SEA LICE MONITORING STUDY IN GOLETAS CHANNEL AND QUEEN CHARLOTTE STRAIT, BC
YEAR 5

Tlatlasikwala First Nation
Marine Harvest Canada Inc
2016

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Prepared for:

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Executive Summary

This year marked the fifth year of the sea lice study conducted by Pacificus Biological Services (Pacificus) within Goletas Channel for Marine Harvest. Similar to previous years, beach seining for juvenile salmon was conducted from April to June, at 20 sites per sampling round excluding a full site sample in May due to low fish capture numbers. The target species for this study were juvenile pink salmon (*Oncorhynchus gorbuscha*) although samples of juvenile chum (*O. keta*), coho (*O. kisutch*), Chinook (*O. tshawytshcha*), and sockeye (*O. nerka*) salmon and Dolly Varden char (*Salvelinas malma*) were sampled. Throughout the sampling months, water temperature, salinity and dissolved oxygen levels were also recorded at each location. Over the course of the three sampling months, a total of 598 fish were retained for lab analysis for sea lice. Of the 598 fish retained, 336 were pink, 93 were chum, 100 were coho, 61 were sockeye, 2 were chinook and 6 were Dolly Varden. Of these samples, a total of 107 *Lepeophtheirus salmonis* lice, and 409 *Caligus clemensi* lice were identified. Table 1 provides a summary of the prevalence, abundance and average intensity for both lice species found on pink salmon juveniles (targeted species) for all study years.

Table 1. Prevalence, abundance and average intensity of *C. clemensi* and *L. salmonis* lice on pink salmon from 2011 to 2016.

	Lepeophtheirus salmonis			*Caligus clemensi*		
Year	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	15.8%	0.24	1.55

Introduction

Pacificus the existing base-line studies (Pacificus 2011, 2013a and 2013b, 2014, 2015) of ambient sea lice levels present in Goletas Channel and Queen Charlotte Strait, British Columbia (Figure 1) by continuing the study during this years' salmonid outmigration period (April, May and June, 2016). The study was conducted on behalf of Marine Harvest Canada, and the Tlatlasikwala First Nation.

A total of 20 beach seine sites were sampled during the 2016 sample year. All 20 sites were the same sites sampled during the 2015 sample year. 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, 12-16.

Two species of sea louse commonly found on salmonids in BC waters, *Lepeophtheirus salmonis* and *Caligus clemensi*, were the focus of this study. The most common species of sea lice in the marine environment are of the family Caligidae (Boxaspen, 2006). Two genera *Lepeophtheirus* and *Caligus* have been identified as infecting fish within the Pacific Ocean (Butterworth et al. 2008). These parasitic copepods have been found on all juvenile pacific salmon species as well as juvenile herring within the coast waters of British Columbia (Beamish et al. 2009). The two species that were the focus of the study have similar developmental cycles. The timelines of each stage differs for each species and is also highly variably dependent on water temperature. The lice start out as eggs then hatch into two motile Nauplius stages. From there they progress into a motile, parasitic copepodid (Co). Once they have attached to a host, the lice progress through four, sessile, chalimus stages (C1, C2, C3 and C4). While in the chalimus stage, the lice are attached to the host by a frontal filament. During the C4 stage, this is no longer the case and 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).

All smolt samples were caught with a beach seine and processed for lab analysis at the BC Center for Aquatic Health Sciences in Campbell River, BC.

[1] http://www.pac.dfo-mpo.gc.ca/fm-gp/maps-cartes/areas-secteurs/12-eng.html (Accessed June 16, 2014)
[2] http://www.pac.dfo-mpo.gc.ca/fm-gp/maps-cartes/areas-secteurs/11-eng.html (Accessed June 16, 2014)

The target species for this study were pink salmon smolts (*Oncorhynchus gorbuscha*) although samples of chum (*O. keta*), coho (*O. kisutch*), Chinook (*O. tshawytshcha*), and sockeye (*O. nerka*) salmon juveniles as well as cutthroat trout (*O. clarki*), Dolly Varden (*Salvelinas malma*) and Pacific herring (*Clupea pallasi*) juveniles were also retained for analysis if encountered. Samples were analysed for sea lice prevalence (percentage of fish that are infected), intensity (average number of sea lice on infected fish) and abundance (average number of sea lice on all fish sampled).

A total of ten fish farms were located within the study area (Figure 2). Currently five of the locations are operational; Bell, Marsh Bay, Shelter Bay, Shelter Pass and Bull Harbour. The non-operational sites included Doyle, Duncan, Doyle, Raynor and Robertson.

As no historical data existed for Goletas Channel and Queen Charlotte Strait prior to 2011, the primary objective of this project is to add to the data that has been collected since 2011. This study now also falls under the requirement to monitor wild salmonids by the Aquaculture Stewardship Council (ASC). This is the fifth study year in Goletas Channel (Pacificus 2011, 2013a, 2014, 2015) and the fourth study year in the Shelter Bay area (Pacificus 2013b, 2014, 2015). Secondary objectives included determining life history characteristics of sea lice in this area in terms of abundance, life stage, and distribution of the two species targeted. Additionally, observations regarding smolt outmigration timing, abundance and distribution patterns were to be determined.

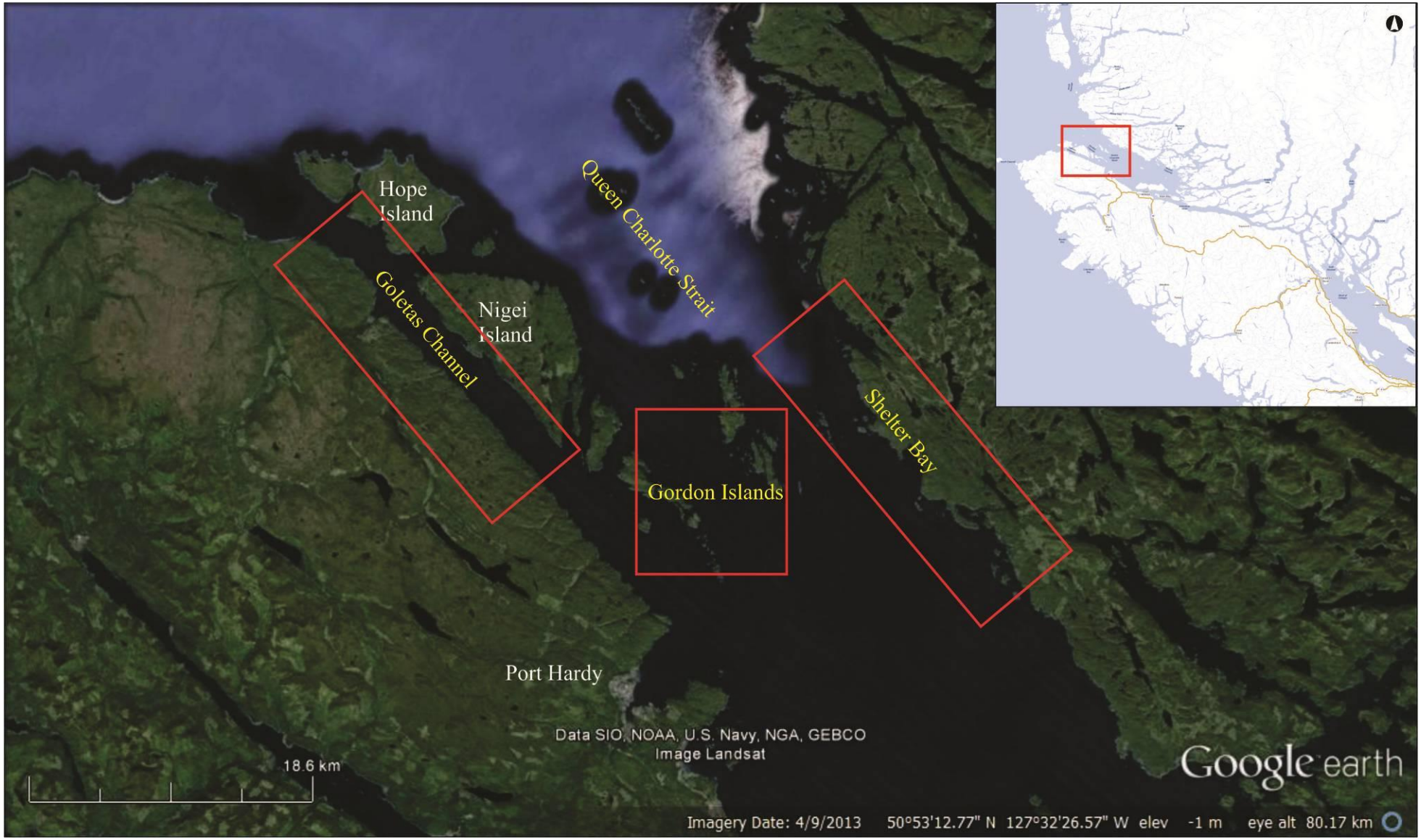

Figure 1: Overview map showing study locations (red boxes) for the 2016 sample year in relation to Port Hardy, Vancouver Island, BC.

