BRITISH COLUMBIA
MARINE CONSERVATION ANALYSIS

Commercial Fisheries
Data Review Workshop Report

Workshop held March 2, 2010
10:00 AM – 5:00 PM

Coast Tsawwassen Inn
1665 56th St, Delta BC

Incorporates expert feedback of draft dated March 10th, 2010

1.0 Introduction

1.1 Objectives of Commercial Fisheries Data Review Workshop and Report

The Commercial Fisheries Data Review Workshop was held in Tsawwassen on March 2nd 2010. This workshop is part of a process of reviewing data gathered to represent human use of the BC marine environment and was organized on the recommendation of the commercial fisheries representatives on the British Columbia Marine Conservation Analysis (BCMCA) Project's Human Use Data Working Group[1]. Other human use data have been subjected to review through other methods, including workshops, participation in sectoral meetings, comments solicited through e-mail and telephone and individual review by sector experts.

The objectives of the Commercial Fisheries Data Review Workshop was to:

1) Finalize the data review process for the commercial fisheries sector;
2) Make recommendations on how the data from the commercial fisheries sector will be portrayed in the Atlas;
3) Identify any gaps in the data;
4) Make recommendations on a richness map using human use data; and
5) Discuss and make recommendations on use of the data in Marxan Analyses.

The objective of this report is to record the comments and observations made during the data review workshop and to summarize the recommendations for commercial fisheries data.

Post workshop comment: Out of 22 members of the commercial fishery sector that were invited to review the workshop report, 2 responded to the request for feedback.
Suggestions and comments that were received based on the draft report dated March 10 2010 have been incorporated. Names and other individual identifiers have been removed.

1.2 Background to the Commercial Fisheries Data Review Workshop

After meeting with several different fishery sectors in 2008 and 2009, the BCMCA collected and helped to develop spatial datasets that represent 22 different commercial fisheries. In December 2009, maps of the datasets and metadata were placed on the BCMCA FTP site and Project Team member Bruce Turris initiated a review of the data among the commercial fisheries sectors. A summary of comments received prior to the workshop can be found in Appendix 2.

[1] See http://www.bcmca.net/user-group-engagement/

The idea of the workshop was initiated at a BCMCA project team meeting in January 2010 and invitations were sent on February 16th 2010. Invitees received two follow-up reminders, either by email or phone, prior to the workshop held on March 2nd 2010.

1.3 Overview of Commercial Fisheries Data Review Workshop

Participants at the workshop had knowledge and expertise on the following fisheries: Geoduck, groundfish, Area A crab, dogfish, prawns, halibut, sea urchins and salmon. A list of the participants and invitees can be found in Appendix 1. The following commercial fisheries data sets were reviewed: Geoduck, Groundfish (Groundfish Trawl, Schedule II Groundfish, Rockfish (ZN)); Sablefish (longline and trap); Halibut, Crab, Prawn, Green Urchin, Red Urchin, Sea Cucumber, Krill, Pink Shrimp, Shrimp Trawl, Sardines, Herring and Salmon (Gillnet, Seine and Trawl).[2]

The workshop started with an overview of the BCMCA, including where this review fit into the BCMCA Project. A number of questions were addressed regarding the project and use of Marxan. This was followed by a dataset-by-dataset review of the data collected to represent commercial fisheries and a discussion on the workshop participant's opinions on developing a human use richness map.

2.0 Project Background

2.1 BCMCA Purpose and Products

The British Columbia Marine Conservation Analysis (BCMCA) is a collaborative project designed to provide resource managers, scientists, decision-makers, and those with a vested interest in the marine environment with better information to have discussions and/or make decisions about the ocean along the BC coast. The BCMCA process and outputs are NOT intended to replace marine planning and decision-making processes.

The overall goal of the BCMCA is to identify areas of high conservation utility and human use in Canada's Pacific waters. The study area covers the area from the Washington-BC border to the Alaska BC border and from the shoreline to the 200 nautical mile EEZ.

The data assembled by the BCMCA will be used to create two products:

[2] Humpback shrimp and sidestripe shrimp were not in an aggregated (multi-year combined) form and were not reviewed at this workshop.

- An atlas that illustrates known ecological values and human uses in Canada's Pacific Ocean. This atlas will be created from existing and publicly available mapped data and its purpose is to illustrate aspects of marine biology, ecology, oceanography, and human use relevant to a coast-wide scale; and
- A set of results from spatial analyses using the Marxan[3] decision support tool. Results will be documented from a range of scenarios, each with different sets of explicit objectives, which inform the values put into Marxan parameters. Broadly, the analyses will apply marine reserve theory to identify areas that would help represent BC's marine biodiversity while minimizing overlap with areas important for human use.

The ecological values and human uses data compiled by the BCMCA will be displayed in an atlas page with an accompanying facing page of information describing the feature, the source datasets, the processing work and any caveats of use. The Atlas will include:

1. Maps of all known and available ecological data layers, such as species distributions and habitats.
2. A richness map of ecological features (combined ecological data).
3. Maps of all known and available human use data layers.
4. A richness map of human use components (combined human use data).
5. Descriptions of the review process for each feature, including comments where the data may be currently lacking.

The features themselves, along with metadata and the atlas page, will also be made available through the BCMCA's data repository. Where sharing restrictions constrain the BCMCA's ability to share the data, contact information will be provided for the data custodian.

