

Skeena River Eulachon Studies:

2005 Data Report

Adult Sampling and Distribution Egg Incubation Distribution

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Table of Contents

1	Introduction.....	1
2	Objectives	1
3	Methods	1
3.1	Adult Eulachon Sampling.....	2
3.2	Egg Location Sampling	2
3.3	Eulachon Larvae Sampling.....	2
3.4	Salt Wedge Penetration.....	2
3.5	Water Temperature	3
3.6	Data Management and Quality Assurance	3
3.7	Safety	3
4	Results.....	3
4.1	Adult Eulachon Sampling.....	3
4.2	Egg Location Sampling	9
4.3	Eulachon Larval Sampling	11
4.4	Salt Wedge Penetration.....	11
4.5	Temperature.....	15
5	Other Information	15
6	Recommendations for Future Studies	16

List of Tables

Table 1: Fish Sampling ID, Locations, Dates, and Catch.....	5
Table 2: Salinity Profile Locations and Measurements	12

List of Figures

Figure 1: Location of Adult Eulachon Sampling Areas.	4
Figure 2: Eulachon Captured (by Sex)	6
Figure 3: Female Eulachon Spawning Condition	7
Figure 4: Male Eulachon Spawning Condition	7
Figure 5: Fork Length per Catch	8
Figure 6: Average Weight per catch (by Sex)	9
Figure 7: Eulachon Incubation Areas and Egg Sampling Sites.....	10
Figure 8: Location of Salinity Testing and Salt Wedge	14
Figure 9: Skeena River Temperature Data, March 8 - May 5, 2005.	15

List of Appendices

- Appendix I: Project Data Forms
- Appendix II: Completed Fish Sampling Forms
- Appendix III: Completed Adult Biological Data Forms
- Appendix IV: Completed Egg Density Sampling Forms
- Appendix V: Completed Salinity Profile Sampling Map and Data Sheets
- Appendix VI: Completed Daily Work Summary Forms
- Appendix VII: Completed Tailgate Safety Meeting Forms
- Appendix VIII: Completed Quality Assurance Forms

1 INTRODUCTION collected using smelt gillnets, 7.5 metres long by 2 metres deep
In the early winter of 2005, the Department of Fisheries and Oceans funded a study of Skeena River eulachon. The study was implemented through the collaboration of Kalum Fisheries and Metlakatla Fisheries, with project management and technical support from Cambria Gordon Ltd. (Terrace, BC). Field work occurred from February through April 2005.

Eulachon (*Thaleichthys pacificus*) spawn in some of the large rivers of the Pacific Coast between Alaska and California. They are a small fish of the smelt family with sizes around 150-220 mm and weights around 35-55 grams. These anadromous fish spend much of their lives at sea and return to fresh water to spawn. It is believed that Skeena River eulachon die after spawning. This is because 'toothed' eulachon have not been found in the Skeena River, and 'toothless' eulachon have not been found in the ocean. In some other rivers it is believed that the some of the fish return to the ocean after spawning (Doug Hay, 2002, ESC mtg).

First Nations people have relied on the eulachon fisheries for food, trade and for survival. Villages that had access to eulachon would trade the oil and the fish with interior villages for supplies that could not be found on the coast. These *grease trails* are a key part of First Nations history in BC.

The lower Skeena River eulachon run starts the annual food gathering cycle for the Tsimshian people. The name *hali'mootk* means *savior fish* in Sm'algyax because it was the first food source to come up the river in the spring (Theresa Ryan, 2002, ECS mtg). The eulachon from the Skeena River were not used for grease, as they were considered large and too dry (as compared to the Ecstall eulachon that were used for grease) (Theresa Ryan, 2002 ECS mtg).

2 Objectives

The objectives of this study were to:

1. Identify areas of eulachon habitat in the lower Skeena River, specifically:
 - a. Identify spawning areas and describe habitat parameters
 - b. Identify egg incubation areas and describe habitat
2. Collect population data of adult eulachon (sex ratio, length, spawning condition)
3. Collect water temperature data in the lower Skeena River
4. Identify the zone of salt water wedge intrusion at high tide

3 Methods

Field work was lead by Don Roberts with assistance from William Benyon, Dale Roberts, Troy Sam, Allen Helin and Penny White. Work was completed from shore or from Don Robert's jet boat.

3.1 Adult Eulachon Sampling

Adult eulachon were collected using smelt gill nets, 7.5 metres long by 2 metres deep with a 3.5cm mesh. Nets were set in areas suitable for sampling, and left for varying time periods, from 2 – 24 hours. During the peak run time, the nets were left in for shorter periods of time because of the high catch. As the run decreased, the nets were left in for longer time periods. In each catch up to 100 fish were sampled for sex, fork length, weight, and spawning condition. These fish were taken back to Kitsumkalum to be sampled. Fork lengths were measured using a 300mm fry board, weights were measured to the nearest 0.1g using a CS 200 Ohaus scale, and spawning condition was assessed by squeezing the abdomen of the fish to express eggs or milt. Fish were characterized as unspawned, partially spawned or spawned.

