SEA LICE MONITORING STUDY IN GOLETAS CHANNEL AND QUEEN CHARLOTTE STRAIT, BC

YEAR 8

Tlatlasikwala First Nation
Mowi Canada West

August 2019

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1.0 EXECUTIVE SUMMARY

2019 marked the eighth year of the sea lice study in Goletas Channel and Queen Charlotte Strait, conducted by Pacificus Biological Services (Pacificus), with assistance from members of the Tlatlasikwala First Nation. The study was conducted for Mowi Canada West (Mowi) and the Tlatlasikwala First Nation and helps fulfill the Aquaculture Stewardship Council's (ASC) requirement of monitoring wild salmonids by studying the abundance, prevalence and intensity of sea lice on juvenile wild salmon. Like previous years, beach seining for juvenile salmon was conducted at 20 sites in two rounds of sampling throughout April and May. However, due to unforeseen delays toward the end of May, a single day of sampling was conducted at the beginning of June during the second round of sampling in 2019. Up to 30 specimens of each target species were collected at each of the sampling sites. The samples were then sent for laboratory analysis to determine the level of sea lice infestation. The target fish species for the present study was juvenile pink salmon (*Oncorhynchus gorbuscha*), although samples of juvenile chum salmon (*O. keta*), coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), and three-spined stickleback (*Gasterosteus aculeatus*) were also collected. To determine the environmental conditions at each site sampled, water temperature, salinity, and dissolved oxygen data were recorded at each sampling location. Over the course of the two sampling events (April and May/June), a total of 520 fish were retained for laboratory analysis. Of the 520 fish collected there were 194 pink salmon, 195 chum salmon, 48 coho salmon, 20 sockeye salmon, and 63 three-spined stickleback. A total of 35 *Lepeophtheirus salmonis* lice and 371 *Caligus clemensi* lice were identified on the 520 fish samples collected during sampling efforts. Table 1 provides a summary of the prevalence, abundance, and average intensity for both lice species found on pink salmon juveniles (target species) for all study years.

Table 1: Prevalence, abundance and average intensity of *L. salmonis* and *C. clemensi* lice on pink salmon from 2011 to 2019.

Year	*Lepeophtheirus salmonis*			*Caligus clemensi*		
	Prevalence	**Abundance**	**Average Intensity**	**Prevalence**	**Abundance**	**Average Intensity**
2011 (n = 611)	4%	0.0	1.1	13%	0.2	1.2
2013 (n = 612)	1%	0.0	1.0	4%	0.0	1.0
2014 (n = 500)	2%	0.0	1.0	5%	0.1	1.0
2015 (n = 460)	19%	0.1	1.2	21%	0.2	1.5
2016 (n = 336)	7%	0.1	1.1	16%	0.2	1.6
2017 (n = 189)	5%	0.1	1.3	10%	0.1	1.1
2018 (n = 201)	6%	0.1	1.2	11%	0.2	2.2
2019 (n = 194)	6%	0.1	1.0	13%	0.2	1.3

2.0 INTRODUCTION

The 2019 sea lice study aimed to add to the existing baseline studies (Pacificus 2011, 2013a and 2013b, 2014, 2015, 2016, 2017, 2018) of ambient sea lice levels present in Goletas Channel and Queen Charlotte Strait, British Columbia (Figure 1) by continuing to study the rate of *L. salmonis* and *C. clemensi* infestation during the 2019 salmonid outmigration period (April and May). The study was conducted on behalf of Mowi Canada West (Mowi) and the Tlatlasikwala First Nation. As no historical data exists for Goletas Channel and Queen Charlotte Strait prior to the establishment of the program in 2011, the primary objective of the project was to add to the data that has been collected over the previous seven years of the study. Secondary objectives of the project included determining the life history characteristics of sea lice in the Goletas Channel and Shelter Bay area, as well as the abundance, life stage, and distribution of the two species targeted (*L. salmonis* and *C. clemensi*). Observations regarding smolt outmigration timing, abundance, and distribution patterns were also collected. The 2019 sea lice study also helps fulfill Mowi's Aquaculture Stewardship Council (ASC) requirement to monitor wild salmonids. This is the eighth year of studying sea lice in Goletas Channel (Pacificus 2011, 2013a, 2014, 2015, 2016, 2017, 2018) and the seventh study year in the Shelter Bay area (Pacificus 2013b, 2014, 2015, 2016, 2017, 2018).

A total of 20 beach seine sites were sampled during the 2019 sample year. All 20 sites were the same sites sampled since 2015; study years prior to 2015 had additional sites that are no longer sampled. Six sites were located within the Shelter Bay area, Queen Charlotte Strait in DFO's Management Areas 11-2[1] and 12-13[2]. The remaining 14 sites were located in Goletas Channel in DFO's Management Areas 12-11, 12-12, 12-15, and 12-16.

Sea lice within the family Caligidae are known to be the most common species of sea lice in marine environments (Boxaspen 2006). Two common genera within this family, *Lepeophtheirus* and *Caligus,* have previously been identified on salmonids within the Pacific Ocean (Butterworth et al. 2008). As the two species of sea louse most commonly found on salmonids off of British Columbia's coast, *Lepeophtheirus salmonis* and *Caligus clemensi* were chosen as the focal species of sea lice for the present study.

[1] http://www.pac.dfo-mpo.gc.ca/fm-gp/maps-cartes/areas-secteurs/12-eng.html (Accessed August 2, 2019)
[2] http://www.pac.dfo-mpo.gc.ca/fm-gp/maps-cartes/areas-secteurs/11-eng.html (Accessed August 2, 2019)

L. salmonis and *C. clemensi* are parasitic copepods that have been found on all species of juvenile pacific salmon, as well as juvenile herring within the coastal waters of British Columbia (Beamish et al. 2009). As members of the family Caligidae, *L. salmonis* and *C. clemensi* have similar developmental cycles that differ in the timeline of developmental stages. Development of the two species is also highly variable depending on certain environmental conditions, such as water temperature. Both species of lice start out as eggs, and hatch two motile Nauplius stages (nauplius 1 and 2). From the nauplius stage, the lice progress into a motile, parasitic copepodid (Co) stage of development, where they find and attach to a host. Once attached to a host, the lice progress through several sessile chalimus stages (C1 and C2 for *L. salmonis*, C1, C2, C3 and C4 for *C. clemensi*). While in the chalimus stages 1 through 3, the lice are attached to the host by a frontal filament. However, during the final stage, the lice become motile once more on the host. The lice then progress into pre adult males (PAM) and pre adult females (PAF), then into reproductively viable adult males (AM) and adult females (AF).

Environmental conditions that have the potential to affect sea lice survival, growth, and reproduction rates include water temperature and salinity. Reproduction and development rates of *C. curtus, C. elongates* and *L. salmonis* were observed to increase with rising water temperatures in Atlantic studies (Saksida et al. 2015). In addition, the rate of incubation in water with salinity less than 15 parts per thousand (ppt) showed failure to produce viable nauplii (Jones and Johnson 2015). There was a certain tolerance for freshwater influence found; however, rising salinity and warmer temperatures were determined to be beneficial for sea lice development and survival.

The target species for the present study were pink salmon smolts (*Oncorhynchus gorbuscha*), although samples of juvenile chum salmon (*O. keta*), coho (*O. kisutch*), Chinook salmon (*O. tshawytscha*), sockeye salmon (*O. nerka*) salmon, cutthroat trout (*O. clarkii*), Dolly Varden char (*Salvelinus malma*) and three-spined stickleback (*Gasterosteus aculeatus*) were also retained for analysis, when encountered. No Atlantic salmon (*Salmo salar*) were observed during the 2019 sampling activities. All fry and smolt samples were captured via beach seine and sent for laboratory analysis at the BC Center for Aquatic Health Sciences in Campbell River, BC.

Ten Mowi fish farms were located within the study area. Seven of the locations remained operational during the 2019 sea lice study (Bell Island, Duncan Island, Doyle Island, Shelter Pass,

Bull Harbour, Raynor, and Robertson Island), with the remaining three being left fallow (Marsh Bay, Shelter Bay, and Heath Bay)(Figures 2, 3, and 4).

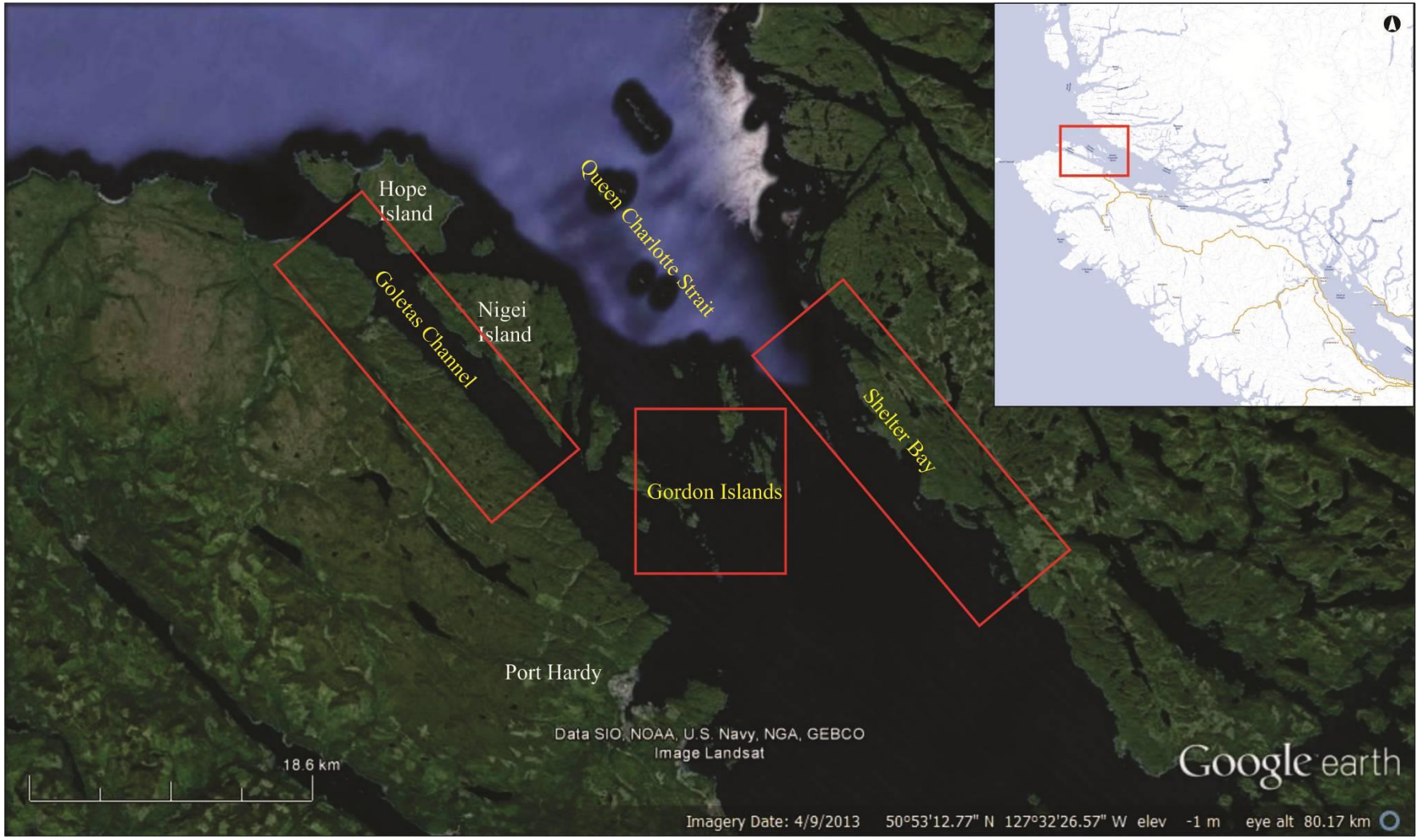

Figure 1: Overview map showing study locations (red boxes) for the 2019 sample year in relation to Port Hardy, Vancouver Island, BC.

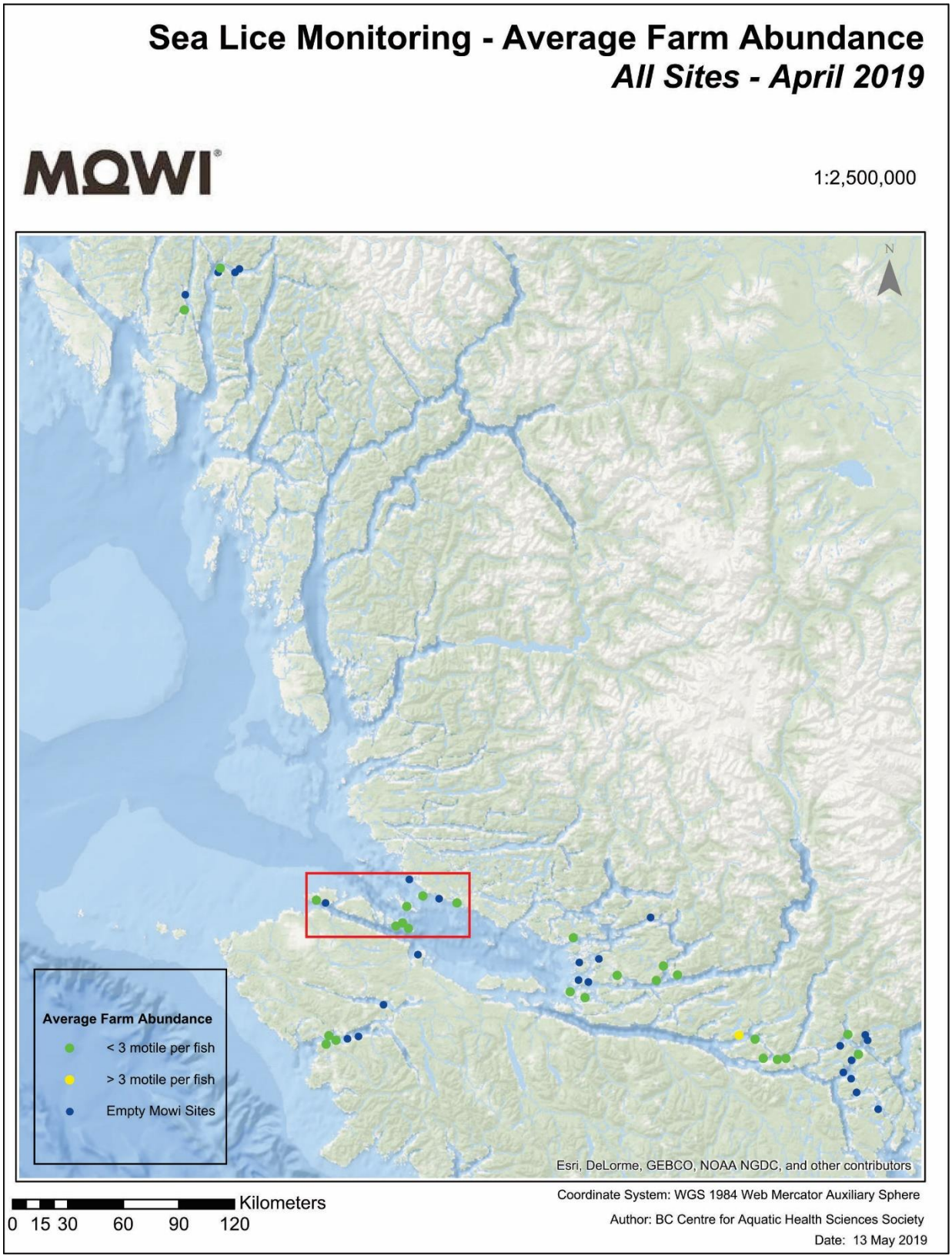

Figure 2: Location of Mowi fish farms along the BC coast in April 2019. 2019 sea lice study area has been outlined in red.

