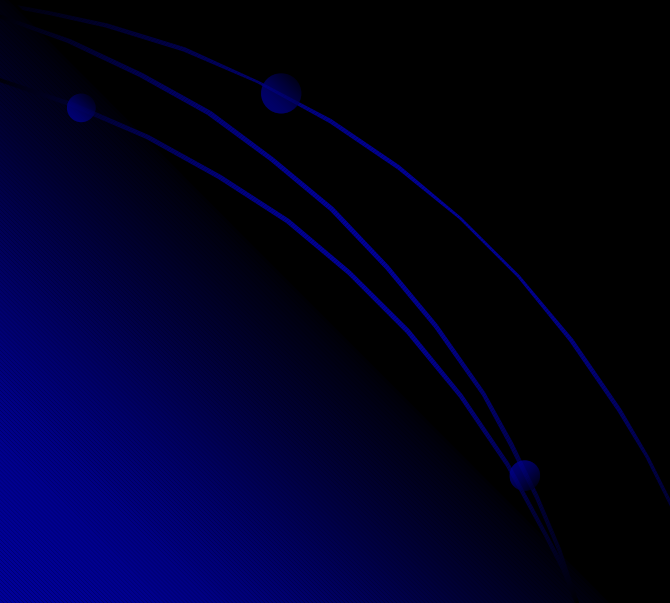


Identification of ecologically and biologically significant areas in Pacific Canada

Glen Jamieson
Cathryn Clarke



Ecosystem-based management (EBM)

A strategic approach to managing human activities that seeks to ensure through collaborative stewardship the coexistence of healthy, fully functioning ecosystems and human communities (towards maintaining long-term system sustainability) by integrating ecological, economic, social, institutional and technological considerations.

Fisheries Act

In Canada, the *Fisheries Act*, enacted in 1857, has been the prime legislative tool governing ocean usage, particularly fishing:

- It regulates the capture, holding and possession of all marine life, and
- It makes unlawful the harmful alteration, disruption or destruction of fish habitat.
- While periodically revised (most recently in 1991), the focus of the Act has been the conservation and protection of commercially exploited species and their habitats.

Oceans Act

- Canada enacted the **Oceans Act** in 1997, which changed the legislative basis for ocean management. Implementation of EBM is now a main objective, and Canada's approach to EBM is beginning to emerge
- The Act provides the basic authorities and management tools relating to:
 - the establishment of **Marine Protected Areas**;
 - the establishment and enforcement by regulation of **Marine Environmental Quality** guidelines, criteria and standards designed to conserve and protect ecosystem health; and
 - the development of **Integrated Management** Plans.

Progress to Date

- **1997-2000:** focus was on developing a MPA strategy
- **2000-2003:** focus was on developing a process to identify ecological objectives and indicators to assess marine environmental health (quality)
- **2004-2005:** EOAs being developed. Management focus is on identifying ecologically and biologically significant areas (EBSAs) which will be given an enhanced level of protection. EBSAs are where monitoring of indicators is likely to occur and some may become new mpas.

STANDARD CONTENT OF AN ECOSYSTEM OVERVIEW AND ASSESSMENT REPORT (EOA)

General Information

- Project Definition
- Methodology of Study

Volume One: Status and Trends

Part A: Geological Systems

- Marine Geology (Bedrock features)
- Geomorphology
- Sedimentology

Part B: Oceanographic System

- Atmosphere / Ocean Exchange
- Physical Oceanography (models)
- Physical-Chemical Properties of Seawater

Part C: Biological Systems

- Flora and Fauna
- Habitat Use and Functional Areas

Part D: Ecosystem Description

- How does the ecosystem work? Ecosystem Relationships

Volume Two: Ecological Assessment and Conclusions

Part E: Ecological Assessment

- Areas of Concern (maps)
- Impacting Activities and Stressors
- Threats and Impacts on Ecosystem Properties and Components – Cumulative Impacts

Part F: Conclusions and Recommendations

- Uncertainties, Unknowns and Limits of Science Support
- Major Environmental Issues and Concerns for the Study Area
- Recommendations to Science Managers
- Recommendations to Integrated Management

Cited References / Resources and Expertise / Annexes

EBSA Criteria

A priori science criteria for EBSAs were recently defined at a national DFO workshop:

DFO 2004. Identification of Ecologically and Biologically Significant Areas. DFO Can. Sci. Advis. Sec. Stock Status Report 2004/051.