3.2 Egg Location Sampling

A 6 inch square Mighty Grab benthic grapple sampler was used to sample for eggs. The grapple was lowered from the boat (while drifting in the current) to the bottom, and then retrieved. The substrate collected was emptied into a pan and inspected for eggs. We had initially anticipated that eggs could be counted from these samples in the field, however this turned out to be impractical, so samples were noted for presence/absence and relative abundance. Where egg incubation areas were documented, general habitat parameters were observed.

3.3 Eulachon Larvae Sampling

Sampling of eulachon larvae was not part of the project plan, but was undertaken occasionally by the crew to further their own understanding of the eulachon run. A 50 cm diameter plankton tow was set for 5 minutes from the back of the anchored jet boat in locations downstream of known spawning areas. The samples were inspected for larvae on board the boat in a shallow clear plastic container.

3.4 Salt Wedge Penetration

Salt water typically penetrates rivers in a wedge on the river bottom which travels upstream as the tide rises. During the highest tides in March and April a (YSI 85) salinity meter was used to measure salinity through the water column. The probe of the meter was typically lowered to the bottom of the river, and salinity was recorded at the bottom, and through the water column to the surface. If no salinity was found, the crew moved further downstream and sampled again to look for the leading edge of the salt water wedge.

As eulachon eggs do not incubate successfully in saltwater, the limit of the salt water wedge at high tide should mark the downstream boundary of potential eulachon spawning and incubation habitat.

3.5 Water Temperature

Onset Stowaway Tidbit temperature data loggers were launched March 8, 2005 and set to log temperature every 2 hours. Logger named Skeena #1 (Serial# 806363/9/4) was set in the eddy below Don Roberts cabin in ~ 2 meters of water at 1030 hrs. Loggers named Skeena #2 (Serial # 806362/9/4) and Skeena #3 (Serial # 806364) were set at GPS - N 54°13'58.3" - W129°29'40.3" in ~ 2 meters of water at 1130 hrs.

3.6 Data Management and Quality Assurance

Data forms (Appendix I) were produced for each aspect of the study and were completed by the field crew. Dave Taft from Cambria Gordon Ltd did quality assurance inspections by inspecting all of the forms during his weekly field inspection and discussing all aspects of the field work with the field crews.

3.7 Safety

Safety tailgate meetings were held each field day and recorded on the safety forms.

4 Results

4.1 Adult Eulachon Sampling

Adult eulachon sampling commenced on February 25, 2005 and continued until April 25, 2005. Figure 1 shows the locations of the sampling sites and included cross references to the completed Fish Sampling Forms (Appendix XX) Nets were set at the following locations:

1. Khyex
2. Kwinitsa Boat Launch (Kwinitsa)
3. Don Robert's Cabin (DR Cabin)
4. Snowbound Creek
5. Kasiks Side Channel at the Skeena River (Kasiks S/C)
6. Alder Creek
7. Scotia River (this was only sampled once as there were gulls in the area)
8. Feak Point (only sampled once)

45 net sets were completed during the 2 months of the project. Table 1 shows the sampling locations and dates, the set time, and catch of males and female eulachon.

A total of 4424 adult eulachon were caught of which 1618 were sampled for length, weight and spawning condition. Of those sampled, 79% were male (1276 fish) and 21% were female (342 fish). The nets were set for an average of 12 hours and 24 minutes but that actual net times ranged from 25 minutes to 26.5 hours.