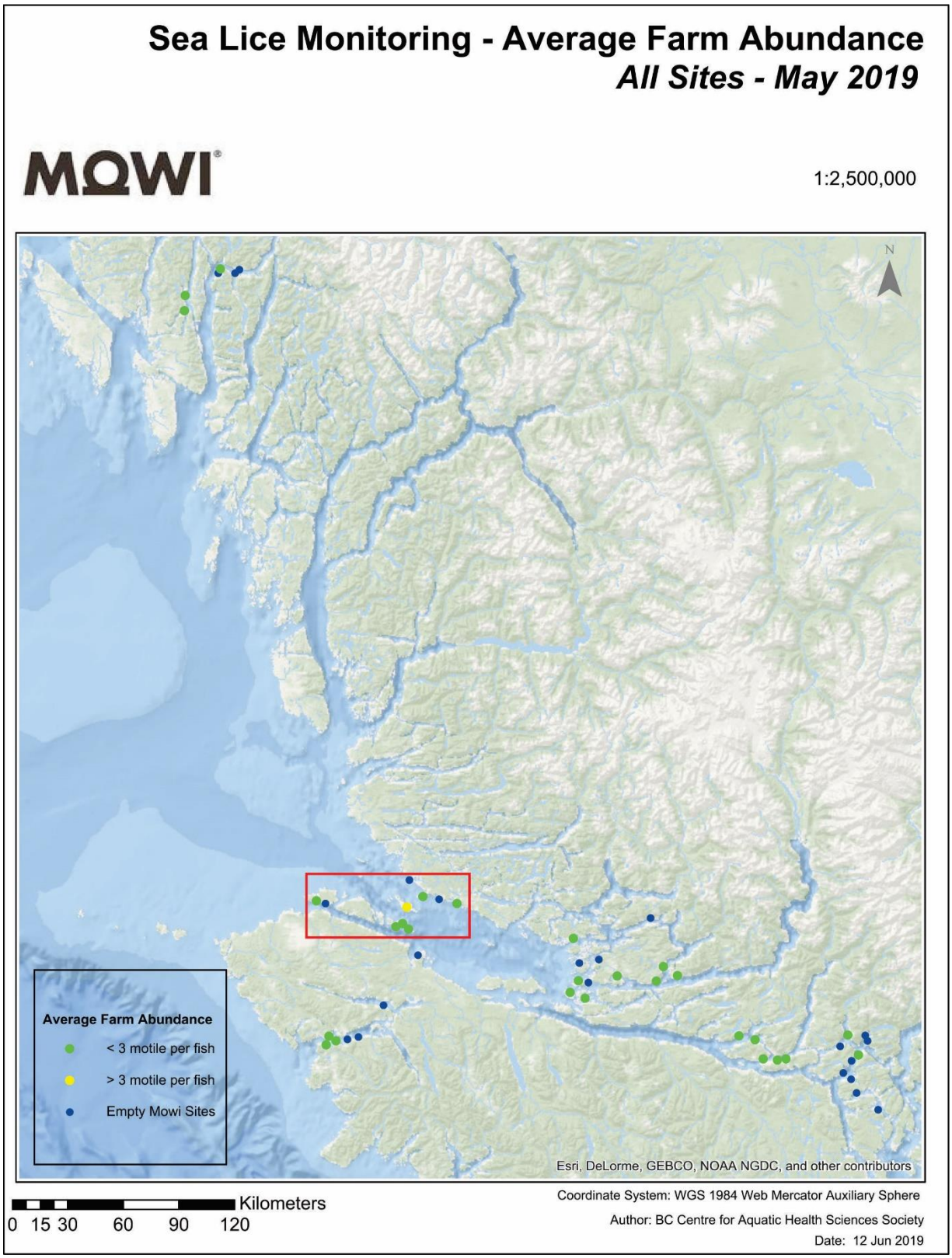

Figure 3: Location of Mowi fish farms along the BC coast in April 2019. The 2019 sea lice study area has been outlined in red.

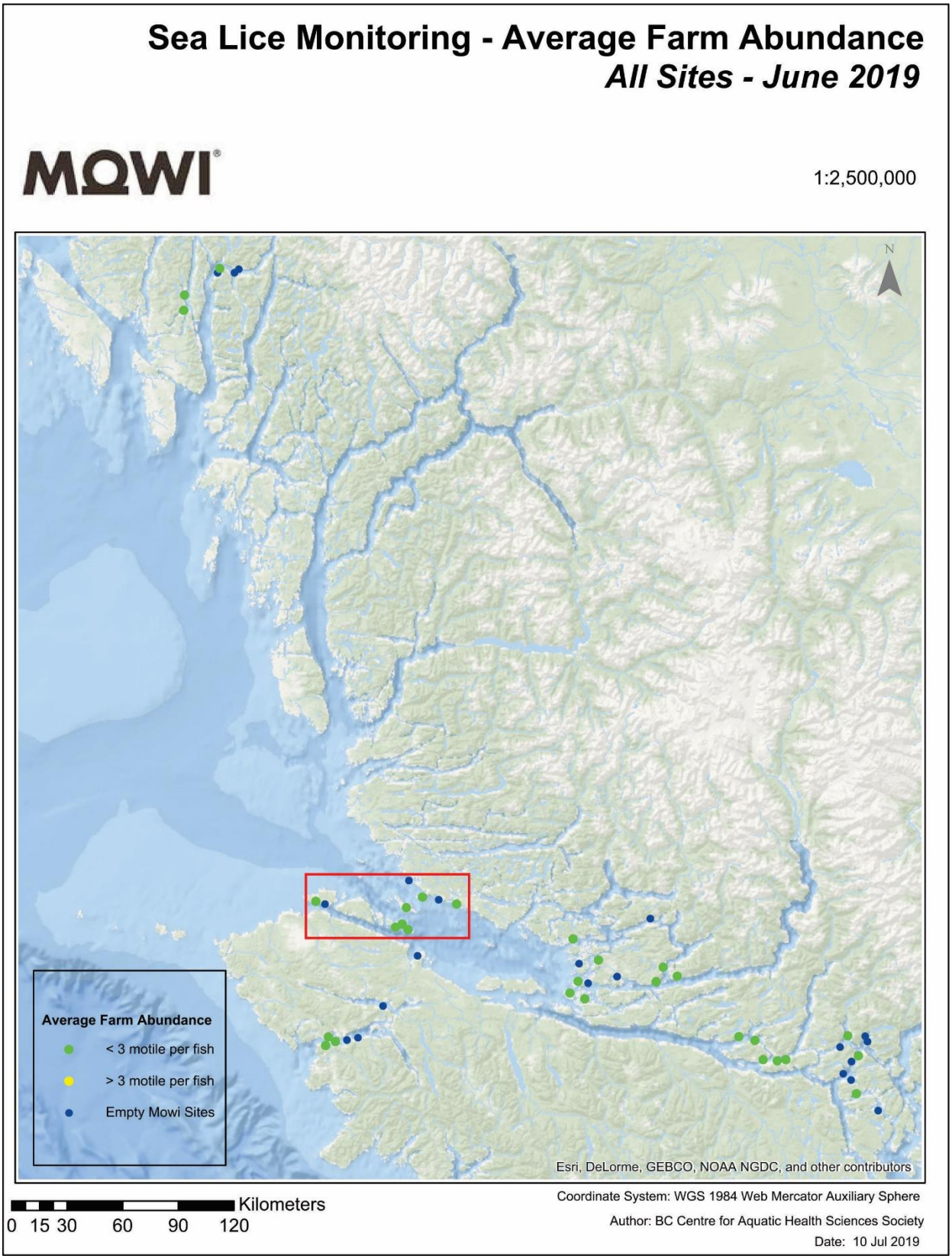

Figure 4: Location of Mowi fish farms along the BC coast in April 2019. The 2019 sea lice study area has been outlined in red.

3.0 METHODOLOGY

To remain consistent with previous years of the sea lice study, the same methodology was employed during the 2019 season. The area surveyed consisted of 20 beach seine sampling locations within Queen Charlotte Strait. The 20 sites were identified with a number from one through 20 based on relative geographic locations, with site numbering remaining consistent with 2017 and 2018 studies (Pacificus 2018, Pacificus 2017). Before the implementation of this site naming convention (outlined in Appendix 1), sample locations within Goletas Channel (Zones 1-5) were determined in the first year of the study (2011) and were subsequently identified during a pre-sampling field reconnaissance survey (Pacificus 2011). Sampling sites in the Shelter Bay area (Zone 6, Queen Charlotte Strait) were identified in 2013 (Pacificus 2013b) and altered slightly in 2014 (Pacificus 2014). All sample locations were chosen based on the presence of appropriate habitat characteristics and the likelihood of juvenile salmonids holding in these locations during the project time frame. Efforts were made to evenly distribute sites throughout the survey area.

Sites 1-14

This is the eighth year of sea lice monitoring at Sites 1 to 14 (Zones 1-5), all located within Goletas Channel. Prior to the implementation of the site number designations in 2017, this area was comprised of five zones, each containing two to four sample sites. However, in 2014, three sites were eliminated due to the lack of fish being captured, allowing for a redistribution of effort and the addition of new sites. Site 14 (formerly within Zone 5), located within the Deserters Group of islands, was added as a sampling site in 2014. Since 2014, sample sites have remained relatively the same throughout each sample year, with 2019 being no exception. In 2019, Sites 4, 5, 8 and 10 were located on the west side of Goletas channel, on Vancouver Island (Figure 5 and 6). Sites 1, 2, and 3 were located on Hope Island (Figure 6), Sites 6, 7 and 9 were located on Nigei Island (Figure 5) and Sites 11 through 14 were located around the Gordon and Deserter Group of Islands (Figure 7).

Sites 15-20

This is the seventh year of sea lice monitoring at Sites 15 to 20 (Zone 6), located northeast of Port Hardy in the Shelter Bay area of Queen Charlotte Strait (Figure 8). Five sampling locations were originally established in this area (Pacificus 2013b). In 2014, one site was eliminated and two were merged into one site in a new location (now referred to as Site 15) due to lack of suitable areas for beach seining. Two new sites were added to the area in April of 2014; Site 18 was located near

Marsh Bay and Site 20 was located by Robinson Island. In May of 2014, an additional sampling location (Site 19) was added and located near Browning Island, in between Sites 18 and 20. Sites 15 through 20 have been sampled on an annual basis since 2014 and were included in the 2019 program.

The 2019 sea lice study, conducted in Goletas Channel and Queen Charlotte Strait, mostly followed the sampling regime of the previous five years of the study, where monthly sampling occurred in April and May. However, in the 2019 study, an additional sample day was conducted in early June, as a combination of unforeseen weather events and situations within the Tlatlasikwala community prevented the conclusion of the second round of sampling during the month of May.

Field crews averaged four to five people, with one person operating the boat and collecting environmental data and three or four people hauling the net and processing fish samples. The sampling crew was composed of personnel from Pacificus. In addition, members from the Tlatlasikwala First Nation joined the crew for a number of the sampling dates.

Fish were sampled using a beach seine net deployed in a simple arc set pattern by boat and pulled into the beach area by the crew, as outlined in the beach seining section of *The Salmonid Field Protocols Handbook* (2008). The seine net was built by Redden Nets in Campbell River with dimensions as follows: 150 ft length with ½" wings and ¼" bunt mesh, 2 fathom depth and #2 lead line.

Prior to setting the net, a preliminary search of the shoreline at each site location was performed from the boat for approximately five minutes at a distance of 10-20m from the shore in order to assess the presence of salmonids. Observations from this survey were used to help focus seining efforts; if fish were observed during the survey, the net would be set to encompass the area in which the fish were observed. However, if no fish were observed during the search, then the set was performed in the area where fish were most likely to be present based on the examination of the site.

At least one sampling event was conducted via beach seine at each sample site. However, if no salmonids were caught on the first set in a sample site, a subsequent set was made within the defined sample area to a maximum of two sets per sampling location (Pacificus 2013a). During the 2011 study, subsequent sets were made to a maximum of three sets per sampling location; however,

results from this study indicated that the third set only resulted in a captured salmonid on one occasion (Pacificus 2011). Therefore, the maximum number of sets per sampling location was modified to two for the 2013 study year and has remained this way in each subsequent year of the study.

Upon capture of target species during beach seine events, specimens were randomly selected for laboratory analysis. A maximum of 30 sample fish per target species were retained from each site for laboratory sea lice analysis in each monthly sample. Target species for the 2019 survey included pink salmon (*Oncorhynchus gorbuscha*), chum (*O. keta*), sockeye (*O. nerka*), coho (*O. kisutch*), Chinook (*O. tshawytscha*), Dolly Varden (*Salvelinus malma*), cutthroat (*O. clarkii*), three-spined stickleback (*Gasterosteus aculeatus*) and Pacific herring (*Clupea pallasii*). The remaining fish captured in the seine net were identified to species level, enumerated, and released.

Sample specimens retained for laboratory analysis were placed in sample bags and immediately euthanized with a Tricaine methanesulfonate (TMS) overdose. Samples in two ounce bags were given 1.0 ml of a 240 mg/L TMS solution, while samples in four ounce bags were given 5.0 ml of TMS solution. Each sample bag, having been pricked with a tack prior to usage, was then placed in a bucket where the solution drained out. Sample bags for each site were placed together in a larger bag with relevant data for the set included on waterproof paper. Once samples were processed, they were placed on ice in a cooler while in the field and then frozen once they were transported back to Port Hardy.

Upon completion of the monthly sampling, the frozen sample specimens were transported to the BC Centre for Aquatic Health Sciences (CAHS) in Campbell River, BC for laboratory analysis. Specimens were identified to species and analyzed for wetted weight and fork length. In addition, microscopic sea lice counts were completed on each fish sample collected. Each sea lice encountered was identified to species, sexed, enumerated, and classified to life stage. For the purpose of analysis, louse prevalence was defined as the number of fish infected out of the total number sampled, abundance as the total average number of lice per fish, and intensity as the total number of lice per infected fish.

In cases where less than ten individuals per species per month were collected, prevalence, abundance and intensity of louse infections was calculated but will not be discussed further within this report due to the increased potential for errors arising from small sample sizes. Values arising

from small sample sizes are still represented in the tables found within this report; however, any utilization of this data should be done with the appropriate context given to the small sample size.

In sets where large numbers of fish (over 100) were encountered in a single set, or where sea conditions did not permit identification and/or processing of fish in the bunt of the net, captured fish were placed in a seawater-filled tote with air stones to maintain dissolved oxygen levels before being processed. Those fish that were not retained were released in a timely manner when identification and quantification had been completed.

Environmental data was collected at every seine location and consisted of temperature (^{0}C), dissolved oxygen (mg/L) and salinity (ppt) measurements at the surface (0m), 1m and 4m depths. These measurements were taken using a 556 YSI meter at the same time and location as the set proximal to the mid-point of the net. Weather conditions at the time of each set were noted, as were any additional comments pertaining to the set. Locational data was collected from the sampling vessel's navigation system, a Ray-Marine multi-function GPS unit.

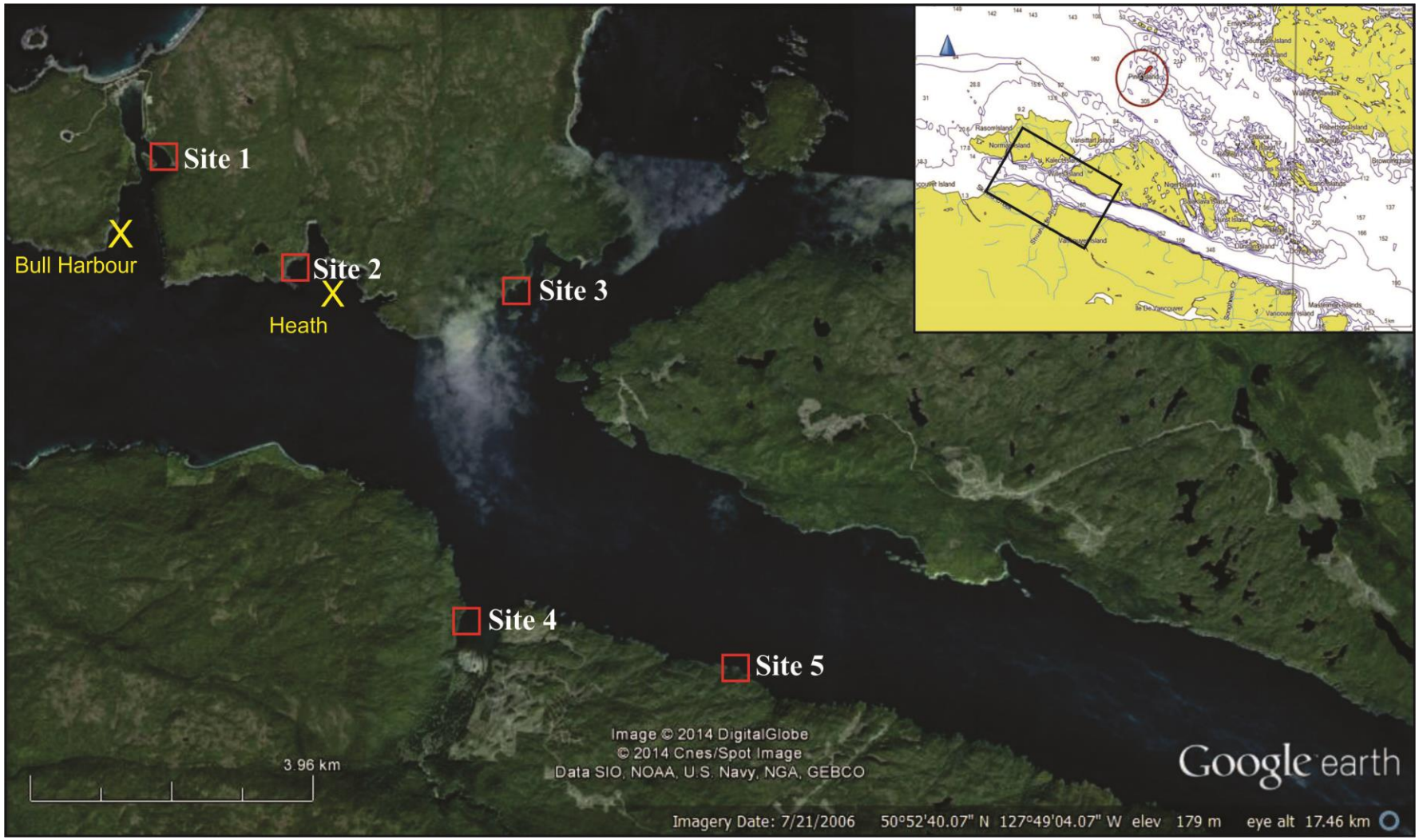

Figure 5: Location map of the sampling sites from 1 to 5 located on Vancouver Island and Hope Island examined during the 2019 sample year in Goletas Channel, British Columbia. The yellow "X" indicates locations of both active and inactive fish farms in the area.

