

Use of FerryBox data to complement environmental monitoring and fisheries surveys on the RV Cefas Endeavour

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Genoa Aquarium



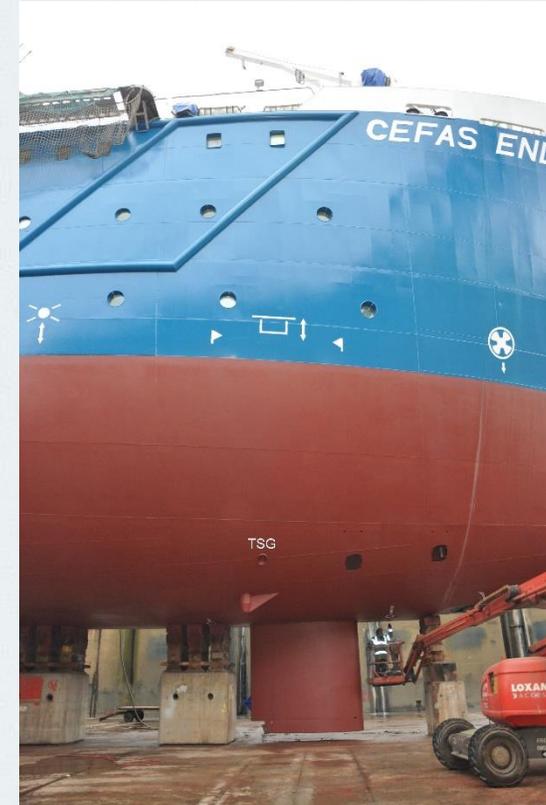
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Cefas

