

Prevalence of Sea Lice *(Lepeophtheirus salmonis and Caligus clemensi)* **on Juvenile Salmonids** **Captured in the** **Broughton Archipelago**

Prepared for

Marine Harvest Canada
124-1334 Island Highway,
Campbell River, BC
V9W 8C9



1310 Marwalk Crescent
Campbell River, BC. V9W 5X1
info@mainstreambio.ca

August 2015

Summary

Beach seine sampling was conducted on behalf of Marine Harvest Canada in the Broughton Archipelago, BC in 2015. Sampling was completed to monitor sea lice abundance, prevalence and intensity on juvenile wild salmon within the Broughton Archipelago.

Sampling was conducted on June 17 and 18, 2015. Sampling was completed at 22 sites within the Broughton Archipelago. The sites were selected based on their locations relative to existing aquaculture sites located in the area and based on the historical abundance of juvenile salmon found at each of the sites.

Thirty individuals from each fish species (all salmonids or sticklebacks) or the total number of captured individuals from a species (if less than 30 were captured) were collected at each of the 22 sites during the sampling events. Water quality measurements including dissolved oxygen, temperature and salinity were recorded at each site during each sampling event.

Collected sample fish were frozen and delivered to the Center for Aquatic Health Sciences for laboratory analysis. Sea lice observed on the individual fish specimens during laboratory analysis were identified as either *Lepeophtheirus spp.* or *Caligus spp.* The lice were recorded by life stage and the sex of pre-adult or adult motile lice was determined. Sea lice infection data was tabulated by CAHS and provided to Mainstream Biological Consulting for reporting.

A total of 140 juvenile chum salmon (*Oncorhynchus keta*), one juvenile coho salmon (*O. kisutch*), and 48 pink salmon (*O. gorbuscha*) underwent analysis for sea lice infection. A total of 10 pink smolts and 39 chum smolts were found to be infected with sea lice, resulting in an abundance of 0.61 sea lice per fish for the 189 samples inspected. No sea lice were observed on the one coho salmon that was analyzed. The overall infection rate of juvenile salmonids was 25.9% and the infection rates by species were as follows:

- Chum salmon – 27.9%
- Coho salmon – 0%
- Pink salmon – 20.8%

A total of 99 *Lepeophtheirus spp.* lice of various life stages were identified on 37 fish and 17 *Caligus spp.* lice were identified on 15 fish. There were three chum salmon that were infected by both species of lice. An un-proportionally high number of sea lice were identified on fish collected from Alder Point accounting for 65.5% of all lice identified on sample fish from the Broughton Archipelago collected in 2015.

This report is limited to the summary and presentation of collected data from this single sample year.

Table of Contents

Summary.....	ii
Table of Contents.....	iv
List of Figures	v
List of Tables	vi
1.0 Introduction.....	1
2.0 Methods.....	3
2.1 Site Locations	3
2.2 Field Procedures.....	5
2.3 Laboratory Procedures	7
2.4 Data Analysis.....	7
3.0 Results	9
3.1 Water Quality Parameters.....	9
3.2 Fish Sample Composition	10
3.3 Fish Size.....	13
3.4 Sea Lice Infection	13
3.4.1 <i>Infection Rates</i>	13
3.4.2 <i>Infection Rates by Sea Lice Species</i>	14
3.4.3 <i>Spatial and Temporal Analysis</i>	14
4.0 Conclusions and Recommendations	16
5.0 References	17
Appendix I – Field Data.....	I
Appendix II –Capture and Collection Sample Totals	V
Appendix III – Sea Lice Analysis Data	X

List of Figures

- Figure 1: An overview map showing the location of the Broughton Archipelago located northeast of Port McNeill, BC.2
- Figure 2: The locations of the 22 beach seine sites in the Broughton Archipelago sampled in 2015. Marine Harvest Canada aquaculture site locations are indicated with a red star.....4

List of Tables

Table 1:	The site number and location of the 22 beach seine sites where fish were collected for sea lice analysis in the Broughton Archipelago in 2015.	3
Table 2:	Water quality parameters collected at beach seine sites in the Broughton Archipelago on June 17 and 18, 2015.	10
Table 3:	The grand total of collected individuals of each fish species captured on June 17 and 18, 2015 in the Broughton Archipelago, BC and the percentage of the total captured population that they represent.	11
Table 4:	The number of captured fish (Total Capture) and the number of individual fish collected (Total Sample) from each of the 22 sample sites in the Broughton Archipelago collected on June 17 and 18, 2015.	11
Table 5:	Comparison of the fish species totals between field data as done by Mainstream Biological Consulting and lab species identification done by CAHS.	12
Table 6:	Results of analysis for sea lice infection on salmonid smolts collected by beach seine in the Broughton Archipelago, BC in 2015.	13
Table 7:	The number of lice in each life stage by species identified on sample fish from the Broughton Archipelago in 2015. LEP = <i>Lepeophtheirus spp.</i> CAL = <i>Caligus spp.</i>	14
Table 8:	The number of sea lice found on collected samples from each of the 22 sample sites in the Broughton Archipelago on Jun 17 and 18, 2015. The number of fish collected from each site and analyzed for infection is also included for reference.	15

1.0 Introduction

At the request of Marine Harvest Canada, beach seine sampling to capture fish for inspection for sea lice infection took place at 22 sites located in the Broughton Archipelago, BC (Figure 1). The sample collection occurred on June 17 and 18, 2015.

Parasitic copepods from the family Caligidae (sea lice) found in the coastal waters of British Columbia are divided into two genus (*Lepeophtheirus spp.* and *Caligus spp.*). Eleven species of *Lepeophtheirus* have been identified infecting fish in the Pacific Ocean, while only one species of *Caligus* (*Caligus clemensi*) have been identified (Margolis and Arthur 1979; McDonald and Margolis, 1995). Both of these genres have similar life histories and developmental stages (Kabata, 1972; Johnson and Albright, 1991a). The sea lice hatch from eggs and develop through two free-swimming naupillii stages before developing into an infectious free-swimming copepodid. At this point, the sea lice attach to their host and develop through four chalimus stages. The chalimus are “non-motile” and are attached to their host by a frontal filament. The final chalimus stage terminates as the sea lice become “motile” and are no longer attached to their hosts by the frontal filament. The sea lice can now move freely on the fish as they develop through a pre-adult stage before becoming reproductively viable adults.

Interest in sea lice and their interaction with juvenile salmonids in near shore environments has been the ongoing focus of both media reports and scientific study in coastal British Columbia. This interest followed claims, made in 2001 and 2002, of high levels of sea lice infections on salmonids in the Broughton Archipelago (Morton *et al.*, 2004). Morton *et al.* (2004) concluded that sea lice abundance on juvenile pink (*Oncorhynchus gorbuscha*) and chum (*O. keta*) salmon were higher at sample sites located near salmon farms. These results lead to the speculation by Morton *et al.* (2004) and others that sea lice infections may be negatively contributing to the survival of juvenile salmonids in the Broughton Archipelago.