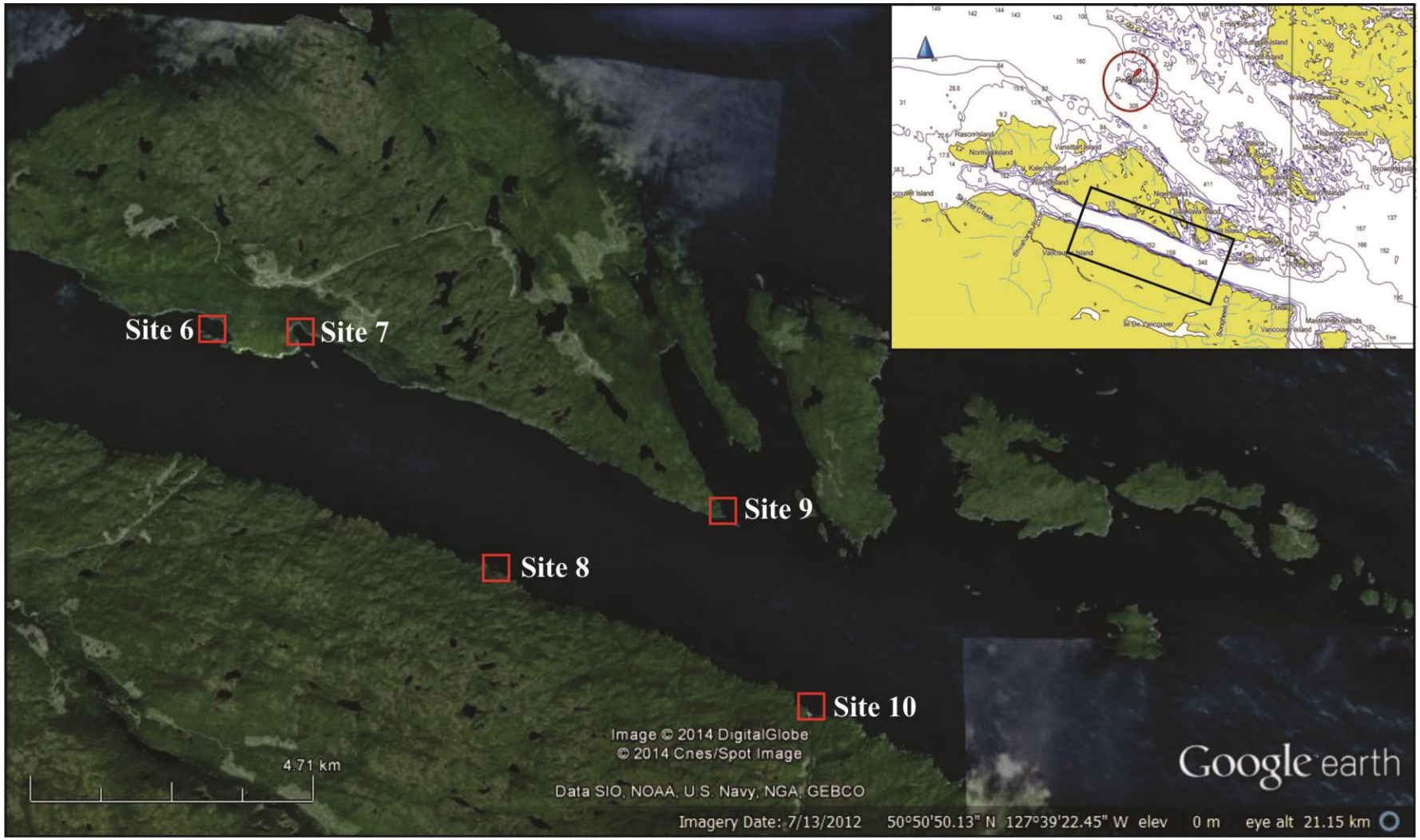

Figure 6: Location map of the sampling sites 6 to 10 located on Vancouver Island and Nigei Island examined during the 2019 sample year in Goletas Channel, British Columbia.

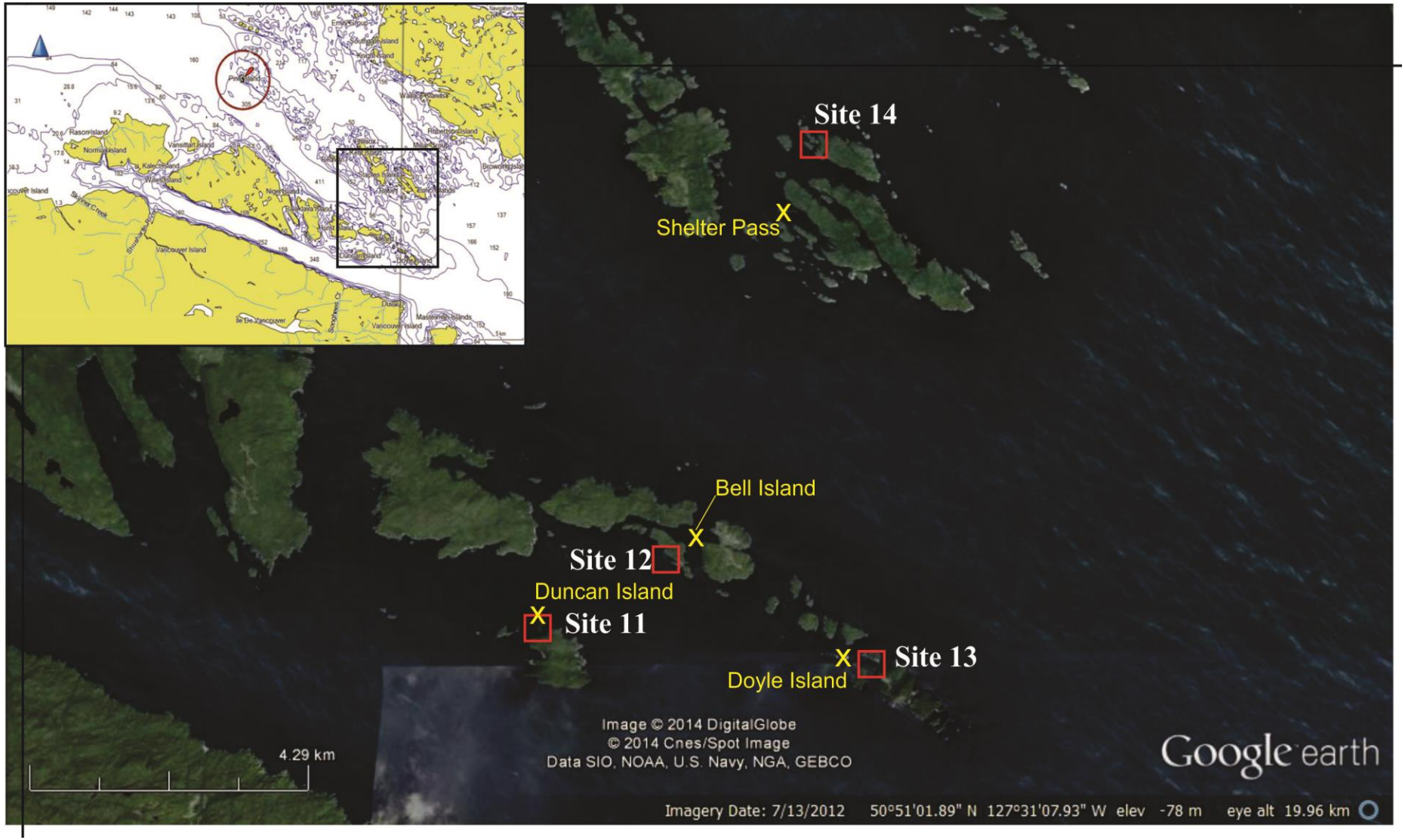

Figure 7: Location map of the sampling sites 11 to 14 located in the Gordon Group examined during the 2019 sample year in Goletas Channel, British Columbia. The yellow "X" indicates both active and inactive fish farm locations.

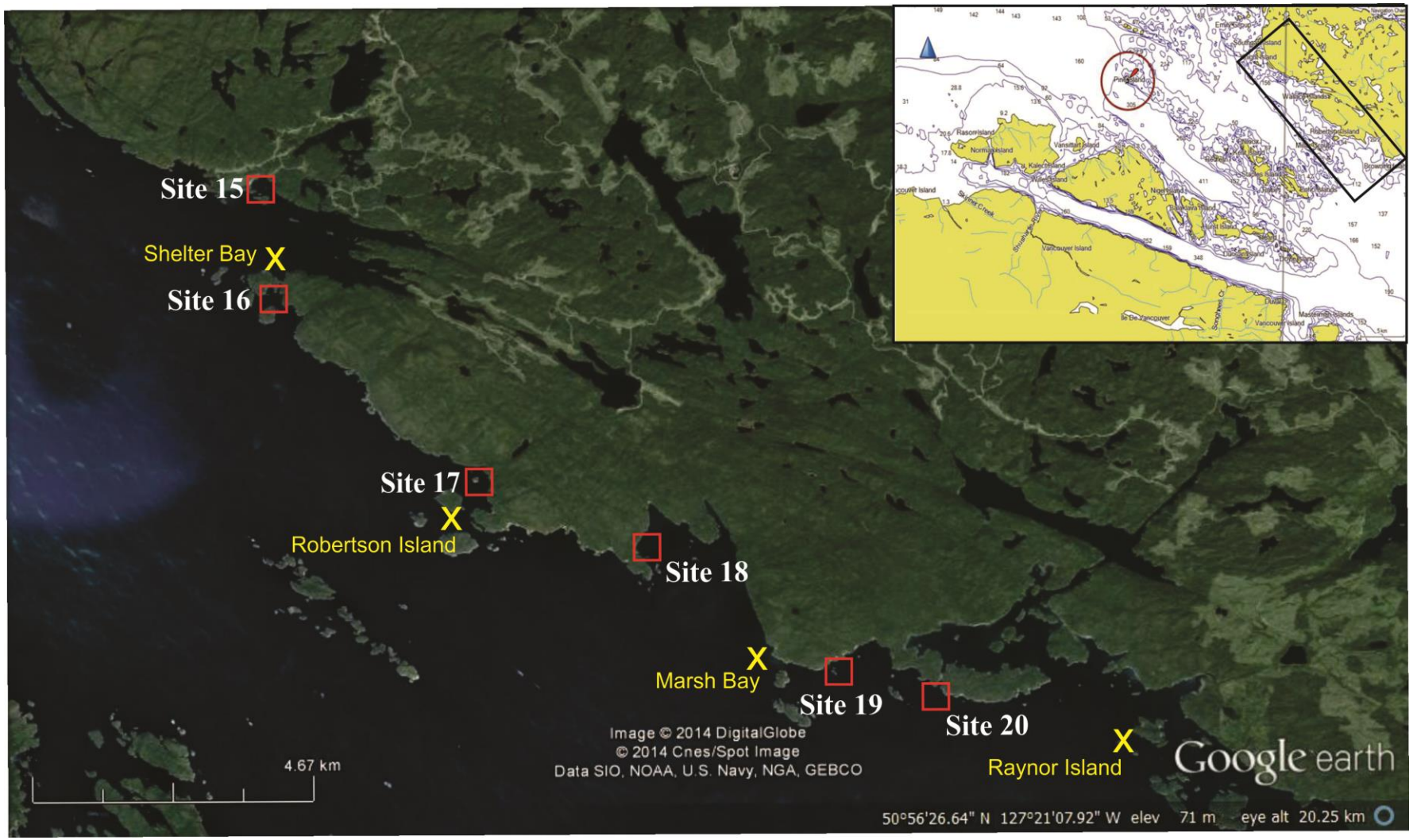

Figure 8: Location map of sampling sites 15 through 20 examined during the 2019 season. These sites are located in the Shelter Bay area of Queen Charlotte Strait, British Columbia. The yellow "X" indicates active and inactive fish farm locations.

4.0 RESULTS

Two rounds of beach seining were completed during the 2019 sample season. The first round occurred from April 23rd to April 26th, 2019. Due to combination of poor weather and unforeseen circumstances within Tlatlasikwala First Nation community towards the end of May, only three days of sampling could be conducted during the second round of sampling. In order to supplement the sampling conducted at the end of May, an additional day of sampling was completed at the beginning of June. Therefore, the second round of sampling occurred on May 21st, May 22nd, May 23rd, June 6th, 2019. With this additional day in June, all 20 sites were sampled during the first and second rounds during the 2019 sampling season.

A project total of 54 sets were completed during the 2019 season, 31 of which were successful at capturing target species. A total of 27 sets were completed during the April sampling, 19 of which were successful at capturing target species. A total of 27 sets were completed during the May/June sampling, 12 of which were successful at capturing target species.

During the April sampling, the crew was unable to capture fish within the first seine attempt at six sites; four of the subsequent sets resulted in the capture of target species. During the May/June sampling, the crew was unable to capture fish within the first seine attempt at ten sites; however, only one of the subsequent sets resulted in the capture of target species.

Data presented within this report have been adjusted to reflect the identification completed during laboratory analysis of samples due to the higher accuracy of identification in a laboratory setting compared to field identification of juvenile salmonids. As a result of more accurate lab identification, the actual number of specimens retained was, in some cases, greater than the maximum number of samples originally intended (30 samples retained per species, per site).

The number of samples obtained in each of the 31 successful sets ranged from 1 to 38 of the target species and averaged 16 samples per successful set. A total of 520 samples were retained for laboratory analysis throughout the 2019 sea lice study. Of the 520 samples collected, 194 were pink salmon, 195 were chum salmon, 48 were coho salmon, 20 were sockeye salmon, and 63 were three-spined stickleback. The sampling retention was highest for chum and pink salmon (37.5% and 37.3%, respectively), followed by three-spined stickleback (12.1%), coho

salmon (2.5%), and sockeye salmon (1.1%). Tables 2 and 3 below provide a summary of the capture and collection totals for 2019.

Table 2: Species sampled during 2019 sea lice study, examined by percent of total capture, the collection (retained for sampling) total, and corresponding collection percentage (number of individual species collected out of total number of fish collected).

Species	Capture total (% of total)	Collection total	Collection %
Pink salmon	62.3	194	37.3
Chum salmon	15.3	195	37.5
Coho salmon	2.5	48	9.2
Sockeye salmon	1.1	20	3.8
Three-spined stickleback	18.5	63	12.1
All species	**100**	**520**	**100**

Table 3: Distribution of fish species captured and sampled at Sites 1 through 20 during the 2019 sea lice study in Goletas Channel and Queen Charlotte Strait.

