REFINEMENT OF INFORMATION RELATING TO ECOLOGICALLY AND BIOLOGICALLY SIGNIFICANT AREAS (EBSAS) IDENTIFIED IN THE NEWFOUNDLAND AND LABRADOR (NL) BIOREGION

Context

Canada has agreed to the Convention on Biological Diversity (CBD) Aichi Target 11 which includes the conservation of 10% of coastal and marine areas by 2020. Areas, especially those of particular importance for biodiversity and ecosystem services, will be conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures. The Newfoundland and Labrador (NL) Shelves has been identified as one of five priority biogeographic units for Marine Protected Area (MPA) Network development. The primary goal of Canada's MPA Network is to provide long-term protection of marine biodiversity, ecosystem function and special natural features.

Based on CBD guidance, the National Framework for Canada's Network of MPAs (Government of Canada 2011), and the Draft Canada NL MPA Network Strategy for the NL Shelves, Ecologically and Biologically Significant Area (EBSAs) are a key feature to be considered in MPA network development. The Oceans Program in the NL Region sought identification and/or clarification of the particular sub areas for each EBSA identified in the NL Bioregion. In the context of MPA Network planning, EBSAs have been internationally recognized as design features for Network development and there has been regional agreement that within the NL Shelves Bioregion, EBSAs will be given priority when selecting areas to protect in the MPA Network. EBSAs have been identified from previous Canadian Science Advisory Secretariat (CSAS) processes; 11 EBSAs were identified in the Placentia Bay-Grand Banks (PB-GB) Large Ocean Management Area (LOMA) (Templeman 2007) and 15 additional EBSAs were identified in the NL Shelves Bioregion (Fisheries and Oceans Canada [DFO] 2013). For both of these processes, the EBSAs were described with the inclusion of a corresponding map, however the data layers that were used to aid in the identification processes were not specifically requested, and in the case of the LOMA EBSAs, the subcomponents were not geospatially identified or described in detail. DFO Oceans requested that DFO Science provide further information on the subcomponents/areas of each EBSA that contributes to their significant features. Specifically:

- Provide detailed descriptions of sub-components of each EBSA identified during the PB-GB LOMA EBSA identification process.
- Provide geospatially referenced data layers of each sub-component of the PB-GB LOMA EBSAs, as well as the additional NL Shelves EBSAs.

This Science Response Report results from the Science Response Process of January 29, 2016 on the Refinement of information relating to Ecologically and Biologically Significant Areas (EBSAs) identified in the Newfoundland and Labrador (NL) Bioregion.

Background

Twenty-six EBSAs have been identified in the NL Shelves Bioregion since 2007 (Figure 1). For the PB-GB LOMA EBSA identification exercise (Templeman 2007), information from several key documents that detailed ecosystem overview and status, fish distribution and spawning, and single species assessment was compiled. Scientists in the NL Region also provided input on those areas that they felt could be deemed significant based on their knowledge and experience. The result of these exercises was the identification and description of 11 EBSAs and their significant features, as well as a corresponding map. All information collected during this process was not archived.

The 15 additional EBSAs that were identified north of the PB-GB LOMA in 2012 are described in detail in DFO 2013. However, the provision of geospatially referenced data layers that were used to identify the EBSAs were not specifically requested.

Analysis and Response

Approach

A Delphic approach was taken to re-collect any information that was the foundation of Templeman (2007), as per Table 1 by consulting with DFO Science and reviewing the original data sources for the 2007 process. This information was geospatially referenced where possible and compiled in a Geographic Information System (GIS) atlas. All data layers that were used to identify the 15 additional EBSAs from the area north of the LOMA were also included in the atlas. These data layers represent the significant areas (e.g. uppermost class) that were identified using quantile classification for each species or ecological component (see DFO 2013 for more info). The program used to house the atlas is a free ESRI software program called ArcGIS Explorer Desktop. It allows for the basic functionality of an interactive map with the ability to turn on or off individual features or layers.

The atlas requires both a map file (.nmf) and the layer packages (.lpk) that contain the data viewed in the map file. A master atlas file (Atlas_Master_EBSA.nmf) was created initially that contains all data layers and all EBSAs. This map file is best used when looking at particular features (e.g. Atlantic Cod, Ivory Gull, etc.) to see where they fall on the map relative to all EBSAs. When looking at a particular EBSA it is better to use the map file associated with that EBSA. These maps only contain features that are relevant to a specific EBSA as outlined in Templeman (2007) and DFO (2013). The individual maps also contain underwater features specific to each EBSA and a note/description (pop-up text box) with a summary of the features from the original report. The note contains a physical description of the EBSA, and a list of key features and other features. Key features correspond to items of high importance in Templeman (2007) as per Table 1 and to key biological features in DFO (2013) Appendix A. Other features correspond to items of moderate importance, and other biological features, respectively.

Placentia Bay Grand Banks Large Ocean Management Area

In 2008 a review was done by DFO Science (Templeman, pers. comm.) to provide further information on 5 of the 11 PB-GB LOMA EBSAs: the Southeast Shoal and Tail of the Banks, the Southwest Shelf Edge and Slope, St. Pierre Bank, Laurentian Channel and Slope, and the Northeast Shelf and Slope. Spatial layers were created for some of the features identified for these EBSAs, however, not all features were defined. Most of the spatial layers from 2008 were carried forward into the Atlas but some modifications were made and other features were added based on consultations with scientific experts and reports published pre-2007 to reflect the state of knowledge at the time the original CSAS Res Doc (2007/052) was developed.

