Fisheries and Oceans Canada | Pêches et Océans Canada
Science | Sciences

Canadian Science Advisory Secretariat (CSAS)

Proceedings Series 2014/012

Newfoundland and Labrador Region

Proceedings of the Regional Peer Review of the Potential Impacts of Finfish Aquaculture on Hard Bottom Substrates and Development of a Standardized Monitoring Protocol

May 22-23, 2013
St. John's, NL

Chairperson: Ben Davis
Editor: James Meade

Science Branch
Fisheries and Oceans Canada
PO Box 5667
St. John's, NL A1C 5X1

September 2014

Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Published by:

Fisheries and Oceans Canada
Canadian Science Advisory Secretariat
200 Kent Street
Ottawa ON K1A 0E6

http://www.dfo-mpo.gc.ca/csas-sccs/
csas-sccs@dfo-mpo.gc.ca

ISSN 1701-1280

Correct citation for this publication:

DFO. 2014. Proceedings of the Regional Peer Review of the Potential Impacts of Finfish Aquaculture on Hard Bottom Substrates and Development of a Standardized Monitoring Protocol; May 22-23, 2013. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2014/012.

TABLE OF CONTENTS

SUMMARY iv

INTRODUCTION 1

WORKING PAPER ABSTRACTS AND DISCUSSION SUMMARIES 1

USE OF REMOTE VIDEO SURVEY METHODOLOGY IN MONITORING BENTHIC IMPACTS FROM AQUACULTURE ON THE SOUTH COAST OF NEWFOUNDLAND (CANADA) 1

APPLICABILITY OF THE USE OF VISUAL INDICATORS (PRESENCE OF *Beggiatoa* AND/OR OPPORTUNISTIC POLYCHAETE COMPLEXES (OPC)) TO IDENTIFY BENTHIC CHANGES ON VARIOUS SUBSTRATES 3

DEPOMOD AS A TOOL FOR PREDICTING THE EXTENT AND SEVERITY OF BENTHIC CHANGES ASSOCIATED WITH AQUACULTURE OPERATIONS ON THE SOUTH COAST OF NEWFOUNDLAND 4

CHARACTERIZATION OF THE IMPACTS OF FINFISH AQUACULTURE ON HARD BOTTOM SUBSTRATES IN NL REGION, INCLUDING CHANGES IN BIODIVERSITY, BIOPHYSICAL CHARACTERISTICS, AND HABITAT FUNCTIONALITY 5

APPENDIX I: TERMS OF REFERENCE 7

APPENDIX II: AGENDA 9

APPENDIX III: LIST OF PARTICIPANTS 11

SUMMARY

A meeting of the Newfoundland and Labrador (NL) Regional Peer Review Process on the Potential Impacts of Finfish Aquaculture on Hard Bottom Substrates and Development of a Standardized Monitoring Protocol was held May 22-23, 2013 in St. John's, Newfoundland. Its purpose was to evaluate the interim monitoring program for assessing the potential impacts on hard bottom substrates. This included advice on the type of equipment, methodology and visual indicators to be used to assess benthic habitat conditions.

These Proceedings include an abstract for each working paper and a summary of the relevant discussions and the key conclusions reached at the meetings. In addition a Science Advisory Report and Research Documents resulting from the meeting will be published on the Fisheries and Oceans Canada (DFO) Canadian Science Advisory Secretariat Website.

Compte-rendu de la réunion régionale d'examen par les pairs sur les incidences potentielles de la pisciculture sur les substrats de fond marin dur et l'élaboration d'un protocole de surveillance normalisé ; du 22 au 23 mai 2013

SOMMAIRE

Une réunion d'examen par les pairs de la région de Terre-Neuve-et-Labrador sur les incidences potentielles de la pisciculture sur les substrats de fond marin dur et l'élaboration d'un protocole de surveillance normalisé s'est tenue du 22 au 23 mai 2013 à St. John's, Terre-Neuve-et-Labrador. Le but de cette réunion était d'évaluer le programme de surveillance provisoire afin d'évaluer les incidences potentielles sur les substrats de fond marin dur. Les avis scientifiques résultant de cette rencontre portent sur l'équipement, la méthodologie ainsi que les indicateurs à utiliser pour évaluer les conditions de l'habitat benthique.