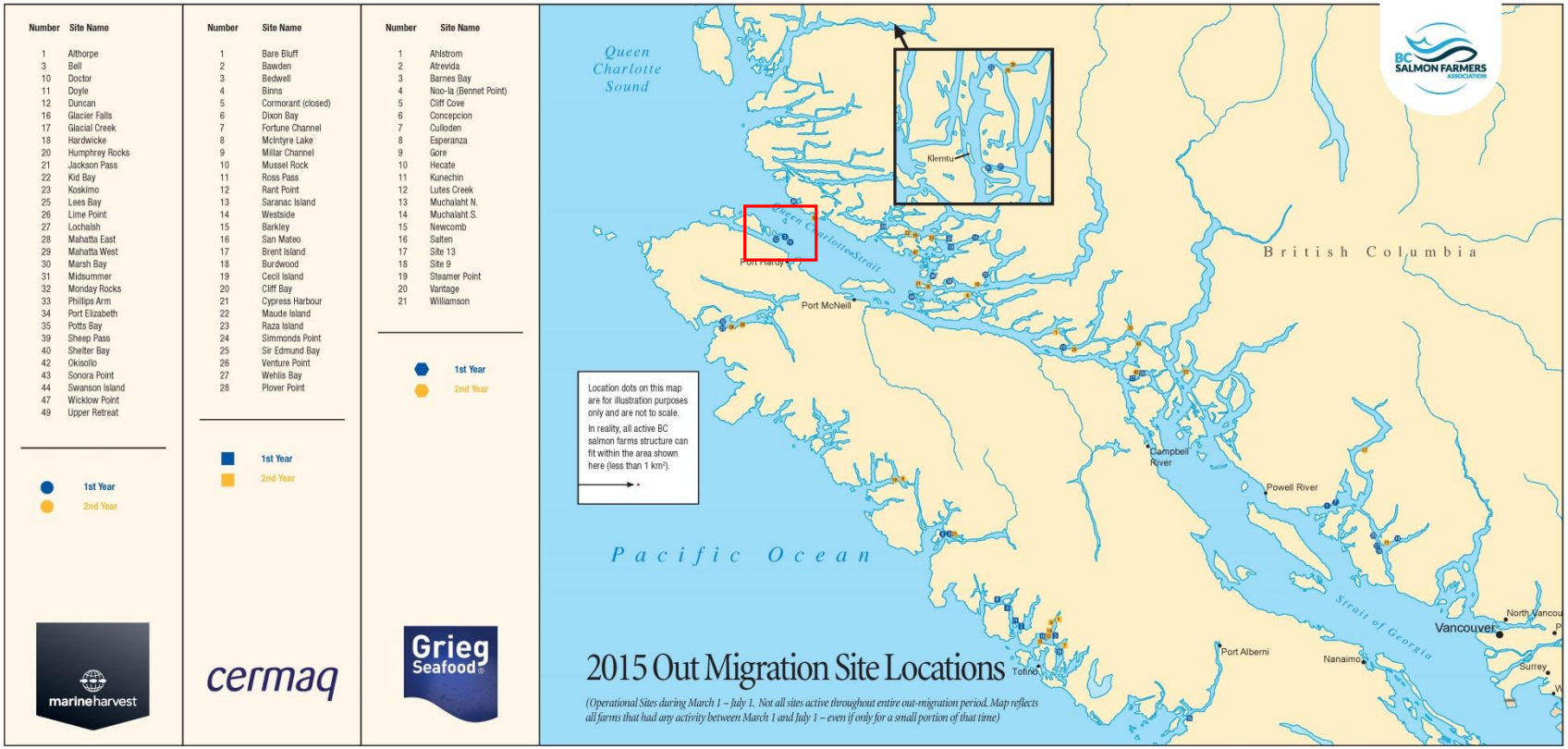

Figure 2: Location map of the fish farms located on the BC coast by company for 2015[3] with area of study location outlined in red.

[3] bcsalmonfarmers.ca/wp-content/uploads/2015/01/Out-Migration-Sites-2007-15-.pdf (Accessed July 25, 2016)

Methodology

The survey area consisted of 20 beach seine sampling locations within Queen Charlotte Strait. The 20 sites are separated into six zones based on relative geographic locations. Sample locations within Goletas Channel (Zones 1-5) were determined in the first year of the study (2011), and identified during the pre-sampling field reconnaissance (Pacificus 2011). Shelter Bay (Zone 6, Queen Charlotte Strait) sampling sites were determined in 2013 (Pacificus 2013b) and altered slightly in 2014 (Pacificus 2014). Sample locations were chosen based on targeting areas with appropriate habitat characteristics and likelihood of juvenile salmonids holding in these locations during the project time frame. Efforts were made to evenly distribute sites throughout the survey.

Zones 1 - 5

This is the fifth year of sea lice monitoring in Zones 1 to 5, all located within Goletas Channel. Originally, all zones contained 3 to 4 sample sites, however in 2014, Site 1 in Zone 1, Site 3 in Zone 2, and Site 1 in Zone 4 were eliminated due to a combination of lack of fish being captured, redistributing effort, and allowing new sites to be added. In addition, Site 4 was added to Zone 5 in 2014 and located within the Deserters Group of islands. Sample sites selected for the 2016 sample year were the same as those selected in 2014 and 2015. Zones 1 and 2 were located on the west side of Goletas channel, on Vancouver Island (Figure 3 and 4) and consisted of two sampling sites per zone. Zones 3 and 4 consisted of three sampling sites per zone. Zone 3 was located on Hope Island (Figure 4), Zone 4 on Nigei Island (Figure 3) and Zone 5 around the Gordon and Deserter Group of Islands (Figure 5). Zone 5 consisted of four sampling sites.

Zone 6

This is the fourth year of sea lice monitoring in Zone 6, located northeast of Port Hardy, in the Shelter Bay area of Queen Charlotte Strait (Figure 6). Five sampling locations were originally established (Pacificus 2013b). In 2014, Site 2 was eliminated and Site 4 and 5 were merged into one site in a new location (now known as Site 4) due to lack of suitable areas for beach seining. Two new sites were added in April of 2014. Site 6 was located near Marsh Bay, and Site 7, was located by Robinson Island. In May of 2014, an additional sampling location (Site 5) was added and located near Browning Island, in between Site 6 and 7. All Zone 6 sites sampled in 2014 and 2015 were repeated for the 2016 sample year.

Initially the study was intended to follow the sampling regime of 2014 and 2015, where monthly sampling was to occur in April and May; however, extremely few fish were observed in this year's May sampling. As a result, the May sampling was only partially completed and an additional full round of sampling was added in June.

Crew size was four people with one person operating the boat and collecting environmental data and three people hauling the net and processing fish samples. The sampling crew was composed of personnel from Pacificus. Gabriel Charlie; a representative from the Tlaltlasikwala First Nation, joined the crew on a portion 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 location was performed for 5 minutes from the boat at a distance of 10-20m from the shore in order to assess the presence of salmonids. If fish were observed then a set encompassed this area, if no fish were observed during this search then the set was performed at the most likely area for fish presence as determined by the crew during the search.

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 the results indicated that only on one occasion did a third set within a sampling location result in a captured salmonid (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 for each sample year since.

If salmonids were caught, specimens were randomly selected for lab analysis and a count of the remaining numbers of fish to be released in the set was made based on field identification to the species level. A maximum of 30 fish/species for each target species were targeted to be retained from each site for the lice analysis in each monthly sample. Target species for the survey were pink (maximum 1440 specimens retained for entire project), chum, sockeye (maximum 1140 specimens

per species retained for the entire project), coho, Chinook, Dolly Varden, cutthroat, stickleback and herring (maximum 1140 specimens per species retained for the entire project).

Retained sample specimens were placed in sample bags and euthanized with a Tricaine methanesulfonate (TMS) overdose immediately. Samples in 2 ounce bags were given 1.0 ml of a 240 mg/L TMS solution while samples in 4 ounce bags were given 5 ml of the TMS solution. Each sample bag, having been pricked with a tack prior to usage, was then placed in a bucket where the solution was allowed to drain out and then poured to ground in the upland area. Sample bags for each site were placed in a larger bag together 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 frozen once they were transported back to Port Hardy. When the monthly sampling was complete the samples were transported in a frozen state to the BC Centre for Aquatic Health Sciences (CAHS) for laboratory analysis which included species identification and microscopic lice counts. Specimens were classified and analyzed for wet weight, fork length and sea lice were identified to species and sexed with life stage determined and enumerated for each sample. 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 10 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 in conclusions based from very small sample sizes. Values are still represented within the following tables however, any utilization of these data arising from very small sample sizes should only be utilized with the appropriate context given to the sample size for which determined the values.

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, caught fish were placed in a sea-water filled tote with airstones 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 (D_0) in milligrams per liter (mg/l) and salinity in parts per thousand (ppt) at the

surface (0m), 1m depth and 4m depth. 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 well as 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.

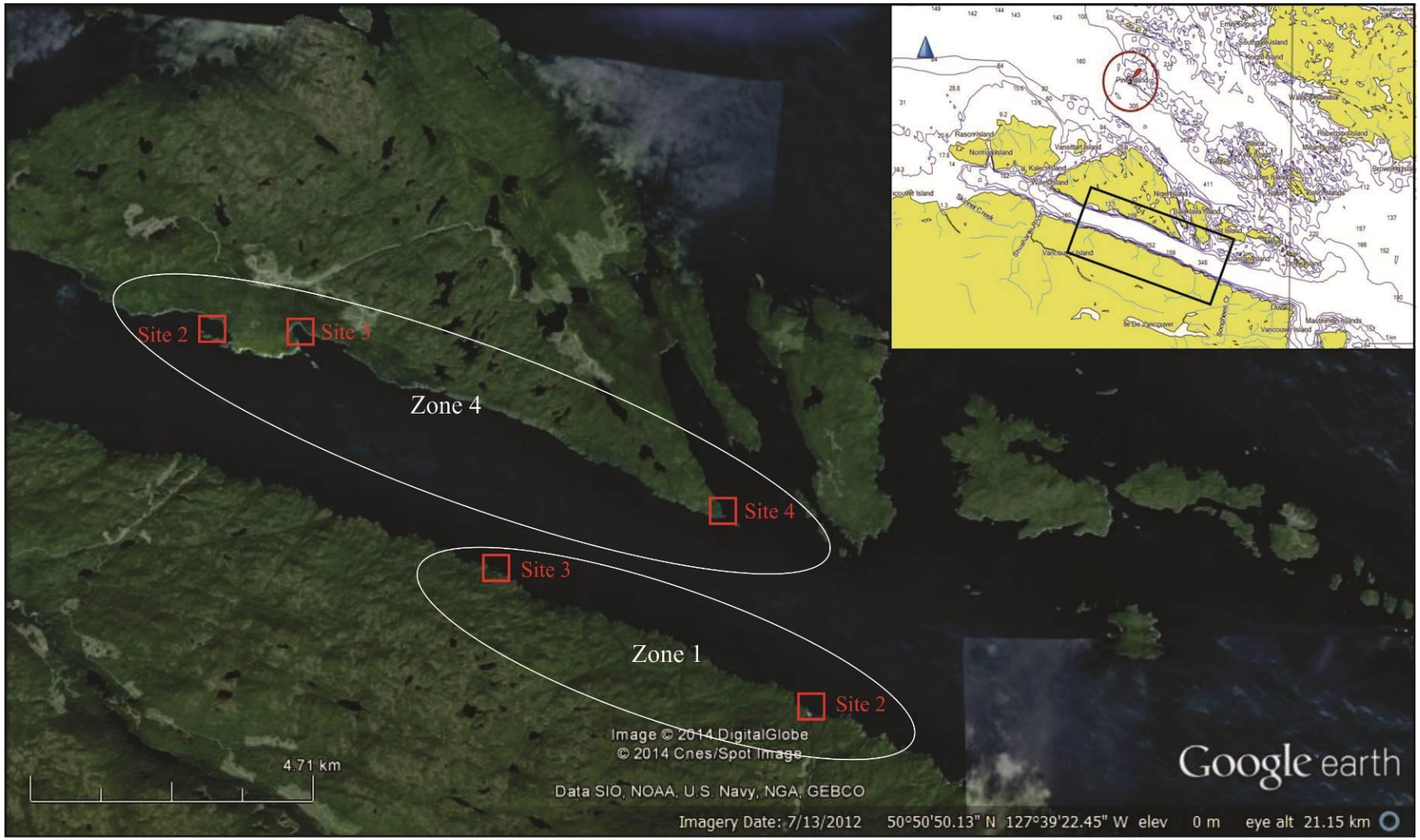

Figure 3: Location map of the sampling sites in Zone 1 (Vancouver Island) and 4 (Nigei Island) examined during the 2016 sample year in Goletas Channel, British Columbia.