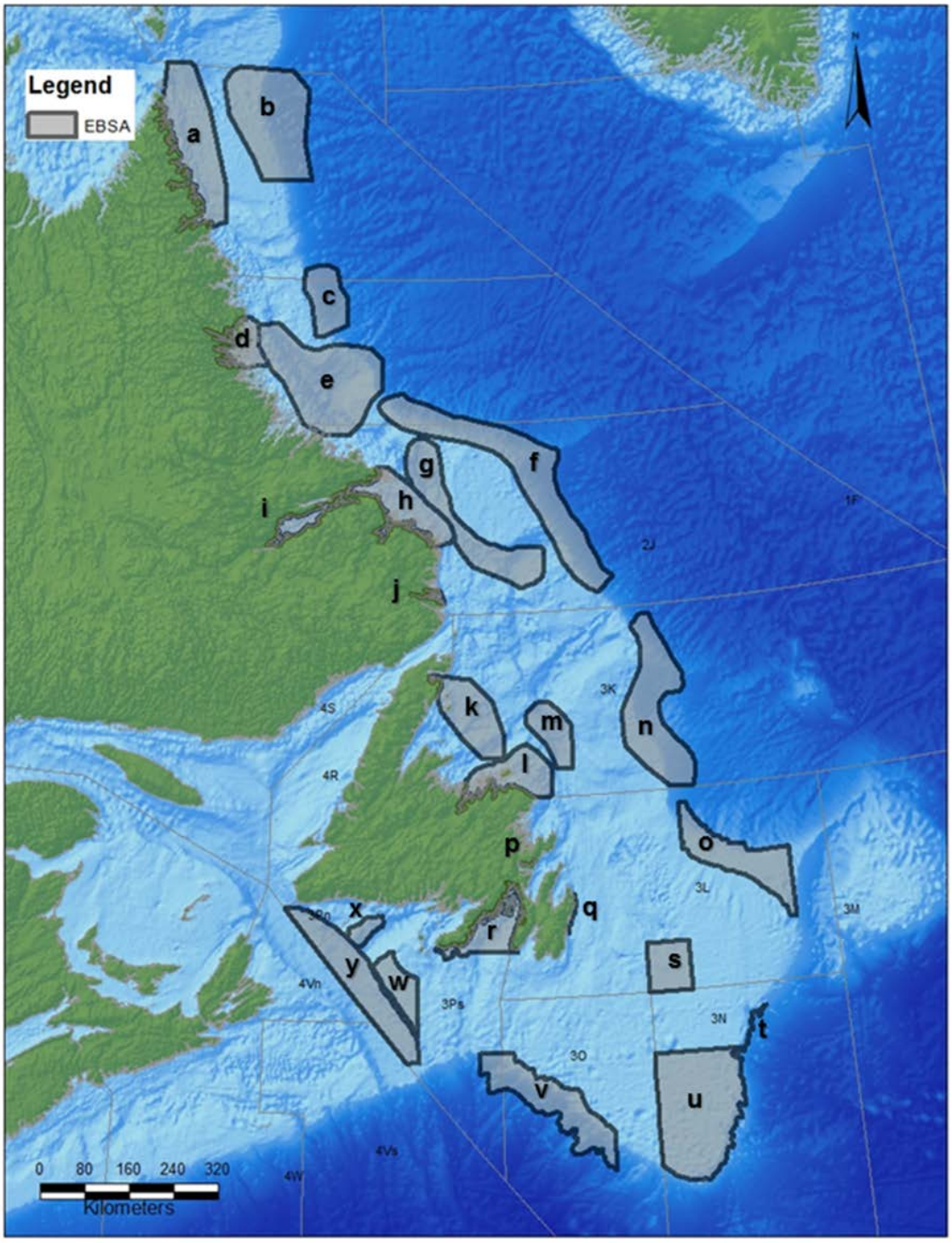

Figure 1. EBSAs in the Newfoundland and Labrador Bioregion: a) Northern Labrador, b) Outer Shelf Saglek Bank, c) Outer Shelf Nain Bank, d) Nain Area, e) Hopedale Saddle, f) Labrador Slope, g) Labrador Marginal Trough, h) Hamilton Inlet, i) Lake Melville, j) Gilbert Bay, k) Grey Islands, l) Fogo Shelf, m) Notre Dame Channel, n) Orphan Spur, o) Northeast Shelf and Slope, p) Smith Sound, q) Eastern Avalon, r) Placentia Bay Extension, s) Virgin Rocks, t) Lilly Canyon-Carson Canyon, u) Southeast Shoal and Tail of the Banks, v) Southwest Shelf Edge and Slope, w) St. Pierre Bank, x) Burgeo Bank, and y) Laurentian Channel.

Southeast Shoal and Tail of the Banks

Polygons for some of the features in this EBSA were drawn during the review in 2008. Capelin and Northern Sand Lance spawning was noted on the shoal itself and therefore was delimited by the physical outline of the shallow gravel area (Fuller and Myers 2004; Figure 2). Several other high priority features also fit into the shoal area due to its unique characteristics such as Yellowtail Flounder spawning, Atlantic Cod spawning, relict populations of Blue Mussel and wedge clams (Fuller and Myers 2004) as well as high primary production and the highest benthic biomass on the Grand Banks.

Nursery areas for Yellowtail Flounder, NAFO Divisions 3NO cod and American Plaice were drawn from Walsh et al. (2001). Two proposed closure areas (small and large) were described that would protect, on average, 62% (small) and 83% (large) of all juvenile Yellowtail Flounder, 14% and 32% of juvenile American Plaice, respectively, and 13% and 44% of all juvenile cod, respectively, on the southern Grand Banks (Figure 2a). Spatial layers for these two closure areas were created in 2008 and added to the Atlas.

The tail of the Banks is another key area of biological significance. The densest concentration of Striped Wolffish exists on the tail of the Grand Banks (Kulka et al. 2003; Figure 2b). The greatest concentration of Yellowtail Flounder (feeding grounds) is also found on the tail of the banks, extending northwards over the southeast shoal and central Grand Bank (Kulka et al. 2003; Figure 2c).

A polygon was created for American Plaice spawning based on maps from Ollerhead et al. (2004; Figure 2d). The area covered is an approximation of Figure 6b from that document and was selected based on the area described in the EBSA document (Templeman 2007). For feeding aggregations of marine mammals and seabirds, an area was marked out for marine mammals during the initial review in 2008 (Figure 3).

Placentia Bay Extension

This EBSA had no digital data from the review in 2008. No references were mentioned for the high concentration of ichthyoplankton (cod, cunner, plaice, Capelin, and others) so Bradbury et al. (2003) was used to identify key areas within the bay. Two areas, along the western side of Placentia Bay, and near the head of the bay were found to have higher concentrations of early-stage eggs of American Plaice, Atlantic Cod and cunner (Figure 4).

Templeman (2007) stated that the largest spawning stock of Atlantic Cod in the Northwest Atlantic exists in the Placentia Bay Extension, however, there is no reference to any spatial extent indicating where it occurs. There is no definitive area relating to this statement but there is a large proportion of spawning cod in that area and to the south and west of Placentia Bay. No polygon was created but a note was included in the EBSA atlas to indicate the area as having high importance for spawning cod.

Two Important Bird Areas (IBAs) exist within the Placentia Bay Extension EBSA, Cape St. Mary's (NF001) and Placentia Bay (NF028; Bird Studies Canada and Nature Canada 2004-14). Polygons already exist for these IBAs and so they were added to the atlas to indicate critical areas for breeding along the coastline (Figure 4). Cetaceans, sea turtles, Harbor Seals, and otters are often found in the area for feeding or migration purposes. Harbour Seals also use the area for pupping and hauling-out during mating season. Sjare et al. (2003) identified several areas of high pelagic fish and marine mammal (Humpback Whale and Harbor Seal) productivity and/or occurrence using Local Ecological Knowledge (LEK). Three areas, St. Lawrence, Marystown and Swift Current, were added to the atlas to address the high biodiversity of marine mammals and pelagic fish in Placentia Bay (Sjare et al. 2003; Figure 4).