The BCMCA will not advocate any particular position or conservation outcome. Rather it will generate a number of products that collaborating organizations can make use of. The work is being conducted outside of a government-led planning process, but ***may*** inform planning processes. The products are intended to be scientifically defensible and collaboratively developed. The intent of the BCMCA is to help move the discussion from a debate on data (sources/quality) to a discussion on marine planning objectives for sustainable use.

2.2 Organizational Structure of the BCMCA

In terms of organizational structure, the BCMCA has a Project Team, a Human Use Data Working Group, and project staff (contractors).

1) The Project Team provides overarching direction and decision-making and is made up of members form the following government and non-government organizations:

[3] www.uq.edu.au/marxan/

- Fisheries and Oceans Canada
- Parks Canada
- BC Integrated Land Management Bureau
- Academic
- Marine users – fisheries, industry, etc. representing the Human Use Data Working Group
- Environmental non-governmental organisations
- Observers: Coastal First Nations, Haida Fisheries Program, BC Oceans and Marine Fisheries Division, the WCVI Aquatic Management Board, South Island Aboriginal Fisheries

2) Human Use Data Working Group provides advice on representing human use data in the atlas, and on using these data in analyses to identify areas important to human use. Members from the Working Group broadly represent six sectors

1) Commercial fisheries
2) Recreational fisheries
3) Shipping and marine transportation
4) Marine recreation and tourism
5) Energy (oil & gas, wind, tidal, wave)
6) Marine and foreshore tenures).

The members from user groups are from the following organizations:

- BC Salmon Farmers Association
- BC Seafood Alliance
- BC Marine Trades Association
- Coast Forest Products Association
- Council of Marine Carriers
- Ocean Renewable Energy Group
- Shell Canada
- Sport Fishing Advisory Board
- Wilderness Tourism Association

3) The project staff implements the project under the project team's direction and consists of a project manager, data manager, project assistant, and external consultants.

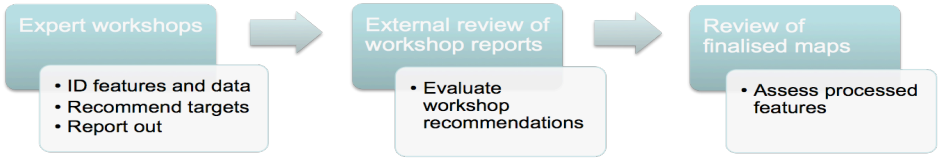
2.3 The BCMCA Data Review Process

Collecting and reviewing the best available data to represent ecological features involved the following (see Figure 1):

- Five expert workshops (Seabirds, invertebrates, plants, mammals, and fishes) were held to identify biophysical features, the best available data, and to recommend conservation targets appropriate for each feature.

- A report was create for each workshop and the reports reviewed by workshop attendees and external reviewers. Comments from the reviews were included in the workshop reports.
- Experts reviewed a report proposing a method and data sources to define physical representation. Comments from the reviews were included in the workshop report.
- ~250 biophysical datasets recommended, ~100 obtained and assembled into ~150 features. Other recommended datasets were not available, duplicate recommendations among workshops or not suitable (eg only covered a portion of the study area).
- Experts via invitation to a web-based review process reviewed assembled and prepared data sets.
- Workshop reports for all themes, reports on feature review are/will be available at BCMCA website.

Figure 1. Ecological Data Input and Review Steps



Collecting and reviewing the best available data to represent human use of the BC Marine environment started with a group-by-group engagement process (see Figure 2). Approximately 100 datasets were assembled to represent 64 Human Use Features. Datasets are being reviewed by appropriate sector for accuracy, completeness prior to inclusion in the Atlas. Some datasets were updated by the BCMCA (EG Recreational fishing, tenures).

Figure 2. General Process for Group-by-Group Engagement

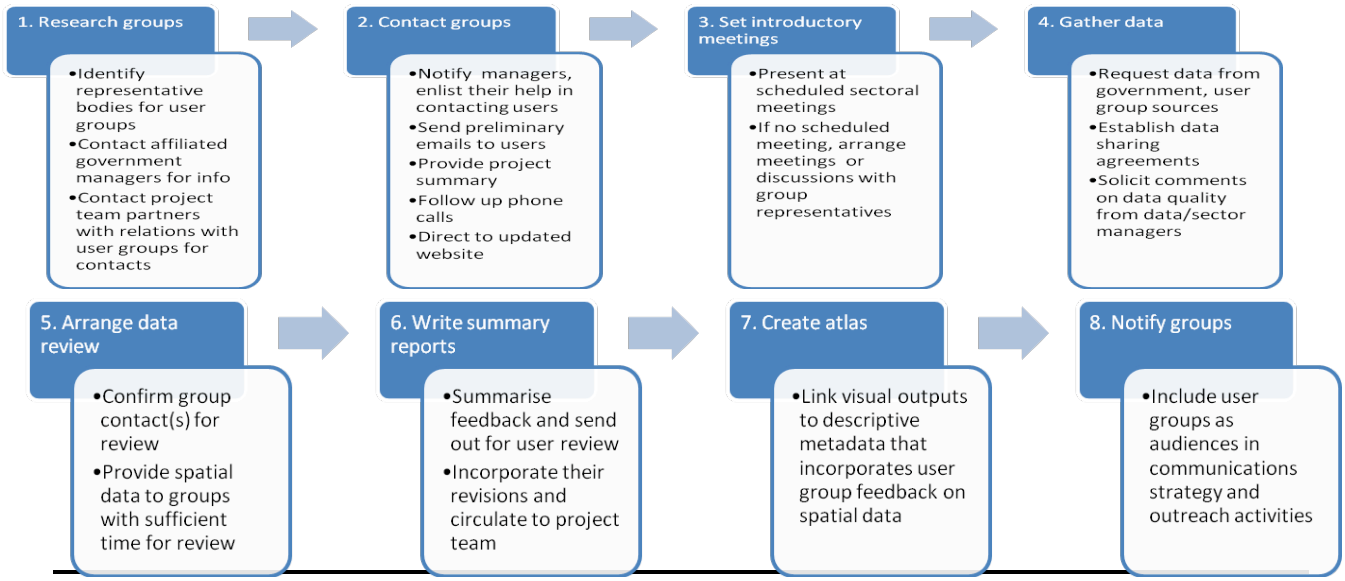
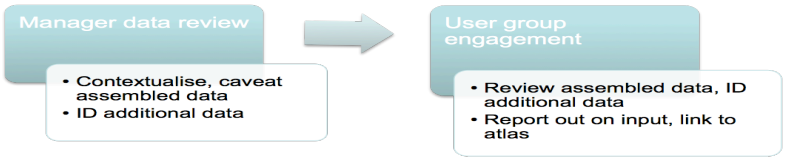