Marine Harvest Canada requested monitoring of sea lice abundance, prevalence and intensity on juvenile wild salmon within the Broughton Archipelago.

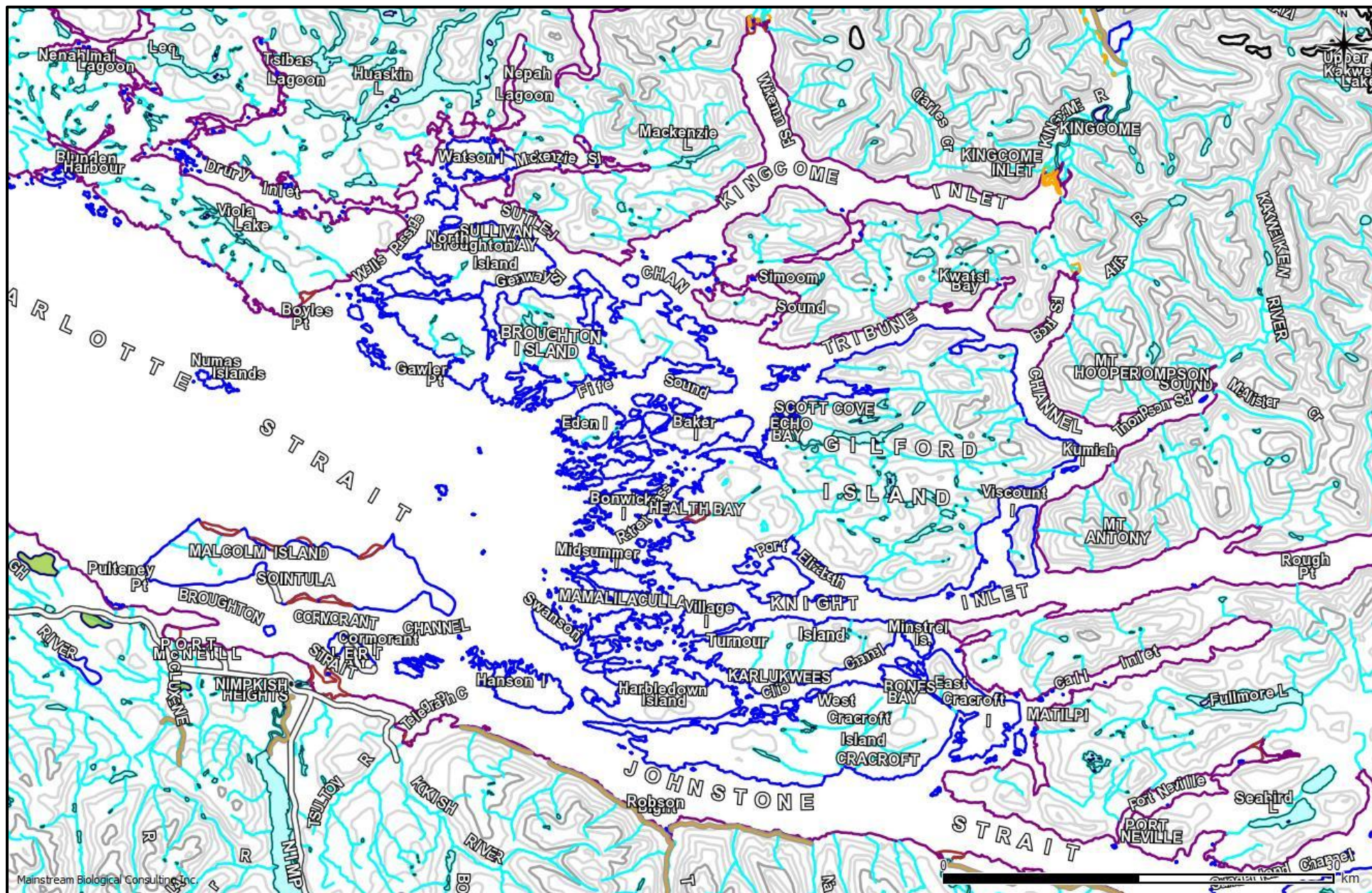


Figure 1: An overview map showing the location of the Broughton Archipelago located northeast of Port McNeill, BC.

2.0 Methods

The fish inspected for sea lice infection were collected from 22 sites in the Broughton Archipelago, BC. These sites were chosen based on their locations relative to existing Marine Harvest Canada aquaculture sites in the area and adapted from sites sampled in 2010 – 2012. The sites were sampled once on June 17 or 18, 2015.

2.1 Site Locations

The approximate locations of the 22 sites at which beach seining was conducted to collect specimens for sea lice analysis are shown in Figure 2. GPS coordinates collected in the field for the sites are presented in Table 1.

Table 1: The site number and location of the 22 beach seine sites where fish were collected for sea lice analysis in the Broughton Archipelago in 2015.

Site #	Site Name	Latitude	Longitude
22	Wicklow Bay	50 46.831	126 42.303
21	Alder Point	50 46.102	126 40.198
20	Jumper Island	50 47.601	126 36.075
19	Baker Island	50 45.695	126 33.389
18	Denham Island	50 47.339	126 29.494
17	Viner Sound	50 46.818	126 26.086
16	Glacier Falls Fish Farm	50 50.935	126 19.435
15	Kwatsi Point	50 50.411	126 15.583
14	Miller Point	50 50.026	126 13.518
13	London Point	50 46.252	126 08.514
12	Oline Point	50 43.524	126 12.681
11	Pumish Point	50 42.994	126 11.338
10	Humphrey Rock	50 41.640	126 15.762
9	Sargeaunt Pass	50 40.220	126 11.731
8	Lance Bay	50 40.329	126 08.951
7	Shelterless Bay	50 40.417	126 06.537
6	Brent Bay	50 38.746	126 06.200
5	Doctor Island Fish Farm	50 39.355	126 17.211
4	Lady Island	50 38.523	126 25.789
3	Chop Bay	50 39.038	126 30.445
2	Midsummer Island Fish Farm (Potts Bay)	50 38.897	126 37.289
1	Swanson Island Fish Farm	50 37.246	126 42.087