Science advice on EBSAs will be presented to oceans and resource managers, who will then determine, after weighing socio-economic considerations, what level of enhanced regulation and protection to EBSA areas will be provided.

EBSA Background Papers

Ecological Functions

- Spawning/Breeding
- Nursery/Rearing
- Feeding and Foraging
- Migration
- Seasonal Refugia

Structural Features

- Physical Oceanographic Processes
- Biological Oceanographic Processes
- Structural Habitat Features
- Biodiversity

EBSA Dimensions

Evaluated based on continuum of main dimensions:

- Uniqueness (Rarity)
- Aggregation
- Fitness Consequences

Other dimensions

- Naturalness
- Resilience
- (Global, national Regional importance)

EBSA Dimension

Uniqueness (Rarity): characteristics are rare, unique, distinct and for which alternatives do not exist

High

Globally unique, loss would mean loss of the unique community assemblage specifically associated

E.g. Hexactinellid sponge reefs

Low

Unique at a local scale but similar areas abundant throughout the PNCIMA

E.g. Kelp beds

EBSA Dimension

Aggregation:

- a) individuals of a species are aggregated for some part of the year
- b) Individuals use the area for some important function in their life history
- c) Structural property or ecological process occurs with high density

High

Individuals of the species are highly aggregated, such as for breeding and rearing purposes, and the aggregation contains a large proportion of the total population

E.g. Seabird breeding colony

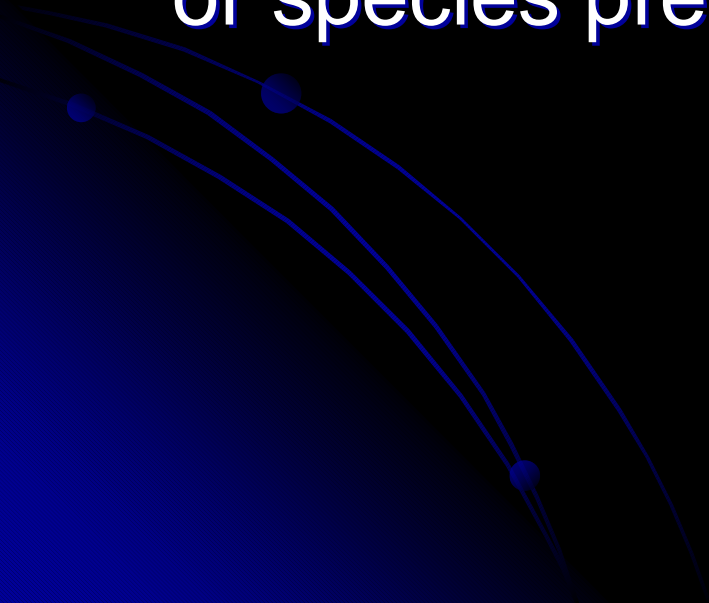
Low

Individuals are widespread or occur in widely scattered, small areas of high density duplicated in many areas

E.g. Pinniped haulouts

EBSA Dimension

Fitness Consequences: areas where activities being undertaken make a major contribution to the fitness (individual survival and fecundity) of the population or species present



High

Migration staging areas or overwintering sites essential for the avoidance of adverse winter conditions, increasing survival and thereby promoting fitness

E.g. many estuaries, polynas for Arctic marine mammals

Low

Multiple migration routes are available and all are relatively equal in fitness consequences

E.g. Open ocean migration routes for cetaceans

Other EBSA Dimensions

Areas can be further distinguished (weighted) by two other dimensions:

1. **Naturalness:** pristine areas or areas where few, in any, exotic species occur
2. **Resilience:** areas which are or contain highly sensitive, easily perturbed and slow to recover species. E.g., areas with tree corals
3. **Global, national and regional proportion**

EBSA Criteria

Vulnerability

- The vulnerability of **species** and **structural features** to disturbance will be considered under **Resilience** and **Fitness Consequences**
- Probability of disturbance for **sites** will not be considered in the EBSA stage (this is a management consideration)