Ce compte rendu comprend le résumé de chaque document de travail ainsi qu'un sommaire des discussions pertinentes et les conclusions essentielles de la rencontre. De plus, un avis scientifique et les documents de recherche découlant de la réunion seront publiés sur le site des avis scientifiques de Pêches et Océans Canada (MPO).

INTRODUCTION

A meeting of the Newfoundland and Labrador Peer Review Process (PRP) was held during May 22 -23, 2013 in St. John's, Newfoundland and Labrador (NL). The purpose of the meeting, as described in the Terms of Reference (ToR: Appendix 1), was to assess the potential impacts of finfish aquaculture on hard bottom substrates and provide advice regarding type of equipment, methodology and visual indicators to be used to assess benthic habitat conditions to develop the appropriate advice.

The current assessment was requested by the Fisheries Protection Program (FPP) to provide advice to inform decisions on siting and stocking and to determine whether additional mitigation measures and/or best management practices are required to minimize adverse effects of aquaculture operations on fish and fish habitat that support fisheries. This advice would then result in more regulatory certainty for DFO and the aquaculture industry, and provide the fishing industry and the general public with more confidence that the environmental impacts of aquaculture operations are being properly managed.

Participation included personnel from the Science, Fisheries and Aquaculture Management, and Ecosystems Management branches of DFO; representatives from the fishing industry; Newfoundland Aquaculture Industry Association (NAIA); aquaculture industry; NL Department of Fisheries and Aquaculture; Miawpukek First Nation (MFN) and; Memorial University.

Open discussion and debate proceeded during and after each presentation. At the meeting, consensus was reached on summary bullets for the assessment of the potential impacts of finfish aquaculture on hard bottom substrates. These are included in a Science Advisory Report (SAR) distributed to and reviewed by the meeting participants.

These proceedings contain abstracts for working papers presented and summaries of the discussion on each. Additional information can be found in the SAR and in research documents cited or from references provided therein.

WORKING PAPER ABSTRACTS AND DISCUSSION SUMMARIES

USE OF REMOTE VIDEO SURVEY METHODOLOGY IN MONITORING BENTHIC IMPACTS FROM AQUACULTURE ON THE SOUTH COAST OF NEWFOUNDLAND (CANADA)

Authors: G. Mabrouk, T.R. Bungay, D. Drover, D. Hamoutene

Presenter: G. Mabrouk

Abstract

Determining the extent of influence of marine salmonid farms on surrounding habitats is very important for environmental monitoring. On the south coast of Newfoundland, Canada, aquaculture is expanding vastly in regions where hard and patchy substrates are predominant. This work explores the use of remote video surveys as a primary tool to assess possible impacts of deposition on the benthos. Two different camera systems were compared in relation to image quality, recording parameters, ease of species identification, and substrate categorization. The challenge of variability among observers was examined and discussed. The work from this study has fed into establishing a guidance document and a list of species for use as a reference by regulatory bodies and environmental companies. This study provides a dependable, cost effective, and efficient tool for the assessment of impacts of aquaculture activities in deep sites with hard and patchy substrates.

Discussion

Video surveying provides an easy, cost effective way for monitoring benthic environments with hard bottoms and patchy substrates when conventional methods such as grab samples are not feasible. Additionally, video monitoring provides a permanent record to which observers can have access for future analysis. It was pointed out that in other provinces, camera systems and frames have been developed to collect continuous video and image extraction. In these jurisdictions, video recording begins with a whiteboard on deck of the vessel with date and site specific information (e.g. date, time, tide, latitude, longitude, site name) followed by a full 360° pan to visually validate the location. The prescribed method establishes the true positioning of the boat and video surveying is conducted by following the drop sample procedure between sampling stations to minimize the probability of snagging cables or lines around cliff edges and boulders or grid and mooring lines. While the camera is unable to view everything (e.g. crevices) it gives a good indication of the benthic habitat.

