Benthic Biodiversity Assessment Esperanza

Finfish Aquaculture Site Hecate Channel, BC Site License AQ1863 (Survey Date – February 22, 2017)

Prepared for

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Summary

This document outlines the attempted benthic biodiversity assessment completed at the Esperanza finfish aquaculture site operated by Grieg Seafood Ltd in Hecate Channel, BC, on February 22, 2017. Sediment collection methods were in accordance with the *Aquaculture Activities Regulations* (AAR) and adapted to address Criterion 2.1 and 4.7 of the Aquaculture Stewardship Council (ASC) Salmon Standard.

Analysis to evaluate benthic habitat conditions was not possible as insufficient sediment for sampling purposes was collected at any of the proposed sample stations at the Esperanza site.

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1.0 Introduction

This document presents the results of the attempted marine sediment and benthic invertebrate data collection conducted as part of a benthic biodiversity study completed at the Esperanza finfish aquaculture site operated by Grieg Seafood Ltd (Campbell River, BC). The Esperanza site is located in Hecate Channel, BC (Figure 1).

The study was completed by adapting the methodology required for operational monitoring of waste dispersion required under *Aquaculture Activities Regulations* (AAR) and comparing the results with the indicators listed in Criterion 2.1 and Criterion 4.7 of the Aquaculture Stewardship Council (ASC) Salmon Standard.

The purpose of the ASC Salmon Standard is to evaluate concerns of potential environmental impact related to salmon farming. The Standard is based on a combination of requirements and performance levels that must be reached in order to determine if potential impacts are being addressed. Principle 2 of the Standard addresses the "potential impacts from salmon farms on natural habitat, local biodiversity and ecosystem function" (ASC, 2012).

This survey was specifically designed to address Criterion 2.1 within Principle 2 of the ASC Salmon Standard which involved the collection of sediment within and outside of the Allowable Zone of Effect (AZE).



Figure 1: An overview map showing the approximate location of the Esperanza finfish aquaculture farm site (red dot) in Hecate Channel, BC.

2.0 Methods

The substrate at sampling locations established for compliance purposes at the Esperanza site have been previously identified to consist of "hard" sediment. Grab attempts at the locations defined by the 1 g DEPOMOD contour prescribed by the ASC Salmon Standard had not been previously attempted at the Esperanza site. Therefore, the field activities involved the attempted collection of sediment samples for physical and chemical analysis, as well as the collection and identification of benthic invertebrates present in the sediment samples.

2.1 Field Sampling

The locations of sediment sampling stations (1 g DEPOMOD contour location) were provided by Grieg Seafood Ltd.

Individual sediment sampling stations were located along three transects; Transect A, Transect B, and Transect C. Stations within the AZE were located 5 m inside the 1 g contour (Figure 2) for all three transects and also at the perimeter of the containment system for Transect B. Access to the sampling station at the perimeter of the containment system on Transect A was blocked by the site floathouse and generator barge. An alternate sampling station was therefore established 17 m from the original sampling location at the containment system perimeter for this transect. Stations outside the AZE were located 25 m outside of the 1 g contour.

As the sediment could not be obtained at any of the proposed stations at the Esperanza site grab attempts at reference locations were not performed.

Sediment collection was attempted using a van Veen grab sampler. No successful sediment samples were collected at any of the sampling stations after four grab attempts at each location.

The coordinates of the sample locations were recorded using a Trimble GeoExplorer GeoXT (Firmware v1.05) using TerraSync 3.30 software and equipped with an external Hurricane antenna.



Figure 2: The locations of the unsuccessful grab attempts for the benthic biodiversity survey at the Esperanza finfish aquaculture site in relation to the pen system and surrounding area on February 22, 2017.

The coordinates of the sample locations were recorded using a Trimble GeoExplorer GeoXT (Firmware v1.05) using TerraSync 3.30 software and equipped with an external Hurricane antenna.

Data filters were set to standards recommended by the Resource Inventory Standards Committee (RISC)¹, with at least 15 fixes taken per location, using satellites greater than 15 % above the horizon with signal to noise ratios (SNR) greater than 40 and a horizontal dilution of precision (HDOP) of five. The GPS data was corrected postmission with Pathfinder Office v5.40 software using data from the Nootka base station (NTKA).

The Trimble antenna was attached to the grab davit and positional fixes were obtained while the grab was completing the estimated bottom third of its descent. Positional fixes were completed when the grab was on the bottom and the drop line was as close vertical as possible.

The time at which each grab was attempted and physical characteristics of any collected sediment were recorded. A digital photograph of each sample was also taken.

¹ Integrated Land Management Bureau. 2008. Province of British Columbia Standards, Specifications and Guidelines for Resource Surveys Using Global Positioning System (GPS) Technology. Release 4.0d.

3.0 Results and Discussion

Representative photographs from the grab attempts at each sampling station are presented in Appendix 1.