EBSA Identification

Areas that rank high in any of **Uniqueness**, **Aggregation** or **Fitness Consequences** criteria for a single species or habitat feature will be considered an EBSA

Areas with lower rankings will be considered EBSAs only if a large number of species are above average ranking, or if **Naturalness**, **Resilience** or **Global, national and regional importance** raise the ranking

EBSA Identification

Expert opinion:

- Identify areas of important ecological functions and structural significance
- Dependent on level of information available

E.g. Groundfish vs. Cetaceans

EBSA Identification

Database support required:

- Spatial information
- location
- type of data collected
- format
- access and confidentiality restrictions
(e.g. can confidential data be used for analysis if it is masked in the final report)
- metadata

EBSA Identification

Expert-identified areas will be:

- digitized from maps, or
- be created as GIS layers from spatial data provided

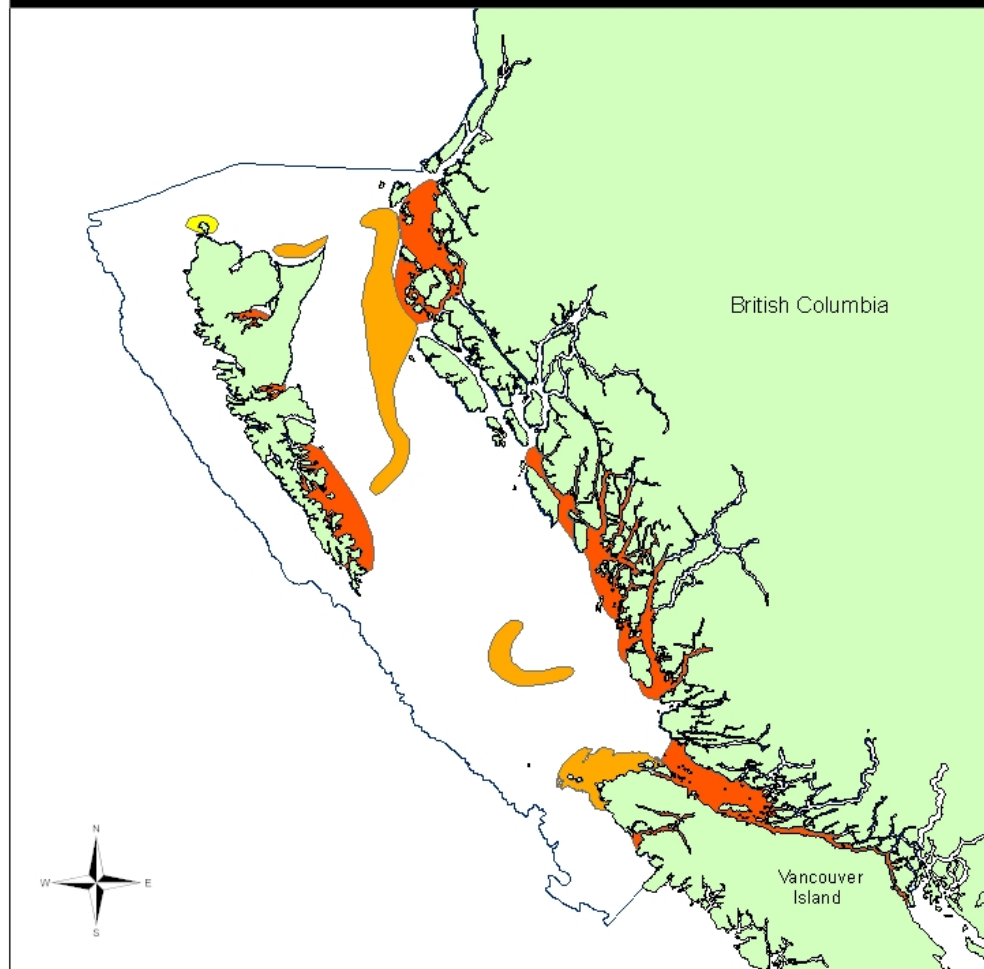
to create EBSA boundaries.