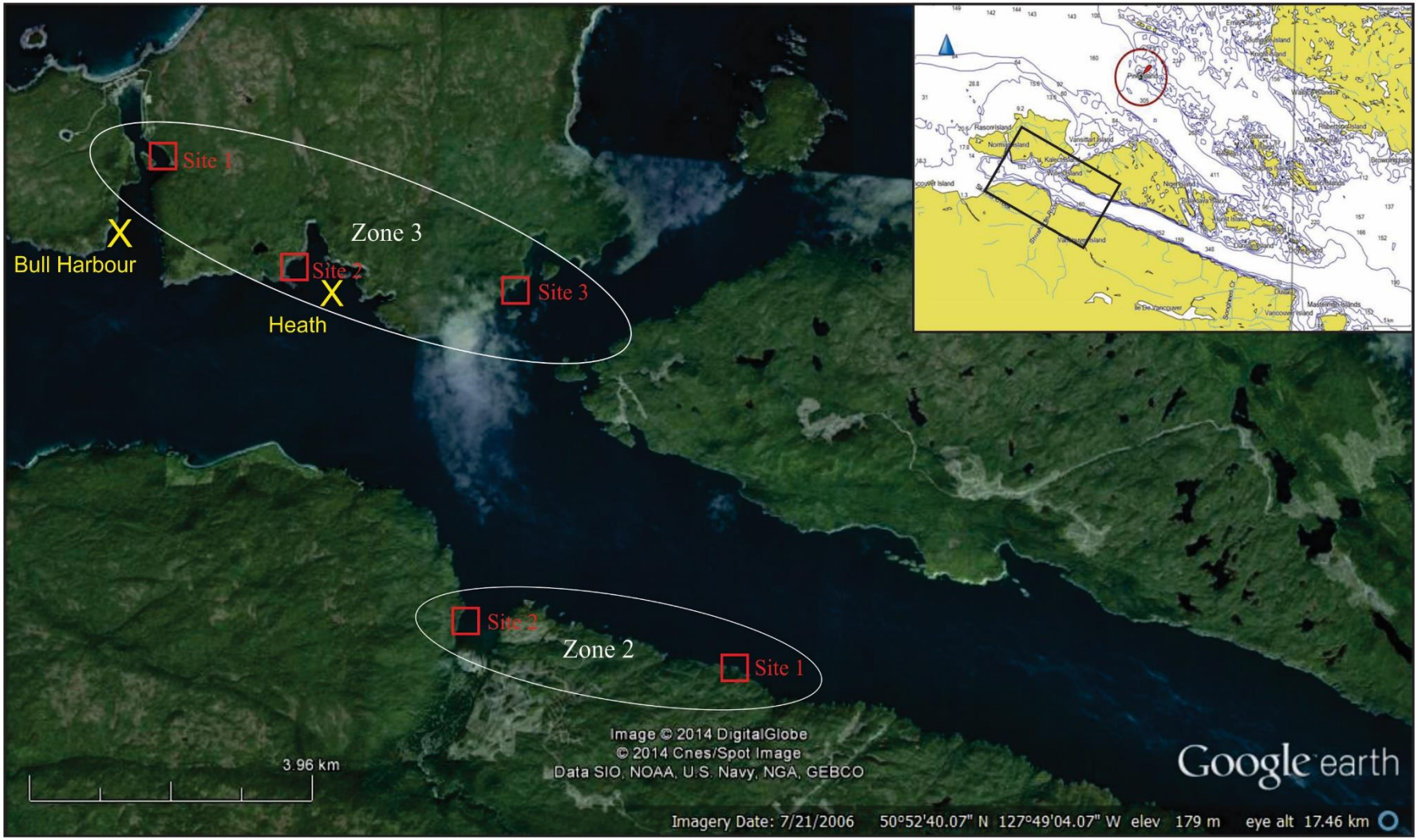

Figure 4: Location map of the sampling sites in Zone 2 (Vancouver Island) and Zone 3 (Hope Island) examined during the 2016 sample year in Goletas Channel, British Columbia**.** The yellow "X" indicates active and inactive fish farm locations.

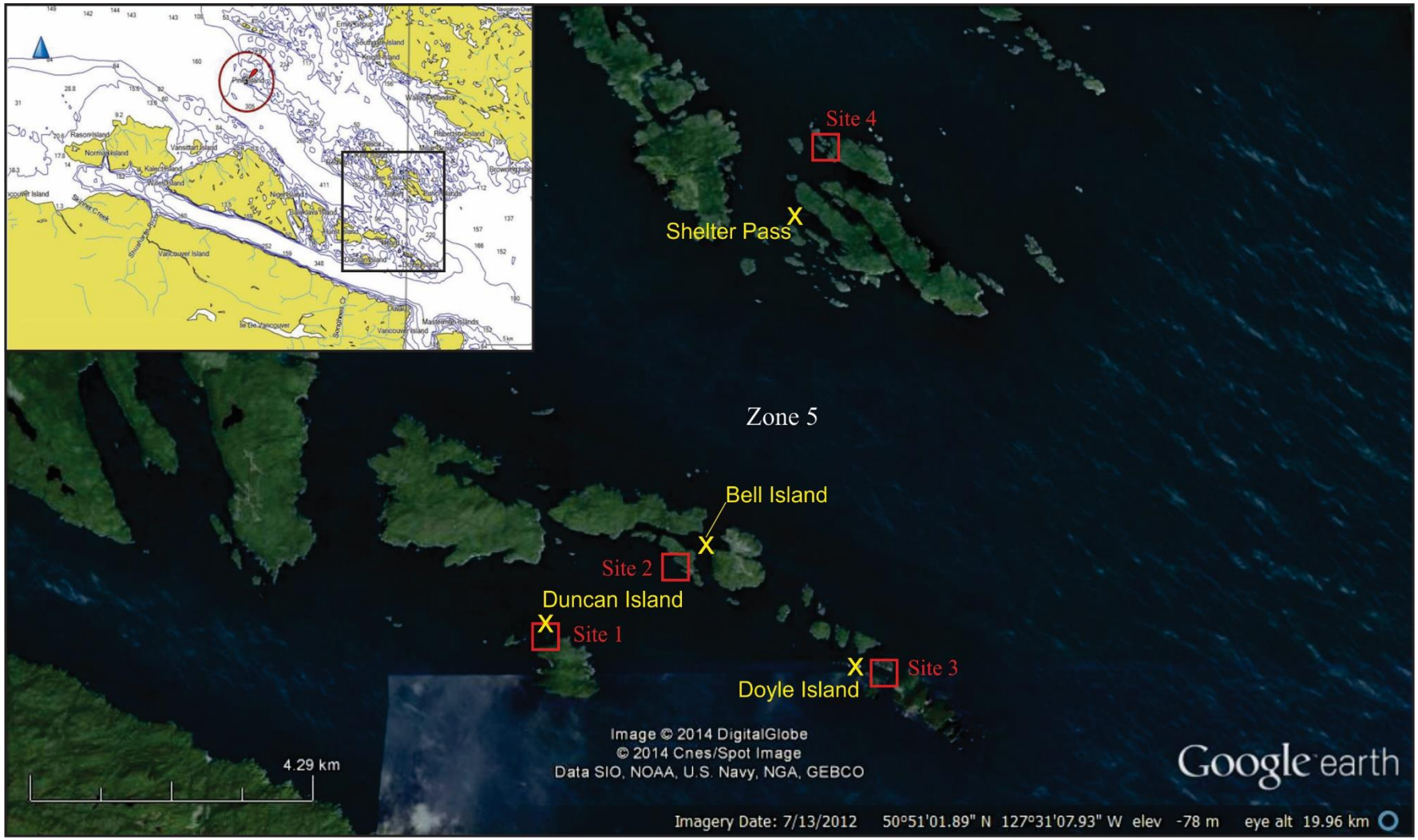

Figure 5: Location map of the sampling sites in Zone 5 (Gordon Group) examined during the 2016 sample year in Goletas Channel, British Columbia. The yellow "X" indicates active and inactive fish farm locations.

