



ACCESS
Arctic Climate Change
Economy and Society



Project no. 265863

ACCESS

Arctic Climate Change, Economy and Society

Instrument: Collaborative Project
Thematic Priority: Ocean.2010-1 "Quantification of climate change impacts on economic sectors in the Arctic"

D4.51 - Interactive noise maps of exploration/ exploitation sites.

Due date of deliverable: **31/08/2013**

Actual submission date: **08/01/2014**

Used Person/months: **...**

Start date of project: **March 1st, 2011**

Duration: **48 months**

Organisation name of lead contractor for this deliverable: **UPC**

Project co-funded by the European Commission within the Seventh Framework Programme (2007-2013)		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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1. INTRODUCTION

This deliverable compares the presence of marine mammals in the Arctic region with anthropogenic activities. The environmental impact of interest here is either an increased acoustic contribution, reducing the communication or sonar range of many cetaceans (as detailed in deliverable 4.52), and increased human presence in areas that used to be relatively calm, possibly causing displacement. Three types of information were collected for the area under study: 1) Presence of marine mammals; 2) Presence of exploitation platforms; 3) Shipping traffic. This information can be combined with sound exposure modelling, as performed under deliverable 2.4.3, to estimate the acoustic impact on the environment. It can also help identifying zones that are important to the animals and affected by human activities; these zones could be designated as Marine Protected Areas in the future.

2. METHODOLOGY

Esri's Arcgis 9.3[®] software, a geographic information system for working with maps and geographic information, was used for this study to illustrate, integrate and combine all data gathered from desktop survey. The figures presented below used the geographic coordinate system GCS_WGS_1984 (datum D_WGS_1984).

- **Oil prospecting:** Data from the areas opened for oil industry explorations and the companies in charge of it was provided and converted from the Norwegian Petroleum Directorate (www.npd.no) as of June 20th, 2012.
- **Marine mammals:** All data from marine mammals distribution in the Barents Sea was found in the literature and converted to GCS_WGS_1984. Since the data was limited and, to the best of our knowledge, it was not published the distribution of the species over the months, we considered a global annual distribution of marine mammals species.
- **Maritime traffic:** One year of AIS data covering part of the Barents Sea has been made available by the Norwegian Coastal Administration (Kystverket). From their website density data containing the number of ship passages was downloaded for each month in 2012. Since December 2012 was not yet fully available, data from December 2011 has been added to correct for the missing days. The NetCDF density data was converted to a CSV format in Matlab[®] and then passed to ArcGIS[®].

Since most part of the data was provided by the Norwegian institutions, the Russian area of the Barents Sea might be underrepresented.

3. RESULTS

Oil prospecting

Figure 1 shows the disposition of the areas covered by the oil extracting activities by company.