Site	Pink		Chum		Coho		Sockeye		Dolly Varden		Three-spined Stickleback		Capture Total	Sample Total
	# Captured	# Sampled	# Captured	# Sampled	# Captured	# Sampled	# Captured	# Sampled	# Captured	# Sampled	# Captured	# Sampled		
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	38	38	117	54	0	0	0	0	0	0	0	0	155	92
3	2	2	10	10	0	0	0	0	0	0	0	0	12	12
4	0	0	0	0	23	23	10	10	7	0	0	0	40	33
5	21	21	3	3	5	5	0	0	0	0	1	1	30	30
6	46	31	10	9	0	0	0	0	0	0	0	0	56	40
7	10	10	28	28	1	1	0	0	0	0	0	0	39	39
8	1	1	7	7	0	0	0	0	0	0	0	0	8	8
9	0	0	2	2	1	1	1	1	0	0	0	0	4	4
10	36	32	84	52	8	8	0	0	0	0	0	0	128	92
11	1	1	0	0	0	0	0	0	0	0	0	0	1	1
12	0	0	3	3	0	0	0	0	0	0	0	0	3	3
13	1000	32	25	25	0	0	0	0	0	0	0	0	1025	57
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	2	2	0	0	0	0	0	0	0	0	348	61	350	63
16	0	0	0	0	10	10	4	4	0	0	1	1	15	15
17	0	0	0	0	0	0	2	2	0	0	0	0	2	2
18	21	21	2	2	0	0	0	0	0	0	0	0	23	23
19	2	2	0	0	0	0	0	0	0	0	0	0	2	2
20	1	1	0	0	0	0	3	3	0	0	0	0	4	4
Total	**1181**	**194**	**291**	**195**	**48**	**48**	**20**	**20**	**7**	**0**	**350**	**63**	**1897**	**520**

4.1 Juvenile Salmonid Abundance, Distribution, Growth and Timing Patterns

Throughout the 2019 sea lice study a total of 1,897 fish were captured (target species only), of which 520 were retained for sampling (Table 3). Most of the specimens retained for sampling were salmonid species, although 63 three-spined stickleback (*Gasterosteus aculeatus*) were also collected for sea lice analysis. A total of 303 samples were collected during the first round of sampling in April (58.3% of the project total), while 217 samples were collected during the second round of sampling conducted in May/June (176 in May, 41 in June; 41.7% of the project total). Sites 1 and 14 did not yield any specimens over the course of the sampling program.

The average length and weight of pink, chum, and coho salmon was observed to increase throughout each sampling month. However, the average length and weight of sampled sockeye salmon was observed to decrease in May compared with April and June (though samples sizes were limited for all samples of sockeye salmon) (Table 4). Pink, chum, coho, and sockeye salmon were all captured in both April and May of 2019; however, only coho and sockeye were captured during in June. Three-spined stickleback were also collected during all three months of sampling.

Table 4: Average lengths and weights of species collected during the 2019 sea lice study, by sampling month collected.

Species	Weight (g)			Length (mm)		
	April	May	June	April	May	June
Pink	1.3 (n=153)	1.8 (n=32)	-	42.2 (n=153)	55.8 (n=32)	-
Chum	1.0 (n=102)	1.6 (n=64)	-	44.1 (n=102)	51.5 (n=64)	-
Coho	11.2 (n=8)	14.1 (n=31)	22.5 (n=9)	97.6 (n=8)	102.5 (n=31)	120 (n=9)
Sockeye	11.4 (n=7)	9.1 (n=10)	12.4 (n=3)	101.3 (n=7)	96.5 (n=10)	101.7 (n=3)
Three-Spined Stickleback	0.3 (n=31)	2.4 (n=1)	0.7 (n=29)	30.5 (n=31)	58.0 (n=1)	39.9 (n=29)

4.2 Sea Lice Infestation

Lice Species Distribution

During the month of April a total of 18 *L. salmonis* were identified on samples originating from Sites 2, 3, 7, 13, and 18. In May, a total of 14 *L. salmonis* were identified on samples from Sites 2, 3, 4, 5, 7, and 10, with an additional three *L. salmonis* found on fish sampled at Site 16 in June. A total of 27 *C. clemensi* were identified during the April sampling at Sites 2, 5, 6, 7, 13, and 18. In May, 303 *C. clemensi* were found on fish samples originating from Sites 2, 3, 4, 5, 6, 7, 8, 10, and 12, with an additional 41 *C. clemensi* identified on specimens from Sites 16 and 17 in June.

The mean prevalence (percentage of fish that were infected compared to the number of fish sampled), the mean abundance (average number of sea lice on all fish sampled) and the mean intensity (average number of sea lice on infected fish) were calculated for each species in Table 5 and for each species at each site in Tables 6 through 10.

Counts of both species of sea lice observed (*L. salmonis and C. clemensi*) were combined to calculate prevalence and abundance (Table 5). Out of the target species sampled, 143 of 520 fish (27.5%) were found to be infected by sea lice. A total of 406 sea lice were on 36 pink salmon, 53 chum salmon, 29 coho salmon, 10 sockeye salmon and 15 three-spined stickleback.

The highest prevalence and abundance of sea lice infection was found in juvenile coho salmon (60.4%, 3.9 respectively). The highest average intensity was also found in coho smolts (6.5). The juvenile pink salmon population sampled in Goletas Channel and the Shelter Bay area in 2019 had an overall prevalence of 18.6%, and an abundance of 0.2, with an average intensity of 1.3 identified sea lice per infected fish (Table 5).

Table 5: Overall prevalence/abundance/intensity of *L. salmonis* and *C. clemensi* found on target species collected during the 2019 sea lice study.

Species	Sample size (n)	Total number of lice	Total number of fish infected	Prevalence (%)	Abundance	Average Intensity
Pink	194	45	36	18.6%	0.2	1.3
Chum	195	108	53	27.2%	0.6	2.0
Coho	48	189	29	60.4%	3.9	6.5
Sockeye	20	37	10	50.0%	1.9	3.7
Three-spined Stickleback	63	27	15	23.8%	0.4	1.8
Total	**520**	**406**	**143**	**27.5%**	**0.8**	**2.8**

Lice Species Prevalence, Abundance and Intensity in Pink Salmon

A total of 194 pink salmon were retained for laboratory sampling, 153 of which were caught during the month of April and 41 during the month of May. *L. salmonis* and *C. clemensi* identified on juvenile pink salmon were identified on the retained individuals from both sampling months (Table 6).

Table 6: Prevalence, abundance and intensity of *L. salmonis* and *C. clemensi* at each sampling location where samples of pink salmon were retained.

Pink Salmon						
Site	*L. salmonis*			*C. clemensi*		
	Prevalence	Abundance	Intensity	Prevalence	Abundance	Intensity
2	0.0%	0.00	0.00	15.8%	0.24	1.50
3	50.0%	0.50	1.00	50.0%	0.50	1.00
5	0.0%	0.00	0.00	9.5%	0.10	1.00
6	0.0%	0.00	0.00	3.2%	0.03	1.00
7	0.0%	0.00	0.00	30.0%	0.40	1.33
8	0.0%	0.00	0.00	0.0%	0.00	0.00
10	3.1%	0.03	1.00	28.1%	0.38	1.33
11	0.0%	0.00	0.00	0.0%	0.00	0.00
13	25.0%	0.25	1.00	6.3%	0.06	1.00
15	0.0%	0.00	0.00	0.0%	0.00	0.00
18	9.5%	0.10	1.00	9.5%	0.10	1.00
19	0.0%	0.00	0.00	0.0%	0.00	0.00
20	0.0%	0.00	0.00	0.0%	0.00	0.00
Total	**6.2%**	**0.06**	**1.00**	**13.4%**	**0.17**	**1.27**

Lice Species Prevalence, Abundance and Intensity in Chum Salmon

A total of 195 chum salmon samples were retained for laboratory analysis (Table 7). Of those samples, 102 were captured in April and 93 were captured in May; no chum salmon were caught during June sampling efforts.

Table 7: Prevalence, abundance and intensity of *L. salmonis* and *C. clemensi* at each sampling location where samples of chum salmon were retained.

Chum Salmon						
Site	***L. salmonis***			***C. clemensi***		
	Prevalence	**Abundance**	**Intensity**	**Prevalence**	**Abundance**	**Intensity**
2	5.6%	0.06	1.00	35.2%	0.65	1.84
3	20.0%	0.20	1.00	10.0%	0.20	2.00
5	0.0%	0.00	0.00	66.7%	1.33	2.00
6	0.0%	0.00	0.00	33.3%	0.33	1.00
7	17.9%	0.18	1.00	35.7%	1.32	3.70
8	0.0%	0.00	0.00	28.6%	0.43	1.50
9	0.0%	0.00	0.00	0.0%	0.00	0.00
10	1.9%	0.02	1.00	7.7%	0.12	1.50
12	0.0%	0.00	0.00	33.3%	0.33	1.00
13	4.0%	0.04	1.00	12.0%	0.20	1.67
18	0.0%	0.00	0.00	0.0%	0.00	0.00
Total	**6.2%**	**0.06**	**1.00**	**23.1%**	**0.49**	**2.13**

Lice Species Prevalence, Abundance and Intensity in Coho Salmon

A total of 48 coho salmon samples were retained for laboratory analysis (Table 8), 8 of which were captured in April, 31 in May, and 9 in June. Due to the small sample size in April, results will not be discussed further (see *Section 3.0 – Methodology* for further explanation).

Table 8: Prevalence, abundance and intensity of *L. salmonis* and *C. clemensi* at each sampling location where samples of coho salmon were retained.

Coho Salmon						
Site	***L. salmonis***			***C. clemensi***		
	Prevalence	**Abundance**	**Intensity**	**Prevalence**	**Abundance**	**Intensity**
4	4.3%	0.04	1.00	65.2%	3.83	5.87
5	0.0%	0.00	0.00	20.0%	0.20	1.00
7	0.0%	0.00	0.00	100.0%	26.00	26.00
9	0.0%	0.00	0.00	0.0%	0.00	0.00
10	0.0%	0.00	0.00	75.0%	5.88	7.83
16	30.0%	0.30	1.00	60.0%	2.30	3.83
Total	**8.3%**	**0.08**	**1.00**	**60.4%**	**3.85**	**6.38**

Lice Species Prevalence, Abundance and Intensity in Sockeye Salmon

A total of 20 sockeye salmon samples were retained for laboratory analysis (Table 9). A total of 7 sockeye salmon were collected in April, 10 were captured in May, and 3 were retained in June. Due to the small sample size of sockeye collected during the three months of the program, results will not be interpreted further (see *Section 3.0 – Methodology* for further explanation).

Table 9: Prevalence, abundance and intensity of *L. salmonis* and *C. clemensi* at each sampling location where samples of sockeye salmon were retained.

Sockeye Salmon						
Site	***L. salmonis***			***C. clemensi***		
	Prevalence	**Abundance**	**Intensity**	**Prevalence**	**Abundance**	**Intensity**
4	20.0%	0.60	3.00	90.0%	2.90	3.22
9	0.0%	0.00	0.00	0.0%	0.00	0.00
16	0.0%	0.00	0.00	0.0%	0.00	0.00
17	0.0%	0.00	0.00	0.0%	0.00	0.00
20	0.0%	0.00	0.00	33.3%	0.67	2.00
Total	**10.0%**	**0.30**	**3.00**	**50.0%**	**1.55**	**3.10**

Lice Species Prevalence, Abundance and Intensity in Three-spined Stickleback

A total of 63 three-spined stickleback were captured and retained for laboratory analysis (Table 10). 33 stickleback were captured in April, with the remaining 30 collected during the second sampling event in May and June (1 in May; 29 in June).

Table 10: Prevalence, abundance and intensity of *L. salmonis* and *C. clemensi* at each sampling location where samples of three-spined stickleback were retained.

Three-Spined Stickleback						
Site	***L. salmonis***			***C. clemensi***		
	Prevalence	**Abundance**	**Intensity**	**Prevalence**	**Abundance**	**Intensity**
5	100.0%	1.00	1.00	100.0%	8.00	8.00
15	0.0%	0.00	0.00	21.3%	0.30	1.38
16	0.0%	0.00	0.00	0.0%	0.00	0.00
Total	**1.6%**	**0.02**	**1.00**	**22.2%**	**0.41**	**1.86**

Louse Life Stage

Louse life stage was determined through laboratory analysis, the distribution of which can be found in Table 11. Louse life stages determined in the analysis include parasitic copepodid (Co), chalimus stages (C1 and C2 for *L. salmonis* and C1 through C4 for *C. clemensi*), pre adult males (PAM) and pre adult females (PAF), as well as viable adult males (AM) and adult females (AF).

Louse Life Stage on Pink Salmon

The most prevalent life stage of *L. salmonis* observed on pink salmon was the C2 stage (50.0%) followed by the C1 and PAF stages (41.7% and 8.3%, respectively). No other stages of *L. salmonis* were found on pink salmon submitted for laboratory analysis during the 2019 study.

The most prevalent life stage of *C. clemensi* observed on pink salmon was the C1 stage (72.7%), followed by Co (15.2%) and C2 stages (12.1%). No other stages of *C. clemensi* were identified on pink salmon submitted for laboratory analysis.

Louse Life Stage on Chum Salmon

The most prevalent life stage of *L. salmonis* observed on chum salmon was the C1 stage (50.0%) followed by the C2 stage (41.7%) and the PAM stage (8.3%). No Co, C3, C4, PAF, AM, or AF stages of *L. salmonis* were observed on chum salmon samples submitted to the lab during the 2019 sea lice study.

The most dominant life stage of *C. clemensi* observed on chum salmon samples submitted to the laboratory was the C1 stage (49.0%), followed by the C2 stage (26.0%), the Co stage (14.6%), and the C3 stage (7.3%). The least prevalent life stages of *C. clemensi* sea lice found on chum salmon were C4 (2.1%) and AF (1.0%), respectively. No other life stages of *C. clemensi* were identified on any of the chum salmon submitted for laboratory testing.

Louse Life Stage on Coho Salmon

The most prevalent life stage of *L. salmonis* observed on coho salmon was the PAM stage (50.0%), followed by both the C1 and C2 stages (both 25.0%). No other stages of *L. salmonis*

were identified on coho salmon samples submitted for laboratory analysis during the 2019 sea lice study.

The most prevalent life stage of *C. clemensi* identified on juvenile coho salmon was the C1 stage (69.2%) followed by the C2 (20.0%), C3 (3.2%), and AF stages (2.7%). The least dominant life stages of *C. clemensi* identified on chum salmon samples were the Co, C4, and AM life stages, which were all found at a prevalence of 1.6%. No PAM or PAF *C. clemensi* lice were identified on any of the coho salmon samples.

Louse Life Stage on Sockeye Salmon

The only life stage of *L. salmonis* found on sockeye salmon samples submitted for laboratory analysis was C2, at a prevalence of 16.7%. No other life stages of *L. salmonis* were identified on sockeye salmon.

The most prevalent life stage of *C. clemensi* identified on juvenile sockeye salmon was the C1 stage (64.5%), followed by the C2 stage (22.6%), the Co stage (9.7%), and the PAF stage (3.2%). There were no C3, C4, PAM, AM, or AF stages of *C. clemensi* lice identified on any of the sockeye salmon submitted for laboratory analysis.

Louse Life Stage on Three-spined Stickleback

The most prevalent stage of *L. salmonis* found on three-spined stickleback submitted for laboratory analysis during the 2019 sea lice study was C2 (100.0%). No other life stages of *L. salmonis* were identified on three-spined stickleback collected during the study.

The most prevalent life stage of *C. clemensi* identified on three-spined stickleback was the C1 stage (57.7%) followed by the C2 stage (15.4%) and the Co and C2 stages (both 11.5%). The AF life stage was also found on three-spined stickleback at a prevalence of 3.8%. No C4, PAM, PAF, or AM life stages of *C. clemensi* were found on any of the three-spined stickleback retained for analysis during the 2019 study.

Table 11: Numbers and life stages of *L. salmonis* and *C. clemensi* sea lice collected from target fish species sampled from April 23rd to June 6th, 2019.