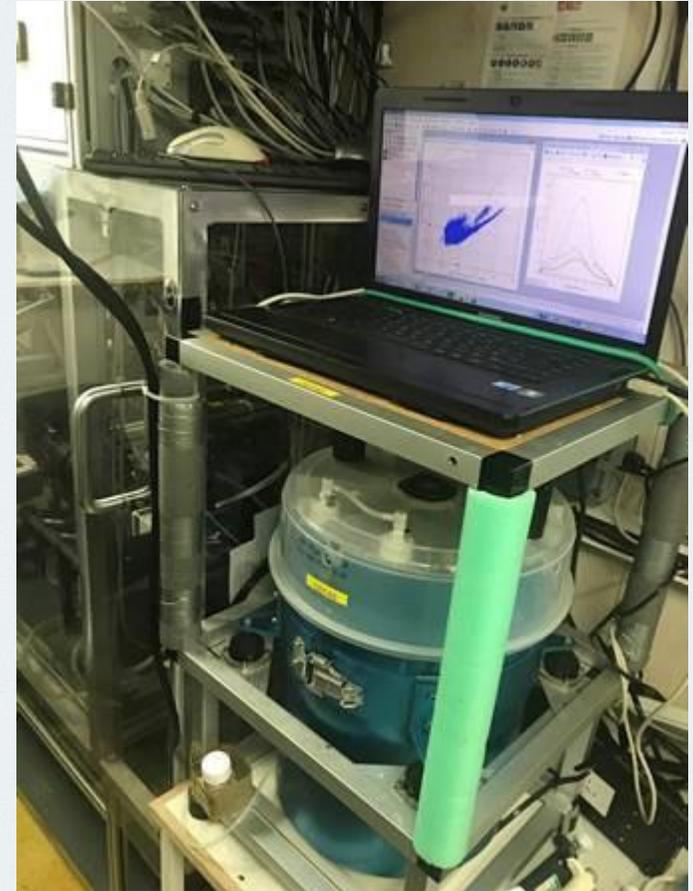
RV Cefas Endeavour



The FerryBox

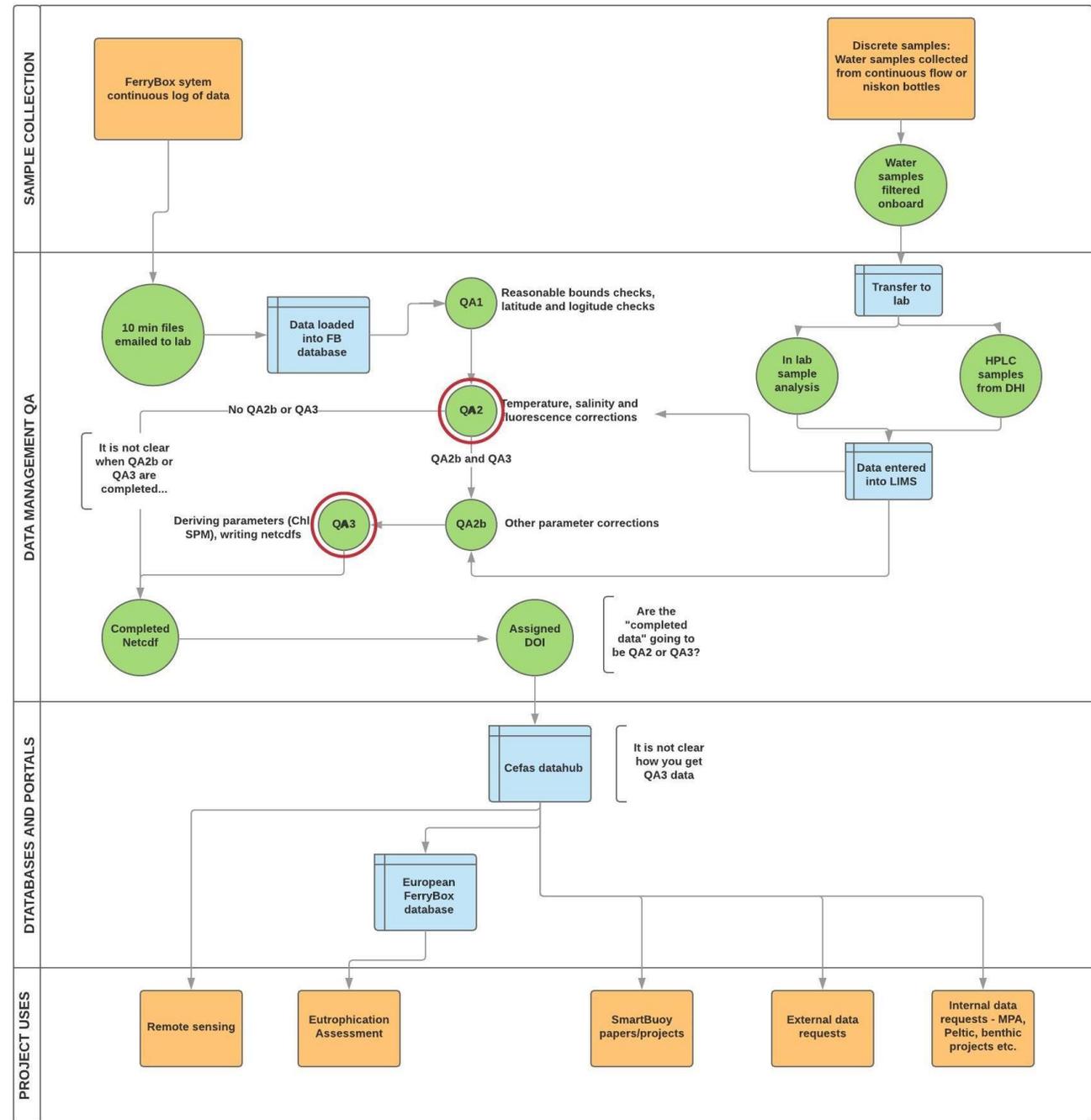


- Continuous intake of water from approx. 4m depth
- Sensors for temperature, salinity, fluorescence, turbidity, oxygen
- External sensors for PAR and hull temperature
- Meteorological sensors measuring air temperature, pressure, humidity, wind speed and direction
- Can attach other instruments e.g. flow cytometer, litter and plankton sampler, water sampler, FRRF.



Ferrybox

- New QA system:
 - QA1 – correcting locations, checking flow rates, removing out of range data
 - QA2 – applying corrections and calibrations to temperature, salinity, PAR, fluorescence etc
 - QA3 – deriving chlorophyll and SPM
- Assigning QA flags to the data for bad flow etc



Laboratory Lowestoft offices SOP (number) date

Cefas
Laboratory ()

Standard Operating Procedure
^ (SOP number)
(Issue number)