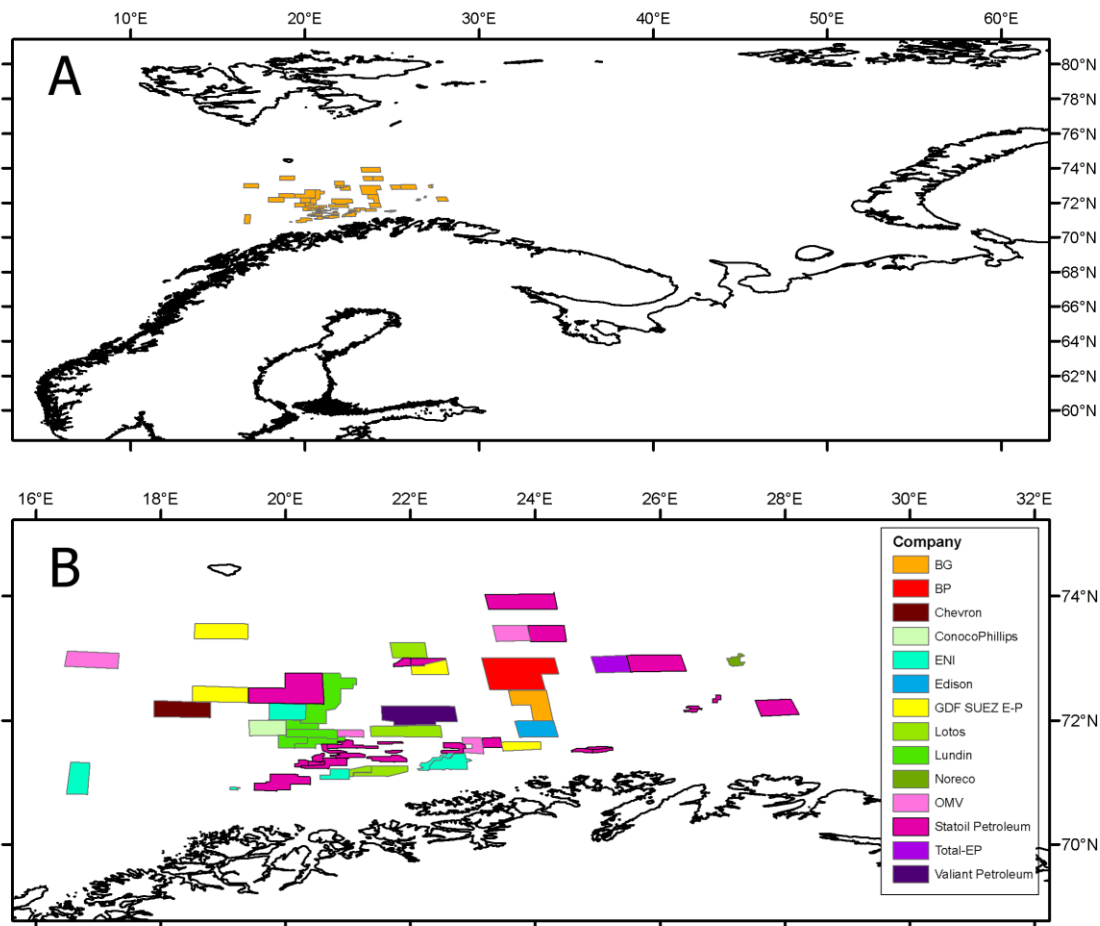


Figure 1. A) oil prospecting areas covered by June 20th, 2012. B) zoom of the previous map where the oil companies in charge of the exploration are highlighted. Data provided by the Norwegian Petroleum Directorate.

Marine mammals

Annual marine mammals distribution in the Barents sea is represented in Figure 2. The pointed line shows the limit of the Barents sea. Data over this limit was not considered in this study. Figure 3 combines this information with the areas occupied by the oil prospecting in Norway, showing an overlapping with the distribution of the following cetacean species: blue whale, minke whale, fin whale, humpback whale, sei whale, bowhead whale, northern bottlenose whale and sperm whale.