Table 1: Fish Sampling ID, Locations, Dates, and Catch

Data form ID	Set Location	Date	Set time (hours)	# males caught	# females caught	Total Fish Caught
F01-02-25	Khyex	Feb 25	7.00	90	40	130
F02-02-25	Kwinitsa	Feb 25	24.08	149	31	180
F03-02-25	Kwinitsa	Feb 25	24.17	368	19	387
F04-02-25	DR Cabin	Feb 25	2.75	12	2	14
F05-02-26	Khyex	Feb 26	4.92	111	147	258
F06-03-01	Khyex	March 1	27.33	92	76	168
F07-03-01	Kwinitsa	March 1	21.67	238	122	360
F08-03-01	Kwinitsa	March 1	21.12	136	76	212
F09-03-01	DR Cabin	March 1	2.42	17	10	27
F10-03-01	Snowbound	March 1	19.90	270	122	392
F11-03-01	DR Cabin	March 1	18.47	135	90	225
F12-03-02	Kasiks S/C	March 2	0.50	0	0	0
F13-03-07	Khyex	March 7	24.00	23	5	28
F14-03-07	DR cabin	March 7	7.00	328	32	360
F15-03-07	Snowbound	March 7	3.38	216	7	223
F16-03-07	Kasiks S/C	March 7	0.42	0	0	0
F17-03-07	Snowbound	March 7	20.60	733	0	733
F18-03-07	DR Cabin	March 7	17.17	349	11	360
F19-03-08	DR Cabin	March 8	20.83	99	2	101
F20-03-13	Khyex	March 13	7.95	15	3	18
F21-03-13	DR Cabin	March 13	5.75	212	4	216
F22-03-13	Alder	March 13	3.30	4	0	4
F23-03-13	Snowbound	March 13	2.20	0	0	0
F24-03-21	Khyex	March 21	7.17	0	0	0
F25-03-21	DR Cabin	March 21	5.02	5	0	5
F26-03-21	Snowbound	March 21	3.00	0	0	0
F27-03-21	Alder	March 21	18.50	6	0	6
F28-03-21	DR Cabin	March 21	17.47	0	0	0
F29-03-22	DR Cabin	March 22	5.47	0	0	0
F30-03-28	DR Cabin	March 28	25.12	3	1	4
F31-03-28	Alder	March 28	26.47	1	0	1
F32-03-29	DR Cabin	March 29	5.63	0	0	0
F33-04-06	Khyex	April 6	4.50	0	1	1
F34-04-06	DR Cabin	April 6	5.12	0	0	0
F35-04-06	Alder	April 6	4.25	0	0	0
F36-04-08	Khyex	April 8	4.42	1	0	1
F37-04-08	Kwinitsa	April 8	3.90	0	0	0
F38-04-08	DR Cabin	April 8	4.57	0	0	0
F39-04-11	Khyex	April 11	24.00	0	1	1
F40-04-11	Scotia	April 11	24.25	0	0	0
F41-04-11	DR Cabin	April 11	23.83	0	0	0
F42-08-18	DR Cabin	April 18	23.42	0	0	0
F43-04-18	Alder	April 18	23.30	1	0	1
F44-04-19	Feak Point	April 19	3.75	0	0	0
F45-04-25	DR Cabin	April 25	8.30	4	4	8

The total catch of eulachon throughout the sampling period is shown in Figure 2

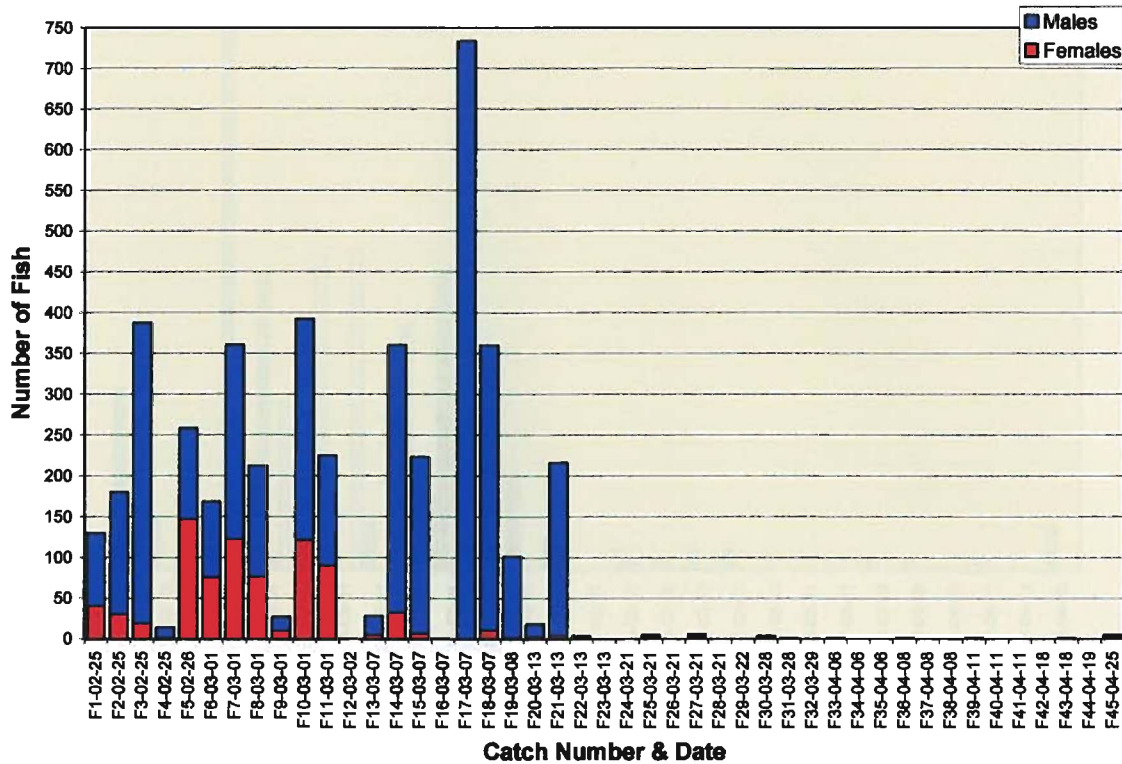


Figure 2: Eulachon Captured (by Sex)

