

# Instructions for generating a cruise report from the Barents Sea Ecosystem Survey

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## Installation of R, R Studio, Rtools and latex

If these tools are not installed on your laptop, take the following steps:

- Install R from <https://cran.uib.no/>
- Install R Studio from <https://rstudio.com/products/rstudio/download/> (R Studio Desktop, free version)
- Download Rtools from <https://cran.r-project.org/bin/windows/Rtools/>
- Install Rtools (you may need to run the installer as administrator)
- Open R Studio (as administrator if you needed this to install Rtools)
- Install latex (TinyTex) by running the following commands in the Console window (bottom left window) in RStudio:

```
install.packages("tinytex")
tinytex::install_tinytex()
```

- Restart R Studio (as administrator)
- Choose File -> New File -> R Markdown... Choose Pdf format and click OK.
- Save the file (anywhere)
- Click the knit button at the top of the document.
- If a window appears prompting you to install packages, click yes. When the installations are complete you should be able to knit the document to pdf and can proceed to the steps below.
- If you successfully knitted the test document but get an error about missing latex installation when knitting the report file, try running R Studio as administrator.

## Create a project and folder structure

1. Create a new R Studio project.
2. Download the cruise report script *Report.Rmd* from <https://github.com/jofall/Cruisenotebook> and place in project directory (or fork/download the entire repository).
3. The script requires a specific folder structure for storing the cruise data. Create these folders in the project directory:
  - Data
    - Acoustic
      - \* Integrated
      - \* Channels
    - Biotic
    - Bird
    - CTD
    - Track
    - Whale

- Definitions
- GeoData

For acoustic, biotic and track data, it is also possible to replace the folder structure with paths directly to the location of data on the server on board. This way, the files in the script will be updated automatically when you knit the file. However, CTD data cannot be read directly from the server location with this version of the script (as there are several different types of .cnv-files and the current code looks for files with this extension).

4. Download the HI logo from <https://hinnsiden.no/tema/profiltorg/LOGO/HI%20logo%20farger%20engelsk.jpg> and place in project directory (optional, but see information below on how to avoid an error if you do not include the logo).

## Gather data

Collect the following cruise data from the server on board/the Cruisenotebook github:

1. Acoustic data: *ListUserFile03.txt* and *ListUserFile16.txt*. If these reports have not been created, export them from LSSS.
  - Example path to acoustic reports on Johan Hjort: `//nas1-jhjort/CRUISE_DATA_YEAR/cruise_name/ACOUSTIC/LSSS/REPORTS/`
  - Place in “Acoustic” folder.
2. Trawl data: The .xml file exported from Sea2Data.
  - Example path from Johan Hjort: `//nas1-jhjort/CRUISE_DATA_YEAR/cruise_name/BIOLOGY/CATCH_MEASUREMENTS/BIOTIC/`
  - Place in “Biotic” folder.
3. Seabird data: Data sheet from bird observer (ods-format, if other format change code for reading in this file at line 1732 in the script) and the file “*Field sheet, Methodology, species codes NINA.xls*”. Place in folder “Birds”.
4. CTD data: *ctdsort.cnv*-files (one for each CTD cast).
  - Example path from Johan Hjort: `//nas1-jhjort/CRUISE_DATA_YEAR/cruise_name/PHYSICS/CTD/CTD_DATA/`
  - Place in “CTD” folder.
5. Definitions: This is a file used for reading the biotic xlm-data. Download *bioticv3* from <https://github.com/jofall/Cruisenotebook> and place in folder “Definitions”.
6. Map data: depth contours for plotting. Download the file *ETOPO1\_nm4.csv* from the github repository and place in folder “GeoData”.
7. Cruise track data: .csv-files (one for each day).
  - Example path from Johan Hjort: `//nas1-jhjort/CRUISE_DATA_YEAR/cruise_name/CRUISE_LOG/TRACK/`
  - Place in “Track” folder.
8. Whale data: Excel-file with sightings and the *Miljø.log*-file (from either the starboard or port side) from the whale observers. Place in “Whale” folder.