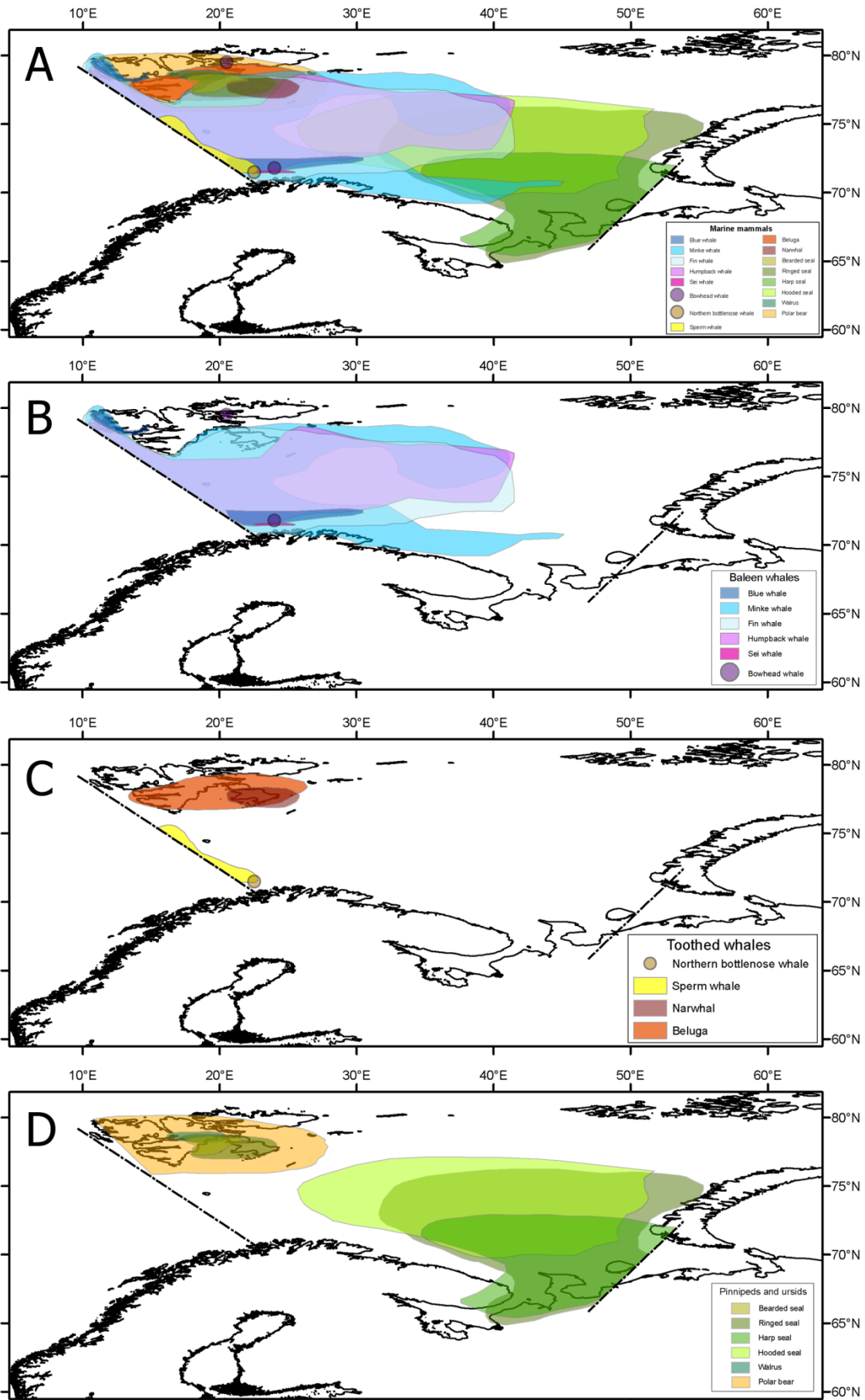


Figure 2.- Distribution of marine mammals (A) in the Barents Sea and specifically baleen whales (B), toothed whales (C) and pinnipeds and ursids (D).