	Species	LEP Co	LEP C1	LEP C2	LEP PAM	LEP PAF	LEP AM	LEP AF	LEP Total	Cal Co	Cal C1	Cal c2	Cal c3	Cal C4	CAL PAM	CAL PAF	CAL AM	CAL AF	CAL Total
April	Pink	0	5	5	0	0	0	0	**10**	3	7	2	0	0	0	0	0	0	**12**
	Chum	0	4	3	1	0	0	0	**8**	1	9	2	0	0	0	0	0	0	**12**
	Coho	0	0	0	0	0	0	0	**0**	0	1	0	0	0	0	0	0	0	**1**
	Sockeye	0	0	0	0	0	0	0	**0**	0	2	0	0	0	0	0	0	0	**2**
	Three-spined Stickleback	0	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**
May	Pink	0	0	1	0	1	0	0	**2**	2	17	2	0	0	0	0	0	0	**21**
	Chum	0	2	2	0	0	0	0	**4**	13	38	23	7	2	0	0	0	1	**84**
	Coho	0	0	1	0	0	0	0	**1**	1	116	36	5	1	0	0	1	1	**161**
	Sockeye	3	3	0	0	0	0	0	**6**	3	18	7	0	0	0	1	0	0	**29**
	Three-spined Stickleback	0	0	1	0	0	0	0	**1**	0	3	3	2	0	0	0	0	0	**8**
June	Pink	0	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**
	Chum	0	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**
	Coho	0	1	0	2	0	0	0	**3**	2	11	1	1	2	0	0	2	4	**23**
	Sockeye	0	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	**0**
	Three-spined Stickleback	0	0	0	0	0	0	0	**0**	3	12	1	1	0	0	0	0	1	**18**

4.3 Water Quality – Salinity, Temperature, and Dissolved Oxygen

Salinity, temperature, and dissolved oxygen data were recorded at each site throughout the entire study period. Measurements were taken at the surface (0m), as well as at 1m and 4m depths. Surface water quality data for the entire study area have been documented in Table 12. The full set of water quality data recorded during for the 2019 sea lice study can be found in Appendix 2.

Salinity

Average salinity of surface waters increased slightly from April to June. During the month of April maximum salinity (32.9 ppt) was recorded at Site 3, on the south side of Hope Island. The lowest surface salinity (15.1 ppt) was recorded on the surface of Site 4 in Goletas Channel.

During the second round of sampling at the end of May and early June, the highest surface salinity (38.0 ppt) was recorded at Site 16, near Duncan Island in the Gordon Group, while the lowest surface salinity (31.1 ppt) was recorded at Site 11, in the Shelter Bay area.

Temperature

The average surface water temperature for the entire study area increased throughout the study period (April 23rd to June 6th, 2019). Average surface water temperature was 9.2°C in April and 10.0°C during the second round of sampling in May and June. In April, the lowest recorded surface temperature (7.7^{o}C) was encountered at both Site 14, near Shelter Pass in the Gordon Group, and Site 20, east of Marsh Bay in the Shelter Bay area. The highest surface temperature for April (10.3^{o}C) was recorded at Site 7, on Nigei Island. The lowest surface water temperature in May and June (8.9^{o}C) was recorded at Site 11, in the Gordon Group. The highest surface temperature recorded in May and June (11.4^{o}C) was found at the surface of Site 15 in the Shelter Bay area.

Dissolved Oxygen

The average surface levels of dissolved oxygen increased throughout the study period. In April, the average level of dissolved oxygen at the surface (0m) was 9.4 mg/L; during the

second round of sampling in May and June, average dissolved oxygen was 11.9 mg/L at the surface. Site 14, in the Gordon Group, was found to have the lowest recorded surface dissolved oxygen level in April (8.2 mg/L), while Site 4, in Goletas Channel on northern Vancouver Island, was found to have the highest level in April (12.0 mg/L). In May and June, the lowest level of dissolved oxygen recorded in surface waters was found at Site 14 (7.3 mg/L), in the Gordon Group. The highest surface dissolved oxygen level in May and June was recorded at Site 11, in the Gordon Group (27.0 mg/L).

Table 12: Summary of surface (0m) water quality data collected at Sites 1 through 20 during the 2019 sea lice study, including temperature (°C), salinity (ppt), and dissolved oxygen (mg/L).

Site	April			May/June		
	Temp (°C)	Salinity (ppt)	Dissolved Oxygen (mg/L)	Temp (°C)	Salinity (ppt)	Dissolved Oxygen (mg/L)
1	-	-	-	10.4	37.1	9.0
2	-	-	-	9.7	37.1	8.5
3	9.2	32.9	9.0	9.6	37.1	9.0
4	9.0	15.1	12.0	9.9	36.5	8.6
5	9.3	32.8	9.5	9.9	37.0	9.9
6	9.8	32.8	10.4	10.6	37.0	9.9
7	10.3	32.6	9.6	10.0	37.1	10.3
8	9.4	32.6	9.8	10.6	37.2	9.4
9	9.2	32.5	9.2	9.0	31.9	17.4
10	9.1	32.3	9.2	10.4	36.6	11.4
11	9.1	32.4	9.3	8.9	31.1	27.0
12	9.0	32.5	9.2	9.6	31.7	17.6
13	9.1	32.4	9.4	9.4	31.6	17.8
14	8.6	32.6	8.2	9.3	36.7	7.3
15	9.9	31.9	10.4	11.4	38.0	10.5
16	8.9	32.5	9.5	10.0	38.0	10.1
17	8.9	32.3	9.0	10.3	37.7	10.5
18	8.8	32.4	8.6	10.3	37.6	11.3
19	8.7	32.2	8.6	10.4	37.6	11.2
20	8.6	32.3	8.4	10.2	37.2	10.7
Average	**9.2**	**31.5**	**9.4**	**10.0**	**36.1**	**11.9**

5.0 DISCUSSION

5.1 Sample Numbers

Of the 1,897 target species captured, a total of 520 individual fish were retained for laboratory analysis from Goletas Channel and Queen Charlotte Strait for the 2019 sea lice monitoring study. Overall, this was an increase from the previous two years of the study (260 fish in 2018; 378 fish in 2017). However, the number of fish retained for analysis in 2019 is a decrease from the number of fish retained for sea lice analysis during the 2016 (598), 2015 (682), and 2014 (579) study years. The total number of fish sampled during the 2019 season was also less than those numbers obtained during the 2011 and 2013 studies (819 and 874, respectively).

Target species sampled during the 2019 study included pink salmon, chum salmon, coho salmon, sockeye salmon, and three-spined stickleback. The majority of fish caught and retained for laboratory analysis were chum salmon (195 individuals) and pink salmon (194 individuals). Smaller sample numbers of coho salmon (48 individuals), sockeye salmon (20 individuals), and three-spined stickleback (63 individuals) were also retained for analysis.

5.2 Distribution

In order to facilitate comparisons between study years and simplify individual site analysis, the sites were renamed in 2017 to Sites 1 through 20. The original site names can be found in Appendix 1, for reference.

Some variability existed in the size of samples collected in April (i.e. Round 1; 303 samples retained) compared to May and June (i.e. Round 2; 217 samples retained). As suggested in reporting from previous years, this variability in the success of sample capture may be linked to changes in fish behavior relative to the tide cycle (Pacificus 2013). It has been suggested that juvenile salmonids may have a tendency to migrate closer to shore on a rising tide. This behaviour is thought to potentially increase the number of successful sets during a rising tide, since fish are more susceptible to being captured by the beach seine. However, the following data also indicates that certain sites have a tendency to be consistently more productive for juvenile salmonids regardless of the tide cycle.

5.3 Water Quality

Water temperatures for the 2019 study year were consistent with previous years of the study based on a comparison of mean water temperature among all study years (with the exception of 2015). In previous years of the study, water temperature increased from April to May, which was consistent with 2019. However, mean water temperature in 2015 exhibited a 1^{o}C decrease over the same time period. Detailed water quality results for previous years of the sea lice monitoring study can be found in the corresponding reports.

In the 2019 study period, the average salinity levels increased by nearly 5 ppt from April to June. Average salinity was found to increase by over 1 ppt from April to May during the 2015 study, and by 0.4 ppt in the 2016 study. However, in four of the previous years (2011, 2013, 2014), mean salinity for the study area remained relatively constant from April to May. In the two most recent years of the study, 2017 and 2018, mean salinity decreased throughout the study period by 0.02 ppt and 1.58 ppt, respectively. Though there was a marked increase in the salinity levels throughout the 2019 study period, the salinity levels obtained throughout the study period are consistent with salinity levels for the marine environment and do not raise any concerns with regards to the water quality within the area (with the exception of the surface value of 15.1 ppt recorded at Site 4 in April, which is likely due to an equipment error)(CCME 1999).

Average dissolved oxygen levels for the 2019 sea lice study ranged from 9.4 mg/L to 11.9 mg/L, which fall within the normal rage of levels obtained in surface waters of marine environments. However, on May 21, 2019, the dissolved oxygen levels obtained at sample sites were unusually high (17.6 to 27.0 mg/L); it is therefore likely that the dissolved oxygen sensor on the 556 YSI multimeter was malfunctioning that day, as the readings returned to within normal range the following day after the 556 YSI device was cleaned and recalibrated.

5.4 Sea lice

Sea lice intensity (number of lice per infested fish) was determined to be 2.8 for all sea lice over the entire study period. Intensity for *L. salmonis* was 1.0 in April, 1.4 in May, and 1.0 in June, while intensity for *C. clemensi* was 1.2 for April, 3.7 for May, and 2.2 for June. Average weight for juvenile pink salmon was 1.3 g (n=153) in April, increasing to 1.8 g (n=32) in May. The threshold level for lethal infection stated in Jones and Hargreaves 2009 is 7.5 lice (*L. salmonis*) per juvenile pink salmon averaging less than or equal to 0.7 g in weight. Given that

the average weight of pink salmon in the present study was well above 0.7 g, it is likely that this threshold of lethal infection would be higher for these fish. However, when the Jones and Hargreaves conclusion is applied, lice intensity on juvenile pink salmon observed during the 2019 survey is still well below the threshold for lethal infection (1.2 lice/infected fish).

In Nendick et al (2011), experimental sea lice infection (*L. salmonis*) on juvenile pink salmon negatively affected swimming performance of only the smallest fish (≤0.34g). In addition, reduction in maximum swimming velocity was dependant on sea lice life stage, and not infection intensity; infection with a single louse of chalimus 3 stage or higher would impact swimming performance in juvenile pink salmon weighing 0.34g or less. Of the 36 individual juvenile pink salmon weighing less than or equal to 0.34g, three fish were infected, one with one chalimus 1 stage *L. salmonis*, one with one chalimus 1 stage *C. clemensi*, and one with one chalimus 2 stage *C. clemensi*. Based on the findings by Nendick et al. (2011), maximum swimming velocity of these individuals would not be reduced. No other small fish (i.e. ≤0.34g) were infected with a chalimus 3 stage or greater.

Based on the data obtained from laboratory analysis of field samples, *C. clemensi* was more prevalent than *L. salmonis* for the Goletas Channel and Queen Charlotte Strait study area in the 2019 study year. Of the 406 sea lice found during laboratory analysis of field samples, 91% were identified as *C. clemensi*. This finding remains consistent with the trend observed in previous years of the study (Table 12).

Table 12: Overall contribution of *L. salmonis* and *C. clemensi* for all infested samples obtained in 2019 compared to previous years of the study.

Year	Total number of sea lice sampled (*L. salmonis* and *C. clemensi*)	Contribution of *L. salmonis* (%)	Contribution of *C. clemensi* (%)
2011	340	20	80
2013	66	24	76
2014	42	24	76
2015	696	12	88
2016	516	21	79
2017	92	21	79
2018	173	21	79
2019	406	9	91

Through a comparison of data for juvenile pink salmon from all study years, sea lice prevalence was determined to be the third highest in the 2019 study year. 2015 remains the highest sea lice prevalence, followed by 2016 (Table 13).

Table 13: The prevalence, abundance and intensity of *L. salmonis* and *C. clemensi* found on samples of juvenile pink salmon over the past eight study years.

Year	*Lepeophtheirus salmonis*			*Caligus clemensi*		
	Prevalence	**Abundance**	**Average Intensity**	**Prevalence**	**Abundance**	**Average Intensity**
2011 (n = 611)	4%	0.04	1.09	13%	0.15	1.24
2013 (n = 612)	1%	0.01	1.00	4%	0.04	1.00
2014 (n = 500)	2%	0.02	1.00	5%	0.06	1.03
2015 (n = 460)	19%	0.13	1.17	21%	0.21	1.50
2016 (n = 336)	7%	0.07	1.14	16%	0.24	1.55
2017 (n = 189)	5%	0.07	1.30	10%	0.11	1.11
2018 (n = 201)	6%	0.07	1.17	0.11	0.24	2.23
2019 (n = 194)	6%	0.06	1.00	13%	0.17	1.27

Pink salmon was the only species captured during all sampling months in all study years (2011, 2013, 2014, 2015, 2016, 2017, and 2018). Based on the 2011 and 2013 results for salmonid outmigration timing, sampling effort in 2014 and 2015 was focused on April and May. In 2016, sampling effort was planned for the months of April and May, however, due to a lack of samples retained in May, sampling also occurred in June. In 2017 and 2018, sampling returned to April and May. For the 2019 season, sampling was intended to occur only in April and May; however, due to unforeseen circumstances involving weather delays and events within the First Nations community, one sample day was completed at the beginning of June in order to complete the second round of sampling. Due to the fluctuating number of months over which the sampling program has occurred, sea lice prevalence and infestation rates for pink salmon were only compared for the months of April and May between the eight study years.

Over the last eight study years, the prevalence of *L. salmonis* on juvenile pink salmon has followed a similar trend of increasing from the April sampling period to May, with the exception of 2016 and 2017, where the trend appeared to be reversed. Data from the previous seven years of the sea lice study have exhibited an April *L. salmonis* prevalence ranging from

0% to 9%, with little increase shown throughout May (0% to 3.4%). The exception to this pattern was encountered in the 2015 study, when prevalence in April was 9.0% and increased to 13.9% during the month of May (an increase of 4.9%). Results from the 2017 study found a deviation from this trend, however, when prevalence of *L. salmonis* in juvenile pink salmon showed a slight decrease from April to May (0.3%), possibly the result of a larger sample size (April, n=154; May, n=224). In 2018, the prevalence of *L. salmonis* on juvenile pink salmon was 2.5% in April (n=162) and increased by 18% in the month of May (20.5%; n=39). In 2019, however, a significant decrease in prevalence was encountered from April (18.9%; n=153) to May (4.9%; n=41), suggesting that more pink salmon infected with *L. salmonis* were encountered earlier in the 2019 sampling season.

With the exception of the 2011 study year, *C. clemensi* prevalence on juvenile pink salmon has followed a trend of increasing from April to May, overall. In 2011, *C. clemensi* prevalence showed a decrease from 9.1% in April to 1.8% in May. However, during the 2014 and 2015 study years, *C. clemensi* prevalence in April was 1.2% and 6.0%, respectively, increasing to 10.5% and 23.2%, respectively in May. In 2016, *C. clemensi* prevalence on juvenile pink salmon was 15% in April , increasing to 17% in May. In 2017, prevalence of *C. clemensi* increased from 12.3% in April to 24.1% in May. A similarly large increase in prevalence was observed during the 2018 study year, when prevalence of *C. clemensi* on juvenile pink salmon increased from 3.1% in April to 43.6% in May. The 2019 data carried on with this trend of significant increases in *C. clemensi* prevalence from April to May, with a prevalence of 4.9% in April increasing to 34.2% in May.