NB! It is important not to place other files in these folders, as the code is based on loading files with specific file extensions.

## Change or check the following in the script to adapt the report to specific survey areas and species in the catch

Line numbers refer to the file *Report\_BEES.Rmd*

1. Remove line 3 if you do not wish to have the HI logo.
2. Change title and author.
3. Check the r packages specified in the second r code chunk (lines 23-25), and install any packages you do not have on your computer.
4. Lines 40-42: specify the extent of your survey area and the depth contours you would like to show in map plots.

### **Trawl data**

5. Load packages by running lines 23-25 (without knitting the whole document!), then run lines 48-72. Run `unique(dataset$Station type)` and check that the gear definitions on lines 75-83 correspond to those used in your cruise. If not, change the definitions. At line 86 I remove test stations that are not part of the official survey, remove this line or adapt to your needs.
6. Check if you are using any other trawls than those specified at lines 495-497, if so add them/modify. Change also the gears at line 501 if necessary.
7. Lines 620-733 contain code for plotting catches of different species on a map, by gear type. For each species, two sets of plots can be produced - one showing catch rates in biomass/nmi and one showing numbers/nmi. Select which species you want to plot by changing the “species <-” argument at line 628. Select whether you want to plot numbers, biomass or both at lines 639-640. The figure size (same for all figures) can be adjusted using the “fig.width” and “fig.height” arguments at line 626.
8. Lines 749-750: specify the species that you wish to plot length distributions, length-weight relationships, and length-age relationships for. Here they are divided into larger (demersal) and smaller (pelagic) species. Note that age data will not be available early in the survey, and will later only be available for species whose otoliths are read on board.
9. Line 804: This inline code summarises the total distance of scrutinized acoustic transects, accounting for the possibility of a reset in the log values, i.e., that the log reaches 10000 and then starts over from 1. No change necessary.
10. Line 806: In this section it is possible to add screenshots from LSSS (or other images) in case you find particularly interesting or unusual echograms. The screenshot must be placed in the project directory, and the filename inserted within the brackets on line 808. The figure width can be adjusted within the curly brackets.

### **Acoustic data**

11. Line 818: For acoustic plots, the maximum bubble size can be adjusted here.
12. Line 821: Change year manually in case you are using this script to plot data from a past year, or use code on line 822
13. Line 823: This script selects data from the 38 kHz frequency, which is what is normally exported from LSSS. Change here if you are looking at other frequencies.
14. Line 836: If you want other names for the acoustic categories than the (usually) Norwegian output from LSSS, specify labels here. “Comment out” or delete lines 836-842 & 978-980 and change the names to Norwegian at lines 869 and 889 if you don’t want to change the names.
15. Line 847: Check name of survey and vessel.
16. Line 869/889: Specify names of pelagic/demersal acoustic categories that you want to plot on a map.

### **CTD**

17. Line 1150: Choose the maximum depth for plots of density and irradiance.

## Whales

If you do not have whale data, “comment out” or delete lines 1207-1318.

20. Line 1220: If other species have been observed, specify names here.
21. Line 1248: This line was required to clean some old entries from the file that belonged to a different cruise. “Comment out” or delete if this does not apply to your cruise.
22. Lines 1286-1317: These plots assume that you are in an area where white-beaked dolphins are much more abundant than the other species, and they therefore get their own plot. If this does not apply, the two plots can be combined into one by deleting the second block of code and removing “%>% dplyr::filter(!species ==”White-beaked dolphin“)” from the first plot.

## Birds

If you do not have seabird data, “comment out” or delete lines 1327-1500.

23. Lines 1415-1436: These two figures show histograms of the total number observed, by species. As some species occur in higher numbers than others, one figure shows species that are more abundant while the other shows those occurring in lower numbers. The split between the figures can be specified at line 1416
  24. The last set of figures show the spatial distribution of bird observations. These are divided into three plots based on observed numbers - low, medium, and high. The split between these three plots can be adjusted at lines 1459, 1477, and 1494 (e.g., “filter(maxN>25)”).
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