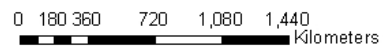
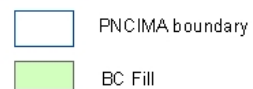
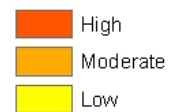
Important Area Ranking Procedure

- Each expert ranked each important area they identified from 1-10 for each of the five EBSA criteria (Uniqueness, Aggregation, Fitness Consequences, Naturalness and Resilience).
- This rank is converted to three qualitative levels for visual presentation:
Low value (1-4), Moderate value (5-7) and High value (8-10)
- When more than one expert was surveyed and a difference of opinion occurred: examples,
 - 3 experts: use the value of the majority (H, L, H = H)
or if all different, take the average (H, L, M = M)
 - 2 experts: use the highest value (precautionary) (H, M = H)
- For the three primary criteria, the final score is the highest ranking
- Under some circumstances, an area's score may be adjusted for the two weighting criteria: Naturalness and Resilience. Low ranking in Naturalness (many exotics) can push the score down and a low score in Resilience can push the score up.

Thematically Important Areas - Herring



Herring Score



EBSA determination

- Questions to be resolved to indicate an EBSA
 - A **very high value** for any species alone
 - An area with **many (high) values** for a number of species – values summed, with a **total value threshold**?
 - How much **value weight** should be given to Resilience and Naturalness
 - Are there **useful frameworks** (MARXAN, cluster analysis, etc.) that help identify (consider spatial proximity and values) **clusters of areas** that could make up an EBSA – how should these be used?
 - How do deal with **data limited species**, and the **great number of species in BC** (every are may be important for at least one species!)

EBSA Valuation

Rank polygons from 0-100 for each of the three primary dimensions



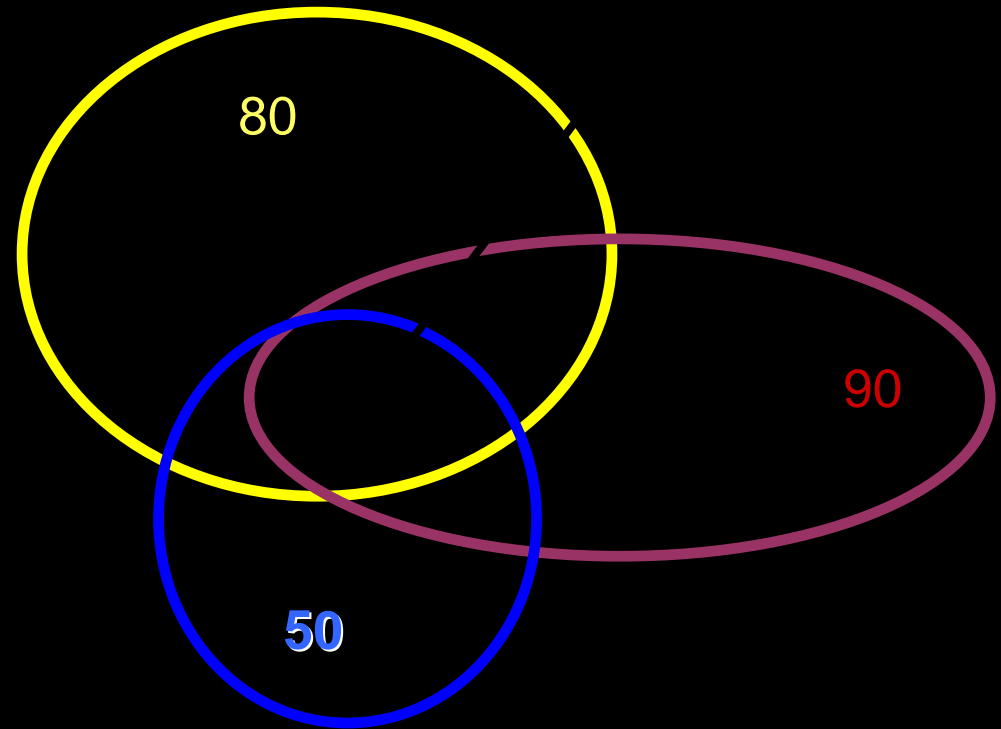
EBSA Valuation

For example, a polygon with Uniqueness = 75, Aggregation = 90 and Naturalness = 90



Over-lapping Polygon Weighting

3 polygons with
varying continua
ranks



What is the
ranking in the
areas of overlap?
Is an EBSA
justified?

