Appendix V5-10C

2009 Roberts Bay Jetty Fisheries Authorization Monitoring Report

MAC RESOURCES

Hope Bay Mining Limited

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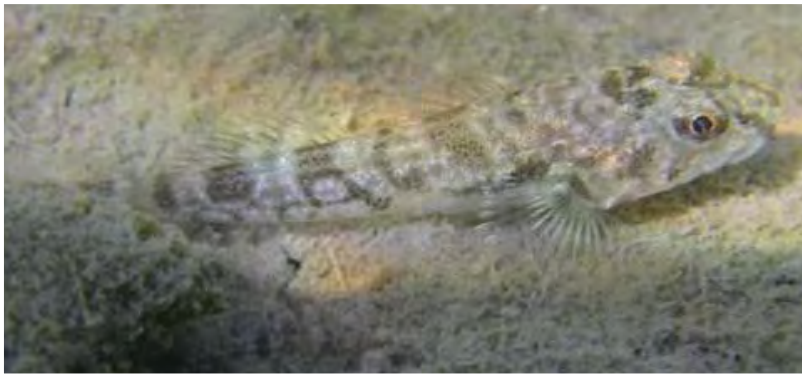
2009 Roberts Bay Jetty Fisheries Authorization Monitoring Report





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December 2009

DORIS NORTH PROJECT

2009 Roberts Bay Jetty Fisheries Authorization Monitoring Report

December 2009
Project #1009-002-19

Prepared for:

NEWMONT™
The Gold Company

Hope Bay Mining Limited

Prepared by:

Rescan™
Engineers and Scientists

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Executive Summary

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Engineers and Scientists

Executive Summary

The Hope Bay Belt Property is located approximately 125 km southwest of Cambridge Bay, Nunavut, on the south shore of Melville Sound. As part of the Doris North Mine infrastructure, a rock jetty was constructed in early July 2007 at the south end of Roberts Bay for barge loading and off-loading.

The jetty was constructed perpendicular to shore and measured 95 m in length, varying in width from 5.3 m to 35 m. The construction of the rock structure resulted in the alteration and/or loss of 0.176 ha of fish habitat. To compensate, four underwater rock reefs (or shoals), each measuring 31.25 m long by 12 m wide and spaced approximately 19 m apart, were constructed west of the jetty in 2008. The four compensation shoals were equivalent to 0.150 ha of fish habitat. In combination with the below high-water sideslope area of the jetty (0.164 ha) which would provide additional habitat for fish and invertebrates, the net gain of fish habitat was equivalent to 0.138 ha.

Authorization for the construction of the jetty in Roberts Bay was granted from Transport Canada and the Department of Fisheries and Oceans (DFO) in June 2007. The Fisheries Authorization granted for the construction of the jetty addresses three conditions for monitoring in Roberts Bay; (1) the implementation of a sediment transportation and deposition monitoring program, (2) a photographic record of construction activities (*completed in 2008*); and (3) implementation of a fish habitat monitoring program.

The fish habitat monitoring program was developed to monitor the stability and successful use of fish habitat compensation structures, specifically the jetty and shoals. As part of this program, the following components were sampled in the constructed compensation shoals in Roberts Bay and in naturally-occurring shoals in the Reference Bay: periphyton biomass (as chlorophyll *a*), periphyton cell density and taxonomic composition, benthic invertebrate density and taxonomic composition, fish community and macro-algae, invertebrate and fish presence by snorkel survey.

This report summarizes the first year of the fish habitat monitoring program and the second year of the sediment transportation and deposition monitoring program. It is submitted as part of the obligations under Section 5 of the Authorization for Works or Undertakings Affecting Fish Habitat granted by DFO (DFO File No: NU-02-0117).

Bathymetric comparisons of Roberts Bay pre-construction and Year II post-jetty construction showed similar patterns to what was observed during Year I post-jetty comparisons. Changes in bed elevation in Roberts Bay were observed at the toe of the jetty and to the east. Other observations with respect to change in bed elevation may be related to lack of data for that area or steepness of slope.

Results of the first year of monitoring indicated that the periphyton and benthic invertebrate communities that have established themselves on the compensation shoals in Roberts Bay are similar to communities found in nearby reference shoals in the Reference Bay. Periphyton assemblages were similar between sites, numerically dominated by blue-green algae and diatoms. The benthic invertebrate community composition on both the constructed and reference shoals were dominated by amphipods, followed by polychaetes. Taxa unique to the shoals of Roberts Bay included a sedentary polychaete (*Leitoscoloplos sp*), a benthic copepod (Harpacticoida) and three genera of amphipods (*Ischyrocerus anguipes*, Stenothoidae, *Weyprechtia pinguis*). Chironomidae were only found in the Reference Bay.

A total of eight fish species and six fish species were captured on the shoals in Roberts Bay and the Reference Bay, respectively. Five fish species were captured in the vicinity of the jetty. Dominant species varied among sites and between sampling periods. Overall, saffron cod and Greenland cod were the dominant species by number for the shoal habitat and side-slopes of the jetty in Roberts Bay, respectively. In the Reference Bay, sculpin dominated the catch.

Snorkel surveys of the compensation structures showed that the shoals were structurally stable; rock material used to construct the shoals had settled into place and there were no signs of rock instability. The jetty, specifically the toe of the jetty, showed signs of instability as rock material was being scoured away. Repairs to the jetty are in discussions with DFO. Visual surveys of the biota inhabiting the shoals produced similar results for both Roberts Bay and the Reference Bay. Various species of algae, invertebrates and fish were identified to inhabit and/or utilize the shoals of Roberts Bay and the Reference Bay. Overall, macro-algae were visually more plentiful on the shoals of the Reference Bay but fish, specifically young of the year, were seen in greater numbers on the constructed shoals in Roberts Bay.

Year 1 of monitoring the compensation structures in Roberts Bay has shown enhancement success as defined in the Doris North No Net Loss Plan. Primary and secondary producers have established themselves on the rock shoals and the side-slopes of the jetty of Roberts Bay. In addition, the monitoring program has documented the use of the shoals and rip-rap slopes of the jetty by fish prey and fish of multiple age classes.

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2009 ROBERTS BAY JETTY FISHERIES AUTHORIZATION MONITORING REPORT

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1. Introduction

1. Introduction

The Hope Bay Belt Property is located approximately 125 km southwest of Cambridge Bay, Nunavut, on the south shore of Melville Sound (Figure 1-1). As part of the Doris North Mine infrastructure, a rock jetty was constructed at the south end of Roberts Bay for barge loading and off-loading.

Authorization for the construction of a jetty in Roberts Bay was granted from Transport Canada and the Department of Fisheries and Oceans (DFO) in June 2007. The jetty was constructed during the open water season in 2007, and repairs, due to settling and erosion, were performed in September 2008.

The Fisheries Authorization granted for the construction of the jetty addresses three conditions for monitoring in Roberts Bay; (1) the implementation of a sediment transportation and deposition monitoring program, (2) a photographic record of construction activities (*completed in 2008*) and (3) implementation of a fish habitat monitoring program.

This report summarizes the first year of the fish habitat monitoring program and the second year of the sediment transportation and deposition monitoring program. It is submitted as part of the obligations under Section 5 of the issued Authorization for Works or Undertakings Affecting Fish Habitat granted by DFO for the Hope Bay Belt Project (DFO File No: NU-02-0117).

1.1 BACKGROUND

Hope Bay Mining Limited (HBML), a wholly owned affiliate of the Newmont Mining Corporation, purchased the Doris North Project from Miramar Hope Bay Ltd. (MHBL) in December of 2007. With the purchase, HBML assumed the Fisheries Authorizations and its obligations from MHBL on the Doris North Project.

Under Section 35(2) of the *Fisheries Act*, any project or activity that causes a "harmful alteration, disruption or destruction of fish habitat" (HADD) requires authorization from DFO. Fish habitat is defined by the *Fisheries Act* as those parts of the environment "on which fish depend, directly or indirectly, in order to carry out their life processes". This report is intended to fulfil obligations specified in the authorization granted to construct a jetty in Roberts Bay to accommodate barge shipments to the mine (DFO File No: NU-02-0117).

1.1.1 Compensation Structures

A barge landing jetty was constructed at the south end of Roberts Bay in early July 2007, once ice had melted off the shore (Plate 1.1-1). Geotextile material was initially placed on the silt/clay substrate prior to placement of run-of-quarry rock. The rock structure was constructed perpendicular to shore and measured 95 m in length, varying in width from 5.3 m to 35 m. Refer to Golder (2007) for construction design and detailed drawings of the "as-built" jetty.

Due to settling and erosion, repairs to the jetty were conducted in September 2008 (Golder 2008).

Figure 1-1

Doris North Project Study Area, 2009

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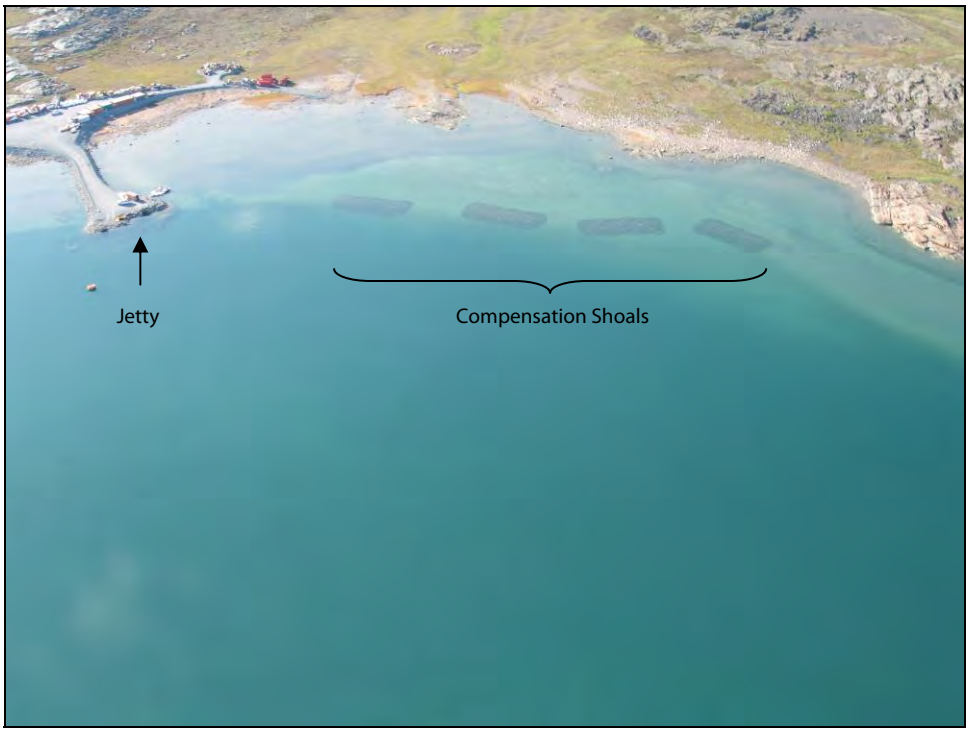

Plate 1.1-1. Aerial view of infrastructure (jetty) and compensation shoals in Roberts Bay, Hope Bay Belt Project. View is looking south.

The construction of the jetty resulted in the alteration of clay and silt tidal flat by the addition of rock substrate. The area adversely affected by the construction of the jetty was 0.176 ha. To compensate for the altered and lost fish habitat, four underwater rock reefs (or shoals) were constructed in 2008 (Plate 1.1-1). The four rock shoals were constructed to the west of the jetty, each measuring 31.25 m long by 12 m wide with a distance of approximately 19 m between each one (Golder 2007). The rock shoals were constructed with an irregular surface by placing piles of rock on the ice prior to spring thaw. The shoals melted through the ice surface and settled into place by mid-August 2008.

The four compensation shoals were equivalent to 0.150 ha of fish habitat (Golder 2007). In addition, the below high-water sideslope area of the jetty provided 0.164 ha of habitat for fish and invertebrates. In the end, the 0.176 ha of lost habitat was offset by a net gain of fish habitat equivalent to 0.138 ha. The created compensation sites were identified as habitat for invertebrate populations, Arctic char, lake trout, coregonids, and sculpin.

1.1.2 DFO Authorization

The Authorization for Works or Undertakings Affecting Fish Habitat can be found in Appendix 1.1-1. This report complies with part of the obligations under Section 5 of the Authorization – Conditions related to Monitoring which state:

> 5.1 The approved monitoring plan shall be implemented in the following years: 2009, the year prior to mine construction, Year of mine construction, Year-2 of mine operation, Year-2 of active mine post-closure (i.e., year prior to jetty lowering to below high water level), Year-1 post lowering of jetty, and Year-2 post lowering of jetty. The detailed Monitoring Plan shall include, but not be limited to, the following:

5.1.1 The stability and successful utilization of all compensation features shall be assessed according to the schedule in 5.1 above.

5.1.2 If at any time during the monitoring period, compensation features are not functioning as intended, measures shall be identified to reduce the risk of future failure and additional compensation shall be created to meet the No Net Loss guiding principle using an adaptive management approach.

5.2 A photographic record of before, during and after construction, showing that all works and undertakings have been completed according to the approved Plan and conditions of this Authorization, shall be submitted to the Iqaluit, NU office of the Department of Fisheries and Oceans, Fish Habitat Management, Eastern Arctic Area, on or before, December 31, 2008 and according to the schedule in 5.1 above.

Completed December 2008 (Golder 2008).

5.3 A written report summarizing the above monitoring results shall be submitted to the Iqaluit, NU office of the Department of Fisheries and Oceans – Fish Habitat Management, Eastern Arctic Area on, or before, December 31, 2008 and according to the schedule in 5.1 above.

Completed December 2008 (Golder 2008).

5.4 The effects of the jetty on nearshore sediment transport shall be monitored during the following years: 2008, 2009, Year of mine constriction, Year-2 of mine operations, Year-2 active mine post-closure (i.e., year prior to jetty lowering to below high water level), Year-1 post-lowering of jetty.

Fish habitat compensation structures established in the open water season of 2008 were required to be monitored for stability and successful fish use as scheduled in Section 5.1 of the *Fisheries Authorization*. However, the compensation structures did not settle 1 meter below the mean water surface level until mid-August 2008. Authorization was granted by DFO to HBML to postpone the biological monitoring program of the compensation structures from 2008 to the open water season of 2009. A copy of the request and authorization can be found in Golder (2008).

This report addresses Sections 5.1 and 5.4 of the DFO authorization. Sections 5.2 and 5.3 of the Authorization which relate to photographic documentation of the area before, during and after construction have been completed (Golder 2008).

1.2 OBJECTIVES

The objectives of the 2009 monitoring program were as follows:

- To characterize deposition changes from sediment transport along the Roberts Bay shoreline adjacent to the jetty;
- To determine the establishment of primary and secondary producers at the four compensation shoals in Roberts Bay;
- To determine fish presence at the four shoals in Roberts Bay and the reference sites; and,
- To document the general state and stability of the compensation structures.

2. Methods

2. Methods

2.1 SEDIMENT TRANSPORT AND DEPOSITION

A bathymetric survey of the area in Roberts Bay adjacent to the compensation shoals and jetty was performed on August 30, 2009 by a crew of three people working from a 5.8-meter power boat. Depth measurements were made with a digital echo sounding system that consisted of a BioSonics DTX scientific echo sounder with a 6.7°, 201 kHz transducer, a computer to control the sounder and record data, and a Garmin GPSmap 182 differential GPS to geo-code data as they were collected. The map datum used for all sampling and analysis was NAD83. The transducer was mounted on a pole, pointed downward, with its face 56 cm below the water surface. During the survey, an electronic monitor continuously measured and recorded the water level at the jetty to allow correction of soundings for tidal influences.

Depth measurements were made on a pre-set grid of 30 transects set 20 m apart and extending approximately 200–300 m from shore. During the survey, several short transects were added to fill gaps in coverage around the jetty. Although the transects in the planned grid reached to shore, in practice the draft of the boat and transducer mount limited operations to water at least 1 m deep.

Soundings were made continuously at a density of several per meter as the boat moved along transects at 1–2 meter per second. During the survey, conditions were too windy and choppy to perform a depth calibration, however, a subsequent test using the same equipment and deployment found that expected and measured depths differed by 0–4 cm (mean 2 cm) between 3.5 and 8.5 m, a depth range similar to the study area. During the shoals and jetty survey, nominal position accuracy of the GPS (indicated by the instrument) was 2–3 m.

After the survey, digital data files were processed using Myriax Echoview™ software to track the bottom, measure water depths, and create ASCII files of depths and geo-coordinates. Depth computations in Echoview accounted for water chemistry at the study site (surface temperature 11°C measured on 30-Aug-09; surface pH 7.8, mean salinity 0–7 m 18 ppt measured on 14-Aug-09). Depths in output files were corrected for the depth of the transducer face below the water surface. As well, echograms and depth measurements were scanned and edited to correct depths where aquatic plants were present (i.e., depths reported to bottom substrate rather than to top of plant).

Additional line transects were conducted to fill in the gaps of any data that could not be collected using the above-noted technique due to either limited water depth and/or bad weather. Where possible, a boat was used to travel a straight transect from east to west along the southern portion of Roberts Bay. Where boat access was not possible in shallow water areas or due to bad weather, water depths were measured by wading. A meter stick and GPS were used to manually read and record water depths every 5–20 meters.

All data collected during the bathymetric surveys were corrected for tide effects and were referenced to an onshore benchmark (Table 2.1-1). The standardized data was imported into ArcGIS software to create the bathymetric maps. Displacement between depth data from the manual and echo sounding surveys were approximately 5 to 20 metres and 0.25 metres, respectively. To minimize interpolation effect on the more widely distributed data and avoid excessive grouping of closely spaced data, values interpolated from a TIN created using 3D Analyst were used to supplement the more widely spaced

manual survey data with points at a minimum of every 10 metres. These interpolated points combined with the manual survey depth data, the echo sounding survey data, and a shoreline (based on SRK CAD file Jetty As-built Plan and Sec.dwg) were used in the Topo to Raster tool in the Spatial Analyst extension to create a grid of 10 m by 10 m cells, producing a map of predicted depths. For bathymetric comparisons between years, the digital elevation models for the bathymetry of the years in question were subtracted from one another using the raster calculator in the spatial analysis extension of ArcGIS. Outputs were divided into 0.25 m classes to represent change in depths.

Table 2.1-1. Benchmark and Tide Gauge Location and Elevation, Hope Bay Belt Project, 2009

Location	Date	Time	UTM Coordinates (Zone 13 NAD 83)		Elevation (m)
Benchmark	29-Aug-09	14:39	432662 E	7563252 N	2.945
Tide Gauge	29-Aug-09	14:39	432212 E	7563363 N	-0.891

2.2 FISH HABITAT MONITORING

The Doris Jetty fish habitat compensation structures were monitored for fish use as specified by the Doris North Project "No Net Loss" Plan (Golder 2007).

Shoals constructed for fish habitat compensation west of the Doris Jetty were monitored using a Control/Impact study design. The constructed shoals and riprap along the side-slope of the jetty are considered to be the impacted study area in the study design (Plate 2.2-1). A control study site was established based on two conditions; (1) the site was a good representation of the habitat of the jetty and constructed shoals (i.e., similar substrate and depth), and (2) it would not be impacted by future mining activities (Figure 1-1; Plate 2.2-2).

Plate 2.2-1. Aerial view of constructed shoals in Roberts Bay, Hope Bay Belt Project, 2009.

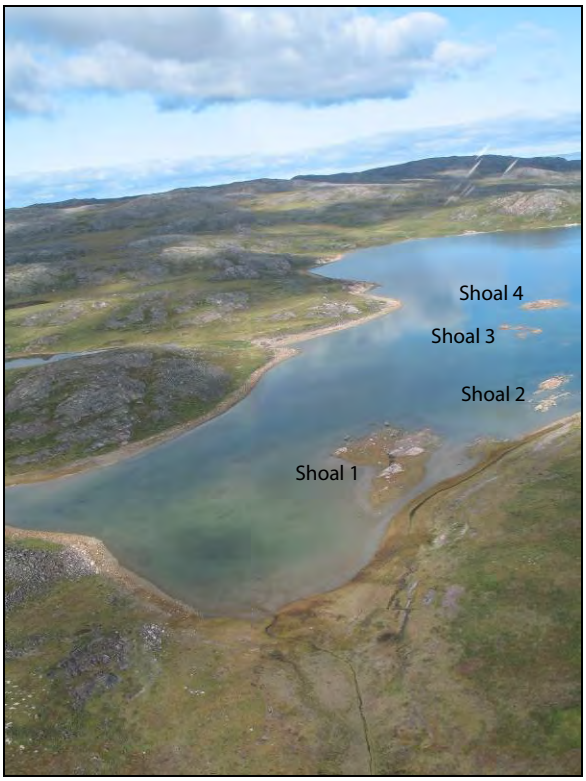

Plate 2.2-2. Aerial view of reference shoals in the Reference Bay, Hope Bay Belt Project, 2009.

The control and impact sites were assessed for fish use twice during the open water season. The first assessment took place in early August (August 3–7, 2009), when the ice first thawed. The second assessment took place in late-August (August 23–September 13, 2009), when the marine environment was at a later state in the summer growing season. Each sampling period captured the different life-stages of the species that use the studied marine environment.

2.2.1 Water Quality

A hand-held Oakton PCS Tstr 35 multi-meter was used to measure water quality variables. A surface water sample was collected from above each shoal. The multi-meter was placed in the collected water and allowed to stabilize prior to readings being recorded. Temperature and pH were recorded for each shoal in Roberts Bay and the Reference Bay.

2.2.2 Primary and Secondary Producers

The colonization of the four compensation shoals and reference sites was assessed by measuring the recruitment of primary and secondary producers to the compensation structures. Both periphyton and benthic macroinvertebrates are fundamental components of marine food webs, specifically as a food source for marine fish.

2.2.2.1 Periphyton

Periphyton samples were obtained using submerged 10 cm x 10 cm Plexiglas plates affixed to an artificial substrate sampler (Plate 2.2-3). Two Plexiglas plates were affixed to each artificial sampler

and five replicate samplers were submerged at each of the four compensation shoals and reference shoals (Figure 2.2-1 and Figure 2.2-2). Samplers were immersed for 35 to 37 days. They were deployed on August 5, 2009 and retrieved between September 9 and September 11, 2009. Chlorophyll *a*, density, and taxonomy were measured from samples collected off the Plexiglas plates.

Plate 2.2-3. Artificial substrate sampler with attached periphyton Plexiglas plates submerged on a shoal in the Reference Bay, Hope Bay Belt Project, 2009.

From each artificial sampler, the two Plexiglas plates were collected and processed for analysis. Periphyton was collected from 50% (50 cm^2) of a plate's surface for biomass estimation (as chlorophyll *a*) (Plate 2.2-4); the remaining 50% of the plate's surface was discarded. From the second Plexiglass plate, the entire surface (100 cm^2) was collected for taxonomic identification and density estimation.

Biomass and taxonomy samples were collected and processed by gently scraping the appropriate portion of each plate with a plastic scrapper. Using filtered salt water (Pall Corporation 47 mm cellulose ester filters with 0.45 micron porosity), the collected periphyton was rinsed into labelled plastic jars (Plate 2.2-4). Chlorophyll *a* samples were filtered onto Pall Corporation 47 mm cellulose ester filters (0.45 micron porosity) using a vacuum filtration apparatus. Filters were then folded, wrapped in foil and kept in an ice packed cooler till they could be frozen back at camp. All biomass samples were sent to ALS Environmental Services (Vancouver, BC) for analysis. Taxonomy samples were preserved in the field with Lugol's Iodine to a weak tea colour and sent to G3 Consulting (Surrey, BC) for identification and enumeration.

Figure 2.2-1

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Periphyton and Benthic Invertebrate Sampling Sites in Roberts Bay, Hope Bay Belt Project, 2009

Figure 2.2-1

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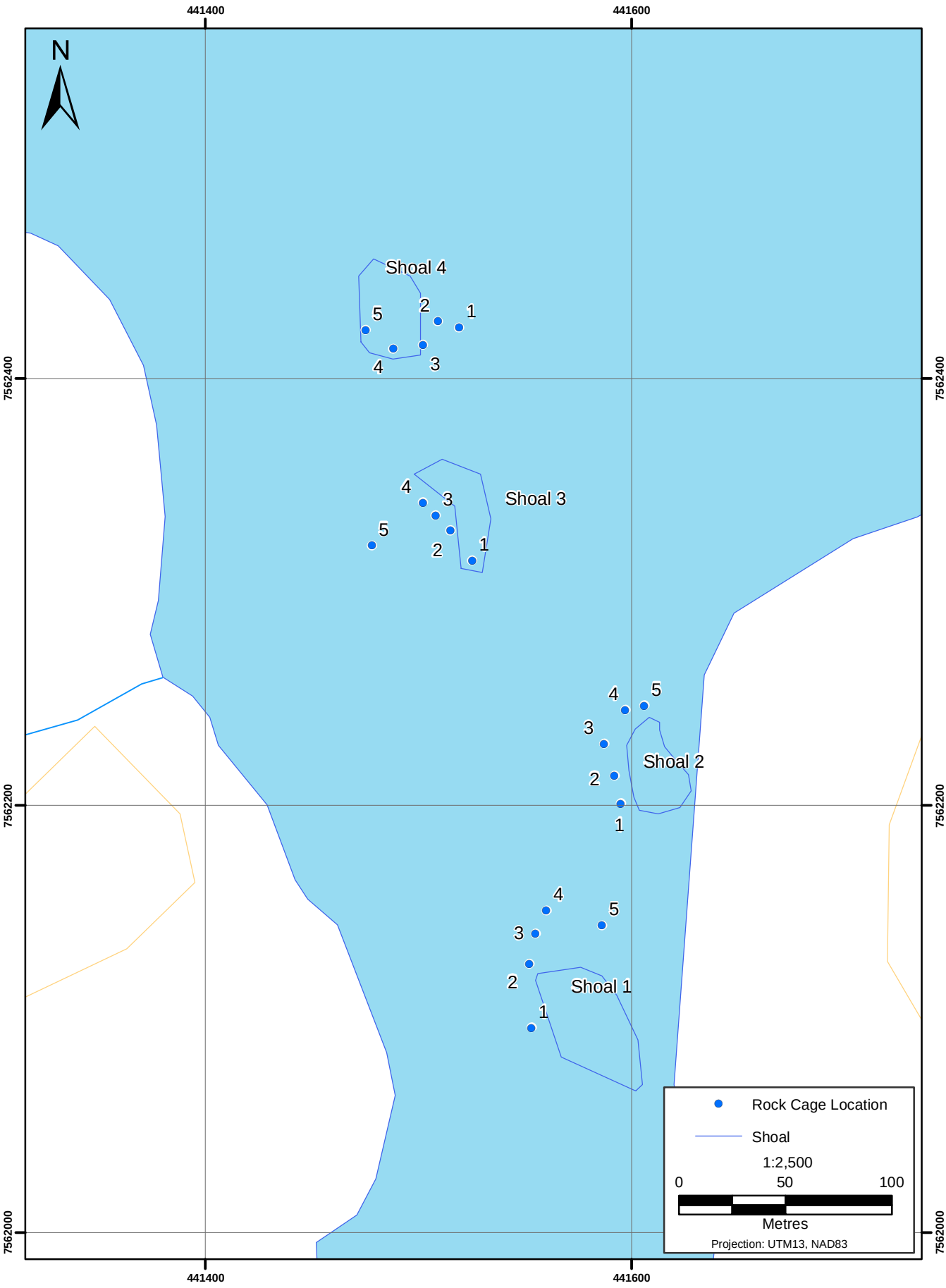

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Periphyton and Benthic Invertebrate Sampling Sites in the Reference Bay, Hope Bay Belt Project, 2009

Figure 2.2-2

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(A)

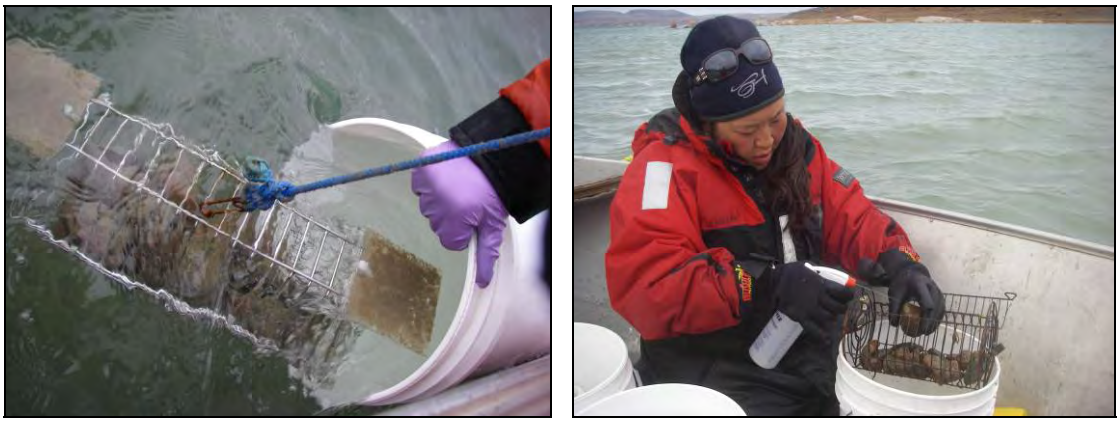
(B) (C)

Plate 2.2-4. (A) Plexiglas plate with 50% of its surface removed and (B) filtered for biomass (chlorophyll *a*) analysis. (C) Surface of Plexiglas plate being cleared of periphyton for taxonomic identification, Hope Bay Belt Project, 2009.

2.2.2.2 Benthic Invertebrates

Benthic macroinvertebrate communities ("benthos") were sampled concurrently with periphyton, using artificial substrate samplers (Plate 2.2-3). The samplers consisted of a cylindrical cage 30 cm long and 17 cm in diameter that was approximately 50% filled with rocks of similar size (large gravel and small cobble). Rocks used were collected from the shoreline (above the high-tide mark) of the Bay area in which they were deployed. The samplers were placed on the shoals (5 replicates per shoal) in Roberts Bay and at the Reference Bay (Figure 2.2-1 and Figure 2.2-2). Samplers were immersed for 35 to 37 days. They were deployed on August 5, 2009 and retrieved between September 9 and September 11, 2009.

Immediately prior to the artificial samplers being retrieved, a 20 L bucket was submerged below the water's surface. Samplers were retrieved off the bottom substrate and placed in the water-filled bucket prior to being pulled out of water and onto the boat (Plate 2.2-5). This minimized the potential of any invertebrates in the sampler being dislodged when breaking the surface of the water. The cage and rocks of each sampler were rinsed in a bucket with filtered (500 µm) salt water (Plate 2.2-5). Benthic invertebrate samples were sieved onto a 500 µm mesh, placed in a 500 ml plastic jar and preserved in a 10% buffered formalin-seawater solution. The jars were labelled, sealed and sent to Columbia Science (Courtenay, BC) for identification and enumeration.



(A) (B)

Plate 2.2-5. (A) Artificial sampler being retrieved into bucket prior to breaking surface of water; and (B) Rocks from artificial sampler being cleaned, Hope Bay Belt Project, 2009.

2.2.3 Fish Community

2.2.3.1 Sampling Frequency

The shoals in Roberts Bay and the Reference Bay were sampled for fish for two full days during two sampling periods, in early-August and late-August. The jetty in Roberts Bay was sampled for 1.5 days during the late-August sampling period. Each site was sampled using a combination of five different types of fishing gear to cover a wide range of fish sizes, life history stages and water depths. Table 2.2-1 shows the sampling dates and effort for the compensation structures in Roberts Bay and the reference shoals in the Reference Bay.

Table 2.2-1. Sampling Dates and Effort for Fish Community Surveys in Roberts Bay and at the Reference Bay, Hope Bay Belt Project, 2009

Location	Site	Date	Number of GNF	Number of GNS	Number of LL	Number of MT	Number of CT
Roberts Bay	Shoal	04-Aug-09	2	2	2	20	6
Roberts Bay	Shoal	05-Aug-09	2	2	2	20	5
Roberts Bay	Shoal	27-Aug-09	3	4	2	20	6
Roberts Bay	Shoal	28-Aug-09	3	4	2	20	6
Roberts Bay	Jetty	24-Aug-09	0	2	0	10	5
Roberts Bay	Jetty	25-Aug-09	3	4	3	10	5
Reference Bay	Shoal	06-Aug-09	2	2	2	20	6
Reference Bay	Shoal	07-Aug-09	2	2	2	20	6
Reference Bay	Shoal	06-Sep-09	2	2	2	10	5
Reference Bay	Shoal	07-Sep-09	2	3	2	10	5

Note:
GNF=Floating Gillnet; GNS=Sinking Gillnet; LL=Long line; MT=Minnow Trap; CT=Crab Trap.

2.2.3.2 Sampling Gear

All sampling was done from an aluminum 5.8-meter boat with a 70-horsepower outboard engine. The UTM of each gear set was recorded with a handheld GPS. Average depths at which gear was fished were recorded with a depth sounder. The times of installation and retrieval of each gear were recorded.

Although the fish sampling techniques varied, fish were processed in a standardized manner as discussed in Section 2.2.3.3.

Gillnets

A combination of floating and sinking gillnets were used to capture fish of a wide range of body sizes that move along the water surface (i.e., pelagic) and sea bottom (i.e., demersal), respectively (Plate 2.2-6).

Plate 2.2-6. Retrieval of a floating monofilament gillnet gang in Roberts Bay, Hope Bay Belt Project, 2009.

Each monofilament index gillnet gang consisted of six panels, ranging from 25 mm to 89 mm stretched mesh. Each gillnet gang was tied in the following order: Panel 1 – 25 mm; Panel 2 – 76 mm; Panel 3 – 51 mm; Panel 4 – 89 mm; Panel 5 – 38 mm; and Panel 6 – 64 mm. Each panel measured 15.2 m long by 2.4 m deep for an area of 36.6 m^2 and a total area of 218.88 m^2 per gang.

Sinking index gillnets consisted of an upper (or "float") line with small buoys that allowed the net to float in the water column. The lower (or "lead") line was weighted and rested along the bottom. Floating index gillnets were similar to sinking gillnets but the lead line lacked weight, allowing the net to float at the surface.

Gillnets were randomly set perpendicular and parallel to compensation structures and reference shoals for approximately one hour to minimize mortality of fish. Set times were extended if initial catches were low. Figures 2.2-3 to 2.2-7 display the position of floating and sinking gillnets.

Long Lines

The long line used was designed to capture actively-feeding surface (pelagic) and bottom (demersal) fish. The long line was 17 m long and rigged with 7 hooks clipped onto the line at 2.5 m intervals. Each hook was attached to the main line with a secondary (short) line and buoy. Hooks were baited with pieces of raw fish. At both ends, the main line was weighted with lead weights. Once set, the long line sat in the water column in a rainbow-like position. Hooks closer to the weighted ends sat lower in the water column than those in the middle, which floated near the surface. Floats were attached by rope to both weighted ends of the long line to mark the location of the gear.

Long lines were randomly set perpendicular and parallel to compensation structures and reference shoals for an initial period of two hours, set times were extended if catch was low. Figures 2.2-3 to 2.2-7 display the position of long line sets in Roberts Bay and the References Bay.

Minnow Traps

Minnow traps were used to sample juvenile fish and small forage fish. The minnow traps used consisted of two 6.3 mm galvanized metal mesh cylinders measuring 42 cm long and 23 cm in diameter. The cylinders were locked together using a clip attached to a rope and buoy. Each minnow trap was baited with a small amount of dry, commercial crab bait.

Minnow traps were placed on the constructed structures and on the reference shoals so that the traps were resting on the substrate. Traps were left to soak overnight and retrieved the following day. Figures 2.2-8 to 2.2-12 show the position of minnow traps set in Roberts Bay and the Reference Bay.

Crab Traps

Crab traps were used to sample large-bodied invertebrates (e.g., crabs, isopods) but also captured fish. The crab trap consisted of a collapsible, spring-loaded rectangular stainless steel frame with mesh netting and two gate style entrances (Plate 2.2-7). When open, the trap measured 30 cm x 42 cm x 80 cm. A bait box was attached within the interior of the trap. Each trap was attached to a rope and buoy and baited with a piece of raw fish and a small amount of dry crab bait.

Traps were placed on or near the constructed structures and on the reference shoals so that the traps were resting on the substrate. Traps were left to soak overnight and retrieved the following day. Figures 2.2-8 to 2.2-12 show the position of crab traps set in Roberts Bay and the Reference Bay.

2.2.3.3 Sample Processing

Captured fish were immediately placed in a water-filled plastic tub to keep them alive until they could be processed and released.

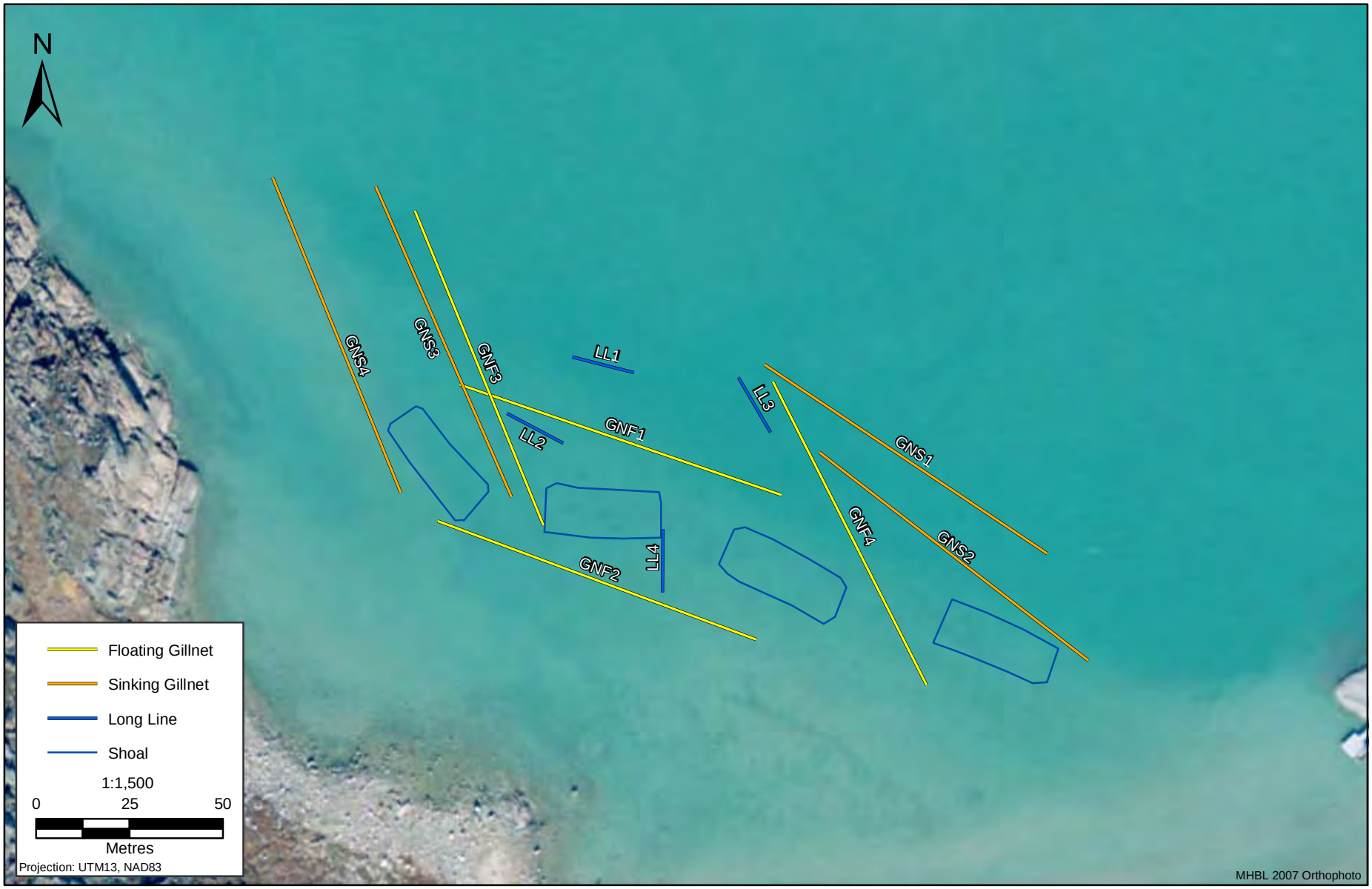


Figure 2.2-3

NEWMONT The Gold Company

Gillnet and Long Line Locations in Roberts Bay during the early-August Fish Community Survey of the Compensation Shoals, Hope Bay Belt Project, 2009

Figure 2.2-3

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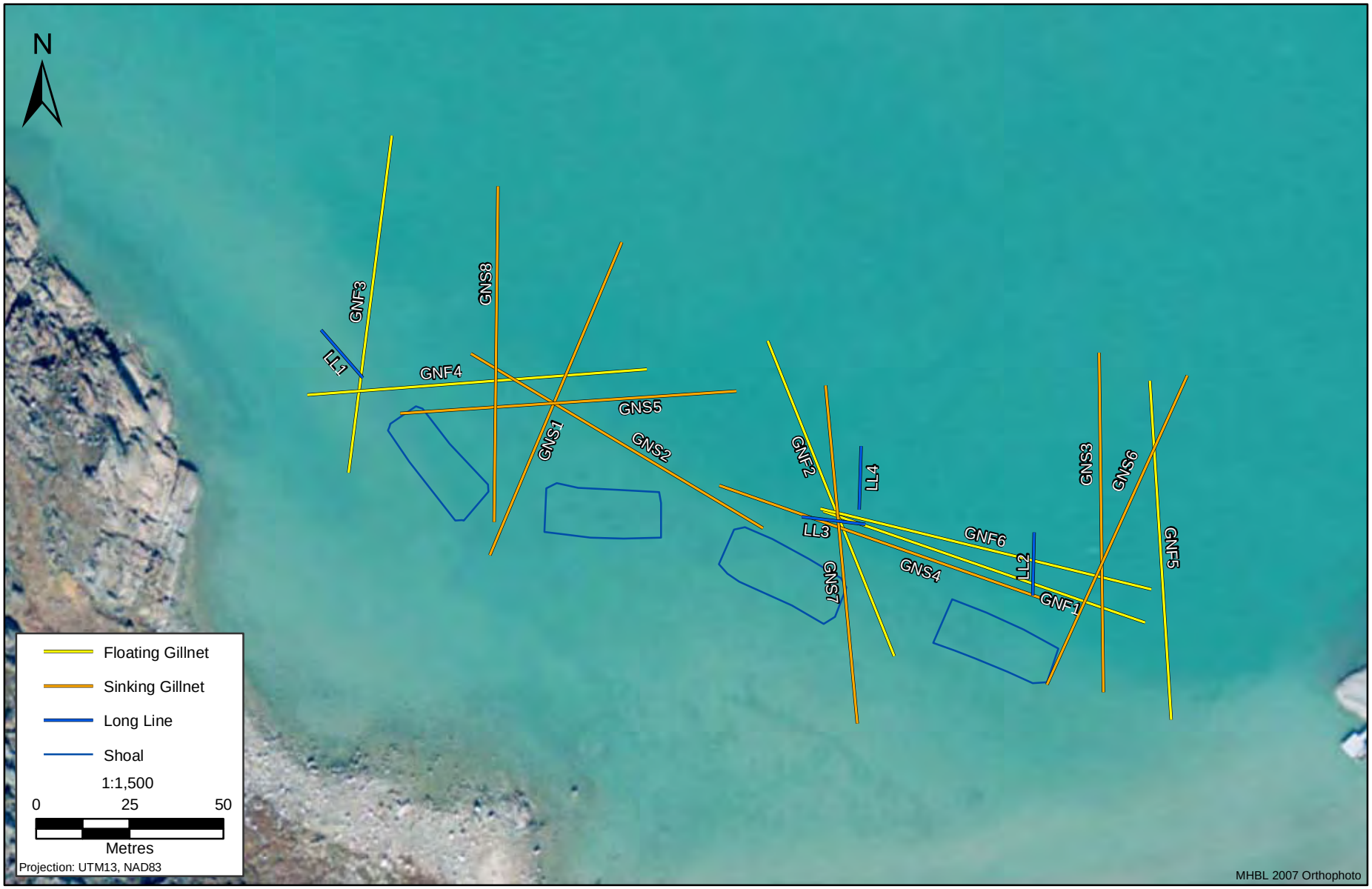

Figure 2.2-4

NEWMONT The Gold Company

Gillnet and Long Line Locations in Roberts Bay during the late-August Fish Community Survey of the Compensation Shoals, Hope Bay Belt Project, 2009

Figure 2.2-4

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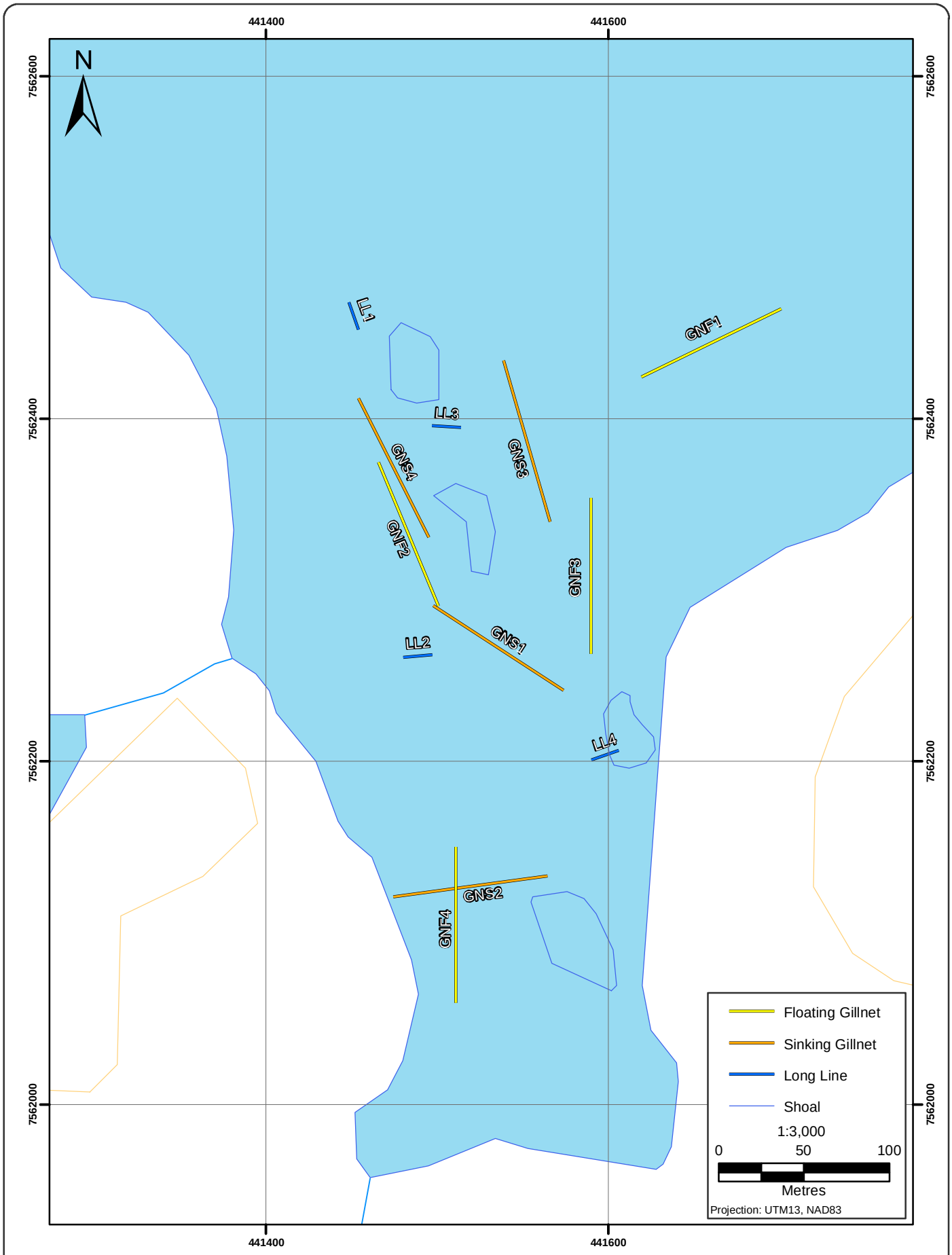

Gillnet and Long Line Locations in the Reference Bay during the early-August Fish Community Survey of the Reference Shoals, Hope Bay Belt Project, 2009

Figure 2.2-5

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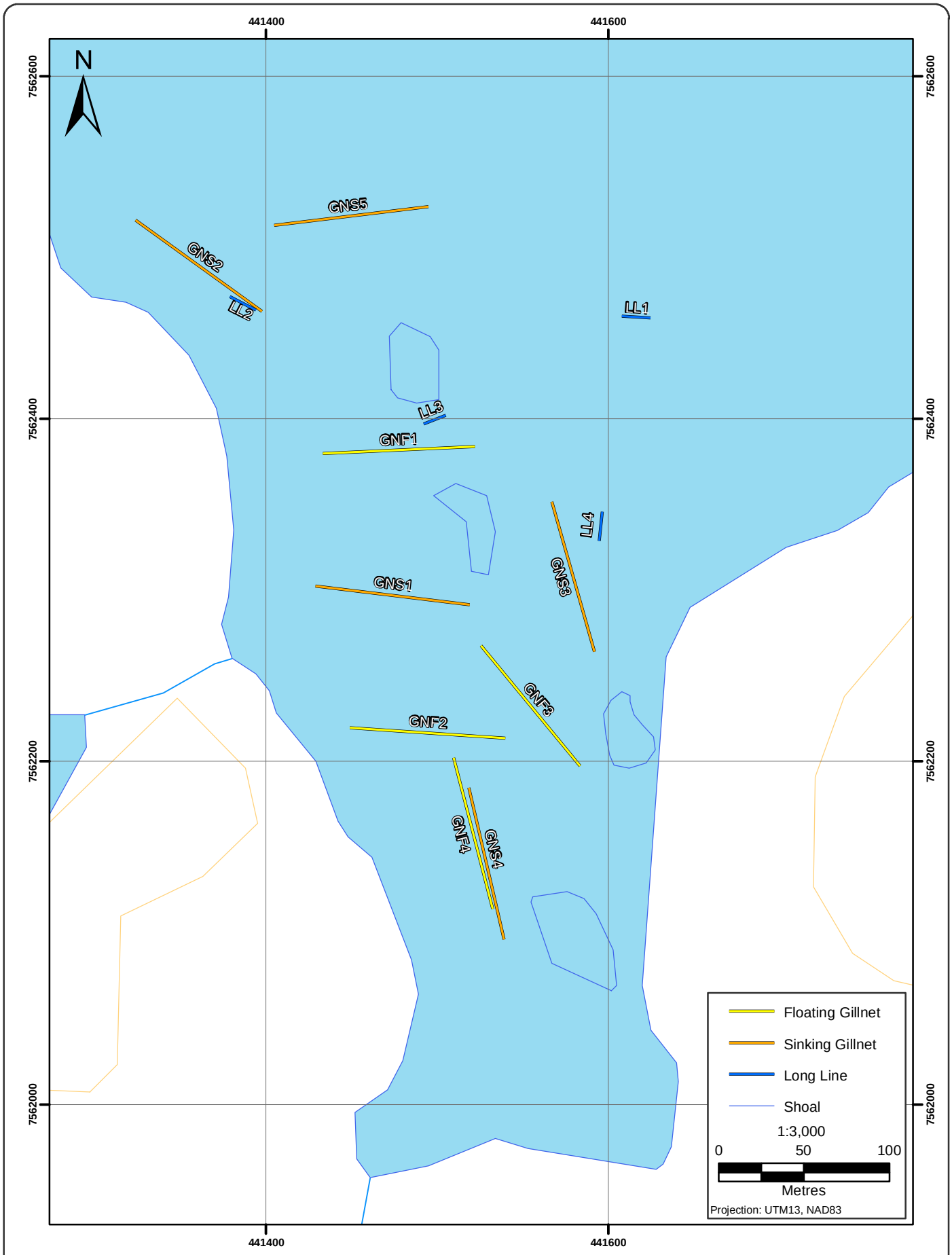