The spawning condition of females may be the best indication of run-timing. Female eulachon appear to spawn shortly after entering the river and leave immediately afterwards while male eulachon appear to remain in the river for several weeks. Unspawned females were captured on the first sampling day (February 25) suggesting that the run had started prior to this date. Don Robert's field observations prior to February 25 suggest that the run started about February 20. Figure 3 shows the spawning condition of all females sampled (n=342) during the program, and shows that the main spawning run of females was over by March 7, although occasional unspawned females were captured on April 25 suggesting that a small portion of the run (or separate spawning populations) continue to enter the river throughout the spring. Local knowledge indicates that gravid female eulachon are still present in the river in June (Don Roberts, Pers. Comm.).

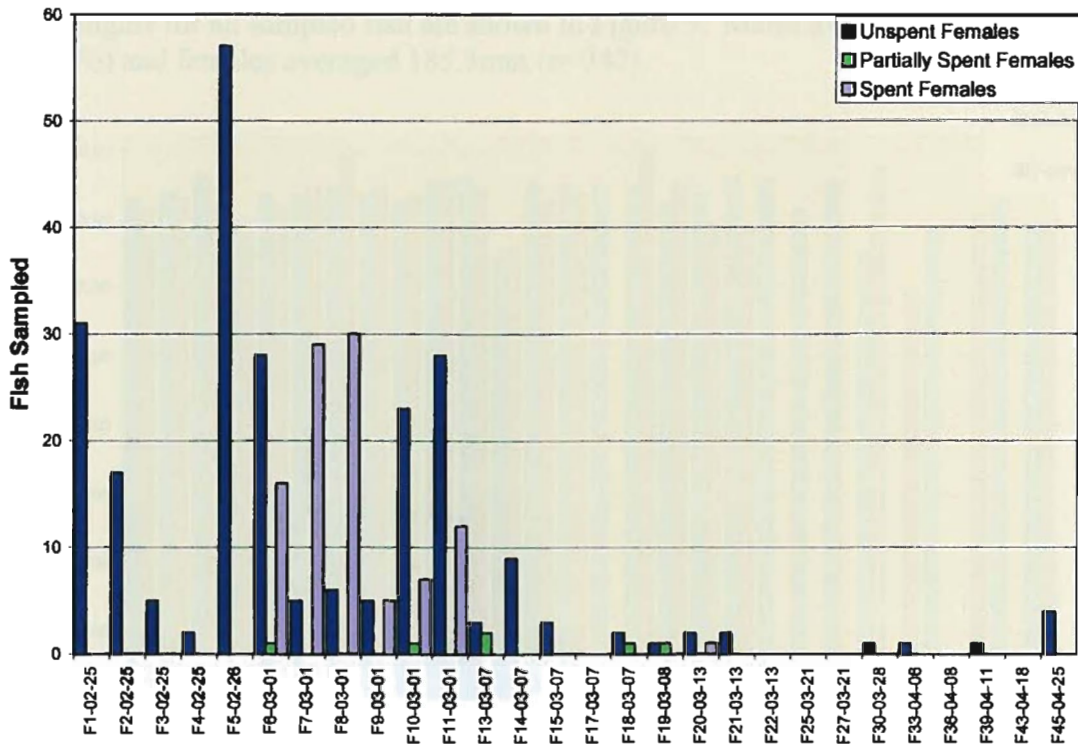


Figure 3: Female Eulachon Spawning Condition

The spawning condition of males sampled (n=1276) is shown in Figure 4 and supports the run timing demonstrated by the females sampled.