Figure 3. Human Use Data Input and Review Steps



2.4 Data Review Process Questions

Several topics for discussion arose out of the background presentation of the BCMCA.

- Comment: There was low participation in the marine fish workshop and workshop attendees did not recommend targets. As a result BCMCA has been actively working with PBS (Pacific Biological Station) to gather data and identify suitable targets for available data. Also, the recommended invertebrate features were generalized, with little data available for specific features.
- Question: Because halibut science isn't done by DFO scientists where does the information come from? *Response: The targets for each data set is part of the process; the work is like a layered cake, the first layer is ensuring that the data sets are representative; the second layer is how the data is represented – these are the purpose of the workshop. Targets for each feature are a third layer.*
- Question: Will recreational fisheries data be reviewed by the commercial fisheries sector to review map accuracy? *Response: the permissions from sports fish datasets have not yet been confirmed so at this time the data cannot be released. If we have time today we can look at the recreational fisheries data in general terms.*

Post workshop comment: I think the discussion was more about on ensuring there was an evidence-based approach for the data underlying the maps, there was some kind of independent review. One way to accomplish this is to have the commercial sector provide input. As an example, I recall from the meeting the recreational sector had identified some large areas which they claimed they utilized off the west coast of Vancouver Island but this was questioned by some of the commercial reps. However, this is further discussed on pages 17 and 18, which may serve to address this.

- Comment: Fisheries change year-to-year and this is an important issue to note for all datasets. How do we address this? *Response: An important part of the review process is to note such issues and to address them by reviewing the data fishery by fishery. Such comments will be included in the facing page with the atlas where the data is presented.*

- Question: Why are pink shrimp and shrimp trawl are separate data sets? *Response: The datasets were provided to the BCMCA as separate data from DFO.*
- Question: What data parameters (such as shoreline) were used for fisheries such as clam or geoduck? *Response: Typically that detail is found in the metadata – we are mapping features to the high water mark, which varies depending on which coastline was used.*
- Discussion: The fisheries data is provided with both cumulative hours and weight caught. As part of the data review process we need to clarify which measure will be displayed in the Atlas. It was decided that each fishery would be reviewed separately to consider the effect of the choice on each fishery, but agreed that having one measure to display the commercial fisheries data would be preferable. Noted that ***cumulative weight caught*** is a generally a good measure to use to display the commercial fisheries data in the atlas.

2.5 Targets and Features Questions

As part of the discussion on the background of the BCMCA, there were several questions and comments regarding targets and features.

- The workshop group discussed the BCMCA's definition of conservation with respect to how "conservation" is defined in the context of recommending targets by the commercial fisheries sector. Comment from the workshop: *If you are concerned about conservation you need to protect areas that are already closed to commercial fisheries.*
- Clarification: Understand that there are two components to the project, one of which is Marxan analyses which requires targets because it uses algorithms. The BCMCA is not a planning process so why conduct Marxan analyses, especially if there are no targets recommended from workshops? *Response: There are other planning process in place which might be using Marxan. BCMCA work, including what we do around targets, will assist other marine planning processes. There is value in exploring how the features relate to each other under different target scenarios.*
- Issue: How will targets be used for future planning when different areas of study area are so different? *Response: The data review process has been the focus to date for the BCMCA, Marxan analyses will be produced and the shortcomings of the analysis tool will be acknowledged. The outputs from Marxan are one type of information that can be taken to a planning table. Among limitations to Marxan are temporal effects such as accounting for shifting migratory patterns over time and the El Nino Effect.*
- Comment: Dive fisheries target sedentary species (EG Geoduck, sea cucumber) - if the fishery experienced a loss of access to an area, it would result in a complete loss to the fishery. This is a different impact than the loss of access to a more mobile fishery.
- Acknowledged that targets are difficult to define and are area specific (what is appropriate for Georgia Strait will be different that what is relevant for Queen Charlotte Sound). The benefit of Marxan is to start to get people thinking about how they can use

the targets, how different targets result in different outputs. When BCMCA conducts the analyses, there will be multiple scenarios with different target levels (e.g.10%, 20, 30%) which will produce different results.