Gillnet and Long Line Locations in the Reference Bay during the late-August Fish Community Survey of the Reference Shoals, Hope Bay Belt Project, 2009

Figure 2.2-6

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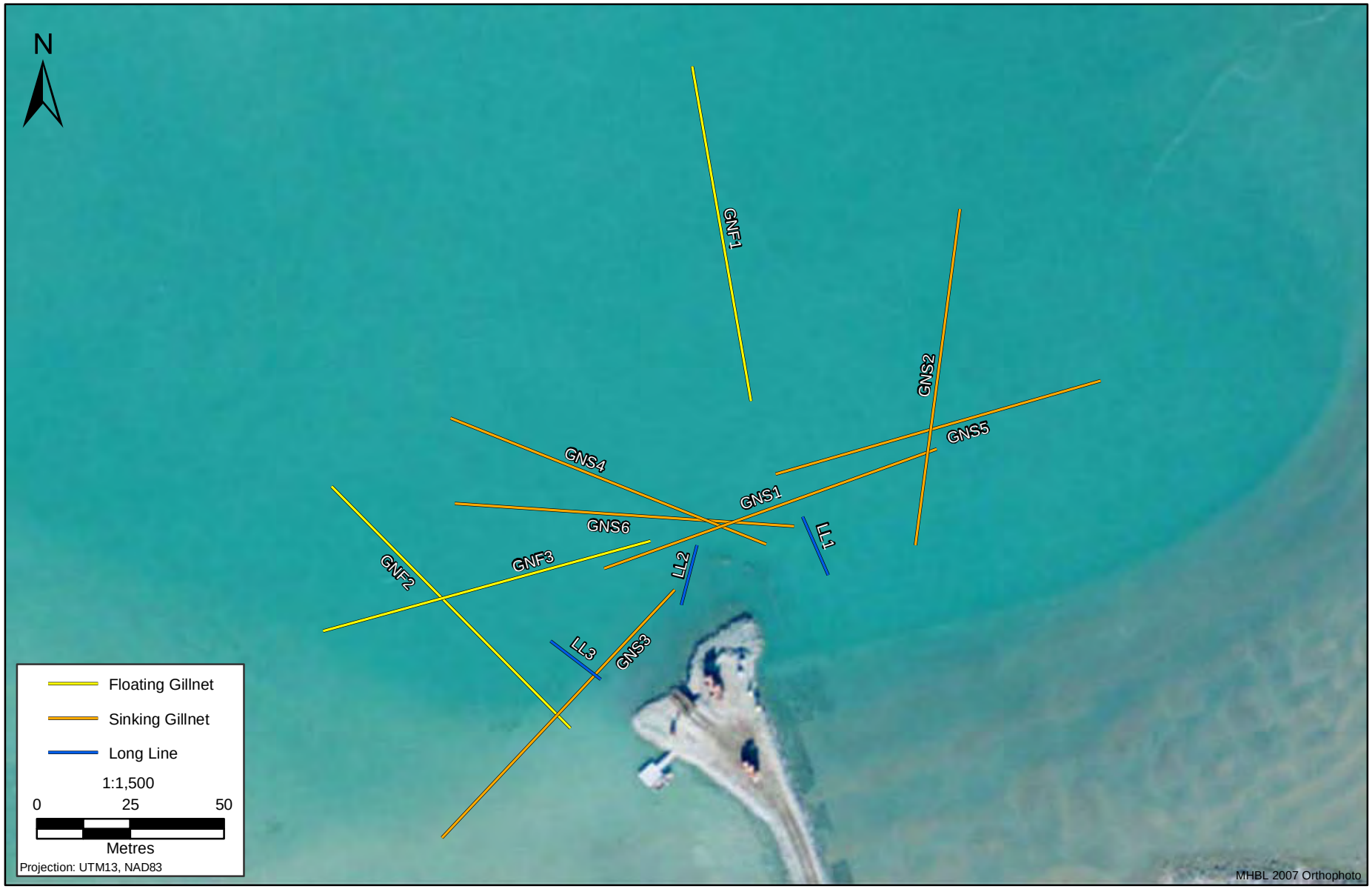


Figure 2.2-7

NEWMONT The Gold Company

Gillnet and Long Line Locations in Roberts Bay during the late-August Fish Community Survey of the Jetty, Hope Bay Belt Project, 2009

Figure 2.2-7

Rescan Engineers & Scientists

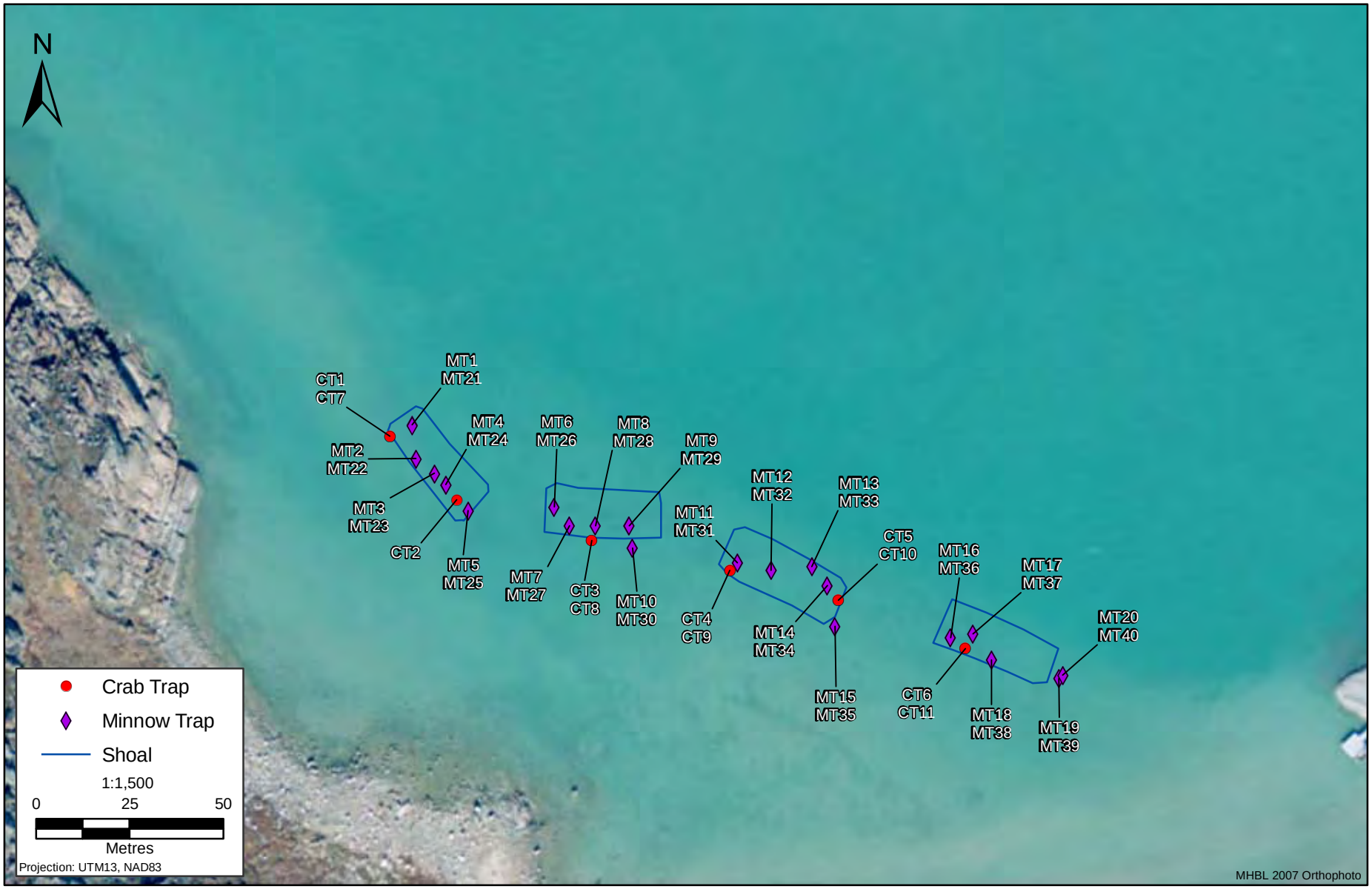


Figure 2.2-8

NEWMONT The Gold Company

Minnow Trap and Crab Trap Locations in Roberts Bay during the early-August Fish Community Survey of the Compensation Shoals , Hope Bay Belt Project, 2009

Figure 2.2-8

Rescan Engineers & Scientists

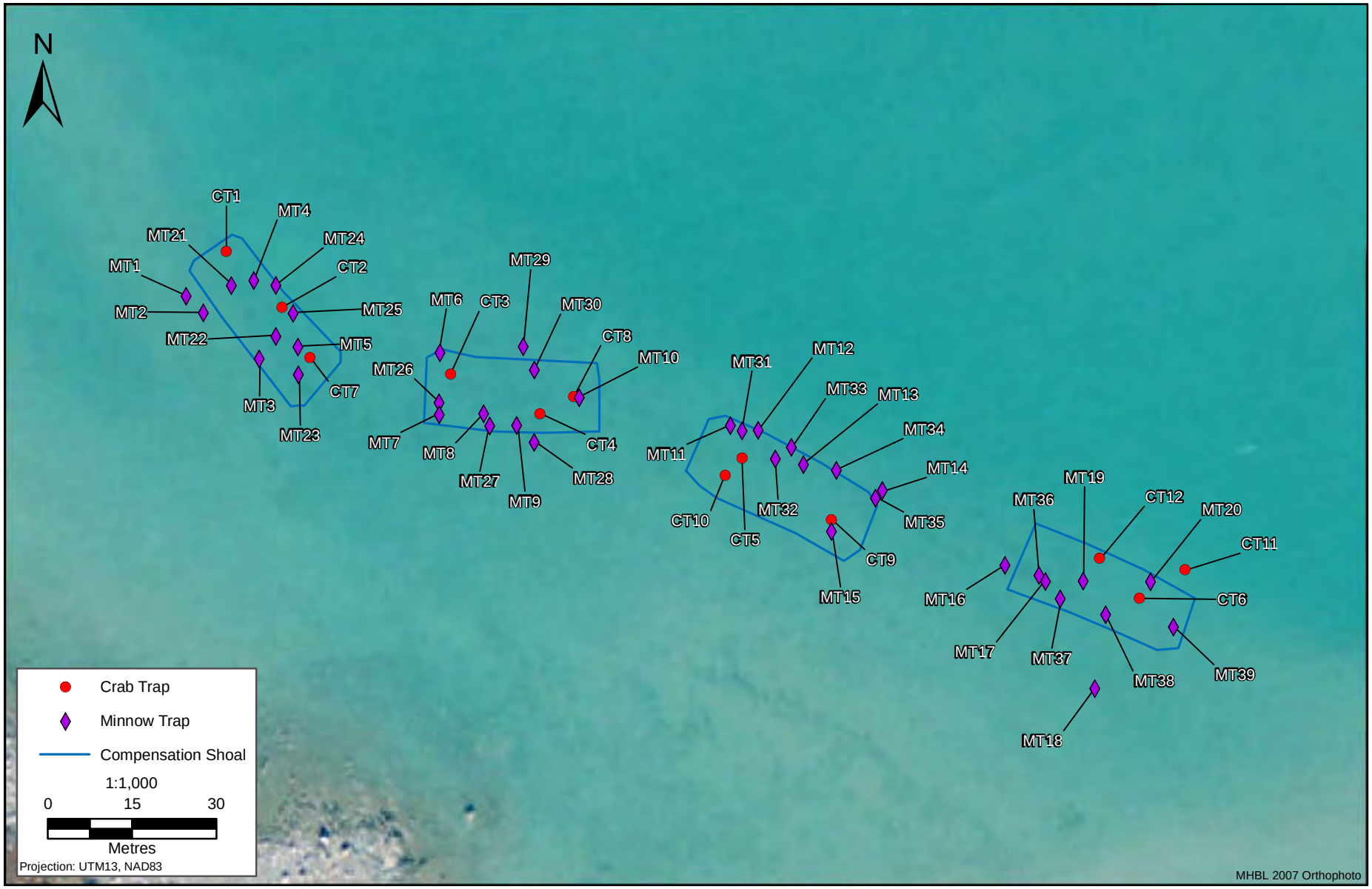


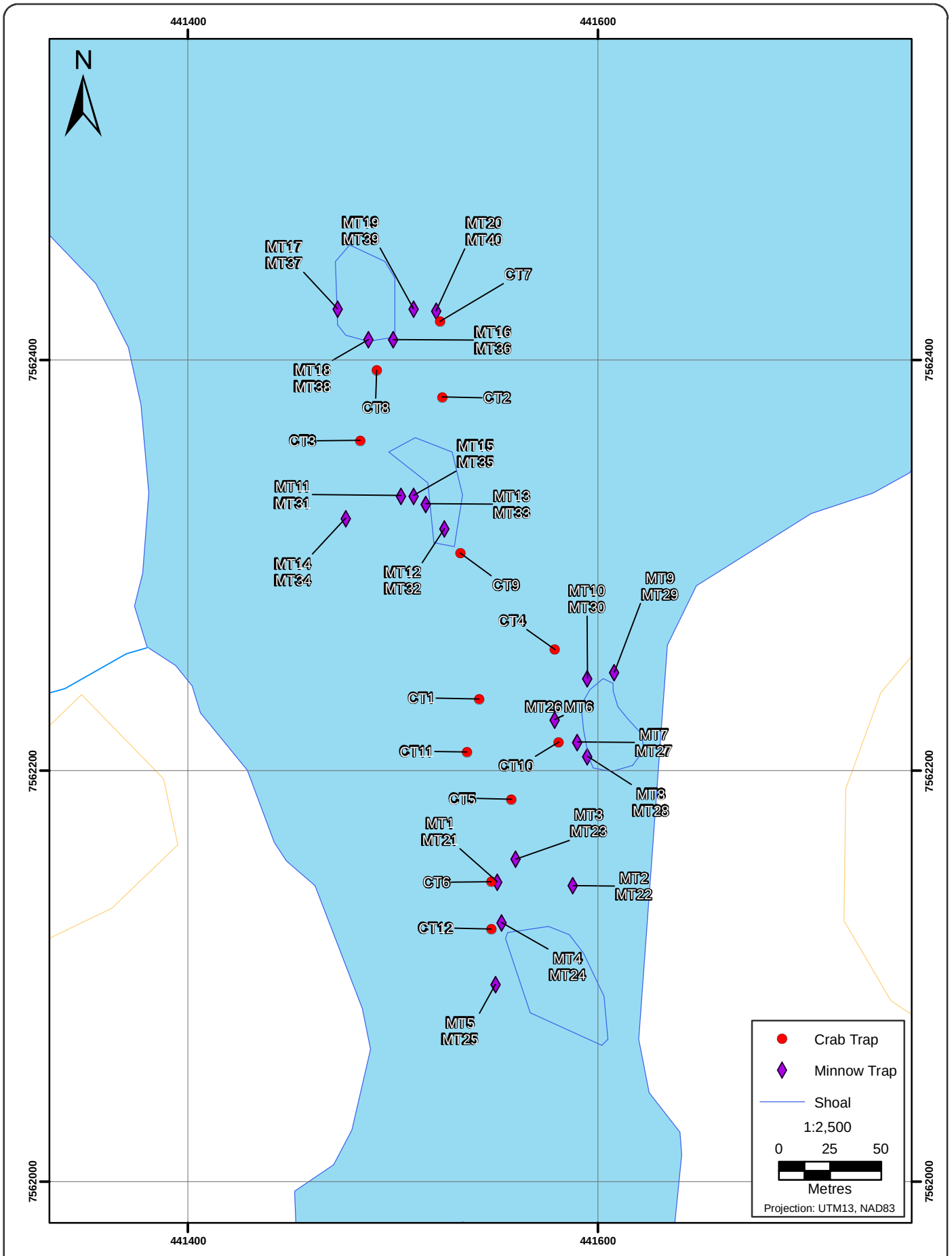
Figure 2.2-9

NEWMONT The Gold Company

Minnow Trap and Crab Trap Locations in Roberts Bay during the late-August Fish Community Survey of the Compensation Shoals , Hope Bay Belt Project, 2009

Figure 2.2-9

Rescan Engineers & Scientists



Minnow Trap and Crab Trap Locations in the Reference Bay during the early-August Fish Community Survey of the Reference Shoals , Hope Bay Belt Project, 2009

Figure 2.2-10

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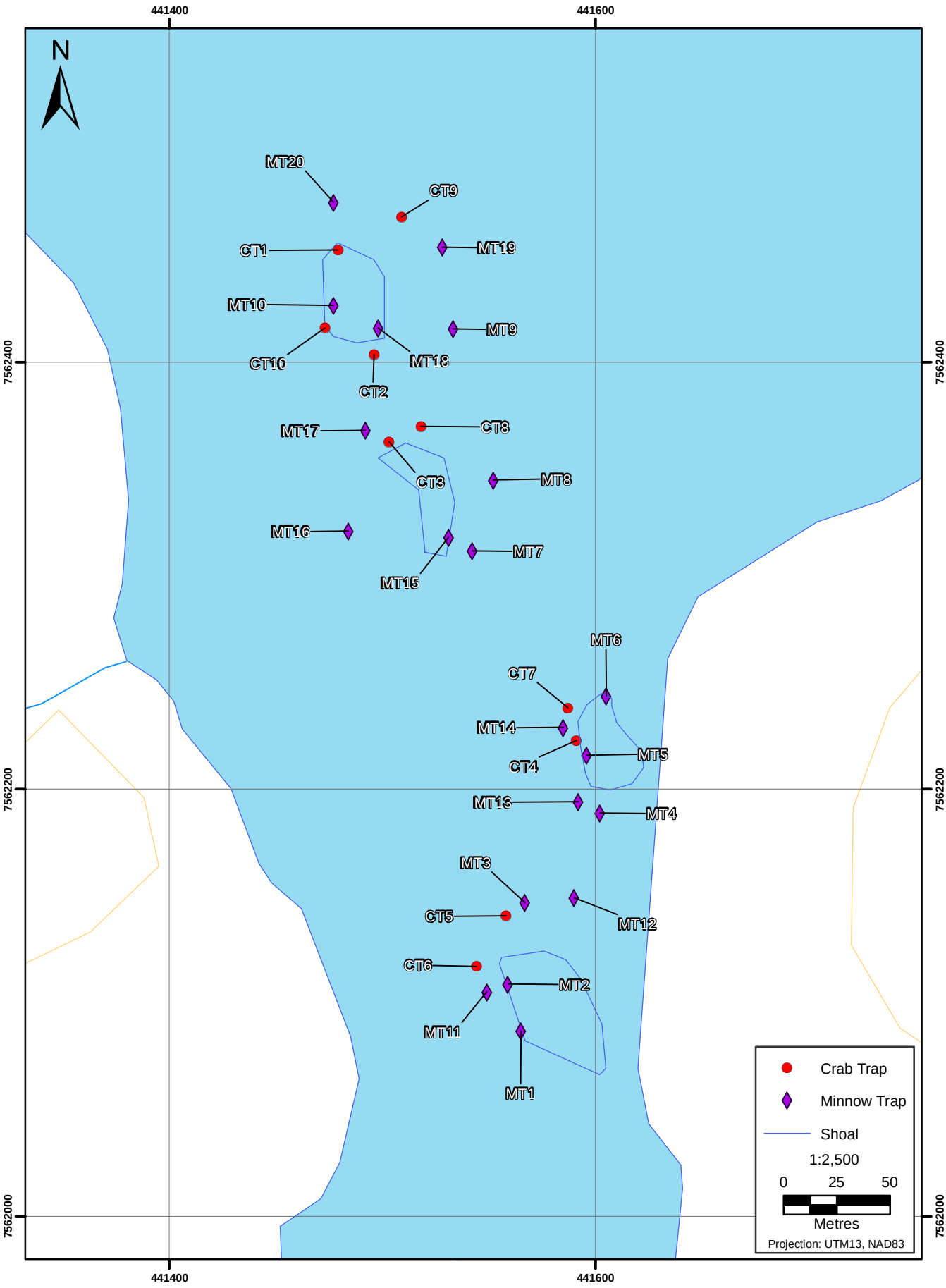

Minnow Trap and Crab Trap Locations in the Reference Bay during the late-August Fish Community Survey of the Reference Shoals, Hope Bay Belt Project, 2009

Figure 2.2-11

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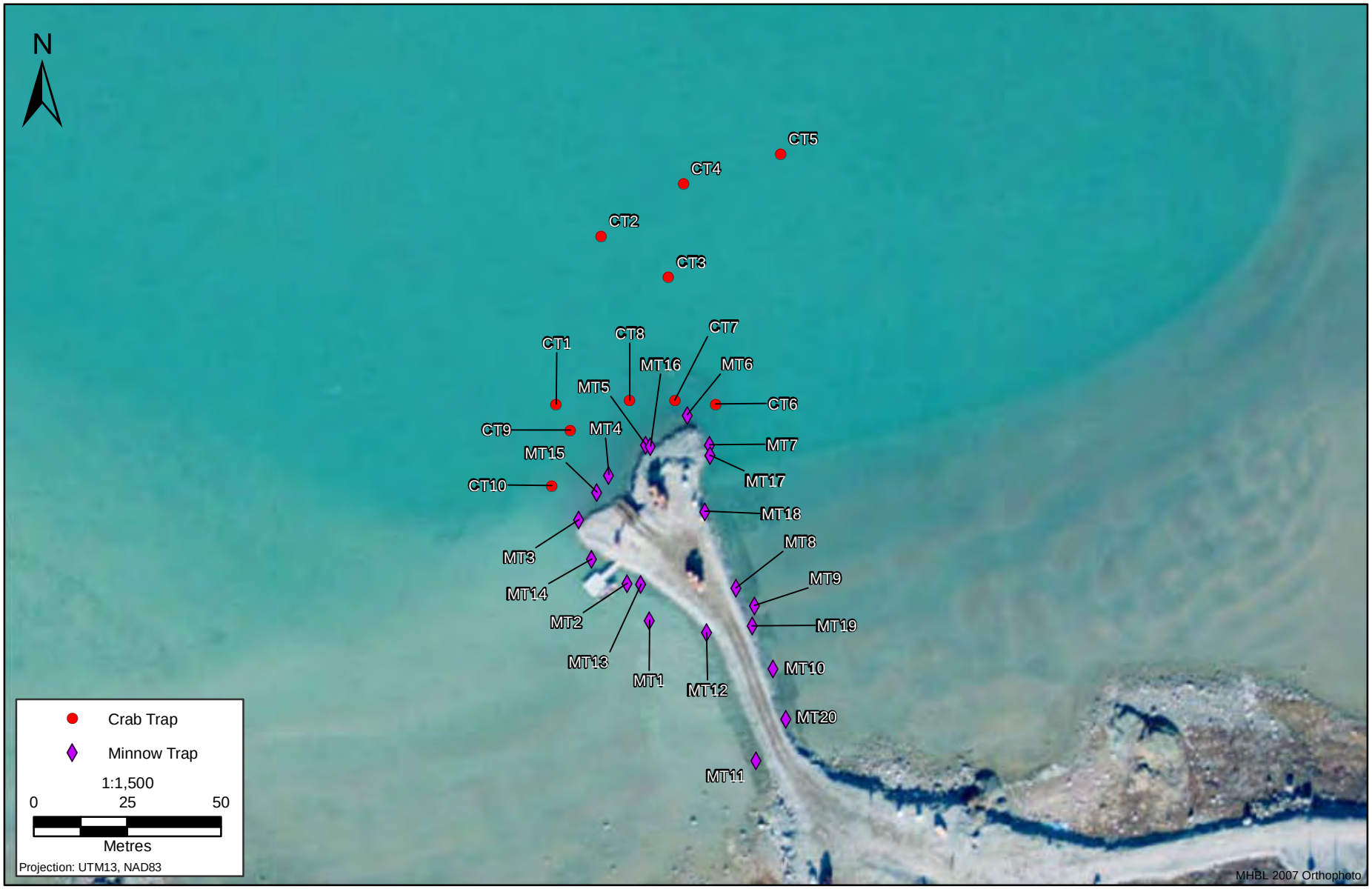

Figure 2.2-12

NEWMONT The Gold Company

Minnow Trap and Crab Trap Locations in Roberts Bay during the late-August Fish Community Survey of the Jetty, Hope Bay Belt Project, 2009

Figure 2.2-12

Rescan Engineers & Scientists

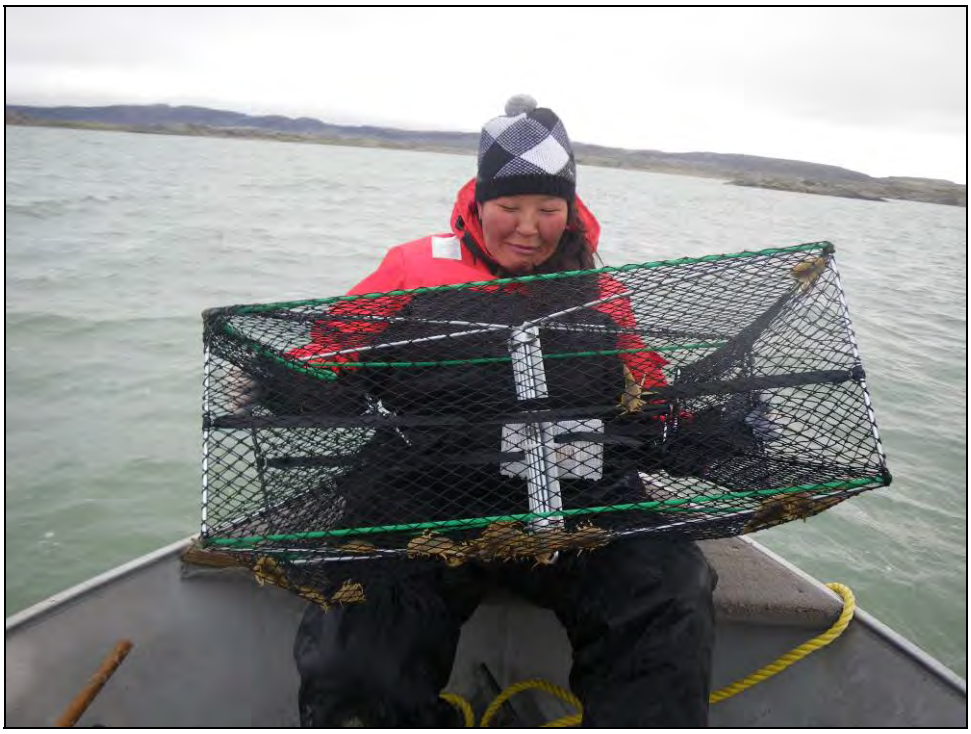

Plate 2.2-7. Retrieval of a crab trap in Roberts Bay, Hope Bay Belt Project, 2009.

All fish were assigned a unique sample number, identified to species, measured for fork length (mm), and weighed (g). A photographic representation of each fish species was taken. Fish were also sampled for various structures (scales, fin rays and otoliths) used to determine age. Scales were collected with a knife below the posterior margin of the dorsal fin on the left side of the fish. Two to three rays of the left pelvic fin were collected with clippers. Otoliths were only collected from incidental mortalities. Aging structures were placed in envelopes, labelled with the site, date, species and sample number and shipped to North Shore Environmental Services (Thunder Bay, ON) for age analysis. Live fish were immediately released back into the water.

2.2.3.4 Aging

Age was estimated by counting the number of annuli (or yearly rings) from each structure. Scales were attached to plastic fiches and annuli were counted with a microfiche reader. The fin rays were air-dried and then mounted in a 50:50 epoxy medium. Microsections were cut using a Beuler Isomet diamond saw and mounted on slides and annuli were counted with a compound microscope. Otoliths were air-dried, cracked and passed over a flame to increase the visibility of annuli. Otoliths were then mounted in Plasticine and immersed in oil for better inspection using a compound microscope. When more than one structure was used for aging, the one with the highest confidence in the annuli count was used.

2.2.4 Snorkel Survey

Snorkel surveys were conducted in Roberts Bay and the Reference Bay to qualitatively and quantitatively assess the direct use and stability of the compensation structures relative to the references shoals (Plate 2.2-8). Surveys were conducted concurrently with fish community assessments, in early-August and in late-August. The jetty was only assessed during the late-August snorkel survey.

Plate 2.2-8. Snorkel survey of the shoals in the Reference Bay, Hope Bay Belt Project, 2009.

Surveys were performed in a zigzag pattern across the constructed shoal structures, around the perimeter of the jetty and in a circular pattern around the reference shoals (note: survey pattern was limited due to the exposed rock outcrop in the centre of each reference shoal). Each shoal was surveyed for 10–15 minutes and the jetty for approximately 30 minutes. On each shoal, approximately six transects spaced five meters apart were surveyed. Snorkel surveys were conducted by one observer in early-August and by two observers in late-August. All surveys were conducted during the day.

When two observers were conducting the survey, observers remained adjacent to one another and moved at the same speed. Observers mentally divided the area into 'sections' in which each observer would look for fish and only count fish that pass within his/her snorkel section. Positions of the snorkelers were maintained at all times to minimize disturbance and double counting of organisms.

Qualitative and quantitative data were collected on algae, invertebrates and fish inhabiting the compensation structures and the reference shoals. Observations were recorded on dive slates attached to the snorkeler's forearm. Number and type of organisms, species, and sizes were recorded. Organisms were only counted once the snorkeler passed them, to reduce double counting. Habitat substrate was recorded for Roberts Bay and the Reference Bay shoals. Underwater photographs of representative organisms were taken when possible. Photographic images of macro-algae were sent to Sandra Lindstrom (North Saanich, BC) for identification.

Data were transferred from dive slates to standard field data sheets. Date, location, transparency (visibility), and time were also recorded on data sheets. All data were later transferred from data sheets to Microsoft Excel spreadsheets.

2.3 DATA ANALYSIS

2.3.1 Primary and Secondary Producers

2.3.1.1 Periphyton

Mean (± 1 standard error) periphyton biomass (μg/cm^2) measured as chlorophyll *a* was calculated for each shoal. The relative abundance by density of the major taxonomic groups was determined for each of the shoals sampled. The density (# cells/cm^2), genus richness (G) and diversity (as Simpson and Shannon diversity index) of periphyton assemblages were calculated. The mean and standard error by shoal was calculated for each variable. Richness is defined as the number of separate genera present in a sample. In assessing genus richness multiple species of the same genus were pooled together. For shoals where the only data available occurred at a higher taxonomic level (*e.g.,* Family or Order), a single genus was considered to be present in the sample.

The Shannon-Weiner Diversity Index uses species richness and abundance to calculate a measure of diversity that can be compared among samples. The Shannon diversity index ranges from 1 to 3.5 in typical communities. The formula is:

$$H = \sum_{i=1} [p_i * \ln(p_i)]$$

where p_i is the proportion of the total number of invertebrates in the sample made up by species *i*.

Simpson's Diversity Index ranges from 0 (no diversity) to 1 (maximum diversity). It is a dominance-type index and is calculated based on the formula:

$$D_s = \sum_{i=1}^{s} [n_i(n_i-1)] / [N(N-1)]$$

where n_i is the number of individuals in the i^{th} species and N is the total number of individuals.

The Shannon – Wiener Diversity Index places more emphasis on the richness of the community while the Simpson's Diversity Index places most weight on those species that dominate the community. Similar Shannon-Wiener and Simpson indices indicate that there are limited amounts of rare species present in the community of interest. In contrast, a high Shannon-Wiener index and a comparatively low Simpson index indicates that there is a large number of species present in the community, but many were present in low numbers.

2.3.1.2 Benthic Invertebrates

Invertebrate samples collected with the artificial substrate sampler were sorted and identified to the lowest possible taxonomic level (usually genus). The relative abundance of taxonomic groups, total density and genus richness were determined for each of the shoals sampled.

In assessing genus richness for benthic invertebrates, multiple species of the same genus were pooled together. All life stages were also pooled, by genus. For sites where the available data only occurred at higher taxonomic levels (e.g., Family or Order), a single genus was considered to be present in the sample.

2.3.2 Fish Community

Fish communities were characterized using relative abundance, mean length (mm), mean weight (g), mean age, and catch-per-unit-effort (CPUE). The data on CPUE and biological characteristics of the fish community identified key species and life history stages that use the constructed habitat directly and determined if there were significant differences in average CPUE between the constructed structures and reference sites.

CPUE is an index of relative abundance that can be used to compare fish populations among different areas. A key factor that allows comparison of CPUE data is the standardization (e.g., type of net, mesh size) of sampling devices. The same nets, traps and amount of bait were used in all locations, allowing comparisons of CPUE data to be made. It is defined as the number of fish captured per sampling device per unit time.

For gillnets, CPUE was the number of fish caught per 100 m^2 of net per hour.

CPUE = number of fish caught per net x (100 m^2*/ total net area) / set time*

For long lines, CPUE was the number of fish caught per hook per hour.

CPUE = number of fish caught per long line / number of hooks / set time

For minnow traps and crap traps, CPUE was calculated from the number of fish caught per trap per 24 hours.

CPUE = number of fish x [24 (hrs)/ set time (hrs)]

Length-frequency distributions were constructed to visualize the distribution of fish among size classes. One of the assumptions of the distributions is that fish of all size classes have an equal probability of being captured, which is often not the case. Also, a large sample size is needed to ensure that all size classes are represented (Johnson et al. 2007). Length-frequency was analyzed if the sample size was adequate ($n \geq 10$) and if species were present in both Roberts Bay and the Reference Bay.

Condition and weight-length regressions are indicators of the relative health of fish within a waterbody. Condition factor was based on the following formula from Ricker (1975):

$$Condition\ (g/mm^3) = weight\ (g) \times 10^5 / length^3\ (mm)$$

Length was multiplied by a factor of 10^5 to avoid fractional values, and a weight-length exponent of exactly 3 was assumed to apply to all species of fish.

Weight-length relationships were calculated for fish species captured in significant numbers (i.e., ≥10) and if species were present in both Roberts Bay and the Reference Bay. Logarithmic transformations were performed on the data prior to conducting the regression.

$$ln(weight) = ln(a) + b[ln(length)]$$

where *a* is a coefficient and *b* is the slope of the regression.

Length-age relationships were described with the von Bertalanffy growth model (Ricker 1975):

$$L_t = L_\infty (1 - exp (-K (t - t_0)))$$

where L_t = length at age (mm), L_∞ = asymptotic length (mm) (i.e., length at infinite age), K = growth rate (year – 1) and t_0 = age (years) at L = 0 mm.

Fisheries related statistics were conducted according to Zar (1984) using the SYSTAT library of computer programs (SYSTAT 2006).

All linear regressions were reported with the appropriate sample size (n), coefficient of determination (r^2, the fraction of variation in the independent parameter that was explained by the dependent parameter) and P value.

2.4 QA/QC

A quality assurance and quality control program (QA/QC) was included in the design of this study. The program included the use of chain of custody forms, taxonomic and laboratory QA/QC procedures and data review.

Field notes were transcribed onto electronic spreadsheets once all transcriptions were checked visually against the field forms and any errors were corrected. The data were also plotted to identify any outliers that may have resulted from transcription errors that occurred in the field.

3. Results & Discussion

3. Results and Discussion

3.1 SEDIMENT TRANSPORT AND DEPOSITION

A bathymetric survey in Roberts Bay was conducted in 2009 to compare to previous years, specifically prior to jetty construction (2006) and the year following jetty construction (2008). The 2009 bathymetric survey conducted in Roberts Bay can be found in Figure 3.1-1. Overall, the contour pattern observed in 2009 was similar to that observed in previous years (Golder 2008).

Detailed comparisons of specific areas, namely compensation structures, were conducted to assess sediment transport and deposition in the Roberts Bay area. Bathymetric data from 2006 and 2008 was provided by Golder Associates. Prior to comparing 2009 bathymetry results to previous years, a 2006 to 2008 depth comparison was conducted by Rescan to verify analyses were similar to previous years. Figure 3.1-2 shows the same patterns in bed elevation between 2006 and 2008 as those produced by Golder (2008). Some data collected in 2009 (nearshore) was excluded from analysis as the area was not covered during 2006 and 2008 bathymetric surveys.

Pre- to Post-Jetty Construction Comparisons

A comparison between 2006 and 2009 bathymetric data produces similar results to that of 2006 to 2008, mainly an accumulation of sediment at the north end of the jetty (Figure 3.1-3). In this area, depths changed between 0.75 to 1.0 m from 2006 to 2009, similar to what was observed in 2006 to 2008 comparison. Changes were expected as barge activity is known to cause sediment disturbance in the area and rock placement more than likely displaced bed sediment and rock into this area during jetty construction.

The steep slope region to the east of the jetty has continued to displace substrate from the area, decreasing depths by 0.75 to 1.0 meters. Three small pockets to the north-north east of this area showed signs of sediment accumulation. Changes could be related to the dramatic steep slopes in the area which make analyses very sensitive to small change.

To the west of the jetty, much of the observed change may be related to the extrapolation of bathymetry data by the computer software. Bathymetry information was lacking for the area south-south west of the constructed shoals. Changes observed at the shoals are known to be extrapolated as depths did not increase over the constructed habitat.

Year I and Year II Post-Jetty Construction Comparisons

Figure 3.1-4 is a bathymetric comparison of Roberts Bay between Year I and Year II post-jetty construction. Overall, results show an opposite trend to that observed during pre-construction comparisons, that being that depths are increasing at the toe of the jetty (north end). Bed elevation in this area was 0.5 to 1.0 m deeper in 2009 compared to 2008.

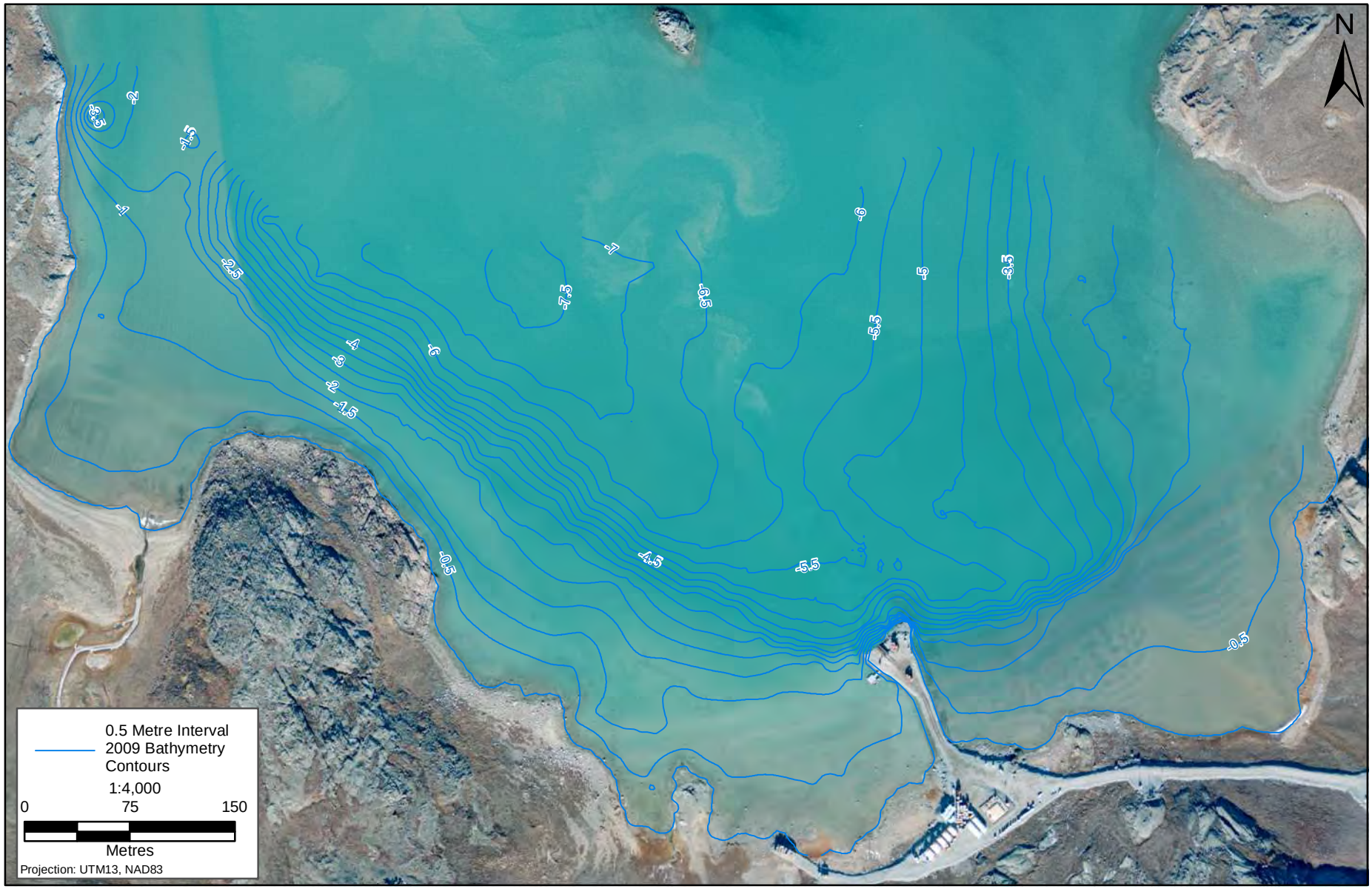

Figure 3.1-1

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Roberts Bay Bathymetry, Hope Bay Belt Project, 2009

Figure 3.1-1

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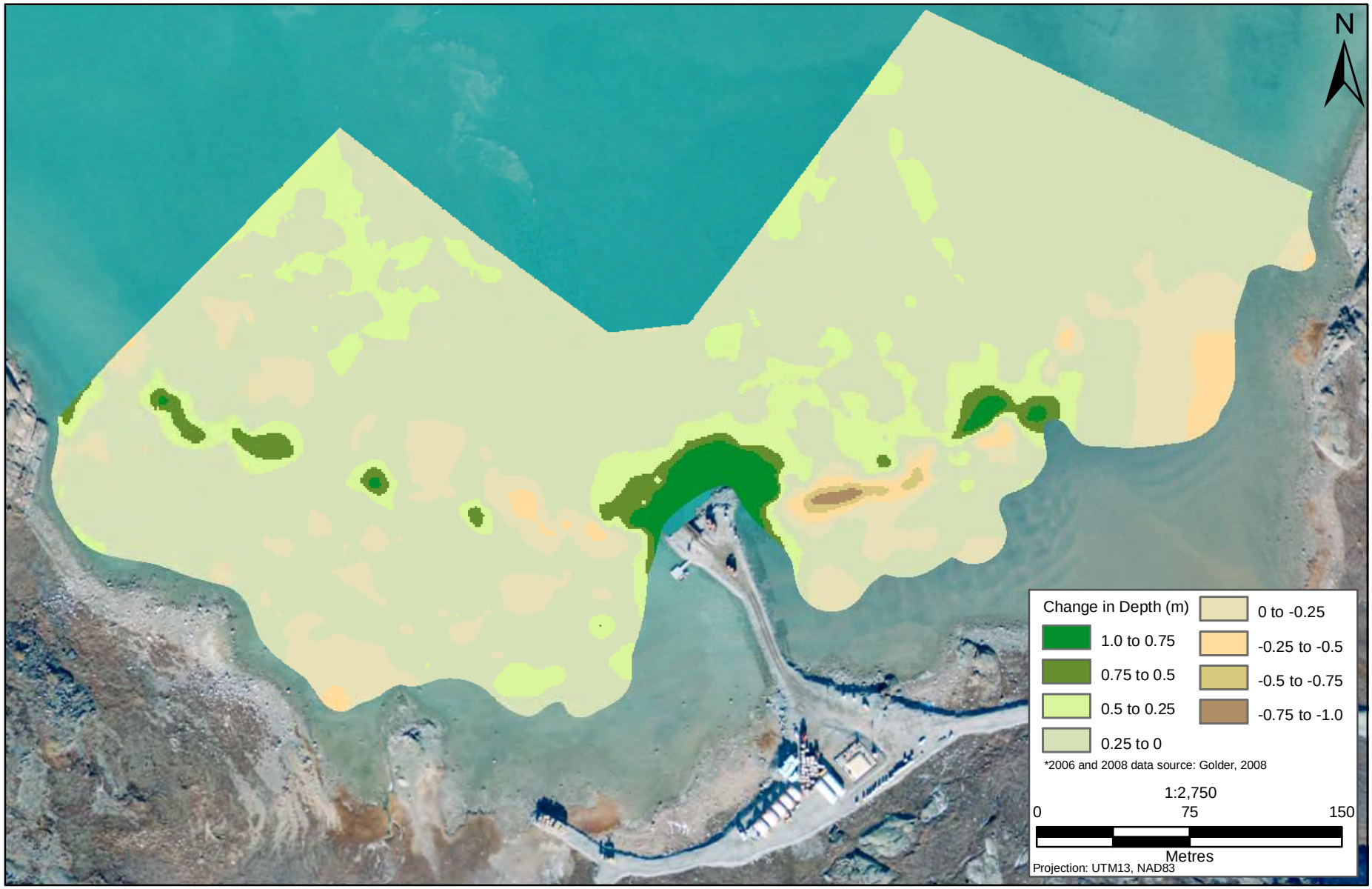


Figure 3.1-2

NEWMONT The Gold Company

Depth Comparisons Between 2006 and 2008

Figure 3.1-2

Rescan Engineers & Scientists

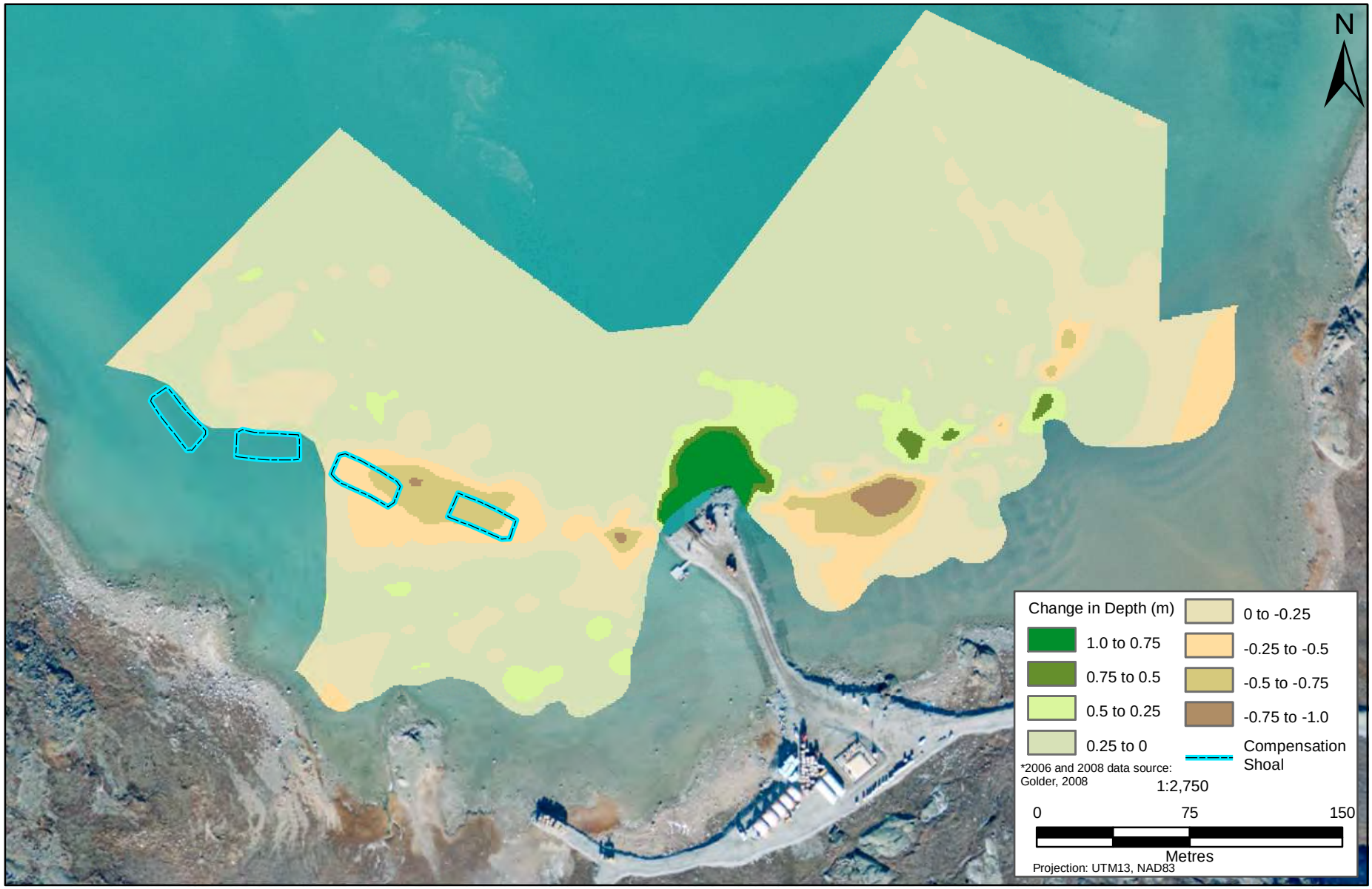


Figure 3.1-3

NEWMONT The Gold Company

Depth Comparisons Between 2006 and 2009

Figure 3.1-3

Rescan Engineers & Scientists

Figure 3.1-4

NEWMONT The Gold Company

Depth Comparisons Between 2008 and 2009

Figure 3.1-4

Rescan Engineers & Scientists

The area east of the jetty shows slight accumulation of sediment where initial changes post-construction showed increased depths in the same area. Further east, bed elevation measured in 2009 decreased by 0.25 to 1.0 m relative to 2008.

