Fisheries and Oceans Canada
Science

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Newfoundland and Labrador

Canadian Science Advisory Secretariat
Science Advisory Report 2007/042

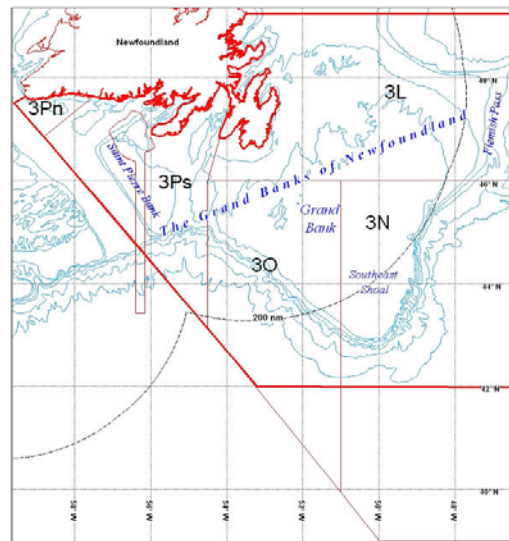# PLACENTIA BAY-GRAND BANKS LARGE OCEAN MANAGEMENT AREA SCIENCE-BASED CONSERVATION OBJECTIVES

Figure 1: Placentia Bay-Grand Banks Large Ocean Management Area.

Context :

Under the Oceans Action Plan I (OAP-I), five Large Ocean Management Area (LOMA) initiatives were established: Pacific North Coast Integrated Management Area (PNCIMA), Beaufort Sea, Gulf of St. Lawrence Integrated Management Area (GOSLIM), Eastern Scotian Shelf Integrated Management Area (ESSIM), and Placentia Bay-Grand Banks (PBGB).

As in each of the five LOMAs, a key product for the Science component of the PBGB initiative was Conservation Objectives (COs). COs are science-based and are intended to protect parts of the ecosystem from serious or irreversible harm. They are traceable to sound science processes and are defensible on objective grounds.

COs are intended to guide participants in the Integrated Management process by setting the bounds within which the Social, Cultural and Economic Objectives are established in the LOMA, thus ensuring that the nature and magnitude of human impacts on ecosystems are sustainable.

Following national guidelines, LOMA-specific COs were identified based on previously identified conservation priorities, including Ecologically and Biologically Significant Areas (EBSAs), Ecologically and Biologically Significant Species and Community Properties (ESSCPs), Depleted and Rare Species, and Degraded Areas.

A Regional Workshop was held in St. John's, NL, May 1-2, 2007 to discuss and review Science considerations in the development of COs for the PBGB LOMA. Participants included those from DFO and other Federal departments, Provincial departments, Non-governmental organizations, Academia, Fisheries industry and union representatives, and other stakeholders.

SUMMARY

- A total of 94 specific Conservation Objectives (COs) were identified for the PBGB LOMA. Of these, 59 were considered to be High Priority, 15 were considered to be Medium Priority, and 20 were considered to be Low Priority. A total of 8 overarching and blanket COs were also identified for the LOMA.

- Science advice in the form of COs must be based on the best information available, even if that information is dated and/or incomplete. Therefore, uncertainties must be communicated clearly throughout the process.

- Phrasing of the COs for the PBGB LOMA was tied very closely to the criteria which they had met as qualifying EBSAs, ESSCPs, Depleted or Rare Species or Degraded Areas and was expressed in a nationally consistent manner using language that directly corresponds to language in existing policies, regulations and legislation.

- Further scientific information may provide evidence for other areas and species to be as important as those parts of the ecosystem that have already been given High Priority status. Therefore, EBSA, ESSCP, Depleted and Rare Species, and Degraded Areas lists, as well as the COs themselves, must be considered living documents.

- Ecological scale is a key factor in determining priority areas and species for conservation. In this process, while the coastal areas were not specifically targeted as conservation priorities, some key species and habitat occurring in the coastal areas have been identified as conservation priorities.

- DFO needs to make it a priority to reduce the knowledge gaps that have been highlighted in this report. There is an obvious bias in favor of data-rich species and areas, and some of the best available information might be significantly dated (e.g. trophic model). However, additional information from research-in-progress and grey literature, and future research could have a significant effect on the identification of conservation priorities.