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APPENDIX 1: Site Numbering Scheme Change

Former Name	New Site Number
Zone 1 Site 2	10
Zone 1 Site 3	8
Zone 2 Site 1	5
Zone 2 Site 2	4
Zone 3 Site 1	1
Zone 3 Site 2	2
Zone 3 Site 3	3
Zone 4 Site 2	6
Zone 4 Site 3	7
Zone 4 Site 4	9
Zone 5 Site 1	11
Zone 5 Site 2	12
Zone 5 Site 3	13
Zone 5 Site 4	14
Zone 6 Site 1	17
Zone 6 Site 3	16
Zone 6 Site 4	15
Zone 6 Site 5	19
Zone 6 Site 6	18
Zone 6 Site 7	20

APPENDIX 2: Environmental Data

	April										May/June								
	Temperature(°C)			Salinity (ppt)			Dissolved Oxygen (mg/L)				Temperature(°C)			Salinity (ppt)			Dissolved Oxygen (mg/L)		
Site	**Surface**	**1m**	**4m**	**Surface**	**1m**	**4m**	**Surface**	**1m**	**4m**	**Site**	**Surface**	**1m**	**4m**	**Surface**	**1m**	**4m**	**Surface**	**1m**	**4m**
1	-	-	-	-	-	-	-	-	-	**1**	10.40	10.30	10.20	37.08	37.08	37.09	8.95	9.03	9.01
2	-	-	-	-	-	-	-	-	-	**2**	9.70	9.70	9.60	37.09	37.10	37.13	8.46	8.51	8.09
3	9.20	9.20	9.20	32.94	32.94	32.95	9.03	8.97	8.93	**3**	9.60	9.60	9.50	37.11	37.12	37.11	8.98	9.01	9.10
4	9.00	9.30	9.30	15.14	32.21	32.85	12.04	9.68	9.19	**4**	9.90	9.70	9.60	36.47	37.11	37.13	8.61	8.64	8.70
5	9.30	9.30	9.30	32.77	32.77	32.78	9.53	9.43	9.42	**5**	9.90	9.70	9.70	36.96	37.06	37.05	9.88	9.43	9.86
6	9.80	9.80	9.80	32.81	32.82	32.81	10.37	10.31	10.45	**6**	10.60	10.40	9.60	37.01	37.04	37.12	9.86	9.61	8.31
7	10.30	9.00	9.00	32.57	32.76	32.76	9.62	8.86	8.88	**7**	10.00	9.50	9.30	37.11	37.11	37.19	10.29	8.54	8.48
8	9.40	9.40	9.40	32.64	32.71	32.74	9.76	9.81	9.42	**8**	10.60	10.00	10.00	37.22	37.14	37.08	9.39	9.24	9.26
9	9.20	9.20	8.90	32.53	32.49	32.56	9.17	9.56	9.61	**9**	8.97	9.00	8.96	31.91	31.92	31.93	17.35	17.12	16.81
10	9.10	9.10	9.00	32.25	32.36	32.38	9.19	9.15	9.15	**10**	10.40	10.40	10.40	36.56	36.55	36.54	11.41	11.44	11.29
11	9.10	9.00	8.90	32.38	32.41	32.42	9.33	9.27	8.78	**11**	8.92	8.89	8.51	31.09	31.62	31.75	27.02	21.49	19.01
12	9.00	9.00	8.90	32.45	32.44	32.45	9.19	9.06	8.85	**12**	9.58	9.50	9.11	31.70	31.71	31.73	17.60	17.25	17.52
13	9.10	9.00	8.90	32.37	32.36	32.35	9.37	9.08	8.86	**13**	9.37	9.35	9.01	31.58	31.58	31.62	17.81	17.75	17.85
14	8.60	8.60	8.60	32.55	32.58	32.58	8.18	8.16	8.22	**14**	9.30	9.20	9.20	36.69	36.70	36.75	7.34	7.48	7.46
15	9.90	9.90	9.40	31.87	32.00	32.41	10.36	10.34	13.16	**15**	11.40	10.90	10.20	38.00	37.98	38.03	10.47	12.32	12.03
16	8.90	8.90	8.80	32.51	32.52	32.51	9.48	9.24	9.00	**16**	10.00	9.80	9.80	37.99	38.02	9.83	10.14	9.79	9.83
17	8.90	8.90	8.80	32.32	32.29	32.42	9.01	8.90	8.68	**17**	10.30	10.20	10.10	37.73	37.73	37.74	10.53	10.49	10.89
18	8.80	8.70	8.60	32.43	32.44	32.43	8.63	8.53	8.76	**18**	10.30	10.30	10.30	37.59	37.60	37.60	11.25	11.10	11.63
19	8.70	8.60	8.60	32.17	32.19	32.20	8.62	8.55	8.33	**19**	10.40	10.40	10.20	37.60	37.61	37.63	11.18	11.22	11.04
20	8.60	8.60	8.60	32.31	32.31	32.32	8.39	8.24	8.24	**20**	10.20	10.20	10.20	37.23	37.55	37.56	10.65	10.20	10.73

APPENDIX 3: Raw Field Data Summary

2019 Goletas Channel and Queen Charlotte Strait Beach Seine

Beach Seine Summary			Date	April 23-26, 2019								Site Total # Fish
Site #	Location	Sample	Pink	Chum	Coho	Sockeye	Chinook	Dolly Varden	Herring	Stickleback	
1	50° 54.753 N	retained									0
	127° 55.837 W	captured									0
2	50° 53.833 N	retained	34	16							50
	127° 54.220 W	captured	34	17							51
3	50° 53.698 N	retained		6							6
	127° 51.420 W	captured		6							6
4	50° 51.119 N	retained			1						1
	127° 52.011 W	captured			1						1
5	50° 50.782 N	retained	21		5						26
	127° 48.839 W	captured	21		5						26
6	50° 51.667 N	retained	31	7							38
	127° 46.712 W	captured	46	8							54
7	50° 51.692 N	retained	6	19							25
	127° 45.477 W	captured	6	19							25
8	50°49.487 N	retained	1	1							2
	127° 42.564 W	captured	1	1							2
9	50° 49.980 N	retained		2	1	1					4
	127° 39.147 W	captured		2	1	1					4
10	50°48.110 N	retained	1	22							23
	127° 37.890 W	captured	1	22							23
11	50°49.095 N	retained	1								1
	127° 33.311 W	captured	1								1
12	50°49.714 N	retained		2							2
	127°31.560 W	captured		2							2
13	50°48.831 N	retained	32	25							57
	127°28.678 W	captured	1000	25							1025
14	50°53.580 N	retained									0
	127° 29.362 W	captured									0
15	50° 58.577 N	retained	2							32	34
	127° 27.477 W	captured	2							50	52
16	50° 57.580 N	retained			1	1				1	3
	127° 27.254 W	captured			1	1				1	3
17	50° 55.920 N	retained				2					2
	127° 24.324 W	captured				2					2
18	50° 55.221 N	retained	21	2							23
	127° 22.516 W	captured	21	2							23
19	50° 54.241 N	retained	2								2
	127°19.289 W	captured	2								2
20	50° 53.990N	retained	1			3					4
	127° 17.859 W	captured	1			3					4
TOTAL RETAINED			153	102	8	7	0	0	0	33	303
TOTAL CAPTURED			1136	104	8	7	0	0	0	51	1306

Beach Seine Summary			Date	May 21-23, 2019							Site Total # Fish
Site #	**Location**	**Sample**	**Pink**	**Chum**	**Coho**	**Sockeye**	**Chinook**	**Dolly Varden**	**Herring**	**Stickleback**	
1	50° 54.753 N	retained									**0**
	127° 55.837 W	captured									**0**
2	50° 53.833 N	retained	**4**	**38**							**42**
	127° 54.220 W	captured	**4**	**100**							**104**
3	50° 53.698 N	retained	**2**	**4**							**6**
	127° 51.420 W	captured	**2**	**4**							**6**
4	50° 51.119 N	retained			**22**	**10**		**0**			**32**
	127° 52.011 W	captured			**22**	**10**		**7**			**39**
5	50° 50.782 N	retained		**3**						**1**	**4**
	127° 48.839 W	captured		**3**						**1**	**4**
6	50° 51.667 N	retained		**2**							**2**
	127° 46.712 W	captured		**2**							**2**
7	50° 51.692 N	retained	**4**	**9**	**1**						**14**
	127° 45.477 W	captured	**4**	**9**	**1**						**14**
8	50°49.487 N	retained		**6**							**6**
	127° 42.564 W	captured		**6**							**6**
9	50° 49.980 N	retained									**0**
	127° 39.147 W	captured									**0**
10	50°48.110 N	retained	**31**	**30**	**8**						**69**
	127° 37.890 W	captured	**35**	**62**	**8**						**105**
11	50°49.095 N	retained									**0**
	127° 33.311 W	captured									**0**
12	50°49.714 N	retained		**1**							**1**
	127°31.560 W	captured		**1**							**1**
13	50°48.831 N	retained									**0**
	127°28.678 W	captured									**0**
14	50°53.580 N	retained									**0**
	127° 29.362 W	captured									**0**
15	50° 58.577 N	retained									**0**
	127° 27.477 W	captured									**0**
16	50° 57.580 N	retained									**0**
	127° 27.254 W	captured									**0**
17	50° 55.920 N	retained									**0**
	127° 24.324 W	captured									**0**
18	50° 55.221 N	retained									**0**
	127° 22.516 W	captured									**0**
19	50° 54.241 N	retained									**0**
	127°19.289 W	captured									**0**
20	50° 53.990N	retained									**0**
	127° 17.859 W	captured									**0**
TOTAL RETAINED			41	93	31	10	0	0	0	1	**176**
TOTAL CAPTURED			**45**	**187**	**31**	**10**	**0**	**7**	**0**	**1**	**281**

Beach Seine Summary			Date 6-Jun-19								Site Total # Fish
Site #	**Location**	**Sample**	**Pink**	**Chum**	**Coho**	**Sockeye**	**Chinook**	**Dolly Varden**	**Herring**	**Stickleback**	
1	50° 54.753 N	retained									**0**
	127° 55.837 W	captured									**0**
2	50° 53.833 N	retained									**0**
	127° 54.220 W	captured									**0**
3	50° 53.698 N	retained									**0**
	127° 51.420 W	captured									**0**
4	50° 51.119 N	retained									**0**
	127° 52.011 W	captured									**0**
5	50° 50.782 N	retained									**0**
	127° 48.839 W	captured									**0**
6	50° 51.667 N	retained									**0**
	127° 46.712 W	captured									**0**
7	50° 51.692 N	retained									**0**
	127° 45.477 W	captured									**0**
8	50°49.487 N	retained									**0**
	127° 42.564 W	captured									**0**
9	50° 49.980 N	retained									**0**
	127° 39.147 W	captured									**0**
10	50°48.110 N	retained									**0**
	127° 37.890 W	captured									**0**
11	50°49.095 N	retained									**0**
	127° 33.311 W	captured									**0**
12	50°49.714 N	retained									**0**
	127°31.560 W	captured									**0**
13	50°48.831 N	retained									**0**
	127°28.678 W	captured									**0**
14	50°53.580 N	retained									**0**
	127° 29.362 W	captured									**0**
15	50° 58.577 N	retained								29	**29**
	127° 27.477 W	captured								298	**298**
16	50° 57.580 N	retained			9	3					**12**
	127° 27.254 W	captured			9	3					**12**
17	50° 55.920 N	retained									**0**
	127° 24.324 W	captured									**0**
18	50° 55.221 N	retained									**0**
	127° 22.516 W	captured									**0**
19	50° 54.241 N	retained									**0**
	127°19.289 W	captured									**0**
20	50° 53.990N	retained									**0**
	127° 17.859 W	captured									**0**
TOTAL RETAINED			0	0	9	3	0	0	0	29	**41**
TOTAL CAPTURED			**0**	**0**	**9**	**3**	**0**	**0**	**0**	**298**	**310**

2018 Goletas Channel and Queen Charlotte Strait Beach Seine

Beach Seine Summary			Date April 17-20								Site Total # Fish
Site #	Location	Sample	Pink	Chum	Coho	Sockeye	Chinook	Dolly Varde	Herring	Stickleback	
1	50° 54.753 N	retained		2							2
	127° 55.837 W	captured		2							2
2	50° 53.833 N	retained	30	19							49
	127° 54.220 W	captured	85	19							104
3	50° 53.698 N	retained									0
	127° 51.420 W	captured									0
4	50° 51.119 N	retained									0
	127° 52.011 W	captured									0
5	50° 50.782 N	retained		1							1
	127° 48.839 W	captured		1							1
6	50° 51.667 N	retained									0
	127° 46.712 W	captured									0
7	50° 51.692 N	retained		1		2					3
	127° 45.477 W	captured		1		2					3
8	50°49.487 N	retained		1	2	2					5
	127° 42.564 W	captured		1	2	2					5
9	50° 49.980 N	retained									0
	127° 39.147 W	captured									0
10	50°48.110 N	retained	2								2
	127° 37.890 W	captured	2								2
11	50°49.095 N	retained									0
	127° 33.311 W	captured									0
12	50°49.714 N	retained	30								30
	127°31.560 W	captured	56								56
13	50°48.831 N	retained									0
	127°28.678 W	captured									0
14	50°53.580 N	retained	30								30
	127° 29.362 W	captured	80								80
15	50° 58.577 N	retained	1								1
	127° 27.477 W	captured	1								1
16	50° 57.580 N	retained	6								6
	127° 27.254 W	captured	6								6
17	50° 55.920 N	retained	2								2
	127° 24.324 W	captured	2								2
18	50° 55.221 N	retained				3					3
	127° 22.516 W	captured				3					3
19	50° 54.241 N	retained	31	10							41
	127°19.289 W	captured	110	10							120
20	50° 53.990N	retained	30	1						1	32
	127° 17.859 W	captured	140	1						1	142
TOTAL RETAINED			162	35	2	7	0	0	0	1	207
TOTAL CAPTURED			482	35	2	7	0	0	0	1	527

Beach Seine Summary			Date May 22-25, 2018								Site Total # Fish
Site #	Location	Sample	Pink	Chum	Coho	Sockeye	Chinook	olly Varde	Herring	Stickleback	
1	50° 54.753 N	retained									0
	127° 55.837 W	captured									0
2	50° 53.833 N	retained	23	4							27
	127° 54.220 W	captured	23	4							27
3	50° 53.698 N	retained									0
	127° 51.420 W	captured									0
4	50° 51.119 N	retained									0
	127° 52.011 W	captured									0
5	50° 50.782 N	retained	1								1
	127° 48.839 W	captured	1								1
6	50° 51.667 N	retained									0
	127° 46.712 W	captured									0
7	50° 51.692 N	retained									0
	127° 45.477 W	captured									0
8	50°49.487 N	retained			5	2					7
	127° 42.564 W	captured			5	2					7
9	50° 49.980 N	retained			3						3
	127° 39.147 W	captured			3						3
10	50°48.110 N	retained									0
	127° 37.890 W	captured									0
11	50°49.095 N	retained									0
	127° 33.311 W	captured									0
12	50°49.714 N	retained									0
	127°31.560 W	captured									0
13	50°48.831 N	retained									0
	127°28.678 W	captured									0
14	50°53.580 N	retained									0
	127° 29.362 W	captured									0
15	50° 58.577 N	retained									0
	127° 27.477 W	captured									0
16	50° 57.580 N	retained									0
	127° 27.254 W	captured									0
17	50° 55.920 N	retained									0
	127° 24.324 W	captured									0
18	50° 55.221 N	retained									0
	127° 22.516 W	captured									0
19	50° 54.241 N	retained	14								14
	127°19.289 W	captured	14								14
20	50° 53.990N	retained	1								1
	127° 17.859 W	captured	1								1
TOTAL RETAINED			39	4	8	2	0	0	0	0	53
TOTAL CAPTURED			39	4	8	2	0	0	0	0	53

2017 Goletas Channel and Queen Charlotte Strait Beach Seine

Beach Seine Summary			April 9-12, 21, 2017					May 9-12, 2017				
Site #	**Location**	**Sample**	**Pink**	**Chum**	**Coho**	**Sockeye**	**3Spine Stickle**	**Pink**	**Chum**	**Coho**	**Sockeye**	**3Spine Stickle**
Zone 1 (VI south)												
Site 2	50°48.110 N	retained	**5**					**2**	**6**			
(Site 10)	127° 37.890 W	captured	5					2	6			
Site 3	50°49.487 N	retained	**6**						**2**			
(Site 8)	127° 42.564 W	captured	6						2			
Zone 2 (VI north)												
Site 1	50° 50.782 N	retained	**2**	**4**				**1**	**6**		**1**	
(Site 5)	127° 48.839 W	captured	2	4				1	6		1	
Site 2	50° 51.119 N	retained							**8**	**30**	**30**	
(Site 4)	127° 52.011 W	captured							8	400	200	
Zone 3 (Hope Isl)												
Site 1	50° 54.753 N	retained										
(Site 1)	127° 55.837 W	captured										
Site 2	50° 53.833 N	retained	**1**	**2**				**2**				
(Site 2)	127° 54.220 W	captured	1	2				2				
Site 3	50° 53.698 N	retained	**2**	**1**				**7**	**8**			
(Site 3)	127° 51.420 W	captured	2	1				7	8			
Zone 4 (Nigei Isl)												
Site 2	50° 51.667 N	retained	**6**	**6**							**30**	
(Site 6)	127° 46.712 W	captured	6	6							100	
Site 3	50° 51.692 N	retained			**4**			**22**	**6**		**1**	
(Site 7)	127° 45.477 W	captured			4			22	6		1	
Site 4	50° 49.980 N	retained	**3**							**7**	**9**	
(Site 9)	127° 39.147 W	captured	3							7	9	
Zone 5 (Gordon Isls)												
Site 1	50°49.095 N	retained										
(Site 11)	127° 33.311 W	captured										
Site 2	50°49.714 N	retained	**30**	**4**					**1**		**1**	
(Site 12)	127°31.560 W	captured	92	4					1		1	
			April 9-12, 21, 2017					**May 9-12, 2017**				
Site #	**Location**	**Sample**	**Pink**	**Chum**	**Coho**	**Sockeye**	**3Spine Stickle**	**Pink**	**Chum**	**Coho**	**Sockeye**	**3Spine Stickle**
Site 3	50°48.831 N	retained										
(Site 13)	127°28.678 W	captured										
Site 4	50°53.580 N	retained										
(Site 14)	127° 29.362 W	captured										
Zone 6 (Shelter Bay)												
Site 1	50° 55.920 N	retained										
(Site 17)	127° 24.324 W	captured										
Site 3	50° 57.580 N	retained	**30**	**6**								
(Site 16)	127° 27.254 W	captured	103	6								
Site 4	50° 58.577 N	retained			**2**		**1**		**1**			**5**
(Site 15)	127° 27.477 W	captured			2		1		1			5
Site 5	50° 54.241 N	retained	**30**	**3**						2		
(Site 19)	127°19.289 W	captured	66	3						2		
Site 6	50° 55.221 N	retained	**6**					**2**				
(Site 18)	127° 22.516 W	captured	6					2				
Site 7	50° 53.990N	retained						**30**	**2**			
(Site 20)	127° 17.859 W	captured						33	2			
TOTAL RETAINED			**121**	**26**	**6**	**0**	**1**	**66**	**40**	**39**	**72**	**5**
TOTAL CAPTURED			**292**	**26**	**6**	**0**	**1**	**69**	**40**	**409**	**312**	**5**