To the west of the jetty, the pattern of decreased bed elevation over the shoals may be an artefact of bathymetric analysis which extrapolates results where data was lacking. Bathymetry in the area in 2010 will verify these findings.

Overall trends comparing pre- to post-jetty construction are similar between 2008 and 2009. The area immediately north of the jetty has shown signs of sediment accumulation which is to be expected for such a constructed structure. Certain areas along the steep bed slope region to the east of the jetty are more sensitive to small change, thus patches of higher and lower elevations have been recorded. Overall, the area surrounding the jetty and rock shoals shows little change in bed elevation.

3.2 FISH HABITAT MONITORING

Fish habitat compensation structures (i.e., shoals and jetty) were monitored for stability and successful use as stated in Section 5.1 of the Authorization. As defined in the Doris North No Net Loss Plan, the successful use of the compensation features is defined as the establishment of primary and secondary productivity on the compensation structures, as well as documented use of the structures as rearing and feeding habitat for fish.

3.2.1 Water Quality

Water quality data was collected at each of the four shoals in both Roberts Bay and the Reference Bay. Data are presented in Table 3.2-1.

Table 3.2-1. Water Quality Measurements for shoals in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

			Water Quality Parameters	
Location	Shoal #	Date	Temperature (˚C)	pH
Roberts Bay	1	11-Sep-09	5.1	8.50
Roberts Bay	2	11-Sep-09	5.3	8.51
Roberts Bay	3	11-Sep-09	5.7	8.52
Roberts Bay	4	11-Sep-09	6.0	8.53
Reference Bay	1	10-Sep-09	4.9	8.70
Reference Bay	2	10-Sep-09	5.0	8.70
Reference Bay	3	10-Sep-09	5.4	8.53
Reference Bay	4	10-Sep-09	4.7	8.58

Water temperature was similar in both Roberts Bay and the Reference Bay. In Roberts Bay, water temperature ranged from 5.1˚C to 6.0˚C, averaging 5.5˚C (Table 3.2-1). In the Reference Bay, water temperatures were slightly cooler showing a range of 4.7˚C to 5.0˚C and averaging 5.0˚C. pH readings for Roberts Bay and the Reference Bay showed minimal variability, with only two sites in the Reference Bay reading slightly higher.

3.2.2 Primary and Secondary Producers

3.2.2.1 Periphyton

All periphyton biomass data (as µg/cm^2 chlorophyll *a*) and algal taxonomic data are presented in Appendices 3.2-1 and 3.2-2, respectively. Periphyton was sampled from five replicates on each of four shoals in Roberts Bay and the Reference Bay.

Biomass

Periphyton biomass was measured on the shoals of Roberts Bay and the Reference Bay as chlorophyll *a* (Figure 3.2-1). In Roberts Bay, average biomass ranged from 0.068 µg/cm^2 (Shoal 3) to 0.114 µg/cm^2 (Shoal 4). Average biomass was generally lower at the reference shoals, ranging from 0.049 µg/cm^2 (Shoal 2) to 0.081 µg/cm^2 (Shoal 4). Biomass was sometimes double in Roberts Bay samples compared to those of the Reference Bay, possibly related to higher nutrient inputs into Roberts Bay from local freshwater streams. Overall, there was no difference between periphyton biomass measured in Roberts Bay to that of the Reference Bay.

Density and Richness

Periphyton densities ranged from 764,304 to 1,000,743 cells/cm^2 in the Reference Bay and 366,042 to 800,074 cells/cm^2 in Roberts Bay (Figure 3.2-2). Average genus richness ranged from 13.4 to 16.4 genera per sample in Roberts Bay and 14.8 to 17.4 genera per sample in the Reference Bay (Figure 3.2-2). Overall, there was no difference between periphyton density and genus richness in Roberts Bay to that of the Reference Bay.

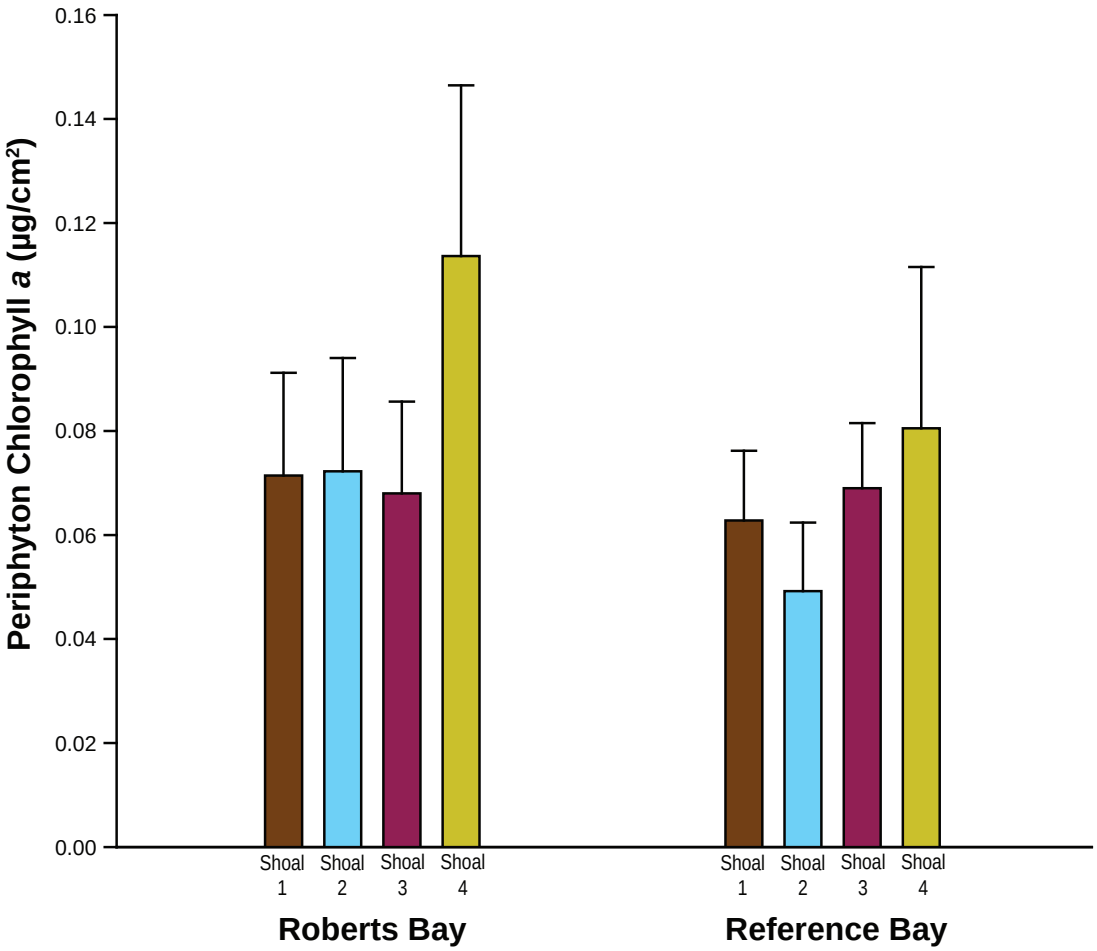
Taxonomic Composition

Five major algal groups were identified in samples from both Roberts Bay and the Reference Bay (Figure 3.2-3). The number of genera within each group varied. Bacillariophyta (diatoms) had the highest number of genera (28), followed by Cyanophyta (cyanobacteria or blue-green algae; 12), Chlorophyta (green algae; 7), Chrysophyta (golden algae; 3), and Pyrrhophyta (dinoflagellates; 2). Overall, the shoals in Roberts Bay and the Reference Bay showed similar patterns with respect to periphyton taxonomic composition. For both bays, Cyanophyta was the dominant group (63% to 67%), followed by Bacillariophyta (31% to 34%) and rare numbers (< 2%) of the other groups (Table 3.2-2). Within each bay, there was generally little variation in the taxonomic composition of periphyton between shoals.

Table 3.2-2. Taxonomic Composition (%) of Periphyton Density in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

	Roberts Bay					Reference Bay				
Group	**1**	**2**	**3**	**4**	**Overall**	**1**	**2**	**3**	**4**	**Overall**
Bacillariophyta	32.7	39.4	29.4	27.1	30.9	29.8	33.2	33.1	40.3	34.0
Pyrrhophyta	0.1	0.0	0.1	0.0	0.1	0.2	0.3	0.1	0.5	0.3
Cyanophyta	64.5	58.7	69.0	71.8	67.3	68.0	64.8	64.2	54.1	63.0
Chlorophyta	2.4	1.6	0.6	0.2	1.0	1.5	0.6	1.4	3.5	1.7
Chrysophyta	0.3	0.3	0.9	0.9	0.7	0.5	1.1	1.2	1.6	1.1

Note: n = 5 for each shoal in Roberts Bay and the Reference Bay except for Roberts Bay Shoal 2 where n = 4.



Note: Error bars represent one standard error of the mean.
n = 5 for each shoal in Roberts Bay and the Reference Bay except for Roberts Bay Shoal 2 where n = 4.

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Average Periphyton Chlorophyll *a* in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-1

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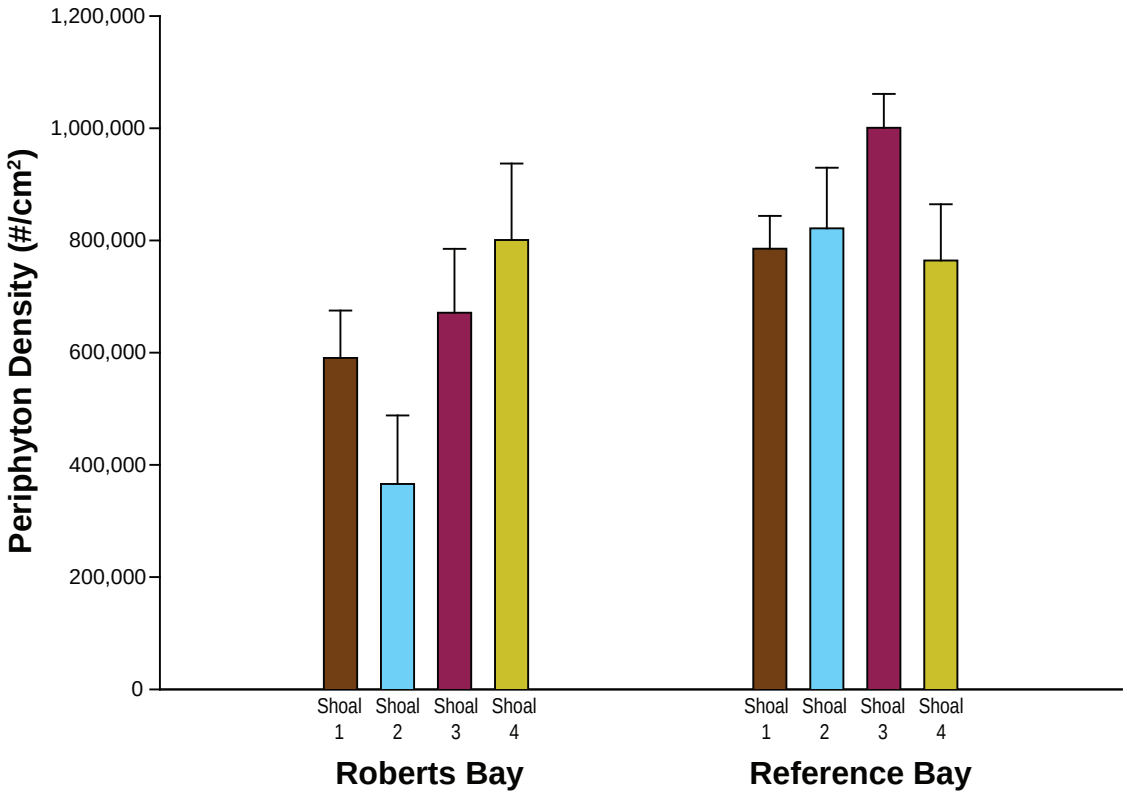

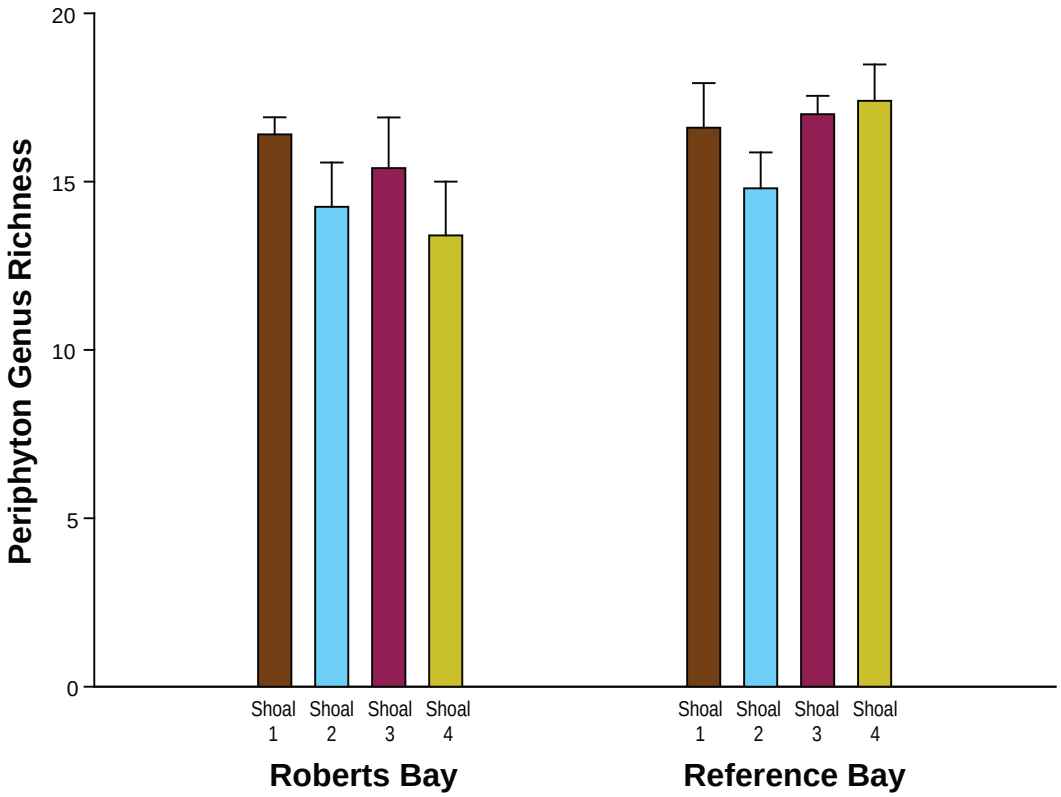

Note: Error bars represent the standard error of the mean.
n = 5 for each shoal in Roberts Bay and the Reference Bay except for Roberts Bay Shoal 2 where n = 4.

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Average Periphyton Density and Richness for Samples Collected from Shoals in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-2

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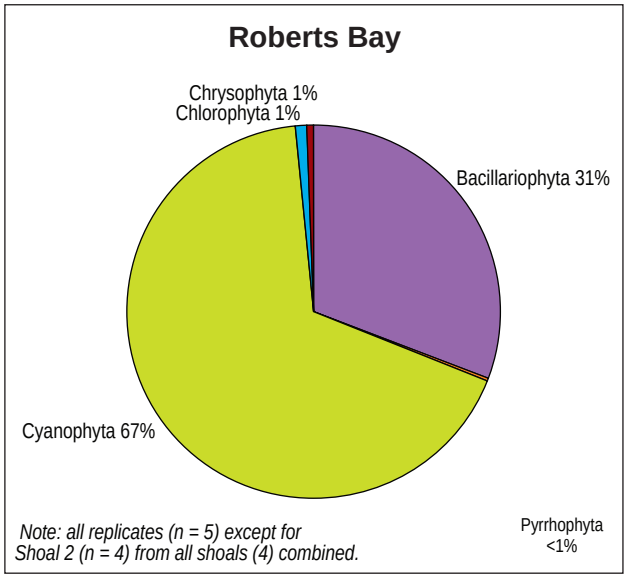

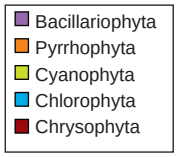

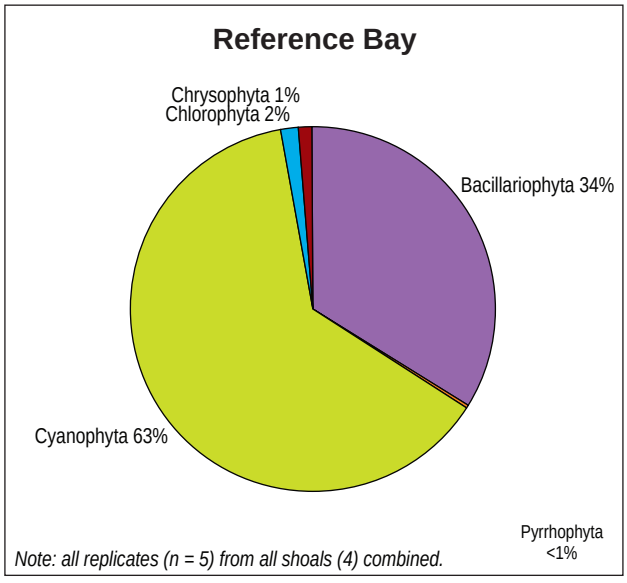

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Average Taxonomic Composition of Periphyton Density (cells/cm^2) in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-3

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For both Roberts Bay and the Reference Bay, the cyanophytes *Synechococcus* (35% to 38%) and *Synechocystis* (21% to 28%) were the most dominant genera present, followed by the bacillariophytes *Navicula* (11% to 12%), *Nitzschia* (5% to 12%), and *Haslea* (2% to 5%). Other genera were mainly below 1% in samples.

Diversity Indices

Shannon and Simpson Diversity indices were calculated for each shoal within Roberts Bay and the Reference Bay (Figure 3.2-4). Periphyton Shannon Diversity was similar for both Roberts Bay (1.79) and the Reference Bay (1.77). Shannon diversity ranged from 1.65 (Shoal 4) to 1.91 (Shoal 2) in Roberts Bay and from 1.62 (Shoal 2) to 1.98 (Shoal 4) in the Reference Bay.

Periphyton Simpson Diversity ranged from 0.72 (Shoal 4) to 0.78 (Shoal 2) in Roberts Bay and 0.70 (Shoal 1) to 0.80 (Shoal 4) in the Reference Bay (Figure 3.2-4). Average diversity was 0.75 for both sites, indicating moderate diversity. Overall, periphyton results show similar algal communities were developing on plates set up on the shoals of Roberts Bay and the Reference Bay.

3.2.2.2 Benthic Invertebrates

Benthic invertebrate communities were sampled from Roberts Bay and the Reference Bay in 2009. Five replicates from each shoal were sampled except for one shoal in Roberts Bay. One trap on Shoal 2 of Roberts Bay was lost and therefore not retrieved in late August. Benthic invertebrate data are presented in Appendix 3.2-3.

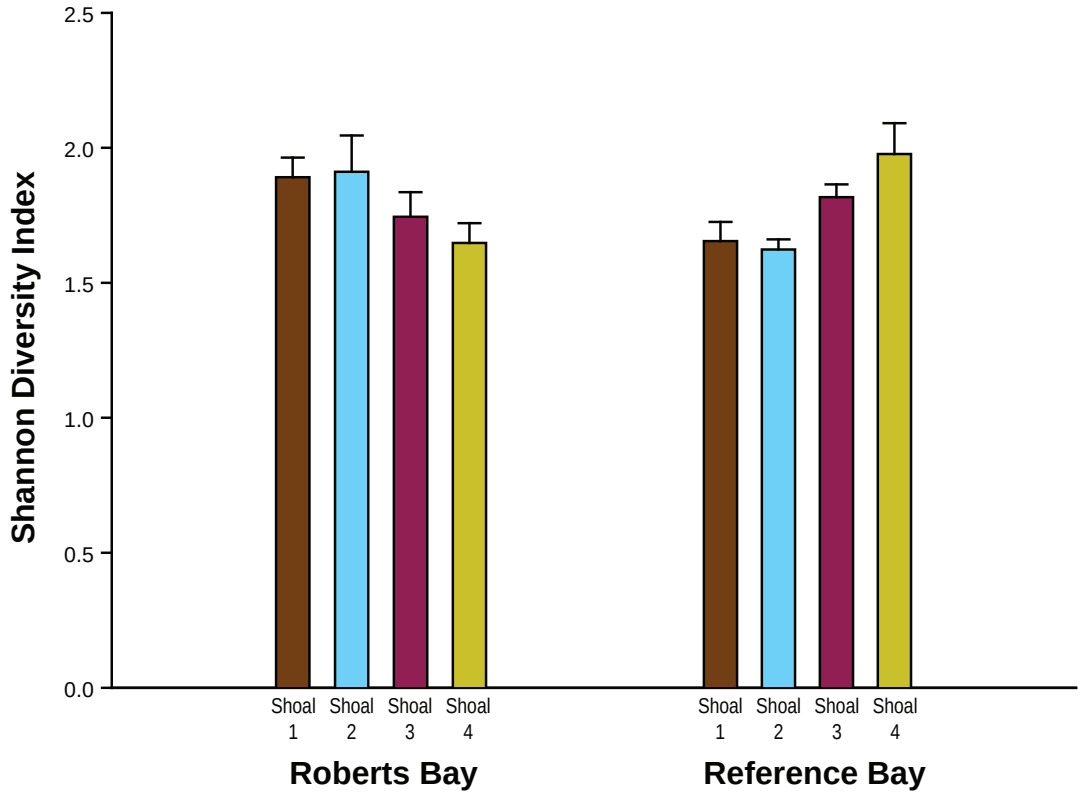
Density and Richness

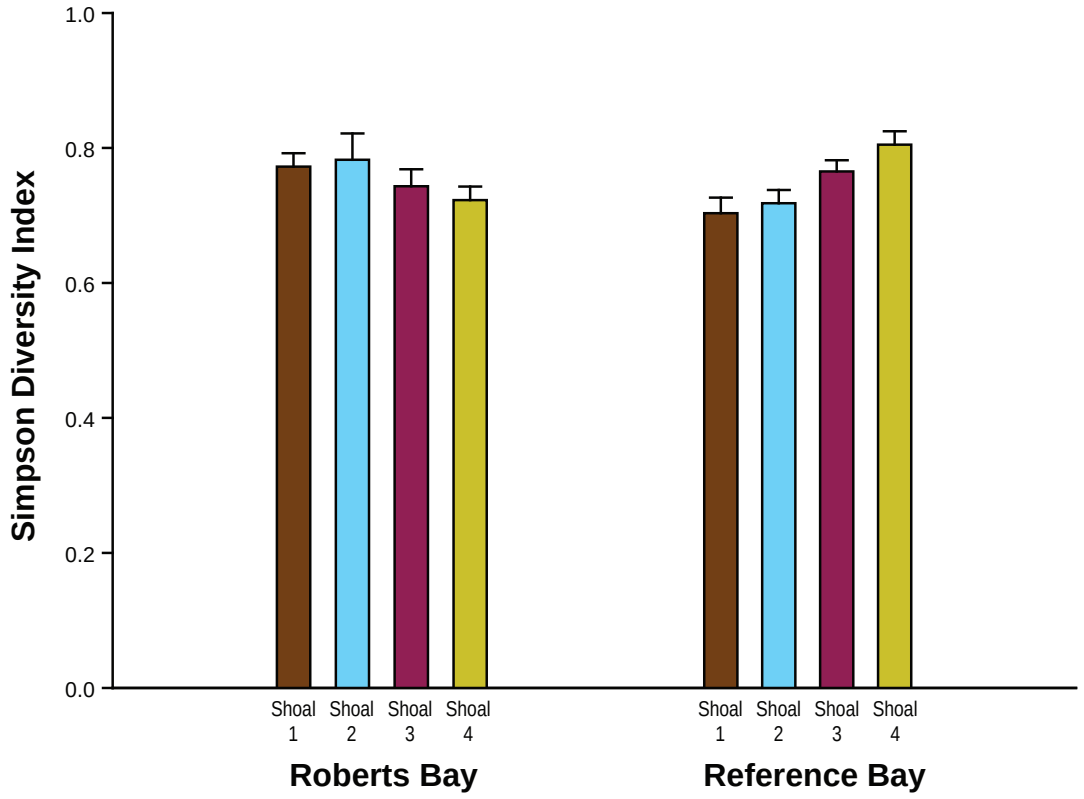
Within Roberts Bay, benthic invertebrate densities ranged from 4 organisms/trap (Shoal 1; Replicate 5) to 53 organisms/trap (Shoal 4; Replicate 2) (Table 3.2-3; Figure 3.2-5). In the Reference Bay, densities of benthic invertebrates ranged from 0 organisms/trap (Shoal 2; Replicate 2) to 66 organisms/trap (Shoal 3; Replicate 1) (Figure 3.2-5). Average genus richness was low among all sites sampled in Roberts Bay and the Reference Bay. Genus richness ranged from 2.2 taxa/trap (Shoal 4) to 3.2 taxa/trap (Shoal 1) in Roberts Bay and 1.0 taxa/trap (Shoal 2) to 3.2 taxa/trap (Shoal 3) in the Reference Bay (Figure 3.2-5). Overall, benthic invertebrate density and genus richness were similar in both Roberts Bay and the Reference Bay.

Community Composition

Twelve invertebrate taxa were sampled in total and included representatives from the following groups: Annelida (Polychaeta), Arthropoda (Arachnida, Amphipoda, Copepoda, Isopoda) and Insecta (Chironomidae) (Table 3.2-4). One juvenile fish specimen was also found in a Reference Bay sample.

The individuals that were collected by each trap were not evenly distributed among the taxa that were identified. Each shoal appeared to be primarily dominated by amphipods (74%–91% in Roberts Bay and 52%–99% in the Reference Bay). In addition to amphipods, the benthic invertebrate community in Roberts Bay was composed of polychaetes or scaleworms (7%–26%) and individual specimens of Isopoda (Shoal 1), Copepoda (Shoal 4) and Arachnida (Shoal 4) (Figure 3.2-6a).





Note: Error bars represent the standard error of the mean.
n = 5 for each shoal in Roberts Bay and the Reference Bay except for Roberts Bay Shoal 2 where n = 4.

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Average Periphyton Shannon and Simpson Diversity for Samples Collected from Shoals in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-4

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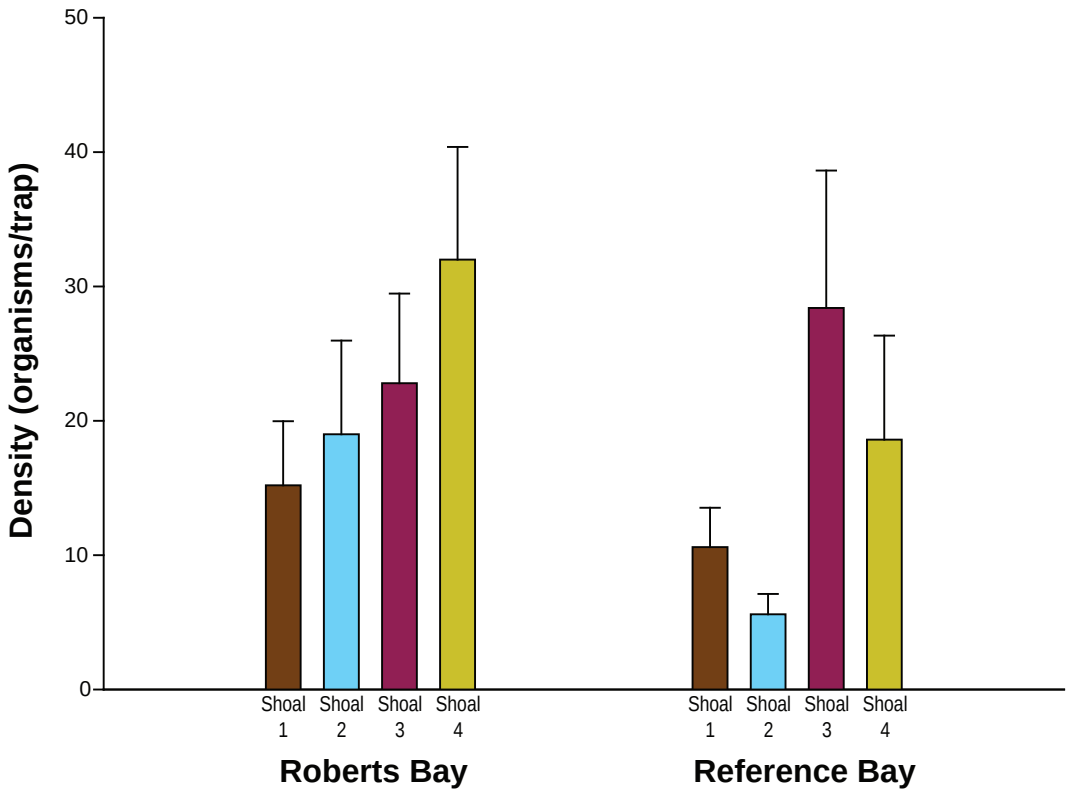
Table 3.2-3. Summary of Benthic Invertebrate Density and Richness in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

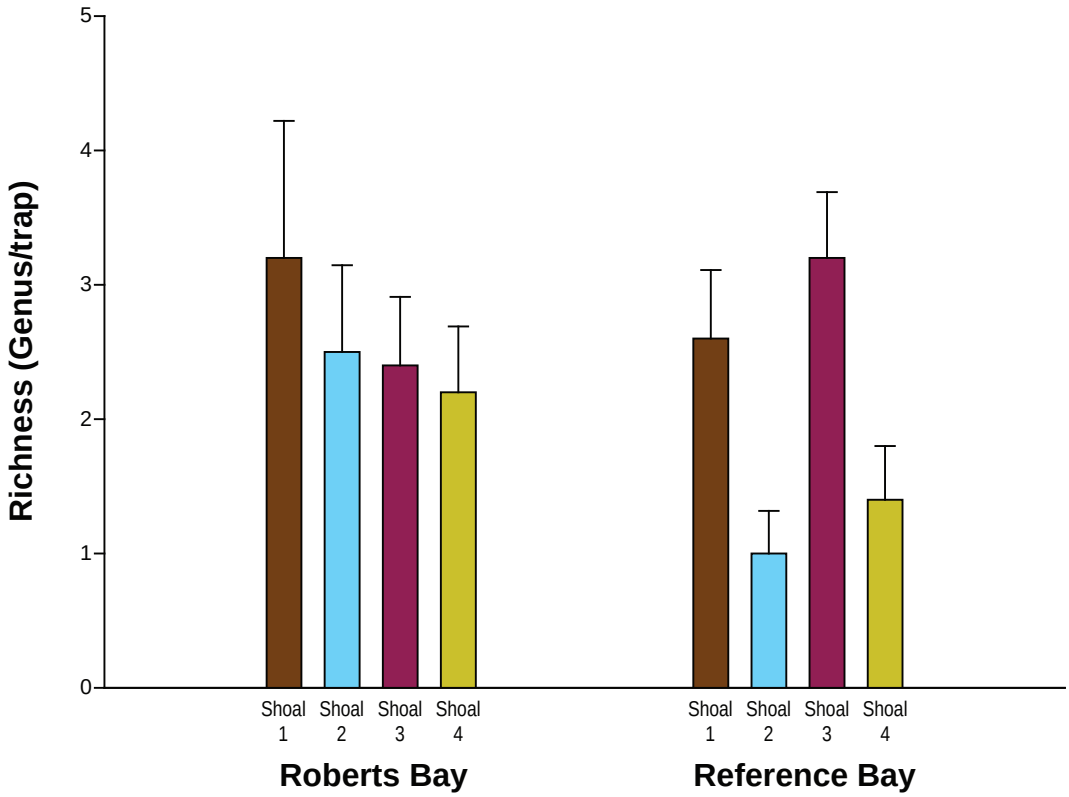
	Shoal 1				Shoal 2				Shoal 3				Shoal 4				Total			
	Mean	SE	Min	Max	Mean	SE	Min	Max	Mean	SE	Min	Max	Mean	SE	Min	Max	Mean	SE	Min	Max
Roberts Bay																				
Average Density (organisms/trap)	15.2	4.76	4	28	19.0	6.96	5	34	22.8	6.66	8	44	32.0	8.39	8	53	23.0	3.44	4	53
Average Richness (taxa/trap)	3.2	1.02	1	7	2.5	0.65	1	4	2.4	0.51	1	4	2.2	0.49	1	3	3.0	0.34	1	7
Reference Bay																				
Average Density (organisms/trap)	10.6	2.93	4	19	5.6	1.50	0	9	28.4	10.23	10	66	18.6	7.74	4	47	15.8	3.62	0	66
Average Richness (taxa/trap)	2.6	0.51	1	4	1.0	0.32	0	2	3.2	0.49	2	5	1.4	0.40	1	3	2.0	0.40	0	5

Note: SE = standard error of the mean.

Table 3.2-4. Summary of Benthic Invertebrate Taxa Captured on Shoals in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Species	Roberts Bay	Reference Bay
ANNELIDA		
Polychaeta Errantia		
Polynoidae (Indeterminate)	X	X
Polychaeta Sedentaria		
Leitoscoloplos sp.	X	-
ARTHROPODA		
Arachnida		
Halacaridae	X	X
Amphipoda		
Apherusa nr. glacialis	X	X
Gammaracanthus loricatus	X	X
Ischyrocerus anguipes	X	-
Lagunogammarus setosus	X	X
Stenothoidae	X	-
Weyprechtia pinguis	X	-
Copepoda		
Harpacticoida	X	-
Isopoda		
Saduria entomon	X	X
INSECTA		
Chironomidae larvae	-	X
CHORDATA		
Teleostei	-	X
Total	**11**	**8**





Note: Error bars represent the standard error of the mean.
n = 5 for each shoal in Roberts Bay and the Reference Bay except for Roberts Bay Shoal 2 where n = 4.

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Density and Richness of Benthic Invertebrates in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-5

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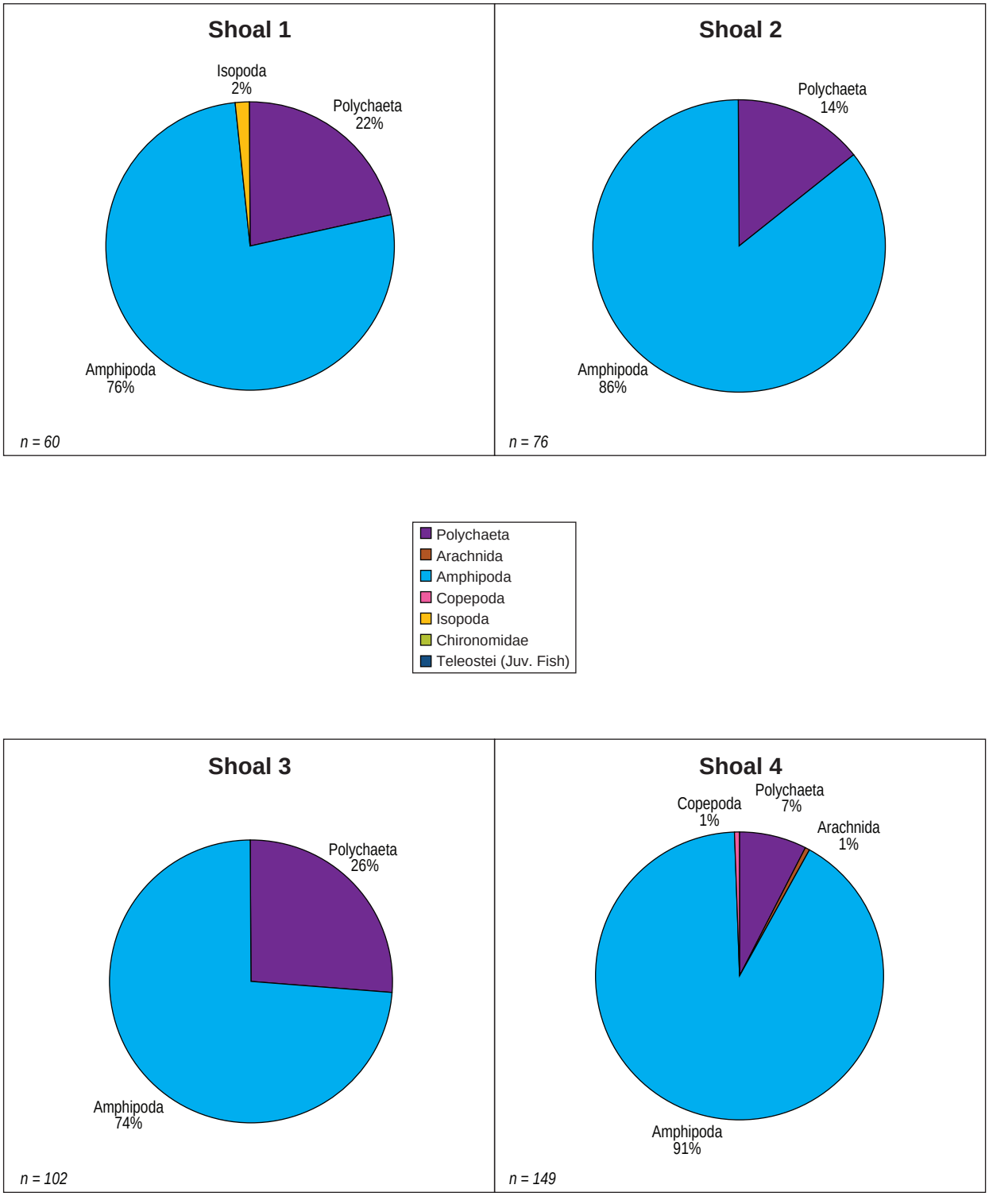

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Taxonomic Composition (% of organisms/trap) of Benthic Invertebrates Sampled from Artificial Rock Samplers in Roberts Bay, Hope Bay Belt Project, 2009

Figure 3.2-6a

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Community composition in the Reference Bay was similar to Roberts Bay (Figure 3.2-6b). Polychaetes composed small portions of the samples collected from Shoal 2 (9%) and 4 (1%); no other benthic invertebrate species was found at these sites. At Shoal 1, species of secondary importance included Chironomidae (23%), Polychaeta (22%) and Isopoda (3%). Arachnida (11%), Polychaeta (6%) and an unknown juvenile fish specimen comprised the remainder of the benthic invertebrate community on Shoal 3 in the Reference Bay.

A lower order assessment of benthic invertebrate taxa revealed distinct difference between Roberts Bay and the Reference Bay communities (Table 3.2-4). Benthic invertebrate taxa unique to the shoals of Roberts Bay include a sedentary polychaete (*Leitoscoloplos sp*), a benthic copepod (Harpacticoida) and three genera of amphipods (*Ischyrocerus anguipes*, Stenothoidae, *Weyprechtia pinguis*). Chironomidae were only found in the Reference Bay, specifically on Shoal 1.

While both Roberts Bay and the Reference Bay were dominated by the Order Amphipoda, the species of amphipod that dominated varied (Figure 3.2-7). Amphipods in Roberts Bay were dominated by *Ischyrocerus anguipes*, a species common to the Arctic Ocean and known to be associated with various algal species and hard substrata (Dvoretsky and Dvoretsky 2008). In the Reference Bay, the gammarid amphipod *Lagunogammarus setosus* was the dominant species present, a species commonly found in cold estuaries, glacial river mouths and brackish bays of Canada and Alaska (Bousfield 1979). It typically occupies shallow or intertidal waters on muddy sand, mud or silt substrate.

3.2.3 Fish Community

3.2.3.1 Community Composition

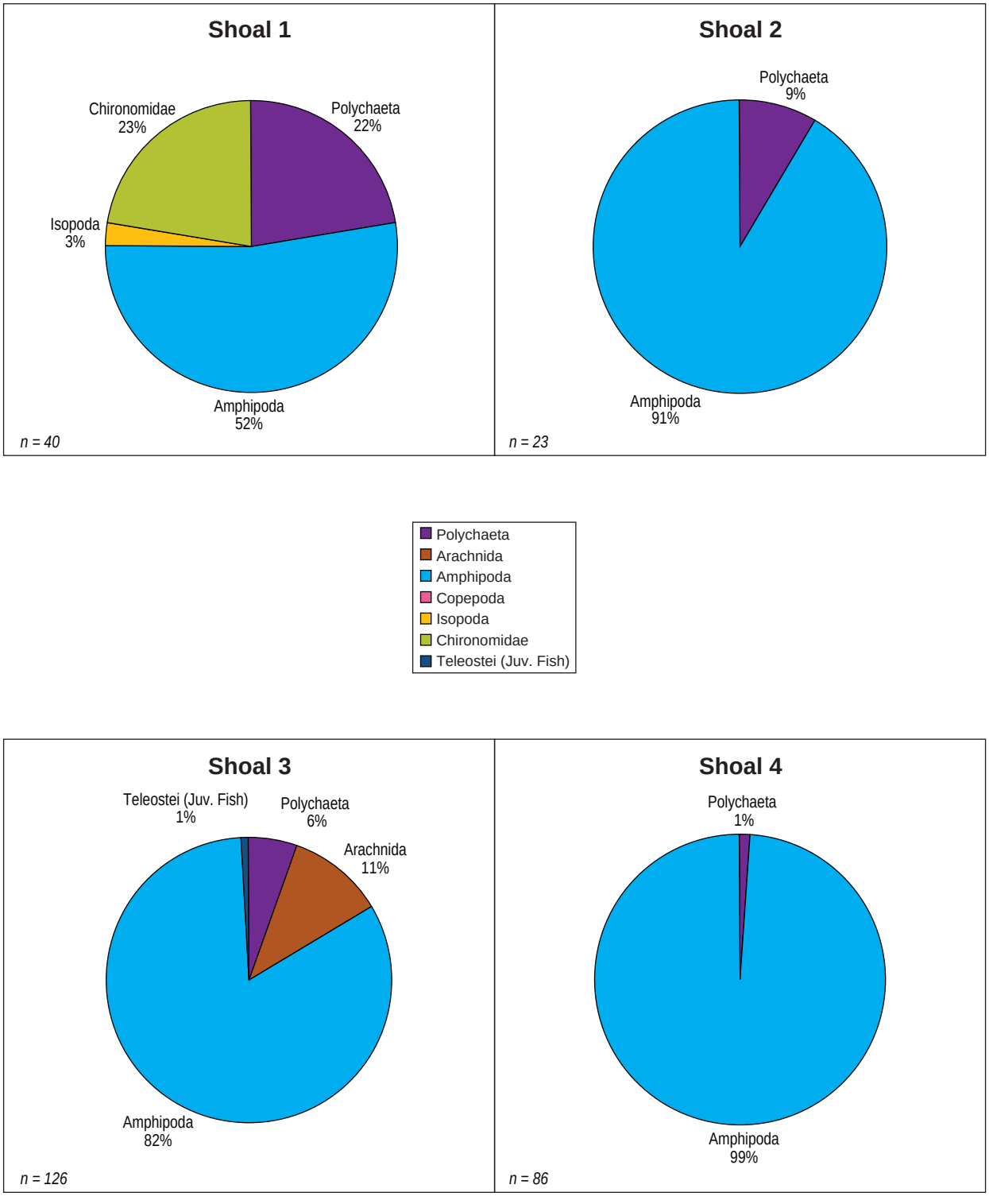
Data on the location, setting and retrieval times, and summary catch for all gear used are presented in Appendix 3.2-4 to Appendix 3.2-8. Biological data for fish sampled in Roberts Bay and the Reference Bay are presented in Appendix 3.2-9.

Overall, fish species captured in Roberts Bay and the Reference Bay were similar. Nine species were captured in total (Table 3.2-5). Fish species present in Roberts Bay and/or the Reference Bay included Arctic char (Plate 3.2-1), Arctic flounder (Plate 3.2-2), Greenland cod (Plate 3.2-3), lake trout (Plate 3.2-4), ninespine stickleback, Pacific herring (Plate 3.2-5), saffron cod (Plate 3.2-6), starry flounder (Plate 3.2-7) and sculpin (*Myoxocephalus* sp.) (Plate 3.2-8).

The majority of fish species, including the Arctic flounder, Pacific herring, saffron cod, starry flounder and sculpin are predominantly found in the marine environment, although they have been found to travel short distances into inland waters. Ninespine stickleback and Arctic char are anadromous, meaning they spawn and rear in freshwater but migrate to the sea to forage. Lake trout is primarily a freshwater fish species but occasionally, it is known to move into estuaries and brackish coastal waters of low salinity.

Arctic flounder, Greenland cod, saffron cod, starry flounder and sculpin are demersal fish, meaning they forage primarily along the sea bottom (Froese and Pauly 2009). Pacific herring is a pelagic fish that forages in open water, usually in the upper and middle sections of the water column. Benthopelagic fish, including the ninespine stickleback, Arctic char and lake trout, forage in both the benthic and pelagic zones of either freshwater or marine habitats.

None of the fish species listed in Table 3.2-5 are endangered or threatened (COSEWIC 2009).



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Taxonomic Composition (% of organisms/trap) of Benthic Invertebrates Sampled from Artificial Rock Samplers in Roberts Bay, Hope Bay Belt Project, 2009

Figure 3.2-6b

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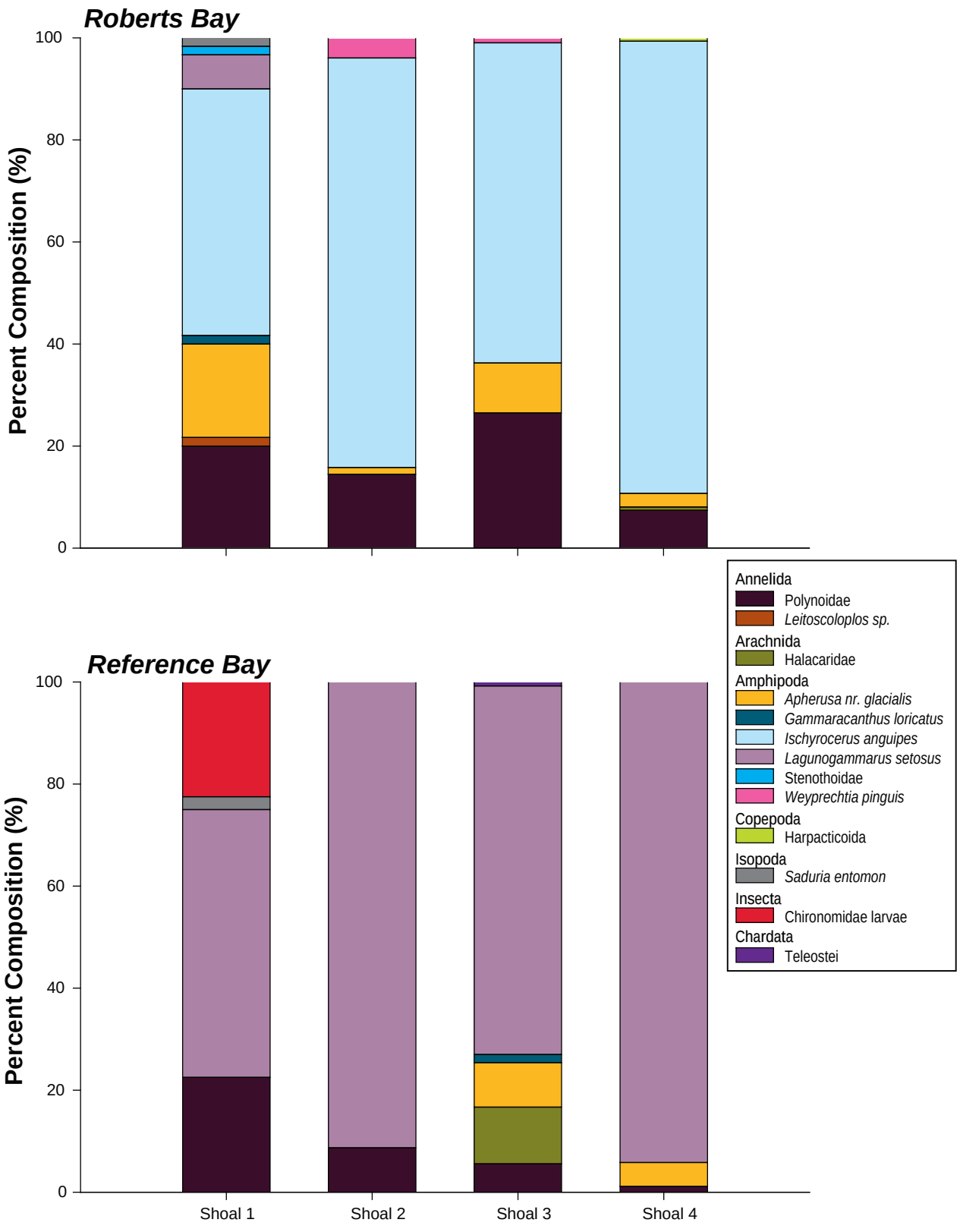

Note: n = 5 for each shoal in Roberts Bay and the Reference Bay except for Roberts Bay Shoal 2 where n = 4.

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Detailed Taxonomic Composition of Benthic Invertebrates in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-7

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Table 3.2-5. Marine Fish Species Captured in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Common Name	Abbreviation	Scientific Name	Habitat	Depth Range	Species Presence	
					Roberts Bay	Reference Bay
Arctic Char	AC	*Salvelinus alpinus*	Anadromous; Freshwater/ Brackish/Marine	Benthopelagic	X	X
Arctic Flounder	AF	*Liopsetta glacialis*	Freshwater/Brackish/ Marine	Demersal	X	X
Greenland Cod	GC	*Gadus ogac*	Brackish/Marine	Demersal	X	X
Lake Trout	LT	*Salvelinus namaycush*	Freshwater/Brackish	Benthopelagic	X	
Ninespine Stickleback	NS	*Pungitius pungitius*	Anadromous; Freshwater/ Brackish/Marine	Benthopelagic	X	
Pacific Herring	PH	*Clupea pallasii*	Freshwater/Brackish/ Marine	Pelagic	X	X
Saffron Cod	SC	*Eleginus gracilis*	Freshwater/Brackish/ Marine	Demersal	X	
Starry Flounder	*SF*	*Platichthys stellatus*	Freshwater/Brackish/ Marine	Demersal	X	X
Sculpin	SP	*Myoxocephalus* sp.	Freshwater/Brackish/ Marine	Demersal	X	X

Note: Habitat types, spatial distributions and migration patterns were taken from Froese and Pauly (2009).

Plate 3.2-1. An Arctic char captured in the Reference Bay, Hope Bay Belt Project, 2009.

Plate 3.2-2. An Arctic flounder captured in Roberts Bay, Hope Bay Belt Project, 2009.

Plate 3.2-3. A Greenland cod captured in Roberts Bay, Hope Bay Belt Project, 2009.

Plate 3.2-4. A lake trout captured in Roberts Bay, Hope Bay Belt Project, 2009.