A total of four grab attempts were made at each of the sampling stations. None of the grab attempts yielded sufficient amounts of sediment for sampling purposes. Limited quantities of sediment collected on Transects A and C consisted of sand, small woody debris, mussel and clam shells and pieces of sponge. No sediment was present in any of the grabs attempted on Transect B. During the attempted sample collection, the field crew repeatedly noted the perceptible impact of the van Veen grab sampler on a potential bedrock bluff.

The location and results of each of the unsuccessful grab attempts are presented in Table 3.

Station	Latitude	Longitude	Sampling Device	Comments
A0m	49 52.78112	126 45.73153	van Veen	Station blocked by house and generator barge. Small woody debris, shells.
A0m	49 52.78154	126 45.73159	van Veen	Skim small woody debris, shells.
A0m	49 52.78041	126 45.73092	van Veen	Small woody debris, shells.
A0m	49 52.78137	126 45.73112	van Veen	Skim small woody debris, shells
A-5m	49 52.77652	126 45.75966	van Veen	Skim sand, small woody debris.
A-5m	49 52.77649	126 45.75968	van Veen	-
A-5m	49 52.77657	126 45.75963	van Veen	-
A-5m	49 52.77660	126 45.75964	van Veen	-
A+25m	49 52.84569	126 45.63632	van Veen	-
A+25m	49 52.84557	126 45.63648	van Veen	-
A+25m	49 52.84548	126 45.63687	van Veen	_
A+25m	49 52.84547	126 45.63675	van Veen	-
B0m	49 52.87119	126 45.68979	van Veen	-
B0m	49 52.87097	126 45.69007	van Veen	-
B0m	49 52.87069	126 45.69041	van Veen	-
B0m	49 52.87070	126 45.69043	van Veen	-
B-5m	49 52.87822	126 45.70899	van Veen	-
B-5m	49 52.87814	126 45.70923	van Veen	-
B-5m	49 52.87786	126 45.70972	van Veen	-
B-5m	49 52.87726	126 45.71063	van Veen	-
B+25m	49 52.72151	126 45.62793	van Veen	-
B+25m	49 52.72154	126 45.62820	van Veen	-
B+25m	49 52.72161	126 45.62830	van Veen	-
B+25m	49 52.72156	126 45.62830	van Veen	-
C-5m	49 52.69254	126 45.60361	van Veen	Rock, sponge, shells.
C-5m	49 52.69294	126 45.60410	van Veen	-
C-5m	49 52.69143	126 45.60465	van Veen	Shells
C-5m	49 52.69040	126 45.60503	van Veen	Shells
C+25m	49 52.67736	126 45.59575	van Veen	Skim sand, clam shell
C+25m	49 52.67748	126 45.59439	van Veen	Skim sand, rocks, shells
C+25m	49 52.67678	126 45.59374	van Veen	-
C+25m	49 52.67617	126 45.59313	van Veen	Skim sand, rocks, shells

Table 3:The location and results of each unsuccessful grab attempts at the sampling stations at
the Esperanza finfish aquaculture site on February 22, 2017.

References

- Aquaculture Stewardship Council. 2012. ASC Salmon Standard Version 1.0. Available online: www.asc-aqua.org.
- Salas, F., Patrício, J. and Marques, J.C. 2006. Ecological Indicators in Coastal and Estuarine Environmental Quality Assessment - A user friendly guide for practitioners. Imprensa da Universidade de Coimbra.
- Word, J.Q. 1978. The Infaunal Trophic Index, p.19-39. In W. Bascom (ed.), Coastal Water Research Project, Annual Report for the Year 1978. Southern California Coastal Water Research Project, El Segunda, California.

Appendix 1 – Sample Photographs



Photo 1

Sediment sample collected at Station A-0m at the Esperanza site on February 22, 2017.



Photo 2

Sediment sample collected at Station A-5m at the Esperanza site on February 22, 2017.



Photo 3

Sediment sample collected at Station A+25m at the Esperanza site on February 22, 2017.



Photo 4

Sediment sample collected at Station B-0m at the Esperanza site on February 22, 2017.



Photo 5

Sediment sample collected at Station B-5m at the Esperanza site on February 22, 2017.



Photo 6

Sediment sample collected at Station B+25m at the Esperanza site on February 22, 2017.



Photo 7

Sediment sample collected at Station C-5m at the Esperanza site on February 22, 2017.



Photo 8

Sediment sample collected at Station C+25m at the Esperanza on February 22, 2017.

Appendix 2 – Esperanza Field Data

Reference Information:

 Farm site:
 Esperanza

 Aquaculture Company:
 Grieg Seafood Ltd

 Site Reference #:
 AQ1863

Geographic Region:Hecate Channel, BCField Crew:K Inman, L DenbighField Investigator:Mainstream Biological Consulting Inc.Laboratory:Kinman Consulting Inc.