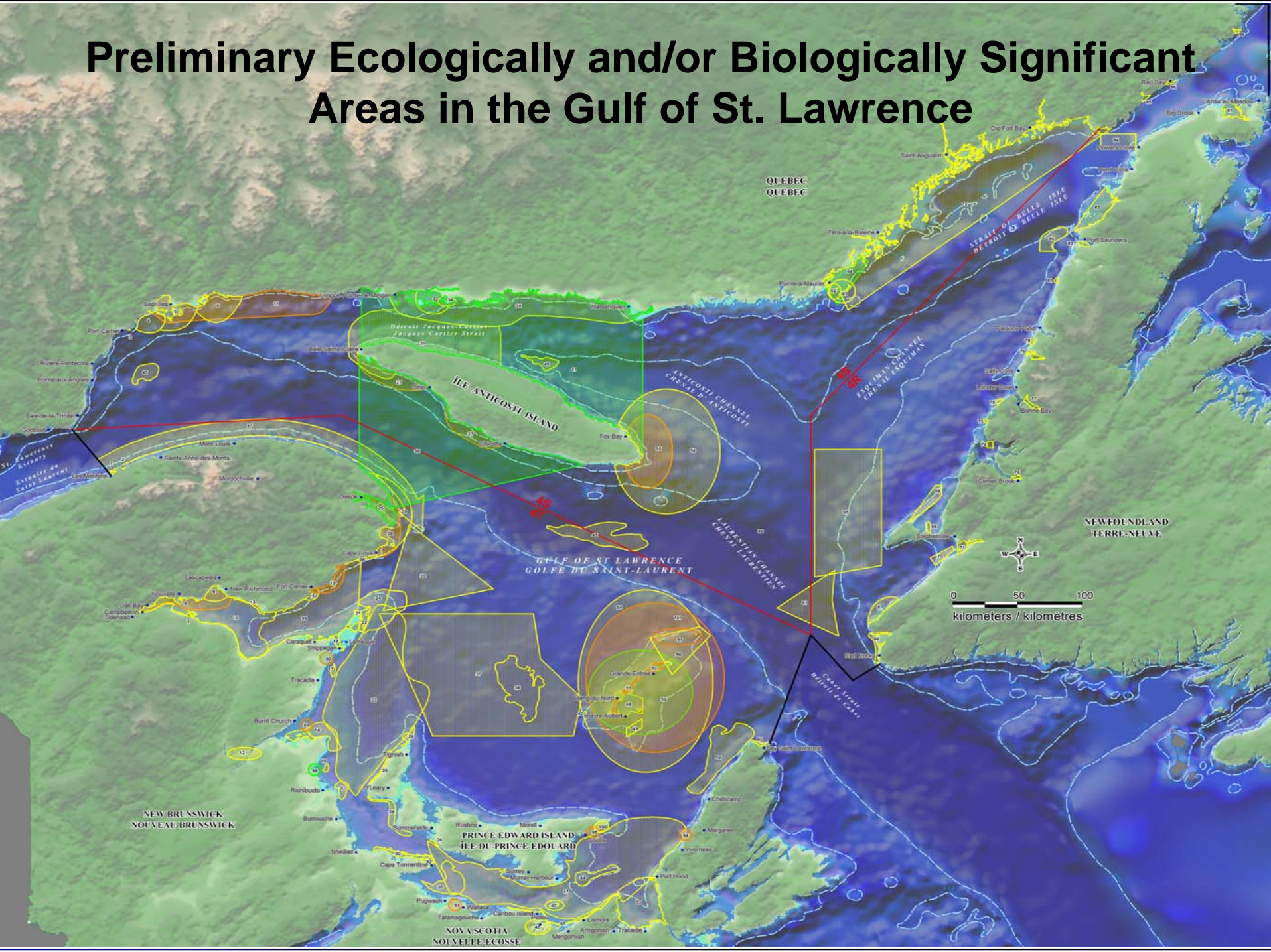
EBSA Identification

Final map produced will show **all** the identified EBSA regions in the PNCIMA, and **briefly summarize the rationale behind each; EBSAs can overlap**