2016 Goletas Channel and Queen Charlotte Strait Beach Seine

Beach Seine Summary			April 11-15, 2016								May 9-11								May 30, 31 June 2, 7							
Site #	Location	Sample	Pink	Chum	Coho	Sockeye	Chinook	olly Varde	Herring	Other	Pink	Chum	Coho	Sockeye	Chinook	olly Varde	Herring	Other	Pink	Chum	Coho	Sockeye	Chinook	olly Varde	Herring	Other
Zone 1 (VI south)																										
Site 2	50°48.110 N	retained	**3**																							
	127° 37.890 W	captured	3																							
Site 3	50°49.487 N	retained	**2**																							
	127° 42.564 W	captured	2																							
Zone 2 (VI north)																										
Site 1	50° 50.782 N	retained	**4**	**8**	**9**	**3**																				
	127° 48.839 W	captured	4	8	9	3																				
Site 2	50° 51.119 N	retained			**29**	**2**														**2**	**30**	**3**				
	127° 52.011 W	captured			47	2														2	72	3				
Zone 3 (Hope Isl)																										
Site 1	50° 54.753 N	retained										**3**	**6**	**52**		**2**					**24**					
	127° 55.837 W	captured										3	6	75		2					24					
Site 2	50° 53.833 N	retained	**7**	**3**							**29**	**33**														
	127° 54.220 W	captured	7	3							128	38														
Site 3	50° 53.698 N	retained	**20**	**11**																						
	127° 51.420 W	captured	20	11																						
Zone 4 (Nigei Isl)																										
Site 2	50° 51.667 N	retained	**5**																**1**							
	127° 46.712 W	captured	5																1							
Site 3	50° 51.692 N	retained	**5**	**9**		**1**																		**3**		
	127° 45.477 W	captured	5	9		1																		3		
Site 4	50° 49.980 N	retained	**2**																							
	127° 39.147 W	captured	2																							
Zone 5 (Gordon Isls)																										
Site 1	50°49.095 N	retained		**1**																						
	127° 33.311 W	captured		1																						
Site 2	50°49.714 N	retained	**1**																							
	127°31.560 W	captured	1																							
Site 3	50°48.831 N	retained														**1**										
	127°28.678 W	captured														1										
Site 4	50°53.580 N	retained	**29**	**1**																						
	127° 29.362 W	captured	42	1																						
Zone 6 (Shelter Bay)																										
Site 1	50° 55.920 N	retained		**1**																						
	127° 24.324 W	captured		1																						
Site 3	50° 57.580 N	retained	**52**	**8**																						
	127° 27.254 W	captured	192	8																						
Site 4	50° 58.577 N	retained	**48**	**10**																						
	127° 27.477 W	captured	63	47																						
Site 5	50° 54.241 N	retained	**58**	**2**															2		1		1			
	127°19.289 W	captured	90	7															2		1		1			
Site 6	50° 55.221 N	retained	**14**																		**1**		**1**			
	127° 22.516 W	captured	14																		1		1			
Site 7	50° 53.990N	retained	**54**	**1**																						
	127° 17.859 W	captured	54	33																						
TOTAL RETAINED			**304**	**55**	**38**	**6**	**0**	**0**	**0**	**0**	**29**	**36**	**6**	**52**	**0**	**3**	**0**	**0**	**3**	**2**	**56**	**3**	**2**	**3**	**0**	**0**
TOTAL CAPTURED			**504**	**129**	**56**	**6**	**0**	**0**	**0**	**0**	**128**	**41**	**6**	**75**	**0**	**3**	**0**	**0**	**3**	**2**	**98**	**3**	**2**	**3**	**0**	**0**

2015 Goletas Channel and Queen Charlotte Strait Beach Seine

Beach Seine Summary			April 7-10, 14 2015						May 11-14 2015					Site Total # Fish
Site #	Location	Sample	Pink	Chum	Coho	Pacific Herring	Chinook	Unidentified	Pink	Chum	Coho	Sockeye	Dolly Varden	
Zone 1 (VI south)														
Site 2	50°48.110 N	retained	**1**								**1**			**2**
	127° 37.890 W	captured	1								1			2
Site 3	50°49.487 N	retained	**31**	**5**	**0**		**0**		**30**	**1**	**29**	**5**		**101**
	127° 42.564 W	captured	41	5	0		0		63	1	29	5		144
Zone 2 (VI north)														
Site 1	50° 50.782 N	retained	**9**	**1**							**6**			**16**
	127° 48.839 W	captured	9	1							6			16
Site 2	50° 51.119 N	retained									**30**	**30**	**1**	**61**
	127° 52.011 W	captured									130	80	1	**211**
Zone 3 (Hope Isl)														
Site 1	50° 54.753 N	retained												**0**
	127° 55.837 W	captured												**0**
Site 2	50° 53.833 N	retained	**15**						**30**		**2**	**5**		**52**
	127° 54.220 W	captured	15						30		2	5		52
Site 3	50° 53.698 N	retained	**11**											**11**
	127° 51.420 W	captured	11											11
Zone 4 (Nigei Isl)														
Site 2	50° 51.667 N	retained							**1**	**2**				**3**
	127° 46.712 W	captured							1	2				3
Site 3	50° 51.692 N	retained	**20**	**3**	**2**	**1**								**26**
	127° 45.477 W	captured	20	3	2	1								26
Site 4	50° 49.980 N	retained												**0**
	127° 39.147 W	captured												0
Zone 5 (Gordon Isls)														
Site 1	50°49.095 N	retained	**30**	**9**							**1**	**1**		**41**
	127° 33.311 W	captured	77	9							1	1		88
Site 2	50°49.714 N	retained	**11**						**41**	**9**				**61**
	127°31.560 W	captured	11						400	9				420
Site 3	50°48.831 N	retained	**34**	**0**					**30**	**30**				**94**
	127°28.678 W	captured	80	0					600	100				780
Site 4	50°53.580 N	retained	**30**			**2**			**30**					**62**
	127° 29.362 W	captured	90			2			1000					1092
Zone 6 (Shelter Bay)														
Site 1	50° 55.920 N	retained	**1**											**1**
	127° 24.324 W	captured	1											1
Site 3	50° 57.580 N	retained	**33**	**14**					**30**	**7**				**84**
	127° 27.254 W	captured	300	14					300	7				621
Site 4	50° 58.577 N	retained							**1**					**1**
	127° 27.477 W	captured							1					1
Site 5	50° 54.241 N	retained	5											**0**
	127°19.289 W	captured	5											0
Site 6	50° 55.221 N	retained	**3**						**1**					**4**
	127° 22.516 W	captured	3						1					4
Site 7	50° 53.990N	retained	**32**	**25**										**57**
	127° 17.859 W	captured	550	25										575
			1214	57	2	3	0	0	2396	119	169	91	1	4052
TOTAL RETAINED			**266**	**57**	**2**	**3**	**0**	**0**	**194**	**49**	**69**	**41**	**1**	**682**

*** retained fish are first row for each site in bold, caught fish are second row for each site in regular print.

2014 Goletas Channel and Queen Charlotte Strait Beach Seine:

Beach Seine Summary		April 8-11 2014						May 12-15 2014				Site Total # Fish
Site #	Location	Pink	Chum	Coho	Sockeye	Chinook	Unidentified	Pink	Chum	Sockeye	Coho	
Zone 1 (VI south)												
Site 2	50°48.110 N	**2**	**0**	**0**	**0**	**0**	**0**	**20**	**0**	**0**	**0**	**22**
	127° 37.890 W	2	0	0	0	0	0	20	0	0	0	**22**
Site 3	50°49.487 N	**11**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**
	127° 42.564 W	11	1	0	0	0	0	0	0	0	0	**12**
Zone 2 (VI north)												
Site 1	50° 50.782 N	**33**	**4**	**0**	**1**	**1**	**0**	**1**	**4**	**0**	**0**	**44**
	127° 48.839 W	46	4	0	4	1	0	1	4	0	0	**60**
Site 2	50° 51.119 N	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**20**	**10**	**31**
	127° 52.011 W	1	0	0	0	0	0	0	0	20	200	**221**
Zone 3 (Hope Isl)												
Site 1	50° 54.753 N	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
	127° 55.837 W	1	0	0	0	0	0	0	0	0	0	**1**
Site 2	50° 53.833 N	**29**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**31**
	127° 54.220 W	182	2	0	0	0	0	0	0	0	0	**184**
Site 3	50° 53.698 N	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**
	127° 51.420 W	8	0	0	0	0	0	0	0	0	0	**8**
Zone 4 (Nigei Isl)												
Site 2	50° 51.667 N	**2**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**
	127° 46.712 W	2	3	0	0	0	0	0	0	0	0	**5**
Site 3	50° 51.692 N	**2**	**0**	**0**	**10**	**0**	**1**	**31**	**1**	**0**	**1**	**46**
	127° 45.477 W	2	1	20	10	0	1	32	1	0	1	**68**
Site 4	50° 49.980 N	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	127° 39.147 W	0	0	0	0	0	0	0	0	0	0	**0**
Zone 5 (Gordon Isls)												
Site 1	50°49.095 N	**31**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**31**
	127° 33.311 W	300	0	0	0	0	0	0	0	0	0	**300**
Site 2	50°49.714 N	**30**	**0**	**0**	**0**	**0**	**0**	**30**	**0**	**0**	**0**	**60**
	127°31.560 W	650	0	0	0	0	0	6000	0	0	0	**6650**
Site 3	50°48.831 N	**30**	**0**	**0**	**0**	**0**	**0**	**35**	**0**	**0**	**0**	**65**
	127°28.678 W	500	0	0	0	0	0	10000	0	0	0	**10500**
Site 4	50°53.580 N	**0**	**0**	**0**	**0**	**0**	**0**	**30**	**0**	**0**	**0**	**30**
	127° 29.362 W	0	0	0	0	0	0	3000	0	0	0	**3000**
Zone 6 (Shelter Bay)												
Site 1	50° 55.920 N	**30**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**31**
	127° 24.324 W	49	0	0	0	0	0	1	**0**	**0**	0	**50**
Site 3	50° 57.580 N	**31**	**2**	**0**	**0**	**0**	**0**	**30**	**0**	**0**	**10**	**73**
	127° 27.254 W	78	3	0	0	0	0	400	0	0	10	**491**
Site 4	50° 58.577 N	**1**	**0**	**0**	**0**	**0**	**0**	**30**	**0**	**0**	**0**	**31**
	127° 27.477 W	1	0	0	0	0	0	37	0	0	0	**38**
Site 5	50° 54.241 N	n/a	n/a	n/a	n/a	n/a	n/a	**0**	0	0	0	**0**
	127°19.289 W	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0	0	**0**
Site 6	50° 55.221 N	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	127° 22.516 W	0	0	0	0	0	0	0	0	0	0	**0**
Site 7	50° 53.990N	**20**	**8**	**0**	**0**	**0**	**0**	**30**	**0**	**0**	**0**	**58**
	127° 17.859 W	20	8	0	0	0	0	37	0	0	0	**65**
		1853	22	30	14	1	1	19528	5	20	211	21685
TOTAL RETAINED		**262**	**20**	**0**	**11**	**1**	**1**	**238**	**5**	**20**	**21**	**579**

*** retained fish are first row for each site in bold, caught fish are second row for each site in regular print.

2013 Goletas Channel Beach Seine:

Beach Seine Dates		April 1-2, 2013			May 6-8, 2013				June 3-5, 2013					Site Total # Fish
Lab Analysis Dates		April 8, 2013			May 16-31, 2013				June 21-26 and July 4, 2013					Site Total # Fish
Site #	Location	Pink	Chinook	on-salmon	Pink	Coho	Sockeye	Chum	Pink	Chinook	Coho	Sockeye	Dolly Varden	
Zone 1 (VI south)														
Site 1	50° 47' 13.115" N	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**2**	**10**
	127° 34' 36.832" W	1	1	1	0	0	0	0	0	0	5	0	2	**10**
Site 2	50° 48' 6.617" N	**4**	**2**	**0**	**30**	**0**	**0**	**15**	**1**	**0**	**0**	**0**	**0**	**52**
	127° 37' 55.582" W	4	2	0	3000	0	0	15	1	0	0	0	0	**3022**
Site 3	50° 49' 26.579" N	**7**	**0**	**0**	**30**	**0**	**0**	**10**	**30**	**0**	**2**	**0**	**0**	**79**
	127° 42' 36.213" W	7	0	0	350	0	0	10	150	0	2	0	0	**519**
Zone 2 (VI north)														
Site 1	50° 50' 32.792" N	**30**	**5**	**0**	**30**	**16**	**0**	**25**	**30**	**5**	**0**	**0**	**0**	**141**
	127° 48' 16.983" W	94	5	0	275	16	0	25	3500	5	0	0	0	**3920**
Site 2	50° 51' 1.563" N	**2**	**0**	**0**	**0**	**14**	**3**	**0**	**0**	**0**	**16**	**0**	**1**	**36**
	127° 51' 36.418" W	2	0	0	0	14	3	0	0	0	65	0	1	**85**
Site 3	50° 52' 24.844" N	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**15**	**0**	**1**	**1**	**0**	**19**
	127° 54' 13.108" W	0	0	0	2	0	0	0	15	0	1	1	0	**19**
Zone 3 (Hope Isl)														
Site 1	50° 54' 40.388" N	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
	127° 55' 42.765" W	0	0	0	0	1	0	0	0	0	0	0	0	**1**
Site 2	50° 53' 48.141" N	**3**	**0**	**0**	**30**	**0**	**0**	**5**	**30**	**0**	**0**	**0**	**0**	**68**
	127° 53' 17.963" W	0	0	0	3500	0	0	5	92	0	0	0	0	**3597**
Site 3	50° 53' 40.083" N	**1**	**2**	**0**	**30**	**0**	**0**	**11**	**11**	**0**	**0**	**0**	**0**	**55**
	127° 51' 34.341" W	1	2	0	3800	0	0	11	11	0	0	0	0	**3825**
Zone 4 (Nigei Isl)														
Site 1	50° 52' 12.580" N	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1**	**0**	**0**	**0**	**0**	**3**
	127° 48' 40.430"W	0	0	0	0	0	0	2	1	0	0	0	0	**3**
Site 2	50° 51' 42.071" N	**4**	**0**	**0**	**30**	**0**	**0**	**8**	**1**	**0**	**0**	**0**	**0**	**43**
	127° 46' 33.619" W	4	0	0	1400	0	0	8	1	0	0	0	0	**1413**
Site 3	50° 51' 42.928" N	**3**	**0**	**0**	**30**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**0**	**37**
	127° 45' 30.676" W	3	0	0	126	0	0	3	0	1	0	0	0	**133**
Site 4	50° 49' 54.803" N	**1**	**0**	**0**	**30**	**0**	**0**	**2**	**30**	**0**	**0**	**0**	**0**	**63**
	127° 39' 12.223" W	1	0	0	150	0	0	2	30	0	0	0	0	**183**
Zone 5 (Gordon Isls)														
Site 1	50° 49' 3.788" N	**0**	**0**	**0**	**30**	**0**	**0**	**6**	**30**	**0**	**16**	**0**	**0**	**82**
	127° 33' 16.194" W	0	0	0	350	0	0	6	250	0	37	0	0	**643**
Site 2	50° 49' 52.875" N	**0**	**0**	**0**	**30**	**0**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**43**
	127° 30' 52.353" W	0	0	0	700	0	0	13	0	0	0	0	0	**713**
Site 3	50° 48' 49.921" N	**0**	**0**	**0**	**30**	**0**	**0**	**4**	**30**	**4**	**0**	**0**	**0**	**68**
	127° 28' 40.714" W	0	0	0	3500	0	0	4	10000	4	0	0	0	**13508**
TOTAL RETAINED		**55**	**11**	**1**	**344**	**15**	**19**	**95**	**213**	**10**	**30**	**2**	**4**	**799**

*** retained fish are first row for each site in bold, caught fish are second row for each site in regular print. Please note: This data represents the field data recorded during beach seines and does not reflect corrections made during lab analysis of samples. Therefore, discrepancies may be present between field and lab data.