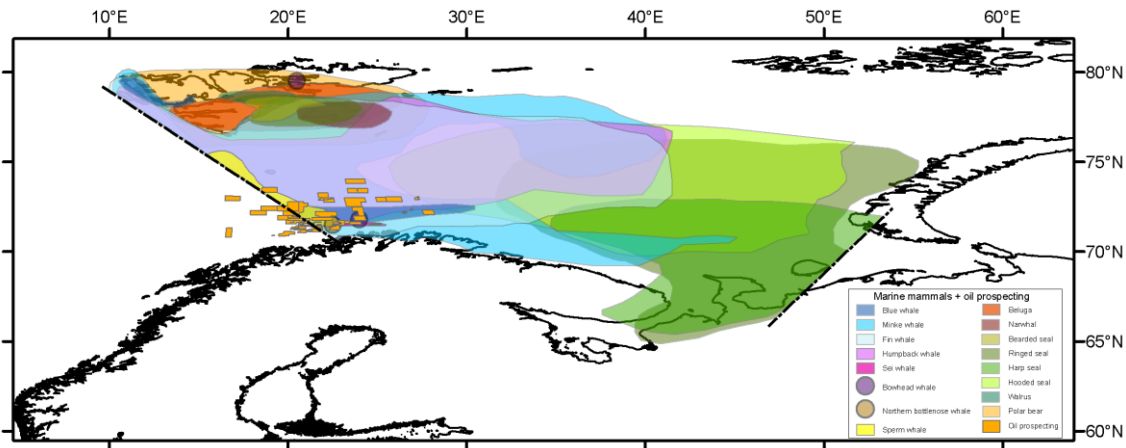


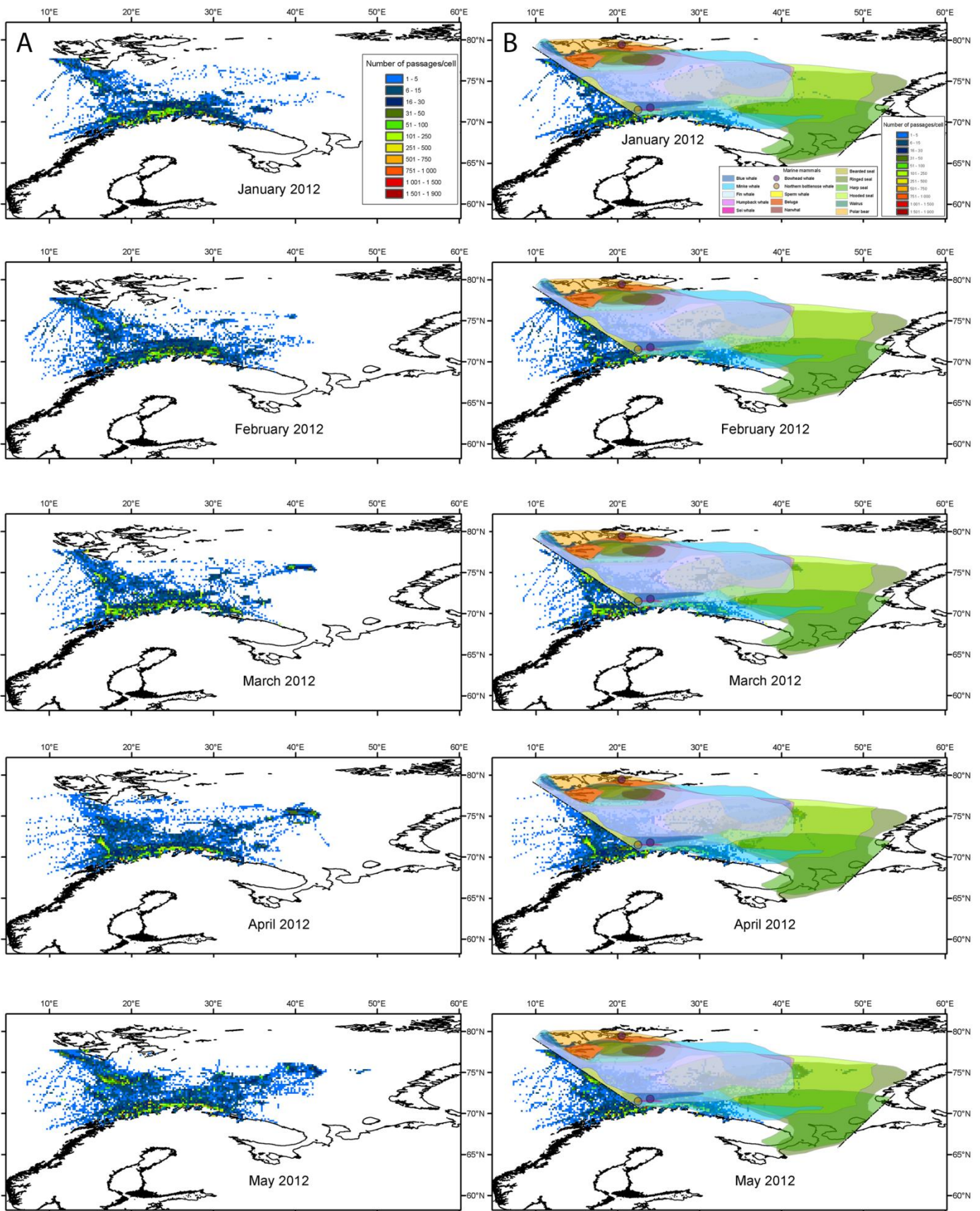
Figure 3.- Combination of data from distribution of marine mammals and oil exploration activities in the Barents sea.