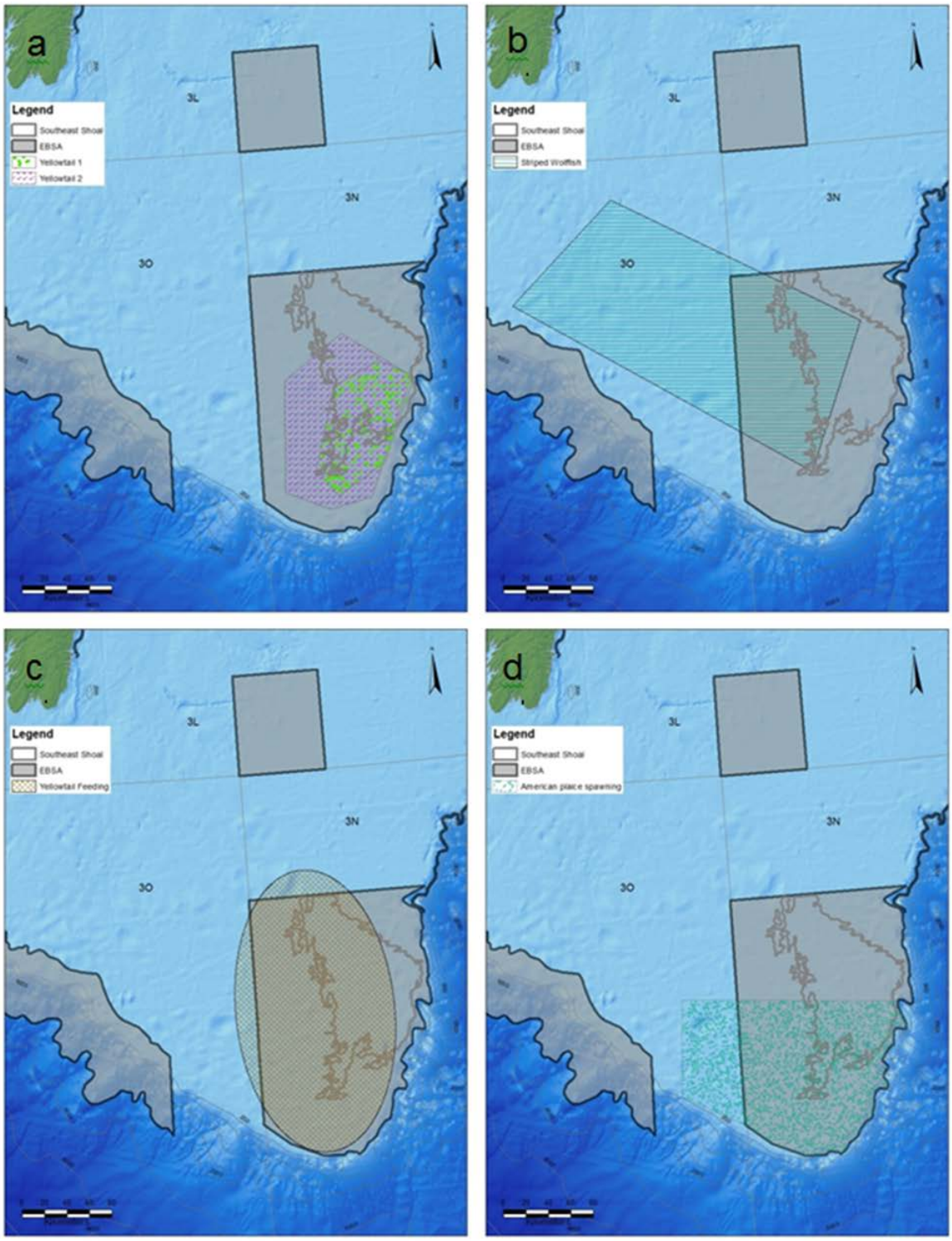

Figure 2. Features of the Southeast Shoal and Tail of the Banks EBSA: a) Southeast shoal/Capelin and sand lance spawning, and Yellowtail Flounder nursery areas, b) Striped Wolffish; c) Yellowtail Flounder feeding, and d) American Plaice spawning.

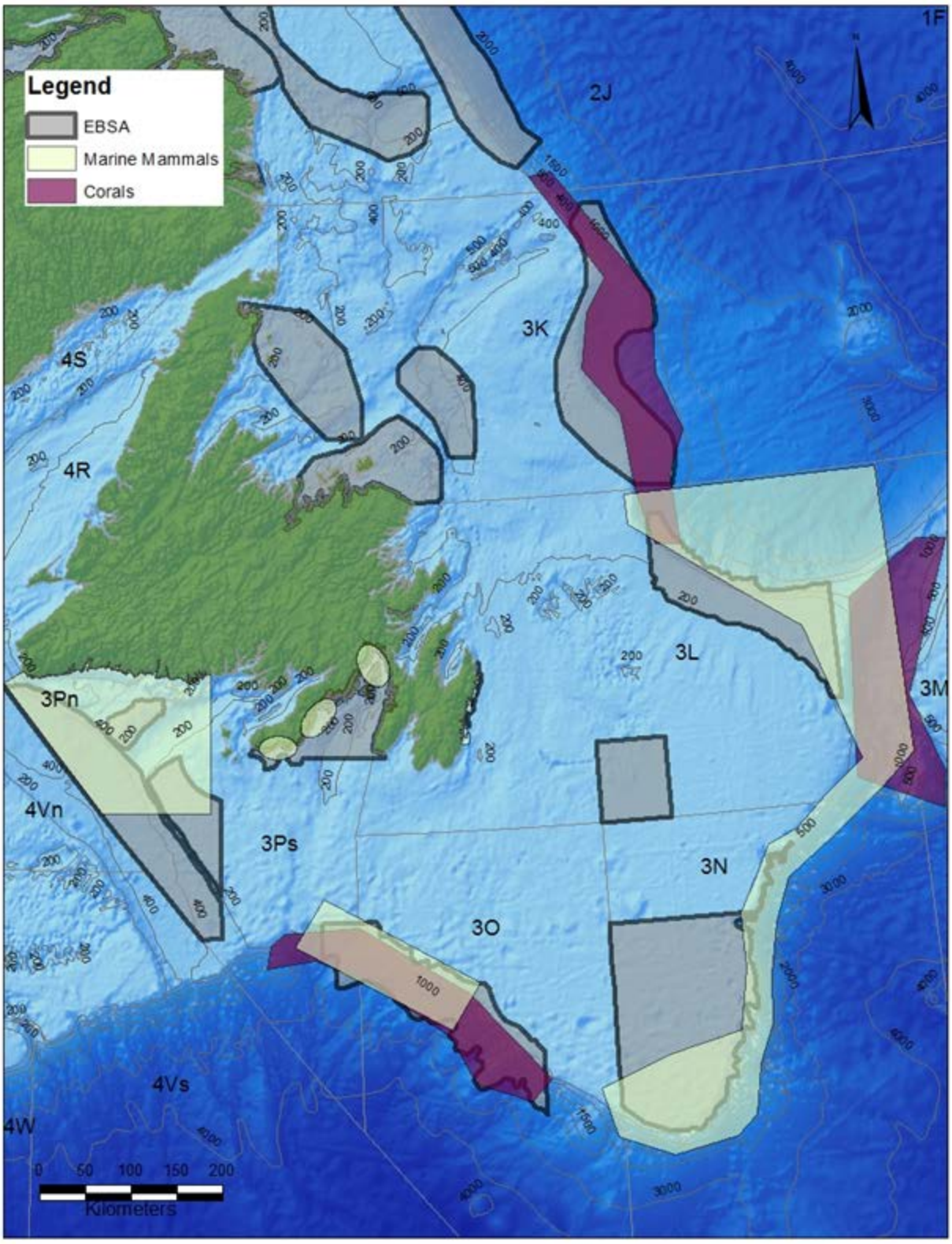

Figure 3. Marine mammal and coral features found throughout the PB-GB LOMA.