- Science should be vigilant to monitor changes in additional properties and management should be responsive to major changes in them, even if the ecological significance of each change is not fully understood.

BACKGROUND

A major component of Integrated Management (IM) of Large Ocean Management Areas (LOMAs) includes identifying COs and ultimately Ecosystem Objectives (EOs). COs are based on four conservation priorities:

Ecologically and Biologically Significant Areas (EBSAs) – areas that have particularly high Ecological or Biological Significance, such that, if perturbed severely, the ecological consequences (in space, in time, and/or outward through the food web) would be substantially greater than an equal perturbation of most other areas, and should therefore receive a greater-than-usual degree of risk aversion in management of activities in order to protect overall ecosystem structure and function within the LOMA. Criteria and guidelines for identifying EBSAs are outlined in Canadian Science Advisory Secretariat (CSAS) Science Advisory Report (SAR) 2004/006 (DFO 2004).

Ecologically Significant Species and Community Properties (ESSCPs) – species or community properties that have particularly high Ecological or Biological Significance, such that, if perturbed severely, the ecological consequences (in space, in time, and/or outward through the food web) would be substantially greater than an equal perturbation of most other species or community properties, and should therefore receive a greater-than-usual degree of risk aversion in management of activities in order to protect overall ecosystem structure and function within the LOMA. Criteria and guidelines for identifying ESSCPs are outlined in CSAS SAR 2006/041 (DFO 2006a).

Depleted or Rare Species – species that are both currently at a very low abundance, and usually were much more abundant at some time in the past, and due to their status, warrant particularly risk averse management to ensure their survival and recovery. Separate criteria and guidelines for identifying Depleted or Rare Species were not developed. Rather, species assessed by COSEWIC as either Threatened or Endangered, populations assessed by DFO and found to be below the Critical – Cautious boundary in the Precautionary Approach framework [CSAS SAR 2006/023, (DFO 2006b)], and those assessed by NAFO and found to be likely to have a biomass below B_{lim} are to be included in this category.

Degraded Areas – areas where environmental quality has been impacted by human activities to a state where the "natural" structure and function of the ecosystem in the area is severely diminished. Separate criteria and guidelines for identifying Degraded Areas were not developed. Rather, areas that have been deemed as such by some other regulatory agency, and can be considered significant at the LOMA scale, are to be included in this category.

Four separate lists of candidate conservation priorities (EBSAs, ESSCPs, Depleted or Rare species, and Degraded areas) were produced for the PBGB LOMA. It was agreed at a National Workshop on the process of identifying COs that it was unrealistic to expect to be able to rank all individual areas and species on a single list from highest to lowest priority, but that there should be an attempt made to at least identify a top tier of conservation priorities; i.e. those ecological properties considered most essential for the natural structure and function for the ecosystem.

Given this requirement, explicit considerations/criteria/guidelines were developed at the workshop on COs, and are outlined in CSAS SAR 2007/10, *Guidance Document on Identifying Conservation Priorities and Phrasing Conservation Objectives for Large Ocean Management Areas* (DFO 2007).

ANALYSIS

Conservation Objectives for the PBGB LOMA

Specifically, for the Placentia Bay-Grand Banks LOMA, to assign conservation priorities to the various tiers and to ultimately define COs:

1. The rationale for each entry on the list was taken into consideration, e.g. was it an EBSA (Figure 2), ESSCP (Table 1), Depleted or Rare Species (Table 2), or Degraded Area?

2. Starting with EBSAs, which had already been given a score and ranked based on multiple layers of significance, other criteria occurring within the specific EBSAs were listed and used to give weight to the existing ranked areas, creating an EBSA Conservation Priority Matrix (Table 3). The 11 new EBSA scores appeared to fall distinctly at high, moderate, and low ends of the range of scores and were, therefore, the basis for the three tiers of priorities.

3. ESSCPs, Depleted or Rare species, and Degraded Areas that were thought to be most important to the functional dynamics of the LOMA ecosystem(s) were automatically added to the highest tier of priorities.