Associated text will **profile areas containing EBSAs and describe EBSAs in more detail**

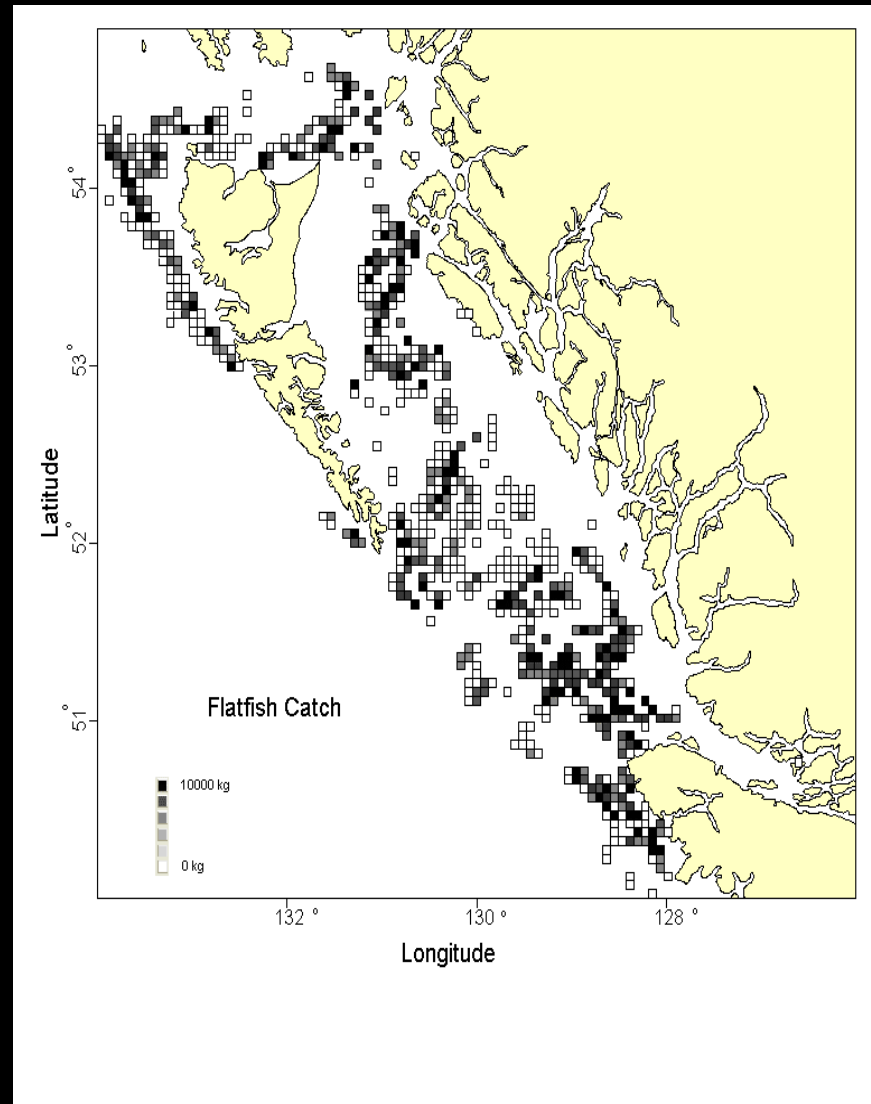


Preliminary Ecologically and/or Biologically Significant Areas in the Gulf of St. Lawrence



Challenges: e.g., Flatfish

- Arrowtooth flounder
- Butter sole
- C-o sole
- Curlfin sole
- Deepsea sole
- Dover sole
- English sole
- Flathead sole
- Pacific halibut
- Pacific sanddab
- Petrale sole
- Rex sole
- Rock sole
- Sand sole
- Slender sole
- Speckled sanddab
- Starry flounder
- Yellowfin sole