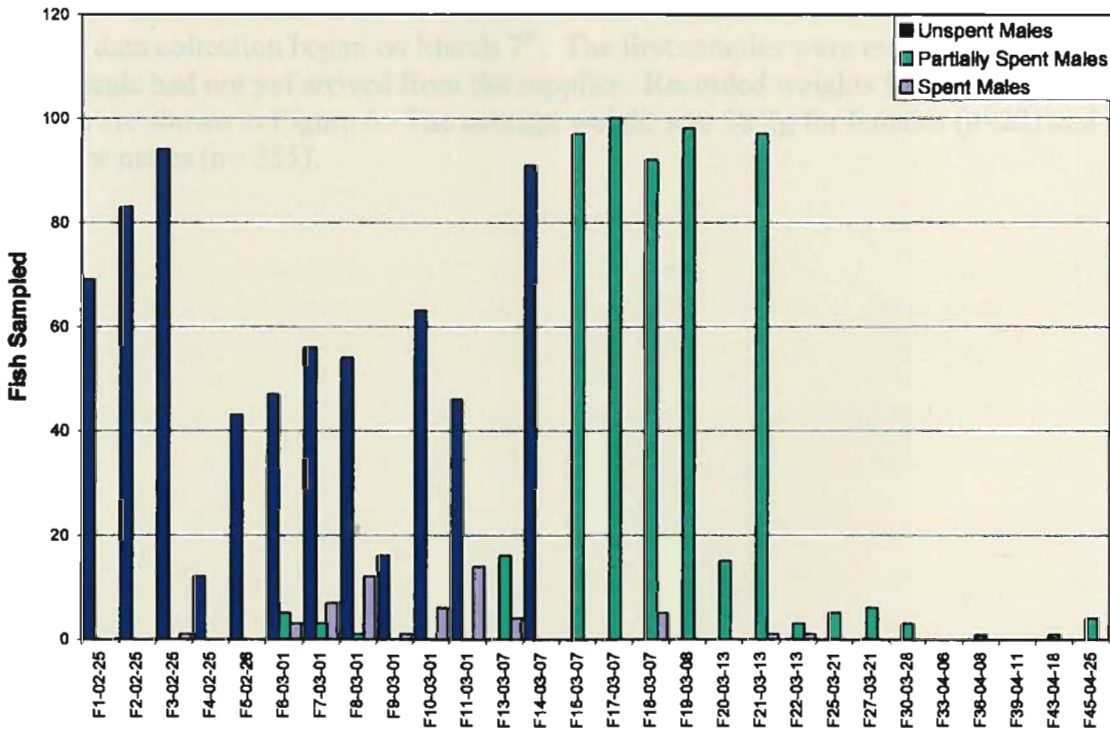


Figure 4: Male Eulachon Spawning Condition

Fork lengths for all sampled fish are shown in Figure 5. Males averaged 186.7 mm (n=1276) and females averaged 185.3mm (n=342).

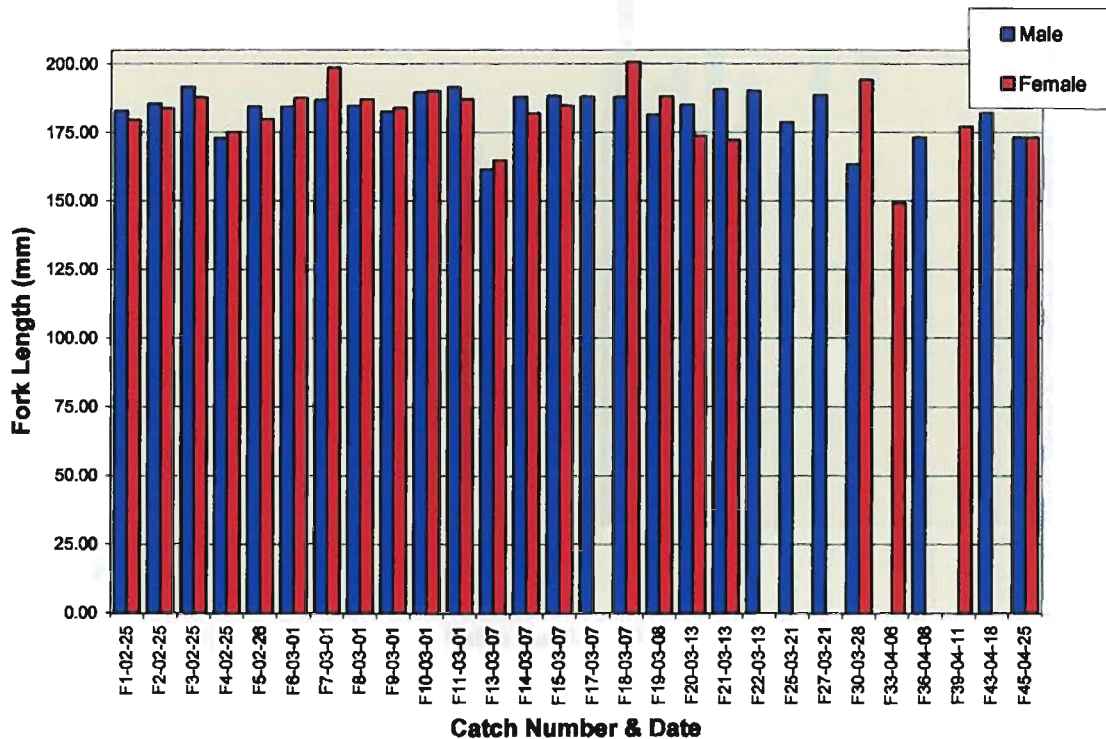


Figure 5: Fork Length per Catch

Weight data collection began on March 7th. The first samples were missed because the weigh scale had not yet arrived from the supplier. Recorded weights for males and females are shown in Figure 6. The average weight was 38.2g for females (n=22) and 43.2g for males (n= 355).