Using framed grids (such as quadrants) can provide standardization of spatial distances, but it can become challenging when dealing with irregular bathymetry including cliffs and boulders on which the system can get lodged, thus different scaling methods should be considered. There was some discussion regarding future work with lasers that can provide a size reference no matter the height of the camera from the seafloor; however, the area for image collection can only be standardized if the camera is at a set distance from the seafloor. Additionally, interpretation bias and observer variability can be greatly reduced by increasing the number of samples collected, the use of image analysis software (e.g. Image J), training of observers, and developing a visual benthic identification guide.

Numerous factors can affect the resolution and quality of images needed for accurate and consistent results, including distance of the camera lens from the seafloor, lighting and camera orientation. However, it is essential to first have a clear understanding of the full suite of benthic indicators to be identified and measured as these will drive the equipment specifications required to deliver the resolution needed for accurate identification and eventual quantification in determining the zone of organic enrichment. As a result, setups and requirements of the camera systems depend on the scope of the monitoring. In the current study, the setup and resolution were designed to fit the needs determined by habitat monitoring requirements; however, other visual imaging tools (e.g. underwater vertical still photography) and image analysis software should be investigated before implementing as a fix requirement in the Standard Operating Procedures (SOPs). There is a need to standardize the spatial distance and optimize the coverage area and thus standardize the resolution. Standard operating procedures can be developed to alleviate some of these issues by setting basic minimum specifications for key characteristics and components (e.g. camera resolution, light intensity, maximum recording depth) and providing vital details for consistent collection of quality imagery (e.g. recording time, area of coverage, observations to record). Standard Operating Procedures should not include details such as exact models, colours and materials of framing, cable composition, power supply details, etc. It is clearly a work in progress and will continue evolving to meet the needs of monitoring requirements.

APPLICABILITY OF THE USE OF VISUAL INDICATORS (PRESENCE OF *Beggiatoa* AND/OR OPPORTUNISTIC POLYCHAETE COMPLEXES (OPC)) TO IDENTIFY BENTHIC CHANGES ON VARIOUS SUBSTRATES

Authors: D. Hamoutene, L. Sheppard, J. Mersereau, V. Oldford, T.R. Bungay, S. Dufour, G. Mabrouk

Presenter: D. Hamoutene

Abstract

Data from sampling conducted on aquaculture sites as well as information extracted from industry monitoring reports were used to evaluate the applicability of using *Beggiatoa* and OPC as indicators of benthic change due to aquaculture. The first set of data analyzed pertains to monitoring reports completed at cage edge; *Beggiatoa* and OPC presence were then noted with no assessment of coverage. Modifications to the habitat monitoring protocols were implemented in June of 2011 with protocols changing from cage edge to transect sampling (transects around the cage array). Data collected after these modifications, were analyzed to reveal trends across sites in relation to distance to cage and evaluate variability within stations located in the same direction. *Beggiatoa* and OPC were not present in reference sites and found to be associated with aquaculture activities with little dependence on depth and substrate type. *Beggiatoa* and OPC correlate well with other indicators of aquaculture activities such as flocculent presence, offgasing and sulphides. Indicators were found to decrease with distance from cage although distributions were patchy. Despite this patchiness, the average difference in the coverage of indicators between stations along transects of the same direction were less than 10 %. When transforming data in dummy variables (absence/presence) we found the same trends suggesting that presence/absence of indicators could also be used as an adequate trigger to inform on waste deposition at finfish sites.

Discussion

Newfoundland has a diverse bathymetry which can be a challenge for the benthic monitoring of aquaculture sites. Many sites are deep (often greater than 100 m) and consist of hard bottoms with patchy substrates making traditional methods for monitoring, such as grab samples, ineffective. Grabs are often either unattainable or consist of “scrapings” of the bottom which are often washed out compromising the reliability of sulphide measurements thus complicating their usability as appropriate indicators. Similar research has been done on monitoring in these conditions (British Columbia mostly), and it was advised to link the data of the current study with previous documents in order to provide continuity for research development.