3.0 Commercial Fisheries Data Set Review

3.1 Overview of Human Use Datasets

- 22 commercial fisheries datasets (multiple years aggregated)
- 4 recreational fisheries (no attributes)
- 11 energy (up to 11, maybe some combined)
- 8 shipping and transport datasets
- 10 tenure categories (finfish aquaculture included)
- 9-10 recreation and tourism datasets

- Many datasets may be similar to what will be available in the PNCIMA Atlas, but will be different in the following ways:
    - The PNCIMA Atlas will be specific to the PNCIMA area vs the BCMCA which encompasses the entire coastline;
    - The PNCIMA text is focused on what each fishery is, whereas BCMCA will focus on datasets and review of the data, including comments on how the data should and should not be used.
- Most of the datasets for commercial fisheries are cut off around 2004-05 and the data was collected by the BCMCA before March of 2009. Several of the datasets were made available to the BCMCA using different year ranges i.e. 1996-2004 vs 2001-2004.
- For each fishery dataset reviewed the following should be considered:
    - Do the years represented make sense?
    - Are there other data sets required to represent the fishery?

3.2 General Comments on Commercial Fisheries Datasets

- Comment: The BCMCA commercial fisheries data does not reflect where fish are abundant but located in areas closed to commercial access. This is especially true where BCMCA has data on sedentary species such as Geoduck (the extent of the fishery does not represent the extent of the resource – areas that can be fished are restricted).
- Comment: The effort expended to capture targeted fish differs among fisheries. For example, it takes longer to collect one geoduck vs one fish. Therefore it is difficult to compare weight caught for a low volume fishery such as Geoduck verses a high volume fishery like hake. The different timeframes used to represent the fisheries compounds the problem.

- Question: Will the data be available to be updated before the deadline? *Response: Unsure, it will depend on DFO response to a request for updated data and if the data is readily available.*
- ***Data Gaps:*** The following commercial fisheries do not have data layers: Euphausiids, Octopus, Swimming Scallops, intertidal clam, tanner crab, hagfish, slime eels, flying squid fisheries.
- Question: Are there rules about data being displayed in the Atlas that apply to data being used in Marxan as well? For example does the 3 boat minimum for DFO to provide information in a grid cell apply equally for BCMCA access for data being displayed in the atlas and used in Marxan. *Response: BCMCA does not have any data from DFO for areas in any fishery where there are less than three boats. The aggregated data allows for a richer dataset that using data from any one year (minimizes the influence of the 3 boat rule).*
- Comment: The years selected to portray each fishery will have an important bearing on how the data is presented compared to current conditions. Environmental conditions have naturally changed the distribution of the fishery over time and management conditions have changed over time as well. Future conditions (management and environmental) will change the fishery as well. For example over time, the effort and weight caught for urchins has changed due to sea otter populations. A 20-year timeframe would show the decrease in areas available to urchin, crab and intertidal clam harvest due to sea otter.

Decisions made at workshop with respect to how the fisheries data will be displayed on the map:

- Display each fishery using the total cumulative weight caught, noting the different time period the catch is for.
- Display relevant fishery closures on each of the maps in the Atlas for each commercial fishery. Note there is no data available to show all closures for all years of data, and that there are seasonal closures and annual closures, both of which impact catch.
- Note on facing pages the percentage of the fishery that is displayed on the adjacent maps (this information is found in the metadata for each fishery) and reflects the information that is restricted due to the 3 boat rule which is in place to ensure privacy rules are met). This must be done for all commercial fisheries datasets.
- Note the source of information and survey methods on facing pages for all data (not just commercial fish data). This is especially important where the survey/data collection was not as rigorous as for the commercial fisheries data.

3.3 Dataset: Cumulative Catch Groundfish Trawl - 1996-2004 - 4 km grid

- Discussion on the data range shown on commercial fisheries datasets. There was a major change to the groundfish management (integrated groundfish) in 2006, which this data will not reflect.
- Hake fishery is included with this data, but the distribution of the fishery has changed dramatically - in the last 3-4 years the hake fishery has been focused in Queen Charlotte Sound.

Recommendations to BCMCA:

- Effort should be made to collect data for more recent years, in addition to the data already collected (i.e. increase the range, particularly post 2004).
- Recommend that the groundfish trawl should be broken out by gear type (mid water vs bottom gear) or that Hake should be separated from the rest of the dataset because hake has distinct fishery patterns.

3.4 Dataset: Groundfish Schedule II - 1996-2004 - 4 km grid

- Comment: There have been dramatic changes in current fishery areas compared to the years of the dataset represents (e.g. areas have been re-opened). 2006-9 would look very different with a shift into Barkley Sound from Nootka Sound that occurred after the RCA's were established in 2004 and the rest of Barkley Sound opened up. Much of the west side of the Charlottes is also now fished.
- How will areas where dogfish are known to be present be shown (where they are present but not fished due to lack of market)? Suggested the International Pacific Halibut Commission (IPHC) multi-species trawl survey would reflect this. Survey data is time sensitive and as a result, analysis will be difficult. IPHC survey data was not requested, therefore not received by the BCMCA.

Post workshop comment: The part about IPHC doesn't sound right. Are we referring to the IPHC setline survey or the work the conservation research society (BC trawl fleet) is doing? I think it is the latter.