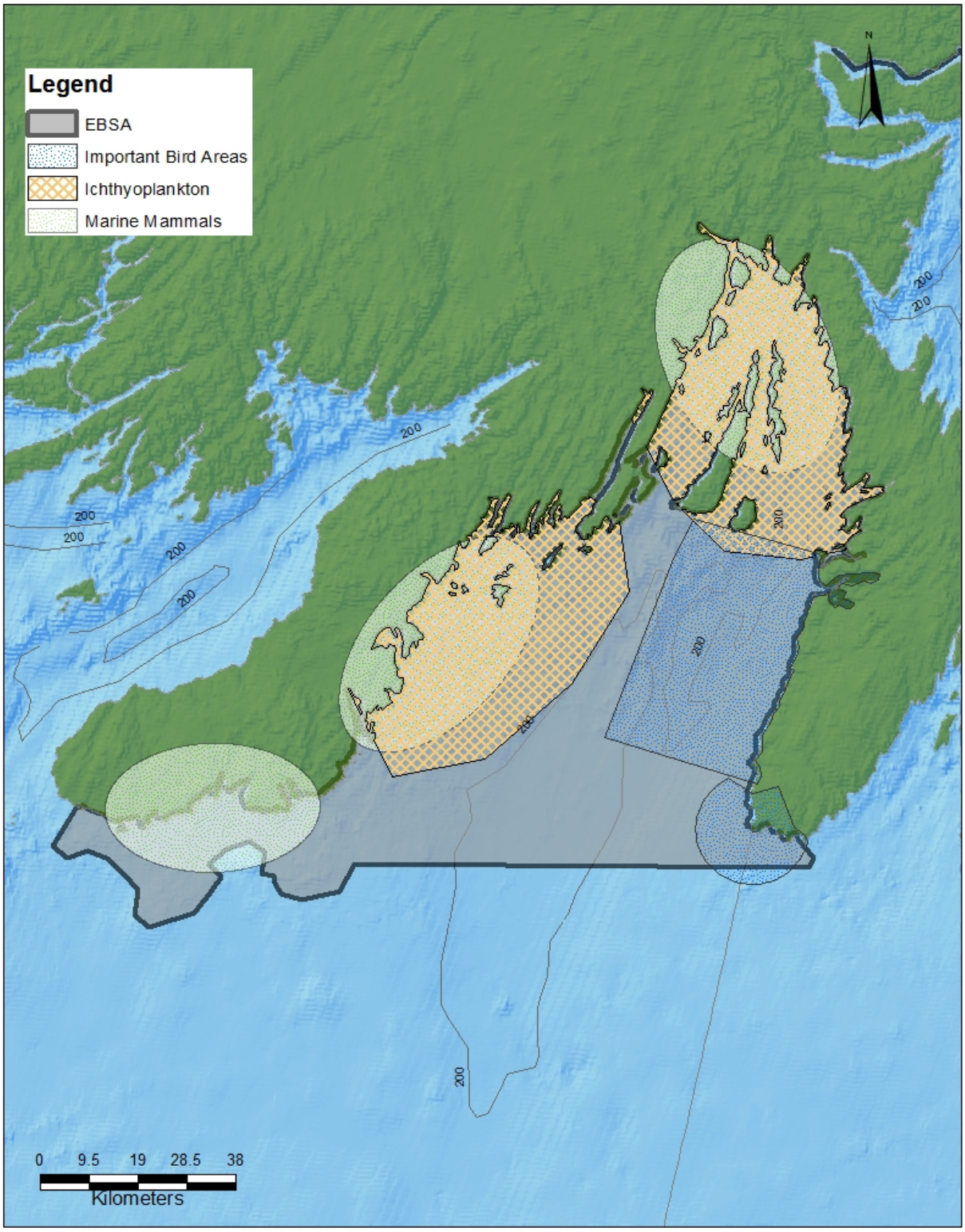

Figure 4. Placentia Bay Extension EBSA with polygons for Important Bird Areas, ichthyoplankton and marine mammals (adapted from Sjare et al. 2003).

Southwest Shelf Edge and Slope

The Southwest shelf edge and slope is a hotspot for haddock feeding and spawning. The 2008 review provided a spatial layer based on Ollerhead et al. (2004) that shows haddock mainly along the edge of the slope (Figure 5). Many groundfish species are located in this area (Kulka et al. 2003) and hence a general note was added to the atlas stating that there is a high diversity of groundfish in this area. There is specific mention of Atlantic Halibut found in the spring along the southwest slope (Kulka et al. 2003). Three polygons for halibut were created during the 2008 review that fall within the boundaries of the southwest shelf edge and slope EBSA (Figure 5).

This EBSA is also known to have a high concentration and diversity of cold-water coral species (Edinger et al. 2007). A large portion of the EBSA is covered by a polygon for corals based on the 2008 review (Figure 3). Marine mammals and leatherback turtles are common along this edge and slope, especially in the summer (Figure 3). Seabirds are also known to feed in this area due to its high concentration of prey.

Redfish also spawn along the slope (Ollerhead et al. 2004). A polygon was added based on spring data from Ollerhead et al. (2004) (Figure 5). Note that the southern edge of the redfish polygon follows along the 1,500 m isobath, however, redfish tend to stay up in the water column and so location is not dependent on water depth. This is an artifact of the presentation of data in the Ollerhead et al. (2004) report. Templeman (2007) also stated that the Southwest shelf and slope constitute a migration route for cod. This may be a reference to the general pattern that cod spend their summers on the shelf and then move to the edges along the slope in the winter. With no reference to a particular area along the shelf, a note was included in the atlas to indicate the importance of the shelf edge for cod migration.

St. Pierre Bank

All polygons for this EBSA were created during the 2008 review. St. Pierre Bank was recognized for having the highest and only concentration of sea scallops on the Grand Banks. Three polygons in the area were drawn, two inside the EBSA and one outside (Figure 6). There is a high concentration of Spiny Dogfish on the western portion of St. Pierre Bank, however, this polygon overlaps the EBSA boundaries slightly (Figure 6). St. Pierre Bank is at the northernmost extent for this species distribution in the Northwest Atlantic (Kulka 2006). This EBSA also contains feeding areas for cetaceans, particularly in the more northern half of the EBSA, but cetaceans are often found throughout the whole area (Figure 3).

Laurentian Channel and Slope

The Laurentian Channel is the sole pupping grounds for Black Dogfish off Canada (Kulka 2006). A polygon was created during the 2008 review based on NL trawl survey data from 1971-2005 (see Figure 11a and 15b in Kulka 2006; Figure 6). Smooth Skates also use the Laurentian Channel as an important juvenile/nursery area (Kulka et al. 2006). An area for Smooth Skate was identified during the 2008 review that covers the entire EBSA and also the Burgeo Bank EBSA (Figure 6). The Channel is also used by migrating cetaceans moving into and out of the Gulf of St. Lawrence (Figure 3).

Smith Sound

Smith Sound was identified as an EBSA primarily for the fact that Atlantic Cod use the area for spawning and nursery grounds and as an overwintering refuge. Since the EBSA is rather small and narrow the whole EBSA was considered important for cod, however, only deeper portions of the sound would be used to overwinter. The original polygon for the EBSA provided by

