conducted ground truthing of the intertidal zone on Ridley Island, Kaien Island and Digby Island. The teams performed 40 transects in each of these areas to record position (G.P.S) as well as substrate type and cover. Also in 1996, the Port Corporation hired **G.A. Borstad Associates Ltd.** to do airborne multispectral imagery of those foreshore areas to acquire detailed maps of the marine vegetation composition.

The project was first developed to run April through July 2000 but because of funding delays the survey never started until the beginning of June missing most of the spring freshets. It was then decided that the project should be given another opportunity the following year. So once again this year, Fisheries and Ocean Canada contracted with Community Fisheries Development Centre in Prince Rupert to perform the survey. This time the crew was able to start just before the first spring freshets i.e. last week of March first week in April. As last year, a crew of 4 was hired to use a small craft and a beach seine net, to fish, catch, identify, count and measure juvenile salmonids in designated sites around Kaien Island and Port Edward Harbour, from the beginning of April 2001 to July 12, 2001, 5 days per week.

Twelve test sites were originally selected. The parameters for the sites selection was as follows: six of the sites were to be impacted directly by development and each one of them was to be paired to a non-impacted site in the vicinity and have similar bio-physical characteristics i.e. tidal influence, substrate and slope. They were to act has the control sites. Looking at the list of the 12 test sites below, for example, Okabe Shipyard site was paired with Casey Cove site, etc.

Impacted Sites	*Non-Impacted Sites*
1. Okabe Shipyard	2. Casey Cove
3. McLeans Shipyard	4. Vigilant Island
5. Rivtow	6. Sunshine Bay
7. Wainwright Basin, Basso	8. Wainwright Basin, Pipeline
9. Porpoise Harbour, Across Pulp Mill	10. Porpoise Passage, Lelu Island
11. Ridley Island, Sawmill	12. Barrett Rock

In addition, 6 sites were selected as auxiliary sites meaning that they were to be surveyed on a more casual basis. They ended up being given the same attention as the test sites and like them were tested every week although for some, testing started a couple weeks later. Each site was selected individually and each one for its unique physical and bio-physical characteristics.

Auxiliary Sites

Impacted Sites	***Non-Impacted Site***
1. Moresby Creek Outfall	4. Miller Bay-Outside
2. Kwinitsa Station	5. Kloyia Bay
3. Kloyia Bay	6. Silver Creek
4. Tsum Tsadai	7. Tsum Tsadai

The 2001 results from the 12 test sites were looked at from several angles. Firstly, each site results were summarised individually by relating the incidence of each species over time. Secondly, impacted and non-impacted sites results were summarised and compared to each other. Thirdly, impacted sites results were compared with the non-impacted sites ones. The number of sample taken for each species at each individual site were combined and totalled in a table and numbers were compared. Finally, all 12 sites were grouped into 3 geographical areas each having roughly similar physical and bio-physical characteristics: Prince Rupert Harbours Sites (6), Porpoise Harbour Sites (4), and Outside Sites (2). The amount of samples caught per species for each area was totalled into tables and associated with it, the most productive site for that particular specie was included. Auxiliary site results were summarised and analysed individually.

During the course of the survey, the DFO Stock Assessment Department offered the Beach Seine Survey to perform some DNA analysis of 100 coho caudal fin clipping. Samples were to be taken from the Prince Rupert Harbour Sites and the number of clipping taken per site were to be allocated according to the percentage of coho produced overall by that site. For example, if 60% of the coho were taken from McLeans Shipyard site, then 60 clipping were taken at that site. The results have not come back to us as yet.

By-catch was also an important component of the overall catch. A wide variety of fishes were caught all of which we recorded[1] and counted. Because of the commercial importance of *Pacific Herring*, we have summoned in the results the total fish caught at each site.

The 2000 results have also been included in this report although the survey only began in early June and the testing method was inconsistent. Leaving some of those inconsistencies aside and explaining others, the results were combined onto graphs and summarised.