- Review of the metadata provided by DFO identified the percent of the Schedule II fishery (which includes some rockfish and halibut) shown on the map vs. how much is restricted from display because of the three-boat rule. Only 63% of the fishery is displayed, therefore this data poorly reflects the extent of the fishery. This information need to be included on the atlas facing page.
- Important to capture presence/absence of use in years where there is use in an area, but less than 3 boats, particularly for the Schedule II fishery where a low % of the data displayed; this excluded data is held by DFO.

- Show closures on the maps for all commercial fisheries, even through there is not data to show all closures for all years of data. There may be confusion between seasonal closures vs annual closures.

Recommendations to BCMCA

- Due to significant management changes efforts should be made to collect data for more recent years, in addition to the data already collected.
- When displaying data using cumulative catch, the facing page needs to clarify that the fisheries occurred at different time for different fisheries.
- Research and report on availability and use of IPHC multi-species trawl survey to more accurately capture dogfish.
- Explore with DFO to see if there is a way to portray areas that are fished, but where access to information is restricted because of the three-boat rule, without showing effort/catch weight.

3.5 Dataset: Rockfish (ZN) - 1993-2004 - 4 km grid

- Rockfish are caught now in areas that they were not before; areas that show high catch in this dataset are no longer relevant. For example the 100 fathom edge of Queen Charlotte Sound /Morseby Gulley are relatively new areas.
- Question: What does ZN data show? Is this rockfish catch by ZN only (which excludes option D halibut catch) or rockfish catch by all hook and line gear? If the data is post-2006, it should include hook and line gear as well as trap. Does this data include this? Preference is to have the data to be all hook and line gear, regardless of license (prior to 2006 halibut catch included some small rockfish volumes). BCMCA needs to clarify what ZN data includes.
- BCMCA needs to clarify if the cumulative data sets would include or exclude the same boat being the only boat the fish a grid cell over 3 or more consecutive years under the 3 boat rule for data privacy.

Recommendations to BCMCA

- Additional years are needed past 2004 to capture the new important use areas. Areas fished where data cannot be released under the 3 boat rule need to be displayed as fishing presence or absence. If new data is obtained, note on the facing page that the actual quantity of catch went down in the first two years of integration.
- Make sure that the BCMCA gets all hook and line data regardless of license to ensure rockfish from all fisheries are included.
- Add to the facing page for all groundfish that there have been significant management changes from 2006 and forward, which has changed distribution in effort and catch.

3.6 Dataset: Sablefish longline and trap - 1993-2004 - 4 km grid

- Reviewed two feature layers

Recommendations to BCMCA

- Gather additional, more recent data.
- Display both fisheries on one map – do not break by trap and longline.

3.7 Dataset: Halibut - 1980-2007

- Reviewed PFD map of the average CPUE by Statistical Area for 1991-2006 (live data was not available for viewing at the workshop). Closures were not shown on this map, but were recommended.
- Is there a better way to present the data? Two main issues: 1)This data is inconsistent with how the other data is represented 2) does not show where fishing occurs.
- How will this be used in Marxan? Can be tracked by using Marxan as an accounting tool but not included in targeting?
- Is the data only from the IPHC (directed halibut) or from all data source (reflecting all halibut including by-catch)? The IPHC logbook was eliminated with integration and since integration halibut can be caught without a specific license. If there is only one logbook, DFO should have all of the information. What is DFO including as data and what is the source? BCMCA needs to clarify
- Integration in 2006 resulted in a fundamental shift for specific fisheries such as dogfish, lingcod and rockfish. The move to ITQs and creating Rockfish Conservation Areas also created fundamental shifts in people's behaviors, therefore it is important to include multiple years of catch data to show important areas.
- The method of how directed catch and non-directed catch was recorded became more accurate after integration. How does this affect numbers? The shift was mostly where the fish was caught.
- Discussion: Is this map worthwhile including as an Atlas page? Halibut needs to be represented by BCMCA maps; suggestion to ask the IPHC not for raw data but for different halibut analyses separating cumulative weight and research catch separately using the 4x4 grid cells that other fisheries data is provided in). BCMCA needs to document what was originally requested for this feature.

Recommendations to BCMCA

- Show closures on halibut maps.
- Request data from IPHC in grid cells used by BCMCA, separating cumulative catch and research catch.
- If this is the only dataset that is provided, then the suggestion is to show the weight map and include all explanations of why the data is presented in this manner and to acknowledge the problems with the representation.

3.8 Dataset: Crab - 2000-2004 - 4 km grid

- Source is assumed to be logbook data held by DFO.

- Electronic monitoring catch data (2003-2008) is more current, more accurate and should be available upon request. Logbook data has generally poor accuracy since electronic monitoring has been initiated.
- Due to the privacy rule of three boats, there are areas missing where crab are known to be caught, however these areas are not represented in the dataset. The concern is that areas important to commercial crabbing, may get excluded because the data is not current enough.
- There are many areas where there are exploratory fisheries, undertaken by one boat – these areas would not be represented because of the three-boat rule.

Recommendations to BCMCA

- BCMCA should request the more recent electronic monitoring catch data (2003-2008) due to the known inaccuracy of logbook data.
- The crab data has catch amounts, traps, number of vessels and soak days as data attributes; to be consistent with other datasets, recommendation to use catch dataset to display the feature.
- Important to note on the atlas facing page how the commercial sector data is gathered; ie logbooks, third party, dockside monitoring etc. The commercial sector wants to be sure that the source of the data and the methodology details are included, including discards.