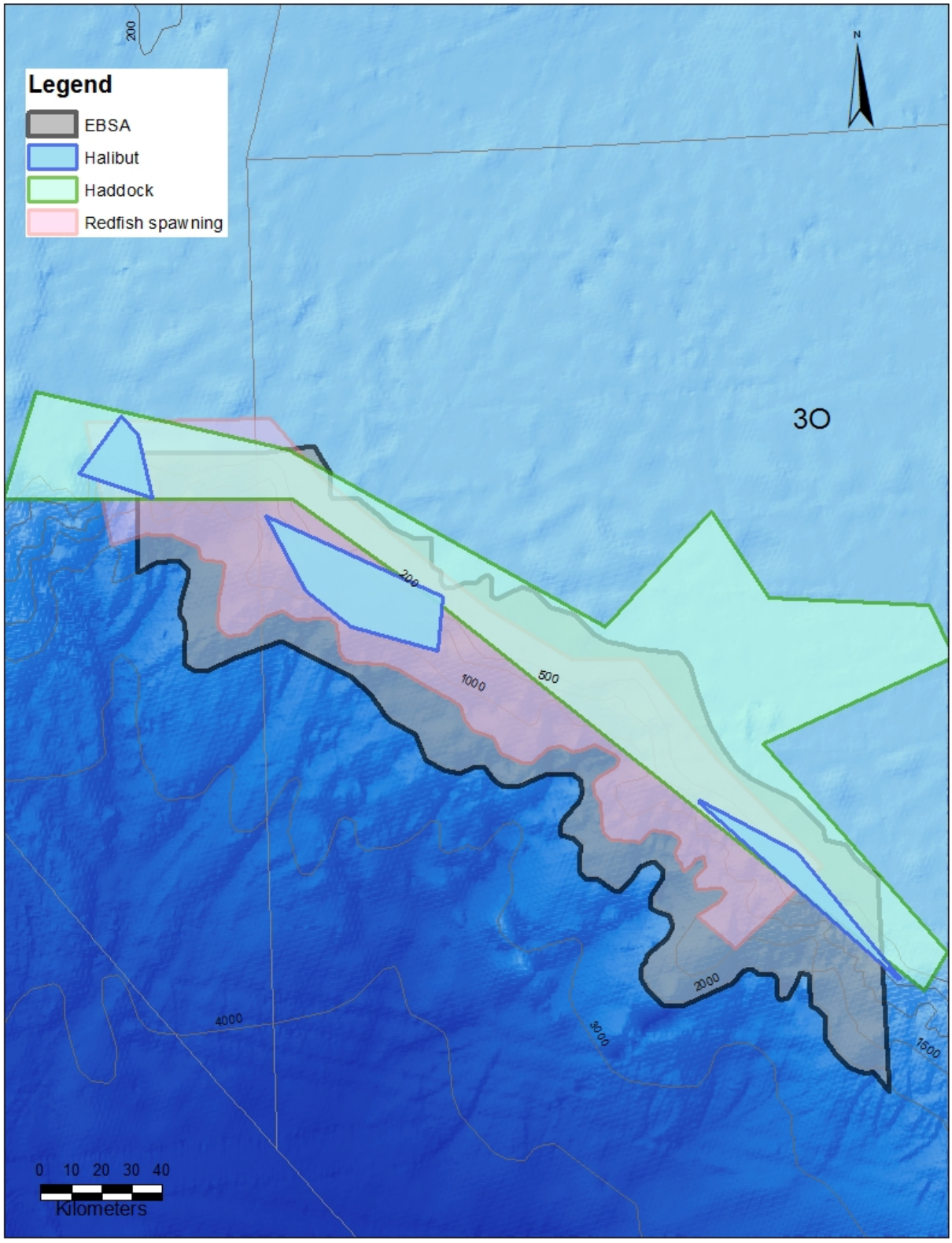

Figure 5. The Southwest Slope Edge and Slope EBSA with halibut, haddock and redfish (spawning) features.

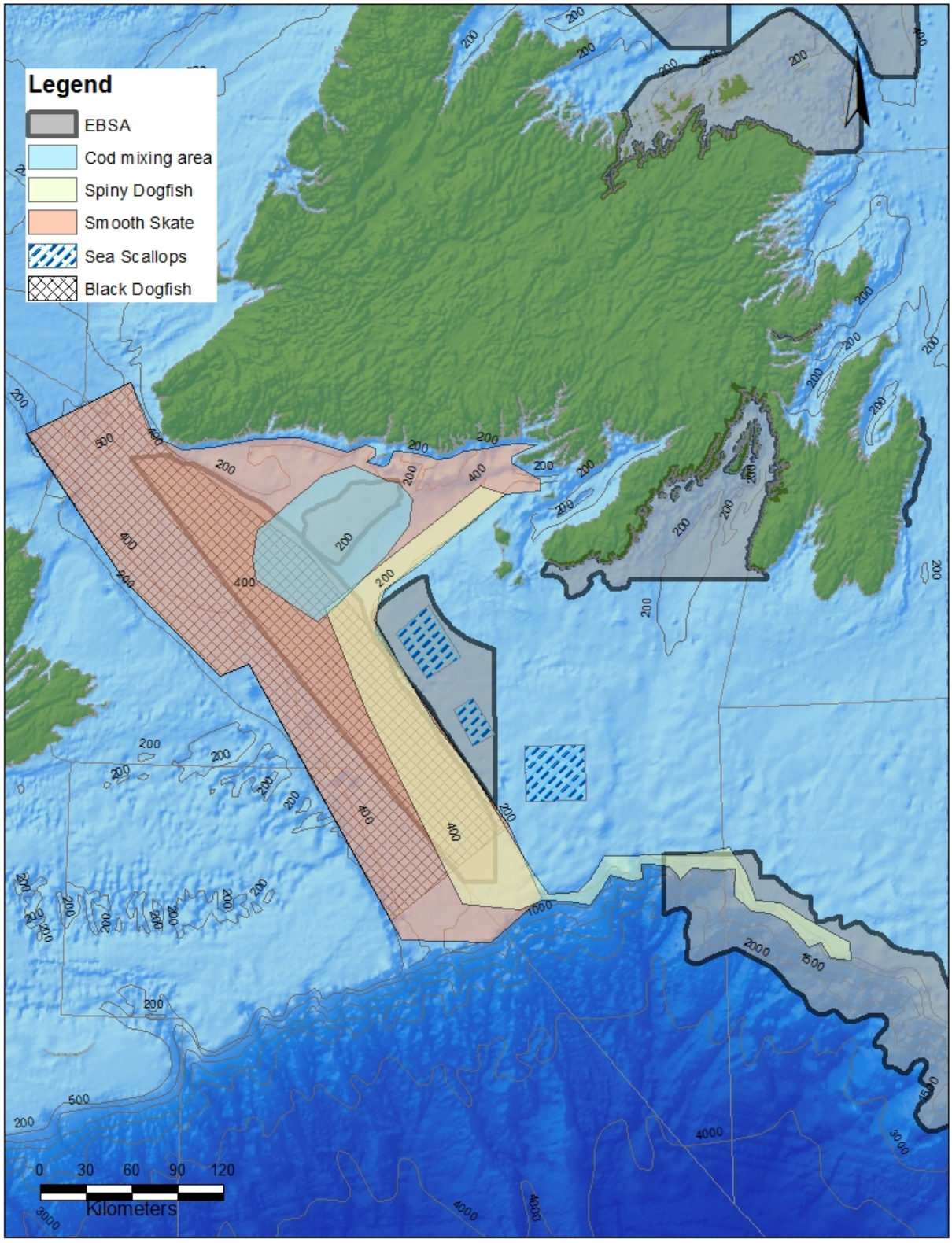

Figure 6. Features for the Laurentian Channel, St. Pierre Bank, and Burgeo Bank EBSAs.

Oceans was also modified to extend to the shoreline within the sound because it was initially a narrow band running through the center of the sound (Figure 7).

Eastern Avalon

The Eastern Avalon EBSA polygon was also modified to extend into the shoreline on the nearshore side since the polygon provided was rather slender and did not match the original document (Templeman 2007; Figure 8). Furthermore, it was extended south to Cappahayden and cropped at the top to Blackhead to better match the text description. One Important Bird Area (IBA) was included to delineate seabird feeding areas, the Witless Bay Islands (NF002; Bird Studies Canada and Nature Canada 2004-14; Figure 8). Cetaceans, leatherback turtles and seals are also found in this area feeding throughout the spring, summer and fall. The entire EBSA was used to delineate this feature since there is no location in particular that relates to these species (Figure 3). It is also possible that the high proportion of tour operators, and therefore recorded sightings, in the area have led to the identification of this area as having high biodiversity.

Lilly Canyon-Carson Canyon

Iceland Scallops occur in high proportion in Lilly and Carson Canyons (Ollerhead et al. 2004). Sampling of Iceland Scallops was done in both Lilly Canyon and Carson Canyon and so both canyons are indicated by two polygons (Figure 9). Marine mammals are also found along the edge of the shelf in this area and are indicated by the marine mammal polygon (Figure 3). Initially the marine mammal spatial layer covered a section of the tail of the banks and the northeast shelf slope, but was modified to include the shelf edge connecting the two areas.