[1] Appendices A

3. METHODOLOGY

The fishing crew for the study consisted of the 4 persons: the skipper and project manager, Bruce Hansen; two deckhands, Jennifer Henderson and Norman McGee; and a data entry technician, Nadia Plamondon. The crew was equipped with an eighteen-foot long Smokercraft aluminium skiff powered by an eighty-five horse powered Mercury outboard. The net used for the study was a beach seine measuring 6 x 100 feet, using one quarter inch mesh in the wings and one eighth inch mesh in the bunt.

With one deckhand holding one end of the net on the beach, the net was set out of the skiff, backing out from the beach until all it was all in the water. Then, towing off of the other end, the net is slowly towed and brought back to the beach forming a bundle. The boat back on the beach, the net is pulled onto the beach by hand with one person pulling the lead line and two persons each pulling each one wing. The towing time was recorded from the time the net first hits the water until the lead line is all pulled in. The average set time for all sets was 7 minutes. The catch was transferred into tots, the net fleeted onto the bow of the vessel and the catch processed immediately before the following set.

A single test consisted of 3 consecutive sets. One set was done with the tide, the other against it and, the set that yielded the most fish was the direction taken for the third and last set. All sets were done around the high tide level from a couple hours prior until a couple hours after. Also, the state of the tide, raising or falling would alternate from one test to the next for every site during the entire survey. Auxiliary sites test were treated equally except 2 rather then 3 consecutive sets were executed per test.

All the information was recorded on a data sheet and entered in a database created for the purpose of survey. In addition to the set time, weather condition and surface temperature were also recorded. Site characteristics were taken from each site and revealed the dominant substrate, the subdominant substrate, the vegetation and the slope.

All fish captured were identified and enumerated, and juvenile salmons were measured and weighted. Because of the difficulty in sampling the entire catch especially when fish are caught in large number, a minimum and maximum sample size of a 100 was set (agreed upon). For example, in a catch of more then a 100 juvenile salmon, only a 100 were measured. The reminder was counted. As for the weight, up to a maximum of 10 per test for each species. All the fish caught were held until the last set was completed. Species[2] other then salmon were all identified and counted.

[2] See appendices B

Sockeye	72	R.I.-Sawmill	52.7
Chinook	1	Barrett Rock	100
*Includes: Barrett Rock, R.I. Sawmill. ** % by species taken at the most productive site.			

The Outside Sites averaged 1096 samples. A total of 2192 samples were taken at these sites, with Barrett Rock, the non-impacted site, 15% more then Ridley Island-Sawmill.

Table 4: 2001 Beach Seine: Porpoise Harbor Sites

Porpoise Harbor Sites*			
Species	**Total samples**	**Most productive site by species**	**% ****
Pink	746	Lelu Island	57.5
Chum	762	R.I.-Across Pulp Mill	69.3
Coho	164	Lelu Island	37.2
Sockeye	77	Wainwright-Basso's	39
Chinook	10	R.I.-Across Pulp Mill	50
*Includes: Wainwright-Pipeline and Basso's, Lelu Is. and Across Pulp Mill. ** % by species taken at the most productive site.			

The Porpoise Harbour Sites averaged 439.8 samples. A total of 2089 samples were taken with 854 coming from the non-impacted sites, W.B-Pipeline and Lelu Island, and 1233 from the impacted sites: a difference of 30.6%.

4.9. By-catch.

A wide variety of other fish species were caught during the survey. *Surf Smelt* and *Pacific Herring* were caught the most consistently and in most significant numbers. In table 5, find the total numbers of *Pacific Herring* caught at each site. The fish were small size, approximately 10 cm, and were estimated to be 2 years old fishes (juveniles). The majority seemed to have been caught between May 14 and June 6 with the Okabe Shipyard site having the highest frequency. It may be good to note that the Pacific Herring are very fragile fishes to handle making accurate counting difficult. Nevertheless, these numbers are still important habitat indicators for this commercially important specie. In appendices 1, find a list of the fish species that were caught during the survey.