Plate 3.2-5. A Pacific herring captured in Roberts Bay, Hope Bay Belt Project, 2009.

Plate 3.2-6. A saffron cod captured in Roberts Bay, Hope Bay Belt Project, 2009.

Plate 3.2-7. A starry flounder captured in Roberts Bay, Hope Bay Belt Project, 2009.

Plate 3.2-8. A sculpin captured in Roberts Bay, Hope Bay Belt Project, 2009.

A total of 92 fish from eight species were captured on and around the compensation shoals in Roberts Bay (Table 3.2-6). In the Reference Bay, a total of 85 fish from six species were captured on and around the reference shoals. A total of 26 fish from five species were captured in the vicinity of the jetty, which was only sampled during the late-August sampling period.

Table 3.2-6. Total Number of Fish Captured from Compensation and Reference Structures during Early- and Late-August Fisheries Surveys, 2009

	Roberts Bay				Reference Bay		
	Shoals			Jetty	Shoals		
Fish Species	Early-August	Late-August	Total	Late-August	Early-August	Late-August	Total
Arctic Char	0	14	**14**	**6**	6	11	**17**
Arctic Flounder	0	0	**0**	**1**	1	0	**1**
Greenland Cod	4	12	**16**	**13**	2	0	**2**
Lake Trout	2	0	**2**	**1**	0	0	**0**
Ninespine Stickleback	0	1	**1**	**0**	0	0	**0**
Pacific Herring	9	1	**10**	**0**	9	3	**12**
Saffron Cod	0	35	**35**	**0**	0	0	**0**
Starry Flounder	1	0	**1**	**0**	1	1	**2**
Sculpin	10	3	**13**	**5**	26	25	**51**
Total	26	66	**92**	**26**	45	40	**85**

Dominant species varied between sites (Table 3.2-6). Saffron cod was the dominant species by number for the shoal habitat in Roberts Bay, making up 38% of all catches. Species of secondary importance included Greenland cod, Arctic char, sculpin, Pacific herring, lake trout, starry flounder and

ninespine stickleback, in descending catch frequency. In the Reference Bay, sculpin (60%) dominated followed by Arctic char, pacific herring, Greenland cod, starry flounder and Arctic flounder, in descending catch frequency. Along the jetty, Greenland cod (50%) dominated the catch followed by Arctic char, sculpin, Arctic flounder and lake trout.

Catch varied considerably between sampling periods in Roberts Bay. In early-August, a total of 26 fish from five species were captured (Table 3.2-6; Figure 3.2-8). Sculpin (38%) and Pacific herring (35%) were the dominant catch. In late-August, a total of 66 fish from six species were captured with saffron cod making up the majority of the count (53%). This fish species was only captured at this location during the late-August sampling period, specifically on August 27, 2009. The majority (n=32) were captured in one gillnet set (Appendix 3.2-5).

Similar to Roberts Bay, sculpin (58%) and Pacific herring (20%) were the dominant species captured during the early-August sampling period in the Reference Bay (Table 3.2-6; Figure 3.2-8). While dominance shifted in Roberts Bay, sculpin (63%) continued to dominate the catch in the Reference Bay during the late-August sampling period.

With the exception of the school of saffron cod captured in late-August from the shoals of Roberts Bay, catch along the constructed habitat of the jetty was similar to that of the shoals. Greenland cod (50%), Arctic char (23%) and sculpin (19%) made up the dominant catch. Lake trout and Arctic flounder were also captured in single specimens.

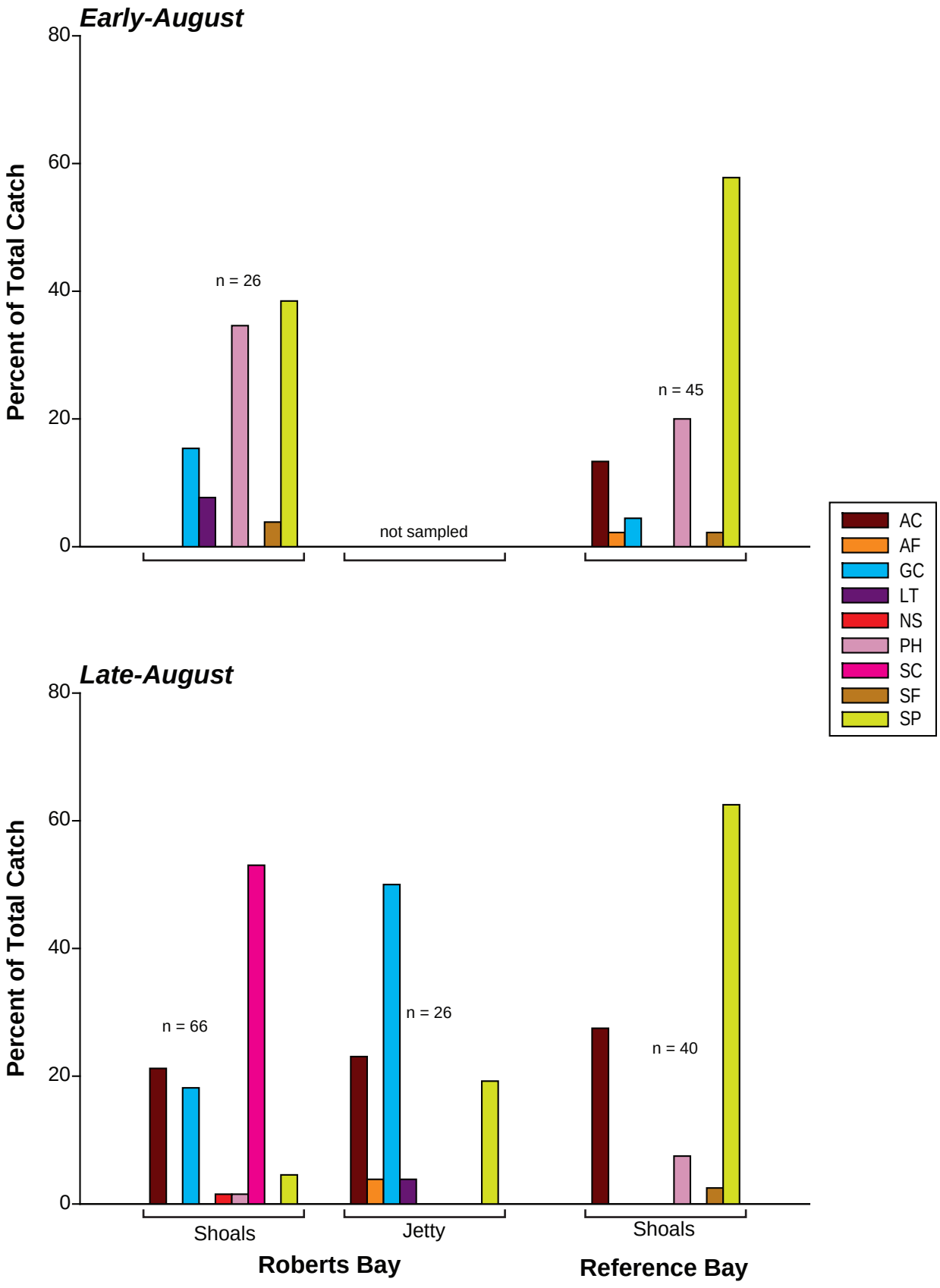
3.2.3.2 Catch-per-Unit-Effort

Tables 3.2-7 to 3.2-11 present summary effort and catch statistics for all sites sampled in Roberts Bay and the Reference Bay.

Floating Gillnets

The total number of floating gillnet sets at each site in 2009 ranged from three to six sets with total effort ranging from four hours to 12.25 hours, depending on the sampling period (Table 3.2-7). A total of 34 fish of five species were caught with floating gillnets in Roberts Bay and 35 fish from four species from floating gillnets set in the Reference Bay. Generally, Arctic char were captured in floating gillnet sets at all sampling locations during both sampling periods. Nets set in and around the compensation shoals of Roberts Bay during early-August captured the most species with the least amount of effort, though there was no difference with respect to the total number of fish captured in floating gillnets between the two shoal sites during that time.

Floating gillnet CPUE showed slight variation between the shoals in Roberts Bay and the shoals in the Reference Bay for both early and late-August sampling (Figure 3.2-9). In early August, sculpin and Pacific herring were the two fish species with the highest CPUE in both Roberts Bay (sculpin: 0.80 fish/100 m^2 of net/hr and Pacific herring: 0.57 fish/100 m^2 of net/hr) and the Reference Bay (sculpin: 0.57 fish/100 m^2 of net/hr and Pacific herring: 1.03 fish/100 m^2 of net/hr). In late-August, Arctic char dominated the floating gillnet catch for all three sites with a CPUE of 0.30 fish/100 m^2 of net/hr, 0.51 fish/100 m^2 of net/hr and 0.38 fish/100 m^2 of net/hr for Roberts Bay shoals, jetty and Reference Bay shoals, respectively. Sculpin and Pacific herring continued to be captured with floating gillnets in the Reference Bay; none were captured in Roberts Bay.



Note: AC=Arctic char; AF=Arctic flounder; GC=Greenland cod; LT=Lake trout; NS=Ninespine stickleback; PH=Pacific herring; SC=Saffron Cod; SF=Starry flounder; SP = Sculpin (Myoxocephalus sp.).
n = total number of fish.

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Percent Composition of Fish Species Captured from Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-8

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Table 3.2-7. Summary Statistics of Floating Gillnet Effort, Catch and CPUE for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

					Total Species Catch										Mean CPUE (fish/100 m²/hr)															
		Sampling	Number Gillnets	Total Effort										All	AC		AF		GC		LT		NS		PH		SC		SF		SP		All Species	
Location	Site	Period	Set	(hrs)	AC	AF	GC	LT	NS	PH	SC	SF	SP	Species	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Roberts Bay	Shoals	EA	4	4.00	1	0	2	2	0	5	0	0	7	17	0.11	0.11	-	-	0.23	0.23	0.23	0.13	-	-	0.57	0.57	-	-	-	-	0.80	0.66	1.94	0.90
Roberts Bay	Shoals	LA	6	12.25	9	0	1	0	0	0	0	0	0	10	0.30	0.15	-	-	0.04	0.04	-	-	-	-	-	-	-	-	-	-	-	-	0.34	0.16
Roberts Bay	Jetty	LA	3	5.23	7	0	0	0	0	0	0	0	0	7	0.51	0.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.51	0.33
Reference Bay	Shoals	EA	4	4.00	2	1	0	0	0	9	0	0	5	17	0.23	0.13	0.11	0.11	-	-	-	-	-	-	1.03	0.75	-	-	-	-	0.57	0.29	1.94	1.24
Reference Bay	Shoals	LA	4	9.37	9	0	0	0	0	3	0	0	6	18	0.38	0.15	-	-	-	-	-	-	-	-	0.21	0.21	-	-	-	-	0.26	0.11	0.85	0.12

EA = early-August; LA = late-August.
AC = Arctic char; AF = Arctic flounder; GC = Greenland cod; LT = Lake trout; NS = Ninespine stickleback; PH = Pacific herring; SC = Saffron cod; SF = Starry flounder; SP = Sculpin (Myoxocephalus sp.).
SE = Standard error.
Dashes indicate no data available.

Table 3.2-8. Summary Statistics of Sinking Gillnet Effort, Catch and CPUE for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

					Total Species Catch										Mean CPUE (fish/100 m²/hr)															
		Sampling	Number Gillnets	Total Effort										All	AC		AF		GC		LT		NS		PH		SC		SF		SP		All Species	
Location	Site	Period	Set	(hrs)	AC	AF	GC	LT	NS	PH	SC	SF	SP	Species	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Roberts Bay	Shoals	EA	4	4.00	0	0	2	0	0	5	0	1	1	9	-	-	-	-	0.23	0.13	-	-	-	-	0.57	0.22	-	-	0.11	0.11	0.11	0.11	1.03	0.22
Roberts Bay	Shoals	LA	8	13.43	5	1	6	0	0	1	35	0	3	51	0.20	0.08	0.05	0.05	0.19	0.10	-	-	-	-	0.03	0.03	1.09	0.93	-	-	0.07	0.07	1.64	0.95
Roberts Bay	Jetty	LA	6	10.03	0	0	7	0	0	0	0	0	0	7	-	-	-	-	0.41	0.16	-	-	-	-	-	-	-	-	-	-	0.00	0.00	0.41	0.16
Reference Bay	Shoals	EA	4	4.00	4	0	0	0	0	2	0	1	11	18	0.46	0.32	-	-	-	-	-	-	-	-	0.23	0.23	-	-	0.11	0.11	1.26	0.57	2.06	0.88
Reference Bay	Shoals	LA	5	10.15	2	0	0	0	0	0	0	1	19	22	0.17	0.17	-	-	-	-	-	-	-	-	-	-	-	-	0.04	0.04	0.98	0.55	1.19	0.52

EA = early-August; LA = late-August.
AC = Arctic char; AF = Arctic flounder; GC = Greenland cod; LT = Lake trout; NS = Ninespine stickleback; PH = Pacific herring; SC = Saffron cod; SF = Starry flounder; SP = Sculpin (Myoxocephalus sp.).
SE = Standard error.
Dashes indicate no data available.

Table 3.2-9. Summary Statistics of Long Line Effort, Catch and CPUE for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

					Total Species Catch											Mean CPUE (fish/#hooks/hr)																	
																AC		AF		GC		LT		NS		PH		SC		SF		SP		All Species	
Location	Site	Sampling Period	Number Long Lines Set	Total Effort (hrs)	AC	AF	GC	LT	NS	PH	SC	SF	SP	All Species		Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Roberts Bay	Shoals	EA	4	12.67	0	0	1	0	0	0	0	0	0	1		-	-	-	-	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-	-	0.10	0.10
Roberts Bay	Shoals	LA	4	12.08	0	0	5	0	0	0	0	0	0	5		-	-	-	-	0.50	0.29	-	-	-	-	-	-	-	-	-	-	-	-	0.50	0.29
Roberts Bay	Jetty	LA	3	6.05	0	0	6	0	0	0	0	0	0	6		-	-	-	-	0.74	0.37	-	-	-	-	-	-	-	-	-	-	-	-	0.74	0.37
Reference Bay	Shoals	EA	4	11.75	0	0	2	0	0	0	0	0	0	2		-	-	-	-	0.38	0.38	-	-	-	-	-	-	-	-	-	-	-	-	0.38	0.38
Reference Bay	Shoals	LA	4	10.90	0	0	0	0	0	0	0	0	0	0		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

EA = early-August; LA = late-August.
AC = Arctic char; AF = Arctic flounder; GC = Greenland cod; LT = Lake trout; NS = Ninespine stickleback; PH = Pacific herring; SC = Saffron cod; SF = Starry flounder; SP = Sculpin (Myoxocephalus sp.).
SE = Standard error.
Dashes indicate no data available.

Table 3.2-10. Summary Statistics of Minnow Trap Effort, Catch and CPUE for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

					Total Species Catch											Mean CPUE (fish/trap/24 hrs)																	
																AC		AF		GC		LT		NS		PH		SC		SF		SP		All Species	
Location	Site	Sampling Period	Number of Traps Set	Total Effort (hrs)	AC	AF	GC	LT	NS	PH	SC	SF	SP	All Species		Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Roberts Bay	Shoals	EA	40	872.90	0	0	0	0	0	0	0	0	1	1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	0.02	0.02	0.02
Roberts Bay	Shoals	LA	40	961.77	0	0	0	0	1	0	0	0	0	1		-	-	-	-	-	-	-	-	0.03	0.03	-	-	-	-	-	-	-	-	0.03	0.03
Roberts Bay	Jetty	LA	20	413.20	0	0	0	0	0	0	0	0	6	6		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.28	0.18	0.28	0.18
Reference Bay	Shoals	EA	40	920.03	0	0	0	0	0	0	0	0	9	9		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.22	0.08	0.22	0.08
Reference Bay	Shoals	LA	20	487.80	0	0	0	0	0	0	0	0	2	2		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.10	0.07	0.10	0.07

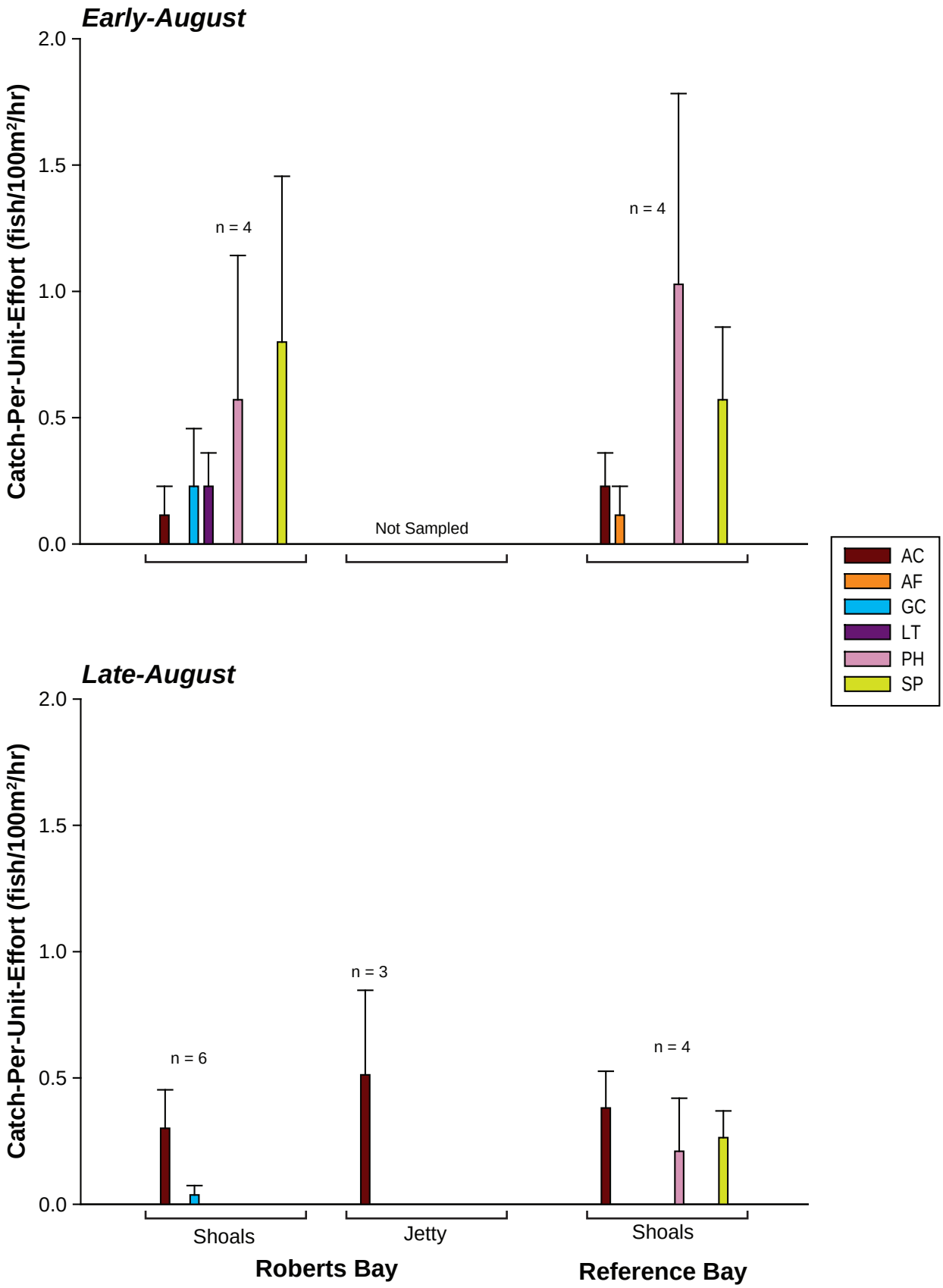
EA = early-August; LA = late-August.
AC = Arctic char; AF = Arctic flounder; GC = Greenland cod; LT = Lake trout; NS = Ninespine stickleback; PH = Pacific herring; SC = Saffron cod; SF = Starry flounder; SP = Sculpin (Myoxocephalus sp.).
SE = Standard error.
Dashes indicate no data available.

Table 3.2-11. Summary Statistics of Crab Trap Effort, Catch and CPUE for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Location	Site	Sampling Period	Number of Traps Set	Total Effort (hrs)	Total Species Catch									
					AC	AF	GC	LT	NS	PH	SC	SF	SP	All Species
Roberts Bay	Shoals	EA	11	213.00	0	0	0	0	0	0	0	0	1	1
Roberts Bay	Shoals	LA	12	289.82	0	0	0	0	0	0	0	0	0	0
Roberts Bay	Jetty	LA	10	202.58	0	0	0	0	0	0	0	0	0	0
Reference Bay	Shoals	EA	12	306.00	0	0	0	0	0	0	0	0	2	2
Reference Bay	Shoals	LA	10	241.05	0	0	0	0	0	0	0	0	0	0

Location	Site	Mean CPUE (fish/trap/24 hrs)																	
		AC		AF		GC		LT		NS		PH		SC		SF		SP		All Species	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Roberts Bay	Shoals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.09	0.09	0.09	0.09
Roberts Bay	Shoals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Roberts Bay	Jetty	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reference Bay	Shoals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.18	0.12	0.18	0.12
Reference Bay	Shoals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

EA = early-August; LA = late-August.
AC = Arctic char; AF = Arctic flounder; GC = Greenland cod; LT = Lake trout; NS = Ninespine stickleback; PH = Pacific herring; SC = Saffron cod; SF = Starry flounder; SP = Sculpin (Myoxocephalus sp.).
SE = Standard error.
Dashes indicate no data available.



Note: AC=Arctic char; AF=Arctic flounder; SP=Sculpin (Myoxocephalus sp.); GC=Greenland cod; LT=Lake trout; PH=Pacific herring.
Error bars represent one standard error of the mean.
n = total number of nets set.

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Average Catch-per-Unit-Effort of Fish Captured in Floating Gillnets in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-9

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Overall, average CPUE for all fish species captured in floating gillnets was identical for both Roberts Bay and the Reference Bay during the early August sampling period. In late-August, floating gillnets set in the Reference Bay captured almost three times more fish than the shoals of Roberts Bay. This difference in the late-August sampling period is most notably due to the continued presence of sculpin and Pacific herring in the Reference Bay.

Sinking Gillnets

The total number of sinking gillnets set at each site in 2009 ranged from four to eight sets with total effort ranging from four hours to 13.43 hours, depending on the sampling period (Table 3.2-8). A total of 67 fish of seven species were caught with sinking gillnets in Roberts Bay and 40 fish from four species from sinking gillnets set in the Reference Bay. Species dominance varied between sites and, for Roberts Bay, between sampling periods. Nets set in and around the compensation shoals of Roberts Bay during late-August captured the most fish in total, namely due to a school of saffron cod (n = 32) that were captured in one set.

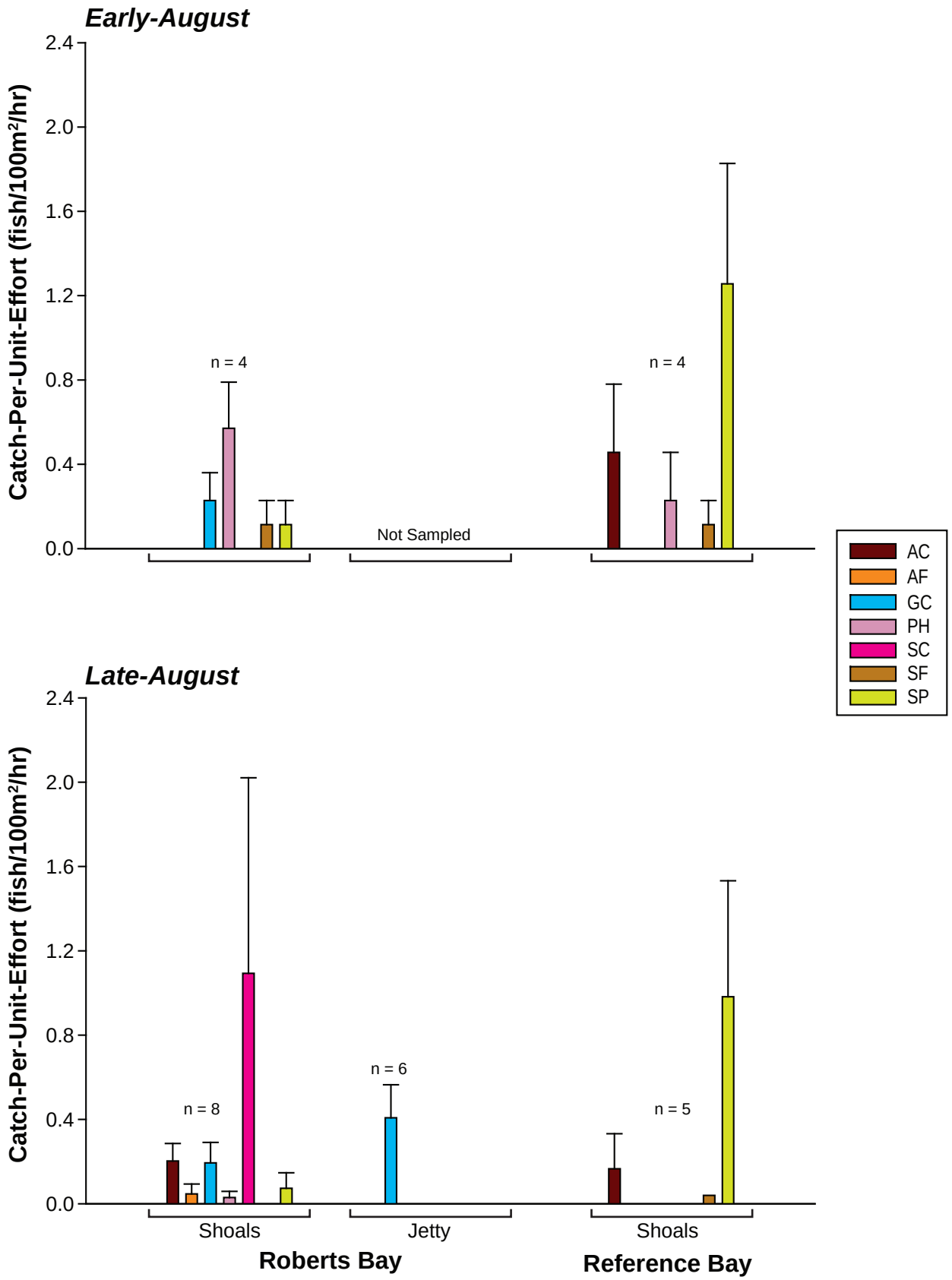
In early August, Pacific herring had the highest average sinking gillnet CPUE for the shoals in Roberts Bay (0.57 fish/100 m^2 of net/hr) (Figure 3.2-10). During that same sampling period, sculpin dominated CPUE in the Reference Bay (1.26 fish/100 m^2 of net/hr), followed by Arctic char (0.46 fish/100 m^2 of net/hr). During the late-August sampling period, the highest average sinking gillnet CPUE was saffron cod for the shoals in Roberts Bay (1.09 fish/100 m^2 of net/hr) and Greenland cod for the jetty (0.41 fish/100 m^2 of net/hr). As in early-August, sculpin continued to have the highest CPUE in the Reference Bay during late-August sampling (0.98 fish/100 m^2 of net/hr). In both Roberts Bay and the Reference Bay, Arctic char followed the above-noted species with average CPUE of 0.20 fish/100 m^2 of net/hr and 0.17 fish/100 m^2 of net/hr, respectively.

Overall, average CPUE for all fish species captured in sinking gillnets varied for both Roberts Bay and the Reference Bay (Table 3.2-8). The early-August sampling of fish in the Reference Bay using sinking gillnets had the highest CPUE (2.06 fish/100 m^2 of net/hr), two times more fish than that captured with sinking gillnets in Roberts Bay during the same sampling period. Roberts Bay dominated the average CPUE for all fish species during the late August sampling period (1.64 fish/100 m^2 of net/hr), namely due to the school of saffron cod that were captured in only that location.

Long Lines

The total number of long lines set at each site in 2009 ranged from three to four lines with total effort ranging from six hours to 12.67 hours, depending on the sampling period (Table 3.2-9). Only Greenland cod were captured using the long line technique; 12 fish in Roberts Bay and only two in the Reference Bay.

Average CPUE for Greenland cod captured with long lines varied between sites and sampling periods (Figure 3.2-11). In early August, the Reference Bay had the highest Greenland cod CPUE (0.38 fish/100 m^2 of net/hr) relative to the compensation shoals in Roberts Bay (0.10 fish/100 m^2 of net/hr). A shift was observed during late-August sampling between shoals in Roberts Bay and the Reference Bay. Average Greenland cod CPUE in Roberts Bay was 0.74 fish/100 m^2 of net/hr for the jetty and 0.50 fish/100 m^2 of net/hr for the shoals; no fish were captured in the Reference Bay.



Note: AC=Arctic char; AF=Arctic flounder; SP=Sculpin (Myoxocephalus sp.); GC=Greenland cod; PH=Pacific herring; SC=Saffron cod; SF=Starry flounder.
Error bars represent one standard error of the mean.
n = total number of nets set.

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Average Catch-per-Unit-Effort of Fish Captured in Sinking Gillnets in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-10

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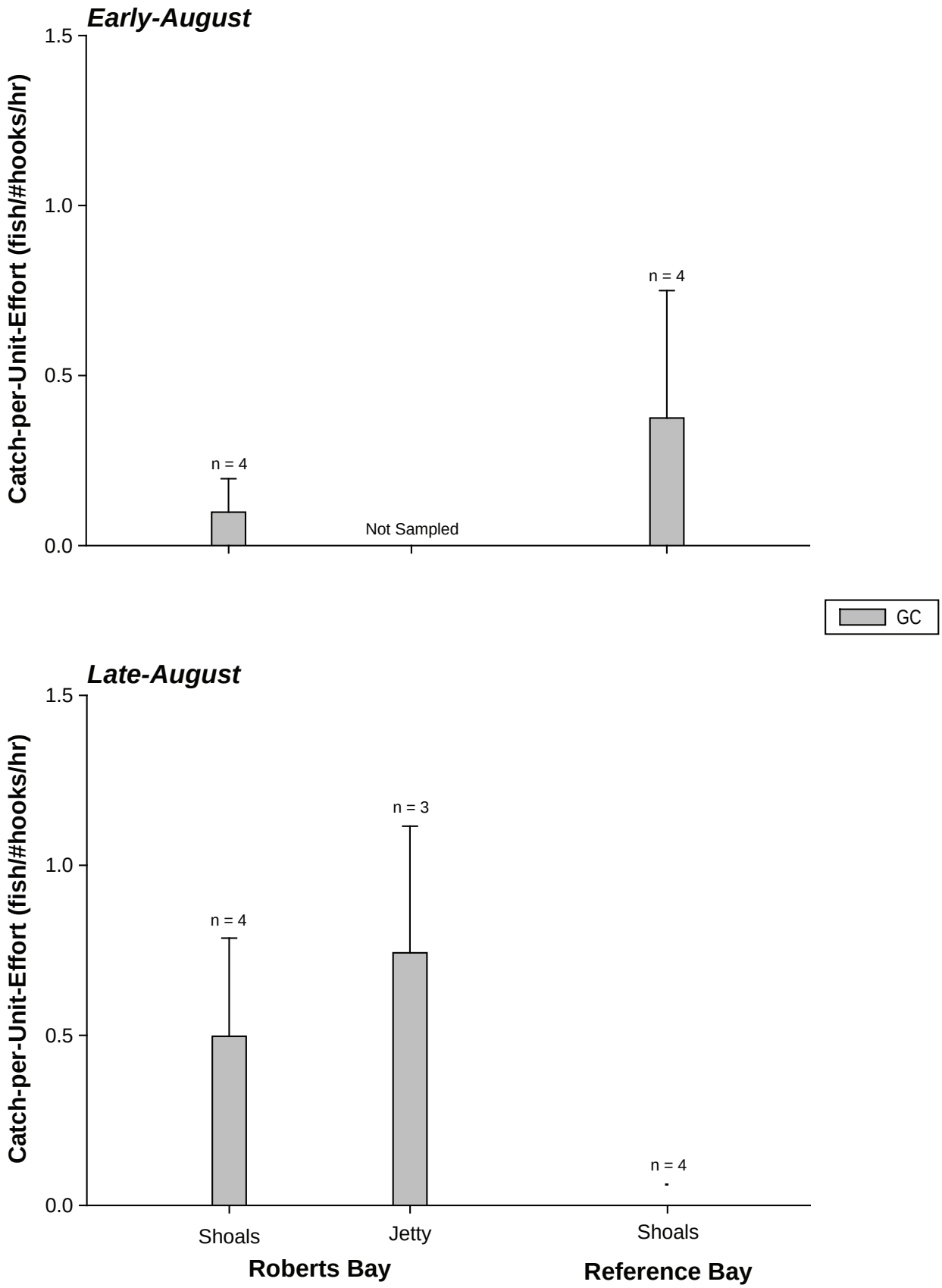

Note: GC=Greenland cod.
Error bars represent one standard error of the mean.
n = total number of long lines set.

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Average Catch-per-Unit-Effort of Fish Captured on Long Lines in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-11

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Minnow Traps

Total number of minnow traps set at each site ranged from 20 to 40 traps with total effort ranging from 413 hours at the jetty in Roberts Bay to 961.77 hours at the Roberts Bay shoals (Table 3.2-10). Generally, sculpin were the most dominant fish species captured in the minnow traps. Using baited minnow traps, seven sculpin were captured in Roberts Bay and 11 in the Reference Bay. One ninespine stickleback was captured during the late-August sampling period on the shoals of Roberts Bay.

In early-August, average CPUE of sculpin was highest in the Reference Bay (0.22 fish/100 m^2 of net/24 hrs) with over ten times more fish captured per hour compared to Roberts Bay (0.02 fish/100 m^2 of net/24 hrs) (Figure 3.2-12). In late-August, the highest average minnow trap CPUE was for sculpin captured on the jetty of Roberts Bay (0.28 fish/100 m^2 of net/24 hrs), followed by the Reference Bay shoals (0.10 fish/100 m^2 of net/24 hrs). Overall, the shoals of Roberts Bay had the lowest average minnow trap CPUE.

Crab Traps

Total number of crab traps set at each site ranged from 10 to 12 traps with total effort ranging from 213 hours to 306 hours (Table 3.2-11). Sculpin were the only fish captured in crab traps. A total of three sculpin were captured during the early-August sampling period; no fish were captured in late-August. Average crab trap CPUE was 0.09 fish/100 m^2 of net/24 hrs for Roberts Bay and 0.18 fish/100 m^2 of net/24 hrs for the Reference Bay (Figure 3.2-13). No invertebrates were captured with crab traps.

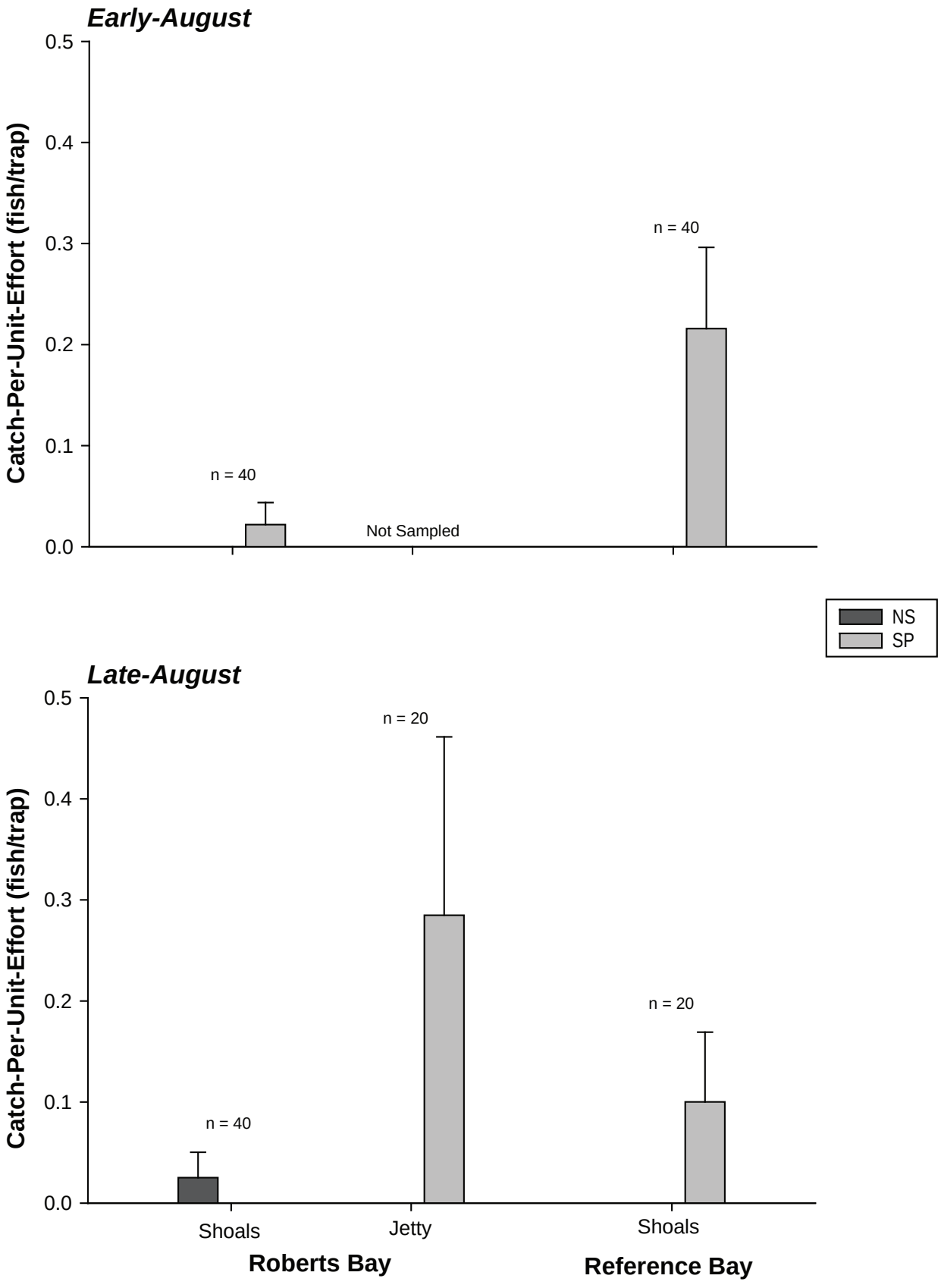
3.2.3.3 Length, Weight and Condition

Only data collected from fish captured in floating and sinking gillnets (combined) were used for analysis because of high abundance. All other sampling techniques (i.e., long line, minnow trap, crab trap) did not produce an adequate sample size. For comparison purposes, only fish species captured in both Roberts Bay and the Reference Bay were plotted. One specimen of Pacific herring (Field Sample #454) captured in the Reference Bay was removed from further analysis as it was identified as an outlier, likely due to a transcription error.

Table 3.2-12 and Table 3.2-13 summarize the length, weight and condition of all fish captured in floating and sinking gillnets from Roberts Bay and the Reference Bay.

The largest fish species captured in Roberts Bay was the Greenland cod, with a mean length of 439 mm and weight of 993 g (Table 3.2-12), followed by Arctic char with a mean length and weight of 336 mm and 473 g, respectively. In the Reference Bay, Arctic char were the largest fish species captured, having a mean length of 426 mm and mean weight of 1,123 g (Table 3.2-13).

Length-frequency distributions were plotted for Arctic char, sculpin and Pacific herring caught in both Roberts Bay and the Reference Bay (Figure 3.2-14 and Figure 3.2-15). Arctic char captured in Roberts Bay showed a unimodal distribution, with a dominant length class mode of 301–400 mm. In the Reference Bay, Arctic char showed a distinct separation of two size classes, 201–400 mm and 601–800 mm. The larger size class was made up of the six char specimens captured during the early-August sampling period (Appendix 3.2-9). Fish within the smaller length range were all captured during the late-August sampling period. Overall, the dominant modal size bin for the Reference Bay was 301–400 mm (Figure 3.2-14).



Note: SP=Sculpin (Myoxocephalus sp.); NS=Ninespine stickleback.
Error bars represent one standard error of the mean.
n = total number of traps set.

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Average Catch-per-Unit-Effort of Fish Captured in Minnow Traps in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-12

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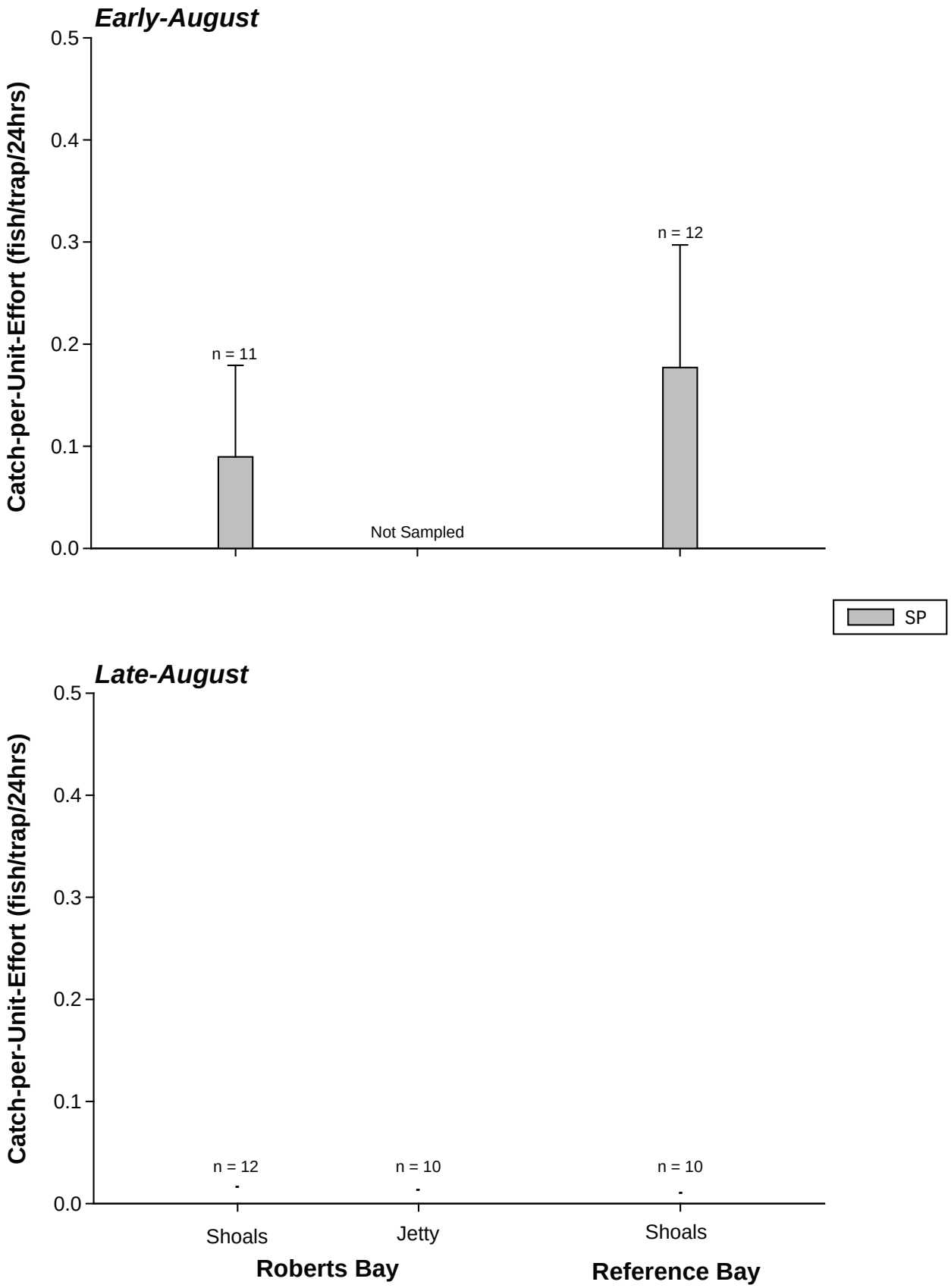

Note: SP=Sculpin (Myoxocephalus sp.).
Error bars represent one standard error of the mean.
n = total number of traps set.

Average Catch-per-Unit-Effort of Fish Captured in Crab Traps in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-13

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Table 3.2-12. Mean Length, Weight and Condition of Fish Captured in Gillnets from Roberts Bay, Hope Bay Belt Project, 2009

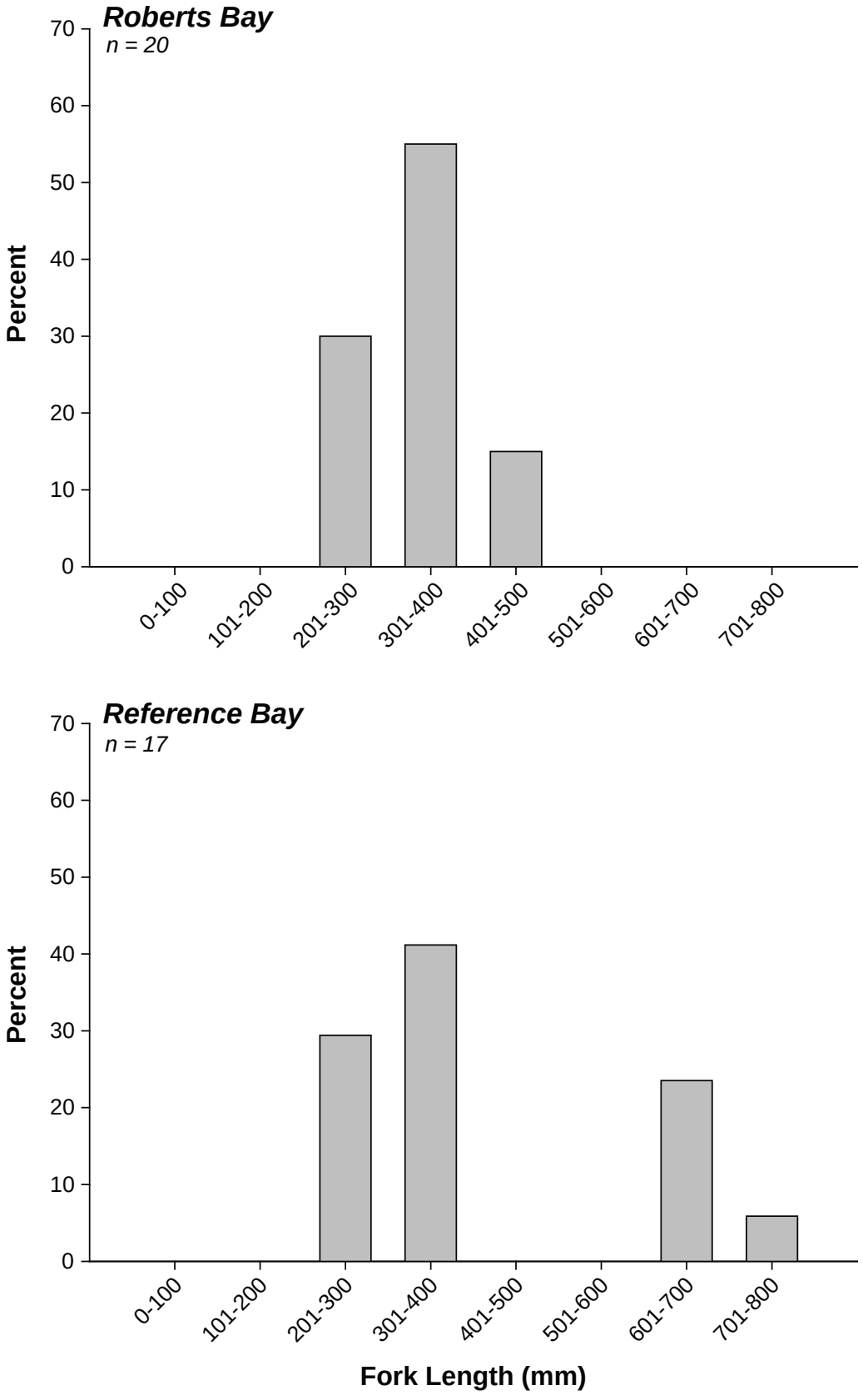
Species	Length (mm)					Weight (g)					Condition (g/mm³)				
	n	Mean	SE	Min	Max	n	Mean	SE	Min	Max	n	Mean	SE	Min	Max
AC	20	336	15	218	446	20	473	58	112	1,025	20	1.12	0.02	1.00	1.24
GC	17	439	9	341	509	17	993	75	388	1,632	17	1.13	0.03	0.98	1.40
PH	10	250	14	137	308	10	190	36	21	459	10	1.14	0.21	0.82	3.01
SC	35	292	5	223	362	35	186	8	70	357	35	0.74	0.03	0.60	1.76
SP	13	278	21	107	375	13	287	48	10	564	13	1.08	0.05	0.81	1.32

Note:
AC = Arctic char; GC = Greenland cod; PH = Pacific herring; SC = Saffron cod; SP = Sculpin (Myoxocephalus sp.).
SE = Standard error of the mean.

Table 3.2-13. Mean Length, Weight and Condition of Fish Captured in Gillnets from the Reference Bay, Hope Bay Belt Project, 2009

Species	Length (mm)					Weight (g)					Condition (g/mm³)				
	n	Mean	SE	Min	Max	n	Mean	SE	Min	Max	n	Mean	SE	Min	Max
AC	17	426	42	209	709	17	1,123	299	99	3,823	17	1.03	0.04	0.57	1.19
PH	11	273	6	250	304	11	196	14	142	286	11	0.95	0.03	0.86	1.19
SP	38	264	7	120	335	38	198	13	13	362	38	0.98	0.02	0.75	1.31

Note:
AC = Arctic char; PH = Pacific herring; SP = Sculpin (Myoxocephalus sp.).
SE = Standard error of the mean.