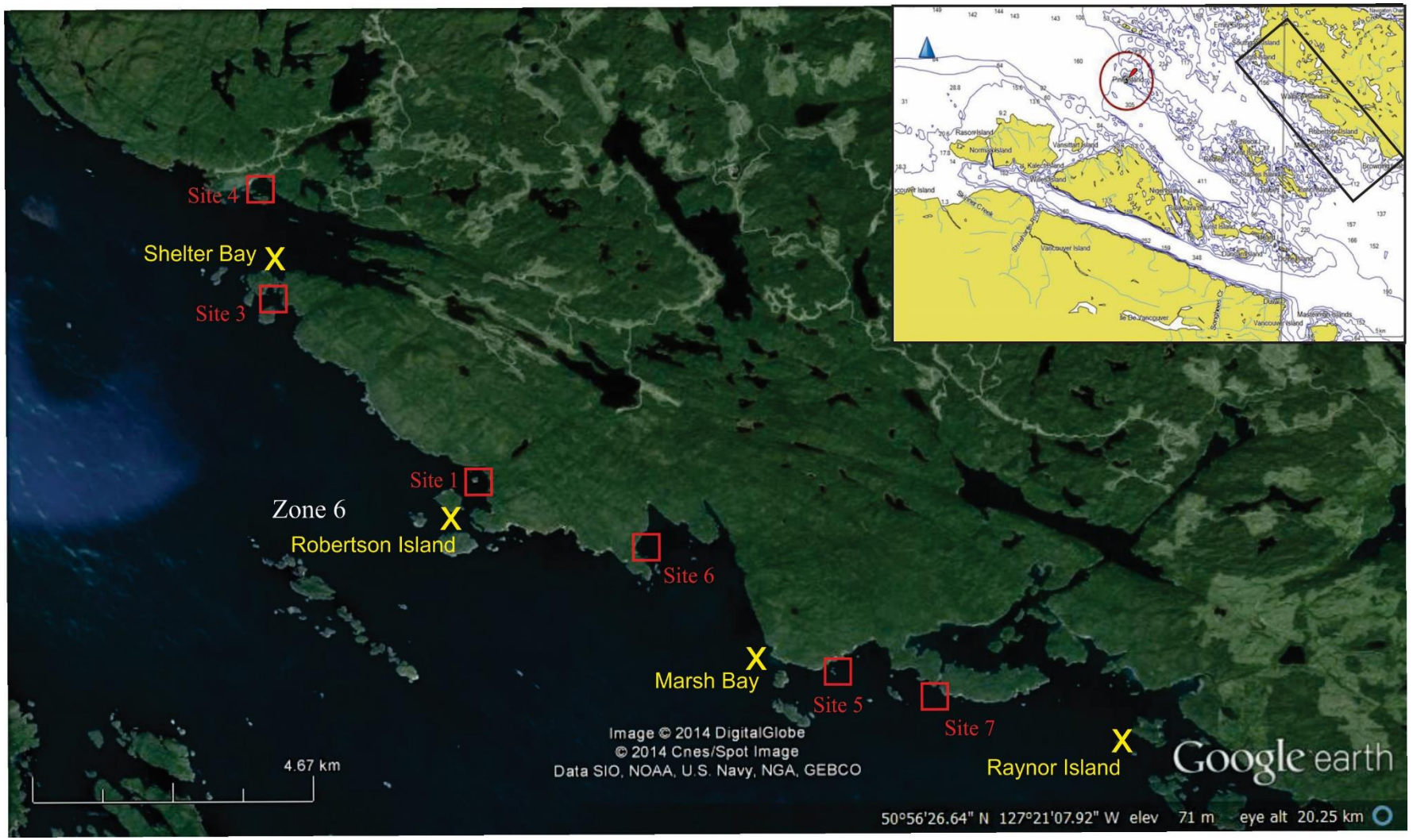

Figure 6: Location map of sampling sites in Zone 6 (Shelter Bay area) examined during the 2016 sample year in Queen Charlotte Strait, British Columbia. The yellow "X" indicates active and inactive fish farm locations.

Results

Three rounds of beach seining were completed during the 2016 sample season. The first round occurred on April 11th, 14th and 15th. The second round occurred from May 9th to May 11th and the third round occurred on May 30th, 31st, June 2nd and June 7th. All 20 sites were sampled during the first and third rounds within the 2016 sample year; however, during the second round in (May 9th-11th) Site 2 within Zone 1, Site 1 and Site 2 within Zone 5 and all of Zone 6 were not sampled due to the lack of fish being caught at all other sites.

A project total of 84 sets were completed during the 2016 season, 27 of which were successful at capturing target species. A total of 27 sets were completed during the April sampling, 18 of which were successful at capturing target species. A total of 19 sets were completed during the May sampling, 3 of which were successful at capturing target species and a total of 38 sets were completed during the June sampling, 6 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 seven sites; six of the subsequent sets resulted in the capture of target species. During the May sampling, the crew was unable to capture fish within the first seine attempt at eight sites. None of the subsequent sets resulted in the capture of target species. In June, the crew was unable to capture fish within the first seine attempt at 17 sites. Three of the subsequent sets resulted in the capture of target species.

Let it be noted that the sample numbers detailed within this report have been adjusted to reflect the identification completed during the lab analysis. Due to the higher accuracy of identification in a lab setting versus the difficulty of field identification of juvenile salmonids, captured and retained data presented within this report has been adjusted to represent the lab analysis identification. As a result of more accurate lab identification the maximum retention number per species, per site (30 samples retained per species, per site) was over achieved in some cases.

The number of samples obtained in each of the 27 successful sets ranged from 1 to 58 target species and averaged 12.0 samples per successful set. A total of 598 samples were retained for laboratory analysis, 336 were pink salmon, 93 were chum, 101 were coho, 60 were sockeye, 2 were Chinook, and 6 were Dolly Varden char. A summary of sample totals by zone and by month is provided in Table 2.

Table 2: Summary of sample totals for juvenile salmonids collected in Goletas Channel and Queen Charlotte Strait, BC during the spring of 2016. Sets were not completed within Zone 6 in May.

Zone	Sample Period			Zone Totals	% of Total Catch by Zone
	April	May	June		
1	5	0	0	5	0.8%
2	55	0	35	90	15.1%
3	41	125	24	190	31.8%
4	22	0	4	26	4.3%
5	32	1	0	33	5.5%
6	248		6	254	42.5%
Monthly Total	403	126	69	**598**	
Monthly % of Total Catch	67.4%	21.1%	11.5%		

Juvenile Salmonid Abundance, Distribution, Growth and Timing Patterns

The project total of target species captured was 598 fish. All were salmonid species. 403 samples were collected during the April sampling (67.4% of the project total), 126 samples were collected during the May sampling. (21.1% of the project total) and 69 samples were collected during the June sampling (11.5% of the project total).

During the month of April, the breakdown of the monthly sample total by zone was as follows: 1.0% of samples were collected in Zone 1, 14% in Zone 2, 10% in Zone 3, 5% in Zone 4, 8% in Zone 5, and 62% in Zone 6. In May, the breakdown of the monthly sample total by zone was as follows: 0% of samples were collected in Zone 1, 0% in Zone 2, 99% in Zone 3, 0% in Zone 4, and 1% in Zone 5. Sets were not completed within Zone 6 during May. During the month of June, the breakdown of the monthly sample total by zone was as follows: 0% of samples were collected in Zone 1, 51% in Zone 2, 35% in Zone 3, 6% in Zone 4, 0% in Zone 5, and 9% in Zone 6.

In April, salmonid samples were collected in every Zone, however only 5 samples were collected in Zone 1. In May samples were only collected within Zone 3 and Zone 5. In June samples were collected in all zones except Zone 1 and 5. The highest proportions of salmonids were collected

in Zones 6 in April. For the month of May the highest proportions were found in Zone 3 and in June the highest proportions were collected in Zone 2.

The average length and weight of the salmonid specimens increased throughout each sampling month for all species collected (Table 3). Pink, chum, coho and sockeye salmon were captured during each sampling month. During May's sampling period, 3 Dolly Varden char were collected and during June another 3 Dolly Varden char were collected.

Sea Lice Infection

Lice Species Distribution

During the month of April a total of 31 *L. salmonis* were identified; originating from Zones 4, 5 and 6. A total of 27 *L. salmonis* originated from Zone 6, two from Zone 5 and two from Zone 4. In May a total of 20 *L. salmonis* were identified from Zones 3 and 5. A total of 13 originated in Zone 3, and 7 originated from Zone 5. In June, a total of 56 *L. salmonis* were identified; originating from Zones 2, 3, 4, and 6. A total of 17 originated in Zone 2, 21 in Zone 3, 13 in zone 4, and 5 in Zone 6.

A total of 100 *C. clemensi* were identified during the April sampling. Nine originated from Zone 2, 11 originated from Zone 3, 9 originated from Zone 4, 1 originated from Zone 5 and 70 originated from Zone 6. During May's sampling, a total of 103 *C. clemensi* were identified in one zone, Zone 3. No lice were identified on samples from Zones 1, 2, 4 and 5. In June a total of 206 *C. clemensi* were identified as originating from 4 zones. *C. clemensi* originated from Zones 2, 3, 4, and 6. 58 were found originating from Zone 2, 81 from Zone 3, 52 from Zone 4 and 15 from Zone 6.

Table 3: Distribution of *L salmonis* and *C. clemensi* by Zone in Goletas Channel and Queen Charlotte Strait during the spring of 2016.

Zone	Fish Sampled	*L. salmonis*	Fish Sampled	*L. salmoni*	Fish Sampled	*L. salmoni*	Zone Total	Fish Sampled	*C. clemensi*	Fish Sampled	*C. clemensi*	Fish Sampled	*C. clemensi*	Zone Total
	April		May		June			April		May		June		
1	5	0	0	0	0	0	0	5	0	0	0	0	0	0
2	55	0	0	0	35	17	52	55	9	0	0	35	58	102
3	41	2	125	13	24	21	185	41	11	125	103	24	81	344
4	22	0	0	0	4	13	17	22	9	0	0	4	52	65
5	32	2	1	7	0	0	10	32	1	1	0	0	0	2
6	248	27	-	-	6	5	38	248	70	-	-	6	15	91
Lice Total		31		20		56	**107**		100		103		206	**409**
Fish Total	403		126		69		**598**	403		126		69		**598**

Lice Species Prevalence, Abundance and Intensity in Pink Salmon

A total of 336 pink salmon were retained for lab sampling, 304 of which were caught during the April sampling, 29 during May's sampling and 3 in June's sampling. All *L. salmonis* identified on juvenile pink salmon were from the samples retained in April. *C. clemensi* were identified on the retained individuals from all sampling months. Due to only three individuals being retained for lab analysis in June, prevalence, abundance and intensity will not be discussed for the month of June.

The mean prevalence (percentage of fish that were infected) for all *L salmonis* was 8.9% and 8.6% for *C. clemensi*. By month, *L. salmonis* prevalence was 7.2% in April, and 0% in May as no *L. salmonis* were identified. *C. clemensi* prevalence on pinks was 15.5% in April and 17.2% in May.

The mean abundance (average number of sea lice on all fish sampled) for *L. salmonis* was 0.10 and 0.11 for *C. Clemensi* on pink salmon. By month *L. salmonis* abundance on pink salmon was 0.08 in April, and 0 in May. *C. clemensi* abundance on pinks was 0.25 in April, and 0.14 in May.

The mean intensity (average number of sea lice on infected fish) for *L. salmonis* lice on pink salmon was 1.09 and 1.32 for *C. clemensi*. By month *L. salmonis* intensity on pink salmon was 1.14 in April and 0 May. *C. clemensi* intensity on pink salmon was 1.62 in April and decreased to 1.0 in May.

Refer to Table 4 for more information regarding species prevalence, abundance and intensity.

Lice Species Prevalence, Abundance and Intensity in Chum Salmon

A total of 93 chum salmon samples were retained for lab analysis. Of those samples, 55 were captured during April, 36 were captured during May's sampling and 2 were captured in June's sampling. Due to only two individuals being retained for lab analysis in June, prevalence, abundance and intensity calculations will not be discussed for the month of June.

L. salmonis prevalence was 10.9% for the April sample sampling and 5.6% for May. C. *clemensi* prevalence on chum was 21.8% in April and 5.6% in May.

The mean abundance for *L. salmonis* on chum salmon was 0.12 and for *C. clemensi* was 0.31. *L. salmonis* abundance on chum salmon was 0.11 in April and 0.06 in May. Similarly, *C. clemensi* abundance went from 0.29 in April and decreased to 0.06 in May.