Table 5: Total *Pacific Herring* Caught Per Site

Sites	Herring
1. Casey Cove	1239
2. Okabe Shipyard	9250

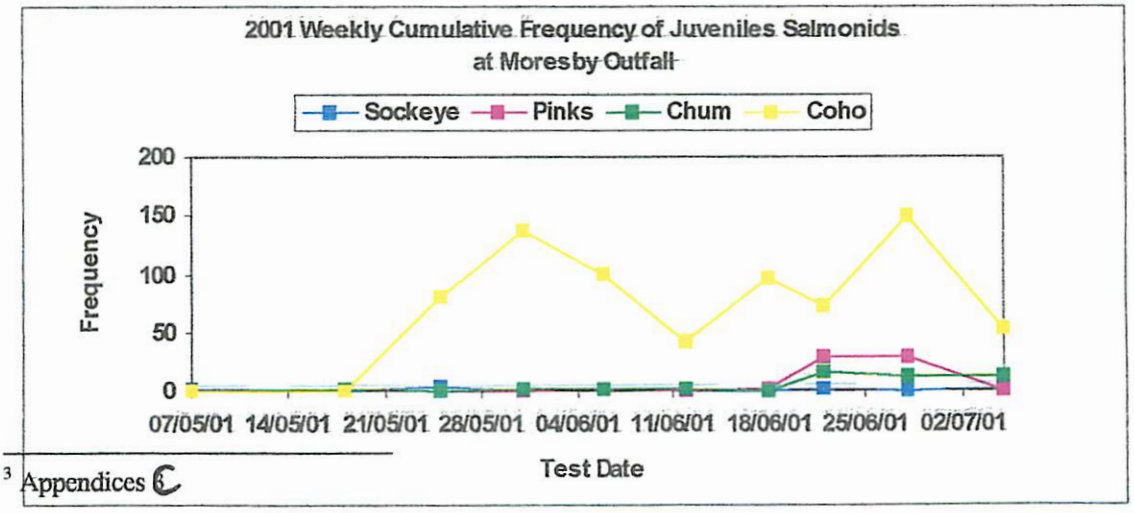
3. Vigilant Island	632
4. McLeans Shipyard	975
5. Sunshine Bay	519
6. Rivtow	80
7. Wainwright Basin-Pipeline	66
8. Wainwright Basin-Basso's	1277
9. Lelu Island	4343
10. Ridley Island-Across Pulp Mill	1070
11. Barrett Rock	124
12. Ridley Island-Sawmill	284

4.10. Auxiliary Sites.

Summarized here are the results of 5 of the 7 auxiliary sites included in the survey: Moresby Creek Outfall, Kwinitsa Station, Kloyia Bay, Miller Bay-Outside, and Miller Bay-Hospital. As mention in the methodology, the fishing and sampling method used at these sites was slightly different. Only 2 sets per test were performed and no weights were taken. Miller Bay sites were supposed to be auxiliary site but ended up being fished and sampled like the test sites i.e. 3 sets per test with weight samples. The Tsum Tsadai and Silver Creek results are not summarized here but were also combined into graphs[3]. Tsum Tsadai is actually located outside the Harbor limits therefore outside the scope of this survey. Nevertheless, this site was fished faithfully every week and can only be complementary to the survey. Silver Creek was only fished steadily by mid-June and for 4 weeks. Silver Creek site is also outside the Harbor limits.

4.10.1 Impacted Site: Moresby Creek Outfall.

Moresby Creek Outfall is located north of Bella Coola Fisheries Ltd. on Kaien Island in Prince Rupert Harbor. It lies on the south side of a culvert, which discharges both the Moresby Creek water with some city outfall. Riprap constitutes the substrate and has a steep sloped. Little to no vegetation is found at this site.



[3] Appendices C

Figure 13: 2001 Weekly Cumulative Frequency of Juvenile Salmonids at the Moresby Outfall.