Similar research has proven *Beggiatoa* and OPCs to be useful indicators of enrichment, and while *Beggiatoa* has been used in other provinces for some time OPCs usage still needs to be validated. Examples were provided from other provinces demonstrating how, *Beggiatoa* has been analyzed based on percent coverage to create monitoring thresholds; however, it is challenging to quantify a value as a threshold since limits can change with depth, diversity and richness while keeping in mind the constraint of the monitoring limitations. In addition, a clear understanding of how coverage thresholds were determined in other provinces is necessary. OPCs were found more challenging to use (i.e. in particular in summer temperatures) and there are many knowledge gaps regarding their nature and usability as indicators.

In the current report, aquaculture operations had the strongest influence on *Beggiatoa* and OPC presence. Water depth and substrate type were also found to have an influence to a lesser extent. To consider thresholds in *Beggiatoa* and OPC coverage in the Newfoundland context, it was suggested that future work consider changes in biodiversity, indices, as well as a combination of indicators. Meanwhile, presence/absence of *Beggiatoa* and OPCs does provide

an idea of enrichment when making comparisons between baseline, production, and fallow monitoring reports.

Sampling time should also be considered before looking at the percent coverage of indicators. In the current study, baseline sites were characterized as sites in which aquaculture activity had not previously existed. Sampling prior to stocking and a few weeks post-harvest is not shown to be always effective and future research should look at determining appropriate monitoring times such as peak biomass and other points of the production cycle.

DEPOMOD AS A TOOL FOR PREDICTING THE EXTENT AND SEVERITY OF BENTHIC CHANGES ASSOCIATED WITH AQUACULTURE OPERATIONS ON THE SOUTH COAST OF NEWFOUNDLAND

Authors: A.W. Ratsimandresy, J.J. Currie, T.R. Bungay, D. Drover, G. Mabrouk

Presenter: A.W. Ratsimandresy

Abstract

On the south coast of Newfoundland, finfish aquaculture farms are generally located in relatively deep water (over 50 m) and over hard patchy bottom substrates. Organic particles released during farm operations are transported, dispersed and potentially degraded as they sink toward the bottom. Effects on the benthic ecosystems depend upon the rate at which the material settles and the ability of ecosystems to assimilate the added flux of organics. The present study evaluates the applicability of the aquaculture waste deposition model, DEPOMOD, in understanding and predicting the pattern and amount of particle deposition from marine finfish cage sites on the south coast of Newfoundland. In order to assess the surface area of deposition underneath and in the vicinity of fish farms, currents at different depths were recorded at locations near two aquaculture farms. The current velocity time series, together with the bathymetry of the area and the feed input data, were considered in order to run DEPOMOD. Observed carbon deposition at the bottom was estimated using data from sediment traps installed around the sites.

Observation showed that the highest deposition is found directly under the cages. Sensitivity analyses and the comparison of DEPOMOD output with observation were not satisfactory with common model parameters used in recent analyses from other regions. This suggests that additional analyses on more sites are needed in order to use the model under Newfoundland conditions and establish its general applicability in predicting carbon deposition.

Discussion

Observed deposition from sediment trap sampling and results from DEPOMOD predictions presented in this study, suggest that the deposition from the studied aquaculture sites are higher underneath the cages and lower in the vicinity. Farther from the cages, (distance over ~75 m to 100 m) observed carbon deposition was of the order of 2 -3 mg C/m^2/day or lower. From an industry point of view, this may help identify where to expect high deposition when carrying out sampling.

There was general agreement that DEPOMOD needs more fine tuning if it is to produce accurate results. The effects of physical and ecological characteristics of aquaculture sites on the south coast of Newfoundland (e.g. hard substrates, steep slopes, weak currents below depths of 5 m, etc.) need additional evaluation. The use of the re-suspension module within DEPOMOD was discussed although its usability is questioned when the currents are low as in the case of the south coast of Newfoundland.