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Length-Frequency Distribution of Arctic Char Captured in Gillnets from Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-14

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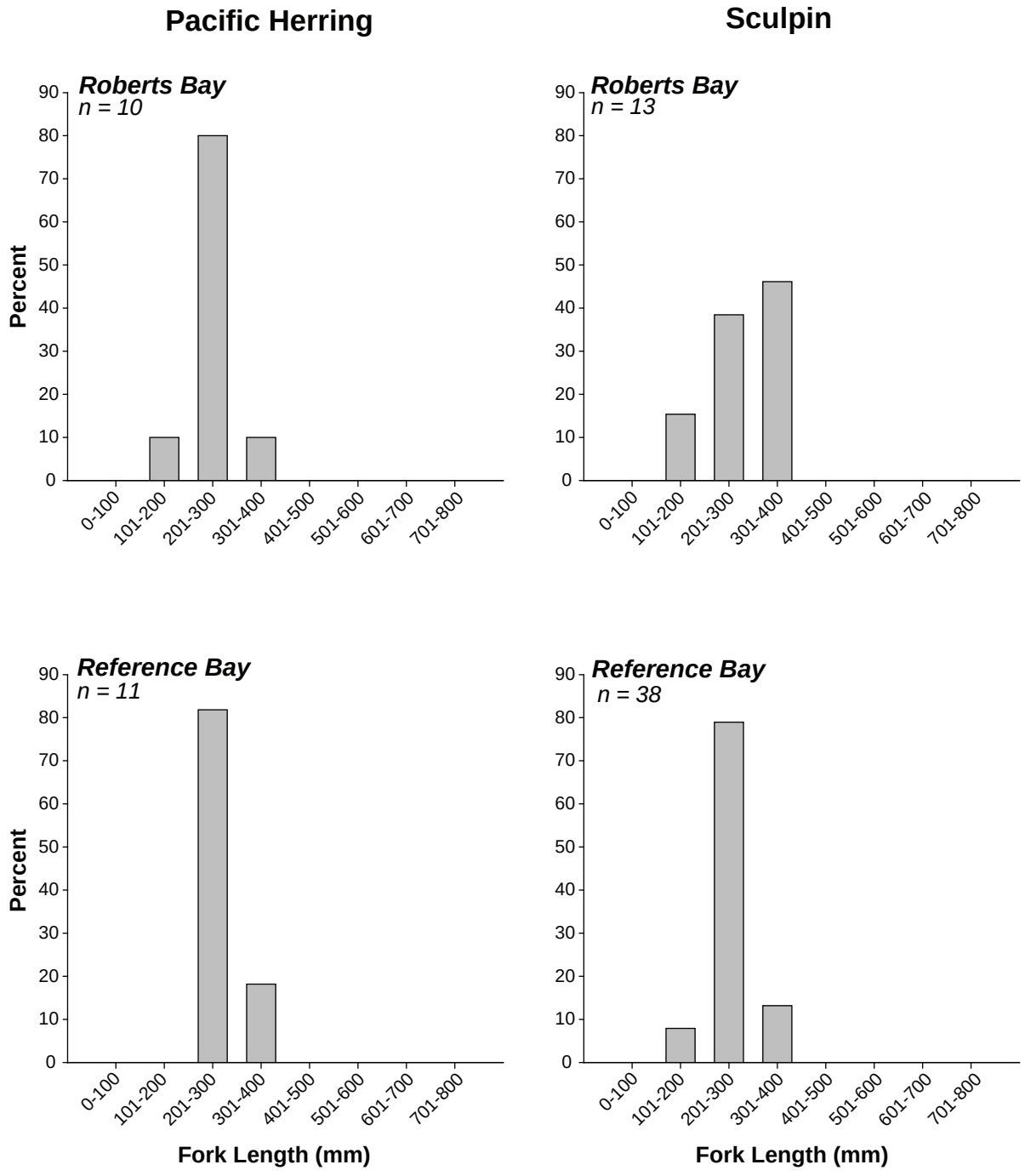

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Length-Frequency Distribution of Pacific Herring and Sculpin Captured in Gillnets from Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-15

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In Roberts Bay, Pacific herring ranged in length class from 101–400 mm with a dominant modal size bin of 201–300 mm (Figure 3.2-15). In the Reference Bay, Pacific herring had a narrower range of length classes (201–400 mm) but shared the same dominant modal size bin (201–300 mm) as Pacific herring captured in Roberts Bay.

Sculpin captured in Roberts Bay and the Reference Bay were similar with respect to length classes, ranging from 101–400 mm (Figure 3.2-15). The dominant length class mode in Roberts Bay (301–400 mm) was larger than that of fish captured in the Reference Bay (201–300 mm).

Weight-length regressions for Arctic char, Pacific herring and sculpin were conducted for fish captured in gillnets from Roberts Bay and the Reference Bay (Figures 3.2-16 to Figure 3.2-18). Regressions of weight-length data for both compensation and reference shoals were highly significant ($P \leq 0.001$) and explained between 98% and 99% of the variation in weight. The slope of regressions from these sites was close to the expected value of 3.0, typical for the length-weight geometry of fish.

Condition was calculated from length and weight data for all fish captured in Roberts Bay and the Reference Bay (Appendix 3.2-9). Table 3.2-12 and 3.2-13 present results for all fish captured in floating and sinking gillnets, combined. For comparison purposes, only fish species from both Roberts Bay and the Reference Bay were plotted (Figure 3.2-19).

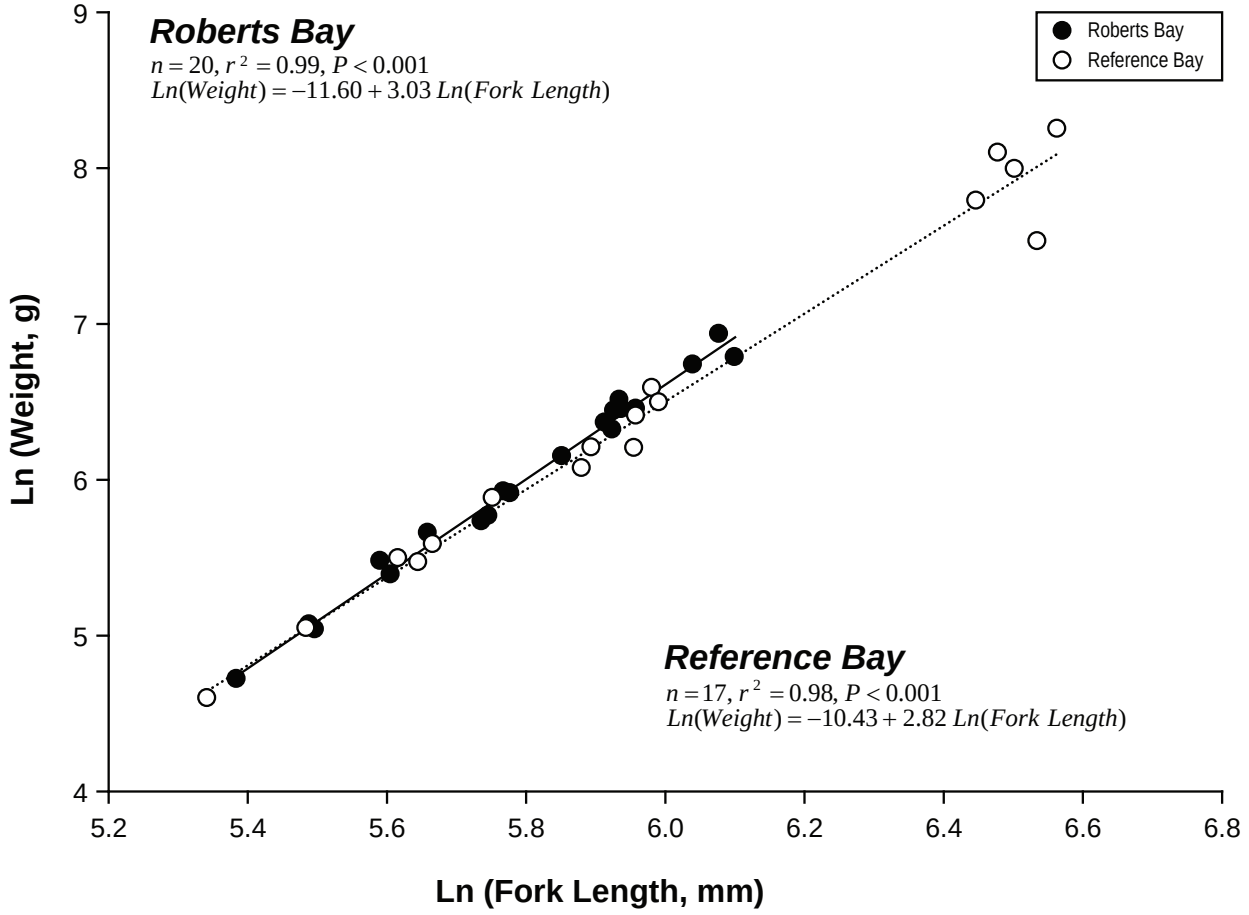
Mean condition of fish captured in gillnets from both Roberts Bay and the Reference Bay was close to the expected value of 1.0 g/mm^3 (Table 3.2-12 and 3.2-13). A comparison of fish condition between Roberts Bay and the Reference Bay indicated that there were significant differences in Arctic Char (ANOVA; $F_{35,0.05} = 6.287$, $P = 0.017$) and sculpin (ANOVA; $F_{49,\ 0.05} = 6.507$, $P = 0.014$) but not for Pacific herring (ANOVA; $F_{20,0.05} = 0.750$, $P = 0.397$) condition. Both Arctic char and sculpin were in significantly better condition in Roberts Bay relative to the Reference Bay ($P < 0.05$).

3.2.3.4 Age and Growth

Age data for all fish sampled for age analysis in Roberts Bay and the Reference Bay are presented in Appendix 3.2-9 and summarized in Table 3.2-14. Age data for fish sampled in the shoals and jetty of Roberts Bay were combined for statistical analysis. Length and age histograms were not generated for all individual fish populations due to insufficient sample size ($n < 5$).

Overall, lake trout were the oldest fish sampled in Roberts Bay, followed by Pacific herring (Table 3.2-14). In the Reference Bay, Pacific herring were the oldest fish species sampled. Arctic char sampled in Roberts Bay had a narrow age range of 3 to 6 years compared to the greater age range observed in the Reference Bay (3 to 11 years) (Table 3.2-14). An age-frequency distribution showed a dominant modal age class of 5 years for fish sampled in Roberts Bay and 4 years for fish sampled in the Reference Bay (Figure 3.2-20). There were no differences between the age of Arctic char sampled in Roberts Bay to those sampled in the Reference Bay (t-test; $P = 0.074$).

Pacific herring sampled in Roberts Bay averaged 9 years and ranged in age from 7 to 11 years (Table 3.2-14). In the Reference Bay, Pacific herring averaged 10 years and ranged in age from 7 to 15 years. An age-frequency distribution of Pacific herring sampled in Roberts Bay and the Reference Bay showed dominant age classes of 8 years and 10 years, respectively (Figure 3.2-21). There were no differences between the age of Pacific herring sampled in Roberts Bay to those sampled in the Reference Bay (t-test; $P = 0.166$).



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Weight-Length Regression for Arctic Char Captured in Gillnets from Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-16

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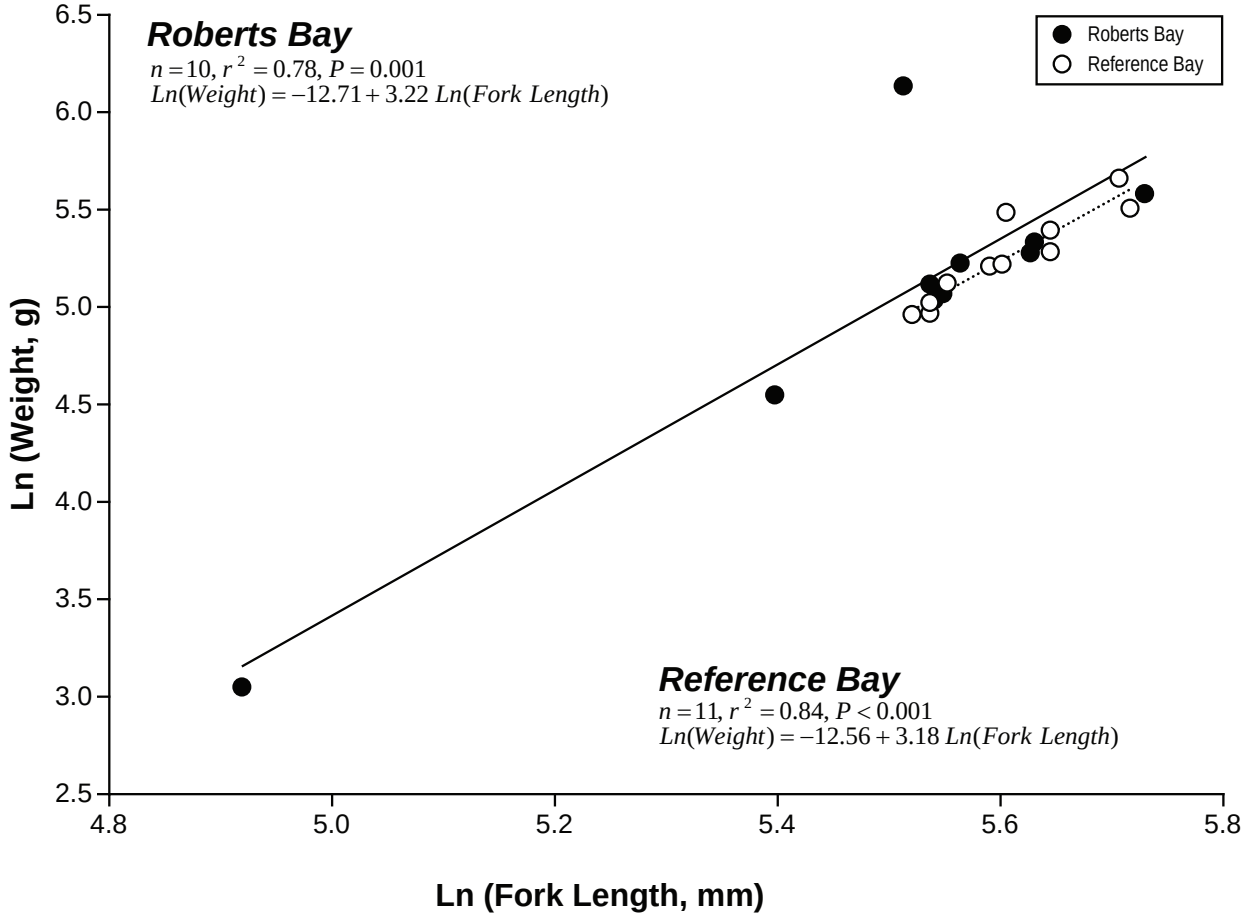

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Weight-Length Regression for Pacific Herring Captured in Gillnets from Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-17

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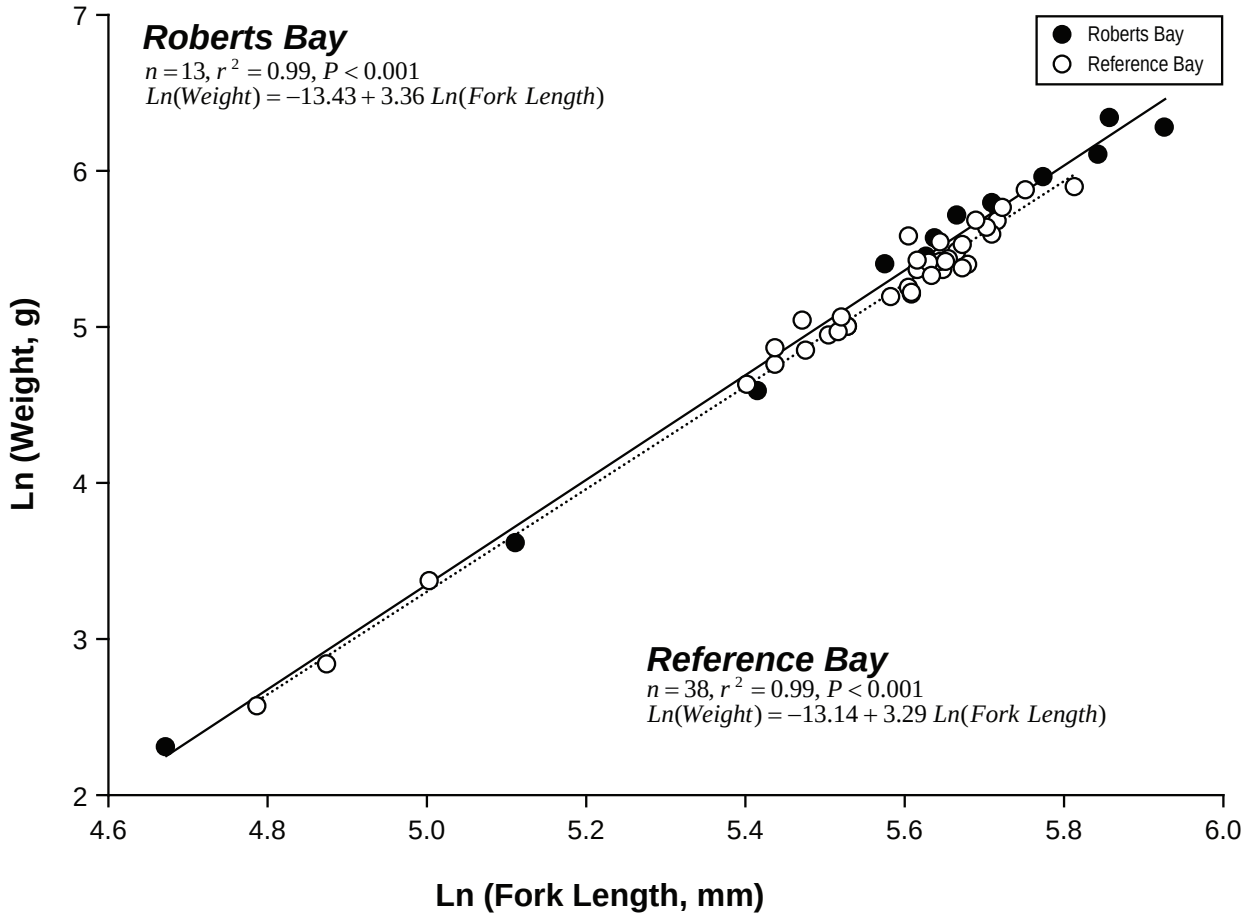

Weight-Length Regression for Sculpin Captured in Gillnets from Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-18

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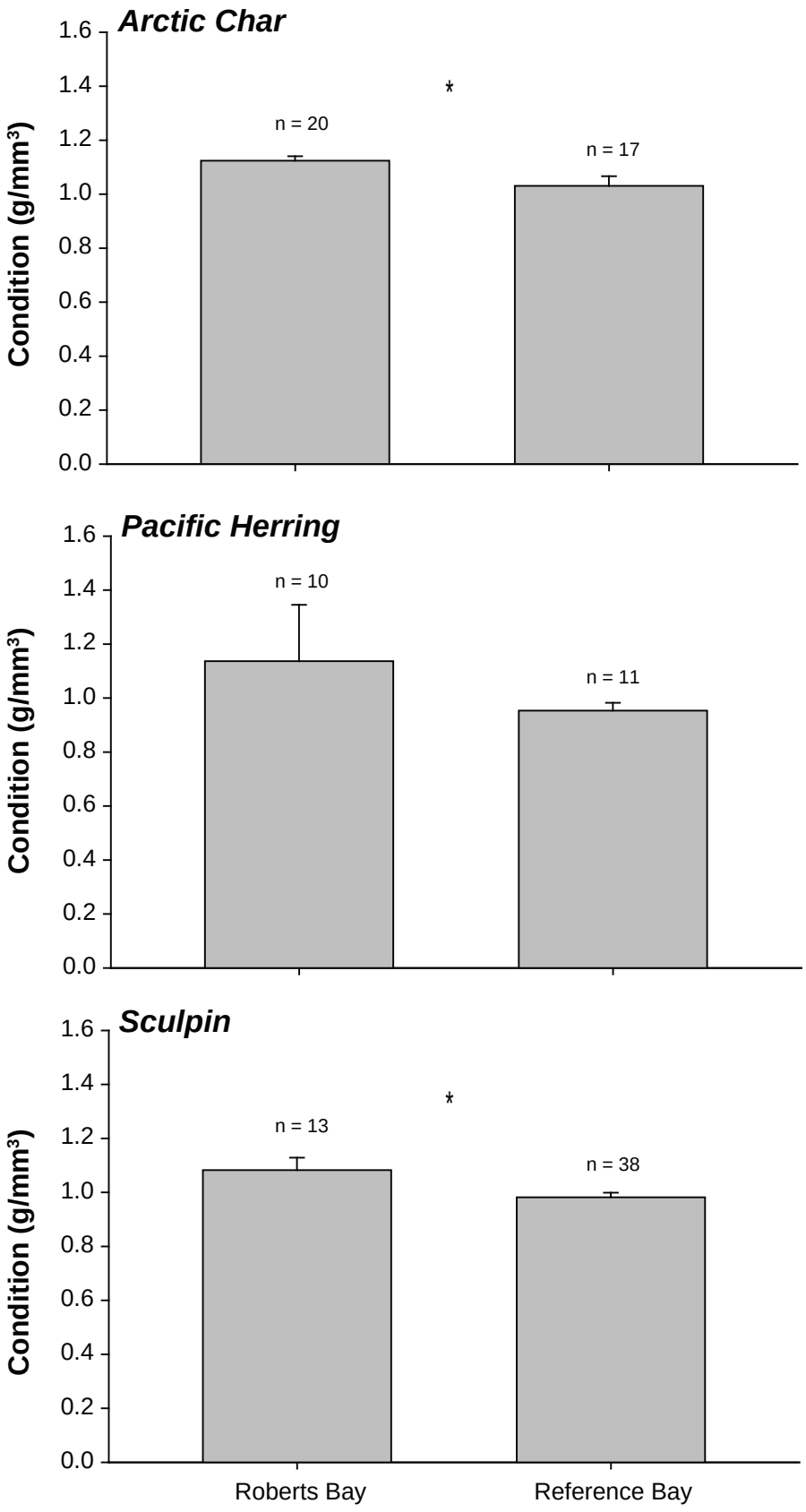

Note: Error bars represent one standard error of the mean.
Asterisk indicates statistical significance.

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Average Condition of Fish Captured in Gillnets from Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-19

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Table 3.2-14. Age of Fish Sampled in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Species	Location	Site	n	Age (years)			
				Mean	SE	Min	Max
Arctic char							
	Roberts Bay	Shoals	14	4	0	3	6
	Roberts Bay	Jetty	6	4	0	3	5
	Reference Bay	Shoals	17	6	1	3	11
Greenland cod							
	Roberts Bay	Shoals	4	5	1	4	6
	Roberts Bay	Jetty	1	3	-	-	-
	Reference Bay	Shoals	2	4	1	3	5
Lake trout							
	Roberts Bay	Shoals	2	10	2	8	12
	Roberts Bay	Jetty	1	18	-	-	-
	Reference Bay	Shoals	-	-	-	-	-
Pacific herring							
	Roberts Bay	Shoals	8	9	0	7	11
	Roberts Bay	Jetty	-	-	-	-	-
	Reference Bay	Shoals	12	10	1	7	15

Note:
SE = Standard error of the mean.

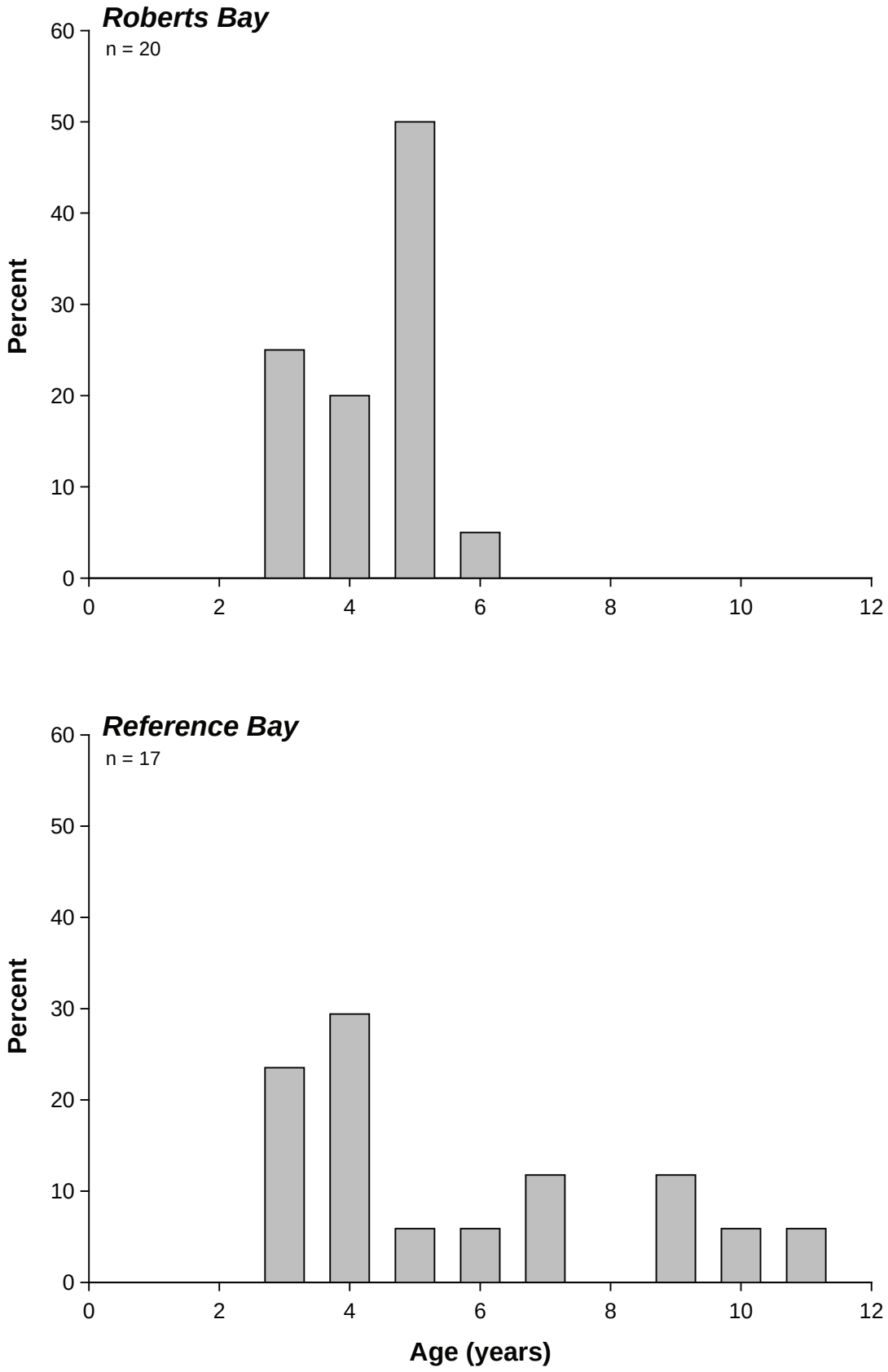
Von Bertalanffy growth models were fit to the age and length data of Arctic char and Pacific herring from Roberts Bay and the Reference Bay (Figure 3.2-22 and 3.2-23). Age explained between 62% and 87% of the variation in fish length for Arctic char and 9% to 58% of the variation in fish length for Pacific herring. Asymptotic lengths for Arctic char were 744 mm in Roberts Bay and 1,267 mm in the Reference Bay. Pacific herring showed asymptotic lengths of 303 mm and 278 mm for Roberts Bay and the Reference Bay, respectively.

3.2.4 Shoal Ecology

Snorkel surveys were conducted in Roberts Bay and the Reference Bay in early-August (August 5 and 9) and in late-August (August 23 and 24). The jetty was only assessed during the late-August survey. Snorkel survey data are presented in Appendix 3.2-10.

Both surveys were conducted during the day although weather conditions and visibility varied greatly between sampling periods. During early-August, weather was poor and visibility was low, approximately 2 m in Roberts Bay and 5 m in the Reference Bay. In late-August, weather conditions were good to excellent with calm waters and minimal turbidity. Visibility was approximately 8 m in Roberts Bay and 10 m in the Reference Bay. Shoals were clearly visible during both surveys, although visibility surrounding the shoals was minimal during the early-August survey (i.e., fish swimming away from shoal may not have been observed).

The structural stability of the shoals was visually assessed during snorkel surveys in Roberts Bay. By late-August 2009, rock material used to construct the compensation shoals had settled into place. There were no visual signs of rock instability as the sideslopes were intact and the substrate surrounding the shoals was free of fallen material. The jetty, specifically the toe of the jetty, showed signs of instability as rock material was being scoured away. Repairs to the jetty are in discussions with DFO.



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Age-Frequency Distributions of Arctic Char Sampled from Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-20

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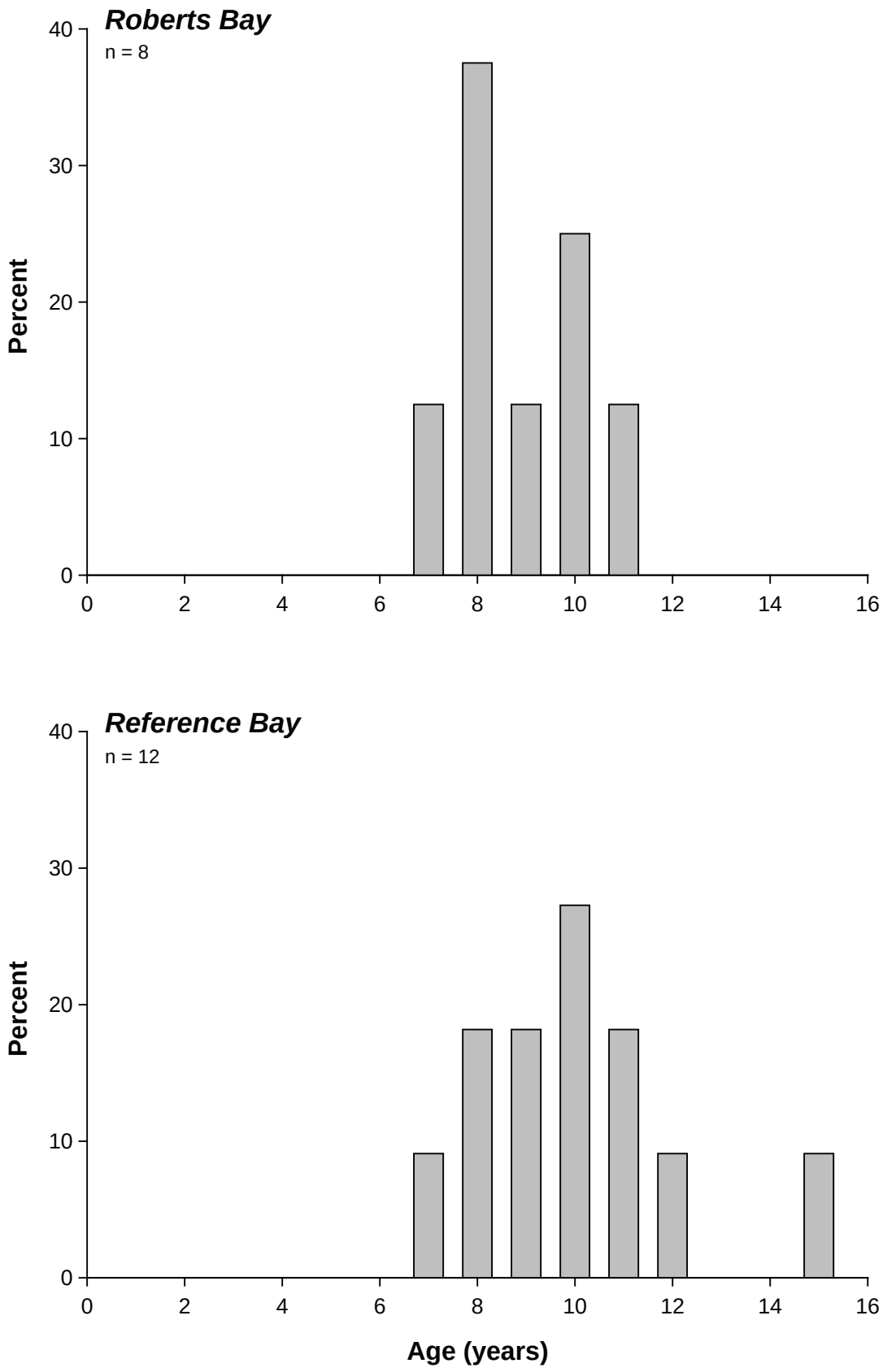

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Age-Frequency Distributions of Pacific Herring Sampled from Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-21

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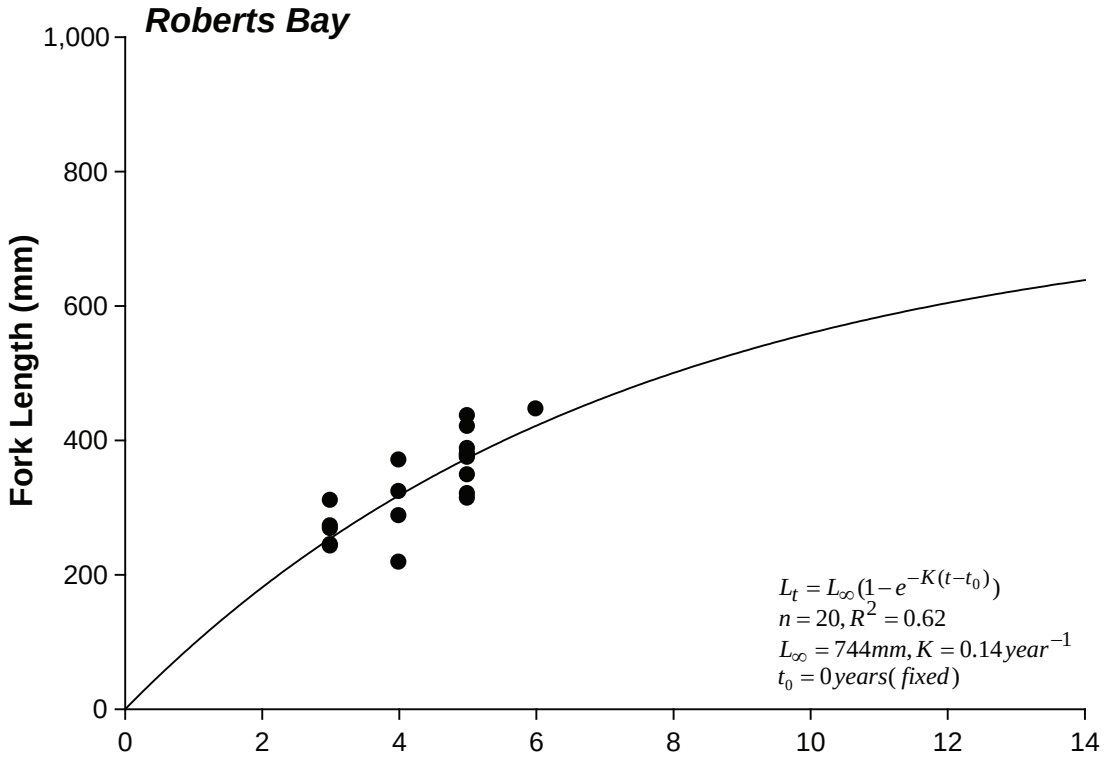
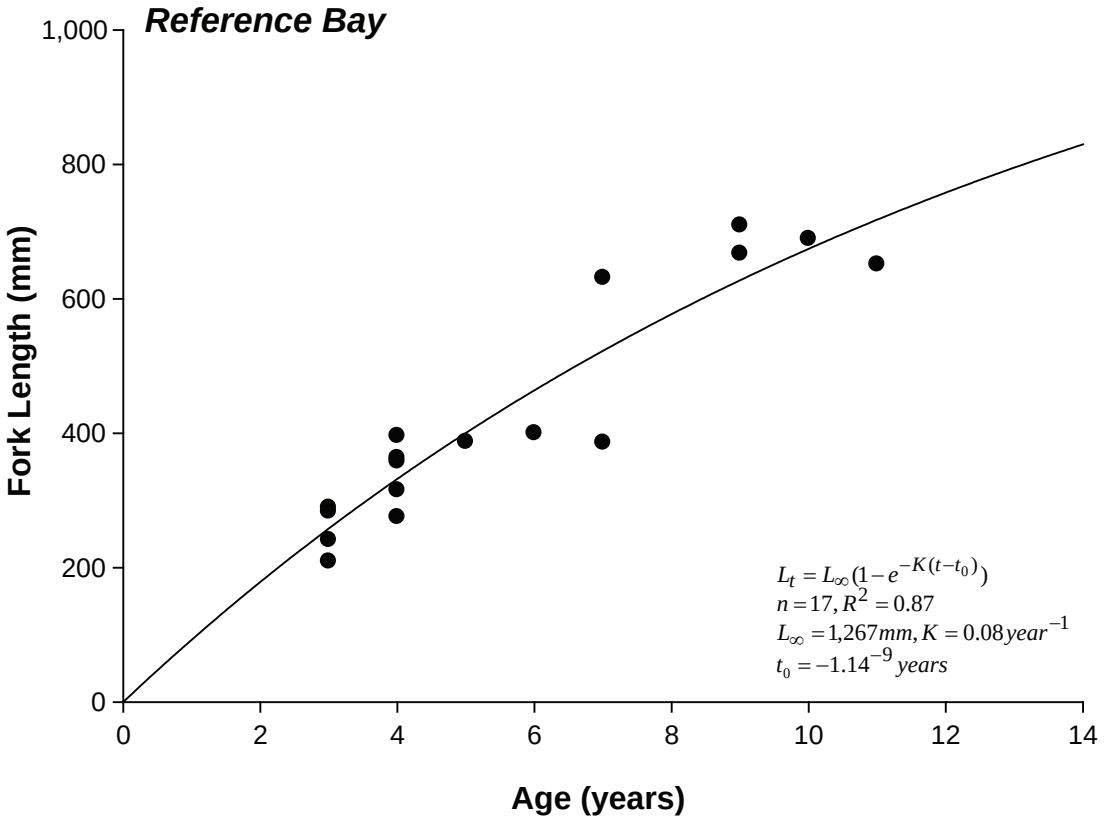


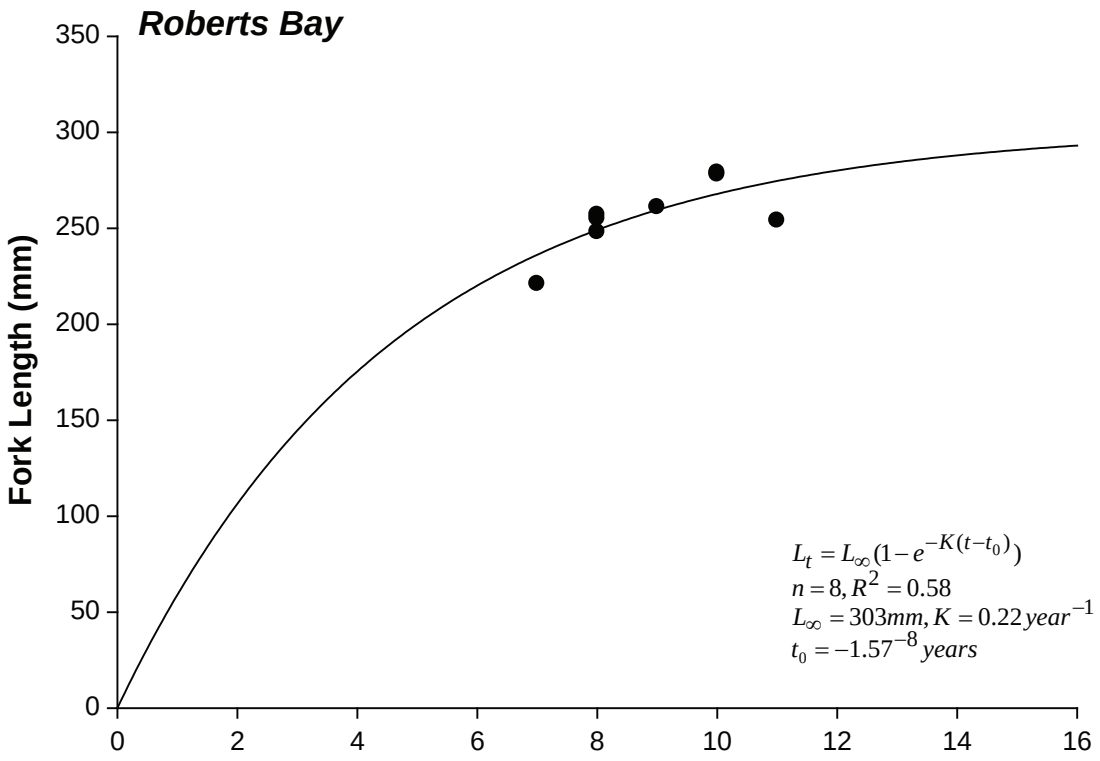


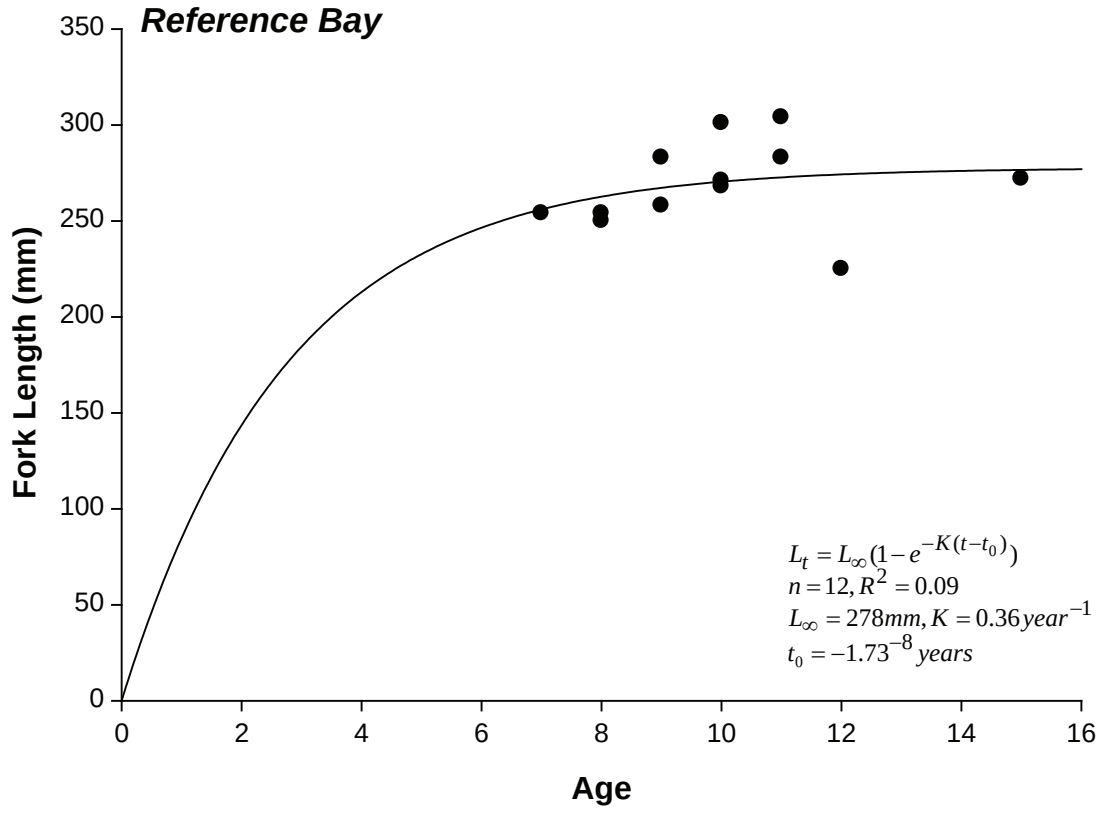
NEWMONT The Gold Company

Von Bertalanffy Growth Model for Arctic Char Sampled in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-22

Rescan Engineers & Scientists





NEWMONT The Gold Company

Von Bertalanffy Growth Model for Pacific Herring Sampled in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Figure 3.2-23

Rescan Engineers & Scientists

Overall, snorkel surveys conducted in Roberts Bay and the Reference Bay produced similar results with respect to organisms present (Table 3.2-15). The absence of organisms during the early-August survey of Roberts Bay may be due to visual limitations experienced during the survey as algae, invertebrates and fish were observed during the late-August survey conducted 18 days later.

Table 3.2-15. Summary of Organisms Observed during Snorkel Surveys in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

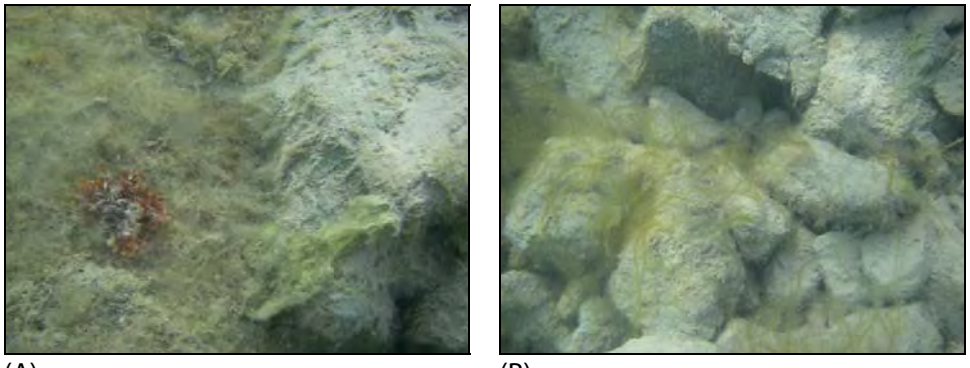
	Early-August		Late-August	
	Roberts Bay*	Reference Bay	Roberts Bay	Reference Bay
Algae	-	X	X	X
Invertebrates	-	X	X	X
Animals	-	X	X	X

Note:
**May have been a result of poor visibility.*

Various species of algae were identified to inhabit both Roberts Bay and the Reference Bay. Species included representatives from the Kingdom Plantae (Division Rhodophyta and Chlorophyta) and Kingdom Chromista (Order Phaeophyceae). In Roberts Bay, brown algae (*Halosiphon tomentosus*), red algae (*Phyllophora truncate*) and filamentous green algae (*Ulva* sp.*)* were identified (Plate 3.2-9). The most dominant algal species inhabiting the Reference Bay could not be identified from photographs although red, green and brown algae (*Fucus distichus*) were present (Plate 3.2-10).

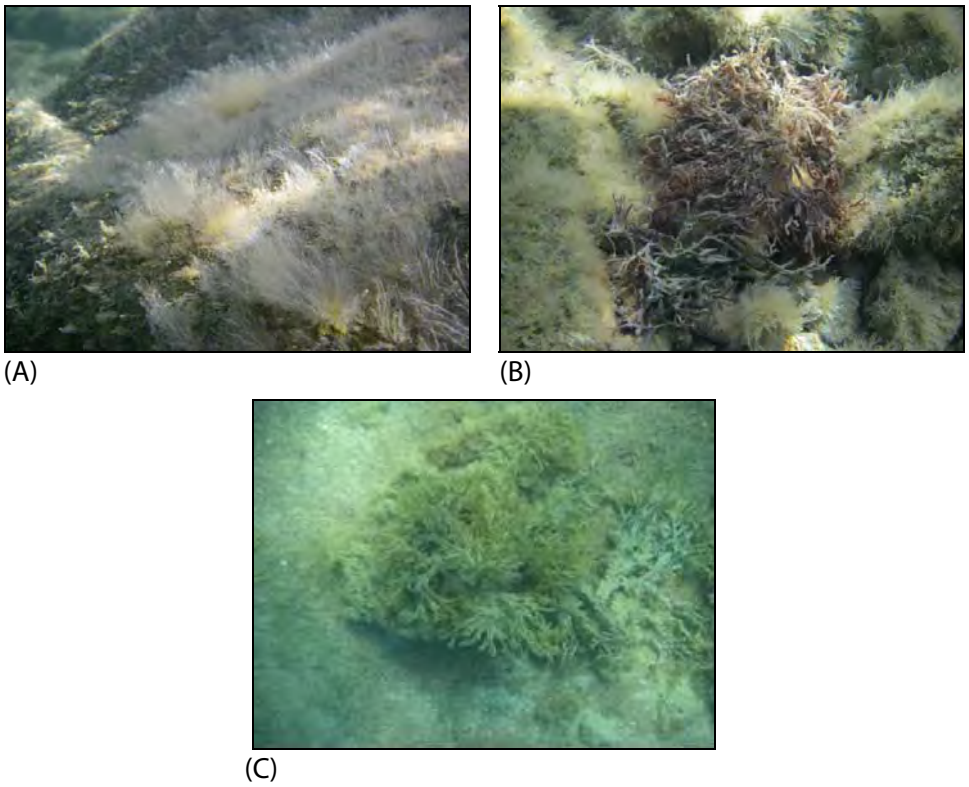
In the Reference Bay, algae were much more plentiful and diverse than those found on the compensation structures in Roberts Bay. As colonization has occurred for thousands of years, the diversity and abundance of algal life in the Reference Bay is to be expected. Surveys of Roberts Bay showed multiple algae species had established themselves on the compensation structures after only one year of having been in place.

Invertebrates species observed during snorkel surveys included bivalves, euphausiids and tunicates. Tunicates were the most abundant invertebrate species observed on the compensation shoals in Roberts Bay (Plate 3.2-11); euphausiids were the dominant invertebrate on reference shoals.



(A) (B)

Plate 3.2-9. Examples of (A) red, green and (B) brown algae seen on the rock shoals and jetty in Roberts Bay during the late-August snorkel survey, Hope Bay Belt Project, 2009.



(A) (B)

(C)

Plate 3.2-10. Examples of (A) unknown, (B) red and (C) brown algae seen on the shoals in the Reference Bay during the late-August snorkel survey, Hope Bay Belt Project, 2009.

Note that although jellyfish were not actively sampled, they were frequently observed in the waters of both Roberts Bay and the Reference Bay during late-August fisheries sampling and snorkel surveys; none were observed in early-August (Plate 3.2-12).

Adult, juvenile and young-of-the-year fish were observed during snorkel surveys at both the compensation and reference sites (Table 3.2-16). Arctic flounder, sculpin (*Myoxocephalus* sp.) and an unknown young-of-the-year fish species were present (Plates 3.2-13 and 3.2-14). Young-of-the-year fish (unknown species) were the most plentiful on compensation structures in Roberts Bay; none were observed in the Reference Bay. Their abundance shows that the structures are providing them with either shelter and/or a food source.

Table 3.2-16. Total Number of Fish Observed during Snorkel Surveys in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

		Unknown	Sculpin		Arctic Flounder	
Location	Site	Young-of-the-Year	Young-of-the-Year	Juveniles and Adults	Adults	Total
Roberts Bay	Shoals	120	2	1	0	123
Roberts Bay	Jetty	20	1	5	1	27
Reference Bay	Shoals	0	2	2	1	5

Note:
Juvenile and adult sculpin range from 100–350 mm fork length.