Northeast Shelf and Slope

A large spring feeding aggregation of Spotted Wolffish can be found in the Northeast Shelf and Slope EBSA (Kulka et al. 2003). The polygon for Spotted Wolffish was created during the 2008 review (Figure 10). The polygon for marine mammals covers most of the slope and area between the banks and the Flemish Cap (Figure 3). Templeman (2007) noted that the marine mammals included Harp Seals around the Sackville Spur west, Hooded Seals around Sackville Spur east, and pilot whales.

Burgeo Bank

The Burgeo Bank EBSA was identified as an area for mixing of 3Ps and 3Pn4RS cod stocks and may be used for overwintering or spawning (Templeman 2007; Ollerhead et al. 2014). The location of this mixing area includes all of the Burgeo Bank EBSA and carries over into part of the Laurentian Channel (Figure 6).

Virgin Rocks

The Virgin Rocks EBSA is located in the middle of the Grand Banks and contains a unique geological feature of large exposed rocks. The outline of a shoal feature in a GIS layer containing seabed features (originally delineated by Atlantic Marine Geological Consulting Ltd.) was used to indicate the rock feature (Figure 10). Templeman (2007) also stated that seabirds are known to congregate here to feed on Capelin, however, no spatial information on this feature could be found for seabirds or Capelin.

Labrador Shelf – North of PB-GB LOMA

EBSAs north of the PB-GB LOMA were identified in 2013 using a process that utilized GIS along with expert scientific opinion. This spatial approach included various data sets on birds, fish, marine mammals and corals and sponges to help identify key areas. The spatial layers

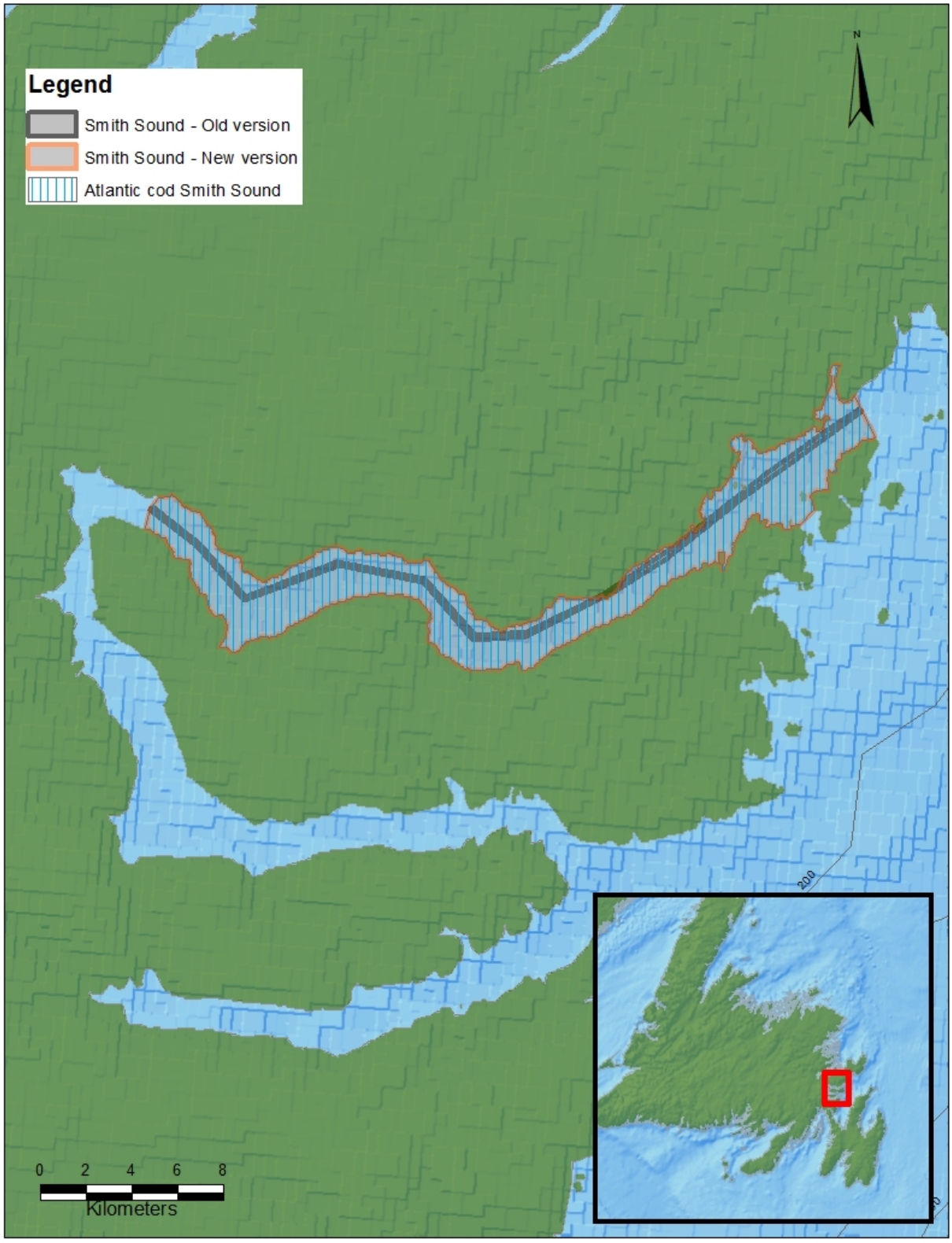

Figure 7. Updated polygon for Smith Sound EBSA and feature for Atlantic Cod.