The mean intensity for *L. salmonis* on chum salmon was 1.10 and was 1.81 for *C. clemensi*. Intensity for *L. salmonis* was 1.0 in April and May. *C. clemensi* intensity also mimicked this trend with 1.33 in April, 1.0 in May.

Refer to Table 4 for more information regarding species prevalence, abundance and intensity.

Lice Species Prevalence, Abundance and Intensity in Coho Salmon

A total of 101 coho salmon samples were retained for lab analysis, 39 of which were captured during April's sampling and 6 during May's sampling while the remaining 56 were captured during June's sampling. Again, due to a small sample size, results from May will not be further discussed. Refer to the methodologies section for further explanation.

No *L. salmonis* were observed on any of the fish from April. Lice of both species were found on all other samples collected.

Mean prevalence for *L. salmonis* on coho salmon was 30% while prevalence for *C. clemensi* was 32%.

Mean abundance for *L. salmonis* 0.39 and *C. clemensi* abundance was 1.45.

Mean intensity for *L. salmonis* was 1.30 and *C. clemensi* was 4.53.

Refer to Table 4 for more information regarding species prevalence, abundance and intensity.

Lice Species Prevalence, Abundance and Intensity in Chinook Salmon

A total of 2 chinook salmon samples were retained for lab analysis, both of which were captured during June's sampling. Due to a small sample size analysis results will not be discussed further.

Lice Species Prevalence, Abundance and Intensity in Sockeye Salmon

A total of 61 sockeye salmon samples were retained for lab analysis. All retained sockeye were captured during the April, May and June samples, however, only six sockeye were sampled in April and three sockeye were sampled during June therefore the lice prevalence, abundance and intensity values reflect the May sampling only.

L. salmonis prevalence was 17.3% in May while *C. clemensi* prevalence was 61.5%.

The mean abundance for all *L. salmonis* on sockeye salmon was 0.18 and was 1.62 for *C. clemensi*. *L. salmonis* abundance on sockeye salmon was 0.19 in May and *C. clemensi* abundance was 1.83 in May.

The mean intensity for all *L. salmonis* was 1.10 and was 2.83 for *C. clemensi*. Intensity of *L. salmonis* was 1.11 in May and 2.97 in May for *C. clemensi*.

Refer to Table 4 for more information regarding species prevalence, abundance and intensity.

Lice Species Prevalence, Abundance and Intensity in Dolly Varden

A total of six Dolly Varden were captured and retained for lab analysis. Three samples were captured in May with the remaining three in June. Due to a small sample size analysis results will not be discussed further.

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Table 4: Temporal changes in *L. salmonis* and *C clemensi* presence on salmonids in Goletas Channel and Queen Charlotte Strait, BC (pink salmon values highlighted in blue). Abundance, prevalence and intensity values that have been generated based on sample values less than 10 have been displayed for informational purposes only. These values have not been discussed further within this report. Any utilization of these data that have arisen from the very small sample sizes should only be utilized with the appropriate context given to the sample size for which determined the values.

					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	1.91	53.69	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	10.60	104.00	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

Louse Life Stage on pink salmon

The most prevalent life stage of *L. salmonis* observed on pink salmon was the C3 stage (50.0%), followed by the C4 stage (23.08%), C2 (11.54%), copepodid, C1, pre-adult male and adult male stages (all 3.85%). No pre-adult or adult females were identified on the pink salmon samples.

The most prevalent life stage of *C. clemensi* observed on pink salmon was the C1 stage (69.5%), followed by C2 (15.25%), C3 and C4 (5.08%), adult male (3.39%) and copepodid stage (1.69%). No pre-adults (both sexes) or adult female *C. clemensi* were identified on pink salmon during the lab analysis.

Refer to Figure 7 for *L. salmonis* and *C. clemensi* prevalence on pink salmon.

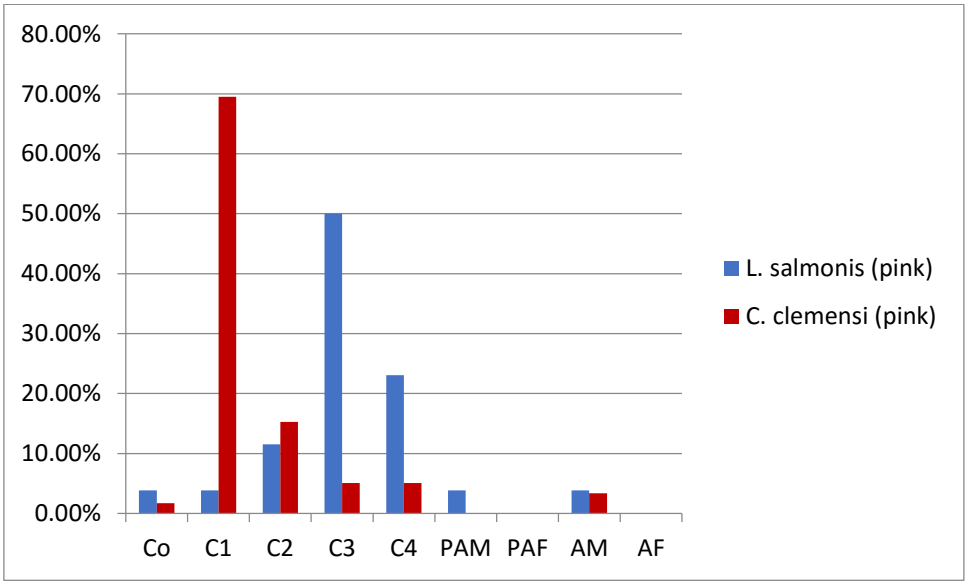

Figure 7: Developmental stages of *Lepeophtheirus salmonis* and *Caligus clemensi* present on juvenile pink salmon in Goletas Channel and Queen Charlotte Strait in the 2016 study period. The development stages are as follows: Co, copepodid; C1-C4, chalimus I to IV, PAF, PAM, pre-adult (both sexes); AM, AF, adult (both sexes).

Louse Life Stage on chum salmon

The most prevalent life stage of *L. salmonis* observed on chum salmon was the C2 stage (36.4%), followed by the C1, C3, and pre-adult male stage (18.2%), and C4 (9.09%). No copepodid, pre adult female or adult stage (male or female) *L. salmonis* were observed on chum salmon.

The most prevalent life stage of *C. clemensi* observed on chum salmon was the C1 stage (60.9%), followed by C2 (13.04%), then C3 and C4 stage (both 8.7%) and the copepodid stage as well as adult male stage (3.4%). No pre-adult (male or female) or adult female *C. clemensi* were identified on chum salmon during the lab analysis.

Refer to Figure 8 for *L. salmonis* and *C. clemensi* life stage and prevalence on chum salmon.

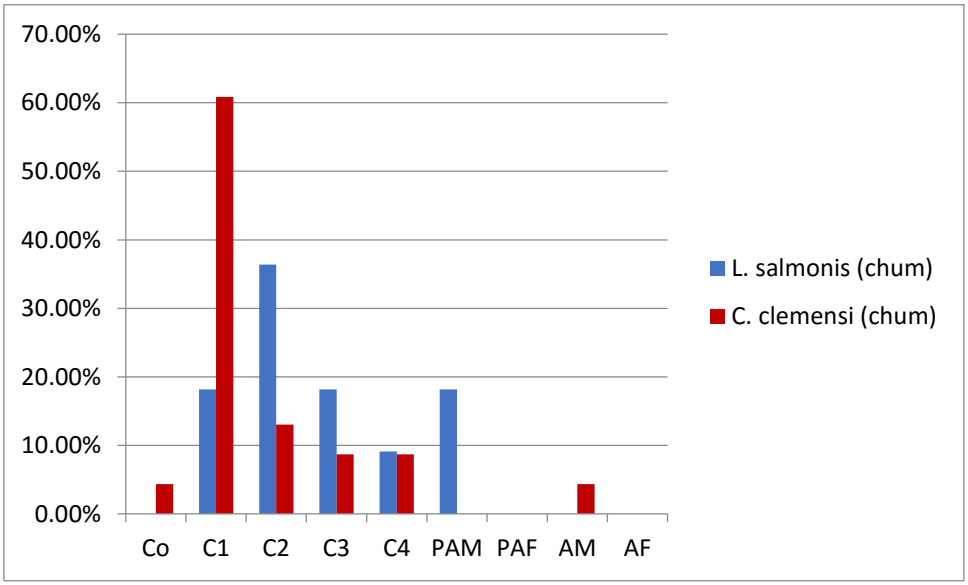

Figure 8: Developmental stages of *Lepeophtheirus salmonis* and *Caligus clemensi* present on juvenile chum salmon in Goletas Channel and Queen Charlotte Strait in the 2016 study period. The development stages are as follows: Co, copepodid; C1-C4, chalimus I to IV, PAF, PAM, pre-adult (both sexes); AM, AF, adult (both sexes).

Louse Life Stage on coho salmon

The most prevalent life stage of *L. salmonis* observed on coho salmon was both the C2 and pre-adult male stage (19.4%), followed by the C1 stage (16.7%), both the C3 and then pre-adult females (11.1%), the C4 and the adult male (8.3%) and lastly the C2 stage (5.56%). No adult females *L. salmonis* were identified on coho salmon during lab analysis.

The most prevalent life stage of *C. clemensi* identified on juvenile coho salmon was the C1 stage (47.2%) followed by C2 stage (20.8%), C3 and C4 (both 11.1%), adult females (5.6%), adult males (2.8%) and pre-adult females (1.4%). There were no copepodid or pre-adult male *C. clemensi* lice identified on any of the juvenile coho.

See Figure 9 for a graphical summary of the *L. salmonis* and *C. clemensi* life stage and prevalence on juvenile coho salmon.