4. Draft COs were then written, based on the National guidelines, for each conservation priority (multiple priorities and objectives were the result for each EBSA).

5. The resulting COs were discussed and reviewed at a Regional Workshop in an effort to produce a finalized list of objectives. In some instances, discussions also led to some modifications/additions/deletions to priority lists (i..e., EBSAs, ESSCPs, and Depleted and Rare Species) that were precursors of the COs.

6. Taking into account wording recommendations from workshop participants, the resulting COs were phrased in a nationally consistent manner using language that directly corresponds to language in existing policies, regulations and legislation.
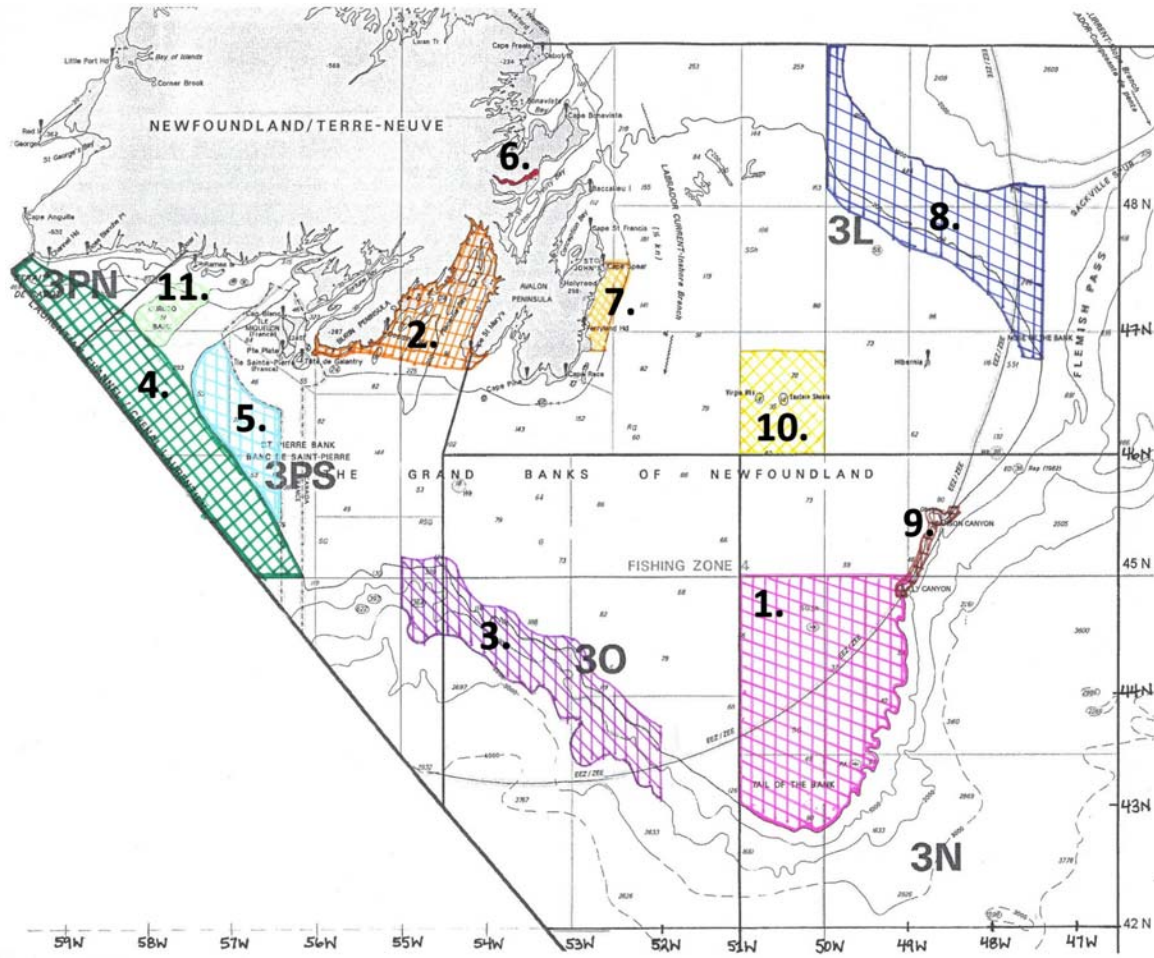
1. ◼ The Southeast Shoal and Tail of the Banks
2. ◼ Placentia Bay Extension
3. ◼ The Southwest Shelf Edge and Slope
4. ◼ Laurentian Channel and Slope
5. ◼ St. Pierre Bank
6. ◼ Smith Sound
7. ◼ Eastern Avalon
8. ◼ Northeast Shelf and Slope
9. ◼ Lilly Canyon-Carson Canyon
10. ◼ Virgin Rocks
11. ◼ Burgeo Bank