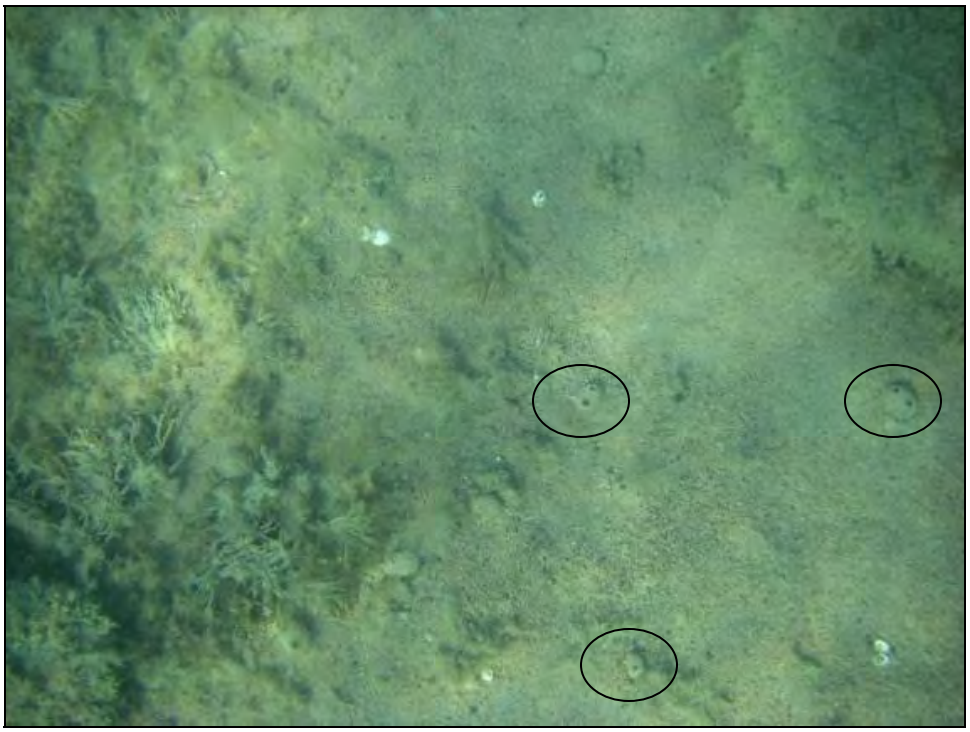


Plate 3.2-11. Tunicates (circled) seen at both Roberts Bay and the Reference Bay during the late-August snorkel surveys, Hope Bay Belt Project, 2009.

Plate 3.2-12. Jellyfish observed during snorkel survey of shoals in the Reference Bay, Hope Bay Belt Project, 2009.

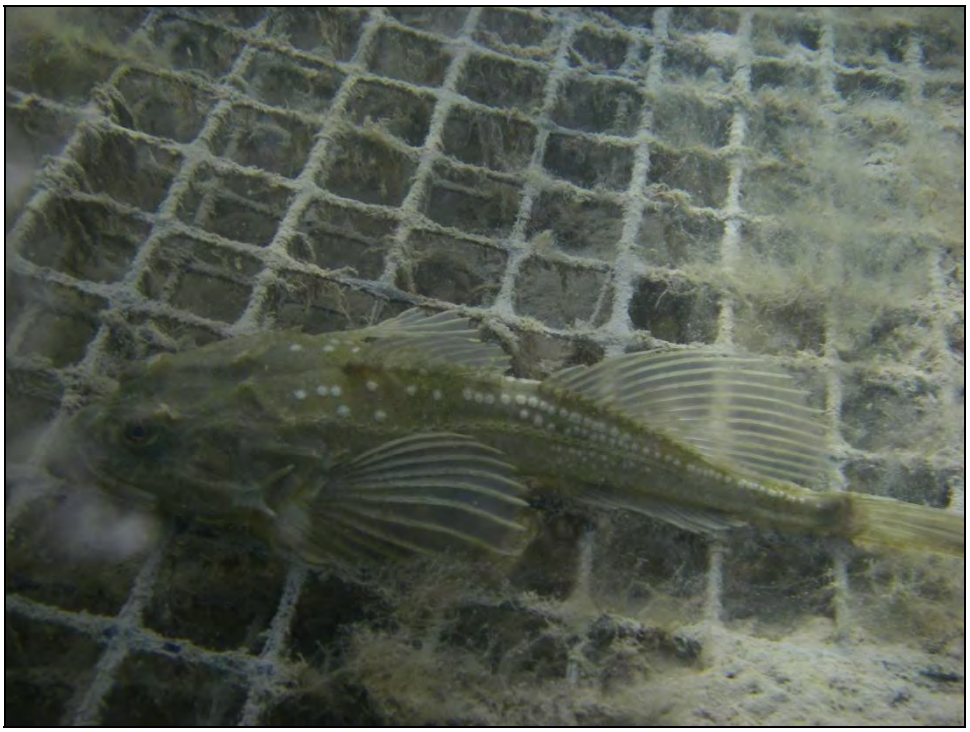
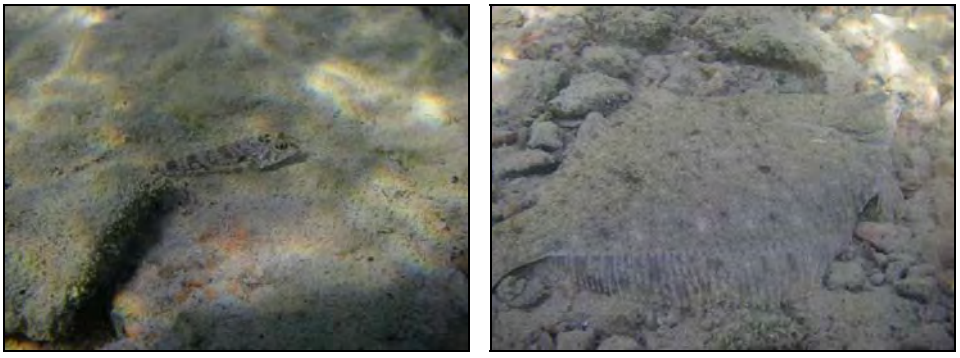


Plate 3.2-13. An adult sculpin observed on the jetty during the late-August snorkel survey in Roberts Bay, Hope Bay Belt Project, 2009.



(A) (B)

Plate 3.2-14. (A) A juvenile sculpin and (B) Arctic flounder observed during the late-August snorkel survey in the Reference Bay, Hope Bay Belt Project, 2009.

Overall, the snorkel survey provided observational evidence that primary and secondary producers have established themselves on the rock shoals and jetty of Roberts Bay. In addition, the surveys have documented the use of the shoals and rip-rap slopes of the jetty by fish prey and fish of multiple age classes.

4. Summary and Conclusions

4. Summary and Conclusions

4.1 SEDIMENT TRANSPORT AND DEPOSITION

Bathymetric comparisons of Roberts Bay pre-construction and Year II post-jetty construction showed similar patterns to what was observed during Year I post-jetty comparisons. Changes in bed elevation in Roberts Bay were observed at the toe of the jetty and to the east. Other observations with respect to change in bed elevation may be related to lack of data for that area or steepness of slope.

4.2 FISH HABITAT MONITORING

Water quality variables showed little variation between Roberts Bay and the Reference Bay. Average water temperature in Roberts Bay ranged from 5.1°C to 6.0°C, averaging 5.5°C. In the Reference Bay, water temperatures were slightly cooler showing a range of 4.7°C to 5.0°C and averaging 5.0°C. pH readings for Roberts Bay and the Reference Bay showed minimal variability.

Periphyton chlorophyll *a* concentrations from plexiglass plates immersed on the shoals ranged from 0.068 µg/cm^2 to 0.114 µg/cm^2 in Roberts Bay and 0.049 µg/cm^2 to 0.081 µg/cm^2 in the Reference Bay. Periphyton density and richness from shoals in the Reference Bay ranged from 764,304 to 1,000,743 cells/cm^2 and richness averaged 16.5 genera per sample. In Roberts Bay, average periphyton densities ranged from 366,042 to 800,074 cells/cm^2 and genus richness among all four shoals averaged 14.9 genera per sample.

Five major algal groups were identified in periphyton samples collected from the shoals in Roberts Bay and the Reference Bay including bacillariophytes, cyanophytes, chlorophytes, chrysophytes and pyrrhophytes. In both Roberts Bay and the Reference Bay, samples were dominated by Cyanophyta (63% to 67%), followed by Bacillariophyta (31% to 34%). More specifically, the cyanophytes *Synechococcus* (35% to 38%) and *Synechocystis* (21% to 28%) were the most dominant genera present. Periphyton Shannon Diversity was similar for both Roberts Bay (1.79) and the Reference Bay (1.77). Average Simpson Diversity was 0.75 for both sites, indicating moderate diversity.

From the shoals in Roberts Bay, benthic invertebrate densities ranged from 4 organisms/trap to 53 organisms/trap, with an average of 23.0 organisms/trap. Densities from the shoals in the Reference Bay ranged from 0 organisms/trap to 66 organisms/trap and averaged 15.8 organisms/trap. Amphipods were responsible for the majority of numbers at Roberts Bay and the Reference Bay, followed by polychaetes. The average number of taxa identified in samples from the Roberts Bay shoals was 7 taxa/trap where as in the Reference Bay the average number of taxa was 5 taxa/trap.

Twelve invertebrate taxa were captured in total and included representatives from the following groups: annelids (Polychaeta), arthropods (Arachnida, Amphipoda, Copepoda, Isopoda) and insects (Chironomidae). Taxa unique to the shoals of Roberts Bay included a sedentary polychaete (*Leitoscoloplos sp*), a benthic copepod (Harpacticoida) and three genera of amphipods (*Ischyrocerus anguipes*, Stenothoidae, *Weyprechtia pinguis*). Chironomidae were only found in the Reference Bay.

A total of 92 fish from eight species and 85 fish from six species were captured on the shoals in Roberts Bay and the Reference Bay, respectively. The jetty, which was only sampled during the late-August sampling period, yielded a total of 26 fish from five species. Fish species captured included Arctic char, Arctic flounder, Greenland cod, lake trout, ninespine stickleback, Pacific herring, saffron cod, starry flounder and sculpin (*Myoxocephalus* sp.).

Dominant species varied among sites and between sampling periods. Overall, saffron cod (38%) and Greenland cod (50%) were the dominant species by number for the shoal habitat and side-slopes of the jetty in Roberts Bay, respectively. In the Reference Bay, sculpin dominated, making up 60% of all catches.

Floating and sinking gillnets captured the majority of fish in both Roberts Bay and the Reference Bay. In Roberts Bay, the largest fish species captured in gillnets was Greenland cod, followed by Arctic char. In the Reference Bay, Arctic char were the largest fish species captured. Arctic char and sculpin captured in Roberts Bay had significantly higher condition indices relative to those captured in the Reference Bay. Pacific herring showed no differences in fish condition between the two bays.

Arctic char sampled for age analysis in Roberts Bay averaged 4 years and had a narrow age range of 3 to 6 years. In the Reference Bay, Arctic char averaged 6 years and ranged in age from 3 to 11 years. Pacific herring in Roberts Bay averaged 9 years and ranged in age from 7 to 11 years. In the Reference Bay, Pacific herring were slightly older, averaging 10 years and ranging in age from 7 to 15 years. There were no differences between the age of Arctic char or Pacific herring sampled in Roberts Bay to those sampled in the Reference Bay.

The structural stability of the compensation structures in Roberts Bay were visually assessed during late-August snorkel surveys. Rock material used to construct the compensation shoals had settled into place and there were no visual signs of rock instability. The jetty, specifically the toe of the jetty, showed signs of instability as rock material was being scoured away. Repairs to the jetty are in discussions with DFO.

Snorkel surveys conducted in Roberts Bay and the Reference Bay produced similar results with respect to organisms present. Various species of algae were identified to inhabit both Roberts Bay and the Reference Bay. Species included representatives from the Kingdom Plantae (Division Rhodophyta and Chlorophyta) and Kingdom Chromista (Order Phaeophyceae). Surveys of Roberts Bay showed multiple algal species had established themselves on the compensation structures after only one year of having been in place.

Invertebrate species observed during snorkel surveys included bivalves, euphausiids and tunicates. Tunicates were the most abundant invertebrate species observed at the compensation shoals in Roberts Bay; euphausiids were the dominant invertebrate on reference shoals.

Adult, juvenile and young-of-the-year fish of multiple species were observed during snorkel surveys at both the compensation and reference sites. The young-of-the-year fish (unknown species) were the most plentiful on the compensation structures in Roberts Bay. Their abundance shows that the structures are providing either shelter and/or a food source for these small fish.

Overall, the monitoring program has demonstrated that the constructed shoals are providing food sources and habitat for fish similar to natural habitat in the area. The constructed shoals are providing food sources that are similar to those of the reference site as chlorophyll *a* concentrations, invertebrate densities and richness are similar between sites. The constructed shoals are also providing viable fish habitat as multiple genera of fish are actively using the constructed habitat.

Year 1 of monitoring the compensation features in Roberts Bay has shown enhancement success as defined in the Doris North No Net Loss Plan. Primary and secondary producers have established themselves on the rock shoals and the side-slopes of the jetty and fish have been observed using the rock shoal and jetty area.

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Appendix 1.1-1

DFO Authorization for Works or Undertakings Affecting Fish Habitat

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DFO File No.: NU-02-0117
Referral File No.: 02-HCAA-CA7-000-000117
Authorization No.: 2

AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT

Authorization issued to:

Hope Bay Mining Ltd.
300-889 Harbourside Drive
North Vancouver, British Columbia
V7P 3S1

Tel: (604) 985-2572
Fax: (604) 980-0731

Location of Project

The jetty associated with the Hope Bay Mining Ltd. underground gold mine ("Doris North Project") is located on the southeastern shore of Roberts Bay in the West Kitikmeot Region of Nunavut. (UTM Zone 48, UTM Easting 541803, UTM Northing 7543202). Fish habitat compensation involves the creation of four (4) nearshore rock shoals located on the southeastern shore of Roberts Bay, just west of the jetty.

Valid Authorization Period

The valid authorization period for the harmful alteration, disruption or destruction of fish habitat associated with the construction of the jetty is:

From:	To:
Date of Issuance	December 30, 2009

The valid periods for other conditions of the authorization are as set out below.

Description of Works or Undertakings (Type of work, schedule, etc.)

The harmful alteration, disruption or destruction hereby authorized is the infilling of fish habitat, as a result of the jetty (95 metres long by 5 to 35 metres wide) construction to facilitate tugs and barges operating for the Doris North Project, affecting 1,760 square metres of fish habitat in Roberts Bay.

Conditions of Authorization

1. The conditions of this Authorization notwithstanding, should the above works or undertakings, due to weather conditions, different soil or other natural conditions, or for any other reason, appear, in the opinion of the Department of Fisheries and Oceans ("DFO") likely to cause greater impacts than the parties previously contemplated, then DFO may direct Hope Bay Mining Ltd. (hereafter referred to as the "Proponent"), and its agents, and contractors, to suspend or alter works and activities associated with the project, to avoid or mitigate adverse impacts to fisheries resources. DFO may also direct the Proponent and its agents, and contractors, to carry out at the Proponent's expense any works or activities deemed necessary by DFO to avoid or mitigate further adverse impacts to fisheries resources. In circumstances where DFO is of the view that greater impacts may occur than were contemplated by the parties DFO may also modify or rescind this authorization. If the authorization is to be changed the Proponent will be given an opportunity to discuss any proposed modifications or rescission.

2. Conditions that relate to the Proponent plan:

   2.1. The Proponent confirms that all plans and specifications relating to this authorization have been duly prepared and reviewed by appropriate professionals working on behalf of the Proponent. The Proponent acknowledges that they are solely responsible for all design, safety and workmanship aspects of all the works associated with this Authorization.

   2.2. The construction of the jetty shall comply with those criteria as identified within this Authorization. Harmful alteration, disruption or destruction of fish habitat other than that specifically identified within this Authorization is prohibited.

   2.3. Works and undertakings shall be conducted in accordance with the practices outlined in the following reports, and as approved by DFO:

      2.3.1. Jetty As-Built, Figure A7, prepared by SRK Consulting, dated September 2007.

      2.3.2. Doris North Project "No-Net-Loss" Plan (NNLP), Revision 6, December 2007 Final Report, prepared by Golder Associates Limited,

dated December 20, 2007.

2.3.3. Roberts Bay Fish Habitat Compensation Shoal Design, Project Number 07-1373-0018, Figure D11, signed and stamped by Nathan Schmidt (Golder Associates Limited), dated January 8, 2008.

2.3.4. Email regarding marine construction blackout, addressed to Tania Gordanier (Fisheries and Oceans Canada), prepared by Terri Maloof (Miramar Hope Bay Limited), dated April 14, 2007.

2.3.5. Revised Water License Application Support Document – Doris North Project, Nunavut, Canada, prepared by Miramar Hope Bay Limited, dated April 2007.

2.3.6. Supporting Documents S10m Supplemental to Revised Water License Application Support Document– Doris North Project, Nunavut, Canada, prepared by Miramar Hope Bay Limited, dated April 2007.

2.3.7. Memorandum regarding Miramar Doris North Project – Jetty Construction Timing and Monitoring, prepared by Golder Associates Limited, Gary Ash, dated June 21, 2007.

2.3.8. Letter regarding Extension of Authorization for Works or Undertakings Affecting Fish Habitat Nu-02-0117 (the Authorization), signed by Chris Hanks (Hope Bay Mining Ltd.), dated June 12, 2008.

2.3.9. The above documents and drawings are hereafter referred to as the "Plan". Where contradictions exist, the most recent version shall apply.

3. Conditions that relate to the mitigation of potential harmful alteration, disruption or destruction ("HADD") of fish habitat. The following measures shall be implemented to avoid the unauthorized HADD of fish habitat:

3.1. No in-water work shall occur between July 15 and August 30 of any year to protect critical spawning and rearing periods for all fish species in Roberts Bay.

3.2. A qualified biologist or environmental inspector shall be on site during all in-water construction, compensation and restoration works to ensure implementation of the designs as intended in the Plan and conditions of this Authorization.

3.3. All materials and equipment used for the purpose of all work phases shall be operated and stored in a manner that prevents any deleterious substance (e.g. petroleum products, debris, etc.) from entering the water.

3.3.1. Any stockpiled materials shall be stored and stabilized above the ordinary high water mark of any water body.

3.3.2. Vehicle and equipment re-fuelling and maintenance shall be conducted above the ordinary high water mark of any water body.

3.3.3. Any part of equipment entering the water shall be free of fluid leaks and externally cleaned/degreased to prevent any deleterious substance from entering the water.

3.4. Only clean, competent, certified non-acid generating rock and material free of fine particulate matter shall be placed in the water.

3.5. Material used for habitat compensation features shall not be taken from below the ordinary high water mark or shoreline of any water body.

3.6. Sediment and erosion control measures shall be implemented prior to work, and maintained during the work phases, to mitigate impacts to fish and fish habitat.

3.6.1. All disturbed areas shall be stabilized upon completion of work and restored to a pre-disturbed state or better.

3.6.2. Sediment and erosion control measures shall be left in place and maintained until all disturbed areas have been stabilized.

4. Conditions that relate to the compensation for the loss of 1,760 square metres of fish habitat as defined in the Plan.

4.1. The amount of fish habitat compensation gained shall equate to 3143 square metres.

4.1.1. Four (4) rock shoals (31.25 metres long by 12.00 metres wide with a minimum depth of 1 metre below mean water level) shall be constructed nearshore, just west of the jetty.

5. Conditions that relate to Monitoring.

5.1. The approved Monitoring Plan shall be implemented in the following years: 2009, the year prior to mine construction, Year of mine construction, Year-2 of mine operation, Year-2 of active mine post-closure (i.e. year prior to jetty lowering to below high water level), Year-

1 post-lowering of jetty, and Year-2 post-lowering of jetty. The detailed Monitoring Plan shall include, but not be limited to, the following:

5.1.1. The stability and successful utilization of all compensation features shall be assessed according to the schedule in 5.1 above.

5.1.1.1. The use of rock shoal structures as rearing and feeding habitat for fish shall be monitored using a Control/Impact (CI) design study as described in the Plan and according to the schedule in 5.1 above.

5.1.1.2. Fish presence shall be monitored using sampling methods as described in the Plan and according to the schedule in 5.1 above.

5.1.2. If at any time during the monitoring period, compensation features are not functioning as intended, measures shall be identified to reduce the risk of future failure and additional compensation shall be created to meet the No-Net-Loss guiding principle using an adaptive management approach.

5.2. A photographic record of before, during and after construction, showing that all works and undertakings have been completed according to the approved Plan and conditions of this Authorization, shall be submitted to the Iqaluit, NU office of the Department of Fisheries and Oceans, Fish Habitat Management, Eastern Arctic Area, on or before, **December 31, 2008** and according to the schedule in 5.1 above.

5.2.1. The photographic record shall include, but not be limited to, a record of the sediment and erosion control measures and compensation measures (i.e. the nearshore rock shoals).

5.2.2. The photographs for each pre-construction, during construction, post-construction time periods shall be taken from the same vantage point(s) and general direction.

5.2.3. All photographs shall be clearly labelled as to date and vantage points. The photographic vantage points and viewing directions shall be indicated, and clearly indexed to the photographs, on a plan view drawing of the construction site(s).

5.3. A written report summarizing the above monitoring results shall be submitted to the Iqaluit, NU office of the Department of Fisheries and Oceans – Fish Habitat Management, Eastern Arctic Area on, or before, **December 31, 2008** and according to the schedule in 5.1 above.

5.4. The effects of the jetty on nearshore sediment transport shall be monitored during the following years: 2008, 2009, Year of mine construction, Year-2 of mine operation, Year-2 of active mine post-closure (i.e. year prior to jetty lowering to below high water level), Year-1 post-lowering of jetty.

5.4.1. Annual bathymetric surveys shall be conducted to determine the extent of sediment deposition adjacent to the jetty.

5.4.2. A written report summarizing the results of the bathymetric surveys shall be submitted to the Iqaluit, NU office of the Department of Fisheries and Oceans – Fish Habitat Management, Eastern Arctic Area on, or before, **December 31** of each year, according to the schedule in 5.4 above.

6. Any deviation from the approved plans, the construction schedule, mitigation, compensation and/or monitoring measures stated above must be discussed with, and approved in writing by the Iqaluit, NU office of the Department of Fisheries and Oceans, Fish Habitat Management, Eastern Arctic Area.

7. All mitigation, compensation and monitoring measures shall be implemented to the satisfaction of the Iqaluit, NU office of the Department of Fisheries and Oceans, Habitat Management, Eastern Arctic Area.

8. Conditions that relate to the financial security as indicated in the irrevocable Letter of Credit in the amount of $67,608.00 dated June 28, 2007.

8.1. Miramar Mining Corporation on behalf of Hope Bay Mining Ltd. shall amend the Letter of Credit issued on June 28, 2007 (Reference No. LGHCV073179) and submit the amended irrevocable standby letter of credit in the amount of sixty-seven thousand six hundred and eight dollars ($67,608.00) to Fisheries and Oceans Canada – Eastern Arctic Area P.O. Box 358 Iqaluit, Nunavut X0A 0H0, no later than **September 5, 2008**.

8.2. The letter of credit from a Canadian Bank in the amount of $67,608.00 shall automatically renew each year and may be used in any manner deemed appropriate to DFO in relation to this Authorization. The letter of credit shall be returned upon satisfactory completion of the above noted habitat compensation works and monitoring program.

8.3. Upon successful completion of Hope Bay Mining Limited responsibilities under the **compensation and monitoring conditions** of this Authorization, as determined by Fisheries and Oceans Canada, the original Letter of Credit shall be returned to the financial institution, referred to on the Letter of Credit, for cancellation.

8.4. Where at any time DFO determines that the amount of security deposit it holds falls below an amount which, in DFO's view, is necessary to satisfy the Proponent's obligations under this Authorization, DFO may request, in writing, that the Proponent deposit with DFO additional security in an amount and form determined at that time by DFO. The Proponent shall comply with DFO's request within 30 (thirty) days from the date it receives the request.

9. Written notification of the commencement of works or undertakings shall be provided to the Iqaluit, NU office of the Department of Fisheries and Oceans, Habitat Management, Eastern Arctic Area, by e-mail to Amy.Liu@dfo-mpo.gc.ca or fax at (867) 979-8039 prior to the initiation of said works or undertakings.

The holder of this authorization is hereby authorized under the authority of section 35(2) of the *Fisheries Act*. R.S.C., 1985, c.F. 14, to carry out the work or undertaking described herein. This authorization is valid only with respect to fish habitat and for no other purposes. It does not purport to release the applicant from any obligation to obtain permission from or to comply with the requirements of any other regulatory agencies.

Failure to comply with any condition of this authorization may result in charges being laid under the *Fisheries Act*.

This authorization form shall be held on site and work crews shall be made familiar with the conditions therein.

Date of Issuance: August 28, 2008

Approved by:

Robert Lambe

Title: Regional Director General,
Central and Arctic Region
Fisheries and Oceans Canada

Appendix 3.2-1

Periphyton Chlorophyll *a* Data for Roberts Bay and the Reference Bay,
Hope Bay Belt Project, 2009

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Appendix 3.2-1. Periphyton Chlorophyll *a* Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Site	Date Sampled	ALS Sample ID	Chlorophyll *a* (µg)	Chlorophyll *a* Density (µg/cm^2)
Roberts Bay				
Shoal 1-1	12-Sep-09	L833898-21	1.920	0.038
Shoal 1-2	12-Sep-09	L833898-22	4.490	0.090
Shoal 1-3	12-Sep-09	L833898-23	6.360	0.127
Shoal 1-4	12-Sep-09	L833898-24	0.808	0.016
Shoal 1-5	11-Sep-09	L833898-25	4.280	0.086
Mean				**0.071**
SE				**0.020**
Shoal 2-1	11-Sep-09	-	-	-
Shoal 2-2	11-Sep-09	L833898-26	1.520	0.030
Shoal 2-3	11-Sep-09	L833898-27	6.630	0.133
Shoal 2-4	11-Sep-09	L833898-28	1.760	0.035
Shoal 2-5	11-Sep-09	L833898-29	4.540	0.091
Mean				**0.072**
SE				**0.024**
Shoal 3-1	11-Sep-09	L833898-30	1.200	0.024
Shoal 3-2	11-Sep-09	L833898-31	1.900	0.038
Shoal 3-3	11-Sep-09	L833898-32	6.000	0.120
Shoal 3-4	11-Sep-09	L833898-33	3.200	0.064
Shoal 3-5	11-Sep-09	L833898-34	4.700	0.094
Mean				**0.068**
SE				**0.018**
Shoal 4-1	11-Sep-09	L833898-35	1.170	0.023
Shoal 4-2	11-Sep-09	L833898-36	5.970	0.119
Shoal 4-3	11-Sep-09	L833898-37	3.290	0.066
Shoal 4-4	11-Sep-09	L833898-38	7.280	0.146
Shoal 4-5	10-Sep-09	L833898-39	10.700	0.214
Mean				**0.114**
SE				**0.033**
Reference Bay				
Shoal 1-1	09-Sep-09	L833898-1	3.390	0.068
Shoal 1-2	09-Sep-09	L833898-2	3.350	0.067
Shoal 1-3	09-Sep-09	L833898-3	1.790	0.036
Shoal 1-4	09-Sep-09	L833898-4	1.760	0.035
Shoal 1-5	09-Sep-09	L833898-5	5.410	0.108
Mean				**0.063**
SE				**0.013**
Shoal 2-1	09-Sep-09	L833898-6	3.580	0.072
Shoal 2-2	09-Sep-09	L833898-7	2.270	0.045
Shoal 2-3	10-Sep-09	L833898-8	0.398	0.008
Shoal 2-4	10-Sep-09	L833898-9	1.900	0.038
Shoal 2-5	10-Sep-09	L833898-10	4.150	0.083
Mean				**0.049**
SE				**0.013**
Shoal 3-1	10-Sep-09	L833898-11	2.660	0.053
Shoal 3-2	10-Sep-09	L833898-12	3.170	0.063
Shoal 3-3	10-Sep-09	L833898-13	5.680	0.114
Shoal 3-4	10-Sep-09	L833898-14	2.010	0.040
Shoal 3-5	10-Sep-09	L833898-15	3.730	0.075
Mean				**0.069**
SE				**0.013**
Shoal 4-1	10-Sep-09	L833898-16	1.810	0.036
Shoal 4-2	10-Sep-09	L833898-17	2.120	0.042
Shoal 4-3	10-Sep-09	L833898-18	4.630	0.093
Shoal 4-4	10-Sep-09	L833898-19	1.720	0.034
Shoal 4-5	10-Sep-09	L833898-20	9.850	0.197
Mean				**0.081**
SE				**0.031**

SE = Standard Error of the Mean.

Appendix 3.2-2

Periphyton Taxonomy Data for Roberts Bay and the Reference Bay,
Hope Bay Belt Project, 2009

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Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Rob Bay Shoal 1				Rob Bay Shoal 1			
	Date	09/01/2009				09/01/2009			
	Replicate	1				2			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	13,140.6	2.8	676,370.7	1.3	2,117.1	0.2	40,863.9	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	2,190.1	0.5	58,309.1	0.1	14,819.7	1.7	691,994.9	0.8
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	2,117.1	0.2	170,266.8	0.2
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	6,570.3	1.4	12,428.4	0.0	44,459.0	5.0	2,447,141.5	2.9
Chrysocapsa	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	2,190.1	0.5	118,470.4	0.2	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	2,117.1	0.2	817,280.5	1.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	2,117.1	0.2	22,986,013.8	27.6
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	2,190.1	0.5	2,642,070.6	5.1	2,117.1	0.2	3,831,002.4	4.6
Donkinia	Bacillariophyta	0.0	0.0	0.0	0.0	33,873.5	3.8	23,586,793.8	28.3
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	2,190.1	0.5	84,546.3	0.2	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	32,851.5	6.9	2,642,071.5	5.1	23,288.0	2.6	948,172.1	1.1
Jaaginema	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	24,091.1	5.0	3,487,533.4	6.7	65,629.9	7.3	3,008,612.5	3.6
Nitzschia	Bacillariophyta	17,520.8	3.7	634,096.1	1.2	95,269.2	10.6	4,980,302.8	6.0
Nitzschia (Closterium sp.)	Bacillariophyta	21,901.0	4.6	1,532,402.0	3.0	4,234.2	0.5	290,304.8	0.3
Nodularia	Cyanophyta	24,091.1	5.0	36,786,285.4	70.8	27,522.2	3.1	17,338,586.4	20.8
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	4,234.2	0.5	679,364.3	0.8
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	2,190.1	0.5	1,902,290.7	3.7	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	2,117.1	0.2	14,983.5	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	216,819.6	45.4	261,571.1	0.5	317,564.0	35.4	170,277.8	0.2
Synechocystis (>1 um spherical)	Cyanophyta	98,554.4	20.6	89,172.0	0.2	222,294.8	24.8	59,597.2	0.1
Thalassionema	Bacillariophyta	4,380.2	0.9	281,820.8	0.5	2,117.1	0.2	306,480.2	0.4
Thalassiosira	Bacillariophyta	6,570.3	1.4	713,358.8	1.4	29,639.3	3.3	1,016,068.2	1.2
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total:	477,441	100	51,922,797	100	897,648	100	83,384,108	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Rob Bay Shoal 1				Rob Bay Shoal 1			
	Date	09/01/2009				09/01/2009			
	Replicate	3				4			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	1,519.4	0.3	58,654.0	0.1
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	17,703.3	3.1	518,465.4	0.8	13,674.4	2.2	872,362.2	1.5
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	1,770.3	0.3	8,542.7	0.0	0.0	0.0	0.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	33,636.2	5.9	369,527.7	0.6	22,790.7	3.7	148,834.6	0.3
Chrysocapsa	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysocapsaceae (Family)	Chrysophyta	3,540.7	0.6	136,683.2	0.2	1,519.4	0.3	49,562.6	0.1
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	1,770.3	0.3	1,025,123.5	1.6	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	1,770.3	0.3	1,423,782.4	2.2	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	8,851.6	1.6	1,733,505.4	2.7	9,116.3	1.5	3,500,650.8	6.0
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	38,947.2	6.9	3,974,131.7	6.2	31,907.0	5.2	4,144,269.1	7.1
Jaaginema	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	1,519.4	0.3	122,195.8	0.2
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	30,095.6	5.3	1,243,495.2	1.9	24,310.1	4.0	938,463.7	1.6
Nitzschia	Bacillariophyta	58,420.8	10.3	2,114,314.2	3.3	24,310.1	4.0	1,094,874.7	1.9
Nitzschia (Closterium sp.)	Bacillariophyta	56,650.5	10.0	2,961,467.4	4.6	48,620.1	8.0	1,759,616.7	3.0
Nodularia	Cyanophyta	24,784.6	4.4	9,304,370.2	14.4	16,713.2	2.7	20,645,748.3	35.5
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	106,219.7	18.7	128,143.4	0.2	255,255.8	42.0	136,868.2	0.2
Synechocystis (>1 um spherical)	Cyanophyta	159,329.5	28.1	144,161.4	0.2	145,860.4	24.0	131,974.5	0.2
Thalassionema	Bacillariophyta	1,770.3	0.3	7,745,376.6	12.0	7,596.9	1.2	24,194,761.4	41.6
Thalassiosira	Bacillariophyta	21,243.9	3.7	31,569,528.1	49.0	3,038.8	0.5	371,475.3	0.6
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total:	566,505	100	64,400,619	100	607,752	100	58,170,312	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Rob Bay Shoal 1				Rob Bab Shoal 2			
	Date	09/01/2009				09/01/2009			
	Replicate	5				1			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	2,336.1	0.6	33,818.6	0.1				
Alexandrium	Pyrrhophyta	2,336.1	0.6	3,757,611.4	8.1				
Amphora	Bacillariophyta	9,344.4	2.3	97,122.1	0.2				
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0				
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0				
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0				
Bleakeleya	Bacillariophyta	2,336.1	0.6	5,980,424.4	12.9				
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0				
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0				
Chlorococcales (Order)	Chlorophyta	4,672.2	1.2	30,511.8	0.1				
Chrysocapsa	Chrysophyta	2,336.1	0.6	80,162.4	0.2				
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0				
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0				
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0				
Cylindrotheca	Bacillariophyta	2,336.1	0.6	24,549,728.3	53.1				
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0				
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0				
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0				
Donkinia	Bacillariophyta	4,672.2	1.2	968,828.7	2.1				
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0				
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0				
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0				
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0				
Haslea	Bacillariophyta	51,394.3	12.7	3,332,533.1	7.2				
Jaaginema	Cyanophyta	0.0	0.0	0.0	0.0				
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0				
Lyngbya	Cyanophyta	2,336.1	0.6	37,576.2	0.1				
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0				
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0				
Navicula	Bacillariophyta	25,697.1	6.4	4,856,712.5	10.5				
Nitzschia	Bacillariophyta	2,336.1	0.6	22,545.7	0.0				
Nitzschia (Closterium sp.)	Bacillariophyta	35,041.5	8.7	1,268,192.2	2.7				
Nodularia	Cyanophyta	2,336.1	0.6	505,025.6	1.1				
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0				
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0				
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0				
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0				
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0				
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0				
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0				
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0				
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0				
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0				
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0				
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0				
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0				
Synechococcus (> 1 um ovoid)	Cyanophyta	168,199.4	41.6	101,457.9	0.2				
Synechocystis (>1 um spherical)	Cyanophyta	84,099.7	20.8	76,093.4	0.2				
Thalassionema	Bacillariophyta	2,336.1	0.6	507,277.6	1.1				
Thalassiosira	Bacillariophyta	0.0	0.0	0.0	0.0				
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0				
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0				
	Total:	404,146	100	46,205,622	100	0	0	0	0