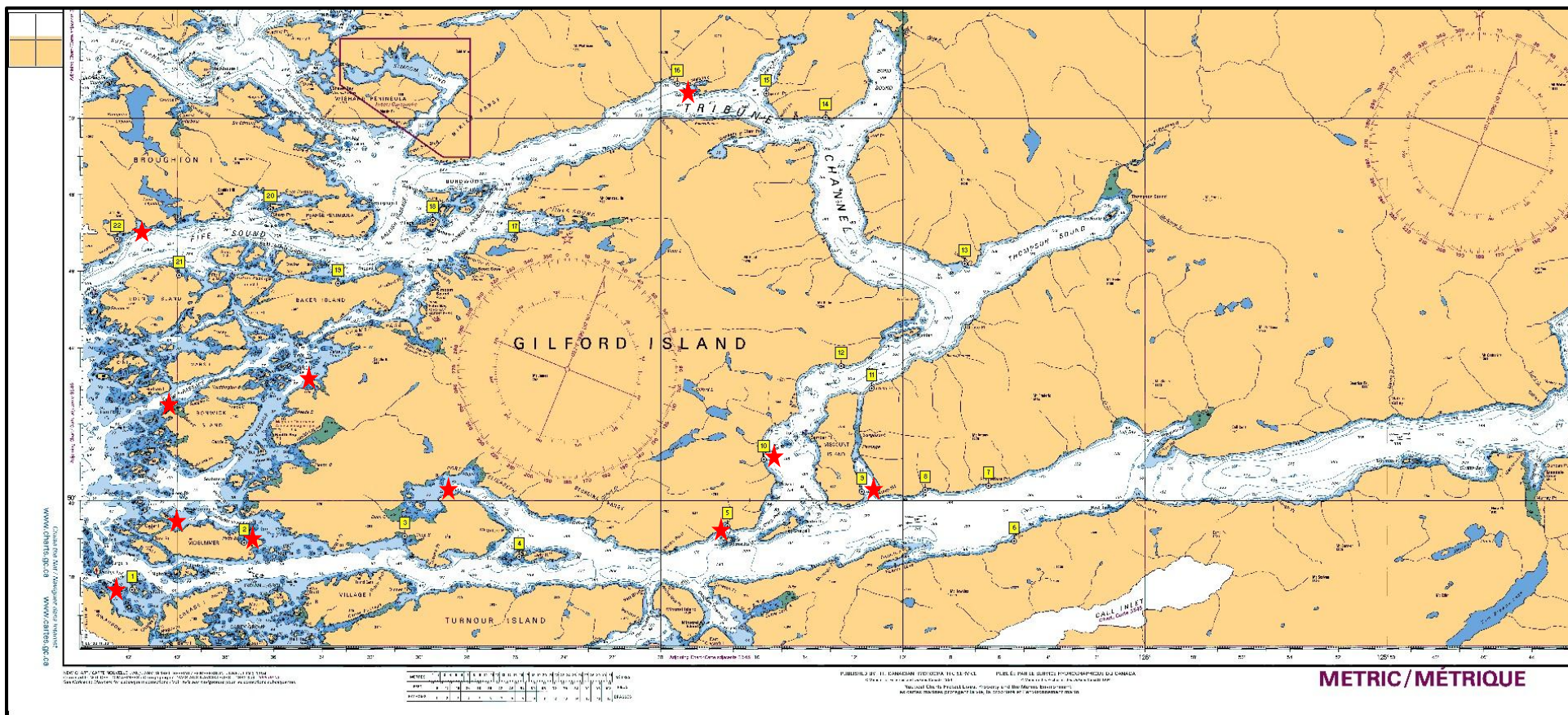


Figure 2: The locations of the 22 beach seine sites in the Broughton Archipelago sampled in 2015. Marine Harvest Canada aquaculture site locations are indicated with a red star.

2.2 Field Procedures

Department of Fisheries and Oceans (DFO) procedures for beach seining, fish collection and field data recording that were used coast wide for juvenile salmon sampling by Mainstream Biological Consulting staff were used during sampling in the Broughton Archipelago in 2015.

An 18ft Boston Whaler, powered by a 50 horsepower outboard motor, was used to access the beach seine sites. A 150 ft (45.7 m) long by 12 ft (3.7 m) deep beach seine net was used to capture specimens. The net was constructed in three 50 ft (15.2 m) sections. The centre bunt section consists of one-quarter inch diameter diamond mesh, while the two side panels (wings) consist of half-inch diameter diamond mesh. Floats were located every 30 cm along the top-line and a lead line weighted the bottom of the net.

A three-person crew was utilized to conduct the beach seine sets and retrieve samples in a consistent manner at each of the ten selected sites. All beaches were approached slowly by boat and one crewmember was put ashore with the towline from one end of the beach seine net. The onshore crewmember held the towline at one side of the sample site, while the second crewmember ensured the net deployed smoothly off the bow of the boat. The third crewmember backed the boat in a wide semicircle towards the opposite side of the sample site. When the net was fully deployed, the second crewmember stepped into the shallow water with the towline or tossed it to the awaiting crewmember on shore. A slow retrieval of the net began immediately while the boat tied to the middle of the bunt by the third crewmember.

A YSI85 water meter was used to measure salinity (ppt) and temperature (°C) at depths of 0.2 m (surface), 1 m and 5 m (if possible). The YSI85 meter was calibrated daily prior to data collection with de-ionized water while traveling to the sample sites.

Two crewmembers retrieved the net evenly from opposite ends ensuring that the lead line remained as close to the bottom as possible. All retrieved netting was piled on the beach above the water level. As the retrieval reached the net bunt, the lead line was retrieved at a faster rate than the floats to allow the netting of the bunt to form a bag under the captured fish. The lead line was then pulled up onto the beach above the

water level. The floats were attached to the bow of the boat to ensure that they stayed above the surface of the water during net retrieval. In this manner a small, shallow bag formed from the bunt of the net held the captured fish in the water.

All crewmembers participated in the collection of individual fish to ensure that captured fish remained in the net for as short a period of time as possible. The net was manipulated, if necessary, in response to rising or falling tides in order to ensure the captured fish remained in the net and were held in sufficient water to minimize stress. The level of sufficient water was dependant on the size and numbers of captured fish, but was generally thought of as enough water to minimize fish contact with the net or with other fish.

A total of 30 individuals from each target species captured or all of the individuals from each specimen group present (if less than 30) were collected as samples for sea lice infection analysis. Individual fish were “swam” into an appropriately sized whirlpac bag. All handling of fish was kept to a minimum. Each individual fish bag was then placed in a species specific pile on the beach.

When all the required fish were collected, a total catch number for each species was recorded. The fish remaining in the net were counted out of the seine net, or an estimate of the remaining fish was made (estimates were used when it appeared that more than 500 individuals from any given species remained in the net). The total of fish remaining in the net was added to the number of retained individuals to calculate a total capture number for a given species.

A crewmember recorded all the information from the beach seine in a standardized format in a field notebook. The information recorded included the following:

- The site number (Site 1-10) and week number (Week 1 or 2);
- The date;
- The time at the end of the individual fish collection;
- Comments on weather and oceanic conditions;
- Comments regarding wildlife present near the sample site;
- Total capture and retained fish numbers for each specimen group; and
- Dissolved oxygen (ppm), water temperature (°C) and salinity (ppt) to one decimal place.