3.9 Dataset: Goeduck - 2000-2005 - 4 km grid

- Comments captured in Sections 2.4, 2.5 or 3.2.

3.10 Dataset: Prawn and shrimp layers

- Reviewed features displaying cumulative weight caught with closures from 2008-9. Prawn, humpback shrimp, pink shrimp, shrimp trawl, sidestripe shrimp.
- Information presented was verified as accurate.
- Comment: good to see prawn data for the QCI.
- BCMCA to clarify the reason why shrimp trawl is divided into multiple species and why is there a shrimp closure noted in Barkley Sound.
- Pink shrimp catch dataset (10km grid - 1997-2004). How does Marxan account for different grid sizes (2x2, 4x4, 10x10)? Dave verified that the BCMCA planning units lined up with the different grid sizes.

Recommendations to BCMCA

- Request to add more recent years.

3.11 Dataset: Green Urchin - 2000-2005 - 4 km grid and Red Urchin 2000-2005 - 4 km grid

- Information presented was verified as accurate.

3.12 Dataset: Sea Cucumber - 2000-2005 - 4 km grid

- Information presented was verified as accurate.

Recommendation to BCMCA:

- Recommended to get data as far back as 1990 and note that the reason for the extended data range was due to the intent to reflect the impact of long-term management closures.
- Important to note that there are large, self imposed closures.

3.13 Dataset: Krill - 2000-2004 - 10 km grid

- Information presented was verified as accurate.

Recommendation to BCMCA:

- Suggestion to mention on the facing page that krill are widespread on the BC coast, but the areas shown on the map are the only areas where fisheries are permitted.

3.14 Dataset: Sardines - 2001-2008 - 4 km grid

Recommendation to BCMCA:

- Suggestion to verify some of the presence /absence areas.
- BCMCA to contact Don Pepper (Head of Sardine Association) for additional review.

3.15 Dataset: Herring - seine and gillnet catchpoints - 1989-2008

- The years chosen for this fishery is very important; i.e. the further back, the better.
- Comment: The data is very detailed, which is good.
- Discussion on how to display – link the catch points for a specific year to polygons for each specific year, then present cumulative catch by area.
    - BCMCA needs to clarify what each point on the dataset represents, and what the units are for the sum of catch for each point (metric or short tons).

Post Workshop Comment: The points look more like fishery locations, in which case they wouldn't be referenced to catch or to effort. If they are catch, are the points actually scaled as to amount of catch at that particular point? (i.e. a catch of 10,000 tons would be larger point than a catch of 100 tons?) It didn't look like it from the maps. I agree on the requirement to clarify what each point on the dataset represents, and whether the units are metric or short tons (if in fact the units are catch.).

- For points geo-located on an island, look for adjacent points for the same year and assign them to the land-based points to those marine waters.
- What about Roe herring datasets?

Post Workshop Comment: Your files must be roe herring data - I don't know what else it could be.

Recommendation to BCMCA:

- Summarize data by year, by 4x4 block, and make the data appear consistent with the other fisheries data.
- BCMCA to clarify with herring representatives whether it is necessary to keep gill net and seine separate.

Post Workshop Comment: I don't think you need to keep seine and gillnet areas of catch separate, as the intent would be to observe areas of catch, so it doesn't matter which gear type caught the fish. However, if you already have them separately, then that's OK too.

3.16 Dataset: Salmon troll, seine, gillnet - 2002-2007

- The map shown is too coarse to be a useful representation. The troll data has similar representational issues to halibut and recreational sportfish (polygons covering large areas). Data should be able to be delivered by sub-area, particularly for troll. Important to request the data be delivered at the sub-area level, even if only
- Attribute data includes cumulative number of fish by species for each gear type. For allocation purposes, DFO uses an average weight figure. This could be requested from DFO and used to calculate a cumulative weight caught by species, therefore using a similar metric to other commercial fisheries.
- Important to separate species in addition to gear type. Noted however that groundfish was not separated by species - for the public, perhaps it would be simpler to not separate species. Currently the gear types need to be kept separate because of the areas used to depict the three fisheries (some are areas, some sub areas, depending on what can be released under the three boat rule).
- Six year range for data is not adequate. In terms of statistical relevance it is better to have consecutive years in multiple of 4 years (4, 8 or 12) for salmon. Therefore recommend adding two more years of data, preferably to mid/early 1990's when more salmon were caught.
- The data is available for number of fish kept, released and boat days/year for each of the three fishery types. Density of boats not a useful attribute. Suggestion to request DFO for as fine as detail as they have (eg sub area) for total cumulative weight catch for salmon for a minimum of an eight-year span. Then you can sub divide by gill net, seine and troll.

Recommendation to BCMCA:

- Convert number of fish to cumulative weight caught based on DFO conversion weight.

- Request data is delivered by DFO using sub-areas and with a data range that extends back to the early 1990's but includes consecutive years in multiples of four.
- Display with species separate; gear separation is less important.

3.17 Comments on recreational sportfish mapping

Participants in the workshop provided the following comments upon viewing preliminary results of the sportfish mapping that was compiled for the BCMCA.