Parameters such as feed waste rates, tuned to obtain predictions of deposition similar to measured values, were significantly higher than the values used in recent analysis from other regions. The use of more realistic feed waste ratios would likely produce different model predictions; therefore, caution should be used when interpreting the results.

Before comparing deposition from observation with that from model prediction, sediment trap content should be further described and analysed in order to address any source of error and ensure adequate parameter values are used within the model. Moreover, a detailed description of the sampling design of the sediment traps and the possible effects of longer sampling periods requires further discussion.

The bathymetry around aquaculture areas in Newfoundland has shown steep sided slopes which would have been not optimally simulated by DEPOMOD. Different modeling approaches and further sensitivity analysis were advised to determine the relative influence of surface current flows, waste feed rates, and fecal components on model outputs. The possibility of analyzing the output of the model with other types of observation will be dependent on first ensuring that realistic model parameters are considered. The limitations and assumptions of the approach need to be analyzed.

Future DEPOMOD assessments need consideration given the factors associated with trap type, deployment duration, depth above seabed and type of buffered solution used as preservative.

The information discussed during the present CSAS process suggests updates are needed to better use DEPOMOD as a tool to assess deposition under and in the vicinity of aquaculture farms on the south coast of Newfoundland. As a result technical reports and other publications referring to this result should be updated accordingly.

CHARACTERIZATION OF THE IMPACTS OF FINFISH AQUACULTURE ON HARD BOTTOM SUBSTRATES IN NL REGION, INCLUDING CHANGES IN BIODIVERSITY, BIOPHYSICAL CHARACTERISTICS, AND HABITAT FUNCTIONALITY

Authors: D. Hamoutene, T.R. Bungay, G. Mabrouk, F.J. Salvo, C. Couturier, A.W. Ratsimandresy, L. Sheppard, S.C. Dufour

Presenter: D. Hamoutene

Abstract

There have been no comprehensive surveys of the benthic communities around aquaculture sites of NL and little is known about the effect of aquaculture deposition on predominant assemblages. Our video analyses revealed the presence of patchy benthic assemblages on the subarctic, predominantly rocky and deep substrates studied. Some NL sites exhibit bare environments with no fauna/flora or very low abundances. Benthic communities showed evidence of change due to aquaculture waste deposition through a decrease in abundance and diversity. Our results further validate the use of *Beggiatoa* sp. and OPCs as indicators of benthic change. *Beggiatoa* sp. presence on sites covered areas encompassing OPC and flocculent presence while OPCs can be absent from sites in operation suggesting the role of other factors (season, depth, etc) and thus requiring further investigation. Our data also highlight the patchiness of indicators, a fact that should be taken into account in the design of regulatory regimes. We observed the presence of indicators at average distances ~70 m from cages suggesting the need to extend sampling transects to at least 100 m (currently 50 m in regulatory protocol) with stations separated by 20 to 30 m. More research is needed on fallow periods as a management tool in the light of the depauperate nature of some benthic environments prior to aquaculture and the persistent presence of indicators in some sites. Regulators need to set

measurable objectives in order to understand where fallow period requirements fit in order to achieve these objectives.

Discussion

Classification of benthic video at active and fallowed aquaculture sites, as well as control sites on the south coast of Newfoundland has produced some data where “zero abundances” of macrofaunal species/complexes occurred. Stations with zero abundance and no indicators were not considered in the analyses despite the availability of a zero-adjusted Bray-Curtis coefficient. This zero-adjusted coefficient can come into force when assemblages are virtually denuded; though it should only be applied if it makes biological sense to regard two blank samples as 100 % similar because both are denuded for the same reason (poverty of the area versus impact of aquaculture in this study). The “zero abundance” values, however, can provide valuable insight when characterizing the Newfoundland environment compared to other regions; therefore they should be incorporated into the document. Further investigation of “zero abundance” values on a site by site basis may help inform on factors behind their occurrence.