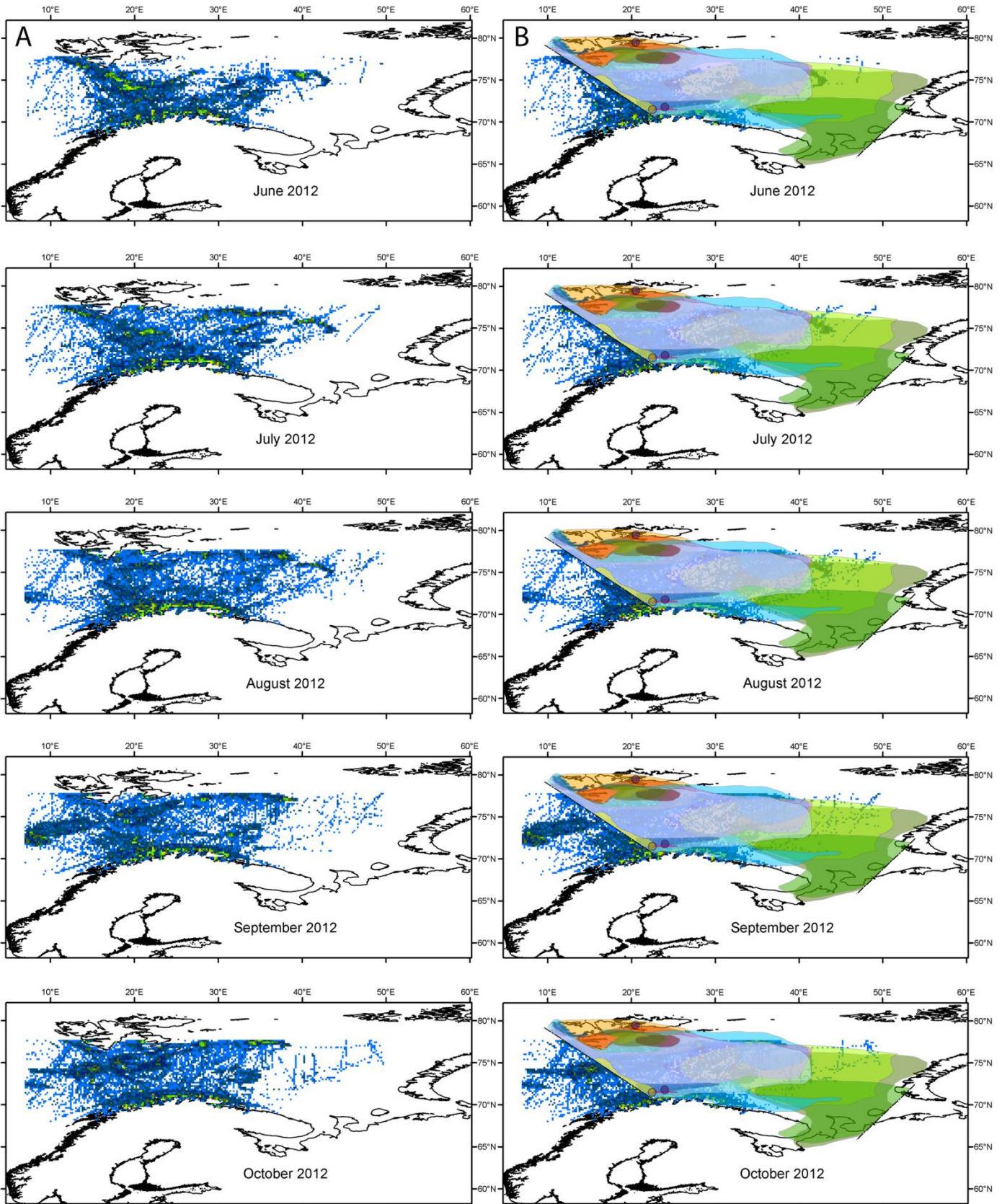
Maritime traffic

Figure 4 allows the comparison between the number of passages per cell each month (4A) and in combination with the marine mammal distribution (4B). A maximum of 1835 passages was observed in December, followed by April and May (1671 and 1631 passages, respectively), while the months with less maximum points of traffic were June and September (with 631 and 816 passages, respectively).

In general, higher transited areas were those near the coastline of Norway, Bjørnøya and the southern coast of Svalbard, overlapping with the distribution of shallow waters baleen whales, such as minke whales and fin whales.

Figure 5, on the other hand, combines all available information of annual marine traffic, oil exploration activities and marine mammal distribution in the Barents Sea.





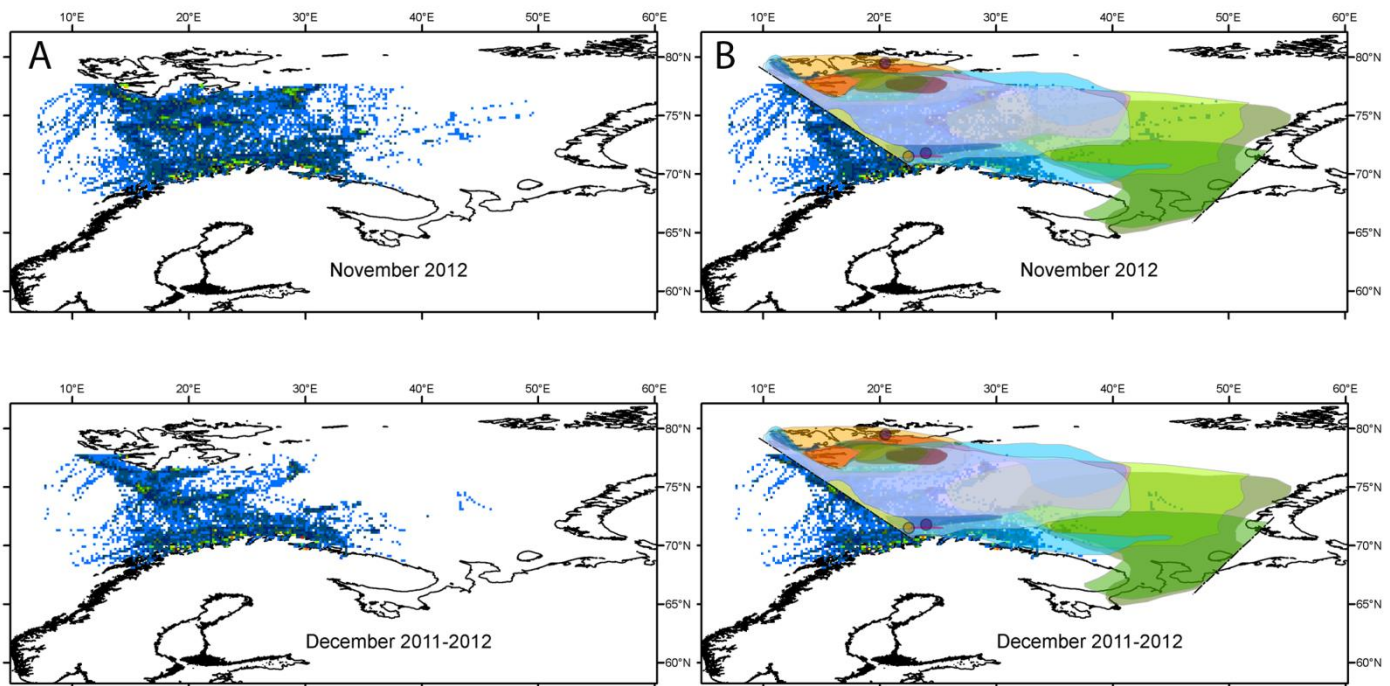


Figure 4. A) Representation of the maritime traffic in terms of number of passages per cell (0.2x0.2 decimal degree) each month. B) Combination of the monthly maritime traffic information with the annual marine mammal distribution, being this last considered only for the area of the Barents Sea (whose limits are displayed by the pointed line). The legend in the month of January is the same for the rest of the months. Note that the data from December is the addition from 1-14 December 2012 and 14-31 December 2011.