Rockfish, Elasmobranchs and Roundfish

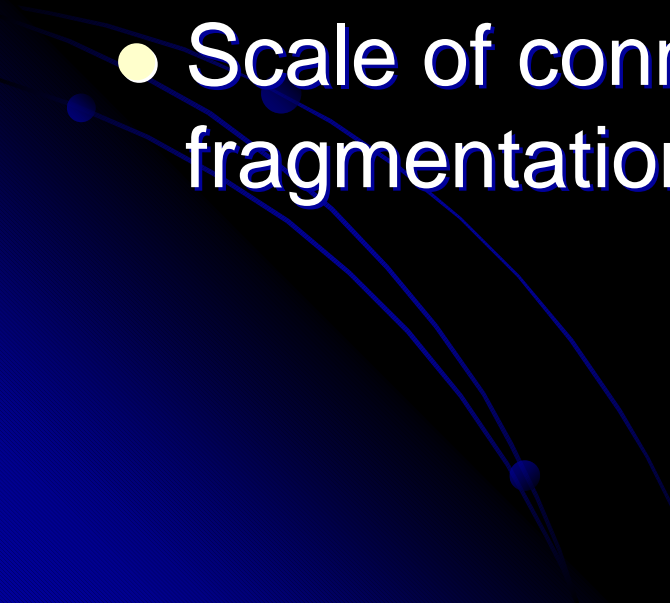
Aurora rockfish
Black rockfish
Blackgill rockfish
Blue rockfish
Bocaccio
Canary rockfish
Chilipepper
China rockfish
Copper rockfish
Darkblotched rockfish
Dusky rockfish
Greenstriped rockfish
Harlequin rockfish
Longspine thornyhead
Pacific ocean perch
Puget sound rockfish
Pygmy rockfish
Quillback rockfish
Redbanded rockfish
Redstripe rockfish
Rockfishes
Rosethorn rockfish
Rougheye rockfish
Sharpchin rockfish
Shortbelly rockfish
Shortraker rockfish
Shortspine thornyhead
Silvergray rockfish
Splitnose rockfish
Stripetail rockfish
Thornyheads
Tiger rockfish
Vermilion rockfish
Widow rockfish
Yelloweye rockfish
Yellowmouth rockfish
Yellowtail rockfish

Abyssal skate
Big skate
Blue shark
Broad skate
Longnose skate
Pacific electric ray
Pacific sleeper shark
Roughtail skate
Sandpaper skate
Skates
Soupfin shark
Spiny dogfish

Pacific cod
Walleye pollock
Surfperches
Pacific hake
Eelpouts
Grenadiers
Jack mackerel

Important Issues

Spatial scale of an EBSA should match the:

- Scale of habitat feature
 - Scale of life history feature
 - Scale of community structure
 - Scale of connectivity – habitat fragmentation and larval connectivity
- 

Temporal scale

- High ranking features may vary temporally but can still be used in identifying EBSAs
- Degree of temporal variation will be used in management action planning



Probability of disturbance

EBSAs are not identified based on **risk**; however sound management will take account of potential threats to significant sites. Locations that are identified as containing 2+ overlapping EBSAs will likely be managed particularly cautiously.

- Areas that do not qualify as EBSAs are not considered ecologically unimportant, they simply do not require an **enhanced** level of protection compared to other ecologically similar areas
- In the final assessment stage, other areas may be flagged for protection based on their social, cultural or economic value

Summary

- The identification of EBSAs is a **management planning tool** only.
- EBSA identification does not imply formal **designation** or any form of **legal protection**. However, future MPAs are likely to be centred around EBSAs.
- The overall IM assessment process will utilize all three background materials: EBSA analysis, Marine Use Analysis, and Ecosystem Overview Report

Caveat

Rankings are all relative, and choices of what areas to call Ecologically and Biologically Significant depend very strongly on the range of choices available. Once a group has made the choices for a particular region, however, it has kicked off an important part of the whole Ecological Objectives-setting and Indicator selection process, because **protecting EBSAs becomes a key conceptual objective**.

- Each Integrated Management working group will establish their own criteria for *where* on these five dimensions they begin to label things as “Ecologically and Biologically Significant Areas”.
- The national framework ensures that the same considerations are taken into account in ranking all sites, because the same dimensions are used in every case.
- The case-specific adaptability is how much weight is given to each of the five dimensions, and what position on a dimension is adequate to spark particular management interest.