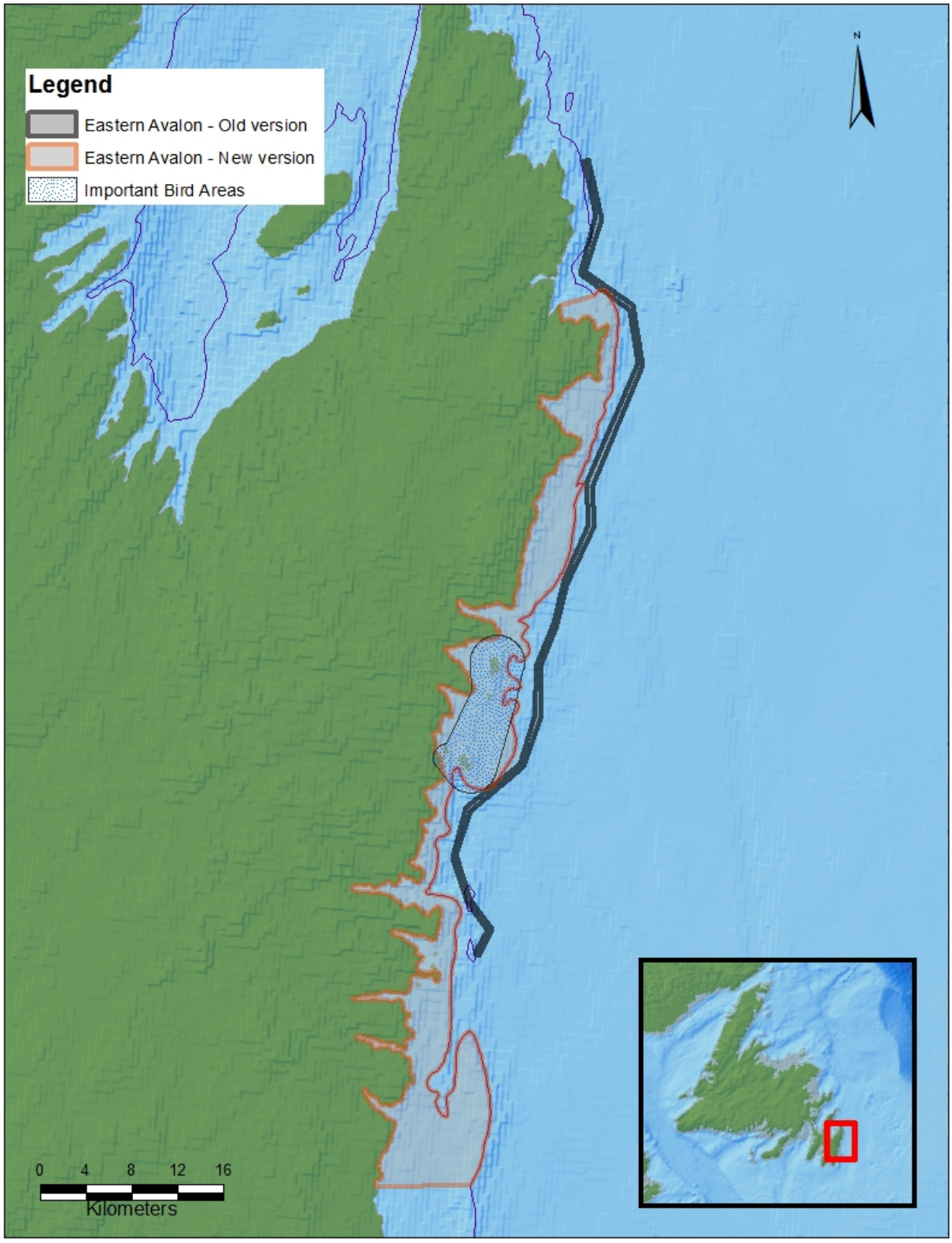

Figure 8. Updated polygon for the Eastern Avalon EBSA and Important Bird Area (Witless Bay) feature.

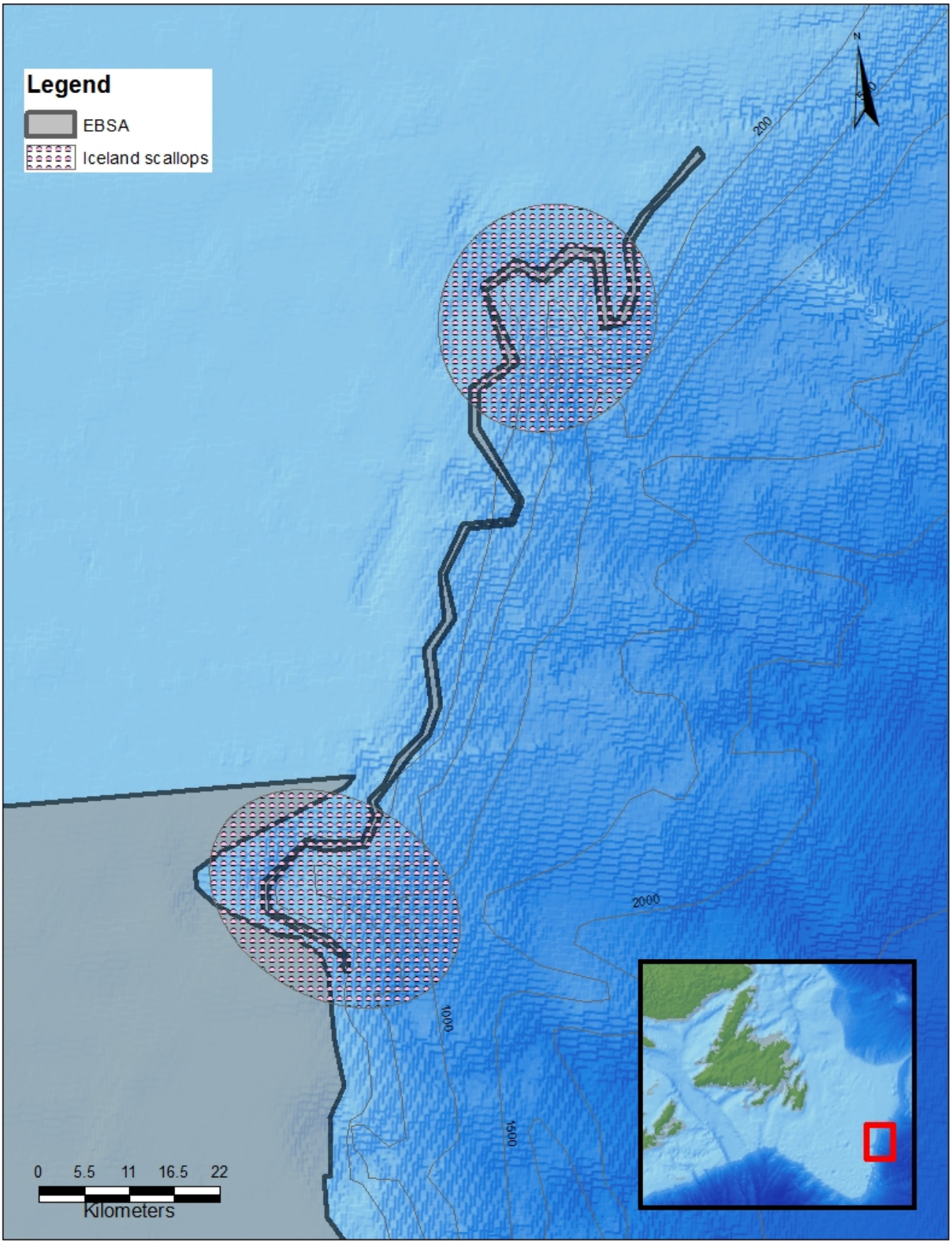

Figure 9. Lilly Canyon-Carson Canyon EBSA and Iceland Scallops feature.