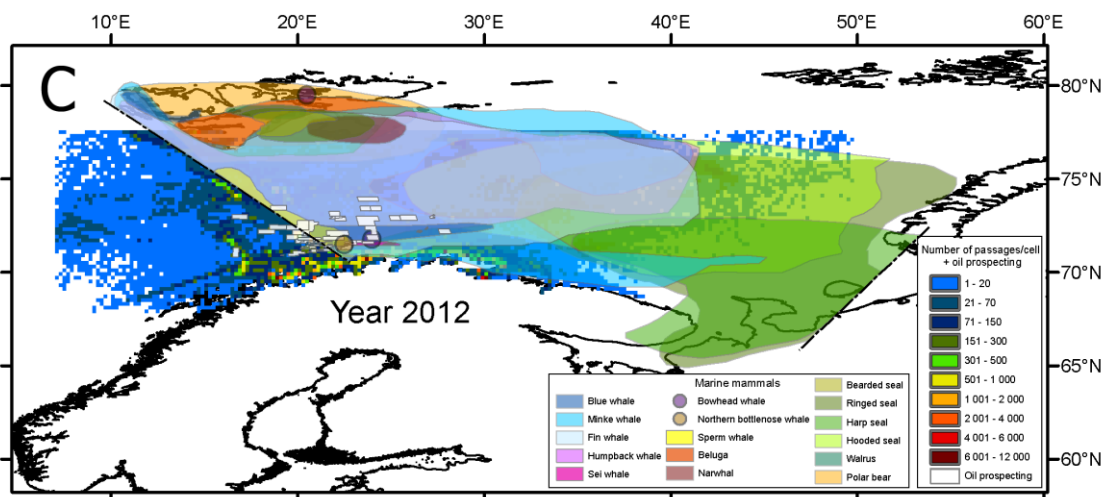
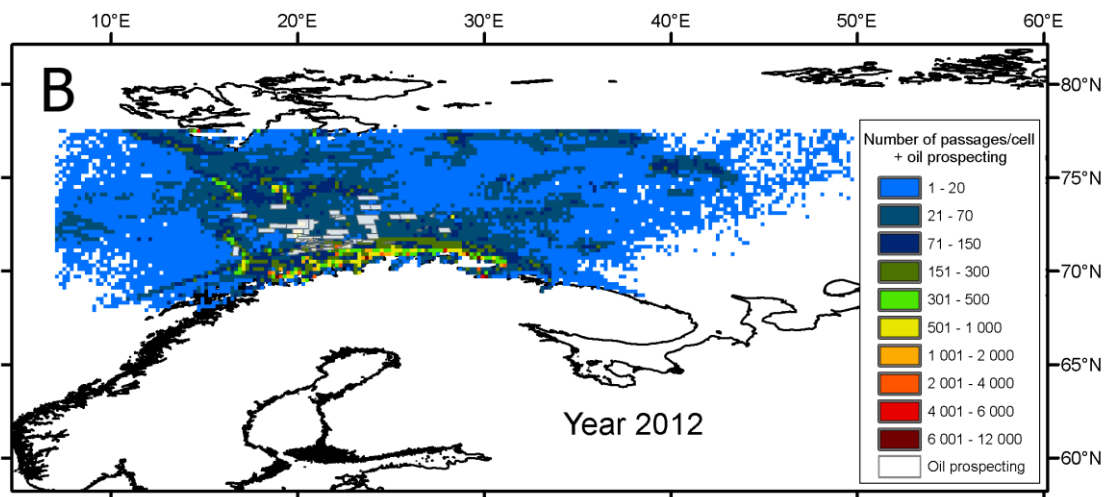