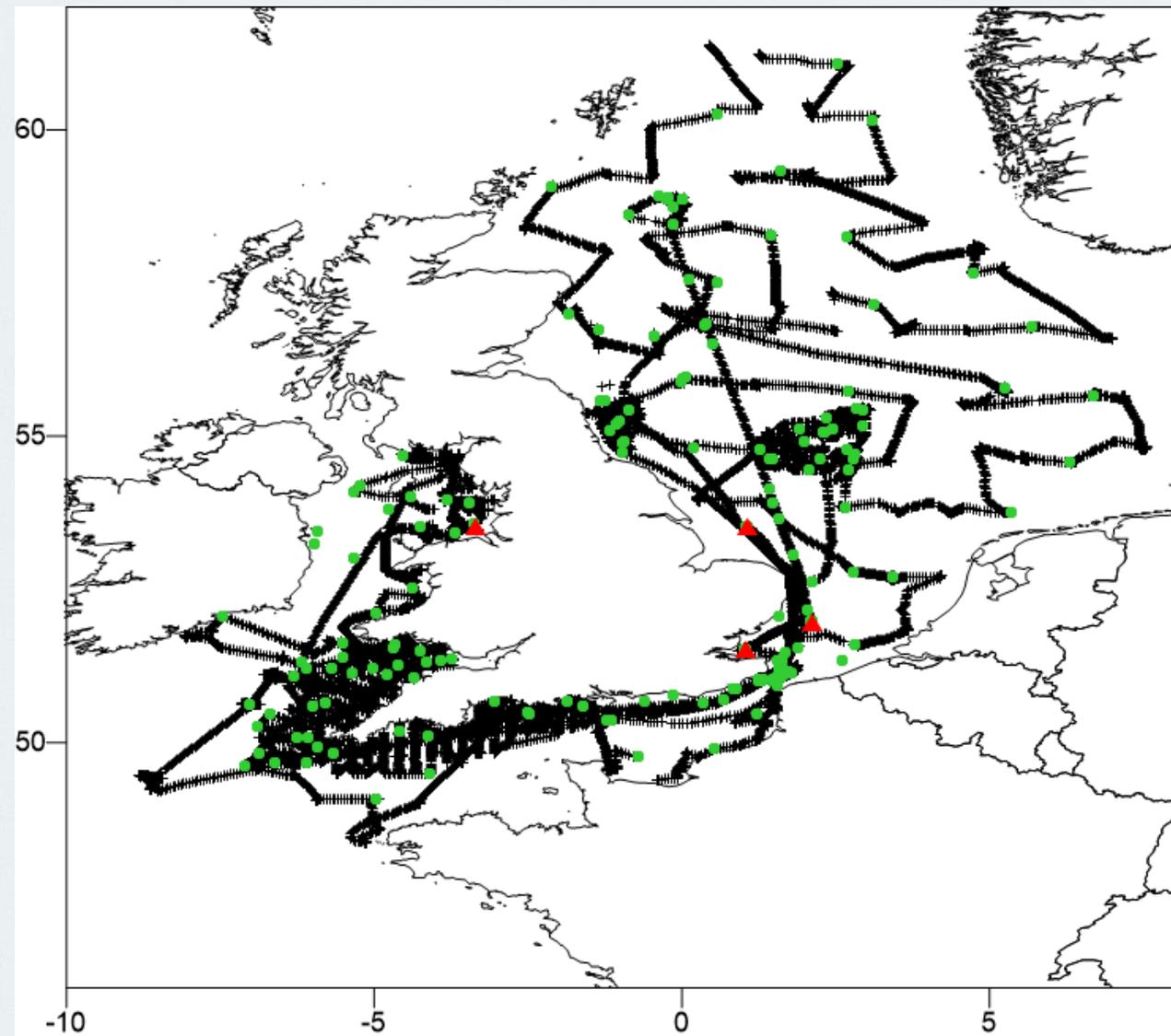
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Standard Operating Procedure
(SOP number)
(Issue number) IN 001

Survey locations

- Surveys cover the North Sea, English Channel, Celtic Sea and Irish Sea
- The RV has several repeat surveys each year visiting the same place – e.g. summer IBTS, autumn pelagic survey, SmartBuoy surveys etc
- Water samples are taken from the flow through intake for calibration of the FerryBox and to obtain parameters that we do not have sensors for (e.g. nutrients)
- Samples were collected manually until recently