Tests started at this site on May 6. **Sockeye** were present at this site but low frequency and inconsistently from May 7 until June 5. They peaked on May 25 with 3 samples. **Pinks** started to show later in the season, May 18, and were also present in low frequency until June 18. They peaked on June 28 with 30 samples. **Chum** started to show May 18 but inconsistently until June 22. They peaked on that date with 17 samples and were present at that site until the end of the survey. **Coho** were present at that site most steady and consistently from May 25 until the end of the survey. They appeared to have come in two waves: one with on May 31 with a peak of 137 samples and a second on June 28 of 150 samples. It is interesting to note that the number of **Coho** samples taken at this site, were the highest overall after the McLeans Shipyard site.

Like we mentioned in the introduction, DNA fin clippings of **Coho** were taken from the Harbor sites. A percentage of them were taken at the Moresby Creek Outfall site and for weeks that followed, clipped **Coho** were fished at that site, suggesting that they may be taking up residence.

4.10.2. Impacted Site: Kwinitsa Station.

The Kwinitsa Station site is located below the old Canadian Pacific Station or Kwinitsa Station on Kaien Island in Prince Rupert Harbor. For most this entire side of the island, riprap was used as landfill. The slope is steep and some vegetation like *Fucus sp.* and *Enteromorpha sp.* have started to colonize the substrate.

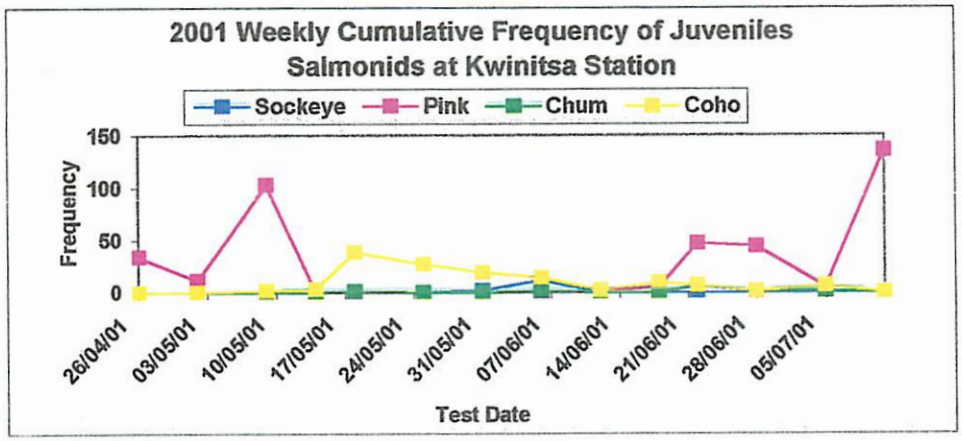


Figure 14: 2001 Weekly Cumulative Frequency of Juvenile Salmonids at the Kwinitsa Station.

Tests started at this site on April 26. **Sockeye** were present in low frequency and inconsistently from May 7 to July 5. They peaked on May 25 with 3 samples. **Pinks** seemed to have been present at the site in two waves. A first one between April 26 and May 9 with a peak on May 9 of 109 samples and the second one, between June 18 and July 11, with a peak on July 11, of 136 samples. **Chums** also were present in low frequency and inconsistently. They started to show May 18 through July 5 with a peak on

June 22 with 12 samples. And finally, Coho started to show on May 9 and were present consistently until July 5 and peaked on May 18 with 29 samples.

4.10.3. Impacted Site: Miller Bay-Hospital.

Miller Bay-Hospital site is located in on the east of Kaien Island, between Galoways Rapids to the south and Butzie Rapids to the north. In the 40s and 50s this foreshore was well used. The site lies on a rocky beach with a gentle slope. Little to no vegetation is found except for the upper intertidal zone where sedges and grasses grow abundantly.

