Plot your sharks on maps using the ggOceanMaps[1] package for R[2]

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1. Background

- Designed for ocean sciences around the globe simplifying mapping in R[2].

- Plot data on bathymetric maps using **ggplot2**[3].

2. Principle

- Uses **sf**[4] and **sp**[5] vector shapefiles and openly available geographic[6-8] data.

- Shapefile handling and **projections** handled behind the scenes by the **basemap()** and **qmap()** functions.

- Map **limits** are defined using a **vector** or **data frame**.

- Uses ggplot2 syntax: add layers using the **+** operator, link **data** and map aesthetics using column names.

3. **basemap()** makes the background of this poster:

```
bm <- basemap(
  c(-15, 17, 34, 76), # limits
  bathymetry = TRUE, # turn bathymetry on
  shapefiles = “GEBCO”, # detailed maps
  ...) # many other options, see ?basemap
```

Diego Delso, delso.photo (CC-BY-SA, Wikipedia)

The Global Biodiversity Information Facility (GBIF) is a network funded by the world's governments aiming to provide open access data about all types of life on Earth. **Blue shark** observations were downloaded from GBIF using the **rgbif** package. The code is available behind the QR tag.

4. Data needs to be added in the same projection than the basemap. This can be done using **ggspatial**[9]:

```
bm +
   ggspatial::geom_spatial_point(
   data = GBIF, # remember to write data =
    aes(x = lon, y = lat),
   color = “#0f4958”)
```

Or by letting ggOceanMaps handle the projection:

```
bm +
   geom_density_2d(
    data = ggOceanMaps::transform_coord(GBIF),
    contour_var = “ndensity”
    aes(x = lon.proj, y = lat.proj,
        color = after_stat(level)))
```

Tromsø

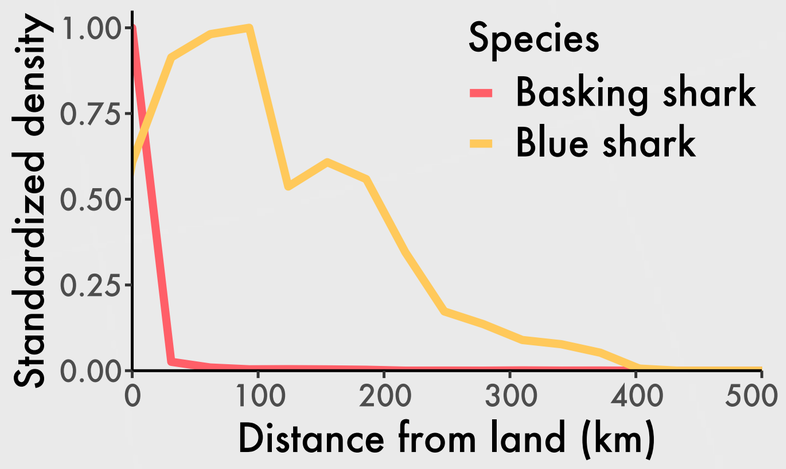
Dugnad for havet is a marine citizen science program run by IMR. People can register their species observations in the portal. The data are validated by experts and available online. These data will be used in the **Sharks on the Move** project to model habitat of **basking sharks**.

Greg Skomal, NOAA Fisheries Service (CC0, Wikipedia)

5. **qmap()** is a shortcut to plot a basemap and automatically add data on it:

```
qmap(
   data = DugnadForHavet,
   color = I(“red”), # escape constants with I()
   size = amount, # column names to aes variables
   alpha = I(0.5))
```

6. **dist2land()** calculates distance of data points to land shapes in ggOceanMaps:



The distance from land for basking shark (red) and blue shark (yellow) observations within the background map area downloaded from GBIF and calculated using the dist2land() function.

7. The **references** together with information on setting map **limits**, **projections**, **detailed bathymetries** and other topics are available on the poster **website**.

Background map: reported occurrences of basking (*Cetorhinus maximus*, red) and blue shark (*Prionace glauca*, yellow) from DfH and GBIF, respectively. Dots indicate occurrences, size the number (for basking shark), and the contour lines kernel densities.The map has been made with ggOceanMaps and ggplot2. The code is available on the website.

The **developer**, Mikko, is a numeric ecologist and scientific diver working as a researcher with population ecology and assessment of deep-sea and cartilaginous fish.

70°N
60°N
50°N
40°N
10°W
0°
10°E

This poster was made with ggOceanMaps version 1.3.0