Figure 2: Placentia Bay Grand Banks Large Ocean Management Area: Ecologically and Biologically Significant Areas.

Table 1: Placentia Bay-Grand Banks Large Ocean Magagement Area: Illustrative List of Ecologically Significant Species and Community Properties.

Key Trophic Species (top 10- highest to lowest)	Rank	Structure Providing Species (unordered)	Properties above the species level (unordered)	Species for control of expansion or abundance
Cod>35 cm	1	Cold water corals	Changes over time in: Frequency distribution of abundance and biomass (e.g. ABC plots)	None significant at the ecosystem level at this time.
Greenland Halibut <40 cm	2	Eelgrass	Changes over time in: Biomass/abundance (proxy for mean size).	
Capelin	3	Rockweed and Kelp	Changes over time in: **Spatially explicit** diversity indices	
Harp seals	4	Benthic invertebrates (infauna)		
Greenland Halibut >40 cm	5			
Piscivorous Small pelagics (e.g. mackerel, short fin squid, piscivorous mesopelagics)	5			
Large Crustaceans	6			
Redfish	7			
Planktivorous Small Pelagics (e.g. herring, planktivorous squid, planktivorous mesopelagics)	8			
Other Benthic Invertebrates	8			
Phytoplankton	8			
Large Zooplankton	9			
Seabirds	10			
Flounders	10			
Polychaetes	10			

Table 2: Placentia Bay-Grand Banks Large Ocean Management Area: Priority Depleted and Rare Species.

Common Name	COSEWIC status	SARA status	NAFO status
Piping plover	Endangered	Endangered	
Atlantic Cod (NL Population)	Endangered	Not listed	Moratorium
Porbeagle Shark	Endangered	Not listed	
Leatherback Turtle	Endangered	Endangered	
Blue whale	Endangered	Endangered	
American Plaice (3LNO)			Moratorium
Capelin (3NO)			Moratorium
Witch flounder (2J3KL, 3NO)			Moratorium
Redfish (3LN)			Moratorium
Spotted Wolffish	Threatened	Threatened	
Northern Wolffish	Threatened	Threatened	
Atlantic Cod (Laurentian North Population)	Threatened	Not listed	
Shortfin Mako	Threatened	TBD	

Table 3: Placentia Bay-Grand Banks: EBSA Conservation Priority Matrix.

EBSA	EBSA Score	Depleted Species (rationale overlap)	Top 10 Trophic + Structural ESS (rationale overlap)	Add Overlap	Total Rank
The Southeast Shoal and Tail of the Banks	25.5	Atlantic cod American Plaice Capelin (3NO) Leatherback	Atlantic cod Capelin (3NO) Seabirds Benthos	8	**33.50**
Placentia Bay Extension	24.25	Atlantic cod American Plaice Leatherback	Atlantic cod Seabirds Eelgrass	7	**31.25**
The Southwest Shelf Edge and Slope	20.25	Atlantic cod Redfish Leatherback	Atlantic cod Redfish Seabirds Corals	8	**28.25**
Laurentian Channel and Slope	9.50	Redfish Porbeagle shark	Redfish Harp seals	4	**13.50**
St. Pierre Bank	10.00		Benthos	1	**11.00**
Smith Sound	8.00	Atlantic Cod	Atlantic Cod Eelgrass	3	**11.00**
Eastern Avalon	5.00	Leatherback	Harp seals	2	**7.00**
Northeast Shelf and Slope	3.50	Northern wolffish Spotted wolffish	Harp seals	3	**6.50**
Lilly Canyon-Carson Canyon	4.00		Corals Harp seals	2	**6.00**
Virgin Rocks	2.50	Atlantic cod American Plaice	Atlantic cod	3	**5.50**
Burgeo Bank	3.25	Atlantic cod	Atlantic cod	2	**5.25**

High= ≥20   Moderate=10-19   Low= 1-9

Sources of Uncertainties

In producing the final list of COs for the PBGB LOMA, several key issues with respect to uncertainties in the analysis of conservation priorities and the development of COs for IM emerged.