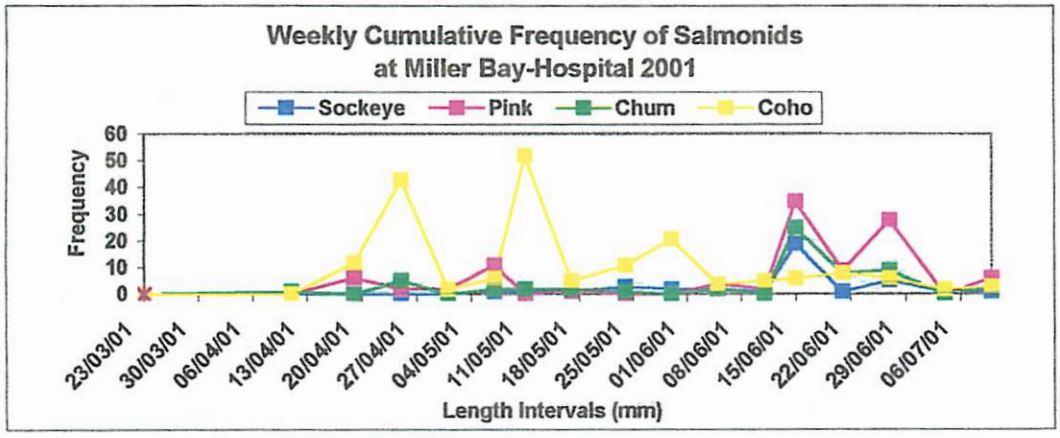


Figure 15: 2001 Weekly Cumulative Frequency of Juvenile Salmonids at Miller Bay-Hospital.

Tests at this site started March 23. Sockeye were present in low frequency but weekly from May 7 until the end of the survey. They peaked on June 15 with 19 samples. Pinks started to show on April 19 and seem to have shown in 2 waves. The first one from Aril 11 to May 7 with a peak on May 7 of 11 samples, and the second one from June 5 to July 10, with a peak on June 15 of 35 samples. Chums first showed on April 11 through July 10 but were present in low frequency and inconsistent throughout the survey. They peaked on June 15 with 25 samples. Coho were present at this site in relatively high and consistent throughout the survey. They first showed on April 19 and peaked on May 11 with 52 samples.

4.10.4. Non-Impacted Site: Miller Bay-Outside.

Miller Bay-Hospital and Outside were paired sites. Miller Bay-Outside is a little more exposed to the weather and has a dominant bedrock substrate, steep slope and some vegetation i.e. *Fucus sp.* and *Entomorpha sp.*

Figure 16: 2001 Weekly Cumulative Frequency of Juvenile Salmonids at Miller Bay-Outside.

Tests at this site started March 23. **Sockeye** started to show May 30 through June 27. They were present in low frequency and peaked on June 15 and 21 with 2 samples. **Pinks** were present from April 19 to June 27 in two wave. The first one on April 19 with 109 samples and numbers seemed to stay low until June 11 when they peaked again with 64 samples. They were last seen on June 27. **Chums** started to show April 11 and were present until the end of the survey. They seemed to have shown in higher frequency after June 11. They peaked June 11 with 24 samples. **Coho** first showed April 19 and were present until the end of the survey. They first peaked on May 17 with 13 samples and again on June 15 with 16 samples.

It is interesting to note that the **Coho** that showed at both Miller Bay-Hospital and Miller Bay-Outside sites, were mostly year old fish probably and most likely from Kloyia River. Few smolts were caught at this site.

4.10.5 Non-Impacted Site: Kloyia Bay.

The Kloyia Bay site is located on the east side of the Kloyia River estuary. This river is one of the few Chinook salmon producing river of this area. It also produces Sockeye and Coho salmon. The site lays on a bedrock substrate with steep slope and abundant vegetation: *Fucus sp.* and *Entomorpha sp.*. Sedges and Grasses are also abundant on the upper intertidal zone.

Figure 17: 2001 Weekly Cumulative Frequency of Juvenile Salmonids at Kloyia Bay.

Tests started at this site on May 1. **Sockeye** were present as soon as tests began on May 1 and showed steadily until May 30. **Pinks** were caught one single time on May 1 with 6 samples. Coho were also present as soon as tests began on May 1and were consistently, throughout the survey. They peaked on May 30 with 104 samples. No Chums or Chinook were caught at this site.