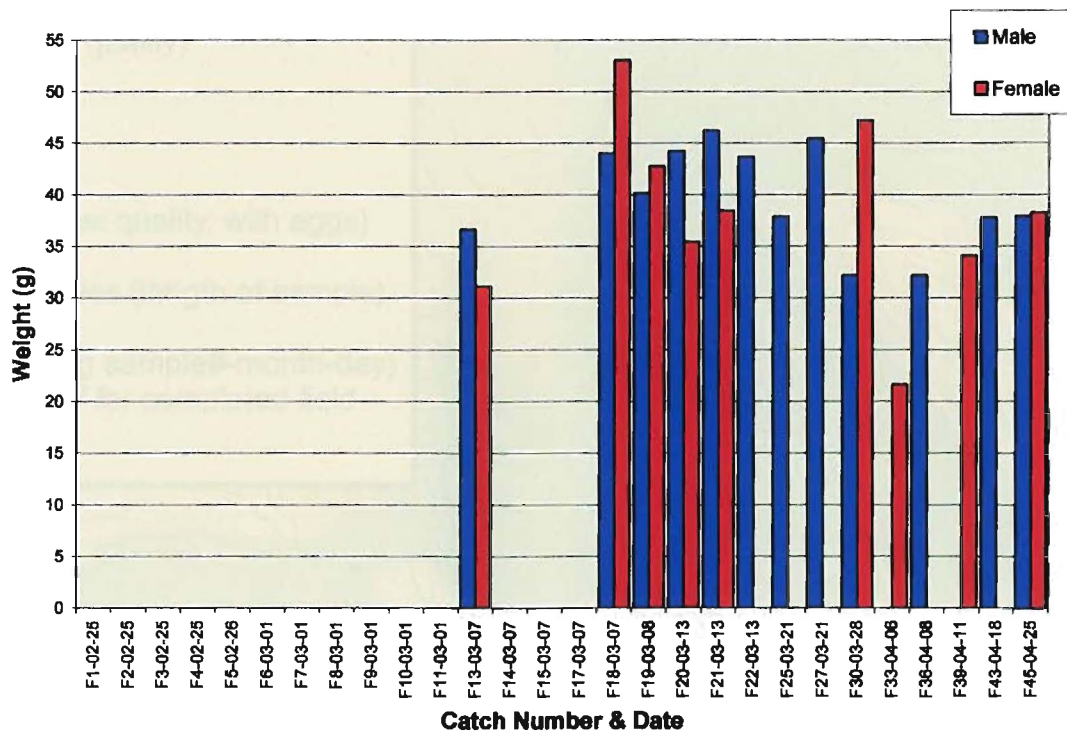


Figure 6: Average Weight per catch (by Sex)

4.2 Egg Location Sampling

Egg grapple sampling occurred in numerous locations from the Khyex River, upstream to the Kasiks River. Figure 7 shows the drifts where continuous grappling occurred, and the main egg incubation areas identified. As the project was not able to provide the resources needed to quantify the densities of eggs, a qualitative system (based on the relative # of egg clusters in each sample) was developed by Don Roberts. This ranking ranged from 1 (highest density) to 6 (lowest density).

A total of 12 areas were identified as supporting eulachon incubation habitat. Figure 7 shows the location and relative ranking of each egg site. Copies of the egg sampling field forms are in Appendix IV. Generally, the habitat at these incubation sites can be characterized as relatively deep areas (5-7 m) with uniform flow. The eggs were found in coarse pepper-sized sand areas, often with gravel and cobbles around the sand.

4.3 Eulachon Larval Sampling

The larval sampling was done to determine potential egg locations. The plankton tow was put onto the boat and if larvae were found in the net, egg grappling was done upstream. Due to project time and budget constraints, no data were collected. Observations of larvae were recorded on the egg sampling field forms.

4.4 Salt Wedge Penetration

Eulachon are broadcast spawners that spawn only in fresh water. By determining the location of the salt wedge, the lower edge of the spawning and egg incubation locations could be determined. Figure 9 shows the locations where the salinity was tested and where the salt wedge was located. Copies of the salinity profile data sheets are also included in Appendix V.

Twenty five salinity profile data were collected at 19 locations from Snowbound Creek, downstream to De Horsey Island at the mouth of the Skeena River. The saltwater wedge was located opposite the north end of De Horsey Island where salinity was measured (during the high slack tide of 6.0 m) at 10.6ppt at the surface and 17.1ppt at 14m. Salinity concentrations declined in the profiles upstream to 2.5ppt at 14.2m depth opposite the mouth of the Ecstall River.

The following table summarizes the salinity profile data.