In addition, relating abundance/richness data from the south coast of Newfoundland to other salmon growing regions could substantiate the fact that the former is a low biodiversity environment. To explain the focus on macrofaunal communities, it was recommended that evidence be presented to support the fact that taking grab samples, or looking at sediment/infaunal communities is not a viable option in this environment.

In future work, it was agreed that an increased sampling area may be necessary, either through additional sampling or variation in camera distance from seabed in order to change the size of the area covered (quadrants). This should be considered due to the low diversity and patchy faunal communities; this may augment the number of species recorded. It is important to consider a number of factors as indicators of habitat condition rather than evaluate habitat solely on the presence of OPC/*Beggiatoa* sp.; other factors such as flocculent and “zero abundance” values may be incorporated into the analysis. How flocculent is characterized as a substrate should be better explained.

It was acknowledged that there is evidence that proper characterization of the spatial extent of areas of deposition necessitates the extension of sampling transects from cage edge beyond the current limit (50 m) to 120 m. In addition, *Beggiatoa* and OPC were still present on fallowed sites. After a one-year fallow period, results suggest a reduction of the spatial extent of benthic organic indicators (*Beggiatoa*, OPC) to the area below the cages. More research is needed to draw conclusions on the fallow period efficiency in contributing towards assimilation of deposits and return to baseline conditions. Overall, it was acknowledged that in the light of the recent changes to the *Fisheries Act*, the development of regional benthic monitoring thresholds of impact and the role of the fallow period need to be further discussed once regulators have set measurable objectives to achieve.

APPENDIX I: TERMS OF REFERENCE

Potential Impacts of Finfish Aquaculture on Hard Bottom Substrates and Development of a Standardized Monitoring Protocol

Regional Peer Review – Newfoundland and Labrador Region

May 22-23, 2013

St. John's, Newfoundland and Labrador

Chairperson: Ben Davis

Context

Fisheries and Oceans Canada (DFO)-Habitat Protection Division (HPD) assesses potential impacts of finfish aquaculture operations on fish and fish habitat that support fisheries of value to Canadians as part of their responsibilities to conserve and protect fish and fish habitat pursuant to the *Fisheries Act*. To assist in this assessment, the Newfoundland aquaculture industry has been responsible for conducting habitat monitoring of finfish aquaculture sites. The analysis of redox and sulphide measurements is an accepted standard practice in other jurisdictions. However, past monitoring practices involving grab sampling for redox and sulfide analyses have presented challenges in the Newfoundland and Labrador (NL) Region as most aquaculture sites are located over hard bottom substrates. Recently, DFO-HPD implemented changes to its monitoring protocol by replacing redox and sulfide analysis with visual observations over hard substrates, which have also been used in other jurisdictions, including British Columbia.

DFO-HPD is also responsible for reviewing new site applications and providing advice regarding siting and maximum stocking densities so as to minimize environmental impacts. Past siting requirements included the location of sites at depths greater than 30 m when over hard bottom substrates, as these areas were expected to be highly erosional and therefore wastes were not expected to accumulate. This has proven to be false, likely due to a combination of low currents, considerable depths and cold temperatures contributing to slow bioremediation processes. As the aquaculture industry continues to expand in the NL Region, DFO is faced with an increased number of new site applications and for existing sites, ongoing monitoring and requests for higher production levels. As stated earlier, the particular environmental conditions in Newfoundland (i.e. low water currents; low water temperatures; hard bottom substrates) necessitate specific advice regarding the implications of site development and expansion in the NL Region.

DFO-HPD will use this advice to make informed decisions on siting and stocking and determine whether additional mitigation measures and/or best management practices are required to minimize adverse effects of aquaculture operations on fish and fish habitat. This advice would then result in more regulatory certainty for DFO and the aquaculture industry, and provide the fishing industry and general public with more confidence that environmental impacts of aquaculture operations are being properly managed.

Objectives

The objectives of the meeting include:

- Evaluate the standardized benthic monitoring protocol developed for assessing potential impacts of finfish aquaculture operations on hard bottom substrates. This would include advice regarding type of video equipment (i.e., ROV, underwater video camera or drop camera), methodology (e.g., grid vs. transect) and potential visual indicators.