The retained fish from each site were packaged separately in re-sealable bags and labelled with the site number (Site 1-22) and the date. Site sample bags were placed in a portable freezer, which was plugged into the boat's battery. The specimens were transferred to a freezer immediately upon return from the field.

The beach seine net was reloaded onto the bow of the boat. Crewmembers scanned the net for obvious holes, which were repaired immediately if found. The YSI85 meter was shut off and stored, and all gear and coolers were reloaded into the boat.

The above procedures for beach seine net deployment and retrieval, as well as those described for fish collection, were repeated at all 22 sample sites. A thorough inspection of the beach seine net took place after all sites were completed. All holes regardless of size were mended at this time.

2.3 Laboratory Procedures

Collected sample fish were frozen and delivered to the Center for Aquatic Health Sciences (CAHS) for laboratory analysis. Sea lice observed on the individual fish specimens during laboratory analysis were identified as either non-motile chalimus, or motile pre-adults and adults. Lice identified as being in any of the four chalimus stages were identified as *Lepeophtheirus spp.* or *Caligus spp.* Motile lice, either pre-adults or adults, were identified as either *Lepeophtheirus spp.* or *Caligus spp.* and the sex of the louse was determined. Sea lice infection data was tabulated by CAHS and provided to Mainstream Biological Consulting for reporting.

Data provided by CAHS also included measured length (fork length for salmonids, total length for non-salmonids) in millimetres and weight (recorded to the nearest tenth of a gram). Lengths and weights were recorded with the specimen's corresponding sea lice analysis results.

2.4 Data Analysis

Beach seine fish sample composition is summarized by species and site. Data on weight and fork length of collected specimens analyzed in the lab are summarized by species. Sea lice infection rates were determined by species. Prevalence, as defined as the number of fish found to have one or more sea lice compared to the total number

of fish, was determined by species. Abundance, as defined as the total number of sea lice observed compared to the total number of fish, was also determined by species.

Statistical analysis of the spatial distribution of sea lice was not conducted. Spatial analysis has been limited to the simple presentation and discussion of the number of sea lice found on fish specimens collected from each site.

3.0 Results

The following sections outline the results of beach seine collection and subsequent sea lice inspection of juvenile salmonids and three spine stickleback from the Broughton Archipelago, BC, collected in 2015. The complete field data for each individual beach seine site can be found in Appendix I.

3.1 Water Quality Parameters

Water quality measurements of temperature and salinity, were taken at the surface, 1 m and 5 m below the surface (if possible) during beach seining at each of the 22 sites. This data and basic summary statistics are presented in Table 2. Lance Bay (Site 8), Shelterless Bay (Site 7) and Brent Bay (Site 6), the eastern most sites, had the lowest recorded salinity levels. The highest salinity was recorded at the Swanson Island Fish Farm (Site 1) and Midsummer Island Fish Farm at Potts Bay (Site 2), the western most sample sites. Recorded temperatures ranged from a 10.1 °C to 16.1 °C. Lower water temperatures were recorded at Midsummer Island (Site 2) and Swanson Island (Site 1) Fish Farm sites, while temperatures exceeding 15.0 °C were recorded at Sites 6, 13, 14, 17 and 18.

Table 2: Water quality parameters collected at beach seine sites in the Broughton Archipelago on June 17 and 18, 2015.

Site	Site Name	Salinity (ppt)			Temperature (°C)		
		0.2m	1.0m	5.0m	0.2m	1.0m	5.0m
22	Wicklow Bay	28.0	28.1	29.5	12.2	12.1	10.9
21	Alder Point	28.8	28.8		12.2	12.2	
20	Jumper Island	28.5	28.7	29.4	13.1	13.1	12.1
19	Baker Island	26.3	27.0		14.2	14.2	
18	Denham Island	22.3	26.3		15.8	14.3	
17	Viner Sound	27.9	28.0	30.7	15.5	15.0	11.3
16	Glacier Falls Fish Farm	27.8	28.2		13.8	13.1	
15	Kwatsi Point	27.3	27.5		14.1	14.0	
14	Miller Point	23.1	23.3	24.2	16.1	15.8	15.1
13	London Point	22.7	23.0	27.3	15.1	14.7	12.4
12	Oline Point	24.1	24.2	24.1	14.4	14.2	14.2
11	Pumish Point	19.8	20.0	23.3	13.4	13.4	13.1
10	Humphrey Rock	11.5	11.6		14.9	14.8	
9	Sargeaunt Pass	11.4	11.4		14.4	14.4	
8	Lance Bay	8.6	8.6	14.0	15.0	15.0	14.2
7	Shelterless Bay	8.2	8.6	13.5	15.0	15.0	14.2
6	Brent Bay	7.9	7.9		15.2	15.2	
5	Doctor Island Fish Farm	10.4	10.6	14.2	15.0	14.9	14.4
4	Lady Island	17.1	17.2		14.1	14.1	
3	Chop Bay	23.3	23.3		12.8	12.7	
2	Midsummer Island Fish Farm (Potts Bay)	31.9	31.9		10.1	10.1	
1	Swanson Island Fish Farm	31.4	31.5	31.7	10.5	10.4	10.3
Averages		21.3	21.6	23.8	14.0	13.8	12.9

3.2 Fish Sample Composition

A total of 1515 individuals from the target fish species (salmonids) were captured during the beach seine sampling conducted in the Broughton Archipelago, BC in 2015. Of those, 189 individual fish (12.5 %) were collected as sample specimens and underwent analysis for sea lice infection (Table 3). The grand total of collected fish from each species and the percentage that it represents of the total beach seine captured population is presented in Table 3. Pink salmon were captured in significantly greater numbers than any other species. A total of 1497 pink salmon were captured, representing 98.8% of all captured salmonids. The majority of these captures were from Alder Point (Site 21), Kwatsi Point (Site 15), Lady Island (Site 4) and Midsummer Island

(Site 2). A summary of the total number of fish captured and collected as specimens at each site over the collection period can be found in Table 4. Weekly totals of fish captured and collected as specimens at each site over the collection period can be found in Appendix II.

Table 3: The grand total of collected individuals of each fish species captured on June 17 and 18, 2015 in the Broughton Archipelago, BC and the percentage of the total captured population that they represent.

Common Name	Total of individuals at all sites		
	Capture Totals	Collection Totals	Collection %
chum salmon	17	17	100.0
coho salmon	1	1	100.0
sockeye salmon	-	-	-
chinook salmon	-	-	-
pink salmon	1497	171	11.4
All species	1515	189	12.5

Table 4: The number of captured fish (Total Capture) and the number of individual fish collected (Total Sample) from each of the 22 sample sites in the Broughton Archipelago collected on June 17 and 18, 2015.