Transect A, B, C Name	Sampling Station Name	Replicate Number	Transect A, B, C Bearing (Magnetic)	Reference Station (Y/N)	Distance from Pens (m)	Sampling Device Type	Sampling Device Capacity (m2)	Quality Control Replicate (Y/N)	Replicate Analysis Type	Sample Date (YYYY-MM-DD)	Sample Time (24HH:MM)	Sample Latitude (Degrees)	Sample Latitude (Minutes)	Sample Longitude (Degrees)	Sample Longitude (Minutes)	GPS Correction Status	Ocean Depth Sample Depth (m) (cm)
Α	0m	1	304	N	17	van Veen	0.10			2017-02-22	13:55	49	52.8457	126	45.6363	Post process corrected	3
А	0m	2	304	N	17	van Veen	0.10			2017-02-22	14:02	49	52.8456	126	45.6365	Post process corrected	0
А	0m	3	304	N	17	van Veen	0.10			2017-02-22	14:09	49	52.8455	126	45.6369	Post process corrected	4
Α	0m	4	304	N	17	van Veen	0.10			2017-02-22	14:16	49	52.8455	126	45.6368	Post process corrected	0
Α	5m	1	304	N	70	van Veen	0.10			2017-02-22	14:24	49	52.8712	126	45.6898	Post process corrected	0
Α	5m	2	304	N	70	van Veen	0.10			2017-02-22	14:33	49	52.8710	126	45.6901	Post process corrected	0
Α	5m	3	304	N	70	van Veen	0.10			2017-02-22	14:42	49	52.8707	126	45.6904	Post process corrected	0
Α	5m	4	304	N	70	van Veen	0.10			2017-02-22	14:51	49	52.8707	126	45.6904	Post process corrected	0
A	25m	1	304	N	100	van Veen	0.10			2017-02-22	15:04	49	52 8782	126	45 7090	Post process corrected	0
A	25m	2	304	N	100	van Veen	0.10			2017-02-22	15:13	49	52.8781	126	45.7092	Post process corrected	0
A	25m	3	304	N	100	van Veen	0.10			2017-02-22	15:21	49	52.8779	126	45.7097	Post process corrected	0
Α	25m	4	304	N	100	van Veen	0.10			2017-02-22	15:30	49	52.8773	126	45.7106	Post process corrected	0
В	0m	1	135	N	0	van Veen	0.10			2017-02-22	15:43	49	52.7215	126	45.6279	Post process corrected	0
В	0m	2	135	N	0	van Veen	0.10			2017-02-22	15:52	49	52.7215	126	45.6282	Post process corrected	0
В	0m	3	135	N	0	van Veen	0.10			2017-02-22	16:01	49	52.7216	126	45.6283	Post process corrected	0
В	0m	4	135	N	0	van Veen	0.10			2017-02-22	16:13	49	52.7216	126	45.6283	Post process corrected	0
В	5m	1	135	N	65	van Veen	0.10			2017-02-22	16:20	49	52.6925	126	45.6036	Post process corrected	0
В	5m	2	135	N	65	van Veen	0.10			2017-02-22	16:32	49	52.6929	126	45.6041	Post process corrected	0
В	5m	3	135	N	65	van Veen	0.10			2017-02-22	16:44	49	52.6914	126	45.6047	Post process corrected	0
В	5m	4	135	N	65	van Veen	0.10			2017-02-22	16:55	49	52.6904	126	45.6050	Post process corrected	0
В	25m	1	135	N	95	van Veen	0.10			2017-02-22	17:18	49	52.6774	126	45.5958	Post process corrected	0
В	25m	2	135	N	95	van Veen	0.10			2017-02-22	17:30	49	52.6775	126	45.5944	Post process corrected	0
В	25m	3	135	N	95	van Veen	0.10			2017-02-22	17:42	49	52.6768	126	45.5937	Post process corrected	0
В	25m	4	135	N	95	van Veen	0.10			2017-02-22	17:55	49	52.6762	126	45.5931	Post process corrected	0
С	5m	1		N	70	van Veen	0.10			2017-02-22	12:40	49	52.7811	126	45.7315	Post process corrected	0
С	5m	2		N	70	van Veen	0.10			2017-02-22	12:49	49	52.7815	126	45.7316	Post process corrected	0
С	5m	3		N	70	van Veen	0.10			2017-02-22	12:58	49	52.7804	126	45.7309	Post process corrected	0
С	5m	4		N	70	van Veen	0.10			2017-02-22	13:07	49	52.7814	126	45.7311	Post process corrected	0
С	25m	1		N	100	van Veen	0.10			2017-02-22	13:19	49	52.7765	126	45.7597	Post process corrected	0
С	25m	2		N	100	van Veen	0.10			2017-02-22	13:28	49	52.7765	126	45.7597	Post process corrected	0
С	25m	3		Ν	100	van Veen	0.10			2017-02-22	13:40	49	52.7766	126	45.7596	Post process corrected	0
С	25m	4		N	100	van Veen	0.10			2017-02-22	13:48	49	52.7766	126	45.7596	Post process corrected	0