Skeena River Eulachon Studies: 2005 Data Report

Table 2: Salinity Profile Locations and Measurements

Date	Number & Location	Depth (m)	Salinity (ppt)	Temperature °C	Tide (m)
March 21, 2005	S#- 01-03-21 DR Cabin	Bottom	-	0.9	1.8
	S# 02-03-21 East Kwinitza	Bottom	-	1.0	3.1
	S# 03-03-21 Snowbound Creek	Bottom	-	1.3	3.1
March 28, 2005	S# 04-03-28 Kwinitza	0.0	0.0	3.3	5.8
		1.0	0.0	3.3	5.8
		2.0	0.0	3.3	5.8
		3.0	0.0	3.3	5.8
		4.0	0.0	3.3	5.8
		14.0	0.0	3.2	5.8
	S# 05-03-28 East Carnation	0.0	0.0	3.3	5.8
		8.0	0.0	3.3	5.8
	S# 06-03-28 Scotia Creek	0.0	0.0	3.3	4.8
		10.0	0.0	3.3	4.8
	S# 07-03-28 Scotia Log Dump	0.0	0.1	3.4	4.8
		10.0	0.1	3.4	4.8
S# 08-03-28 DR Cabin	0.0	0.0	3.3	4.8	
	12.0	0.0	3.3	4.8	
April 6, 2005	S# 09-04-06 Khyex Bridge	0.0	0.0	5.0	4.4
		2.5	0.0	5.0	4.4
	S# 10-04-06 Khyex Bridge	0.0	0.0	5.6	5.8
		2.5	0.1	5.6	5.8
		2.9	0.3	5.6	5.8
		3.9	0.2	5.5	5.8
	S# 11-04-06 Kwinitza	0.0	0.0	5.7	4.8
		12.2	0.0	5.6	4.8
	S# 12-04-06 DR Cabin	0.0	0.0	5.7	4.8
		7.0	0.0	5.6	4.8
	S# 13-04-06 Old Tunnel	0.0	0.0	5.6	4.8
		13.0	0.0	5.6	4.8
	S# 14-04-06 Old tunnel	0.0	0.0	5.7	4.8
		6.0	0.0	5.6	4.8
	S# 15-04-06 Above Khtada	0.0	0.0	5.6	4.8
		8.8	0.0	5.5	4.8
	S# 16-04-06 Scotia	0.0	0.1	5.6	4.8
		6.8	0.1	5.6	4.8
S# 17-04-06 SW Carnation	0.0	0.1	5.7	3.5	
	13.0	0.1	5.6	3.5	
April 25, 2005	S# 18-04-25 De Horsey Is.	0.0	10.6	9.9	6.0
		2.0	16.0	8.9	6.0
		5.0	16.3	8.9	6.0
		10.0	17.0		6.0
		14.2	17.1	8.9	6.0
	S# 19-04-25 Shirley Sawmill	0.0	11.4	9.4	5.9
		2.0	12.1	9.4	5.9
		5.0	12.9	9.1	5.9
		10.0	13.4	9.1	5.9
		14.2	13.6	9.1	5.9

Skeena River Eulachon Studies: 2005 Data Report

Date	Number & Location	Depth (m)	Salinity (ppt)	Temperature °C	Tide (m)
April 25, 2005	S# 20-04-25 Veitch Rock Pt.	0.0	9.2	9.7	5.9
		2.0	10.9	9.2	5.9
		5.0	11.8	9.1	5.9
		10.0	11.9	9.1	5.9
		14.2	12.5	9.1	5.9
	S# 21-04-25 Mowitch Pt.	0.0	2.6	9.5	5.9
		2.0	3.1	9.3	5.9
		5.0	7.9	9.2	5.9
		10.0	8.6	9.2	5.9
		14.2	8.8	9.2	5.9
	S# 22-04-25 Pt. Essington	0.0	2.1	9.5	5.9
		2.0	3.0	9.3	5.9
		5.0	4.3	9.2	5.9
		10.0	6.3	9.2	5.9
		14.2	6.6	9.2	5.9
	S# 23-04-25 Raspberry Is.	0.0	0.7	8.9	5.9
		2.0	0.7	8.9	5.9
		5.0	1.0	8.9	5.9
		10.0	1.9	9.0	5.9
		14.2	2.5	9.1	5.9
	S# 24-04-25 Tyhee Towers	0.0	0.1	8.6	5.9
		2.0	0.2	8.4	5.9
		5.0	0.3	8.3	5.9
		10.0	0.5	8.5	5.9
		14.2	0.5	8.5	5.9
S# 25-04-25 Aberdeen	0.0	0.0	8.3	5.9	
	12.2	0.0	8.3	5.9	

4.5 Temperature

Temperature data were successfully downloaded May 5 from only 1 of the 3 loggers launched (identified as Skeena #1, set in the back eddy below Don Robert's cabin). The other loggers could not be found (they had either been stolen or lost to floating debris, or obscured by the high river levels). The temperature data of the Skeena River at this location is shown in Figure 8. The temperature logger continues to log temperature every 2 hours at this location, and will be downloaded in 2006 should funding permit. Raw temperature data remains on file at Cambria Gordon Ltd's office in Terrace.