- Is there a way for the commercial sector to record areas that have been identified as recreational fishing areas where they have not seen recreational use? For example recreational crabbing off of Brooks Peninsula or in Thasis Inlet.
- Is there information to justify why areas were mapped for recreational use? Is there documentation to note if the source is from one or multiple individuals? *Response: There is a report on the methods used to compile the recreational layer. Method was based on interviews at sport fish advisory board meetings with interviewees verifying existing use polygon and identifying new or disused areas. There is not information on the number of users per area.*
- Request to obtain sports fish datasets and review with each commercial sector. *Response: the permissions from sports fish datasets have not yet been confirmed so at this time, the data cannot be released.* BCMCA will verify that data can be shared and will share with what is available.
- Concern – areas identified as important to recreational fisheries is misleading; example about how information provided to create rockfish areas in the past, ended up in erroneous areas being protected.
- Concerns about lack of monitoring in recreational and aboriginal sector, compared to the commercial sector – suggested that be noted with recreational fishing data.
- Due to the nature of the suspected inconsistency in the methods for recording recreational fishing data, there is a concern with how it will be used in Marxan. If there is misinformation about recreational fishing in an area, this may have implications in areas where there is commercial fishery also occurring.
- Is there a way to ground-truth the data? Can DFO Area Fishery Officers comment?
- Comment: Halibut, Crab and prawn wants to review areas identified as recreational fisheries; suggestion to document each sector's comments for reference in future discussions that may take place.

Recommendation to BCMCA:

- Have the recreational fishery layer open to ground truthing from the commercial fishing sector.
- Have area specific DFO Fisheries Officers review the recreational crab and prawn fishery data and provide comments.

4.0 Richness Map

Discussion on how a richness map could be created for commercial fisheries data.

- The BCMCA plans to create a richness map for both ecological and human use data to be included in the atlas.
- One method is to look at a grid cell on a map and identify the number of species found. However, the data has been collected according to different standards, how will this affect the richness map? In addition, different sectors have different volumes of data.
- For the ecological component for the project, richness will be mapped for each ecological group (# species present in grid) and for all groups combined. The map isn't intended to represent richness or quality of habitat, but rather to assess diversity based on the available data.
- The purpose of the human use richness mapping is to try and represent the areas that have more uses. The problem is how to present the layers because the data is inconsistent.
- Does it make sense to do a separate density map for commercial fisheries because the datasets are so rich? Comment: it depends on what you are planning for; participants would like to see what the difference with a human use richness map just for commercial fisheries and for all human uses.

Recommendation to BCMCA:

- BCMCA to develop a separate diversity map for commercial fisheries and all human uses and present to the Human Use Data Working Group for review.

5.0 Marxan Analysis

A brief review of what Marxan is and how it works was conducted.

- Using 2x2 km planning units (nearshore) and 4x4 km planning units (offshore), the algorithm will create output that includes the identified targets for features in the very efficient spatial configurations.
- Marxan is a mathematical program that minimizes costs while maximizing efficiency.
- BCMCA will likely run Marxan 100 different times for each scenario. Once the runs are complete, you end up with a sum solution map which shows which planning units were selected more than other planning units.
- The cost likely going to be based on the number of planning units used.
- Dave showed an example of how Marxan was used in California
- Comment: Unclear how appropriate Marxan is for species that are not sedentary?
    - Marxan has limitations, one of which is to take into account temporal variations. E.g. bird migration, herring. BCMCA is trying to cope with this variation by using numerous years of data.

- As long as the assumptions and imitation of the tool are recognized, the outputs of the tool may be useful in understanding of other sectors data.

*End

Appendix 1. Attendees and invitees to the workshop

Present
Dan Edwards, BC Dogfish Association / CIC
Michelle James, Underwater Harvesters Association
Tim Joys, Canadian Sablefish Association / Underwater Harvesters Association
John Koolman, CIC (Commercial Industry Caucus)
Chris Sporer, Pacific Halibut Management Association / Prawn Caucus
Bruce Turris, BC Seafood Alliance

Dave Nicolson (BCMCA)
Jaclyn McPhadden (BCMCA)

Invited and unable to attend
James Austin, Underwater Harvesters Association
Chris Bos (BCMCA)
Christina Burridge, BC Seafood Alliance
Lorne Clayton, Shrimp Trawl Fishermen's Association
Dave Dawson, Ocean Fisheries / Groundfish Trawl Advisory Committee / CIC
Mike Featherstone, Pacific Urchin Harvesters Association / Underwater Harvesters Association
Bob Fraumeni, Canadian Sablefish Association
Mike Guns, Lingcod Fishermen's Association / CIC
Lorena Hamer, Herring Conservation Society
Krista Royle (BCMCA)
Ron Macdonald, Canadian Sablefish Association
Tony Mijacika, Herring / Salmon Fishermen / Mutual Marine Insurance Corporation
Rob Morley, Canadian Fishing Company
Bob Morreau, Groundfish Trawl Advisory Committee
Brian Mose, Deep Sea Trawlers Association / CIC
Don Pepper, Sardine Fishermen's Association
Greg Taylor, Ocean Fisheries
Herb VanGrootel, CIC / Zn Fishermen's Association / Pacific Halibut Management Association