Site	Chum		Coho		Pink		Total Capture	Total Sample
	Capture Total	Sample Total	Capture Total	Sample Total	Capture Total	Sample Total		
22								
21	4	4			205	30	209	34
20					7	7	7	7
19								
18	1	1			13	13	14	14
17								
16								
15	4	4			101	30	105	34
14								
13								
12								
11								
10								
9			1	1			1	1
8					5	5	5	5
7					4	4	4	4
6								
5								
4					850	30	850	30
3	1	1			22	22	23	23
2	7	7			290	30	297	37
1								
Total	17	17	1	1	1497	171	1515	189

Fish species collection totals recorded on the field data sheets were compared to the actual number of fish that underwent analysis for sea lice infection. The comparison of the reported numbers of each species collected in the field to the lab species identification of fish that underwent analysis for sea lice infection found differences in species totals (Table 5). The discrepancies resulted in a significant shift of field identified pink salmon to chum salmon based on the lab species identification. Sample specimens were collected in late June. At this time in the salmon life cycle differentiating between chum and pink salmon is difficult. The cause of the difference in species identification between MBC staff (field) and CAHS staff (lab) is unknown. As sea lice data is linked to the species identification done in the lab and provided by CAHS, the data presented in the remainder of this report is based on the fish species identification as done in the lab by CAHS.

Table 5: Comparison of the fish species totals between field data as done by Mainstream Biological Consulting and lab species identification done by CAHS.

Species	Field Fish Species Identification (MBC)	Lab Fish Species Identification (CAHS)
Chum salmon	17	140
Coho salmon	1	1
Sockeye salmon	-	-
Chinook salmon	-	-
Pink salmon	171	48

3.3 Fish Size

Analysis of weight and length data was completed in the lab for collected specimens. The weight of 140 chum smolts collected on June 17 and 18, 2015 ranged from 2.3 g to 11.9 g and averaged 5.9 g (SD = 2.0). The fork length of the chum smolts ranged from 63 mm to 105 mm and averaged 80.7 mm (SD = 8.3).

The weight of 48 pink smolts collected on June 17 and 18, 2015 ranged from 1.5 g to 5.9 g and averaged 3.4 g (SD = 1.1). The fork length of the pink smolts ranged from 53 mm to 85 mm and averaged 68.1 mm (SD = 7.7).

The one coho salmon collected weighed 13.6 g and had a fork length of 110 mm.

3.4 Sea Lice Infection

3.4.1 Infection Rates

A total of 140 chum, 48 pink and one coho salmon were inspected for sea lice infection (n = 189 fish). Prevalence was defined as the number of fish found to have one or more sea louse compared to the total number of fish. Abundance was defined as the total number of sea lice observed compared to the total number of fish (Table 6). Sea lice counts of both species observed (*L. salmonis* and *C. clemensi*) were added together for the prevalence and abundance calculations, due to the very low instance of lice.

A total of 39 chum smolts and 10 pink salmon were found to be infected with sea lice, resulting in an abundance of 0.61 sea lice per fish for the 189 samples inspected. No sea lice were observed on the one coho salmon that was analyzed in the lab. The overall infection rate of the 189 juvenile salmonids was 25.9%. Table 6 gives the infection rates by species.

Table 6: Results of analysis for sea lice infection on salmonid smolts collected by beach seine in the Broughton Archipelago, BC in 2015.

Species	Sample size (n)	Total number of lice observed	Total number of fish infected	Prevalence (%)	Abundance
chum	140	94	39	27.9	0.67
coho	1	0	0	0.0	0.0
pink	48	22	10	20.8	0.46
Total	189	116	49	25.9	0.61

3.4.2 Infection Rates by Sea Lice Species

A total of 99 *Lepeophtheirus spp.* sea lice of various life stages were identified on 37 sample fish and 17 *Caligus spp.* sea lice were found on 15 sample fish (Table 7; Appendix III). There were three chum salmon that were infected by both species of sea lice. There was a high number of adult male and female *Lepeophtheirus spp.* lice found on the sample fish accounting for 69 of the 99 lice of this species.

Table 7: The number of lice in each life stage by species identified on sample fish from the Broughton Archipelago in 2015. LEP = *Lepeophtheirus spp.* CAL = *Caligus spp.*

Life Stage ¹	Number of lice
LEP Co	6
LEP C1	2
LEP C2	0
LEP C3	2
LEP C4	0
LEP PAM	4
LEP PAF	16
LEP AM	33
LEP AF	36
TOTAL LEP	99
CAL Co	0
CAL C1	6
CAL C2	2
CAL C3	1
CAL C4	1
CAL PAM	0
CAL PAF	0
CAL AM	3
CAL AF	4
TOTAL CAL	17

¹ Lice life stage codes: Co = copepodid, C1-4 = chalimus 1-4, PAM = pre-adult male, PAF = pre-adult female, AM = adult male, AF = adult female.

3.4.3 Spatial and Temporal Analysis

Statistical analysis of spatial differences of sea lice infection was not completed. Table 8 presents the number of lice found on fish collected from the 22 sites relative the total number of fish collected at each site. The numbers of lice detected on fish collected from Alder Point (Site 21) are significantly higher than other sites. The 76 lice detected on specimens collected at Alder Point account for 65.5% (n=116) of all lice detected on fish collected from the Broughton Archipelago on June 17 and 18, 2015.

Table 8: The number of sea lice found on collected samples from each of the 22 sample sites in the Broughton Archipelago on Jun 17 and 18, 2015. The number of fish collected from each site and analyzed for infection is also included for reference.

Site #	Site Name	Number of fish collected for sea lice analysis	Number of Lice detected on sample fish
22	Wicklow Bay	0	0
21	Alder Point	34	76
20	Jumper Island	7	17
19	Baker Island	0	0
18	Denham Island	14	2
17	Viner Sound	0	0
16	Glacier Falls Fish Farm	0	0
15	Kwatsi Point	34	8
14	Miller Point	0	0
13	London Point	0	0
12	Oline Point	0	0
11	Pumish Point	0	0
10	Humphrey Rock	0	0
9	Sargeaunt Pass	1	0
8	Lance Bay	5	1
7	Shelterless Bay	0	0
6	Brent Bay	4	2
5	Doctor Island Fish Farm	0	0
4	Lady Island	30	1
3	Chop Bay	23	3
2	Midsummer Island Fish Farm (Potts Bay)	37	6
1	Swanson Island Fish Farm	0	0
TOTAL		189	116

4.0 Conclusions

This report represents only one year and one monthly sample period of beach seining and sea lice analysis conducted in the Broughton Archipelago by Marine Harvest Canada. This report is limited to the summary and presentation of collected data from this single sample event.