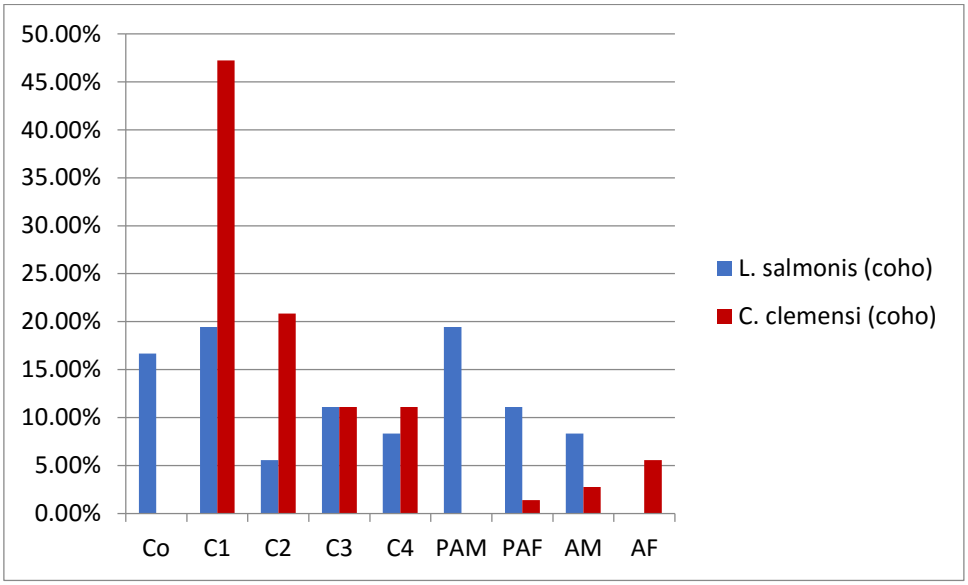

Figure 9: Developmental stages of *Lepeophtheirus salmonis* and *Caligus clemensi* present on juvenile coho salmon in Goletas Channel and Queen Charlotte Strait in the 2016 study period. The development stages are as follows: Co, copepodid; C1-C4, chalimus I to IV, PAF, PAM, pre-adult (both sexes); AM, AF, adult (both sexes).

Louse Life Stage on Chinook salmon

A total of 2 juvenile Chinook were collected throughout the entire study in 2016. Of these 2 samples, each fish had a single louse. The *L. salmonis* identified in the lab analysis was an adult male. The *C. clemensi* identified was C1. No other sea lice were found on the two juvenile Chinook sampled.

Louse Life Stage on sockeye salmon

The most prevalent *L. salmonis* on any of the analyzed sockeye were the copepodid and C2 stages (both 33.3%) followed by the adult male stage (22.2%) and lastly the C1 stage (11.1%). The most prevalent life stage of *C. clemensi* was C2 (35.5%) followed closely by C2 (27.4%), C3 (24.2%) and C4 (11.3%). The least prevalent stage was adult females (1.6%). No copepodid stage, or pre-adult male or female or adult male stage lice were identified on retained sockeye salmon.

Refer to Figure 10 for *L. salmonis* and *C. clemensi* life stage and prevalence on sockeye salmon.

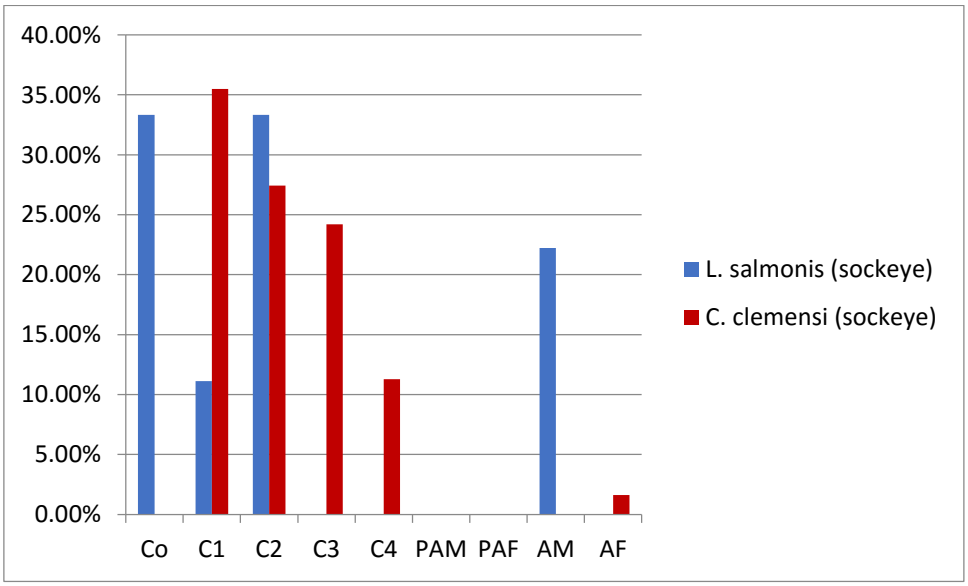

Figure 10: Developmental stages of *Lepeophtheirus salmonis* and *Caligus clemensi* present on juvenile sockeye salmon Goletas Channel and Queen Charlotte Strait in the 2016 study period. The development stages are as follows: Co, copepodid; C1-C4, chalimus I to IV, PAM, PAF, pre-adult (both sexes); AM, AF, adult (both sexes).

Louse Life Stage on Dolly Varden char

Every stage *L. salmonis* were found on the Dolly Varden submitted for analysis in the 2016 sampling year. The most prevalent life stage of *L. salmonis* observed on Dolly Varden char was pre-adult female stage (20%), followed by the copepodid, C3, C4 and adult male stage (13.3%). The C1, C2, pre adult male and adult female all had 6.7% prevalence.

The most prevalent life stage of *C. clemensi* identified on juvenile Dolly Varden char was the C1 stage (27.3%) followed by C2, C3, C4 and adult male stage (18.2%). There were no copepodid, pre-adult male or female or adult male *C. clemensi* lice identified on any of the juvenile Dolly Varden.

Refer to Figure 11 for *L. salmonis* and *C. clemensi* life stage and prevalence on Dolly Varden.

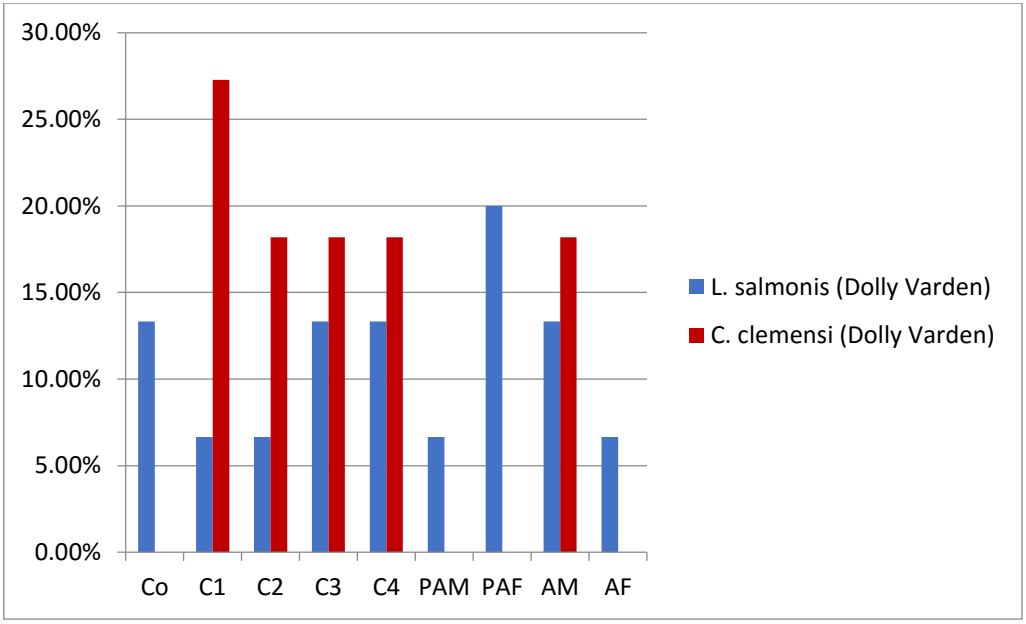

Figure 11: Developmental stages of *Lepeophtheirus salmonis* and *Caligus clemensi* present on juvenile Dolly Varden char Goletas Channel and Queen Charlotte Strait in the 2016 study period. The development stages are as follows: Co, copepodid; C1-C4, chalimus I to IV, PAM, PAF, pre-adult (both sexes); AM, AF, adult (both sexes).

Water Quality - Salinity and Temperature

Salinity and temperature were recorded at each site throughout the entire study period at the surface (0m), 1m depth and 4m depth. Average salinity and average temperature were calculated for the entire study area at each sample depth. Results for average salinity at each depth over the entire study area are presented in Figure 12. Results for average temperature at each depth over the entire study area are presented in Figure 13.

Average salinity increased from April to June for all sample depths. For the month of April, there was a slight increase in salinity from the surface to 4m depth indicating some stratification of fresh and saltwater during that time frame. During the month of April maximum salinity (31.65 ppt) was recorded at the 4m depth at Site 1 in Zone 3; Bull Harbour, Hope Island . Minimum salinity (26.62 ppt) was recorded on the surface at Site 2 in Zone 1; Songhees River estuary.

For the month of May, average salinity values were relatively uniform from the surface to 4m depth. During the month of May, maximum salinity (31.76 ppt) was recorded at the 4m depth at Site 3 in Zone 3; south side of Hope Island. Minimum salinity (31.33 ppt) was recorded at the surface at Site 1 in Zone 2; south of Shushartie Bay, northeastern Vancouver Island.

For the month of June, average salinity values increased slightly from the surface to 4m depth. During the month of June, maximum salinity (33.17 ppt) was recorded at the 4m depth at Site 2 in Zone 2; Shushartie Bay, Northeastern Vancouver Island. Minimum salinity (31.61 ppt) was recorded at the surface at Site 2 in Zone 1; Songhees estuary, Vancouver Island.

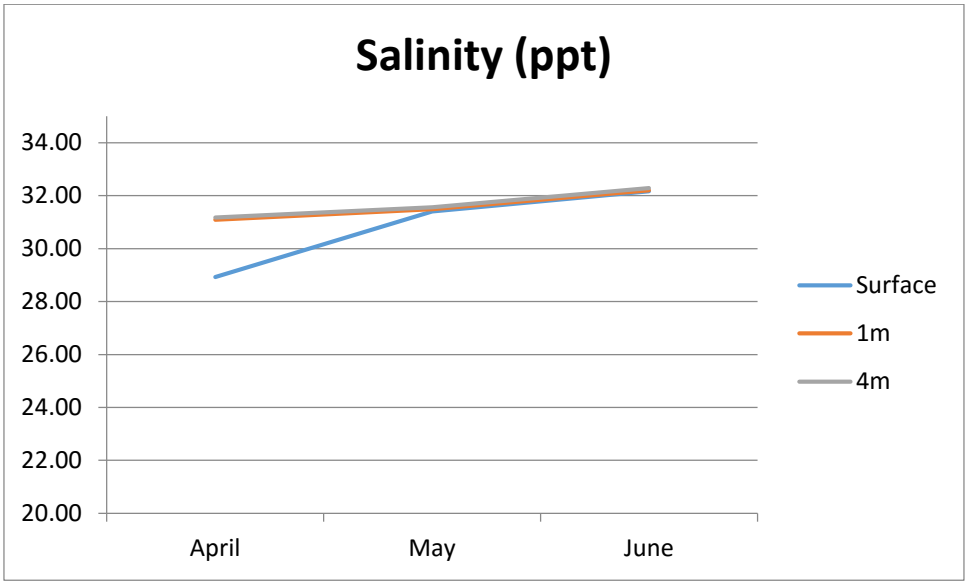

Figure 12: The average salinity recorded at the surface, 1m and 4m depth during the 2016 study period.