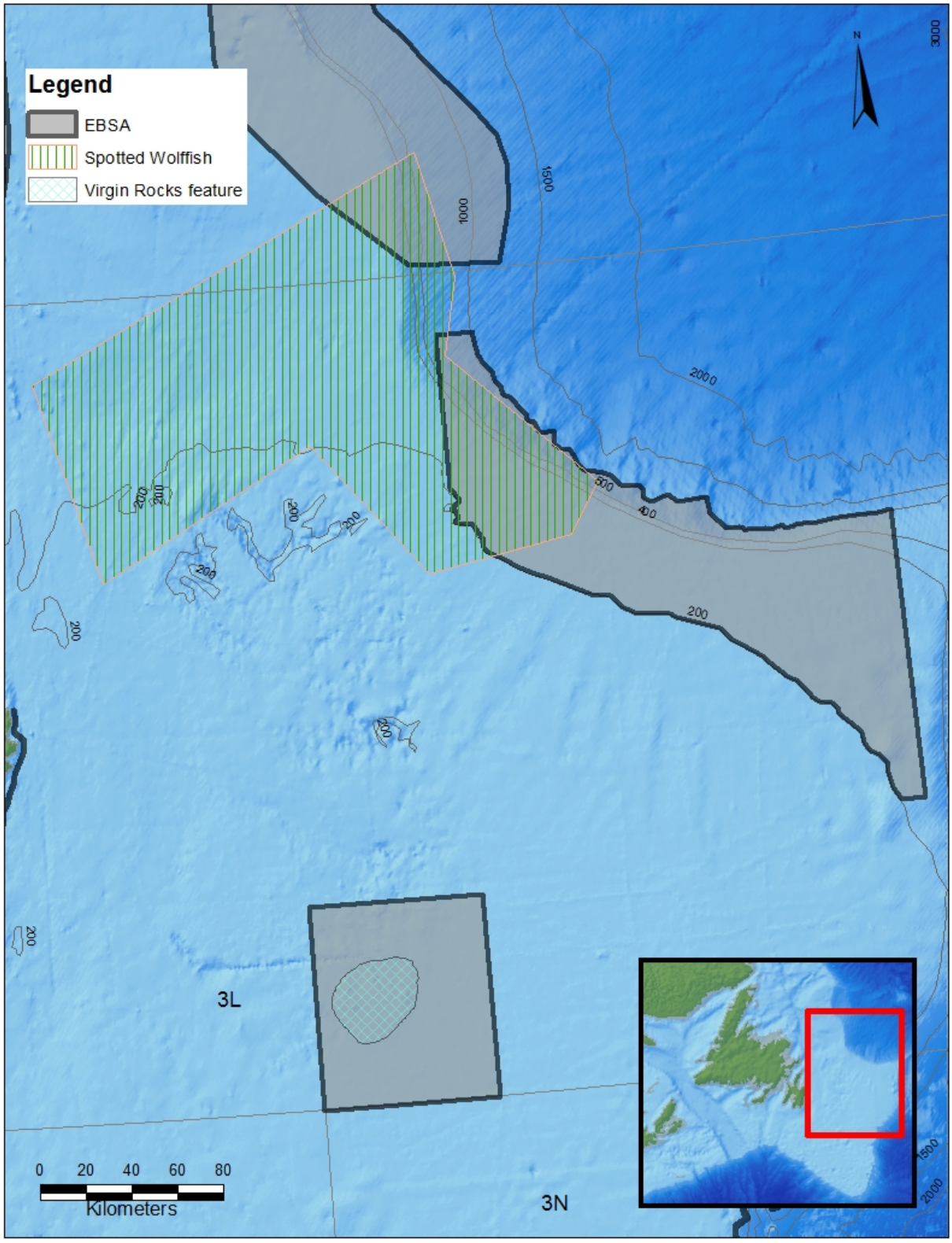

Figure 10. Spotted Wolffish feature on the Northeast Shelf and Slope EBSA, and the underwater rock feature on the Virgin Rocks EBSA.

created from this process constitute the biological and ecological data that was added to the EBSA atlas and these layers represent the significant areas (e.g. uppermost class) that were identified using quantile classification for each species or ecological component (see DFO 2013 for more info). Any data that lies inside the boundary of an EBSA was included in the atlas file for that EBSA.

Conclusions

This review process allowed for the development of several geospatially referenced layers of biological and ecological data for the PB-GB LOMA EBSAs. An atlas was compiled containing spatial data for all 26 EBSAs in the NL Bioregion and will be a useful tool for identifying particular sub areas that may be of interest to the Oceans program during MPA network development.

Contributors

Name	Affiliation
Margaret Warren	DFO Science - Ecological Sciences Section
Nadine Wells	DFO Science - Ecological Sciences Section
Dale Richards	DFO Science – CSA - NL Region
Erika Parrill	DFO Science – CSA - NL Region
Mardi Gullage	DFO Oceans
Tony Bowdring	DFO Oceans
Neil Ollerhead	DFO Science – Ecological Sciences Section
Robyn Jamieson	DFO Science – Environmental Sciences
Nadine Templeman	DFO Science – NHQ
Robin Anderson	DFO Science – Ecological Sciences Section
Pierre Pepin	DFO Science – Biological and Physical Oceanography Section
Jack Lawson	DFO Science – Marine Mammals Section
Melissa Abbott	DFO Oceans
Mariano Koen-Alonso	DFO Science – Ecological Sciences Section
Corey Morris	DFO Science – Ecological Sciences Section
Fran Mowbray	DFO Science – Pelagics Section

Approved by

Barry McCallum
Regional Director of Science,
Newfoundland and Labrador Region
DFO

May 11, 2016

Sources of information

Bird Studies Canada and Nature Canada. 2004-2014. Important Bird Areas of Canada Database. Port Rowan, Ontario: Bird Studies Canada. To access the Canadian IBA directory: http://www.ibacanada.com

Bradbury, I.R., Snelgrove, P.V.R., and Pepin, P. 2003. Passive and active behavioural contributions to patchiness and spatial pattern during the early life history of marine fishes. Mar. Ecol. Prog. Ser. 257: 233-245.

DFO. 2013. Identification of additional Ecologically and Biologically Significant Areas (EBSAs) within the Newfoundland and Labrador Shelves Bioregion. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/048

Edinger, E., Baker, K., Devillers, R., and Wareham, V. 2007. Coldwater corals off Newfoundland and Labrador – Distribution and fisheries impacts. World Wildlife Fund (WWF): 41p.

Fuller, S.D., and Myers, R.A. 2004. The Southern Grand Bank: A marine protected area for the world. World Wildlife Fund Canada: 99p.

Government of Canada. 2011. National Framework for Canada's Network of Marine Protected Areas. Fisheries and Oceans Canada, Ottawa. 31 pp.

Kulka, D.W. 2006. Abundance and distribution of demersal sharks on the Grand Banks with particular reference to the NAFO regulatory area. NAFO SCR Doc. 06/20.

Kulka, D.W., Antle, M.C., and Simms, J.M. 2003. Spatial analysis of 18 demersal species in relation to petroleum license areas on the Grand Bank (1980-2000). Can. Tech. Rep. Fish. Aquat. Sci. 2473.

Kulka, D.W., Swain, D. Simpson, M.R., Miri, C.M., Simon, J., Gauthier, J., McPhie, R., Sulikowski, J., and Hamilton, L. 2006. Distribution, abundance, and life history of *Malacoraja senta* (Smooth skate) in Canadian Atlantic waters with reference to its global distribution. DFO. Can. Sci. Advis. Sec. Res. Doc. 2006/093.

Ollerhead, L.M.N., Morgan, M.J., Scruton, D.A., and Marrie, B. 2004. Mapping spawning times and locations for 10 commercially important fish species found on the Grand Banks of Newfoundland. Can. Tech. Rep. Fish. Aquat. Sci. 2522: iv + 45p.

Sjare, B., Nakashima, B., and Mercer, D. 2003. Integrating scientific and local ecological knowledge to identify potential critical habitats: A case study in Placentia Bay, Newfoundland. DFO. Can. Sci. Advis. Sec. Res. Doc. 2003/114.

Templeman, N. 2007. Placentia Bay-Grand Banks Large Ocean Management Area Ecologically and Biologically Significant Areas. DFO. Can. Sci. Advis. Sec. Res. Doc. 2007/052.

Walsh, S.J., Simpson, M., Morgan, M.J., Dwyer, K.S., and Stansbury, D. 2001. Distribution of juvenile yellowtail flounder, American plaice and Atlantic cod on the Southern Grand Bank of Newfoundland: a discussion of nursery areas and marine protected areas. NAFO SCR Doc. 01/78.

This Report is Available from the

Center for Science Advice (CSA)
Newfoundland and Labrador Region
Fisheries and Oceans Canada
PO Box 5664

St. John's, NL A1C 5X1

Telephone: 709-772-3332
E-Mail: DFONLCentreforScienceAdvice@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

ISSN 1919-3769

Correct Citation for this Publication:

DFO. 2016. Refinement of Information Relating to Ecologically and Biologically Significant Areas (EBSAs) Identified in the Newfoundland and Labrador (NL) Bioregion. DFO Can. Sci. Advis. Sec. Sci. Resp. 2016/032.

MPO. 2016. Peaufinage des renseignements sur les zones d'importance écologique et biologique désignées dans la biorégion de Terre-Neuve-et-Labrador. Secr. can. de consult. sci. du MPO, Rép. des Sci. 2016/032.