A total of 39 chum smolts and 10 pink salmon were found to be infected with sea lice, resulting in an abundance of 0.61 sea lice per fish for the 189 samples inspected. No sea lice were observed on the one coho salmon that was analyzed in the lab. The overall infection rate of juvenile salmonids was 25.9% and the infection rates by species were as follows:

- Chum salmon – 27.9%
- Coho salmon – 0%
- Pink salmon – 20.8%

A total of 99 *Lepeophtheirus spp.* lice of various life stages were identified on 37 fish and 17 *Caligus spp.* lice were identified on 15 fish. There were three chinook salmon that were infected by both species of lice. An un-proportionally high number of sea lice were identified on fish collected from Alder Point accounting for 65.5% of all lice identified on sample fish from the Broughton Archipelago collected in 2015.

5.0 References

- Brown M., and D. Austen. 1996. Data Management and Statistical Techniques. Pgs 17-61 in B.R. Murphy and D.W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- Burger. R.L. 1991. Life history of sockeye salmon (*Oncorhynchus nerka*). In: Pacific Salmon Life Histories. C Grott, L Margolis (eds). UBC Press, Vancouver. Pp 1-117.
- Coad B. 1995. Encyclopaedia of Canadian Fishes. Canadian Museum of Nature and Canadian Sportfishing Productions Inc. Singapore.
- Harbo R. 1999. Whelks to Whales Costal Marine Life of the Pacific Northwest. Harbour Publishing. Madiera Park, BC Canada.
- Hayes D., C. Ferreri and W. Taylor. 1996. Active Fish Capture Methods. Pgs 193-218 in B.R. Murphy and D.W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- Healey M.C. 1991. Life history of chinook salmon (*Oncorhynchus tshawytscha*). In: Pacific Salmon Life Histories. C Grott, L Margolis (eds). UBC Press, Vancouver. Pp 313-393.
- Jones S. and A. Nemec. 2004. Pink Salmon Action Plan Research. Part II: Sea Lice on Juvenile Salmon and on Three-spine Sticklebacks in 2003. PSARC Working Paper H2004-01.
- Johnson S.C. and L.J. Albright. 1991a. The developmental stages of *Lepeophtheirus salmonis* (Kroyer, 1837) (Copepoda: Caligidae). Canadian Journal of Zoology 69: 929-950.
- Johnson S.C. and L.J. Albright. 1991b. Development, growth and survival of *Lepeophtheirus salmonis* (Copepoda: Caligidae) under laboratory conditions. Journal of the Marine Biological Association of the UK 71: 425-436.
- Kabata Z. 1972. Developmental stages of *Caligus clemensi* (Copepoda: Caligidae) from fishes of British Columbia. Journal of the Fisheries Research Board of Canada 29: 1571-1593.
- Kabata Z. 1974. The species of *Lepeophtheirus* (Copepoda: Caligidae), from fishes of British Columbia. Journal of the Fisheries Research Board of Canada 30: 729-759.
- Margolis L., J.R. Arthur. 1979. Synopsis of the parasites of fishes of Canada. Bulletin of the Fisheries Research Board of Canada, Number 199. Ottawa. 269 pages.
- McDonald T.E., and L. Margolis. 1995. Synopsis of the parasites of fishes of Canada (1978-1993). Canadian Special Publication of Fisheries and Aquatic Sciences No. 122. National Research Council of Canada, Ottawa. 265 pages.
- Morton A., R. Routledge, C. Peet and A. Ladwig. 2004. Sea Lice (*Lepeophtheirus salmonis*) infection rates on juvenile pink (*Oncorhynchus gorbuscha*) and chum (*Oncorhynchus keta*) salmon in the near shore marine environment of British Columbia, Canada. Canadian Journal of Fisheries and Aquatic Sciences 61: 147-157.

- Parker R.R. and L. Margolis. 1964. A new species of parasitic copepod, *Caligus clemensi* sp. nov. (Clogoida: Caligidae), from pelagic fishes in the coastal waters of British Columbia. *Journal of Fisheries Research Board of Canada* 21: 873-889.
- Pollard W.R., G.F. Hartman, C. Groot, and P. Edgell. 1997. *Field Identification of Coastal Juvenile Salmonids*. Published by Harbour Publishing for the Federal Department of Fisheries and Oceans and MacMillan Bloedel Ltd. Madeira Park, BC Canada.
- Salo E.O. 1991. Life history of chum salmon (*Oncorhynchus keta*). In: *Pacific Salmon Life Histories*. C Groot, L Margolis (eds). UBC Press, Vancouver. Pp 233-309.
- Sandercock F.K. 1991. Life history of coho salmon (*Oncorhynchus kisutch*). In: *Pacific Salmon Life Histories*. C. Groot, L. Margolis (eds). UBC Press, Vancouver. Pp 397-445.
- Townend J. 2004. *Practical Statistics for Environmental and Biological Scientists*. John Wiley and Sons Ltd. England.
- Tucker C.S., C. Sommerville and R. Wootten. 2000. The effect of temperature and salinity on the settlement and survival of copepodids of *Lepeophtheirus salmonis* (Kroyer, 1837) on Atlantic salmon, *Salmo salar* L. *Journal of Fish Diseases* 23: 309-320.
- Tully O., And D.T. Nolan. 2002. A review of the population biology and host-parasite interactions of the sea louse *Lepeophtheirus salmonis* (Copepoda: Caligidae). *Parasitology* 124: S165-S182.

Appendix I – Field Data

Site	Site Name	Date(dd/mm)	Time
22	Wicklow Bay	17/06	11:53
Weather	High overcast, light breeze		
Comments	2 fish seen near set location along steep bluff. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	28.0	28.1	29.5
Temp. (°C)	12.2	12.1	10.9

Site	Site Name	Date(dd/mm)	Time
21	Alder Point	17/06	12:23
Weather	Clear, calm.		
Comments			
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	28.8	28.8	
Temp. (°C)	12.2	12.2	
Samples	# Captured	# Specimens	
pink	205	30	
chum	4	4	

Site	Site Name	Date(dd/mm)	Time
20	Jumper Island	17/06	13:00
Weather	Clear, calm		
Comments	Set on 2 jumping fish. Poor water visibility. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	28.5	28.7	29.4
Temp. (°C)	13.1	13.1	12.1

Site	Site Name	Date(dd/mm)	Time
19	Baker Island	17/06	13:30
Weather	Clear, calm.		
Comments	No fish observed. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	26.3	27.0	
Temp. (°C)	14.2	14.2	

Site	Site Name	Date(dd/mm)	Time
18	Denham Island	17/06	13:55
Weather	Clear, calm.		
Comments	No fish observed. Good visibility.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	22.3	26.3	
Temp. (°C)	15.8	14.3	
Samples	# Captured	# Specimens	
pink	13	13	
chum	1	1	