The average water temperature for the entire study area increased from April to June. Average water temperature at the surface was 9.35°C in April, 10.0°C in May, and 10.64°C in June. At 1m water depth, average water temperature was 9.26°C in April, 9.82°C in May, and 10.39°C in June. At 4m water depth, average water temperature was 9.16°C in April, 9.60°C in May, and 10.10°C in June. For the month of April, the lowest recorded temperature (8.7ºC) was recorded at the surface at Site 2 in Zone 1, Songhees River. The highest temperature for April (10.8ºC) was recorded at the surface at Site 2 in Zone 2; Shushartie Bay. In May the lowest recorded temperature (9.4ºC) was recorded at the 4m depth at all sites in Zone 3; Hope Island. The highest temperature recorded in May (10.4ºC) was found at the surface of Site 4 in Zone 4. In June the lowest recorded temperature (9.2ºC) was recorded at the 1m depth at Site 3 in Zone 3; southern Hope Island. The highest temperature recorded in June (13.5ºC) was found at the surface Site 4 in Zone 6; Shelter Bay.

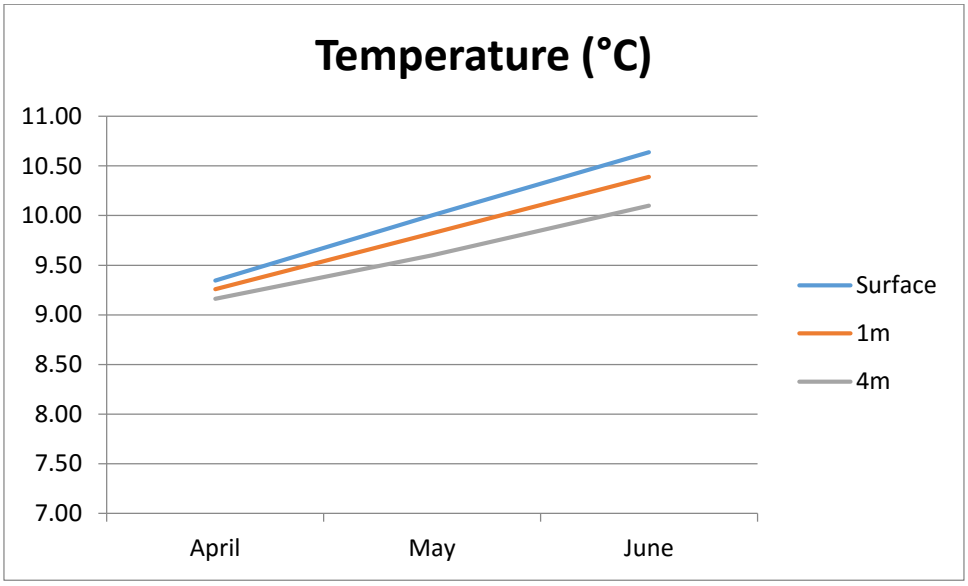

Figure 13: Average water temperature for April, May and June during the 2016 study period.

Discussion

Sample numbers

There were a total of 598 individual fish captured and retained for lab analysis from Goletas Channel and Queen Charlotte Strait for the 2016 study year. Overall this was a slight decrease from the 682 individual fish retained for sea lice analysis during the 2015 study year and only a very slight increase from the 2014 study year (579). The total number of sampled fish during this year's study was also less, when compared to the totals for April, May and June of the 2011 and 2013 study years, which were 819 and 874 respectively.

Salmonids sampled this year included pink, chum, coho, Chinook and sockeye salmon, as well as Dolly Varden char. The majority of fish caught and retained for lab analysis were pinks (336 individuals). Smaller sample numbers of chum (93 individuals), coho (100 individuals) and sockeye (61 individuals) were also retained and analyzed in the lab. Only two Chinook and 6 Dolly Varden were collected for lab analysis during the 2016 study year.

Distribution

A summary of sample percentages by zone is presented in Table 5. In order to accurately compare numbers between study years, the sample percentages for April and May were extracted from the total sample numbers for the 2011, 2013 study years when sampling occurred on four months. The same method was used for the 2016 data as sampling was conducted in three months.

Fish capture distribution for the overall 2016 study year was dissimilar to sample distribution in any of the other study years. The closest similarity to other years came from Zones 2 and 4. In 2016 Zone 2 contributed 10.28%; this was a decrease from 2015 where 11.29% of the samples came from Zone 2. Similarly the percentage of samples from Zone 4 decreased minutely from 2015 (4.25%) to 2016 (4.11%).

Greater variability between the 2016 and 2015 study years was observed in all other zones (Zones 1, 3, 5 and 6). In Zone 1 the percentage of the total samples significantly decreased from 15.1% in 2015 to 0.93% in 2016. The percentage of the total sample from Zone 3 conversely, increased significantly from 9.24% in 2015 to 31.03% in 2016. In Zone 5 the percentage of samples collected significantly decreased compared to all of the past years results (2011: 36.08%, 2013:

23.40%, 2014: 32.10%, 2015: 37.83%) to 6.17% in 2016. Finally, in Zone 6 the percentage of the total sample for 2015 was 22.29%, while in 2016 it was 46.88%.

Over the course of the entire study period, there was significant variability in sample size from April to May. In May, excluding Zone 6 that was not sampled in the May, samples were only collected from two zones; Zone 3 and Zone 5. It was this variability that based the decision to exclude Zone 6 from the May sampling.

Similar variability between April and June was also encountered. A significantly smaller number of salmonids were captured and retained from Zones 4, 5 and 6 in June (4, 0 and 6 respectively) than there were in April (22, 32 and 248 respectively). Overall fewer samples were collected in each zone in June than in April. Fish numbers were less uneven between Zones 2 and 3 between April (55 and 41 respectively) and June (35 and 24 respectively). As suggested in reporting from previous years, 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 may result in more 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.

Table 5: A comparison of sample percentage for the months of April, and May, by zone for the 2011 - 2016 study years. (Note: Zone 6 (Shelter Bay) was not sampled during the 2011 study year, in April or May in 2013, and in 2016, Zone 6 was not sampled in May).

Year	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
2011	15.90%	14.80%	15.80%	16.70%	36.80%	n/a
2013	12.60%	30.70%	15.60%	17.60%	23.40%	n/a
2014	5.90%	13.00%	6.90%	8.80%	32.10%	33.30%
2015	15.10%	11.29%	9.24%	4.25%	37.83%	22.29%
2016	0.93%	10.28%	31.03%	4.11%	6.17%	46.88%

Timing

A total of three months of beach seining took place in the 2016 study year. Beach seining during the first month occurred predominantly during the third week of April (11-15). Beach seining during the second month was completed during the second week of May. Seining during the third month was completed in the last two days of May (30 and 31), the first week of June (June 2) and the second week of June (June 7) due to poor weather during the first week of June.

The sample totals for pink salmon captured during the 2016 study year do not follow the trend observed during any of the other study years (Figure 14). In every other year the highest proportion of pink salmon captured occurred in the second month (May). This trend suggested that in previous years the peak of the pink salmon smolt migration was being intercepted during beach seines conducted in May. However this year, it appears as if the peak of the pink salmon migration was earlier than previous years.

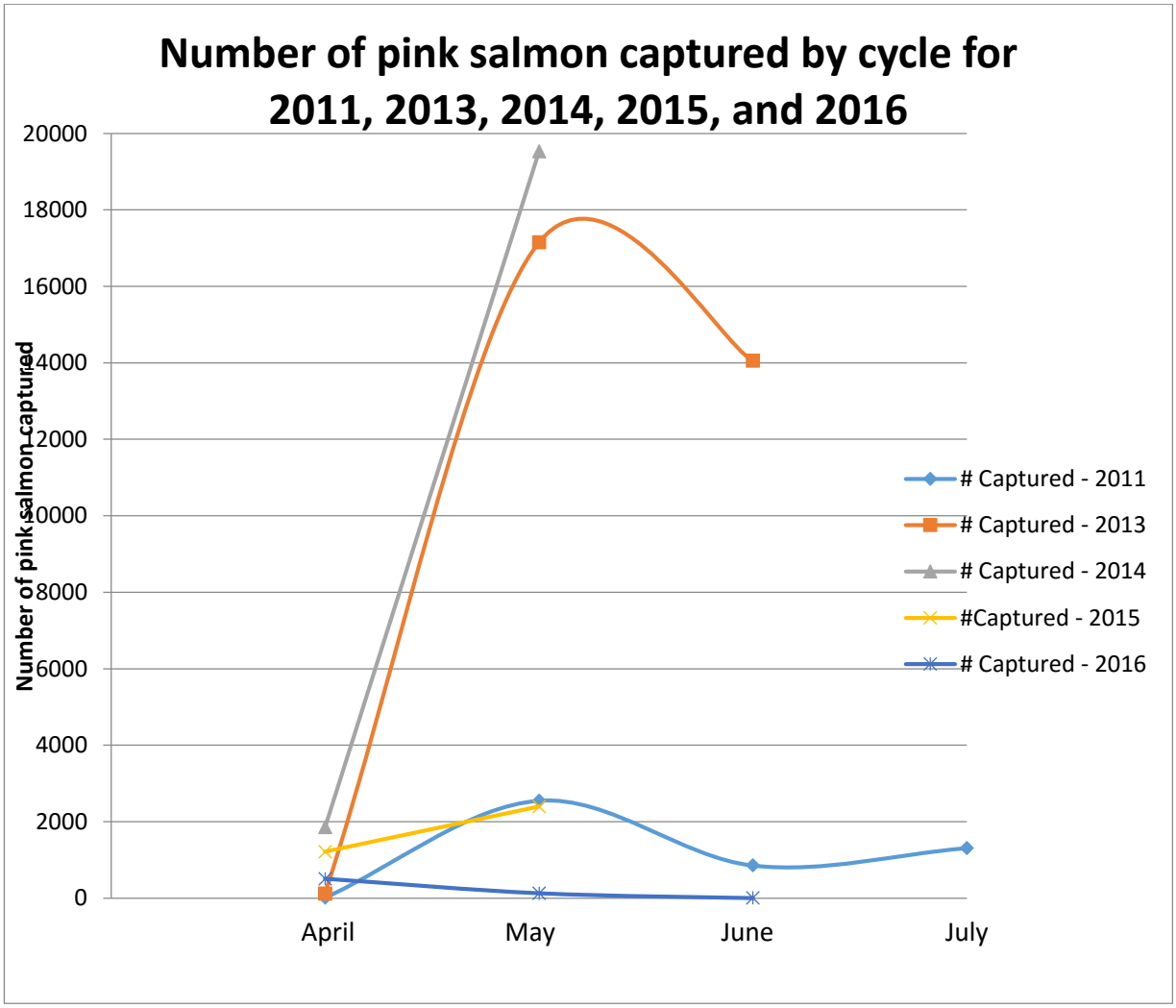

Figure 14: A comparison of the number of pink salmon juveniles captured during the 2011, 2013, 2014, 2015 and 2016 sea lice studies.