Cefas water sampler



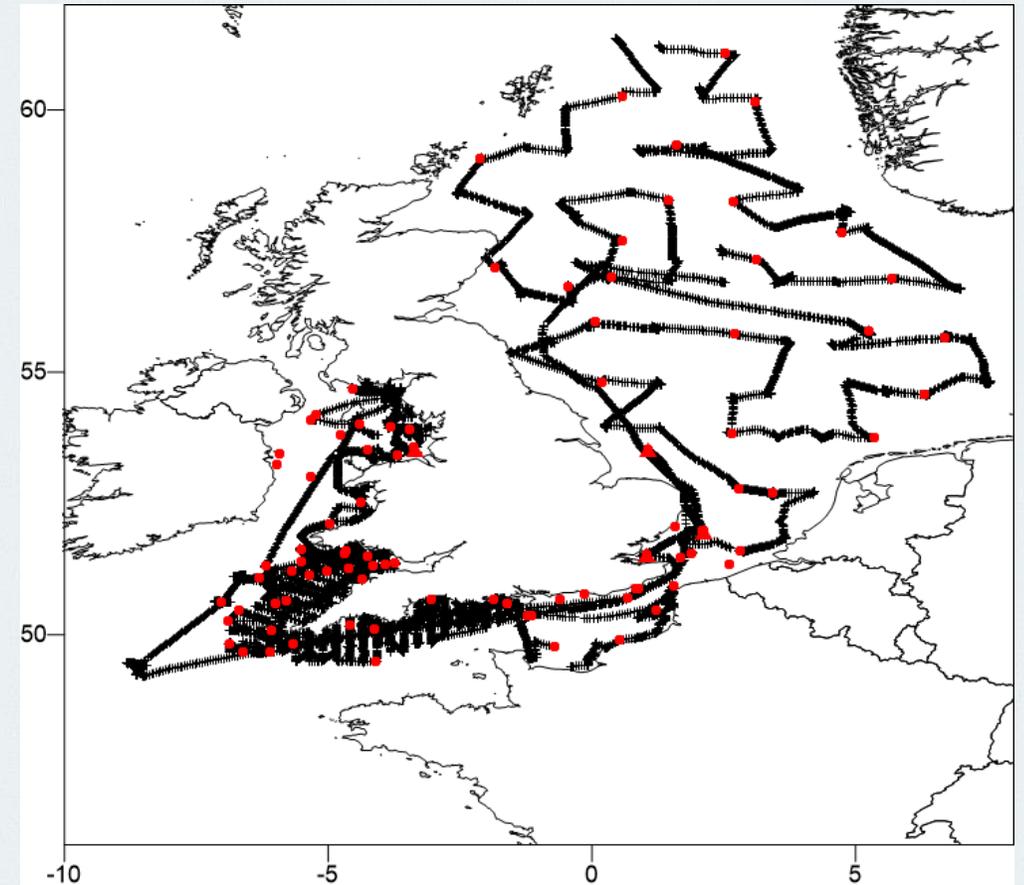
- Compact design
- Up to 16 bag capacity
- Multiple bag size options
- Previously deployed on the CPR, routinely deployed on the SmartBuoy
- Currently under testing on RV Cefas Endeavour as part of the FerryBox system.
- Samples have been analysed for TOxN and Si (bags spiked with mercuric chloride) and phytoplankton species composition and abundance (bags spiked with Lugols iodine).

What can we use the data for?

- To complement data collected as part of a survey
- To fill gaps in between stations and get a broader picture
- To obtain data for core parameters on all surveys rather than only on specific ones
- Cross checks against other instruments – e.g. profilers
- Currently the two biggest users are:
 - Eutrophication monitoring
 - Pelagic fish survey