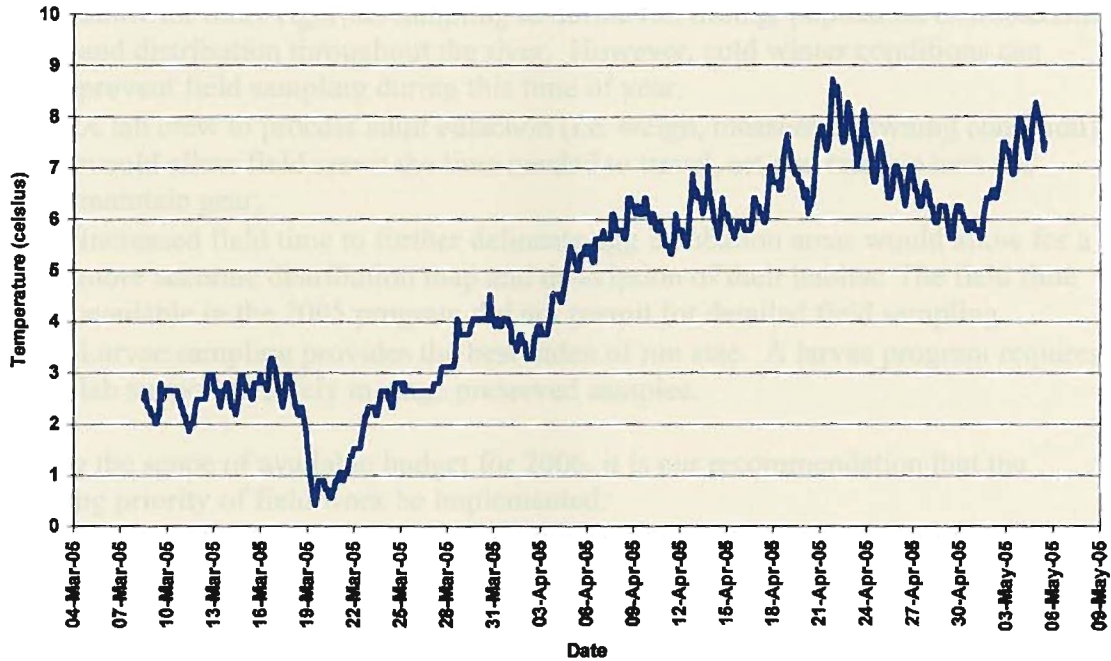


Figure 9: Skeena River Temperature Data, March 8 - May 5, 2005.

5 Other Information

Daily work summary forms were completed for each field day on the project. Copies of these are included in Appendix VI.

Safety issues were well managed during the project. Tailgate safety meetings were held each field trip, and were documented on the Tailgate Safety Meeting Form, copies of which are included in Appendix VII.

No substantial quality assurance issues were identified during the project. Completed Quality Assurance Forms are included in Appendix VIII.

6 Recommendations for Future Studies

The budget allocated for this project allowed for regular, but very brief field assessments, with minimal support, lab and reporting time. The following recommendations are provided to improve the project should it be funded in 2006:

- Project planning and preparation should be complete and funding in place well in advance of the start of the eulachon run (i.e. by January 15). This would allow for the mobilization of all gear in advance of any fish coming in the river.
- Given that most of the spawning appears to occur over a 2-3 week period in late February and early March, further field time invested during this period would allow for more rigorous sampling to define run timing, population characteristics and distribution throughout the river. However, cold winter conditions can prevent field sampling during this time of year.
- A lab crew to process adult eulachon (i.e. weigh, measure, spawning condition) would allow field crews the time needed to travel, set and retrieve nets and maintain gear.
- Increased field time to further delineate egg incubation areas would allow for a more accurate distribution map and description of their habitat. The field time available in the 2005 program did not permit for detailed field sampling.
- Larvae sampling provides the best index of run size. A larvae program requires lab support to safely manage preserved samples.

Pending the scope of available budget for 2006, it is our recommendation that the following priority of field work be implemented:

1. Implement a detailed and more rigorous egg sampling program. This work has the flexibility to be done when river conditions are safe for the crew (i.e., in March and April, and avoiding whether events). The work is relatively simple to do and can provide a relative index of run size as well as spawner distribution. It may not be practical to expect a qualitative study as it is very difficult to sample the substrate in a consistent manner (the grapple sampler does not consistently capture substrate).
2. Implement a qualitative larvae program. This will require lab support.
3. Increase sampling effort at the beginning of the run.