- Conservation priorities, and therefore, objectives, are based on the best information available, even if that information is dated and/or incomplete. Therefore, uncertainties exist and must be identified and communicated clearly throughout the whole process.

- There is an obvious bias in favor of data-rich species and areas, and some of the best available information might be significantly dated (e.g. trophic model). However, additional information from research-in-progress and grey literature, and future research could have a significant effect on the identification of conservation priorities.

ADDITIONAL STAKEHOLDER PERSPECTIVES

WWF Canada Perspectives

The following comments/recommendations, with respect to the process of identifying COs for the PBGB LOMA, were communicated by WWF-Canada:

General

- It is important to reach agreement on what that process is trying to achieve at the outset of any multi-stakeholder process. From a conservation standpoint, reaching agreement on some broad conservation goals (e.g. resilient and productive ecosystems, with diverse habitats, communities, species and populations; strong marine environmental quality that supports ecosystem functioning) will provide the overarching context for the more detailed COs and help establish common ground among the various interests around the table.

- Science and Oceans Branches should agree on realistic timelines and communicate these to participants and stakeholders (e.g. CO finalization, Desirable State Objective development, IM Plan development).

- WWF-Canada feels it is important for both stakeholders and decision-makers to acknowledge that the entire LOMA ecosystem is degraded at the outset of the IM initiative. Agreement that there is a problem and a need for a new approach to management will allow for more effective collaboration toward improving the situation.

- There are many areas and species that do not qualify as 'significant' under the federal framework for developing COs (based on EBSAs, ESSCPs, Depleted and Rare Species and Degraded Areas). Nevertheless, every habitat type, community type and species occupies a niche or plays a role in the resilience and overall functioning of the PBGB ecosystem. By focusing only on significant and degraded species and areas, we risk letting other important ecosystem components 'fall through the cracks.'

Identifying representative areas as conservation priorities provides a baseline for monitoring, a storehouse for genes and species, and a capacity for resilience by "keeping all of the parts" of the biodiversity of the regional ecosystem. In this way, representative areas provide a critical complement to significant areas and species. The lack of inclusion of such areas is a gap in the existing CO framework.

The CO development process could address this gap by setting out objectives to conserve the "full range of biodiversity/community types/habitat types" of the LOMA. To do this we must identify and delineate the extent of samples of each habitat or community type throughout the region. The typical approach to defining the range of habitat and community types of a region (in the absence of complete multi-species data) is to develop a classification scheme based on relatively enduring proxy features of the marine environment. WWF-Canada is working with geologist Gordon Fader to create a seabed feature classification that spans the entire Northwest Atlantic Ecoregion. It is our intent that these recognizable seabed features (e.g., banks and basins) serve as proxies for general habitat types and that the classification be used as an interim habitat map in conservation planning processes, such as the PBGB IM initiative.

Ecologically and Biologically Significant Areas:

- WWF-Canada's analysis of conservation priorities in the Grand Banks region also identified the Southeast Shoal and the Southwest Slope of the Grand Bank as the top priorities within the LOMA.

  However, WWF-Canada recommends that spawning and nursery areas for all cod populations in the PBGB LOMA be identified as conservation priorities. Given the importance of Smith Sound to the small remnant 2K3KL population of Atlantic cod – a depleted and ESS – this area should be considered for high priority status also. Analytical approaches and the mapping of traditional ecological knowledge should be used to identify these areas.