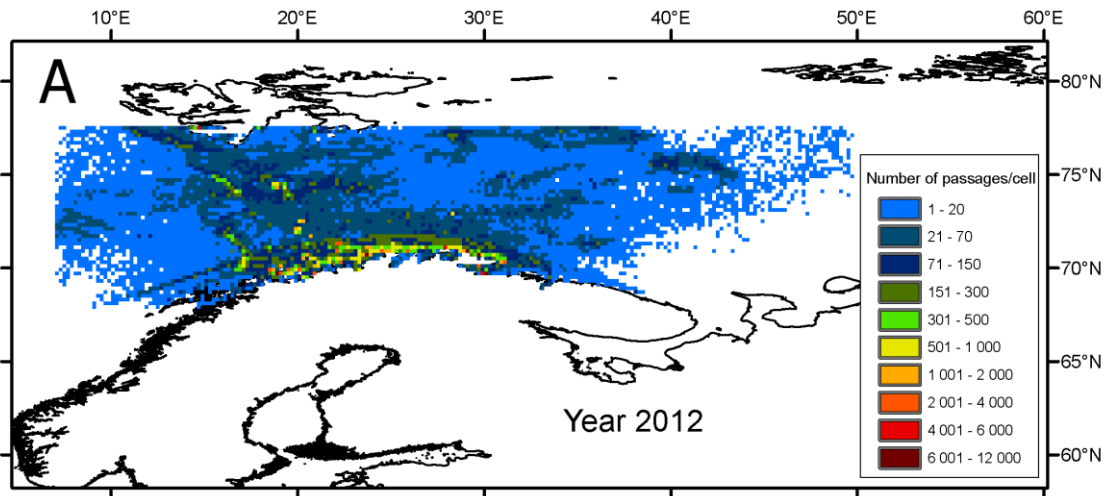
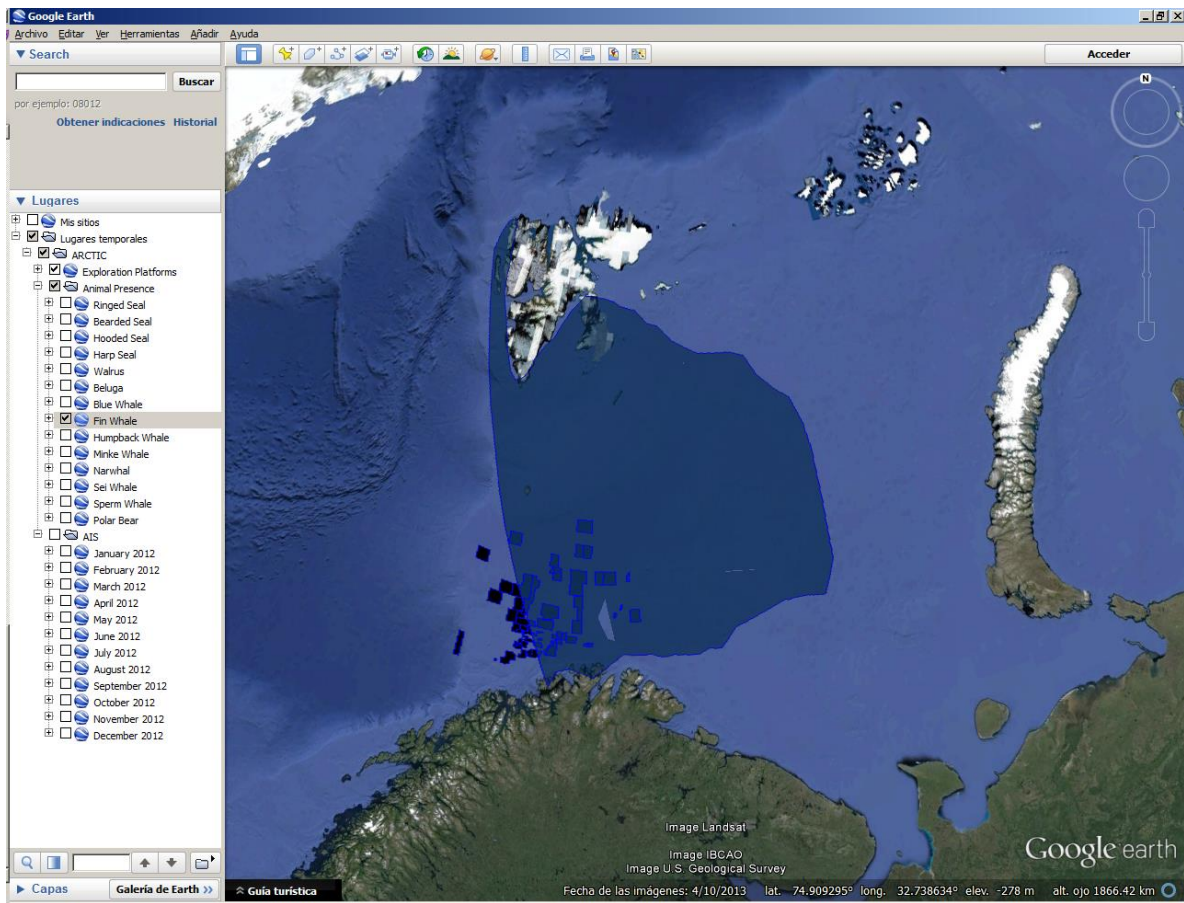