Insufficient catch data is available to accurately compare timing trends for other species. This is the fifth year for sea lice monitoring and data collection discerning juvenile salmon migration. Prior to 2011, no data existed for juvenile salmonid behaviour and migration in Goletas Channel and Queen Charlotte Straits.

Water Quality

Water quality data for the 2016 study year was consistent when compared with past study years based on a comparison of mean water temperature and mean salinity from all study years with the exception of 2015 (Figures 15 and 16). In three of the previous study years, water

temperature increased from April to May which was consistent with 2016; however mean water temperature in 2015 showed a marked decrease (1°C) from April to May. During the 2011 study year, mean water temp showed a slight increase from April to May, but during the 2013 and 2014 study years, mean temperature increased by more than 1°C from April to May. During the 2016 study year mean water temperature increased by less than 1°C from April to May.

In three of the previous years (2011, 2013, 2014), mean salinity for the study area remained relatively constant from April to May. During the 2015 study year average salinity increased by over 1 ppt from April to May. In 2016, mean salinity increased by 0.40 ppt from April to May.

It should be noted, that water quality data for 2011 is only available for Zones 1-5 (Goletas Channel) and not for Zone 6 (Shelter Bay, Queen Charlotte Strait).

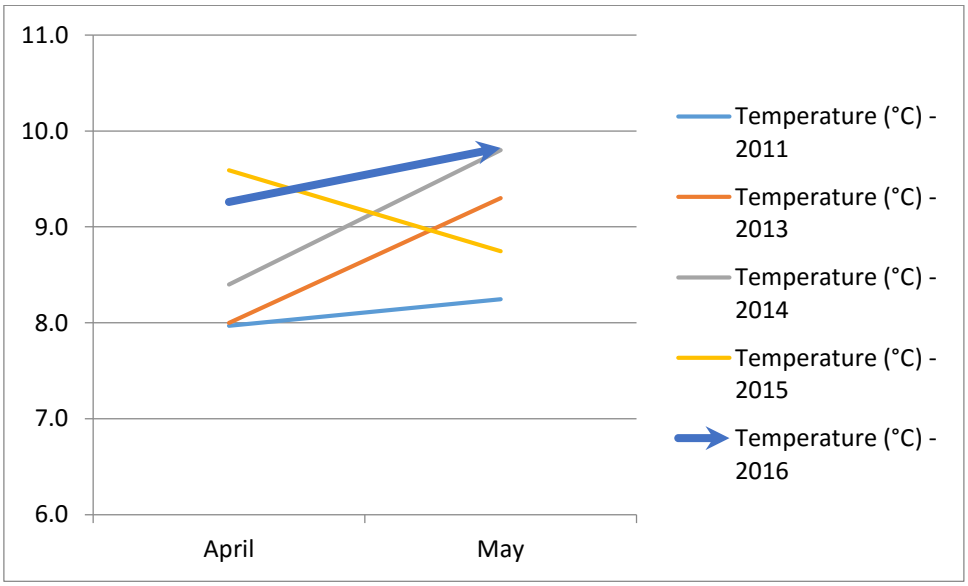

Figure 15: A comparison of temperature (°C) for 1m depths at sampling locations in Goletas Channel and Queen Charlotte Strait during the 2011, 2013, 2014, 2015 and 2016 sampling period.

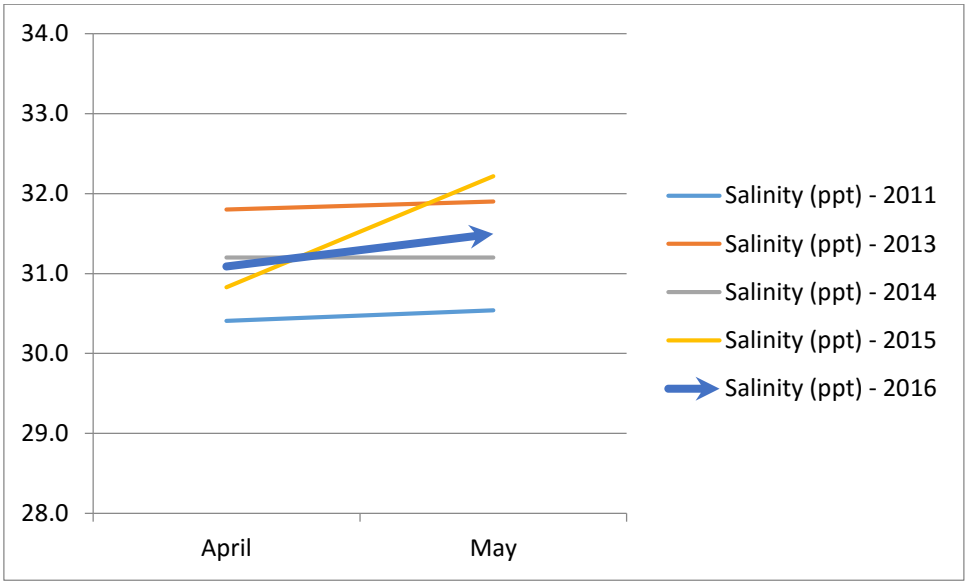

Figure 16: A comparison of salinity (ppt) for 1m depths at sampling locations in Goletas Channel and Queen Charlotte Strait during the 2011, 2013, 2014, 2015 and 2016 sampling period.

Sea lice

Sea lice intensity (average number of lice per infected fish) was 1.81 for all sea lice over the entire study period. Intensity for *L. salmonis* was 0.36 in April and 1.69 in May and 1.52 in June, while intensity for *C. clemensi* was 1.02 for April, 0.99 for May and 5.30 in June. Average weight for juvenile pink salmon was 0.50g in April, increasing to 1.69g in May and 3.09g in June. The threshold level for lethal infection stated in Jones and Hargreaves 2009 is 7.5 lice (*L. salmonis*) per fish averaging less than 0.7g in weight. Based on the Jones and Hargreaves conclusion, lice intensity on juvenile pink salmon observed during this survey is well below the threshold for lethal infection.

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 109 individual juvenile pink salmon weighing less than 0.34g one fish was infected with two Chalimus 3 stage or higher *L. salmonis*; a single Chalimus 4 and a single adult male. Based

on the Nendick et al (2011) findings, maximum swimming velocity of this one individual would be reduced. No other small fish (i.e. ≤0.34g) were infected with a Chalimus 3 stage or greater.

Based on the summary data in Table 2, *C. clemensi* was more prevalent than *L. salmonis* for the Goletas Channel and Queen Charlotte Strait study area in the 2016 study year. Of the 516 sea lice identified during the lab analysis, 79% were *C. clemensi*. This trend remains similar to the trends observed in previous years. In 2015, of the 696 sea lice identified, 88% were *C. clemensi* (Pacificus, 2015). In 2014, of the 42 sea lice identified during the lab analysis, 76% were *C. clemensi* (Pacificus 2014). Similarly, in 2013 *C. clemensi* accounted for 76% of identified sea lice (Pacificus 2013a) while in 2011, 80% of the identified sea lice were *C. clemensi* (Pacificus 2011).

Through a comparison of data for juvenile pink salmon from all study years, sea lice prevalence was the second highest in the 2016 study year with 2015 being the highest. 2016 showed the highest average intensity for *C. clemensi* at 1.55. The abundance rates for both *L. salmonis* and *C. clemensi* for 2016 were mixed with *L. salmonis* being the second highest but significantly lower than the highest year and *C. clemensi* being the highest of this data set but only marginally higher than 2015. 2013 still shows some of the lowest values for sea lice prevalence, abundance and intensity for both *L. salmonis* and *C. clemensi* (Refer to Appendix 2 for raw data from 2011, 2013 and 2014). A comparison of the total number of lice and the total number of infected pink juveniles identified in each year illustrates this difference (Table 6).

Table 6: The prevalence, abundance and intensity of *L. salmonis* and *C. clemensi* over the past 5 sampling years on pink juvenile salmon.

	Lepeophtheirus salmonis			*Caligus clemensi*		
Year	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	15.8%	0.24	1.55

Pink salmon was the only species captured during all sampling months in all study years (2011, 2013, 2014, 2015 and 2016). Based on the 2011 and 2013 results for salmonid outmigration timing and the average weight and size of the salmonids, sampling effort in 2014 was focused within April and May. Again in 2015, sampling effort focussed on the months of 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. As a result, sea lice prevalence and infectious rates on pink salmon were only compared for the months of April and May between the four study years.

Over the last 4 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, however this year the trend reversed. This opposite trend, however, could be due to the lack of fish sampled in the May as well as the incomplete sample (Site 2 in Zone 1, Site 1 and Site 2 in Zone 5 and Zone 6 were not sampled). Based on the results of the past four study years, *L. salmonis* prevalence in April ranged from 0% to 9.0% and showed little-to-no increase into the month of May (0% in 2011, 0.6% in 2013, 3.36% in 2014) except in 2015 where prevalence in April was 9.0% and increased to 13.9% during the month of May, an increase of 4.9%.

With the exception of the 2011 study year, *C. clemensi* prevalence on juvenile pink salmon also followed a similar trend of increase from April to May over every study year. In 2011, *C. clemensi* prevalence showed a decrease from 9.1% in April to 1.8% in May. Unlike the trend for *L. salmonis*, prevalence of *C. clemensi* mimicked the past years' trend and increased from April to May during the 2016 study year. During the 2014 and 2015 study years C. clemensi prevalence in April was 1.15% and 6.0% respectively and increasing to 10.5% and 23.2% respectively in May. In 2016, C. clemensi prevalence on pink salmon was the highest ever at 15% in April and increased to 17% in May an increase of 2.0%.

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Appendix 1: Raw Field Data Summary

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 2: 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**														