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Rob Bab Shoal 2				Rob Bab Shoal 2			
	Date	09/01/2009				09/01/2009			
	Replicate	2				3			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	8,141.4	2.3	333,473.7	0.6	27,595.2	9.2	734,695.1	0.6
Aphanocapsa	Cyanophyta	2,035.4	0.6	17,051.4	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	4,070.7	1.2	16,506,946.4	29.3	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	2,035.4	0.6	18,988.5	0.0	13,797.6	4.6	424,781.5	0.3
Chrysocapsa	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	6,106.1	1.7	21,102,630.3	37.4	9,198.4	3.1	2,335,953.8	1.8
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	14,247.5	4.1	773,451.5	1.4	48,291.6	16.2	3,980,940.2	3.1
Jaaginema	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	2,035.4	0.6	73,662.0	0.1	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	26,459.7	7.5	1,021,447.7	1.8	64,388.8	21.5	65,019,857.2	50.1
Nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	11,498.0	3.8	18,598,525.1	14.3
Nitzschia (Closterium sp.)	Bacillariophyta	10,176.8	2.9	982,160.7	1.7	22,996.0	7.7	1,479,559.1	1.1
Nodularia	Cyanophyta	6,106.1	1.7	1,146,222.7	2.0	32,194.4	10.8	35,228,187.4	27.1
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	2,299.6	0.8	1,597,924.2	1.2
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	149,802.6	42.6	70,272.4	0.1	16,097.2	5.4	6,966.9	0.0
Synechocystis (>1 um spherical)	Cyanophyta	112,352.0	31.9	101,656.1	0.2	41,392.8	13.8	37,452.2	0.0
Thalassionema	Bacillariophyta	8,141.4	2.3	14,230,422.0	25.2	0.0	0.0	0.0	0.0
Thalassiosira	Bacillariophyta	0.0	0.0	0.0	0.0	9,198.4	3.1	315,331.5	0.2
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total:	351,711	100	56,378,385	100	298,948	100	129,760,174	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Rob Bab Shoal 2				Rob Bab Shoal 2			
	Date	09/01/2009				09/01/2009			
	Replicate	4				5			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	35,680.3	6.1	1,790,296.1	0.8	15,476.7	2.6	1,320,676.5	1.9
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	7,756.6	1.3	325,718.7	0.1	3,869.2	0.7	506,721.0	0.7
Chrysocapsa	Chrysophyta	0.0	0.0	0.0	0.0	5,803.8	1.0	398,306.6	0.6
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	3,102.6	0.5	1,796,608.1	0.8	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	4,654.0	0.8	6,862,537.0	2.9	17,411.3	3.0	6,685,927.6	9.7
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	1,551.3	0.3	14,971,733.1	6.3	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	1,934.6	0.3	5,338,837.0	7.8
Haslea	Bacillariophyta	44,988.2	7.6	4,884,526.0	2.1	54,168.4	9.2	2,341,607.6	3.4
Jaaginema	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	80,668.6	13.7	2,854,610.5	1.2	96,729.3	16.4	9,335,313.4	13.6
Nitzschia	Bacillariophyta	15,513.2	2.6	421,080.6	0.2	7,738.3	1.3	280,059.1	0.4
Nitzschia (Closterium sp.)	Bacillariophyta	4,654.0	0.8	252,647.9	0.1	29,018.8	4.9	1,575,334.0	2.3
Nodularia	Cyanophyta	60,501.4	10.3	187,882,430.8	78.9	42,560.9	7.2	25,253,605.4	36.8
Odontella	Bacillariophyta	1,551.3	0.3	3,742,933.4	1.6	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	1,551.3	0.3	1,162,417.9	0.5	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	1,551.3	0.3	84,216.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	125,656.8	21.3	189,490.5	0.1	21,280.4	3.6	25,672.7	0.0
Synechocystis (>1 um spherical)	Cyanophyta	181,504.3	30.8	164,225.1	0.1	278,580.3	47.2	252,059.5	0.4
Thalassionema	Bacillariophyta	1,551.3	0.3	5,165,248.0	2.2	3,869.2	0.7	9,708,728.7	14.2
Thalassiosira	Bacillariophyta	15,513.2	2.6	1,996,230.5	0.8	11,607.5	2.0	5,587,187.1	8.1
Ulothrix	Chlorophyta	1,551.3	0.3	3,593,215.9	1.5	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total:	589,501	100	238,140,166	100	590,049	100	68,610,036	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Rob Bay Shoal 3				Rob Bay Shoal 3			
	Date	09/01/2009				09/01/2009			
	Replicate	1				2			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	12,264.5	2.8	615,385.7	2.3	10,074.4	2.2	569,198.1	2.6
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	1,752.1	0.4	56,364.2	0.2	0.0	0.0	0.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	1,679.1	0.4	972,282.0	4.5
Chlorococcales (Order)	Chlorophyta	5,256.2	1.2	83,531.5	0.3	0.0	0.0	0.0	0.0
Chrysocapsa	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	1,752.1	0.4	897,063.7	3.4	3,358.1	0.7	1,217,315.4	5.7
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	29,785.3	6.8	4,551,407.9	17.2	15,111.7	3.3	957,089.9	4.5
Jaaginema	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	85,851.8	19.5	3,314,214.1	12.5	16,790.7	3.7	2,147,122.9	10.0
Nitzschia	Bacillariophyta	8,760.4	2.0	422,731.6	1.6	3,358.1	0.7	243,070.5	1.1
Nitzschia (Closterium sp.)	Bacillariophyta	12,264.5	2.8	1,183,647.3	4.5	5,037.2	1.1	486,140.9	2.3
Nodularia	Cyanophyta	12,264.5	2.8	9,125,199.6	34.4	15,111.7	3.3	9,918,369.5	46.1
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	141,918.3	32.3	114,130.7	0.4	211,563.4	46.3	113,440.3	0.5
Synechocystis (>1 um spherical)	Cyanophyta	110,380.9	25.1	99,872.6	0.4	166,228.3	36.4	150,403.4	0.7
Thalassionema	Bacillariophyta	3,504.2	0.8	5,861,874.0	22.1	3,358.1	0.7	4,132,198.3	19.2
Thalassiosira	Bacillariophyta	14,016.6	3.2	180,365.9	0.7	3,358.1	0.7	43,212.7	0.2
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	1,679.1	0.4	546,908.6	2.5
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total:	439,771	100	26,505,789	100	456,708	100	21,496,752	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Rob Bay Shoal 3				Rob Bay Shoal 3			
	Date	09/01/2009				09/01/2009			
	Replicate	3				4			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	11,315.5	1.3	637,289.0	1.2	15,768.7	1.6	226,060.0	0.1
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	1,971.1	0.2	12,682.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	2,263.1	0.3	71,347.6	0.1	9,855.4	1.0	156,621.6	0.1
Chrysocapsa	Chrysophyta	9,052.4	1.0	124,001.6	0.2	11,826.5	1.2	1,371,439.1	0.7
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	5,913.3	0.6	7,989,621.6	4.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	1,971.1	0.2	7,767,687.4	3.9
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	9,052.4	1.0	1,703,299.6	3.1	3,942.2	0.4	3,406,038.6	1.7
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	1,971.1	0.2	317,048.4	0.2
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	49,788.2	5.5	2,479,686.4	4.5	17,739.8	1.8	2,568,092.8	1.3
Jaaginema	Cyanophyta	2,263.1	0.3	15,356.9	0.0	7,884.3	0.8	142,672.0	0.1
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	126,733.6	14.0	2,751,982.2	5.0	61,103.7	6.2	32,827,199.7	16.3
Nitzschia	Bacillariophyta	22,631.0	2.5	1,504,610.8	2.7	17,739.8	1.8	285,344.4	0.1
Nitzschia (Closterium sp.)	Bacillariophyta	52,051.3	5.8	2,511,730.3	4.6	27,595.2	2.8	1,775,470.9	0.9
Nodularia	Cyanophyta	18,104.8	2.0	11,645,148.8	21.2	78,843.5	8.0	86,180,132.0	42.8
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	1,971.1	0.2	14,267,181.1	7.1
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	1,971.1	0.2	42,273.1	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	2,263.1	0.3	3,583,308.2	6.5	3,942.2	0.4	14,267,180.9	7.1
Synechococcus (> 1 um ovoid)	Cyanophyta	271,572.0	30.1	109,199.1	0.2	295,663.1	30.1	118,886.1	0.1
Synechocystis (>1 um spherical)	Cyanophyta	305,518.5	33.8	276,433.1	0.5	384,362.0	39.2	347,770.7	0.2
Thalassionema	Bacillariophyta	9,052.4	1.0	25,165,820.1	45.8	15,768.7	1.6	17,184,027.5	8.5
Thalassiosira	Bacillariophyta	9,052.4	1.0	1,387,517.5	2.5	11,826.5	1.2	9,698,512.7	4.8
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	2,263.1	0.3	1,016,977.0	1.8	1,971.1	0.2	396,310.5	0.2
	Total:	902,977	100	54,983,708	100	981,601	100	201,348,253	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Rob Bay Shoal 3				Rob By Shoal 4			
	Date	09/01/2009				09/01/2009			
	Replicate	5				1			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	13,286.6	2.3	357,143.5	0.2	0.0	0.0	0.0	0.0
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	1,898.1	0.3	228,979.5	0.1	0.0	0.0	0.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	7,592.3	1.3	239,359.8	0.2	0.0	0.0	0.0	0.0
Chrysocapsa	Chrysophyta	7,592.3	1.3	1,302,638.3	0.8	0.0	0.0	0.0	0.0
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	1,514.8	0.5	656,657.2	3.5
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	3,796.2	0.7	1,700,683.2	1.1	0.0	0.0	0.0	0.0
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	17,082.8	3.0	1,013,234.6	0.7	33,326.0	11.1	1,273,112.2	6.8
Jaaginema	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	119,579.3	20.8	65,901,424.2	42.9	33,326.0	11.1	6,354,833.2	34.1
Nitzschia	Bacillariophyta	24,675.1	4.3	2,808,548.4	1.8	10,603.7	3.5	775,516.8	4.2
Nitzschia (Closterium sp.)	Bacillariophyta	66,432.9	11.6	1,786,514.5	1.2	16,663.0	5.5	268,024.1	1.4
Nodularia	Cyanophyta	22,777.0	4.0	31,105,585.8	20.2	0.0	0.0	0.0	0.0
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	32,267.4	5.6	25,949.5	0.0	45,444.5	15.1	24,367.3	0.1
Synechocystis (>1 um spherical)	Cyanophyta	227,770.1	39.6	206,086.4	0.1	159,055.8	52.8	143,913.7	0.8
Thalassionema	Bacillariophyta	9,490.4	1.7	27,477,533.9	17.9	1,514.8	0.5	9,137,160.7	49.0
Thalassiosira	Bacillariophyta	20,878.9	3.6	19,528,893.9	12.7	0.0	0.0	0.0	0.0
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total:	575,119	100	153,682,575	100	301,449	100	18,633,585	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Rob By Shoal 4				Rob By Shoal 4			
	Date	09/01/2009				09/01/2009			
	Replicate	2				3			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	1,825.1	0.2	26,164.4	0.0	5,694.3	0.6	379,009.4	0.1
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	1,898.1	0.2	40,707.4	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	1,825.1	0.2	1,878,805.8	0.7	1,898.1	0.2	1,648,652.0	0.6
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	0.0	0.0	0.0	0.0	3,796.2	0.4	119,679.9	0.0
Chrysocapsa	Chrysophyta	10,950.5	1.0	3,468,919.5	1.3	20,878.9	2.0	1,543,576.7	0.5
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	1,898.1	0.2	10,176,864.4	3.5
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	16,425.7	1.5	7,989,473.2	3.0	13,286.6	1.3	5,782,322.8	2.0
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	23,726.0	2.2	954,081.4	0.4	49,350.2	4.8	1,984,489.2	0.7
Jaaginema	Cyanophyta	1,825.1	0.2	14,678.2	0.0	5,694.3	0.6	45,796.0	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	1,825.1	0.2	6,605,176.3	2.5	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	82,128.6	7.7	1,783,398.6	0.7	186,012.2	18.2	149,599,902.6	51.4
Nitzschia	Bacillariophyta	23,726.0	2.2	28,431,614.8	10.8	22,777.0	2.2	34,665,199.2	11.9
Nitzschia (Closterium sp.)	Bacillariophyta	43,801.9	4.1	1,651,293.6	0.6	18,980.8	1.9	715,560.6	0.2
Nodularia	Cyanophyta	62,052.7	5.8	195,931,269.8	74.2	68,331.0	6.7	79,653,798.9	27.4
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	1,825.1	0.2	330,258.8	0.1	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	295,663.1	27.6	356,687.9	0.1	273,324.1	26.8	109,903.6	0.0
Synechocystis (>1 um spherical)	Cyanophyta	476,346.1	44.5	430,997.9	0.2	324,572.3	31.8	293,673.1	0.1
Thalassionema	Bacillariophyta	12,775.6	1.2	11,559,058.9	4.4	7,592.3	0.7	3,297,304.3	1.1
Thalassiosira	Bacillariophyta	12,775.6	1.2	2,739,925.6	1.0	15,184.7	1.5	751,052.1	0.3
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total:	1,069,497	100	264,151,805	100	1,021,169	100	290,807,492	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Rob By Shoal 4				Rob By Shoal 4			
	Date	09/01/2009				09/01/2009			
	Replicate	4				5			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	1,533.1	0.2	70,643.8	0.0	0.0	0.0	0.0	0.0
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	0.0	0.0	0.0	0.0	4,599.2	0.6	144,996.8	0.2
Chrysocapsa	Chrysophyta	4,599.2	0.6	1,578,196.8	0.9	0.0	0.0	0.0	0.0
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	6,132.3	0.8	9,890,126.8	5.5	7,665.3	0.9	8,830,470.4	9.9
Entomoneis	Bacillariophyta	4,599.2	0.6	8,322,522.4	4.6	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	44,459.0	5.7	5,944,439.3	3.3	39,859.8	4.8	961,712.4	1.1
Jaaginema	Cyanophyta	1,533.1	0.2	416,126.1	0.2	0.0	0.0	0.0	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	4,599.2	0.6	208,062.9	0.2
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	102,715.5	13.2	14,126,098.6	7.9	105,781.7	12.7	4,551,499.9	5.1
Nitzschia	Bacillariophyta	16,863.7	2.2	15,425,229.2	8.6	12,264.5	1.5	14,728,193.1	16.6
Nitzschia (Closterium sp.)	Bacillariophyta	38,326.7	4.9	4,334,645.6	2.4	27,595.2	3.3	1,040,315.0	1.2
Nodularia	Cyanophyta	26,062.2	3.3	82,083,113.0	45.9	19,929.9	2.4	11,258,467.5	12.7
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	183,968.1	23.6	73,973.6	0.0	206,964.1	24.9	83,220.3	0.1
Synechocystis (>1 um spherical)	Cyanophyta	321,944.2	41.3	291,295.1	0.2	390,932.3	47.0	353,715.5	0.4
Thalassionema	Bacillariophyta	18,396.8	2.4	36,249,207.8	20.3	7,665.3	0.9	46,729,421.2	52.5
Thalassiosira	Bacillariophyta	7,665.3	1.0	192,650.7	0.1	4,599.2	0.6	59,182.5	0.1
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total:	778,798	100	178,998,269	100	832,456	100	88,949,258	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Ref Shoal 1				Ref Shoal 1			
	Date	09/01/2009				09/01/2009			
	Replicate	1				2			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	31,236.3	4.6	3,747,685.4	13.4	25,624.1	2.9	131,195.6	0.1
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	3,203.0	0.4	309,122.2	0.3
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	3,203.0	0.4	57,960.5	0.1
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	13,387.0	2.0	212,744.3	0.8	9,609.0	1.1	340,807.1	0.3
Chrysocapsa	Chrysophyta	0.0	0.0	0.0	0.0	9,609.0	1.1	2,637,843.7	2.5
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	3,203.0	0.4	4,945,956.0	4.6
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	4,462.3	0.7	137,082.5	0.5	22,421.1	2.6	4,706,640.7	4.4
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	9,609.0	1.1	525,507.4	0.5
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	4,462.3	0.7	484,489.5	1.7	9,609.0	1.1	492,663.7	0.5
Jaaginema	Cyanophyta	8,924.6	1.3	30,056.4	0.1	3,203.0	0.4	14,490.1	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	3,203.0	0.4	463,683.4	0.4
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	58,010.2	8.5	2,775,944.2	9.9	73,669.4	8.4	1,592,304.8	1.5
Nitzschia	Bacillariophyta	13,387.0	2.0	581,387.9	2.1	25,624.1	2.9	4,945,957.3	4.6
Nitzschia (Closterium sp.)	Bacillariophyta	35,698.6	5.2	5,215,740.8	18.7	73,669.4	8.4	2,925,389.0	2.7
Nodularia	Cyanophyta	0.0	0.0	0.0	0.0	35,233.2	4.0	67,324,759.7	63.2
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	133,869.7	19.6	62,798.3	0.2	160,150.8	18.2	64,396.6	0.1
Synechocystis (>1 um spherical)	Cyanophyta	356,985.8	52.3	323,000.7	1.2	384,362.0	43.8	347,770.7	0.3
Thalassionema	Bacillariophyta	8,924.6	1.3	10,945,878.4	39.2	9,609.0	1.1	8,797,104.3	8.3
Thalassiosira	Bacillariophyta	8,924.6	1.3	251,217.1	0.9	9,609.0	1.1	2,283,640.7	2.1
Ulothrix	Chlorophyta	4,462.3	0.7	3,158,155.0	11.3	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0	3,203.0	0.4	3,542,025.8	3.3
	Total:	682,735	100	27,926,181	100	877,627	100	106,449,219	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Ref Shoal 1				Ref Shoal 1			
	Date	09/01/2009				09/01/2009			
	Replicate	3				4			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	0.0	0.0	0.0	0.0	6,351.3	0.8	75,443.1	0.2
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	1,587.8	0.2	2,128.3	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	1,587.8	0.2	86,836.0	0.3
Chlorococcales (Order)	Chlorophyta	2,190.1	0.3	34,804.8	0.0	1,587.8	0.2	50,058.4	0.1
Chrysocapsa	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	9,526.9	1.2	183,887.7	0.5
Gyrosigma	Bacillariophyta	2,190.1	0.3	2,242,659.1	2.3	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	6,570.3	1.0	449,152.3	0.5	11,114.7	1.4	536,340.7	1.6
Jaaginema	Cyanophyta	2,190.1	0.3	9,907.8	0.0	1,587.8	0.2	14,366.3	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	1,587.8	0.2	17,957.8	0.1
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	76,653.4	12.0	2,173,100.6	2.3	53,985.9	7.0	15,024,445.0	43.9
Nitzschia	Bacillariophyta	30,661.4	4.8	8,337,935.6	8.6	14,290.4	1.8	775,777.7	2.3
Nitzschia (Closterium sp.)	Bacillariophyta	221,199.8	34.6	5,253,583.2	5.4	100,032.7	12.9	2,514,091.1	7.4
Nodularia	Cyanophyta	2,190.1	0.3	140,969.1	0.1	0.0	0.0	0.0	0.0
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	2,190.1	0.3	68,221,691.1	70.8	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	1,587.8	0.2	22,986.1	0.1
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	1,587.8	0.2	1,915,501.2	5.6
Synechococcus (> 1 um ovoid)	Cyanophyta	87,603.9	13.7	35,225.5	0.0	206,416.6	26.6	83,000.1	0.2
Synechocystis (>1 um spherical)	Cyanophyta	197,108.7	30.8	178,344.0	0.2	349,320.4	45.0	316,065.1	0.9
Thalassionema	Bacillariophyta	4,380.2	0.7	8,243,260.3	8.6	4,763.5	0.6	7,891,864.7	23.1
Thalassiosira	Bacillariophyta	2,190.1	0.3	225,456.7	0.2	3,175.6	0.4	1,062,464.8	3.1
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	3,175.6	0.4	1,711,181.1	5.0
Unknown	Pyrrhophyta	2,190.1	0.3	863,076.4	0.9	3,175.6	0.4	1,915,501.2	5.6
	Total:	639,508	100	96,409,166	100	776,444	100	34,199,896	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Ref Shoal 1				Ref Shoal 2			
	Date	09/01/2009				09/01/2009			
	Replicate	5				1			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	14,755.8	1.6	332,418.2	0.2	13,414.3	1.2	462,569.5	0.5
Aphanocapsa	Cyanophyta	4,215.9	0.4	226,043.8	0.1	2,682.9	0.2	207,138.4	0.2
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	25,295.6	2.7	719,361.9	0.4	0.0	0.0	0.0	0.0
Chrysocapsa	Chrysophyta	8,431.9	0.9	319,852.1	0.2	8,048.6	0.7	253,849.8	0.3
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	2,108.0	0.2	1,412,773.8	0.8	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	4,215.9	0.4	725,276.0	0.4	2,682.9	0.2	1,030,221.5	1.1
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	12,647.8	1.3	401,793.1	0.2	29,511.6	2.6	890,047.8	1.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	10,539.8	1.1	1,017,196.9	0.6	10,731.5	0.9	21,576,909.6	23.1
Jaaginema	Cyanophyta	0.0	0.0	0.0	0.0	5,365.7	0.5	64,730.6	0.1
Leptolyngbya	Cyanophyta	6,323.9	0.7	54,038.4	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	84,318.7	8.9	1,830,955.9	1.1	99,266.1	8.7	5,189,246.6	5.6
Nitzschia	Bacillariophyta	16,863.7	1.8	1,627,515.0	1.0	32,194.4	2.8	2,541,488.9	2.7
Nitzschia (Closterium sp.)	Bacillariophyta	31,619.5	3.3	1,716,519.5	1.0	32,194.4	2.8	1,213,700.8	1.3
Nodularia	Cyanophyta	21,079.7	2.2	48,105,560.5	28.7	34,877.3	3.1	40,857,791.8	43.7
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	2,108.0	0.2	87,421,656.7	52.2	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	2,682.9	0.2	3,866,582.2	4.1
Synechococcus (> 1 um ovoid)	Cyanophyta	147,557.8	15.5	69,219.4	0.0	295,115.5	25.9	118,666.0	0.1
Synechocystis (>1 um spherical)	Cyanophyta	548,071.7	57.6	495,895.3	0.3	563,402.4	49.4	509,766.5	0.5
Thalassionema	Bacillariophyta	8,431.9	0.9	20,615,196.1	12.3	5,365.7	0.5	11,025,800.7	11.8
Thalassiosira	Bacillariophyta	2,108.0	0.2	423,832.1	0.3	0.0	0.0	0.0	0.0
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0	2,682.9	0.2	3,596,151.7	3.9
	Total:	950,694	100	167,515,104	100	1,140,219	100	93,404,662	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Ref Shoal 2				Ref Shoal 2			
	Date	09/01/2009				09/01/2009			
	Replicate	2				3			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	2,080.6	0.3	75,298.9	0.1
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	6,323.9	1.0	90,659.5	0.2	2,080.6	0.3	28,406.9	0.0
Aphanocapsa	Cyanophyta	2,108.0	0.3	11,920.3	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	2,080.6	0.3	3,195,789.3	4.1
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	2,108.0	0.3	66,456.9	0.1	4,161.2	0.6	66,129.1	0.1
Chrysocapsa	Chrysophyta	6,323.9	1.0	759,507.3	1.5	2,080.6	0.3	356,973.0	0.5
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	2,080.6	0.3	35,697.3	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	4,215.9	0.7	291,405.5	0.6	2,080.6	0.3	477,237.9	0.6
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	8,431.9	1.3	152,579.8	0.3	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	8,431.9	1.3	809,237.2	1.6	10,403.0	1.5	669,324.4	0.8
Jaaginema	Cyanophyta	2,108.0	0.3	6,675.3	0.0	4,161.2	0.6	16,733.0	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	88,534.7	13.7	5,874,310.4	11.3	153,963.8	22.6	60,055,137.7	76.3
Nitzschia	Bacillariophyta	6,323.9	1.0	362,376.8	0.7	20,805.9	3.0	662,352.3	0.8
Nitzschia (Closterium sp.)	Bacillariophyta	33,727.5	5.2	1,246,065.5	2.4	131,077.3	19.2	4,743,831.5	6.0
Nodularia	Cyanophyta	23,187.7	3.6	38,929,657.6	74.8	4,161.2	0.6	1,241,530.0	1.6
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	147,557.8	22.9	59,333.0	0.1	104,029.6	15.2	48,800.3	0.1
Synechocystis (>1 um spherical)	Cyanophyta	295,115.5	45.8	267,020.5	0.5	228,865.1	33.5	207,077.2	0.3
Thalassionema	Bacillariophyta	8,431.9	1.3	2,712,525.9	5.2	2,080.6	0.3	4,183,278.4	5.3
Thalassiosira	Bacillariophyta	2,108.0	0.3	434,004.1	0.8	2,080.6	0.3	52,290.9	0.1
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	4,161.2	0.6	2,635,465.5	3.3
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total:	645,038	100	52,073,736	100	682,434	100	78,751,353	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Ref Shoal 2				Ref Shoal 2			
	Date	09/01/2009				09/01/2009			
	Replicate	4				5			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	6,406.0	1.0	40,834.6	0.1	13,469.1	1.3	85,857.4	0.3
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	2,135.3	0.3	10,233,253.7	12.8	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	2,135.3	0.3	19,921.3	0.0	6,734.5	0.7	370,687.7	1.3
Chrysocapsa	Chrysophyta	0.0	0.0	0.0	0.0	29,183.0	2.9	3,004,210.1	10.8
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	2,135.3	0.3	137,755.3	0.2	0.0	0.0	0.0	0.0
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	0.0	0.0	0.0	0.0	11,224.2	1.1	846,288.0	3.0
Jaaginema	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	115,308.6	18.6	26,318,668.5	32.8	103,263.1	10.1	1,121,158.1	4.0
Nitzschia	Bacillariophyta	40,571.5	6.6	1,468,328.8	1.8	33,672.7	3.3	541,626.0	1.9
Nitzschia (Closterium sp.)	Bacillariophyta	183,639.6	29.7	9,969,188.9	12.4	114,487.3	11.2	4,316,068.6	15.5
Nodularia	Cyanophyta	6,406.0	1.0	12,370,042.4	15.4	11,224.2	1.1	15,964,592.2	57.5
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	21,353.4	3.4	8,586.2	0.0	157,139.4	15.4	63,185.8	0.2
Synechocystis (>1 um spherical)	Cyanophyta	213,534.4	34.5	193,206.0	0.2	538,763.8	52.7	487,473.5	1.8
Thalassionema	Bacillariophyta	4,270.7	0.7	10,166,687.3	12.7	0.0	0.0	0.0	0.0
Thalassiosira	Bacillariophyta	8,541.4	1.4	537,958.2	0.7	0.0	0.0	0.0	0.0
Ulothrix	Chlorophyta	4,270.7	0.7	7,281,546.6	9.1	2,244.8	0.2	974,924.1	3.5
Unknown	Pyrrhophyta	8,541.4	1.4	1,373,876.3	1.7	0.0	0.0	0.0	0.0
	Total:	619,250	100	80,119,854	100	1,021,406	100	27,776,071	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Ref Shoal 3				Ref Shoal 3			
	Date	09/01/2009				09/01/2009			
	Replicate	1				2			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	29,785.3	3.1	427,002.3	1.0	20,477.4	2.4	293,564.1	0.3
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	1,861.6	0.2	1,077,964.9	1.1
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	14,016.6	1.4	469,513.3	1.1	1,861.6	0.2	58,689.2	0.1
Chrysocapsa	Chrysophyta	22,777.0	2.3	2,311,335.5	5.4	9,307.9	1.1	101,058.8	0.1
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	1,752.1	0.2	456,549.9	1.1	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	1,752.1	0.2	880,690.1	2.1	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	7,008.3	0.7	574,120.7	1.3	1,861.6	0.2	171,563.4	0.2
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	1,861.6	0.2	68,625,369.8	71.9
Haslea	Bacillariophyta	21,024.9	2.2	648,188.1	1.5	22,339.0	2.6	1,886,438.1	2.0
Jaaginema	Cyanophyta	7,008.3	0.7	56,364.3	0.1	3,723.2	0.4	29,943.6	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	3,723.2	0.4	28,937.2	0.0
Navicula	Bacillariophyta	113,885.0	11.7	2,198,197.5	5.1	89,356.0	10.4	7,677,507.9	8.0
Nitzschia	Bacillariophyta	10,512.5	1.1	304,366.3	0.7	22,339.0	2.6	2,207,302.0	2.3
Nitzschia (Closterium sp.)	Bacillariophyta	63,074.8	6.5	2,282,746.0	5.3	89,356.0	10.4	3,233,890.1	3.4
Nodularia	Cyanophyta	12,264.5	1.3	10,777,802.5	25.1	24,200.6	2.8	9,592,626.7	10.1
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	1,861.6	0.2	26,949.2	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	346,911.3	35.6	139,493.0	0.3	307,161.1	35.9	123,509.5	0.1
Synechocystis (>1 um spherical)	Cyanophyta	315,373.9	32.4	285,350.3	0.7	251,313.6	29.3	227,388.6	0.2
Thalassionema	Bacillariophyta	3,504.2	0.4	12,033,750.8	28.1	0.0	0.0	0.0	0.0
Thalassiosira	Bacillariophyta	1,752.1	0.2	6,191,604.3	14.4	3,723.2	0.4	47,909.7	0.1
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	1,752.1	0.2	2,818,208.5	6.6	0.0	0.0	0.0	0.0
	Total:	974,155	100	42,855,284	100	856,328	100	95,410,613	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Ref Shoal 3				Ref Shoal 3			
	Date	09/01/2009				09/01/2009			
	Replicate	3				4			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	1,569.6	0.1	159,052.6	0.2	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	20,404.4	1.9	903,670.2	1.3	26,573.2	2.9	412,700.0	0.6
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	2,044.1	0.2	24,659.3	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	1,569.6	0.1	504,929.1	0.8	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	10,987.0	1.0	260,492.6	0.4	10,220.5	1.1	328,955.5	0.5
Chrysocapsa	Chrysophyta	21,974.0	2.1	628,356.7	0.9	4,088.2	0.4	385,781.6	0.6
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	2,044.1	0.2	591,823.8	0.9
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	3,139.1	0.3	1,205,429.3	1.8	10,220.5	1.1	1,883,833.7	2.7
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	1,569.6	0.1	2,057,266.0	3.1	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	14,126.1	1.3	1,917,152.4	2.9	28,617.3	3.1	1,501,753.9	2.2
Jaaginema	Cyanophyta	4,708.7	0.4	75,739.6	0.1	0.0	0.0	0.0	0.0
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	95,743.7	9.0	10,120,907.2	15.1	149,218.6	16.4	5,580,402.5	8.0
Nitzschia	Bacillariophyta	14,126.1	1.3	965,677.4	1.4	61,322.7	6.7	27,297,872.2	39.3
Nitzschia (Closterium sp.)	Bacillariophyta	103,591.6	9.8	3,644,952.6	5.4	147,174.5	16.1	5,844,255.5	8.4
Nodularia	Cyanophyta	36,100.1	3.4	16,986,582.4	25.3	8,176.4	0.9	1,951,075.3	2.8
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	2,044.1	0.2	14,466,804.1	20.8
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	2,044.1	0.2	221,933.8	0.3
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	211,891.9	20.0	113,616.4	0.2	220,761.8	24.2	88,768.3	0.1
Synechocystis (>1 um spherical)	Cyanophyta	494,414.4	46.6	447,346.1	0.7	220,761.8	24.2	199,745.2	0.3
Thalassionema	Bacillariophyta	3,139.1	0.3	6,362,106.1	9.5	6,132.3	0.7	8,236,214.7	11.9
Thalassiosira	Bacillariophyta	15,695.7	1.5	19,951,008.4	29.7	10,220.5	1.1	443,868.1	0.6
Ulothrix	Chlorophyta	4,708.7	0.4	562,364.8	0.8	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	1,569.6	0.1	315,580.6	0.5	0.0	0.0	0.0	0.0
	Total:	1,061,029	100	67,182,230	100	911,664	100	69,460,447	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Ref Shoal 3				Ref Shoal 4			
	Date	09/01/2009				09/01/2009			
	Replicate	5				1			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	32,121.4	2.7	555,058.1	0.5	7,738.3	1.1	435,823.4	0.2
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	16,060.7	1.3	877,653.6	0.8	5,803.8	0.8	182,972.1	0.1
Chrysocapsa	Chrysophyta	0.0	0.0	0.0	0.0	3,869.2	0.6	132,769.1	0.1
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	2,007.6	0.2	87,188.4	0.1	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Donkinia	Bacillariophyta	16,060.7	1.3	6,372,889.7	6.1	3,869.2	0.6	534,874.2	0.3
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	1,934.6	0.3	49,788,351.8	26.7
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	2,007.6	0.2	403,649.6	0.4	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	16,060.7	1.3	1,283,605.7	1.2	7,738.3	1.1	404,530.3	0.2
Jaaginema	Cyanophyta	0.0	0.0	0.0	0.0	7,738.3	1.1	622,354.6	0.3
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	148,561.6	12.4	13,620,748.5	13.0	75,448.8	11.0	104,318,268.4	55.9
Nitzschia	Bacillariophyta	54,204.9	4.5	1,416,813.0	1.4	38,691.7	5.6	1,400,295.6	0.8
Nitzschia (Closterium sp.)	Bacillariophyta	138,523.6	11.5	3,481,472.7	3.3	191,524.0	28.0	7,239,529.3	3.9
Nodularia	Cyanophyta	56,212.5	4.7	58,822,009.1	56.2	5,803.8	0.8	7,844,777.0	4.2
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	198,751.3	16.6	79,917.9	0.1	58,037.6	8.5	31,119.7	0.0
Synechocystis (>1 um spherical)	Cyanophyta	487,844.1	40.6	441,401.3	0.4	261,169.0	38.1	236,305.8	0.1
Thalassionema	Bacillariophyta	10,037.9	0.8	12,109,490.3	11.6	1,934.6	0.3	5,321,130.1	2.9
Thalassiosira	Bacillariophyta	16,060.7	1.3	1,821,266.8	1.7	11,607.5	1.7	4,934,882.0	2.6
Ulothrix	Chlorophyta	4,015.2	0.3	516,671.4	0.5	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	2,007.6	0.2	2,690,997.9	2.6	1,934.6	0.3	3,111,771.9	1.7
	Total:	1,200,538	100	104,580,834	100	684,843	100	186,539,755	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Ref Shoal 4				Ref Shoal 4			
	Date	09/01/2009				09/01/2009			
	Replicate	2				3			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	0.0	0.0	0.0	0.0	10,403.0	1.4	358,727.3	0.3
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	2,080.6	0.3	133,864.9	0.1
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	2,080.6	0.3	50,199.3	0.0
Asterolampra	Bacillariophyta	1,642.6	0.2	10,821,921.0	14.8	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	8,212.9	1.1	194,720.4	0.3	16,644.7	2.3	394,633.4	0.3
Chrysocapsa	Chrysophyta	4,927.7	0.6	394,549.1	0.5	16,644.7	2.3	856,736.2	0.8
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	8,322.4	1.2	1,445,740.9	1.3
Donkinia	Bacillariophyta	8,212.9	1.1	6,307,478.8	8.6	6,241.8	0.9	575,242.1	0.5
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	31,208.9	4.0	815,740.8	1.1	24,967.1	3.5	4,517,939.7	4.0
Jaaginema	Cyanophyta	0.0	0.0	0.0	0.0	18,725.3	2.6	702,791.5	0.6
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	1,642.6	0.2	12,766.4	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	123,192.9	15.8	18,824,756.8	25.8	72,820.7	10.1	30,747,099.6	27.1
Nitzschia	Bacillariophyta	3,285.1	0.4	79,262.0	0.1	6,241.8	0.9	903,588.2	0.8
Nitzschia (Closterium sp.)	Bacillariophyta	202,036.4	25.9	6,347,156.3	8.7	93,626.6	13.0	1,505,984.5	1.3
Nodularia	Cyanophyta	8,212.9	1.1	4,659,212.2	6.4	39,531.2	5.5	60,629,619.9	53.4
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	2,080.6	0.3	1,874,108.6	1.6
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pseudo-nitzschia	Bacillariophyta	1,642.6	0.2	634,096.9	0.9	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	2,080.6	0.3	602,392.1	0.5
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	103,482.1	13.3	41,610.1	0.1	174,769.7	24.2	81,984.5	0.1
Synechocystis (>1 um spherical)	Cyanophyta	266,096.8	34.1	240,764.4	0.3	205,978.6	28.5	186,369.4	0.2
Thalassionema	Bacillariophyta	11,498.0	1.5	21,546,085.6	29.5	8,322.4	1.2	5,354,596.5	4.7
Thalassiosira	Bacillariophyta	1,642.6	0.2	142,671.9	0.2	8,322.4	1.2	234,263.8	0.2
Ulothrix	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown	Pyrrhophyta	3,285.1	0.4	1,981,553.0	2.7	2,080.6	0.3	2,454,189.9	2.2
	Total:	780,222	100	73,044,346	100	721,965	100	113,610,072	100

(continued)

Appendix 3.2-2. Periphyton Taxonomy Data for Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (completed)

Rescan Hope Bay Marine Periphyton Samples	Sample ID	Ref Shoal 4				Ref Shoal 4			
	Date	09/01/2009				09/01/2009			
	Replicate	4				5			
Taxa	Division	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent	Concentration #/cm^2	Concentration Percent	Biovolume µm^3/cm^2	Biovolume Percent
Achnanthes	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alexandrium	Pyrrhophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphora	Bacillariophyta	54,314.4	10.6	972,140.9	4.4	58,767.6	5.2	1,677,697.4	1.1
Aphanocapsa	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphanothece	Cyanophyta	0.0	0.0	0.0	0.0	12,593.1	1.1	177,238.5	0.1
Asterolampra	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bleakeleya	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calothrix	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaetoceros	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorococcales (Order)	Chlorophyta	8,760.4	1.7	271,862.9	1.2	94,447.9	8.4	2,239,284.8	1.5
Chrysocapsa	Chrysophyta	8,760.4	1.7	150,304.6	0.7	27,285.0	2.4	2,457,711.5	1.6
Chrysocapsaceae (Family)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysophyceae (Class)	Chrysophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cocconeis	Bacillariophyta	1,752.1	0.3	101,455.4	0.5	0.0	0.0	0.0	0.0
Cylindrotheca	Bacillariophyta	0.0	0.0	0.0	0.0	2,098.8	0.2	5,626,631.7	3.7
Dactyliosolen	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dictyosphaerium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diploneis	Bacillariophyta	0.0	0.0	0.0	0.0	4,197.7	0.4	4,861,409.8	3.2
Donkinia	Bacillariophyta	3,504.2	0.7	1,345,595.5	6.1	14,691.9	1.3	1,203,560.4	0.8
Entomoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eucampia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariopsis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gyrosigma	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haslea	Bacillariophyta	14,016.6	2.7	507,276.9	2.3	33,581.5	3.0	1,350,392.1	0.9
Jaaginema	Cyanophyta	21,024.9	4.1	1,521,832.8	7.0	10,494.2	0.9	84,399.7	0.1
Leptolyngbya	Cyanophyta	0.0	0.0	0.0	0.0	10,494.2	0.9	332,323.4	0.2
Lyngbya	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mastogloia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Monoraphidium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula	Bacillariophyta	68,331.0	13.4	1,648,649.9	7.5	140,622.5	12.5	5,598,222.6	3.7
Nitzschia	Bacillariophyta	1,752.1	0.3	42,273.1	0.2	44,075.7	3.9	1,152,055.0	0.8
Nitzschia (Closterium sp.)	Bacillariophyta	59,570.6	11.6	2,155,926.8	9.8	46,174.5	4.1	1,114,071.6	0.7
Nodularia	Cyanophyta	12,264.5	2.4	9,621,814.2	43.9	83,953.7	7.5	112,479,318.7	74.2
Odontella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oedogonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oscillatoria	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pinnularia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurocapsa	Cyanophyta	0.0	0.0	0.0	0.0	2,098.8	0.2	243,070.6	0.2
Pseudo-nitzschia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhaphoneis	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizosolenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenedesmus	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spirulina	Cyanophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stigeoclonium	Chlorophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surirella	Bacillariophyta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synechococcus (> 1 um ovoid)	Cyanophyta	173,455.7	33.9	81,368.1	0.4	251,861.1	22.4	118,148.1	0.1
Synechocystis (>1 um spherical)	Cyanophyta	78,843.5	15.4	71,337.6	0.3	251,861.1	22.4	227,884.0	0.2
Thalassionema	Bacillariophyta	1,752.1	0.3	1,352,740.1	6.2	0.0	0.0	0.0	0.0
Thalassiosira	Bacillariophyta	1,752.1	0.3	22,545.7	0.1	18,889.6	1.7	358,909.7	0.2
Ulothrix	Chlorophyta	1,752.1	0.3	2,029,110.2	9.3	2,098.8	0.2	2,700,783.3	1.8
Unknown	Pyrrhophyta	0.0	0.0	0.0	0.0	12,593.1	1.1	7,595,953.0	5.0
	Total:	511,607	100	21,896,234	100	1,122,881	100	151,599,066	100

Appendix 3.2-3

Benthic Invertebrate Data Collected from Roberts Bay and the Reference Bay,
Hope Bay Belt Project, 2009

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Appendix 3.2-3 Benthic Invertebrate Data Collected from Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Location	Roberts Bay																																	
Site	Shoal 1										Shoal 2								Shoal 3										Shoal 4					
Sampling Date (m/d/y)	9/12/09								9/11/09		9/11/09								9/11/09										9/11/09				9/10/09	
Replicate	1	1	2	2	3	3	4	4	5	5	2	2	3	3	4	4	5	5	1	1	2	2	3	3	4	4	5	5	1	1	2	2	3	3	4	4	5	5
Stage	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J
ANNELIDA																																						
Polychaeta Errantia																																						
Polynoidae (Indeterminate)	0	3	0	2	0	7	0	0	0	0	0	0	0	4	0	4	0	3	0	0	0	7	0	7	0	12	0	1	0	0	0	7	0	0	0	4	0	0
Polychaeta Sedentaria																																						
Leitoscoloplos sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ARTHROPODA																																						
Arachnida																																						
Halacaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Amphipoda																																						
Apherusa nr. glacialis	0	0	8	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0	7	0	0	0	0	0	2	0	0	0	2	0	0	0
Gammaracanthus loricatus	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ischyrocerus anguipes	17	0	7	0	0	0	2	0	3	0	4	0	21	0	28	0	8	0	8	0	17	0	12	0	22	0	5	0	7	0	41	0	21	0	15	0	48	0
Lagunogammarus setosus	0	0	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stenothoidae	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weyprechtia pinguis	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copepoda																																						
Harpacticoida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Isopoda																																						
Saduria entomon	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA																																						
Chironomidae larvae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHORDATA																																						
Teleostei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(continued)

Appendix 3.2-3 Benthic Invertebrate Data Collected from Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (completed)

Location	Reference Bay																																	
Site	Shoal 1										Shoal 2										Shoal 3										Shoal 4					
Sampling Date (m/d/y)	9/09/09										9/09/09				9/10/09						9/10/09										9/10/09					
Replicate	1	1	2	2	3	3	4	4	5	5	1	1	2	2	3	3	4	4	5	5	1	1	2	2	3	3	4	4	5	5	1	1	2	2	3	3	4	4	5	5
Stage	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J
ANNELIDA																																								
Polychaeta Errantia																																								
Polynoidae (Indeterminate)	0	1	0	0	0	1	0	5	0	2	0	0	0	0	0	0	0	2	0	0	0	3	0	0	0	0	0	1	0	3	0	0	0	0	0	1	0	0	0	0
Polychaeta Sedentaria																																								
Leitoscoloplos sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ARTHROPODA																																								
Arachnida																																								
Halacaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	12	0	0	0	0	0	0	0	0	0	0	0
Amphipoda																																								
Apherusa nr. glacialis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	4	0	1	0	0	0	1	0	0	0	0	0	4	0	0	0	0	0
Gammaracanthus loricatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ischyrocerus anguipes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lagunogammarus setosus	0	1	1	2	1	0	8	2	5	1	2	3	0	0	7	1	1	1	5	1	42	13	3	4	8	5	3	1	10	2	4	1	36	10	11	2	13	1	2	1
Stenothoidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weyprechtia pinguis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copepoda																																								
Harpacticoida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isopoda																																								
Saduria entomon	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INSECTA																																								
Chironomidae larvae	0	7	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHORDATA																																								
Teleostei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Notes:

Stage: A = adults, J = Juveniles

Appendix 3.2-4

Set Times, Retrieval Times and Locations of Floating Gillnets used in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

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Appendix 3.2-4. Set Times, Retrieval Times and Locations for Floating Gillnets used in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Location		Gear			Set		Retrieval		UTM 1			UTM 2			
Location	Site	Method	Type	#	Date In	Time In	Date Out	Time Out	Depth	Easting	Northing	Depth	Easting	Northing	Catch Summary
Roberts Bay	Shoals	GN	F	1	04-Aug-09	9:00	04-Aug-09	10:00	2.0	432272	7563392	2.0	432358	7563362	1 AC; 2 GC; 1 LT; 5 PH
Roberts Bay	Shoals	GN	F	2	04-Aug-09	10:20	04-Aug-09	11:20	1.4	432351	7563323	1.5	432266	7563355	6 SP
Roberts Bay	Shoals	GN	F	3	05-Aug-09	9:00	05-Aug-09	10:00	5.2	432260	7563438	1.5	432294	7563354	1 SP
Roberts Bay	Shoals	GN	F	4	05-Aug-09	10:15	05-Aug-09	11:15	7.5	432356	7563393	1.4	432397	7563311	1 LT
Roberts Bay	Shoals	GN	F	1	27-Aug-09	11:18	27-Aug-09	13:22	3.8	432369	7563358	3.5	432455	7563328	NFC
Roberts Bay	Shoals	GN	F	2	27-Aug-09	13:33	27-Aug-09	15:37	1.4	432354	7563403	6.4	432388	7563319	2 AC
Roberts Bay	Shoals	GN	F	3	27-Aug-09	15:42	27-Aug-09	17:36	1.5	432242	7563368	4.5	432254	7563458	NFC
Roberts Bay	Shoals	GN	F	4	28-Aug-09	10:59	28-Aug-09	13:28	1.4	432322	7563396	5.1	432231	7563389	5 AC
Roberts Bay	Shoals	GN	F	5	28-Aug-09	13:34	28-Aug-09	15:38	1.2	432456	7563393	5.6	432462	7563302	2 AC; 1 GC
Roberts Bay	Shoals	GN	F	6	28-Aug-09	15:46	28-Aug-09	17:26	3.3	432368	7563358	4.2	432457	7563337	NFC
Roberts Bay	Jetty	GN	F	1	25-Aug-09	10:07	25-Aug-09	11:02	4.7	432522	7563485	5.0	432537	7563396	NFC
Roberts Bay	Jetty	GN	F	2	25-Aug-09	11:09	25-Aug-09	13:09	3.1	432425	7563373	5.3	432489	7563308	5 AC
Roberts Bay	Jetty	GN	F	3	25-Aug-09	13:55	25-Aug-09	16:14	5.1	432423	7563334	2.6	432511	7563358	2 AC
Reference Bay	Shoals	GN	F	1	06-Aug-09	9:15	06-Aug-09	10:15	2.7	441619	7562424	2.0	441701	7562464	1 SP
Reference Bay	Shoals	GN	F	2	06-Aug-09	10:30	06-Aug-09	11:30	2.5	441501	7562291	2.7	441466	7562375	NFC
Reference Bay	Shoals	GN	F	3	07-Aug-09	11:30	07-Aug-09	12:30	2.7	441590	7562263	1.1	441590	7562354	1 AC; 3 SP; 1 AF; 7 PH
Reference Bay	Shoals	GN	F	4	07-Aug-09	13:50	07-Aug-09	14:50	6.8	441511	7562059	1.5	441511	7562150	1 AC; 1 SP; 2 PH
Reference Bay	Shoals	GN	F	1	06-Sep-09	12:20	06-Sep-09	14:46	2.8	441433	7562380	1.5	441522	7562384	2 AC; 1 SP
Reference Bay	Shoals	GN	F	2	06-Sep-09	14:51	06-Sep-09	16:29	3.0	441540	7562214	2.2	441449	7562220	3 PH
Reference Bay	Shoals	GN	F	3	07-Sep-09	11:35	07-Sep-09	13:38	1.1	441526	7562268	2.7	441584	7562197	2 AC; 2 SP
Reference Bay	Shoals	GN	F	4	07-Sep-09	13:54	07-Sep-09	17:09	1.3	441533	7562114	2.3	441510	7562202	5 AC; 3 SP

Note: Catch Summary includes fish that escaped prior to being sampled for biological data.
AC = Arctic char; AF = Arctic flounder; GC = Greenland cod; LT = Lake trout; NFC = No Fish Captured; PH = Pacific herring; SP = Sculpin (Myoxocephalus sp.).
GN = Gillnet; F = Floating.

Appendix 3.2-5

Set Times, Retrieval Times and Locations of Sinking Gillnets used in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

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Appendix 3.2-5. Set Times, Retrieval Times and Locations for Sinking Gillnets used in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Location		Gear			Set		Retrieval		UTM 1			UTM 2			
Location	Site	Method	Type	#	Date In	Time In	Date Out	Time Out	Depth	Easting	Northing	Depth	Easting	Northing	Catch Summary
Roberts Bay	Shoals	GN	S	1	04-Aug-09	11:45	04-Aug-09	12:45	6.9	432353	7563397	5.9	432429	7563346	1 GC; 2 PH
Roberts Bay	Shoals	GN	S	2	04-Aug-09	13:00	04-Aug-09	14:00	5.2	432368	7563374	3.8	432440	7563318	1 GC; 1 PH
Roberts Bay	Shoals	GN	S	3	05-Aug-09	11:30	05-Aug-09	12:30	4.2	432249	7563445	1.2	432286	7563362	1 SP; 2 PH
Roberts Bay	Shoals	GN	S	4	05-Aug-09	12:40	05-Aug-09	13:40	2.3	432256	7563363	1.8	432222	7563447	1 SF
Roberts Bay	Shoals	GN	S	1	27-Aug-09	9:55	27-Aug-09	11:08	1.7	432280	7563346	5.5	432315	7563430	1 AF
Roberts Bay	Shoals	GN	S	2	27-Aug-09	11:12	27-Aug-09	13:14	2.6	432353	7563353	2.5	432275	7563400	NFC
Roberts Bay	Shoals	GN	S	3	27-Aug-09	13:28	27-Aug-09	15:25	1.3	432443	7563400	5.9	432444	7563309	2 GC; 32 SC; 1 PH
Roberts Bay	Shoals	GN	S	4	27-Aug-09	16:41	27-Aug-09	17:47	2.6	432427	7563335	2.2	432341	7563365	1 AC; 3 SC
Roberts Bay	Shoals	GN	S	5	28-Aug-09	9:46	28-Aug-09	10:50	1.3	432256	7563384	4.7	432346	7563390	1 AC; 1 GC
Roberts Bay	Shoals	GN	S	6	28-Aug-09	10:54	28-Aug-09	13:00	1.4	432466	7563394	5.5	432429	7563311	1 AC; 3 GC
Roberts Bay	Shoals	GN	S	7	28-Aug-09	13:10	28-Aug-09	15:30	1.3	432370	7563392	6.0	432378	7563301	3 SP
Roberts Bay	Shoals	GN	S	8	28-Aug-09	15:42	28-Aug-09	17:20	1.7	432281	7563355	4.1	432282	7563445	2 AC
Roberts Bay	Jetty	GN	S	1	24-Aug-09	13:34	24-Aug-09	15:36	5.1	432498	7563351	4.6	432587	7563383	1 GC
Roberts Bay	Jetty	GN	S	2	24-Aug-09	15:40	24-Aug-09	17:42	4.8	432593	7563447	4.2	432581	7563357	NFC
Roberts Bay	Jetty	GN	S	3	25-Aug-09	9:16	25-Aug-09	10:18	3.9	432517	7563345	2.0	432455	7563279	2 GC; 1 unknown
Roberts Bay	Jetty	GN	S	4	25-Aug-09	10:56	25-Aug-09	12:49	3.4	432541	7563357	5.6	432457	7563391	3 GC
Roberts Bay	Jetty	GN	S	5	25-Aug-09	14:03	25-Aug-09	16:21	4.0	432544	7563376	5.2	432631	7563401	NFC
Roberts Bay	Jetty	GN	S	6	25-Aug-09	16:47	25-Aug-09	17:32	5.2	432458	7563368	5.1	432549	7563362	1 GC
Reference Bay	Shoals	GN	S	1	06-Aug-09	11:45	06-Aug-09	12:45	2.3	441498	7562291	4.2	441574	7562242	3 AC; 6 SP
Reference Bay	Shoals	GN	S	2	06-Aug-09	13:15	06-Aug-09	14:15	1.8	441474	7562121	4.0	441565	7562133	1 AC; 3 SP; 2 PH
Reference Bay	Shoals	GN	S	3	07-Aug-09	9:00	07-Aug-09	10:00	2.6	441566	7562340	3.2	441539	7562434	2 SP; 1 SF
Reference Bay	Shoals	GN	S	4	07-Aug-09	10:15	07-Aug-09	11:15	3.0	441495	7562331	2.1	441454	7562412	NFC
Reference Bay	Shoals	GN	S	1	06-Sep-09	10:29	06-Sep-09	12:04	1.3	441429	7562303	1.7	441519	7562292	11 SP
Reference Bay	Shoals	GN	S	2	06-Sep-09	12:15	06-Sep-09	14:26	3.0	441324	7562516	3.4	441398	7562463	2 SP
Reference Bay	Shoals	GN	S	3	07-Sep-09	10:19	07-Sep-09	11:25	1.9	441567	7562352	1.8	441592	7562264	2 AC; 1 SP
Reference Bay	Shoals	GN	S	4	07-Sep-09	11:31	07-Sep-09	13:49	1.0	441518	7562185	2.0	441539	7562096	3 SP; 1 SF
Reference Bay	Shoals	GN	S	5	07-Sep-09	13:58	07-Sep-09	16:57	4.6	441495	7562524	2.8	441405	7562513	2 SP

Note: Catch Summary includes fish that escaped prior to being sampled for biological data.
AC = Arctic char; GC = Greenland cod; NFC = No Fish Captured; PH = Pacific herring; SP = Sculpin (Myoxocephalus sp.).
GN = Gillnet; S = Sinking.

Appendix 3.2-6

Set Times, Retrieval Times and Locations of Long Lines used in Roberts Bay and the Reference Bay,
Hope Bay Belt Project, 2009

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Appendix 3.2-6. Set Times, Retrieval Times and Locations for Long Lines used in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Location		Gear		Set		Retrieval		UTM 1			UTM 2			
Location	Site	Method	#	Date In	Time In	Date Out	Time Out	Depth	Easting	Northing	Depth	Easting	Northing	Catch Summary
Roberts Bay	Shoals	LL	1	04-Aug-09	10:25	04-Aug-09	14:25	3.8	432318	7563395	5.6	432302	7563399	NFC
Roberts Bay	Shoals	LL	2	04-Aug-09	14:45	04-Aug-09	17:30	2.7	432299	7563376	2.5	432284	7563384	1 GC
Roberts Bay	Shoals	LL	3	05-Aug-09	9:15	05-Aug-09	12:45	6.8	432355	7563379	4.8	432346	7563394	NFC
Roberts Bay	Shoals	LL	4	05-Aug-09	12:50	05-Aug-09	15:15	2.1	432326	7563336	1.8	432326	7563353	NFC
Roberts Bay	Shoals	LL	1	27-Aug-09	10:08	27-Aug-09	13:36	1.3	432246	7563394	1.6	432235	7563406	NFC
Roberts Bay	Shoals	LL	2	27-Aug-09	13:40	27-Aug-09	16:35	3.1	432425	7563335	4.5	432425	7563352	NFC
Roberts Bay	Shoals	LL	3	28-Aug-09	9:56	28-Aug-09	13:07	2.6	432363	7563356	2.9	432380	7563354	2 GC
Roberts Bay	Shoals	LL	4	28-Aug-09	13:20	28-Aug-09	15:51	1.8	432379	7563358	2.4	432379	7563375	3 GC
Roberts Bay	Jetty	LL	1	25-Aug-09	10:00	25-Aug-09	12:30	5.2	432551	7563365	5.0	432558	7563349	3 GC
Roberts Bay	Jetty	LL	2	25-Aug-09	13:45	25-Aug-09	16:27	2.6	432523	7563357	3.9	432519	7563341	3 GC
Roberts Bay	Jetty	LL	3	25-Aug-09	16:44	25-Aug-09	17:35	3.5	432484	7563331	4.5	432497	7563321	NFC
Reference Bay	Shoals	LL	1	06-Aug-09	9:30	06-Aug-09	14:45	3.0	441454	7562452	2.5	441448	7562468	2 GC
Reference Bay	Shoals	LL	2	06-Aug-09	14:45	06-Aug-09	16:30	4.0	441497	7562262	4.7	441480	7562261	NFC
Reference Bay	Shoals	LL	3	07-Aug-09	11:00	07-Aug-09	14:15	2.2	441514	7562395	2.5	441497	7562396	NFC
Reference Bay	Shoals	LL	4	07-Aug-09	14:20	07-Aug-09	15:50	2.7	441590	7562201	2.0	441606	7562206	NFC
Reference Bay	Shoals	LL	1	06-Sep-09	10:40	06-Sep-09	14:10	2.1	441625	7562459	2.8	441608	7562460	NFC
Reference Bay	Shoals	LL	2	06-Sep-09	14:31	06-Sep-09	16:33	4.4	441379	7562471	3.2	441394	7562464	NFC
Reference Bay	Shoals	LL	3	07-Sep-09	10:25	07-Sep-09	13:22	1.5	441505	7562402	1.4	441492	7562397	NFC
Reference Bay	Shoals	LL	4	07-Sep-09	13:25	07-Sep-09	15:50	1.9	441595	7562329	2.7	441597	7562346	NFC

Note: GC = Greenland cod; NFC = No Fish Captured.
LL = Long line.

Appendix 3.2-7

Set Times, Retrieval Times and Locations of Minnow Traps used in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

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Appendix 3.2-7. Set Times, Retrieval Times and Locations for Minnow Traps used in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Location			Gear		Set		Retrieval		UTM			Catch
Location	Site	Shoal #	Method	#	Date In	Time In	Date Out	Time Out	Depth	Easting	Northing	Summary
Roberts Bay	Shoals	4	MT	1	03-Aug-09	14:30	04-Aug-09	13:30	1.5	432259	7563381	NFC
Roberts Bay	Shoals	4	MT	2	03-Aug-09	14:35	04-Aug-09	13:30	1.5	432260	7563372	NFC
Roberts Bay	Shoals	4	MT	3	03-Aug-09	14:36	04-Aug-09	13:30	1.5	432265	7563368	NFC
Roberts Bay	Shoals	4	MT	4	03-Aug-09	14:38	04-Aug-09	13:30	1.5	432268	7563365	NFC
Roberts Bay	Shoals	4	MT	5	03-Aug-09	14:40	04-Aug-09	13:30	1.5	432274	7563358	NFC
Roberts Bay	Shoals	3	MT	6	03-Aug-09	14:42	04-Aug-09	13:30	1.5	432297	7563359	NFC
Roberts Bay	Shoals	3	MT	7	03-Aug-09	14:44	04-Aug-09	13:30	1.5	432301	7563354	NFC
Roberts Bay	Shoals	3	MT	8	03-Aug-09	14:46	04-Aug-09	13:30	1.5	432308	7563354	NFC
Roberts Bay	Shoals	3	MT	9	03-Aug-09	14:48	04-Aug-09	13:30	1.5	432317	7563354	NFC
Roberts Bay	Shoals	3	MT	10	03-Aug-09	14:50	04-Aug-09	13:30	1.5	432318	7563348	NFC
Roberts Bay	Shoals	2	MT	11	03-Aug-09	14:52	04-Aug-09	13:30	1.5	432346	7563344	NFC
Roberts Bay	Shoals	2	MT	12	03-Aug-09	14:54	04-Aug-09	13:30	1.5	432355	7563342	NFC
Roberts Bay	Shoals	2	MT	13	03-Aug-09	14:56	04-Aug-09	13:30	1.5	432366	7563343	NFC
Roberts Bay	Shoals	2	MT	14	03-Aug-09	14:58	04-Aug-09	13:30	1.5	432370	7563338	NFC
Roberts Bay	Shoals	2	MT	15	03-Aug-09	15:00	04-Aug-09	13:30	1.5	432372	7563327	NFC
Roberts Bay	Shoals	1	MT	16	03-Aug-09	15:02	04-Aug-09	13:30	1.5	432403	7563324	NFC
Roberts Bay	Shoals	1	MT	17	03-Aug-09	15:04	04-Aug-09	13:30	1.5	432409	7563325	NFC
Roberts Bay	Shoals	1	MT	18	03-Aug-09	15:06	04-Aug-09	13:30	1.5	432414	7563318	NFC
Roberts Bay	Shoals	1	MT	19	03-Aug-09	15:10	04-Aug-09	13:30	1.5	432432	7563313	NFC
Roberts Bay	Shoals	1	MT	20	03-Aug-09	15:15	04-Aug-09	13:30	1.5	432433	7563314	NFC
Roberts Bay	Shoals	4	MT	21	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432259	7563381	NFC
Roberts Bay	Shoals	4	MT	22	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432260	7563372	NFC
Roberts Bay	Shoals	4	MT	23	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432265	7563368	NFC
Roberts Bay	Shoals	4	MT	24	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432268	7563365	NFC
Roberts Bay	Shoals	4	MT	25	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432274	7563358	NFC
Roberts Bay	Shoals	3	MT	26	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432297	7563359	NFC
Roberts Bay	Shoals	3	MT	27	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432301	7563354	NFC
Roberts Bay	Shoals	3	MT	28	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432308	7563354	NFC
Roberts Bay	Shoals	3	MT	29	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432317	7563354	NFC
Roberts Bay	Shoals	3	MT	30	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432318	7563348	NFC
Roberts Bay	Shoals	2	MT	31	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432346	7563344	NFC
Roberts Bay	Shoals	2	MT	32	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432355	7563342	NFC
Roberts Bay	Shoals	2	MT	33	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432366	7563343	NFC
Roberts Bay	Shoals	2	MT	34	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432370	7563338	1 SP
Roberts Bay	Shoals	2	MT	35	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432372	7563327	NFC
Roberts Bay	Shoals	1	MT	36	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432403	7563324	NFC
Roberts Bay	Shoals	1	MT	37	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432409	7563325	NFC
Roberts Bay	Shoals	1	MT	38	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432414	7563318	NFC
Roberts Bay	Shoals	1	MT	39	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432432	7563313	NFC
Roberts Bay	Shoals	1	MT	40	04-Aug-09	13:30	05-Aug-09	10:30	1.5	432433	7563314	NFC
Roberts Bay	Shoals	4	MT	1	27-Aug-09	9:31	28-Aug-09	9:01	1.4	432252	7563375	NFC
Roberts Bay	Shoals	4	MT	2	27-Aug-09	9:32	28-Aug-09	9:02	1.4	432255	7563372	NFC
Roberts Bay	Shoals	4	MT	3	27-Aug-09	9:33	28-Aug-09	9:03	1.5	432265	7563364	NFC
Roberts Bay	Shoals	4	MT	4	27-Aug-09	9:34	28-Aug-09	9:04	2.0	432264	7563378	NFC
Roberts Bay	Shoals	4	MT	5	27-Aug-09	9:36	28-Aug-09	9:05	1.6	432272	7563366	NFC
Roberts Bay	Shoals	3	MT	6	27-Aug-09	9:37	28-Aug-09	9:18	1.5	432297	7563365	NFC
Roberts Bay	Shoals	3	MT	7	27-Aug-09	9:37	28-Aug-09	9:18	1.4	432297	7563354	NFC
Roberts Bay	Shoals	3	MT	8	27-Aug-09	9:38	28-Aug-09	9:18	1.1	432305	7563354	NFC
Roberts Bay	Shoals	3	MT	9	27-Aug-09	9:39	28-Aug-09	9:18	1.6	432311	7563352	NFC
Roberts Bay	Shoals	3	MT	10	27-Aug-09	9:39	28-Aug-09	9:18	1.3	432322	7563357	NFC
Roberts Bay	Shoals	2	MT	11	27-Aug-09	9:41	28-Aug-09	9:27	2.1	432349	7563352	NFC
Roberts Bay	Shoals	2	MT	12	27-Aug-09	9:41	28-Aug-09	9:27	1.7	432354	7563351	NFC
Roberts Bay	Shoals	2	MT	13	27-Aug-09	9:42	28-Aug-09	9:27	2.0	432362	7563345	NFC
Roberts Bay	Shoals	2	MT	14	27-Aug-09	9:43	28-Aug-09	9:27	1.9	432376	7563340	NFC
Roberts Bay	Shoals	2	MT	15	27-Aug-09	9:44	28-Aug-09	9:27	1.4	432367	7563333	NFC
Roberts Bay	Shoals	1	MT	16	27-Aug-09	9:45	28-Aug-09	9:34	1.5	432398	7563327	NFC
Roberts Bay	Shoals	1	MT	17	27-Aug-09	9:45	28-Aug-09	9:35	1.5	432405	7563324	NFC
Roberts Bay	Shoals	1	MT	18	27-Aug-09	9:46	28-Aug-09	9:36	1.5	432414	7563305	NFC
Roberts Bay	Shoals	1	MT	19	27-Aug-09	9:47	28-Aug-09	9:37	1.3	432412	7563324	NFC
Roberts Bay	Shoals	1	MT	20	27-Aug-09	9:48	28-Aug-09	9:37	2.3	432424	7563324	NFC
Roberts Bay	Shoals	4	MT	21	28-Aug-09	9:08	29-Aug-09	9:38	1.4	432260	7563377	1 NS
Roberts Bay	Shoals	4	MT	22	28-Aug-09	9:08	29-Aug-09	9:38	1.4	432268	7563368	NFC
Roberts Bay	Shoals	4	MT	23	28-Aug-09	9:09	29-Aug-09	9:39	1.4	432272	7563361	NFC
Roberts Bay	Shoals	4	MT	24	28-Aug-09	9:10	29-Aug-09	9:39	1.7	432268	7563377	NFC
Roberts Bay	Shoals	4	MT	25	28-Aug-09	9:11	29-Aug-09	9:40	1.8	432271	7563372	NFC
Roberts Bay	Shoals	3	MT	26	28-Aug-09	9:19	29-Aug-09	9:40	1.5	432297	7563356	NFC
Roberts Bay	Shoals	3	MT	27	28-Aug-09	9:20	29-Aug-09	9:40	1.2	432306	7563352	NFC