Figure 5. A) annual marine traffic information from 14 December 2011 to 14 December 2012. B) oil prospecting activities with annual marine traffic information. C) combination of the annual passages per cell, oil exploration industry and annual distribution of marine mammals of the Barents sea (limited by the pointed line).

Maritime traffic

The layers in ArcGIS have been exported to a Google Earth kmz file (using the shp2kml tool available from <http://www.zonums.com>) to make the data available to the general public. It allows combining the cetacean presence with the platform positions and shipping activities. Areas that incorporate the presence of several species and experience increased anthropogenic activities could be considered for additional protective measures. Two examples of its use are provided in Figures 6A and 6B. In Figure 6A a number of exploration platforms fall inside the area with known fin whale presence; in Figure 6B the animal presence (cetaceans: blue; seals: green; polar bear: yellow) is overlaid with shipping activities in January 2012. Once sound measurements become available to validate modelling, these layers can be combined with sound exposure levels to evaluate the environmental acoustic impact from both shipping and the platforms. The kmz file can be downloaded from the ACCESS website (<http://>) or the LAB website (<http://www.lab.upc.edu/ACCESS/ARCTIC.kmz>).



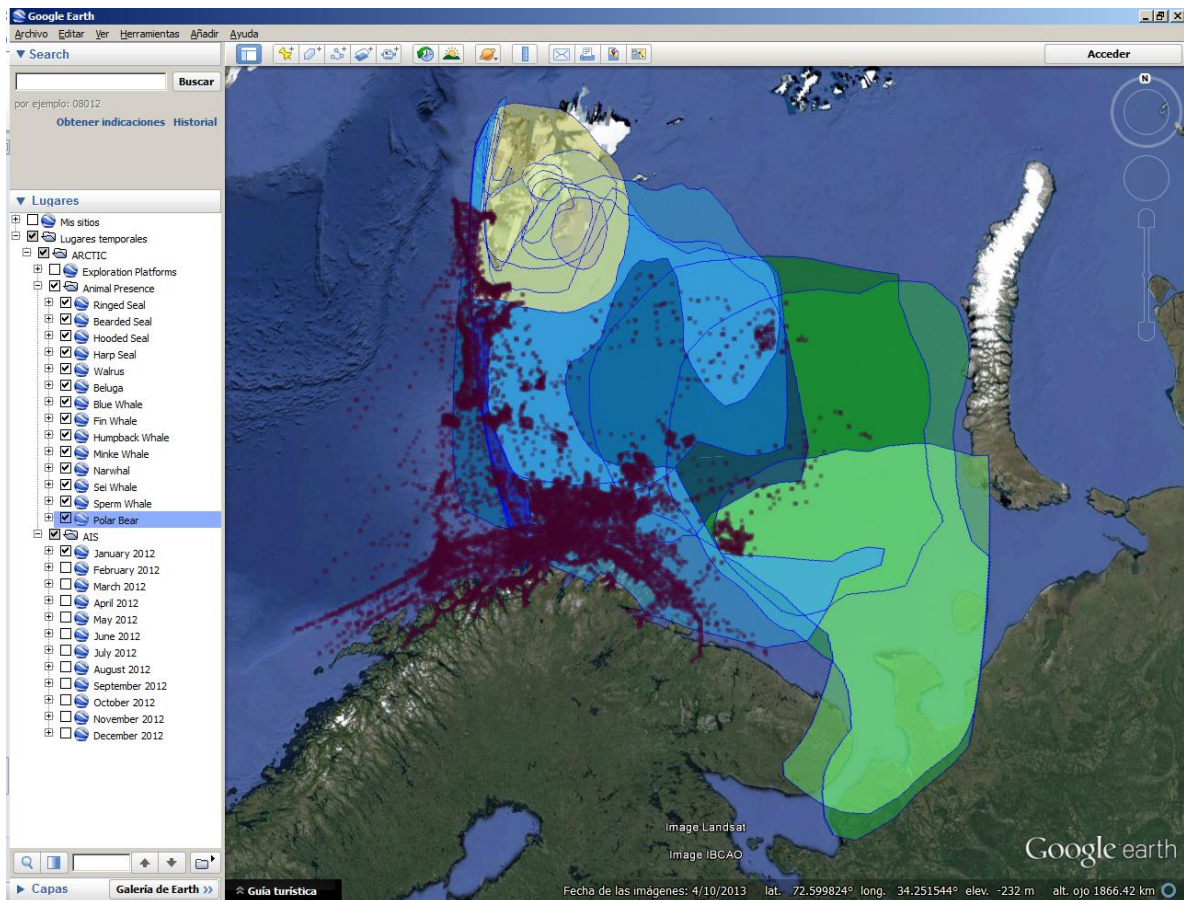


Figure 6. Usage of ArcGIS layers in Google Earth. A) Exploration platform locations and fin whale presence. B) Shipping activity in January and animal presence.