Site	Site Name	Date(dd/mm)	Time
17	Viner Sound	17/06	14:50
Weather	Clear, calm.		
Comments	No fish observed. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	27.9	28.0	30.7
Temp. (°C)	15.5	15.0	11.3

Site	Site Name	Date(dd/mm)	Time
16	Glacier Falls Fish Farm	17/06	15:22
Weather	Clear, calm.		
Comments	No fish observed. Fish observed while pulling net onto boat. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	27.8	28.2	
Temp. (°C)	13.8	13.1	

Site	Site Name	Date(dd/mm)	Time
15	Kwatsi Point	17/06	15:50
Weather	Clear, calm.		
Comments	Set on a small school of fish but lost set in the tide. Reset.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	27.3	27.5	
Temp. (°C)	14.1	14.0	
Samples	# Captured	# Specimens	
pink	101	30	
chum	4	4	

Site	Site Name	Date(dd/mm)	Time
14	Miller Point	17/06	16:15
Weather	Clear, calm, small chop at site.		
Comments	No fish observed. Fish observed while pulling net onto the boat. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	23.1	23.3	24.2
Temp. (°C)	16.1	15.8	15.1

Site	Site Name	Date(dd/mm)	Time
13	London Point	17/06	16:50
Weather	Clear, calm.		
Comments	No fish observed. Set on only possible location due to high tide. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	22.7	23.0	27.3
Temp. (°C)	15.1	14.7	12.4

Site	Site Name	Date(dd/mm)	Time
12	Oline Point	17/06	17:15
Weather	Clear, calm.		
Comments	No fish observed. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	24.1	24.2	24.1
Temp. (°C)	14.4	14.2	14.2

Site	Site Name	Date(dd/mm)	Time
11	Pumish Point	18/06	07:01
Weather	High overcast, calm.		
Comments	No fish observed. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	19.8	20.0	23.3
Temp. (°C)	13.4	13.4	13.1

Site	Site Name	Date(dd/mm)	Time
10	Humphrey Rock	18/06	09:01
Weather	High overcast, calm.		
Comments	No fish observed. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	11.5	11.6	
Temp. (°C)	14.9	14.8	

Site	Site Name	Date(dd/mm)	Time
9	Sargeaunt Pass	18/06	07:21
Weather	High overcast, calm.		
Comments	Small fish observed jumping at the site.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	11.4	11.4	
Temp. (°C)	14.4	14.4	
Samples	# Captured	# Specimens	
Coho	1	1	

Site	Site Name	Date(dd/mm)	Time
8	Lance Bay	18/06	07:45
Weather	Calm, high overcast.		
Comments	No fish observed. Set done off of rock ledge at really low tide.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	8.6	8.6	14.0
Temp. (°C)	15.0	15.0	14.2
Samples	# Captured	# Specimens	
pink	5	5	

Site	Site Name	Date(dd/mm)	Time
7	Shelterless Bay	18/06	08:02
Weather	Calm, high overcast.		
Comments	Set on one observed fish. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	8.2	8.6	13.5
Temp. (°C)	15.0	15.0	14.2

Site	Site Name	Date(dd/mm)	Time
6	Brent Bay	18/06	08:22
Weather	Calm, overcast.		
Comments	Set on stickleback observed.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	7.9	7.9	
Temp. (°C)	15.2	15.2	
Samples	# Captured	# Specimens	
pink	4	4	

Site	Site Name	Date(dd/mm)	Time
5	Doctor Island Fish Farm	18/06	09:47
Weather	High overcast, light wind and chop.		
Comments	No fish observed. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	10.4	10.6	14.2
Temp. (°C)	15.0	14.9	14.4

Site	Site Name	Date(dd/mm)	Time
4	Lady Island	18/06	10:20
Weather	Slight chop, overcast.		
Comments	Set on fish near kelp.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	17.1	17.2	
Temp. (°C)	14.1	14.1	
Samples	# Captured	# Specimens	
pink	850	30	

Site	Site Name	Date(dd/mm)	Time
3	Chop Bay	18/06	10:49
Weather	Slight chop and breeze.		
Comments	Set on fish in kelp.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	23.3	23.3	
Temp. (°C)	12.8	12.7	
Samples	# Captured	# Specimens	
pink	22	22	
chum	1	1	

Site	Site Name	Date(dd/mm)	Time
2	Midsummer Island Fish Farm (Potts Bay)	18/06	11:28
Weather	Calm and overcast.		
Comments	Set on fish.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	31.1	31.9	
Temp. (°C)	10.1	10.1	
Samples	# Captured	# Specimens	
pink	290	30	
chum	7	7	

Site	Site Name	Date(dd/mm)	Time
1	Swanson Island Fish Farm	18/06	12:05
Weather	Calm, overcast.		
Comments	No fish observed. No target species captured.		
Water Quality	0.2 m (surface)	1 m	5 m
Salinity (ppt)	31.4	31.5	31.7
Temp. (°C)	10.5	10.4	10.3

Appendix II –Capture and Collection Sample Totals

Capture totals at each sample site. Collection totals are equal to capture totals if the capture total was less than 30. If the capture total was greater than 30, collection totals are assumed to be 30 unless a different collection total is given in parenthesis.

Site 22

Sample Date – 06/17/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Site 21

Sample Date – 06/17/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon	4	4
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon	205	30

Site20

Sample Date – 06/17/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon	7	7

Site 19

Sample Date – 06/17/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Site 18

Sample Date – 06/17/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon	1	1
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon	13	13

Site 17

Sample Date – 06/17/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Site 16

Sample Date – 06/17/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Site 15

Sample Date – 06/17/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon	4	4
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon	101	30

Site 14

Sample Date – 06/17/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Site 13

Sample Date – 06/17/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Site 12

Sample Date – 06/17/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Site 11

Sample Date – 06/18/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Site 10

Sample Date – 06/18/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Site 9

Sample Date – 06/18/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon	1	1
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Site 8

Sample Date – 06/18/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon	5	5

Site 7

Sample Date – 06/18/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Site 6

Sample Date – 06/18/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon	4	4

Site 5

Sample Date – 06/18/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Site 4

Sample Date – 06/18/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon	850	30

Site 3

Sample Date – 06/18/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon	1	1
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon	22	22

Site 2

Sample Date – 06/18/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon	7	7
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon	290	30

Site 1

Sample Date – 06/18/15		Catch Totals Sample Totals	
Scientific Name	Common Name		
<i>Oncorhynchus keta</i>	chum salmon		
<i>Oncorhynchus kisutch</i>	coho salmon		
<i>Oncorhynchus nerka</i>	sockeye salmon		
<i>Oncorhynchus tshawytscha</i>	chinook salmon		
<i>Oncorhynchus gorbuscha</i>	pink salmon		

Appendix III – Sea Lice Analysis Data

Data from sample fish infected with *Lepeophtheirus spp.* sea lice collected in the Broughton Archipelago, BC, in 2015. Lice life stage codes: Co = copepodid, C1-4 = chalimus 1-4, PAM = pre-adult male, PAF = pre-adult female, AM = adult male, AF = adult female. Fish species codes: P=pink salmon, Co=coho salmon, Ch=chum salmon.