Eutrophication monitoring

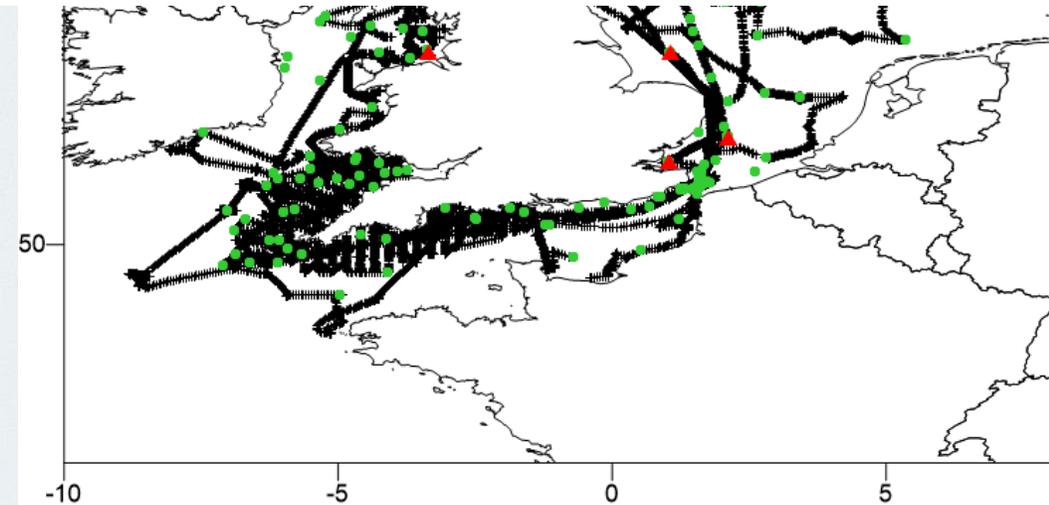
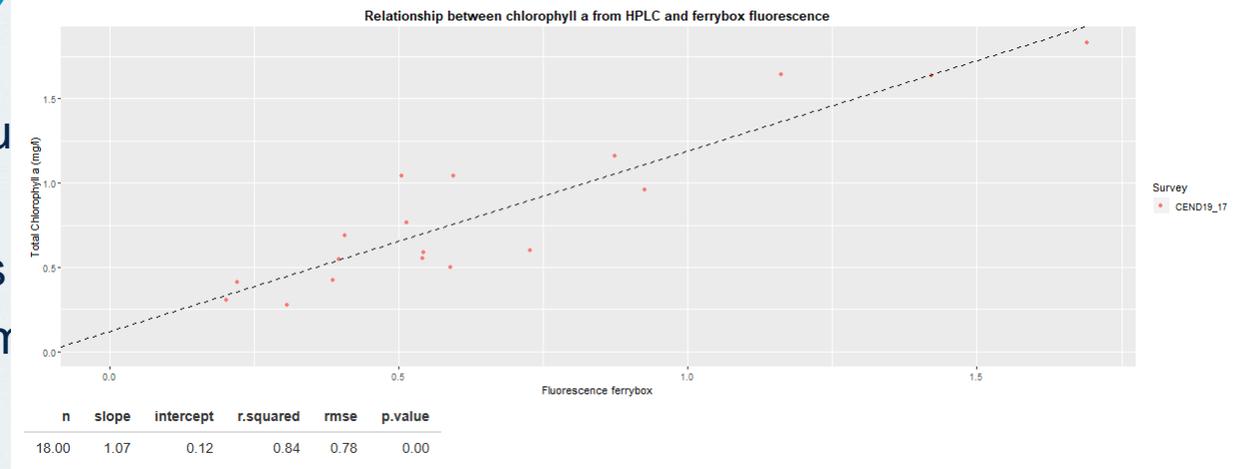
- Previously eutrophication monitoring consisted of surveys specifically for collecting relevant data and a network of SmartBuoys with frequent changeovers and 24hr calibration.
- Funding cuts mean this has now been reduced to four SmartBuoys in key locations (likely to be cut further) and no winter nutrients survey.
- The FerryBox can run wherever the ship goes so can collect data in any location where there is an existing survey.
- The water sampler can be programmed to take regular samples (e.g. daily nutrients samples) or staff on board asked to manually collect samples from the flow through intake.