- Analysis of available datasets could help identify additional EBSAs and refine the boundaries of existing EBSAs. Analytical or data driven approaches such as the mapping of trawl survey data could refine the boundaries of the current broadly defined EBSAs. For example, if the Southeast Shoal is an important nursery area for yellowtail flounder, analysis of the trawl survey data could help identify specific portions of the shoal that are most important to juvenile flounder.

Ecologically Significant Species and Community Properties:

- WWF-Canada recommends that a separate ecopath model be developed for the PBGB LOMA to help identify ESSs. Using the output of the 2J3KLNO analysis appears (with different community properties than the LOMA) to have led to some some misleading results. For example, the hooded seals and Greenland halibut would probably figure less prominently in the results of a model specific to the LOMA area.

- WWF-Canada feels that the phrase "no net loss" is not appropriate for use in a conservation objective for cold-water corals as it implies that restoration is an option

for these areas. Given some of the gorgonian colonies can take hundreds of years to form, restoration is not an option for these species.

<u>Depleted and Rare Species</u>:

- Depleted and Rare species should be determined using stock management units instead of COSEWIC "Designatable Units" for cod and other fishes. Since all fish related management and conservation decisions are made at the DFO stock management unit level it makes sense that COs be set at the same level. Thus, for cod, there would be separate objectives for 3NO, 2J3KL, 3Ps and potentially 3Pn4RS.

- If all commercial species have not been assessed under the Precautionary Approach Framework (PAF) they should be, since it is possible that there are stocks that are below the Critical-Cautious boundary in the PAF or below B_{lim} that are not under moratoria. All species that fall below the Critical-Cautious boundary in the PAF or below B_{lim} should be high priority on the depleted species list.

CONCLUSIONS

<u>Overarching and Blanket Conservation Objectives for the PBGB LOMA</u>

Overarching goals which form the framework under which the more process-oriented objectives are described include:

- sustainable use of resources;
- conservation of biodiversity and ecological functionality of the system; and
- avoidance of human activities that produce serious or irreversible harm to biodiversity or ecological functionality.

Blanket COs to maintain the integrity of the ecosystem include:

- maintain species diversity
- maintain ecosystem diversity
- maintain species productivity
- maintain marine environmental quality
- maintain ecosystem structure and function

<u>High Priority Conservation Objectives for the PBGB LOMA</u>

<u>The Southeast Shoal and Tail of the Banks</u> (Area 1)

(Area east of 51°W and south of 45°N, extending to the edge of Grand Bank)

Ensure that the features listed below are not altered and/or disrupted by human activities to the point they can no longer be considered a unique feature and/or fulfill the ecological function that initially triggered their identification as significant in the area:

- Area of highest overall benthic biomass on the Grand Banks
- Unique offshore capelin spawning
- Unique yellowtail nursery
- Unique shallow, sandy habitat with glacial history
- Cetacean aggregation and feeding
- Seabird aggregation and feeding
- American plaice (nursery habitat)
- Atlantic cod spawning
- Reproduction and survival of striped wolfish
- Unique relict populations of blue mussels and wedge clams

Placentia Bay Extension (Area 2)

(Area including all of Placentia Bay and across the mouth of the bay from Point Crewe on the Burin Peninsula to Point Lance on the Avalon Peninsula out to the 50 m isobath)

Ensure that the features listed below are not altered and/or disrupted by human activities to the point they can no longer be considered a unique feature and/or fulfill the ecological function that initially triggered their identification as significant in the area:

- Seabird aggregation, feeding, nesting, and refuge
- Ichthyoplankton concentrations (cod, cunner, plaice, capelin and others)
- Cod, cunner, plaice, capelin and other species spawning activity
- Cod, cunner, plaice, capelin and other species nursery habitat
- Atlantic cod spawning biomass
- Cetacean aggregation and feeding
- Leatherback aggregation, feeding and migration
- Harbour seal aggregation and reproduction
- Otter aggregation and reproduction

The Southwest Shelf Edge and Slope (Area 3)

(Area from 55°W to 52°W, encompassing the shelf edge of Grand Bank to the 2000 m isobath)

Ensure that the features listed below are not altered and/or disrupted by human activities to the point they can no longer be considered a unique feature and/or fulfill the ecological function that initially triggered their identification as significant in the area:

- Unique seabird biodiversity
- Unique coral concentrations and biodiversity
- Unique groundfish biomass
- Unique species biodiversity
- Haddock aggregation and spawning

- Seabird aggregation and feeding
- Cetacean aggregation and feeding
- Leatherback aggregation and feeding
- Atlantic cod migration
- Redfish spawning
- Structural habitat provided by corals
- Atlantic halibut concentration

Depleted and Rare Species

Ensure the **survival and recovery** of depleted or rare **species** listed below:

- Atlantic cod
- 3LNO American Plaice
- 3NO Capelin
- 2J3KL and 3NO Witch Flounder
- 3LN Redfish
- Porbeagle shark
- Leatherback seaturtle
- Blue whale
- Haddock
- South coast herring
- Large gorgonian corals

Degraded Areas

Based on the guidelines for Degraded Areas to be declared by some competent regulatory authority as in need of rehabilitation, or by sufficient weight of evidence indicating that the area cannot serve its ecological function on EBSA or ESS scale:

NO Degraded Areas were identified for the PBGB LOMA

Ecologically Significant Species

Ensure the species listed below are not perturbed by human activities to the point where they are unable to fulfill their ecological role within the ecosystem:

- Atlantic cod > 35cm (influential predator)
- Greenland halibut < 40 cm
- Capelin (important food supply)
- Harp seals (influential predator)
- Greenland halibut > 40cm (influential predator)
- Piscivorous small pelagics (influential predators)
- Phytoplankton
- Zooplankton
- Sandlance (forage/prey species)
- Cetaceans
- Benthos

Ensure no net functional loss, due to human activities, of **structural habitat** provided by the species listed below:

- Corals and sponges
- Eelgrass
- Rockweed and kelp

Prevent non-authorized introduction of invasive species.

Control the spread and abundance of invasive species.

Control the spread and abundance of harmful and toxic species.

Medium Priority Conservation Objectives for the PBGB LOMA

Laurentian Channel and Slope (Area 4)

(Area from 45°N to 47.5°N, from the slopes of the banks into the Laurentian Channel to the western boundary of the LOMA)

Ensure that the features listed below are not altered and/or disrupted by human activities to the point they can no longer be considered a unique feature and/or fulfill the ecological function that initially triggered their identification as significant in the area:

- Unique black dogfish pupping and aggregation
- Smooth skate (< 30cm) nursery/rearing
- Multi-species (fish, cetacean, pinniped) migration

St. Pierre Bank (Area 5)

(Northwest St. Pierre Bank, south and west of the Canada-France International Boundary, to the 200 m isobath)

Ensure that the features listed below are not altered and/or disrupted by human activities to the point they can no longer be considered a unique feature and/or fulfill the ecological function that initially triggered their identification as significant in the area:

- Unique sea scallop concentrations
- Sea scallop spawning and feeding
- Cetacean aggregation, feeding, and migration
- Spiny dogfish aggregation
- Spiny dogfish pupping

Smith Sound (Area 6)

(Coastal area located in Trinity Bay (near 48.25°N; 53.5°W) on the east coast of Newfoundland)

Ensure that the features listed below are not altered and/or disrupted by human activities to the point they can no longer be considered a unique feature and/or fulfill the ecological function that initially triggered their identification as significant in the area:

- Unique spawning area for northern Atlantic cod
- Unique northern Atlantic cod refuge
- Northern Atlantic cod spawning, nursing, migration, and refuge

Depleted and Rare Species

Ensure the **survival and recovery** of depleted or rare species listed below:

- Northern wolffish
- Shortfin mako
- Spotted wolffish

Low Priority Conservation Objectives for the PBGB LOMA

Eastern Avalon (Area 7)

(Area from Cape Spear to Cappahayden along the Eastern Avalon coastline; out to approximately 100m)

Ensure that the features listed below are not altered and/or disrupted by human activities to the point they can no longer be considered a unique feature and/or fulfill the ecological function that initially triggered their identification as significant in the area:

- Cetacean aggregation and feeding
- Leatherback aggregation and feeding
- Seal aggregation and feeding
- Seabird aggregation and feeding

Northeast Shelf and Slope (Area 8)