(continued)

Appendix 3.2-7. Set Times, Retrieval Times and Locations for Minnow Traps used in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Location			Gear		Set		Retrieval		UTM			Catch
Location	Site	Shoal #	Method	#	Date In	Time In	Date Out	Time Out	Depth	Easting	Northing	Summary
Roberts Bay	Shoals	3	MT	28	28-Aug-09	9:21	29-Aug-09	9:41	1.5	432314	7563349	NFC
Roberts Bay	Shoals	3	MT	29	28-Aug-09	9:22	29-Aug-09	9:42	1.9	432312	7563366	NFC
Roberts Bay	Shoals	3	MT	30	28-Aug-09	9:23	29-Aug-09	9:43	1.8	432314	7563362	NFC
Roberts Bay	Shoals	2	MT	31	28-Aug-09	9:28	29-Aug-09	9:44	2.1	432351	7563351	NFC
Roberts Bay	Shoals	2	MT	32	28-Aug-09	9:28	29-Aug-09	9:44	1.7	432357	7563346	NFC
Roberts Bay	Shoals	2	MT	33	28-Aug-09	9:29	29-Aug-09	9:45	1.6	432360	7563348	NFC
Roberts Bay	Shoals	2	MT	34	28-Aug-09	9:30	29-Aug-09	9:46	2.0	432368	7563344	NFC
Roberts Bay	Shoals	2	MT	35	28-Aug-09	9:30	29-Aug-09	9:46	1.9	432375	7563339	NFC
Roberts Bay	Shoals	1	MT	36	28-Aug-09	9:38	29-Aug-09	9:48	1.5	432404	7563325	NFC
Roberts Bay	Shoals	1	MT	37	28-Aug-09	9:38	29-Aug-09	9:48	1.4	432408	7563321	NFC
Roberts Bay	Shoals	1	MT	38	28-Aug-09	9:39	29-Aug-09	9:49	1.5	432416	7563318	NFC
Roberts Bay	Shoals	1	MT	39	28-Aug-09	9:40	29-Aug-09	9:50	1.2	432428	7563316	NFC
Roberts Bay	Shoals	1	MT	40	28-Aug-09	9:41	29-Aug-09	9:50	2.1	432493	7563543	NFC
Roberts Bay	Jetty	-	MT	1	24-Aug-09	15:41	25-Aug-09	8:37	0.8	432525	7563286	NFC
Roberts Bay	Jetty	-	MT	2	24-Aug-09	15:46	25-Aug-09	8:40	0.8	432519	7563296	NFC
Roberts Bay	Jetty	-	MT	3	24-Aug-09	15:51	25-Aug-09	8:42	0.9	432506	7563313	NFC
Roberts Bay	Jetty	-	MT	4	24-Aug-09	15:56	25-Aug-09	8:45	1.0	432514	7563325	NFC
Roberts Bay	Jetty	-	MT	5	24-Aug-09	16:01	25-Aug-09	8:47	0.8	432524	7563333	NFC
Roberts Bay	Jetty	-	MT	6	24-Aug-09	16:06	25-Aug-09	8:50	0.7	432535	7563341	NFC
Roberts Bay	Jetty	-	MT	7	24-Aug-09	16:11	25-Aug-09	8:52	1.0	432541	7563333	NFC
Roberts Bay	Jetty	-	MT	8	24-Aug-09	16:16	25-Aug-09	8:55	1.0	432548	7563295	NFC
Roberts Bay	Jetty	-	MT	9	24-Aug-09	16:21	25-Aug-09	8:57	0.5	432553	7563290	NFC
Roberts Bay	Jetty	-	MT	10	24-Aug-09	16:25	25-Aug-09	9:01	0.5	432558	7563273	1 SP
Roberts Bay	Jetty	-	MT	11	25-Aug-09	8:38	26-Aug-09	8:59	0.4	432554	7563248	NFC
Roberts Bay	Jetty	-	MT	12	25-Aug-09	8:44	26-Aug-09	9:01	0.3	432541	7563283	2 SP
Roberts Bay	Jetty	-	MT	13	25-Aug-09	8:44	26-Aug-09	9:02	0.3	432523	7563296	NFC
Roberts Bay	Jetty	-	MT	14	25-Aug-09	8:48	26-Aug-09	9:04	0.4	432510	7563302	NFC
Roberts Bay	Jetty	-	MT	15	25-Aug-09	8:49	26-Aug-09	9:05	0.6	432511	7563320	NFC
Roberts Bay	Jetty	-	MT	16	25-Aug-09	8:51	26-Aug-09	9:07	0.6	432526	7563333	NFC
Roberts Bay	Jetty	-	MT	17	25-Aug-09	8:52	26-Aug-09	9:08	0.7	432541	7563330	NFC
Roberts Bay	Jetty	-	MT	18	25-Aug-09	8:54	26-Aug-09	9:10	1.2	432540	7563315	NFC
Roberts Bay	Jetty	-	MT	19	25-Aug-09	8:59	26-Aug-09	9:11	0.4	432553	7563284	NFC
Roberts Bay	Jetty	-	MT	20	25-Aug-09	9:01	26-Aug-09	9:14	0.4	432562	7563259	3 SP
Reference Bay	Shoals	1	MT	1	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441551	7562146	NFC
Reference Bay	Shoals	1	MT	2	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441588	7562144	1 SP
Reference Bay	Shoals	1	MT	3	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441560	7562157	NFC
Reference Bay	Shoals	1	MT	4	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441553	7562126	NFC
Reference Bay	Shoals	1	MT	5	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441550	7562096	NFC
Reference Bay	Shoals	2	MT	6	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441579	7562225	NFC
Reference Bay	Shoals	2	MT	7	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441590	7562214	NFC
Reference Bay	Shoals	2	MT	8	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441595	7562207	2 SP
Reference Bay	Shoals	2	MT	9	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441608	7562248	NFC
Reference Bay	Shoals	2	MT	10	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441595	7562245	NFC
Reference Bay	Shoals	3	MT	11	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441504	7562334	NFC
Reference Bay	Shoals	3	MT	12	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441525	7562318	NFC
Reference Bay	Shoals	3	MT	13	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441516	7562330	NFC
Reference Bay	Shoals	3	MT	14	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441477	7562323	NFC
Reference Bay	Shoals	3	MT	15	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441510	7562334	1 SP
Reference Bay	Shoals	4	MT	16	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441500	7562410	NFC
Reference Bay	Shoals	4	MT	17	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441473	7562425	NFC
Reference Bay	Shoals	4	MT	18	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441488	7562410	1 SP
Reference Bay	Shoals	4	MT	19	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441510	7562425	NFC
Reference Bay	Shoals	4	MT	20	06-Aug-09	10:00	07-Aug-09	10:00	1.5	441521	7562424	NFC
Reference Bay	Shoals	1	MT	21	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441551	7562146	NFC
Reference Bay	Shoals	1	MT	22	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441588	7562144	NFC
Reference Bay	Shoals	1	MT	23	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441560	7562157	NFC
Reference Bay	Shoals	1	MT	24	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441553	7562126	NFC
Reference Bay	Shoals	1	MT	25	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441550	7562096	NFC
Reference Bay	Shoals	2	MT	26	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441579	7562225	NFC
Reference Bay	Shoals	2	MT	27	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441590	7562214	NFC
Reference Bay	Shoals	2	MT	28	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441595	7562207	NFC
Reference Bay	Shoals	2	MT	29	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441608	7562248	NFC
Reference Bay	Shoals	2	MT	30	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441595	7562245	NFC
Reference Bay	Shoals	3	MT	31	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441504	7562334	NFC
Reference Bay	Shoals	3	MT	32	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441525	7562318	NFC
Reference Bay	Shoals	3	MT	33	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441516	7562330	2 SP
Reference Bay	Shoals	3	MT	34	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441477	7562323	NFC

(continued)

Appendix 3.2-7. Set Times, Retrieval Times and Locations for Minnow Traps used in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (completed)

Location			Gear		Set		Retrieval		UTM			Catch
Location	Site	Shoal #	Method	#	Date In	Time In	Date Out	Time Out	Depth	Easting	Northing	Summary
Reference Bay	Shoals	3	MT	35	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441510	7562334	NFC
Reference Bay	Shoals	4	MT	36	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441500	7562410	NFC
Reference Bay	Shoals	4	MT	37	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441473	7562425	1 SP
Reference Bay	Shoals	4	MT	38	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441488	7562410	NFC
Reference Bay	Shoals	4	MT	39	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441510	7562425	NFC
Reference Bay	Shoals	4	MT	40	07-Aug-09	11:00	08-Aug-09	10:00	1.5	441521	7562424	1 SP
Reference Bay	Shoals	1	MT	1	06-Sep-09	9:40	07-Sep-09	9:49	0.5	441565	7562087	NFC
Reference Bay	Shoals	1	MT	2	06-Sep-09	9:41	07-Sep-09	9:47	0.7	441559	7562109	NFC
Reference Bay	Shoals	1	MT	3	06-Sep-09	9:42	07-Sep-09	9:45	1.0	441567	7562147	NFC
Reference Bay	Shoals	2	MT	4	06-Sep-09	9:43	07-Sep-09	9:43	1.0	441602	7562189	NFC
Reference Bay	Shoals	2	MT	5	06-Sep-09	9:45	07-Sep-09	9:41	1.4	441596	7562216	NFC
Reference Bay	Shoals	2	MT	6	06-Sep-09	9:47	07-Sep-09	9:39	1.5	441605	7562244	NFC
Reference Bay	Shoals	3	MT	7	06-Sep-09	9:49	07-Sep-09	9:37	1.5	441542	7562312	NFC
Reference Bay	Shoals	3	MT	8	06-Sep-09	9:50	07-Sep-09	9:35	1.5	441552	7562345	1 SP
Reference Bay	Shoals	4	MT	9	06-Sep-09	9:51	07-Sep-09	9:33	1.4	441533	7562416	NFC
Reference Bay	Shoals	4	MT	10	06-Sep-09	9:52	07-Sep-09	9:30	1.9	441477	7562427	1 SP
Reference Bay	Shoals	1	MT	11	07-Sep-09	9:50	08-Sep-09	10:21	0.6	441549	7562105	NFC
Reference Bay	Shoals	1	MT	12	07-Sep-09	9:53	08-Sep-09	10:24	0.7	441590	7562149	NFC
Reference Bay	Shoals	2	MT	13	07-Sep-09	9:55	08-Sep-09	10:26	1.2	441592	7562194	NFC
Reference Bay	Shoals	2	MT	14	07-Sep-09	9:57	08-Sep-09	10:28	1.5	441585	7562229	NFC
Reference Bay	Shoals	3	MT	15	07-Sep-09	9:59	08-Sep-09	10:30	1.3	441531	7562318	NFC
Reference Bay	Shoals	3	MT	16	07-Sep-09	10:01	08-Sep-09	10:32	1.6	441484	7562321	NFC
Reference Bay	Shoals	3	MT	17	07-Sep-09	10:03	08-Sep-09	10:34	1.6	441492	7562368	NFC
Reference Bay	Shoals	4	MT	18	07-Sep-09	10:05	08-Sep-09	10:36	1.0	441498	7562416	NFC
Reference Bay	Shoals	4	MT	19	07-Sep-09	10:07	08-Sep-09	10:38	1.2	441528	7562454	NFC
Reference Bay	Shoals	4	MT	20	07-Sep-09	10:09	08-Sep-09	10:41	1.7	441477	7562475	NFC

Note: Catch Summary includes fish that escaped prior to being sampled for biological data.
NFC = No Fish Captured NS = Ninespine stickleback; SP = Sculpin (Myoxocephalus sp.).
MT = Minnow Trap.

Appendix 3.2-8

Set Times, Retrieval Times and Locations of Crab Traps used in Roberts Bay and the Reference Bay,
Hope Bay Belt Project, 2009

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Appendix 3.2-8. Set Times, Retrieval Times and Locations for Crab Traps used in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Location			Gear		Set		Retrieval		UTM			Catch
Location	Site	Shoal #	Method	#	Date In	Time In	Date Out	Time Out	Depth	Easting	Northing	Summary
Roberts Bay	Shoals	4	CT	1	03-Aug-09	15:30	04-Aug-09	13:30	1.5	432253	7563378	NFC
Roberts Bay	Shoals	4	CT	2	03-Aug-09	15:30	04-Aug-09	9:00	1.5	432271	7563361	NFC
Roberts Bay	Shoals	3	CT	3	03-Aug-09	15:30	04-Aug-09	13:30	1.5	432307	7563350	NFC
Roberts Bay	Shoals	2	CT	4	03-Aug-09	15:30	04-Aug-09	13:30	1.5	432344	7563342	NFC
Roberts Bay	Shoals	2	CT	5	03-Aug-09	15:30	04-Aug-09	13:30	1.5	432373	7563334	NFC
Roberts Bay	Shoals	1	CT	6	03-Aug-09	15:30	04-Aug-09	13:30	1.5	432407	7563321	NFC
Roberts Bay	Shoals	4	CT	7	04-Aug-09	13:30	05-Aug-09	11:00	1.5	432253	7563378	NFC
Roberts Bay	Shoals	3	CT	8	04-Aug-09	13:30	05-Aug-09	11:00	1.5	432307	7563350	NFC
Roberts Bay	Shoals	2	CT	9	04-Aug-09	13:30	05-Aug-09	11:00	1.5	432344	7563342	NFC
Roberts Bay	Shoals	2	CT	10	04-Aug-09	13:30	05-Aug-09	11:00	1.5	432373	7563334	1 SP
Roberts Bay	Shoals	1	CT	11	04-Aug-09	13:30	05-Aug-09	11:00	1.5	432407	7563321	NFC
Roberts Bay	Shoals	4	CT	1	27-Aug-09	9:12	28-Aug-09	9:00	1.5	432259	7563383	NFC
Roberts Bay	Shoals	4	CT	2	27-Aug-09	9:14	28-Aug-09	9:01	2.1	432269	7563373	NFC
Roberts Bay	Shoals	3	CT	3	27-Aug-09	9:15	28-Aug-09	9:18	1.4	432299	7563361	NFC
Roberts Bay	Shoals	3	CT	4	27-Aug-09	9:16	28-Aug-09	9:18	1.0	432315	7563354	NFC
Roberts Bay	Shoals	2	CT	5	27-Aug-09	9:18	28-Aug-09	9:27	1.3	432351	7563346	NFC
Roberts Bay	Shoals	1	CT	6	27-Aug-09	9:19	28-Aug-09	9:37	1.8	432422	7563321	NFC
Roberts Bay	Shoals	4	CT	7	28-Aug-09	9:11	29-Aug-09	9:40	1.5	432274	7563364	NFC
Roberts Bay	Shoals	3	CT	8	28-Aug-09	9:23	29-Aug-09	9:44	1.4	432321	7563357	NFC
Roberts Bay	Shoals	2	CT	9	28-Aug-09	9:31	29-Aug-09	9:47	1.0	432367	7563335	NFC
Roberts Bay	Shoals	2	CT	10	28-Aug-09	9:31	29-Aug-09	9:48	1.4	432348	7563343	NFC
Roberts Bay	Shoals	1	CT	11	28-Aug-09	9:42	29-Aug-09	9:51	2.3	432430	7563326	NFC
Roberts Bay	Shoals	1	CT	12	28-Aug-09	9:42	29-Aug-09	9:52	2.0	432415	7563328	NFC
Roberts Bay	Jetty	-	CT	1	24-Aug-09	16:31	25-Aug-09	9:19	4.7	432500	7563344	NFC
Roberts Bay	Jetty	-	CT	2	24-Aug-09	16:34	25-Aug-09	9:20	5.5	432512	7563389	NFC
Roberts Bay	Jetty	-	CT	3	24-Aug-09	16:35	25-Aug-09	9:25	5.6	432530	7563378	NFC
Roberts Bay	Jetty	-	CT	4	24-Aug-09	16:36	25-Aug-09	9:30	5.2	432534	7563403	NFC
Roberts Bay	Jetty	-	CT	5	24-Aug-09	16:38	25-Aug-09	9:36	4.7	432560	7563411	NFC
Roberts Bay	Jetty	-	CT	6	25-Aug-09	9:42	26-Aug-09	9:24	3.7	432543	7563344	NFC
Roberts Bay	Jetty	-	CT	7	25-Aug-09	9:43	26-Aug-09	9:25	3.1	432532	7563345	NFC
Roberts Bay	Jetty	-	CT	8	25-Aug-09	9:46	26-Aug-09	9:26	2.6	432520	7563345	NFC
Roberts Bay	Jetty	-	CT	9	25-Aug-09	9:49	26-Aug-09	9:27	2.0	432504	7563337	NFC
Roberts Bay	Jetty	-	CT	10	25-Aug-09	9:51	26-Aug-09	9:28	2.0	432499	7563322	NFC
Reference Bay	Shoals	2	CT	1	06-Aug-09	11:00	07-Aug-09	10:00	5.2	441542	7562235	NFC
Reference Bay	Shoals	3	CT	2	06-Aug-09	11:00	07-Aug-09	10:00	1.9	441524	7562382	1 SP
Reference Bay	Shoals	3	CT	3	06-Aug-09	11:00	07-Aug-09	10:00	2.2	441484	7562361	NFC
Reference Bay	Shoals	2	CT	4	06-Aug-09	11:00	07-Aug-09	10:00	2.3	441579	7562259	NFC
Reference Bay	Shoals	1	CT	5	06-Aug-09	11:00	07-Aug-09	10:00	1.9	441558	7562186	NFC
Reference Bay	Shoals	1	CT	6	06-Aug-09	11:00	07-Aug-09	10:00	1.5	441548	7562146	NFC
Reference Bay	Shoals	4	CT	7	07-Aug-09	10:00	08-Aug-09	14:00	1.6	441523	7562419	1 SP
Reference Bay	Shoals	4	CT	8	07-Aug-09	10:00	08-Aug-09	14:00	2.0	441492	7562395	NFC
Reference Bay	Shoals	3	CT	9	07-Aug-09	10:00	08-Aug-09	14:00	2.5	441533	7562306	NFC
Reference Bay	Shoals	2	CT	10	07-Aug-09	10:00	08-Aug-09	14:00	1.9	441581	7562214	NFC
Reference Bay	Shoals	2	CT	11	07-Aug-09	10:00	08-Aug-09	14:00	2.5	441536	7562209	NFC
Reference Bay	Shoals	1	CT	12	07-Aug-09	10:00	08-Aug-09	14:00	1.0	441548	7562123	NFC
Reference Bay	Shoals	4	CT	1	06-Sep-09	10:12	07-Sep-09	10:14	1.9	441479	7562453	NFC
Reference Bay	Shoals	4	CT	2	06-Sep-09	10:15	07-Sep-09	10:09	1.2	441496	7562404	NFC
Reference Bay	Shoals	3	CT	3	06-Sep-09	10:17	07-Sep-09	10:04	1.6	441503	7562363	NFC
Reference Bay	Shoals	2	CT	4	06-Sep-09	10:20	07-Sep-09	9:59	1.8	441591	7562223	NFC
Reference Bay	Shoals	1	CT	5	06-Sep-09	10:23	07-Sep-09	9:53	1.3	441558	7562141	NFC
Reference Bay	Shoals	1	CT	6	07-Sep-09	9:53	08-Sep-09	10:21	0.9	441544	7562117	NFC
Reference Bay	Shoals	2	CT	7	07-Sep-09	9:59	08-Sep-09	10:26	1.8	441587	7562238	NFC
Reference Bay	Shoals	3	CT	8	07-Sep-09	10:05	08-Sep-09	10:31	1.3	441518	7562370	NFC
Reference Bay	Shoals	4	CT	9	07-Sep-09	10:11	08-Sep-09	10:36	1.7	441509	7562468	NFC
Reference Bay	Shoals	4	CT	10	07-Sep-09	10:16	08-Sep-09	10:41	1.4	441473	7562416	NFC

Note: NFC = No Fish Captured; SP = Sculpin (Myoxocephalus sp.).
CT = Crab Trap.

Appendix 3.2-9

Biological Data for Fish Sampled in Roberts Bay and the Reference Bay,
Hope Bay Belt Project, 2009

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Appendix 3.2-9 Biological Data for Fish Sampled in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

Location		Gear				Individual	Field		Length	Weight	Condition	Aging Structures			Age	
Location	Site	Method	Type	#	Date	Number	Sample	Species	(mm)	(g)	(g/mm^3)	Otolith	Scales	Fin Clip	(years)	Comment
Roberts Bay	Shoals	GN	F	1	04-Aug-09	1	1050	GC	509	1632	1.24	-	X	X	6	PICS 411-412
Roberts Bay	Shoals	GN	F	1	04-Aug-09	2	1051	LT	408	781	1.15	-	X	X	8	PICS 413-414
Roberts Bay	Shoals	GN	F	1	04-Aug-09	3	1052	PH	261	185	1.04	-	X	-	9	Mortality
Roberts Bay	Shoals	GN	F	1	04-Aug-09	4	1053	PH	221	94	0.87	-	X	-	7	Mortality
Roberts Bay	Shoals	GN	F	1	04-Aug-09	5	1054	PH	248	459	3.01	-	X	-	8	Mortality
Roberts Bay	Shoals	GN	F	1	04-Aug-09	6	1055	PH	278	195	0.91	-	X	-	10	Mortality
Roberts Bay	Shoals	GN	F	1	04-Aug-09	7	1056	PH	279	206	0.95	-	X	-	10	Mortality
Roberts Bay	Shoals	GN	S	1	04-Aug-09	8	1057	GC	341	388	0.98	-	X	X	4	
Roberts Bay	Shoals	GN	S	1	04-Aug-09	9	1058	PH	257	158	0.93	-	X	-	8	Mortality
Roberts Bay	Shoals	GN	S	2	04-Aug-09	10	1059	GC	445	882	1.00	-	X	X	4	
Roberts Bay	Shoals	GN	S	2	04-Aug-09	11	1060	PH	308	264	0.90	-	X	-	-	Mortality
Roberts Bay	Shoals	LL	-	2	04-Aug-09	12	1061	GC	528	1725	1.17	-	X	X	6	PICS 418-419
Roberts Bay	Shoals	GN	F	2	04-Aug-09	13	-	SP	289	302	1.25	-	-	-	-	PICS 416-417
Roberts Bay	Shoals	GN	F	2	04-Aug-09	14	-	SP	302	327	1.19	-	-	-	-	
Roberts Bay	Shoals	GN	F	2	04-Aug-09	15	-	SP	304	318	1.13	-	-	-	-	
Roberts Bay	Shoals	GN	F	2	04-Aug-09	16	-	SP	281	261	1.18	-	-	-	-	
Roberts Bay	Shoals	GN	F	2	04-Aug-09	17	-	SP	264	221	1.20	-	-	-	-	
Roberts Bay	Shoals	GN	F	2	04-Aug-09	18	-	SP	166	37	0.81	-	-	-	-	
Roberts Bay	Shoals	GN	F	4	05-Aug-09	19	1062	LT	363	540	1.13	X	X	X	12	Mortality
Roberts Bay	Shoals	GN	S	3	05-Aug-09	20	1063	PH	255	153	0.92	-	X	-	8	Mortality
Roberts Bay	Shoals	GN	S	3	05-Aug-09	21	1064	PH	254	166	1.01	-	X	-	11	Mortality
Roberts Bay	Shoals	GN	F	3	05-Aug-09	22	-	SP	107	10	0.82	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	05-Aug-09	23	-	SP	278	232	1.08	-	-	-	-	
Roberts Bay	Shoals	GN	S	4	05-Aug-09	24	-	SF	409	1105	1.62	-	-	-	-	
Roberts Bay	Shoals	MT	-	34	05-Aug-09	25	-	SP	107	10	0.82	-	-	-	-	
Roberts Bay	Shoals	CT	-	10	05-Aug-09	26	-	SP	157	26	0.67	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	27	252	SC	302	194	0.70	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	28	253	SC	320	222	0.68	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	29	254	SC	305	190	0.67	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	30	255	SC	330	215	0.60	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	31	256	SC	230	214	1.76	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	32	257	SC	270	155	0.79	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	33	258	SC	284	167	0.73	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	34	259	SC	279	170	0.78	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	35	260	SC	302	199	0.72	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	36	270	SC	276	143	0.68	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	37	271	SC	223	70	0.63	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	38	272	SC	316	228	0.72	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	39	273	SC	265	130	0.70	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	40	274	SC	311	212	0.70	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	41	275	SC	293	164	0.65	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	42	276	SC	299	187	0.70	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	43	277	SC	304	211	0.75	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	44	278	SC	282	150	0.67	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	45	279	SC	292	169	0.68	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	46	280	SC	325	253	0.74	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	47	281	SC	285	168	0.73	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	48	282	SC	282	152	0.68	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	49	283	SC	282	163	0.73	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	50	284	SC	326	226	0.65	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	51	285	SC	316	249	0.79	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	52	286	SC	302	225	0.82	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	53	287	SC	362	357	0.75	-	-	-	-	

(continued)

Appendix 3.2-9 Biological Data for Fish Sampled in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Location		Gear				Individual	Field		Length	Weight	Condition	Aging Structures			Age	
Location	Site	Method	Type	#	Date	Number	Sample	Species	(mm)	(g)	(g/mm^3)	Otolith	Scales	Fin Clip	(years)	Comment
Roberts Bay	Shoals	GN	S	3	27-Aug-09	54	288	SC	300	199	0.74	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	55	289	SC	306	205	0.72	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	56	290	SC	296	184	0.71	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	57	291	SC	235	89	0.69	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	58	292	SC	280	162	0.74	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	59	293	GC	445	925	1.05	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	60	294	GC	455	1100	1.17	-	-	-	-	
Roberts Bay	Shoals	GN	S	3	27-Aug-09	61	295	PH	137	21	0.82	-	-	-	-	Mortality; preserved
Roberts Bay	Shoals	GN	F	2	27-Aug-09	62	296	AC	420	842	1.14	-	X	X	5	
Roberts Bay	Shoals	GN	F	2	27-Aug-09	63	297	AC	379	633	1.16	X	X	X	5	Mortality; parasites/tapeworm + inverts in belly (pics)
Roberts Bay	Shoals	GN	S	4	27-Aug-09	64	298	SC	262	131	0.73	-	-	-	-	
Roberts Bay	Shoals	GN	S	4	27-Aug-09	65	299	SC	289	184	0.76	-	-	-	-	
Roberts Bay	Shoals	GN	S	4	27-Aug-09	66	300	SC	291	173	0.70	-	-	-	-	
Roberts Bay	Shoals	GN	S	4	27-Aug-09	67	301	AC	370	580	1.15	-	X	X	4	
Roberts Bay	Shoals	GN	S	5	28-Aug-09	68	302	GC	484	1259	1.11	-	-	-	-	
Roberts Bay	Shoals	GN	S	5	28-Aug-09	69	303	AC	310	308	1.03	-	X	X	3	PICS in water; orange streak on leading rays of right pec fin
Roberts Bay	Shoals	GN	S	6	28-Aug-09	70	304	GC	410	747	1.08	-	-	-	-	
Roberts Bay	Shoals	GN	S	6	28-Aug-09	71	305	GC	455	1050	1.11	-	-	-	-	
Roberts Bay	Shoals	GN	S	6	28-Aug-09	72	306	GC	410	698	1.01	-	-	-	-	
Roberts Bay	Shoals	GN	S	6	28-Aug-09	73	307	AC	348	468	1.11	-	X	X	5	
Roberts Bay	Shoals	LL	-	3	28-Aug-09	74	308	GC	540	1649	1.05	-	-	-	-	
Roberts Bay	Shoals	LL	-	3	28-Aug-09	75	309	GC	461	1305	1.33	-	-	-	-	
Roberts Bay	Shoals	GN	F	4	28-Aug-09	76	310	AC	313	319	1.04	-	X	X	5	
Roberts Bay	Shoals	GN	F	4	28-Aug-09	77	311	AC	218	112	1.08	-	X	X	4	
Roberts Bay	Shoals	GN	F	4	28-Aug-09	78	312	AC	242	159	1.12	-	X	X	3	
Roberts Bay	Shoals	GN	F	4	28-Aug-09	79	313	AC	244	154	1.06	-	X	X	3	
Roberts Bay	Shoals	GN	F	4	28-Aug-09	80	314	AC	272	219	1.09	-	X	X	3	
Roberts Bay	Shoals	GN	F	5	28-Aug-09	81	315	GC	405	783	1.18	-	-	-	-	
Roberts Bay	Shoals	GN	F	5	28-Aug-09	82	316	AC	387	634	1.09	-	X	X	5	
Roberts Bay	Shoals	GN	F	5	28-Aug-09	83	317	AC	374	555	1.06	-	X	X	5	
Roberts Bay	Shoals	GN	S	7	28-Aug-09	84	318	SP	375	530	1.01	-	-	-	-	PICS 4647-4649; no spots
Roberts Bay	Shoals	GN	S	7	28-Aug-09	85	319	SP	322	386	1.16	-	-	-	-	PICS 4650-4652; no spots
Roberts Bay	Shoals	GN	S	7	28-Aug-09	86	320	SP	350	564	1.32	-	-	-	-	PICS 4653-4655; no spots
Roberts Bay	Shoals	LL	-	4	28-Aug-09	87	321	GC	446	704	0.79	-	-	-	-	
Roberts Bay	Shoals	LL	-	4	28-Aug-09	88	322	GC	555	2029	1.19	-	-	-	-	
Roberts Bay	Shoals	LL	-	4	28-Aug-09	89	323	GC	498	1404	1.14	-	-	-	-	
Roberts Bay	Shoals	GN	S	8	28-Aug-09	90	324	AC	446	884	1.00	-	X	X	6	
Roberts Bay	Shoals	GN	S	8	28-Aug-09	91	325	AC	375	627	1.19	X	X	X	5	Mortality; parasites present
Roberts Bay	Shoals	MT	-	24	29-Aug-09	92	326	NS	58	1	0.51	-	-	-	-	
Roberts Bay	Jetty	GN	S	1	24-Aug-09	93	102	GC	460	1150	1.18	-	X	X	3	PICS 1517-1521
Roberts Bay	Jetty	GN	S	2	24-Aug-09	94	103	SP	225	98	0.86	-	-	-	-	PICS 1534-1539; no spots
Roberts Bay	Jetty	GN	S	2	24-Aug-09	95	104	SP	345	446	1.09	-	-	-	-	PICSS 1540-1545; no spots
Roberts Bay	Jetty	GN	S	2	24-Aug-09	96	105	AF	185	90	1.42	-	-	-	-	PICS 1546-1548; right eyed
Roberts Bay	Jetty	GN	S	2	24-Aug-09	97	106	LT	670	2400	0.80	-	X	X	18	PICS 1549-1552; very skinny, frayed fins
Roberts Bay	Jetty	MT	-	10	25-Aug-09	98	107	SP	118	13	0.79	-	-	-	-	
Roberts Bay	Jetty	GN	S	3	25-Aug-09	99	108	GC	447	1000	1.12	-	-	-	-	
Roberts Bay	Jetty	GN	S	3	25-Aug-09	100	109	GC	450	1100	1.21	-	-	-	-	
Roberts Bay	Jetty	LL	-	1	25-Aug-09	101	110	GC	589	2500	1.22	-	-	-	-	
Roberts Bay	Jetty	LL	-	1	25-Aug-09	102	111	GC	505	1600	1.24	-	-	-	-	
Roberts Bay	Jetty	LL	-	1	25-Aug-09	103	112	GC	625	2800	1.15	-	-	-	-	PICS 4360-4364
Roberts Bay	Jetty	GN	S	4	25-Aug-09	104	113	GC	441	1100	1.28	-	-	-	-	
Roberts Bay	Jetty	GN	S	4	25-Aug-09	105	114	GC	480	1550	1.40	-	-	-	-	PICS 4365-4368
Roberts Bay	Jetty	GN	S	4	25-Aug-09	106	115	GC	422	800	1.06	-	-	-	-	Mortality

(continued)

Appendix 3.2-9 Biological Data for Fish Sampled in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (continued)

Location		Gear				Individual	Field		Length	Weight	Condition	Aging Structures			Age	
Location	Site	Method	Type	#	Date	Number	Sample	Species	(mm)	(g)	(g/mm^3)	Otolith	Scales	Fin Clip	(years)	Comment
Roberts Bay	Jetty	GN	F	2	25-Aug-09	107	116	AC	268	239	1.24	-	X	X	3	
Roberts Bay	Jetty	GN	F	2	25-Aug-09	108	117	AC	320	373	1.14	-	X	X	5	
Roberts Bay	Jetty	GN	F	2	25-Aug-09	109	118	AC	287	286	1.21	-	X	X	4	
Roberts Bay	Jetty	GN	F	2	25-Aug-09	110	119	AC	436	1025	1.24	X	X	X	5	Mortality; small fish (herring?) in stomach
Roberts Bay	Jetty	GN	F	3	25-Aug-09	111	120	AC	323	369	1.10	-	X	X	4	
Roberts Bay	Jetty	GN	F	3	25-Aug-09	112	121	AC	378	672	1.24	X	X	X	5	Mortality
Roberts Bay	Jetty	LL	-	2	25-Aug-09	113	122	GC	522	1650	1.16	-	-	-	-	
Roberts Bay	Jetty	LL	-	2	25-Aug-09	114	123	GC	536	2000	1.30	-	-	-	-	
Roberts Bay	Jetty	LL	-	2	25-Aug-09	115	124	GC	595	2750	1.31	-	-	-	-	
Roberts Bay	Jetty	GN	S	6	25-Aug-09	116	125	GC	404	723	1.10	-	-	-	-	
Roberts Bay	Jetty	MT	-	12	26-Aug-09	117	126	SP	109	13	1.00	-	-	-	-	
Roberts Bay	Jetty	MT	-	12	26-Aug-09	118	127	SP	113	12	0.83	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Aug-09	119	1065	AC	667	2954	1.00	-	X	X	9	Green Tag #4452
Reference Bay	Shoals	GN	S	1	06-Aug-09	120	1066	AC	709	3823	1.07	-	-	X	9	PICS 444-464
Reference Bay	Shoals	GN	S	1	06-Aug-09	121	1067	AC	689	1858	0.57	-	X	X	10	
Reference Bay	Shoals	GN	S	2	06-Aug-09	122	1068	AC	283	237	1.05	-	X	X	3	
Reference Bay	Shoals	LL	-	1	06-Aug-09	123	1069	GC	455	1058	1.12	-	X	X	3	
Reference Bay	Shoals	LL	-	1	06-Aug-09	124	1070	GC	564	2058	1.15	-	X	X	5	PICS 466-477
Reference Bay	Shoals	GN	F	1	06-Aug-09	125	-	SP	238	154	1.14	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Aug-09	126	-	SP	266	179	0.95	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Aug-09	127	-	SP	304	291	1.04	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Aug-09	128	-	SP	293	220	0.87	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Aug-09	129	-	SP	289	239	0.99	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Aug-09	130	-	SP	275	213	1.02	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Aug-09	131	-	SP	222	102	0.93	-	-	-	-	
Reference Bay	Shoals	GN	S	2	06-Aug-09	132	-	SP	283	224	0.99	-	-	-	-	PICS 465
Reference Bay	Shoals	GN	S	2	06-Aug-09	133	-	SP	252	148	0.92	-	-	-	-	
Reference Bay	Shoals	GN	F	3	07-Aug-09	134	1071	AC	631	2410	0.96	-	X	X	7	PICS 488; big hump
Reference Bay	Shoals	GN	F	3	07-Aug-09	135	1072	PH	254	143	0.87	-	X	-	8	Mortality
Reference Bay	Shoals	GN	F	3	07-Aug-09	136	1073	PH	254	151	0.92	-	X	-	7	Mortality
Reference Bay	Shoals	GN	F	3	07-Aug-09	137	1074	PH	268	182	0.95	-	X	-	10	Mortality
Reference Bay	Shoals	GN	F	3	07-Aug-09	138	1075	PH	271	184	0.92	-	X	-	10	Mortality
Reference Bay	Shoals	GN	F	3	07-Aug-09	139	1076	PH	258	167	0.97	-	X	-	9	Mortality
Reference Bay	Shoals	GN	F	3	07-Aug-09	140	1077	PH	250	142	0.91	-	X	-	8	Mortality
Reference Bay	Shoals	GN	F	3	07-Aug-09	141	1078	PH	283	219	0.97	-	X	-	9	Mortality
Reference Bay	Shoals	GN	F	4	07-Aug-09	142	1079	AC	651	3278	1.19	-	X	X	11	PICS 493-494; crooked tail
Reference Bay	Shoals	GN	F	4	07-Aug-09	143	1080	PH	304	245	0.87	-	X	-	11	Mortality
Reference Bay	Shoals	GN	F	4	07-Aug-09	144	1081	PH	283	196	0.86	-	X	-	11	Mortality
Reference Bay	Shoals	GN	F	3	07-Aug-09	145	-	AF	347	509	1.22	-	-	-	-	
Reference Bay	Shoals	GN	F	3	07-Aug-09	146	-	SP	149	29	0.88	-	-	-	-	
Reference Bay	Shoals	GN	F	3	07-Aug-09	147	-	SP	131	17	0.76	-	-	-	-	
Reference Bay	Shoals	GN	F	3	07-Aug-09	148	-	SP	120	13	0.75	-	-	-	-	
Reference Bay	Shoals	GN	F	4	07-Aug-09	149	-	SP	284	213	0.93	-	-	-	-	
Reference Bay	Shoals	GN	S	3	07-Aug-09	150	-	SP	272	264	1.31	-	-	-	-	
Reference Bay	Shoals	GN	S	3	07-Aug-09	151	-	SP	302	267	0.97	-	-	-	-	
Reference Bay	Shoals	GN	S	3	07-Aug-09	152	-	SF	361	558	1.19	-	-	-	-	PICS 482-484
Reference Bay	Shoals	MT	-	8	07-Aug-09	153	-	SP	87	6	0.91	-	-	-	-	
Reference Bay	Shoals	MT	-	8	07-Aug-09	154	-	SP	116	11	0.70	-	-	-	-	
Reference Bay	Shoals	MT	-	15	07-Aug-09	155	-	SP	69	3	0.91	-	-	-	-	
Reference Bay	Shoals	MT	-	18	07-Aug-09	156	-	SP	72	4	1.07	-	-	-	-	
Reference Bay	Shoals	MT	-	8	07-Aug-09	157	-	SP	115	15	0.99	-	-	-	-	
Reference Bay	Shoals	CT	-	2	07-Aug-09	158	-	SP	313	314	1.02	-	-	-	-	
Reference Bay	Shoals	MT	-	37	08-Aug-09	159	-	SP	54	1	0.64	-	-	-	-	

(continued)

Appendix 3.2-9 Biological Data for Fish Sampled in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (completed)

Location		Gear				Individual	Field		Length	Weight	Condition	Aging Structures			Age	
Location	Site	Method	Type	#	Date	Number	Sample	Species	(mm)	(g)	(g/mm^3)	Otolith	Scales	Fin Clip	(years)	Comment
Reference Bay	Shoals	MT	-	40	08-Aug-09	160	-	SP	67	3	1.00	-	-	-	-	
Reference Bay	Shoals	MT	-	33	08-Aug-09	161	-	SP	147	35	1.10	-	-	-	-	
Reference Bay	Shoals	MT	-	33	08-Aug-09	162	-	SP	156	39	1.03	-	-	-	-	
Reference Bay	Shoals	CT	-	7	08-Aug-09	163	-	SP	240	134	0.97	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Sep-09	164	436	SP	230	116	0.95	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Sep-09	165	437	SP	286	228	0.97	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Sep-09	166	438	SP	252	148	0.92	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Sep-09	167	439	SP	272	190	0.94	-	-	-	-	Orange pelvic fins
Reference Bay	Shoals	GN	S	1	06-Sep-09	168	440	SP	283	254	1.12	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Sep-09	169	441	SP	279	223	1.03	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Sep-09	170	442	SP	239	127	0.93	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Sep-09	171	443	SP	306	317	1.11	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Sep-09	172	444	SP	300	279	1.03	-	-	-	-	Orange fins
Reference Bay	Shoals	GN	S	1	06-Sep-09	173	445	SP	280	205	0.93	-	-	-	-	
Reference Bay	Shoals	GN	S	1	06-Sep-09	174	446	SP	335	362	0.96	-	-	-	-	PICS 4937-4952; Orange fins/red eyes
Reference Bay	Shoals	GN	S	2	06-Sep-09	175	447	SP	315	355	1.14	-	-	-	-	Not red on underside
Reference Bay	Shoals	GN	S	2	06-Sep-09	176	448	SP	246	140	0.94	-	-	-	-	Not red on underside
Reference Bay	Shoals	GN	F	1	06-Sep-09	177	449	AC	363	495	1.03	-	X	X	4	
Reference Bay	Shoals	GN	F	1	06-Sep-09	178	450	AC	387	607	1.05	-	X	X	5	
Reference Bay	Shoals	GN	F	1	06-Sep-09	179	451	SP	230	129	1.06	-	-	-	-	Not red on underside
Reference Bay	Shoals	GN	F	2	06-Sep-09	180	452	PH	301	286	1.05	X	X	X	10	PIC 4975
Reference Bay	Shoals	GN	F	2	06-Sep-09	181	453	PH	272	240	1.19	X	X	X	15	PIC 4976
Reference Bay	Shoals	GN	F	2	06-Sep-09	182	454	PH	225	312	2.74	X	X	X	12	PIC 4977
Reference Bay	Shoals	MT	-	8	07-Sep-09	183	455	SP	158	58	1.47	-	-	-	-	PICS 5037-5043
Reference Bay	Shoals	MT	-	10	07-Sep-09	184	456	SP	94	5	0.60	-	-	-	-	PICS 5044-5048
Reference Bay	Shoals	GN	S	3	07-Sep-09	185	457	SP	249	143	0.93	-	-	-	-	No spots/color on underside
Reference Bay	Shoals	GN	S	3	07-Sep-09	186	458	AC	386	493	0.86	-	X	X	7	PICS 5049-5051 (in water)
Reference Bay	Shoals	GN	S	3	07-Sep-09	187	459	AC	358	433	0.94	X	X	X	4	Mortality; PICS 5052-5056; Orange/yellow belly
Reference Bay	Shoals	GN	F	3	07-Sep-09	188	460	SP	291	215	0.87	-	-	-	-	PICS 5059-5061
Reference Bay	Shoals	GN	F	3	07-Sep-09	189	461	SP	273	182	0.89	-	-	-	-	PICS 5062-5064
Reference Bay	Shoals	GN	F	3	07-Sep-09	190	462	AC	289	266	1.10	-	X	X	3	
Reference Bay	Shoals	GN	F	3	07-Sep-09	191	463	AC	275	243	1.17	-	X	X	4	
Reference Bay	Shoals	GN	S	4	07-Sep-09	192	464	SF	120	26	1.50	-	-	-	-	PICS 5065-5066; Left eye
Reference Bay	Shoals	GN	S	4	07-Sep-09	193	465	SP	291	250	1.01	-	-	-	-	PICS 5067-5068; no spots on underside
Reference Bay	Shoals	GN	S	4	07-Sep-09	194	466	SP	275	226	1.09	-	-	-	-	PICS 5069-5070; no spots on underside
Reference Bay	Shoals	GN	S	4	07-Sep-09	195	467	SP	285	224	0.97	-	-	-	-	PICS 5071-5072; no spots on underside
Reference Bay	Shoals	GN	F	4	07-Sep-09	196	468	AC	396	725	1.17	-	X	X	4	
Reference Bay	Shoals	GN	F	4	07-Sep-09	197	469	AC	400	661	1.03	-	X	X	6	
Reference Bay	Shoals	GN	F	4	07-Sep-09	198	470	AC	315	358	1.15	-	X	X	4	
Reference Bay	Shoals	GN	F	4	07-Sep-09	199	471	AC	241	155	1.11	-	X	X	3	
Reference Bay	Shoals	GN	F	4	07-Sep-09	200	472	AC	209	99	1.08	-	X	X	3	
Reference Bay	Shoals	GN	F	4	07-Sep-09	201	473	SP	296	292	1.13	-	-	-	-	
Reference Bay	Shoals	GN	S	5	07-Sep-09	202	474	SP	273	184	0.90	-	-	-	-	
Reference Bay	Shoals	GN	S	5	07-Sep-09	203	475	SP	250	157	1.00	-	-	-	-	PICS 5129-5132; horns 'furry'

Note:
Gear Method: CT = Crab trap; GN = Gillnet; LL = Long line; MT = Minnow trap.
Gear Type: F = Floating; S = Sinking.
Species: AC = Arctic char; AF = Arctic flounder; GC = Greenland cod; LT = Lake trout; NS = Ninespine stickleback; PH = Pacific herring; SF = Starry flounder; SP = Sculpin (Myoxocephalus sp.).

Appendix 3.2-10

Snorkel Survey Data from Early- and Late-August Surveys in Roberts Bay and the Reference Bay,
Hope Bay Belt Project, 2009

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Appendix 3.2-10. Snorkel Survey Data from Early- and Late-August Surveys in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009

A. Early-August

	Roberts Bay					Reference Bay			
	Shoal 1	**Shoal 2**	**Shoal 3**	**Shoal 4**	**Jetty**	**Shoal 1**	**Shoal 2**	**Shoal 3**	**Shoal 4**
Date	05-Aug-09	05-Aug-09	05-Aug-09	05-Aug-09	-	09-Aug-09	09-Aug-09	09-Aug-09	09-Aug-09
Time	late afternoon	late afternoon	late afternoon	late afternoon	-	late afternoon	late afternoon	late afternoon	late afternoon
Visibility	poor; ~2 m	poor; ~2 m	poor; ~2 m	poor; ~2 m	-	poor; ~5 m	poor; ~5 m	poor; ~5 m	poor; ~5 m
Algae/Plants	No filamentous algae growth on boulder/cobble shoals, just 'dust-like' algae.	No filamentous algae growth on boulder/cobble shoals, just 'dust-like' algae.	No filamentous algae growth on boulder/cobble shoals, just 'dust-like' algae.	No filamentous algae growth on boulder/cobble shoals, just 'dust-like' algae.	not surveyed	-	6 patches of reddish seaweed.	26 patches of reddish seaweed.	17 patches of reddish seaweed.
Invertebrates	No invertebrate life observed during transects of four shoals.	No invertebrate life observed during transects of four shoals.	No invertebrate life observed during transects of four shoals.	No invertebrate life observed during transects of four shoals.	not surveyed	1000's of euphausiids swimming in one location by large boulder.	-	Small white clam beds between split shoal area in fine substrate; 1000's of euphausiids in two locations by large boulders.	Dozens of small white clams in soft, fine substrate.
Animals	No animal life observed during transects of four shoals.	No animal life observed during transects of four shoals.	No animal life observed during transects of four shoals.	No animal life observed during transects of four shoals.	not surveyed	-	-	-	1 large SP
General Comments	-					-			

Note:
SP = Sculpin (Myoxocephalus sp.).

Appendix 3.2-10. Snorkel Survey Data from Early-and Late-August Surveys in Roberts Bay and the Reference Bay, Hope Bay Belt Project, 2009 (completed)

B. Late-August

	Roberts Bay					Reference Bay			
	Shoal 1	**Shoal 2**	**Shoal 3**	**Shoal 4**	**Jetty**	**Shoal 1**	**Shoal 2**	**Shoal 3**	**Shoal 4**
Date	23-Aug-09	23-Aug-09	23-Aug-09	23-Aug-09	23-Aug-09	24-Aug-09	24-Aug-09	24-Aug-09	24-Aug-09
Time	09:30-11:50	09:30-11:50	09:30-11:50	09:30-11:50	09:30-11:50	10:30-13:00	10:30-13:00	10:30-13:00	10:30-13:00
Visibility	good; ~8 m	good; ~8 m	good; ~8 m	good; ~8 m	good; ~8 m	excellent; ~10 m	excellent; ~10 m	excellent; ~10 m	excellent; ~10 m
Algae/Plants	Long, tube-like algae on N and W edge of shoal (picture); rocks covered in ~5 mm of filamentous algae	7 patches of fucus; long, tube-like algae present; 1 patch of large-leafy algae	Fucus present	Fucus sparse; lots of long, thin-like algae (picture)	Algae on rocks found on E and W side of jetty; long tube-like algae found on N side of jetty.	Fucus at N end; algae on rocks (~2-3cm thick).	Fucus at N end covering ~10%.	Few Fucus.	Lots of Fucus.
Invertebrates	Numerous tunicates on NW and N side of shoal; majority on fine sediment/few on rocks	1 huge jellyfish with 5-7 YOY fish feeding off its tentacles; 1 tunicate	tunicates on NE side of shoal only; 3 large jellyfish	Tunicates on N side of shoal only; 1 large jellyfish with 7 YOY fish feeding off tentacles	-	1 large (orange) jellyfish.	100's of euphausiids; few Hydrozoa; few tunicates at N end of shoal.	Many euphausiids.	Hydrozoa
Animals	-	13 YOY fish (~20 mm) swimming mid-water/above rocks; 7 YOY fish feeding off jellyfish tentacles; 2 SP (~50mm and 85mm).	68 YOY fish; 1 SP (130 mm)	25 YOY fish + 7 YOY fish feeding off jellyfish tentacles.	On W side of jetty: 4 SP (250mm, 115 mm, 100mm and 50mm); 1 AF (150 mm); 20 YOY fish. On E side of jetty: 2 SP (350 mm; 160 mm) (picture).	1 AF (220 mm); 2 juvenile sculpin.	1 SP (90 mm).	2 YOY sculpin.	-
Habitat	Average Water Depth: 1.6 m. Substrate: 20% cobble, 80% boulder.	Average Water Depth: 1.6 m. Substrate: 20% cobble, 80% boulder.	Average Water Depth: 1.6 m. Substrate: 20% cobble, 80% boulder.	Average Water Depth: 1.6 m. Substrate: 20% cobble, 80% boulder.	Average Water Depth: 1.6 m. Substrate: 20% cobble, 80% boulder.	Average Water Depth: 0.70 m. Substrate: 35% sand, 20% gravel, 10% cobble and 35% boulder.	Average Water Depth: 0.70 m. Substrate: 30% sand, 25% gravel, 10% cobble and 35% boulder.	Average Water Depth: 0.90 m. Substrate: 30% sand, 5% gravel, 15% cobble and 50% boulder.	Average Water Depth: 1.0m. Substrate: 15% sand; 30% gravel, 15% cobble and 40% boulder.
General Comments	At all Roberts Bay shoal sites, lots of free-floating medusa Hydrozoa in water column.					-			

Note:
AF = Arctic flounder; SP = Sculpin (Myoxocephalus sp.).
YOY = Young-of-the-Year.