Ship track for 2014 with daily oxygen samples

Eutrophication monitoring: chlorophyll

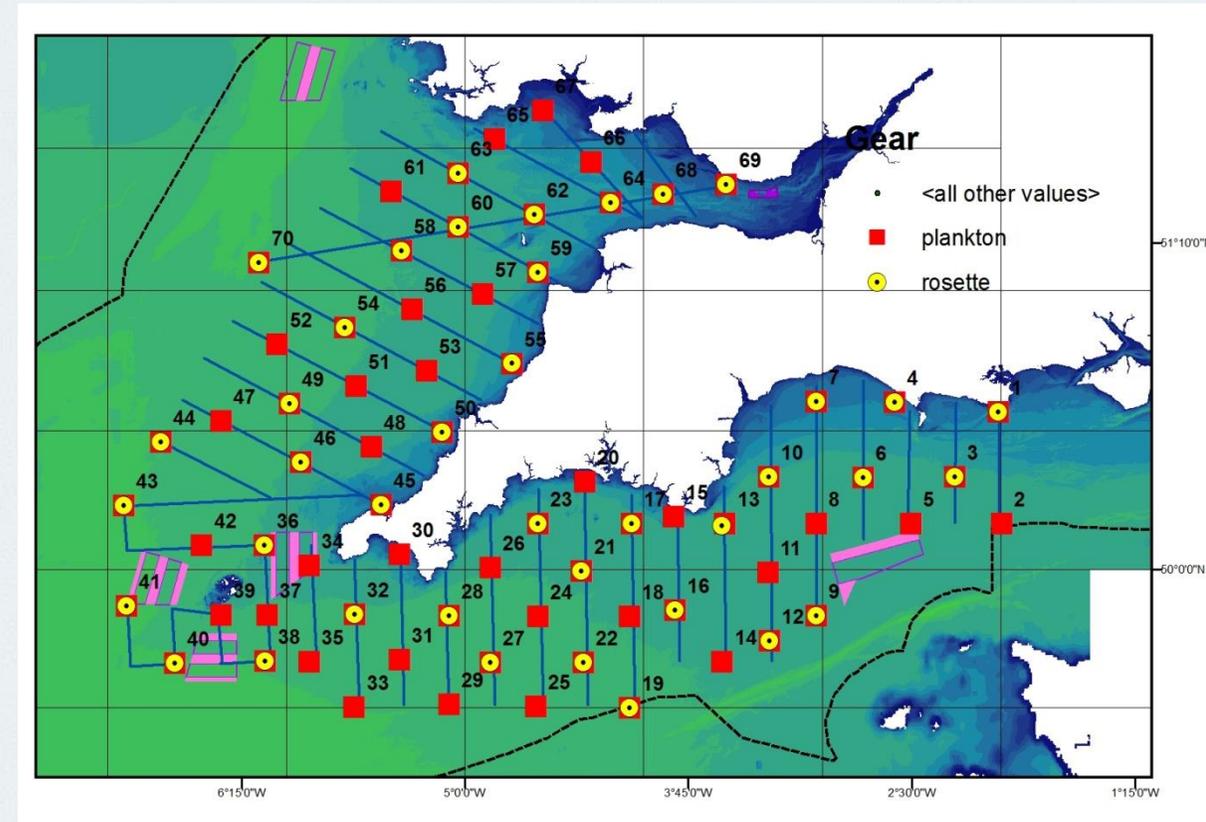
- The FerryBox measures fluorescence continuously but relationship between chlorophyll fluorescence and chlorophyll concentration is not constant and changes depending on the location, season, phytoplankton community and other factors.
- Currently we only convert to chlorophyll concentration on surveys with sufficient discrete chlorophyll samples to obtain a good relationship.
- Ideally we will develop a model based on all of our previous data to predict the relationship for surveys with insufficient HPLC samples.



Ship track for 2014 with daily chlorophyll samples

Pelagic survey

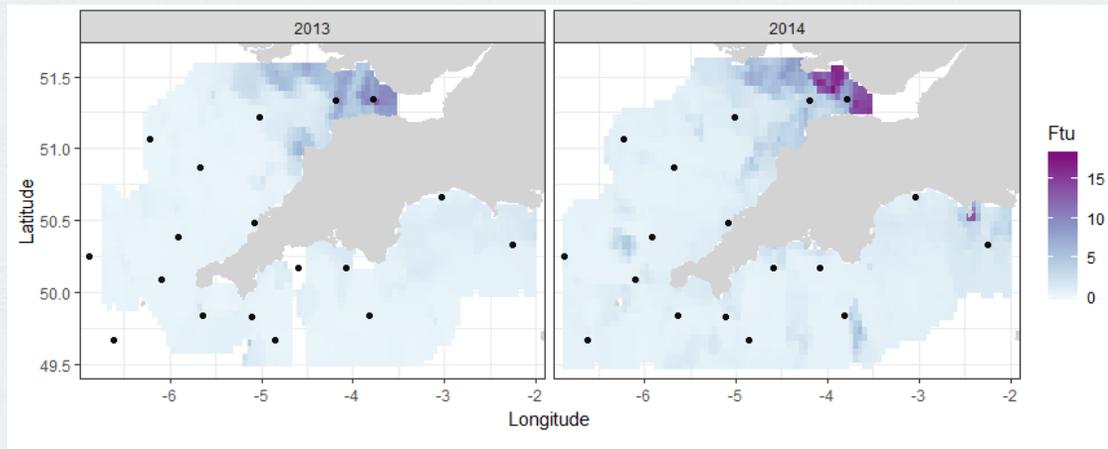
- Autumn survey in the Western English Channel and Celtic Sea from 2012-present
- Focussed on understanding of pelagic fish and their drivers but interested in everything from picophytoplankton to fin whales.
- Data collected:
 - Temperature, salinity, chlorophyll, oxygen, nutrients, plankton, fish, marine mammals and birds
- Using nets, profilers, acoustics, observers, water samples and **FerryBox!**
- The survey has 70 stations of which 18 key stations collect all parameters.