- Evaluate the applicability of the use of visual indicators (accumulation of flocculent, off-gassing, presence of *Beggiatoa* and/or Opportunistic Polychaete Complexes (OPC), etc.) to identify benthic impacts on various substrates.
- Validate the use of DEPOMOD (a commercial model for predicting organic deposition under finfish aquaculture sites) as a tool for predicting the extent and severity of benthic changes associated with aquaculture operations within the NL Region.
- Evaluate the characterization of the impacts of finfish aquaculture on hard bottom substrates in NL Region, including changes in biodiversity, biophysical characteristics, and habitat functionality. Discuss the development of regional benthic monitoring of thresholds of impact.

Expected Publications

- Science Advisory Report
- Proceedings
- Research Document(s)

Participation

- DFO Science
- DFO Fisheries and Aquaculture Management
- DFO Ecosystems Management
- Provincial representatives
- Aboriginal communities/organizations
- Aquaculture Industry
- Fishing Industry
- Academics
- Other invited experts

APPENDIX II: AGENDA

REGIONAL CSAS PROCESS

Newfoundland and Labrador Regional Peer Review Meeting:

Potential Impacts of Finfish Aquaculture on Hard Bottom Substrates and Development of a Standardized Monitoring Protocol

22-23 May 2013

Conception Bay South Room - Holiday Inn

St John's, NL

Chair: Ben Davis

DAY 1 – WEDNESDAY 22 MAY 2013

Time	Description	Presenter
9:00 – 9:30	Welcome, Introductions, Housekeeping Review of Agenda, Review Terms of Reference	Chair: Ben Davis
9:30 – 10:00	**Presentation #1: Use of remote video survey methodology in monitoring benthic impacts from aquaculture on the south coast of Newfoundland (Canada)**	Gehan Mabrouk
10:00 - 10:30	Reviewer Presentations and Author Response	Bob Sweeney & Suzanne Dufour
10:30 – 10:45	**BREAK**	
10:45 - 11:30	Open Discussion	ALL
11:30 - 12:00	**Presentation #2: Applicability of the use of visual indicators (presence of *Beggiatoa* and/or Opportunistic Polychaete Complexes (OPC)) to identify benthic changes on various substrates.**	Dounia Hamoutene
12:00 - 1:00	**LUNCH (not provided)**	
1:00 - 1:30	Reviewer Presentations and Author Response	Terri Sutherland & Blythe Chang
1:30 - 2:15	Open Discussion	ALL
2:15 - 2:45	**Presentation #3: DEPOMOD as a tool for predicting the extent and severity of benthic changes associated with aquaculture operations on the South coast of NL**	Andry Ratsimandresey
2:45 - 3:00	**BREAK**	
3:00 – 3:30	Reviewer Presentations and Author Response	Blythe Chang & Jon Chamberlain
3:30 - 4:15	Open Discussion	ALL

Time	Description	Presenter
4:15 - 4:45	General Discussion of Papers in Preparation for Developing Science Advisory Report	ALL
4:45 – 5:00	Summary & Adjournment	Ben Davis

DAY 2 – THURSDAY 23 MAY 2013

Time	Description	Presenter
9:00 – 9:15	Welcome, Housekeeping, Review of Agenda	Ben Davis
9:15 – 9:45	**Presentation #4: Characterization of the impacts of finfish aquaculture on hard bottom substrates in NL region, including changes in biodiversity, biophysical characteristics, and habitat functionality.**	Dounia Hamoutene
9:45 - 10:30	Reviewer Presentation and Author Response	Terri Sutherland
10:30 – 10:45	**BREAK**	
10:45 - 11:30	Open Discussion	ALL
11:30 - 12:00	General Discussion of Papers in Preparation for Developing Science Advisory Report	ALL
12:00 - 1:00	**LUNCH (not provided)**	
1:00 – 3:00	Science Advisory Report Development	ALL
3:00 - 3:15	**BREAK**	
3:15 - 4:00	Science Advisory Report Development	ALL
4:00 – 5:00	Final Consensus, Conclusions & Next Steps	Ben Davis