Appendix 2. Summary of Comments Received Prior to the Workshop

- Halibut and prawn: the charts (catch and effort) look correct according to fishermen consulted.
- Crab: There are several areas in Gwaii Haanas and in Queen Charlotte Sound, particularly the Goose Island Bank that have had commercial crab fisheries in the last few years but with less than three vessels. DFO has this data from the crab electronic monitoring (EM) program in their data base now but it is removed from public viewing because of the three boat rule which ensures DFO data released meets privacy requirements. Is there a way to include this data in the BCMCA data base without compromising the fishermen who may not want their spots known to others? The detail is in the DFO data base now and could be released to BCMCA through a request to Jim Boutillier with approval from the Crab fishermen, but not sure if it is necessary. Is there a way to get it into the process without giving away trade secrets?
- Herring: General comments - The data presented is for a 20-year time series - 1989 to 2008. (Some would argue it should be a longer time series.) In the "Catch Folder", there is no catch data - only a one-page text document about possibilities for mapping. Seine and gillnet catch locations are plotted on one coast wide map, and look generally correct. (There is one seine catch location in Victoria, which is probably an error.) There is no information on amount of catch, or on effort. (I'm not complaining about this - just commenting on what is posted.) Areas open for gillnet fishing are plotted for 2008 only. (I don't know why you would bother to post this information for just one year. That's pretty useless). I have this vague sense that I am missing something, but maybe that's all there is for herring?
- Herring: the 20 yr time and the size of the mapping, 4sq.km scale would miss a lot of the areas fished in the years previous to 1998. Particularly on the WC and QCI. Cape Mark and central Price Island on the west side Weetaam Bay would also fall into this category. What is the purpose of this mapping exercise? When they start discussing the relative importance of fishing areas and catch statistics and over emphasizing importance by overlapping points or polygons my antenna start to quiver.

Appendix 3. Glossary of Terms

The definitions included here are relevant to the context of the BC Marine Conservation Analysis project's use of these terms. Some definitions do not necessarily apply more broadly.

Areas of high conservation value - areas that are important to effectively representing and conserving marine biodiversity.

Areas of importance to human use – areas that are important to marine user groups. The BCMCA project team is inviting user groups to help identify the areas that are important to them.

Biodiversity - the variety of species and ecosystems on earth and the ecological processes of which they are a part, including ecosystem, species and genetic diversity components.

Conservation - the protection, maintenance and rehabilitation of biodiversity, allowing for the sustainable utilization of species and ecosystems, and the natural resources they provide.

Conservation planning – the exercise of identifying areas important for meeting conservation objectives (e.g., biodiversity representation within a defined region) and then designing management measures to ensure that those conservation objectives are met (the BCMCA is only helping with the first half of this exercise – identifying important areas).

Ecosystem - is a dynamic complex of plant, animal and microorganism communities and their abiotic environment, all interacting as a functional unit in an area.

Engagement – the BCMCA's process of inviting the feedback and participation of user groups on the BCMCA project.

Expert workshops - The project team organized five workshops where experts on the theme of each workshop (e.g., marine mammals, marine birds) were invited to participate. At these workshops, experts identified sources of the best available ecological data for the BCMCA atlas and spatial analyses, and made recommendations to help define the parameters for analyses.

Feature (Marxan context): Features are the spatial layers to be mapped and included in site selection analyses by the BCMCA. (e.g. broad ecological units, species habitats, aquatic features, areas of ecological or human use focus).

Human Use Data Working Group – a committee of user group representatives that provides advice to the project team about the preparation and use of human use data in the BCMCA project.

Marxan – a decision support tool used around the world to identify areas that meet conservation objectives (e.g., representing biodiversity) at a minimal cost to marine users (see http://www.bcmca.ca/Marxan.html for more details).

Planning Unit (Marxan context): The building blocks of Marxan are the parcels of land or water that are compared to one another – these parcels are called planning units, or sometimes called analysis units. The amount of each feature present in each planning unit is recorded and used in site selection analyses.

Planning Unit Cost (Marxan context): The individual 'cost' of each planning unit. The 'cost' can reflect any relative economic, social or ecological measure and is sometimes referred to as a suitability measure. (i.e. How 'suitable' is each planning unit for meeting the objectives of any specific Marxan scenario).

Project team member – project team members are responsible for implementation of the BCMCA project according to a Terms of Reference drafted by members at the outset of the project (available at www.bcmca.ca). Strategic and major project decisions are taken after input from all project team members. The project team strives for consensus in all decisions.

Project team observer – An observer has been invited to the Project Team to represent a constituent group. Observers are invited to speak, question, and participate fully in Project Team meetings. However, observers can choose whether or not to be part of a decision. If they choose to be part of a decision they agree to follow the decision making procedures. Where observers choose not to attend meetings or participate in decisions, the Project Team will make the decisions necessary to move the project forward in their absence. Observers self-designate themselves as such.

Richness map – a map that results from laying multiple maps on top of one another to highlight where the areas identified on each individual map overlap with each other.

Sector – the term that refers to the broad groups of human users in BC's marine environment that have been identified by the BCMCA. The sectors are (1) commercial fishing, (2) recreational fishing, (3) energy, (4) marine recreation and tourism, (5) shipping and marine transport, and (6) marine and foreshore tenures. Each sector may consist of multiple distinct user groups.

Spatial analyses – the process of deriving new information through the assembly and interpretation of existing spatial data. Three separate spatial analyses will be conducted for the BCMCA:

1. Identifying areas of high conservation value (using ecological data only)
2. Identifying areas of high conservation value that minimize overlap with areas important to human use (using ecological and human use data);

Targets (Marxan context): Quantitative values that define how much of each particular feature is required to meet the goals or objectives of any specific Marxan scenario.

User group – a more specific term than sector, used to refer to a set of human users that essentially all participate in the same marine activity (e.g., halibut fishing or industrial shipping or sea kayaking). There may be numerous user groups within a sector and there may be multiple representative bodies for any given user group.