4.11. 2000 Results.

Beach Seine 2000 was not able to start before June 6, missing almost 2 months of survey time. Nevertheless, the crew was able to go out and fish for 7 consecutive weeks, 5 days per week. It was a first for the skipper and the crew at this type of survey. It took them a few weeks to get comfortable with the fishing technique and the sampling method. All but the catch per unit effort (CPUE) seems to have been carried out uniformly. This makes last year data questionable but not unusable. Without comparing numbers, we can look at species were there and where.

On at first glance **Sockeye** seem to have had a strong show last year compare to this year. They were present at most sites and in high frequency. This year **Sockeye** made appearances at a few sites and at fewer in high frequency. Also, last year, they seemed to have been present until later during the year compare to this year. Looking at McLeans Shipyard for example, **Sockeye** showed up until July 7 in 2000, and were last in 2001 on June 1.

Coho made few appearances last year compare to this year. Except for McLeans Shipyard and Vigilant Island, sample sizes did not raise above 10. This year **Coho** made strong appearances throughout the survey. Looking at Vigilant Island and McLeans Shipyard, we may have fished the tail end of the **Coho** migration but according to this year **Coho** seemed to be present at a few sites until late June. So the survey might have missed their migration completely or there may have been few **Coho** to speak of last year.

Chums seemed to have had little to no presence last year compare to this year. The only place they seemed to have showed in significant numbers was at Sunshine Bay and Rivtow. This year **Chums** were present in high frequency from the beginning until the end at most of the sites.

Pinks seemed to have has a stronger presence overall last year then for the same time this year. We know that **Pinks** are the first ones to go out with the first freshets therefore most of the **Pinks** were misted by the survey in 2000. Numbers also suggests that 2000 must have been a high frequency year for **Pinks**.

There were little to no Chinook to speak of this year. Last year, although never in high frequency **Chinook** showed some at most sites.

2. INTRODUCTION

The Intertidal Foreshore Juvenile Salmonids Density Project was developed to compliment previous studies[1] that focused on intertidal foreshore classification of Kaien Island, Digby Island, Prince Rupert and Port Edward Harbours[2]. These studies determined the relative amount of intertidal vegetation and substrate types, and were accomplished by a combination of multispectral imagery and ground thruthing.

The intertidal foreshore provides an essential component in the life cycle of salmonids and other fish. Human economic activity competes for many of the same areas of intertidal foreshore. This project was design to look at the utilisation of the intertidal foreshore of Kaien Island, Digby Island, Prince Rupert and Port Edward Harbour by juvenile salmonids. This was accomplished by comparing the fish productivity of specific sites of intertidal foreshore areas directly impacted by human development, with non-impacted impacted intertidal foreshore areas.

This project was initially designed to encompass the spring and summer period of juvenile salmonids presence for 2 years beginning 2000 and 2001. Administrative delays did not permit complete coverage in the year 2000, however work in 2001 was carried out as planned.

3. METHODOLOGY

To provide an accurate picture of the seasonal utilisation of the intertidal foreshore by juvenile salmonids, the importance of a standard method of data collection is crucial. This was accomplished by using a constant fishing effort and by reducing the number variables between site to a minimum.

Twelve sites were originally selected. Six of the sites were impacted sites and each one of them was paired to a non-impacted site with similar bio-physical characteristics i.e. tidal influences, substrate type, slope gradient, Looking at the list of the 12 site below, odd number numbered sites were the impacted sites and each one of them was paired with the even numbered non-impacted site directly across.

Test Sites[3]

Impacted Sites	Non-Impacted Sites
1. Okabe Shipyard	2. Casey Cove
3. McLeans Shipyard	4. Vigilant Island
5. Rivtow	6. Sunshine Bay
7. Wainwright Basin, Basso	8. Wainwright Basin, Pipeline
9. Porpoise Harbour, Across Pulp Mill	10. Porpoise Passage, Lelu Island
11. Ridley Island, Sawmill	12. Barrett Rock

[1] References to reports
[2] Survey maps

Six additional sites were selected as auxiliary sites. These sites were included in the survey as time progressed and were chosen for reason specific to their location and site characteristics (in brackets).