(Area on northeastern Grand Bank, starting at the Nose of the Bank, from 48°W to 50°W, and from the edge of the shelf to the 1000 m isobath)

Ensure that the features listed below are not altered and/or disrupted by human activities to the point they can no longer be considered a unique feature and/or fulfill the ecological function that initially triggered their identification as significant in the area:

- Spotted wolffish aggregation
- Cetacean aggregation at Sackville Spur

- Pinniped aggregation at Sackville Spur
- Coral concentrations north of Tobin's Point

Lilly Canyon-Carson Canyon (Area 9)

(Area from 44.8°N to 45.6°N along the 200 m isobath of the southeast slope of Grand Bank)

Ensure that the features listed below are not altered and/or disrupted by human activities to the point they can no longer be considered a unique feature and/or fulfill the ecological function that initially triggered their identification as significant in the area:

- Iceland scallop concentration
- Reproduction and survival of Iceland scallops
- Cetacean aggregation and refuge/overwintering
- Pinniped aggregation and refuge/overwintering

Virgin Rocks (Area 10)

(In the area from 46-46.8°N and from 50-51°W)

Ensure that the features listed below are not altered and/or disrupted by human activities to the point they can no longer be considered a unique feature and/or fulfill the ecological function that initially triggered their identification as significant in the area:

- Unique geological feature/ habitat
- Atlantic cod spawning
- American plaice spawning
- Yellowtail flounder spawning
- Seabird feeding

Burgeo Bank (Area 11)

(Burgeo Bank, the area following the 200 m isobath, south of 47.5°N)

Ensure that the features listed below are not altered and/or disrupted by human activities to the point they can no longer be considered a unique feature and/or fulfill the ecological function that initially triggered their identification as significant in the area:

- Unique 3Pn4RS and 3Ps cod stock mixing
- Atlantic cod spawning
- Atlantic cod overwintering

OTHER CONSIDERATIONS

Through the course of discussions surrounding science considerations in the development of COs for the PBGB LOMA, several highlights and other topics for consideration repeatedly emerged:

- Although the process of identifying COs for the PBGB LOMA experienced gaps in data, dated data, and human resources and time constraints, these experiences have also identified areas for future research and collaboration, and identified areas for future funding and organization as we move towards an integrated approach to management of our marine resources.

- Further scientific information may provide evidence for other areas and species to be as important as those parts of the ecosystem that have already been given High Priority status. Increasing coverage of non-commercial and/or pelagic species in surveys, including food habit studies in surveys, and/or increasing marine habitat research (particularly the role of structural species) could enhance our knowledge of significant areas, significant species, and community properties considerably. Therefore, EBSA, ESSCP, Depleted and Rare Species, and Degraded Areas lists, as well as the COs themselves, must be considered living documents.

- We need to commit to revisiting and re-evaluating these lists at regular intervals in order to monitor changes in the ecosystem, and to provide the best and most up-to-date advice in support of Integrated Management.

- Coastal areas were not specifically targeted through this process due to their finer spatial scale, differences in data density, jurisdictional complexities in coastal areas, and multiple use issues. However, some key species and habitats (e.g. eelgrass; kelp) occurring in the coastal areas were identified as conservation priorities with the rationale that functional properties of the whole LOMA depend on some processes that occur in these sites or habitats. Recognizing the importance of coastal areas, it is felt that Coastal Management Areas (CMAs) are a priority and should proceed as quickly as possible under some other framework.

- Currently, "Degraded Areas" refer to those areas that have been deemed as such by some other regulatory agency, and that can be considered significant at the LOMA scale. For the PBGB LOMA, none were identified at this time. However, in the future, "Degraded Areas" might also consider those areas where habitat has been modified through human activities, e.g. heavily explored/exploited offshore areas.

- The target ecosystem which is to be conserved through these priorities was questioned throughout this process. It is unclear whether the target ecosystem is the one which was existent pre-human activity, in the 1980's, the current ecosystem, or that of some other period.

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CORRECT CITATION FOR THIS PUBLICATION

DFO, 2007. Placentia Bay-Grand Banks Large Ocean Management Area Conservation Objectives. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/042.