Date of seine	Set #	Site name	Date Examined	Fish Species	Fish #	Length (mm)	Weight (g)	LEP Co	LEP C1	LEP C2	LEP C3	LEP C4	LEP PAM	LEP PAF	LEP AM	LEP AF	LEP Total
18-Jun-15	14	Lance Bay	22-Jun-15	P	3	56	2.29							1			1
18-Jun-15	20	Chop Bay	22-Jun-15	P	7	65	3.50								1	1	2
18-Jun-15	20	Chop Bay	22-Jun-15	Ch	25	73	4.87							1			1
17-Jun-15	8	Kwatsi Point	29-Jun-15	Ch	34	102	9.99									1	1
17-Jun-15	8	Kwatsi Point	29-Jun-15	Ch	45	76	5.89								1		1
17-Jun-15	8	Kwatsi Point	29-Jun-15	P	61	80	5.84							1			1
18-Jun-15	21	Midsummer Island	29-Jun-15	Ch	91	91	7.01									1	1
18-Jun-15	21	Midsummer Island	29-Jun-15	Ch	96	63	3.05								1		1
17-Jun-15	2	Alder Point	30-Jun-15	Ch	101	79	5.98	1								1	2
17-Jun-15	2	Alder Point	30-Jun-15	Ch	102	80	6.34									1	1
17-Jun-15	2	Alder Point	30-Jun-15	P	103	76	3.33				1			2	1	2	6
17-Jun-15	2	Alder Point	30-Jun-15	Ch	104	81	6.35	4							3	1	8
17-Jun-15	2	Alder Point	30-Jun-15	Ch	105	80	6.20						1			5	6
17-Jun-15	2	Alder Point	30-Jun-15	Ch	107	78	5.40	1					1		4	3	9
17-Jun-15	2	Alder Point	30-Jun-15	Ch	108	76	5.05									1	1
17-Jun-15	2	Alder Point	30-Jun-15	P	110	85	5.92									1	1
17-Jun-15	2	Alder Point	30-Jun-15	Ch	112	80	5.43									1	1
17-Jun-15	2	Alder Point	30-Jun-15	Ch	114	70	3.15				1		1	1	1	1	5
17-Jun-15	2	Alder Point	30-Jun-15	Ch	116	84	6.84									1	1
17-Jun-15	2	Alder Point	30-Jun-15	Ch	118	78	5.59									1	1
17-Jun-15	2	Alder Point	30-Jun-15	Ch	119	70	3.80								1	2	3
17-Jun-15	2	Alder Point	30-Jun-15	P	120	70	3.90								2		2
17-Jun-15	2	Alder Point	30-Jun-15	Ch	121	79	4.70						1		1	2	4
17-Jun-15	2	Alder Point	30-Jun-15	Ch	122	90	7.40								1		1
17-Jun-15	2	Alder Point	30-Jun-15	Ch	125	94	8.90		1								1
17-Jun-15	2	Alder Point	30-Jun-15	Ch	126	90	9.60		1					2	2		5
17-Jun-15	2	Alder Point	30-Jun-15	Ch	127	72	4.40								1		1
17-Jun-15	2	Alder Point	30-Jun-15	Ch	128	70	3.10							2	1	1	4
17-Jun-15	2	Alder Point	30-Jun-15	Ch	129	84	7.60							1			1
17-Jun-15	2	Alder Point	30-Jun-15	P	131	55	1.50							2	3		5
18-Jun-15	19	Lady Island	30-Jun-15	Ch	147	75	4.00									1	1
18-Jun-15	16	Brent Bay	2-Jul-15	P	168	65	2.60								1	1	2
17-Jun-15	3	Jumper Island	2-Jul-15	Ch	171	80	5.90							1	1	1	3
17-Jun-15	3	Jumper Island	2-Jul-15	Ch	172	79	5.02								3	2	5
17-Jun-15	3	Jumper Island	2-Jul-15	Ch	175	68	3.90							2	4	2	8
17-Jun-15	5	Denham Island	2-Jul-15	Ch	178	84	6.30									1	1
17-Jun-15	5	Denham Island	2-Jul-15	Ch	186	74	4.00									1	1

Data from sample fish infected with *Caligus sp.* sea lice collected in the Broughton Archipelago, BC, in 2015. Life stage codes: Co = copepodid, C1-4 = chalimus 1-4, PAM = pre-adult male, PAF = pre-adult female, AM = adult male, AF = adult female. Fish species codes: P=pink salmon, Co=coho salmon, Ch=chum salmon.

Date of seine	Set	Site name	Date Examined	Fish Species	Fish #	Length (mm)	Weight (g)	CAL Co	CAL C1	CAL C2	CAL C3	CAL C4	CAL PAM	CAL_PAF	CAL AM	CAL AF	CAL Total
17-Jun-15	8	Kwatsi Point	29-Jun-15	Ch	37	78	5.91		1								1
17-Jun-15	8	Kwatsi Point	29-Jun-15	Ch	38	88	5.37		1								1
17-Jun-15	8	Kwatsi Point	29-Jun-15	Ch	44	75	6.34								1		1
17-Jun-15	8	Kwatsi Point	29-Jun-15	Ch	47	80	5.51									1	1
17-Jun-15	8	Kwatsi Point	29-Jun-15	Ch	53	80	5.81									1	1
18-Jun-15	21	Midsummer Island Fish Farm	29-Jun-15	Ch	68	86	7.84				1	1					2
18-Jun-15	21	Midsummer Island Fish Farm	29-Jun-15	Ch	73	91	8.93								1		1
18-Jun-15	21	Midsummer Island Fish Farm	29-Jun-15	Ch	89	105	10.21									1	1
17-Jun-15	2	Alder Point	30-Jun-15	Ch	101	79	5.98									1	1
17-Jun-15	2	Alder Point	30-Jun-15	Ch	114	70	3.15		1								1
17-Jun-15	2	Alder Point	30-Jun-15	Ch	124	88	7.00		1								1
17-Jun-15	2	Alder Point	30-Jun-15	Ch	127	72	4.40			2							2
17-Jun-15	2	Alder Point	30-Jun-15	P	132	64	2.70		1								1
17-Jun-15	2	Alder Point	30-Jun-15	P	134	70	4.40								1		1
17-Jun-15	3	Jumper Island	2-Jul-15	Ch	169	84	5.80		1								1