Auxiliary Sites

Impacted Sites

1. Moresby Creek Outfall: next to sewage outfall.
2. Kwinitsa Station: next to contaminate site.
3. Miller Bay-Hospital: ?

Non-Impacted Sites

3. Miller Bay-Outside: typical non-impacted Miller Bay foreshore.
4. Kloyia Bay: next to Kloyia Creek, which produces all 6 species of salmon.
5. Silver Creek: head of Prince Rupert Harbour.
6. Tsum Tsadai: proximity to Skeena River estuary.

To fish the crew used an 18' foot Smokercraft Aluminium Skiff powered by a 75-hp outboard. The net used for the study was a beach seine measuring 6' X 100' feet using one-quarter inch mesh in the wings and one eight inch mesh in the bunt.

With one deckhand holding one end of the net on the beach, the net was fully deployed slowly from the skiff as it moved in reverse away from the beach. The net was slowly towed in a circle back to the beach forming an enclosure. The boat back on the beach, the net was retrieved onto it by hand with one person pulling the lead line and two persons retrieving the cork line. The towing time was recorded from the time the net was initially deployed until the lead line was fully retrieved. Towing time was recorded every set and the mean set time for all sets was 7 minutes. The catch was removed from the bunt of the net into tots and the net fleeted onto the bow of the vessel. Subsequently, the captured fishes were identified, tallied and the juvenile salmonids were measured for length and weight, immediately before the following set. All fish caught were held until the third set. completion of the 3rd set, were released, & after weighing

Because of the difficulty in sampling the entire catch especially when fish were caught in large numbers it was decided to use a minimum and maximum sub-sample size of 100. For example, in a catch of more then 100 juvenile salmons, only a 100 were measured. The reminder was counted. As for the weight sampling , up to a maximum of 10 weights were taken per species per test. For example, if the first test yielded 1 coho, and the second set yielded 25, 9 additional coho weight were taken. This completed the weight sampling for that test. Non-salmonids, including *Pacific Herring* were identified and counted.

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[3] Photos

A single test or unit of effort, consisted of 3 consecutive sets. One set was played with the tide, the second against it and the set that yielded the most fish was the direction taken for the third and last set thus completing the unit of effort. Because of time constraints, unit of effort at auxiliary sites consisted of 2 consecutive sets rather then 3, and no weight samples were taken.

The objective of a constant fishing effort requires that all the tests be executed at the same time and/or at the same tide levels. It was decided that all tests and sampling activities were to take place within the bracketed Hydrographic Service booked high tide, a time when fish activities are taught to be at their peaks. Also, because of time constraints, not all tests or unit of effort could be performed on high tide but rather mostly occurred before or after the tide. To compensate for this and to maximise coverage, if a test was performed just prior to high tide testing at the same site the following was deliberately timed to commence immediately following booked high tide.

All of the catch information was recorded on data sheets[4] and entered in a database created for the purpose of the survey. In addition to the set times, weather condition and surface temperatures were also recorded. The dominant substrate, the sub-dominant substrate, vegetation type and slope gradient were initially recorded for each site.

—Discussion development —

During the course of the survey, the DFO Stock Assessment Department requested that the survey collect DNA analysis from 100 clipped coho. Samples were to be taken from the Prince Rupert Harbour sites and the number of fin clips were to be allocated according to the percentage of total salmonid catch represented by coho. For example if 60% of the coho taken from McLeans Shipyard site, then 60 fin clips were taken from that site. The results have not come back to us as yet.

Non-salmonids were also an important component of the overall catch results. A wide variety of fishes were caught all of which were recorded[5] and counted. Because of the specific commercial importance of *Pacific Herring*, we have summarised the results for this specie. Application of this constant effort methodology began mid-season in the year 2000 (June 6). The failure to detect the commencement of the juvenile salmonids migration significantly reduces the value of year 2000 data and resulted in a great difference in effort between 2000 and 2001.