2013 Queen Charlotte Strait Beach Seine:

Beach Seine Summary		06-Jun-13			03-Jul-13			Site Total # Fish
Site #	Location	Pink	Coho	Chum	Pink	Chinook	Herring	
Shelter Bay								
Site 1	50°55'58.90"N	**30**	**0**	**0**	**9**	**0**	**31**	**70**
	127°24'19.94"W	500	0	0	9	0	500	1009
Site 2	50°56'42.39"N	**0**	**0**	**0**	**n/a**	**n/a**	**n/a**	**0**
	127°26'02.88"W	0	0	0				0
Site 3	50°57'41.21"N	**0**	**3**	**0**	**1**	**1**	**0**	**5**
	127°27'16.18"W	0	3	0	1	1	0	5
Site 4	50°58'37.90"N	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	127°27'25.39"W	0	0	0	0	0	0	0
Site 5	50°59'15.24"N	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	127°30'21.21"W	0	0	0	**0**	**0**	0	0
TOTAL RETAINED		**30**	**3**	**0**	**10**	**1**	**31**	**75**
		500	3	0	10	1	500	1014

2011 Goletas Channel Beach Seine:

Beach Seine Summary		March 30-April 1, 2011			April 27-29, 2011			May 30-June 3, 2011					June 28 30-July 4, 2011				Site Total # Fish
Site #	Location	Pink	Chum	Coho	Pink	Chum	Chinook	Pink	Chum	Coho	Herring	Dolly Varden	Pink	Chum	Coho	Herring	
Zone 1 (VI south)																	
Site 1	50° 47' 13.115" N	**0**	**0**	**3**	**3**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**13**
	127° 34' 36.832" W	0	0	3	3	0	0	0	7	0	0	0	0	0	0	0	13
Site 2	50° 48' 6.617" N	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**4**
	127° 37' 55.582" W	0	0	0	0	0	0	1	0	0	0	6	0	0	0	0	7
Site 3	50° 49' 26.579" N	**2**	**0**	**0**	**31**	**7**	**0**	**31**	**30**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**101**
	127° 42' 36.213" W	2	0	0	731	7	0	68	171	0	0	0	0	0	0	0	979
Zone 2 (VI north)																	
Site 1	50° 50' 32.792" N	**1**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**
	127° 48' 16.983" W	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	3
Site 2	50° 51' 1.563" N	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**3**	**45**	**0**	**0**	**0**	**0**	**0**	**0**	**49**
	127° 51' 36.418" W	0	0	0	1	0	0	0	3	259	0	0	0	0	0	0	263
Site 3	50° 52' 24.844" N	**0**	**0**	**0**	**18**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**23**
	127° 54' 13.108" W	0	0	0	18	0	0	0	0	0	0	7	0	0	0	0	25
Zone 3 (Hope Isl)																	
Site 1	50° 54' 40.388" N	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
	127° 55' 42.765" W	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
Site 2	50° 53' 48.141" N	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	127° 53' 17.963" W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Site 3	50° 53' 40.083" N	**0**	**0**	**0**	**34**	**11**	**2**	**0**	**0**	**0**	**0**	**0**	**35**	**36**	**0**	**0**	**118**
	127° 51' 34.341" W	0	0	0	1000	11	2	0	0	0	0	0	40	42	0	0	1095
Zone 4 (Nigei Isl)																	
Site 1	50° 52' 37.046" N	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	127° 50' 2.288" W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Site 2	50° 51' 42.071" N	**4**	**0**	**0**	**1**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**9**
	127° 46' 33.619" W	4	0	0	1	0	0	3	0	0	0	0	0	0	1	0	9
Site 3	50° 51' 42.928" N	**0**	**0**	**0**	**0**	**0**	**0**	**44**	**33**	**5**	**30**	**0**	**0**	**0**	**0**	**30**	**142**
	127° 45' 30.676" W	0	0	0	0	0	0	60	140	5	500	0	0	0	0	45	750
Site 4	50° 49' 54.803" N	**0**	**0**	**0**	**36**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**40**
	127° 39' 12.223" W	0	0	0	380	4	0	0	0	0	0	0	0	0	0	0	384
Zone 5 (Gordon Isls)																	
Site 1	50° 49' 3.788" N	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**30**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**31**
	127° 33' 16.194" W	0	0	0	1	0	0	0	160	0	0	0	0	0	0	0	161
Site 2	50° 49' 52.875" N	**0**	**0**	**0**	**31**	**6**	**0**	**30**	**30**	**0**	**0**	**0**	**46**	**30**	**14**	**0**	**187**
	127° 30' 52.353" W	0	0	0	411	6	0	685	1331	0	0	0	1251	80	14	0	3778
Site 3	50° 48' 49.921" N	**3**	**2**	**0**	**2**	**0**	**0**	**30**	**30**	**4**	**0**	**0**	**18**	**8**	**0**	**0**	**97**
	127° 28' 40.714" W	3	2	0	2	0	0	36	70	4	0	0	18	8	0	0	143
TOTAL RETAINED		**11**	**2**	**3**	**159**	**30**	**2**	**139**	**163**	**54**	**30**	**8**	**99**	**74**	**15**	**30**	**819**

*** retained fish are first row for each site in bold, caught fish are second row for each site in regular print.

APPENDIX 4: Summarized Data from lab analysis

2016 Study Year

					L. salmonis					C. clemensi				
Month	**Species**	**Number sampled**	**Ave Weight (g)**	**Ave Length (mm)**	**Total # Lice**	**# Fish Infected**	**Prevalence**	**Abundunance**	**Intensity**	**Total # Lice**	**# Fish Infected**	**Prevalence**	**Abundunance**	**Intensity**
April	Pink	304	0.50	37.13	25	22	7.2%	0.08	1.14	76	47	15.5%	0.25	1.62
	Chum	55	1.39	48.04	6	6	10.9%	0.11	1.00	16	12	21.8%	0.29	1.33
	Coho	38	9.57	93.00	0	0	0.0%	0.00	0.00	5	3	7.9%	0.13	1.67
	Chinook	0	0.00	0.00	0	0	0.0%	0.00	0.00	0	0	0.0%	0.00	0.00
	Sockeye	6	6.96	89.17	0	0	0.0%	0.00	0.00	3	2	33.3%	0.50	1.50
	Dolly Varden	0	0.00	0.00	0	0	0.0%	0.00	0.00	0	0	0.0%	0.00	0.00
May	Pink	29	1.69	54.34	0	0	0.0%	0.00	0.00	5	5	17.2%	0.17	1.00
	Chum	36	0.00	0.00	2	2	5.6%	0.06	1.00	2	2	5.6%	0.06	1.00
	Coho	6	23.23	117.33	1	1	16.7%	0.17	1.00	1	1	16.7%	0.17	1.00
	Chinook	0	0.00	0.00	0	0	0.0%	0.00	0.00	0	0	0.0%	0.00	0.00
	Sockeye	52	13.27	96.88	10	9	17.3%	0.19	1.11	95	32	61.5%	1.83	2.97
	Dolly Varden	3	112.97	184.33	7	1	33.3%	2.33	7.00	0	0	0.0%	0.00	0.00
June	Pink	3	3.09	64.67	0	0	0.0%	0.00	0.00	1	1	33.3%	0.33	1.00
	Chum	2	0.00	0.00	3	2	100.0%	1.50	1.50	11	2	100.0%	5.50	5.50
	Coho	56	18.93	112.98	38	29	51.8%	0.68	1.31	139	28	50.0%	2.48	4.96
	Chinook	2	261.49	213.00	1	1	50.0%	0.50	1.00	2	1	50.0%	1.00	2.00
	Sockeye	3	8.16	91.00	1	1	33.3%	0.33	1.00	1	1	33.3%	0.33	1.00
	Dolly Varden	3	75.64	188.00	13	3	100.0%	4.33	4.33	52	3	100.0%	17.33	17.33

2015 Study Year

					L. salmonis					C. clemensi				
Month	**Species**	**Number sampled**	**Ave Weight (g)**	**Ave Length (mm)**	**Total # Lice**	**# Fish Infected**	**Prevalence**	**Abundundance**	**Intensity**	**Total # Lice**	**# Fish Infected**	**Prevalence**	**Abundundance**	**Intensity**
April	Pink	266	0.40	36	30	24	9.0%	0.113	1.25	24	16	6.0%	0.090	1.50
	Chum	57	1.00	43	8	7	12.3%	0.140	1.14	6	6	10.5%	0.105	1.00
	Coho	2	11.31	102	0	0	0.0%	0.000	0.00	0	0	0.0%	0.000	0.00
	Herring	3	0.06	20	0	0	0.0%	0.000	0.00	0	0	0.0%	0.000	0.00
May	Pink	194	1.67	52	30	27	13.9%	0.155	1.11	71	45	23.2%	0.366	1.58
	Chum	49	1.45	47	10	8	16.3%	0.204	1.25	16	6	12.2%	0.327	2.67
	Coho	69	12.44	102	5	4	5.8%	0.072	1.25	409	69	50.7%	5.928	11.69
	Sockeye	41	6.47	78	0	0	0.0%	0.000	0.00	87	23	56.1%	2.122	3.78
	Dolly Varden	1	62.18	185	0	0	0.0%	0.000	0.00	0	0	0.0%	0.000	0.00

2014 Study Year

					L. salmonis					C. clemensi				
Month	**Species**	**Number sampled**	**Avg Weight (g)**	**Avg Length (mm)**	**Total # Lice**	**# Fish Infected**	**Prevalence**	**Abundunance**	**Intensity**	**Total # Lice**	**# Fish Infected**	**Prevalence**	**Abundunance**	**Intensity**
April	Pink	262	0.37	34.06	1	1	0.38%	0.004	1.00	3	3	1.15%	0.011	1.00
	Chum	20	0.49	36.70	0	0	0.00%	0.000	0.00	1	1	5.00%	0.050	1.00
	Chinook	1	0.05	39.00	0	0	0.00%	0.000	0.00	0	0	0.00%	0.000	0.00
	Sockeye	11	3.78	72.00	0	0	0.00%	0.000	0.00	0	0	0.00%	0.000	0.00
	non salmonid	1	0.92	43.00	0	0	0.00%	0.000	0.00	0	0	0.00%	0.000	0.00
May	Pink	238	1.18	48.43	8	8	3.36%	0.034	1.00	25	24	10.50%	0.105	1.04
	Chum	5	1.21	45.40	0	0	0.00%	0.000	0.00	1	1	20.00%	0.200	1.00
	Coho	21	13.83	104.19	0	0	0.00%	0.000	0.00	2	1	9.52%	0.095	2.00
	Sockeye	20	8.20	91.10	1	1	5.00%	0.050	1.00	0	0	0.00%	0.000	0.00

2013 Study Year: Goletas Channel

					L. salmonis					C.clemensi				
Month	Species	#	Avg wt (g)	Avg Ln(mm)	total # lice	# fish infected	Prevelance	Abundance	Intensity	total # lice	# fish infected	Prevelance	Abundance	Intensity
April	Pink	55	0.32	32.4	0	0	0.0%	0.00	0.0	1	1	1.8%	0.02	1.0
April	Chinook	11	0.39	35.6	0	0	0.0%	0.00	0.0	0	0	0.0%	0.00	0.0
April	non-salmonid	1	0.39	35	0	0	0.0%	0.00	0.0	0	0	0.0%	0.00	0.0
	Total	67												
May	Pink	344	0.82	42.1	2	2	0.6%	0.01	1.0	18	18	5.2%	0.05	1.0
May	Chum	95	1.19	46.7	2	2	2.1%	0.02	1.0	7	5	5.3%	0.07	1.4
May	Coho	15	9.19	92	0	0	0.0%	0.00	0.0	0	0	0.0%	0.00	0.0
May	Sockeye	19	6.23	82.58	2	2	10.5%	0.11	1.0	3	1	5.3%	0.16	3.0
	Total	473												
June	Pink	213	2.25	58.3	4	4	1.9%	0.02	1.0	7	7	3.3%	0.03	1.0
June	Chinook	6	5.12	76.8	0	0	0.0%	0.00	0.0	1	1	16.7%	0.17	1.0
June	Coho	30	23	121.6	2	2	6.7%	0.07	1.0	4	2	6.7%	0.13	2.0
June	Sockeye	2	3.6	68.5	0	0	0.0%	0.00	0.0	0	0	0.0%	0.00	0.0
June	Dolly Varden	4	26.7	136.2	1	1	25.0%	0.25	1.0	0	0	0.0%	0.00	0.0
		255			13					41				

2013 Study Year: Queen Charlotte Strait

					L. salmonis					*C.clemensi*				
Month	Species	# Sampled	Avg wt (g)	Avg Ln(mm)	total # lice	# fish infected	Prevelance	Abundance	Intensity	total # lice	# fish infected	Prevelance	Abundance	Intensity
June	Pink	30	2.5	59.4	0	0	0.0%	0.00	0.0	1	1	3.3%	0.03	1.0
June	Coho	3	27.5	129.7	1	1	33.3%	0.33	1.0	0	0	0.0%	0.00	0.0
	Total	33												
July	Pink	9	1.86	59.1	0	0	0.0%	0.00	0.0	3	3	33.3%	0.33	1.0
July	Chinook	1	39.9	155	0	0	0.0%	0.00	0.0	0	0	0.0%	0.00	0.0
July	Herring	31	0.4	38.6	0	0	0.0%	0.00	0.0	7	6	19.4%	0.23	1.2
	Total	41												

2011 Study Year: Goletas Channel

Capture	Dates	Species	# of fish	Avg Lth (mm)	Avg wt (g)	*L. salmonis*					*C. clemensi*					Salinity	Temperature
						total # lice	# fish infected	Prevelance	Abundance	Intensity	total # lice	# fish infected	Prevelance	Abundance	Intensity	ppm	°C
First Capture	March 30 - April 1, 2011	Pink	11	31.3	0.28	0	0	0%	0	0	2	1	9.1%	0.18	2.0	30.4	8.0
		Chum	2	36.0	0.46	0	0	0%	0	0	0	0	0.0%	0.00	0.0		
		Coho	3	80.0	4.93	0	0	0%	0	0	0	0	0.0%	0.00	0.0		
		Total	**16**														
Second Capture	April 27 - 29, 2011	Pink	164	36.8	0.55	0	0	0%	0	0	4	3	1.8%	0.02	1.3	30.5	8.2
		Chum	21	44.9	1.01	0	0	0%	0	0	5	4	19.0%	0.24	1.3		
		Non Salmonid	2	38.0	0.62	0	0	0%	0	0	0	0	0.0%	0.00	0.0		
		Total	**187**														
Third Capture	May 30- June 3, 2011	Pink	298	53.8	2.20	12	12	4%	0.04	1	30	28	9.4%	0.10	1.1	31.0	10.3
		Chum	43	80.7	9.36	2	2	5%	0.05	1	18	13	30.2%	0.42	1.4		
		Coho	11	96.6	14.99	0	0	0%	0.00	0	1	1	9.1%	0.09	1.0		
		Herring	30	34.7	0.35	1	1	3%	0.03	1	8	7	23.3%	0.27	1.1		
		Dolly Varden	8	135.6	36.50	2	1	13%	0.25	2	3	2	25.0%	0.38	1.5		
		Total	**391**														
Fourth Capture	June28 - July 4, 2011	Pink	138	85.8	9.20	12	10	7%	0.09	1.2	61	46	33.3%	0.44	1.3	31.1	9.9
		Chum	46	115.6	23.89	8	5	11%	0.17	1.6	16	11	23.9%	0.35	1.5		
		Coho	4	118.5	27.97	3	2	50%	0.75	1.5	1	1	25.0%	0.25	1.0		
		Herring	30	35.5	0.48	1	1	3%	0.03	1	60	23	76.7%	2.00	2.6		
		Total	**218**														