APPENDIX III: LIST OF PARTICIPANTS

Name	Affiliation	E-mail
Erika Parrill	DFO-CSAS	erika.parrill@dfo-mpo.gc.ca
Janelle Arsenault	Simcorp Marine Environmental Inc.	jarsenault@simcorp.ca
Bob Sweeney	Simcorp Marine Environmental Inc.	bsweeney@simcorp.ca
Lynn Lush	DFO Science	Lynn.Lush@dfo-mpo.gc.ca
Isabel Costa	DFO Science	Isabel.Costa@dfo-mpo.gc.ca
Terry Bungay	MI-MUN	terry.bungay@mi.mun.ca
Corey Morris	DFO Science	Corey.Morris@dfo-mpo.gc.ca
Atef Mansour	DFO Science	Atef.Mansour@dfo-mpo.gc.ca
Andry Ratsimandresy	DFO Science	Andry.Ratsimandresy@dfo-mpo.gc.ca
Jim Meade	DFO-CSA	James.Meade@dfo-mpo.gc.ca
Jonathan Kawaja	NL DFA	jonathankawaja@gov.nl.ca
Chris Hendry	DFO Aquaculture Management	Chris.Hendry@dfo-mpo.gc.ca
Ed Parker	DFO-FPP	Edward.Parker@dfo-mpo.gc.ca
Ben Davis	DFO Science	Ben.Davis@dfo-mpo.gc.ca
Jennifer Caines	Northern Harvest Sea Farms	jcaines@northernharvest.com
Jennifer Woodland	Cold Ocean Salmon Inc.	jennifer.woodland@cookeaqua.com
Sharon DeDominicis	Marine Harvest Canada	sharon.dedominicis@marineharvest.com
Suman Atwal	Grieg seafood bc	suman.atwal@griegseafood.com
Ross Hinks	MFN	rhinks@mfngov.ca
Syliva Rumbolt	FFAW	sylvia.rumbolt@nf.sympatico.ca
Blythe Chang	DFO	Blythe.Chang@dfo-mpo.gc.ca
Gehan Mabrouk	DFO Science	Gehan.Mabrouk@dfo-mpo.gc.ca
Kim Burt	DFO Science	Kimberley.Burt@dfo-mpo.gc.ca
Ed Porter	DFO	Edward.Porter@dfo-mpo.gc.ca
Jay Parsons	DFO	Jay.Parsons@dfo-mpo.gc.ca
Corina Busby	DFO	Corina.Busby@dfo-mpo.gc.ca
Dounia Hamoutene	DFO Science	Dounia.Hamoutene@dfo-mpo.gc.ca
Terri Sutherland	DFO Science	Terri.Sutherland@dfo-mpo.gc.ca
Darrell Green	NAIA	dgreen@naia.ca
Dwight Drover	DFO Science	Dwight.Drover@dfo-mpo.gc.ca
Pierre Goulet	DFO Science	Pierre.Goulet@dfo-mpo.gc.ca
Harry Murray	DFO Science	Harry.Murray@dfo-mpo.gc.ca
Joe Mersereau	DFO Science	Joe.Mersereau@dfo-mpo.gc.ca
Robyn Pearce	DFO	Robyn.Pearce@dfo-mpo.gc.ca
Flora Salvo	MUN	fsalvo@mun.ca
Suzanne Dufour	MUN	sdufour@mun.ca
Terry Fleet	DFO	Terry.Fleet@dfo-mpo.gc.ca
John O'Rourke	DFO	John.Orourke@dfo-mpo.gc.ca
Dale Richards	DFO-CSA	Dale.Richards@dfo-mpo.gc.ca
Geoff Perry	DFO Aquaculture Management	Geoff.Perry@dfo-mpo.gc.ca
Nadine Templeman	DFO	Nadine.Templeman@dfo-mpo.gc.ca
Darrin Sooley	DFO-FPP	Darrin.Sooley@dfo-mpo.gc.ca