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[4] Data Sheet
[5] Species list

4 RESULTS

The weekly cumulative frequency of juvenile salmonids graph represent the cumulative sub-samples of a test i.e. 3 sets per site per date for the duration of the survey. For example, looking at **Figure 1**, at Casey Cove on April 12, 2001, a total of 259 juvenile Pink salmon and a total of 16 juvenile Chum salmon was sub-sample for that test. As a sub-sample, this number represented a portion of the total amount of salmonids caught for that test at that site for that date. Where, total test numbers of juvenile were less then 100 per set the numbers are absolute, thus the cumulative frequency graph are a mix of absolute and relative numbers. Total amount for this test was 754 fish. Total catch[6] numbers for each site and for the entire survey can be found in appendices F.

4.1. Paired Sites Prince Rupert Harbour no.1.

4.1.1. Casey Cove.

Casey Cove is located on Digby Island, southeast of the Prince Rupert Harbor Fairview Terminal. The site is located on the north side of the cove and lays on a gradual sloping beach composed of cobble and gravel substrate. A 2 to 3 meters edge of sea grasses grows on the surf zone where dead seaweed, wood and debris also accumulate.

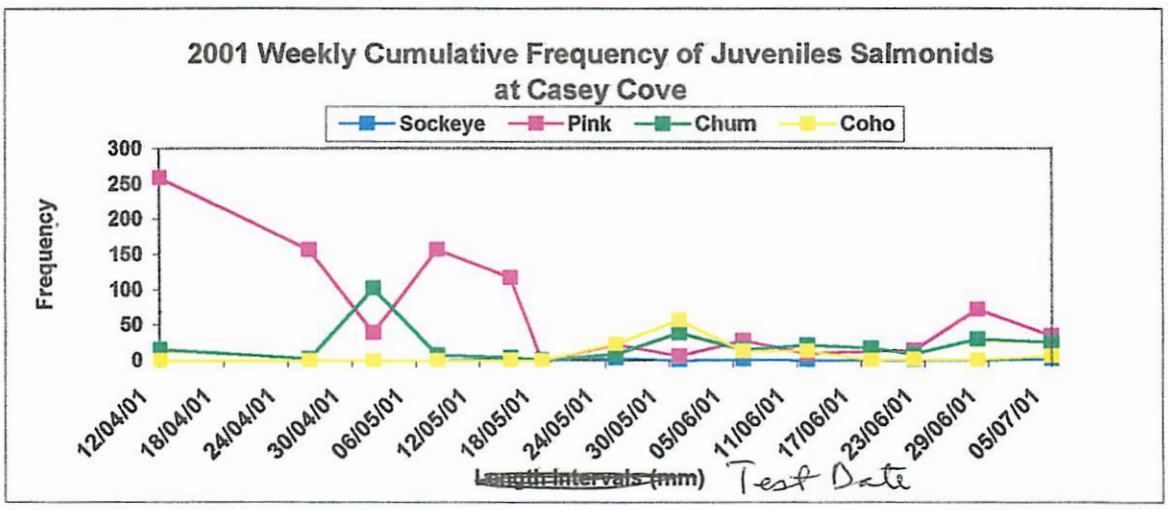

Figure 1: 2001 Weekly Cumulative Frequency of Juveniles Salmonids at Casey Cove

Pinks were present in large numbers at this site for the duration of the survey. More then 60% were caught between April 12 and May 15. They peaked on April 12 with 259 samples. Chums were present consistently at this site from the beginning until the end of the survey. They peaked on May 2 with 102 samples. Coho started to show by May 25 and were present until July 10 with the majority caught between May 25 and June 12 with a peak on May 31 of 58 samples. Sockeye made small and sporadic appearances between May 15 and July 5. No Chinook were caught at this site.

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[6] Appendices F: Total catch numbers.