Pelagic survey

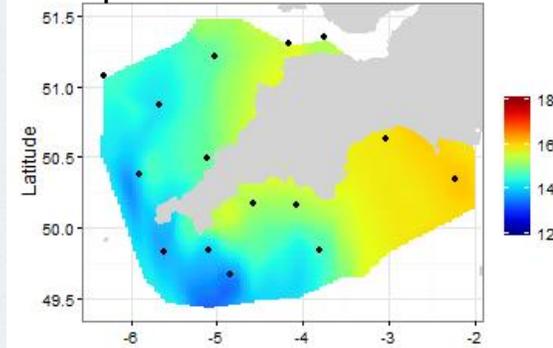
- From the FerryBox data we can interpolate to get maps of each parameter over the study area

Turbidity

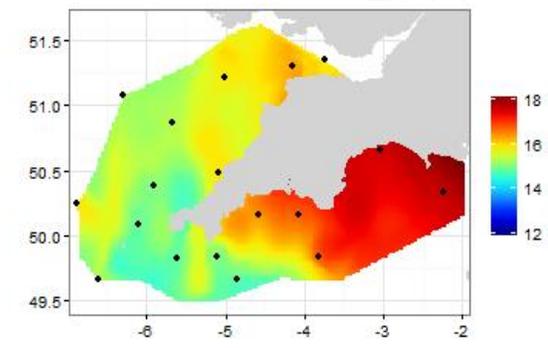


Capuzzo et al. in prep

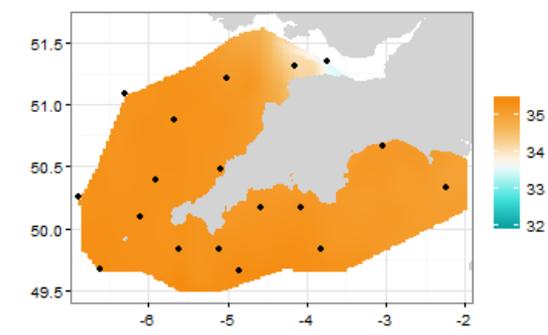
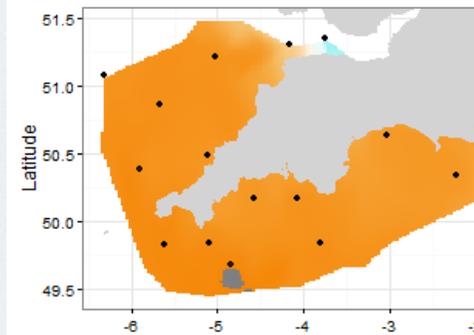
Temperature 2013



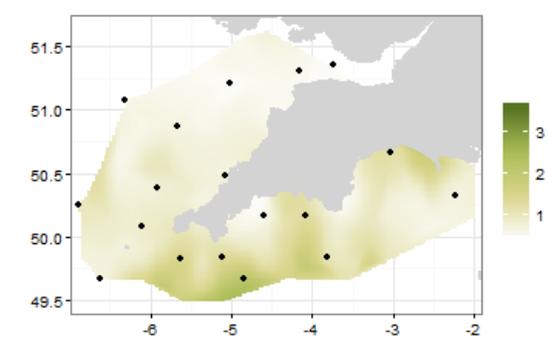
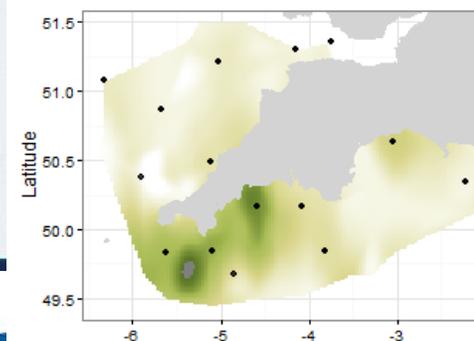
2014



Salinity

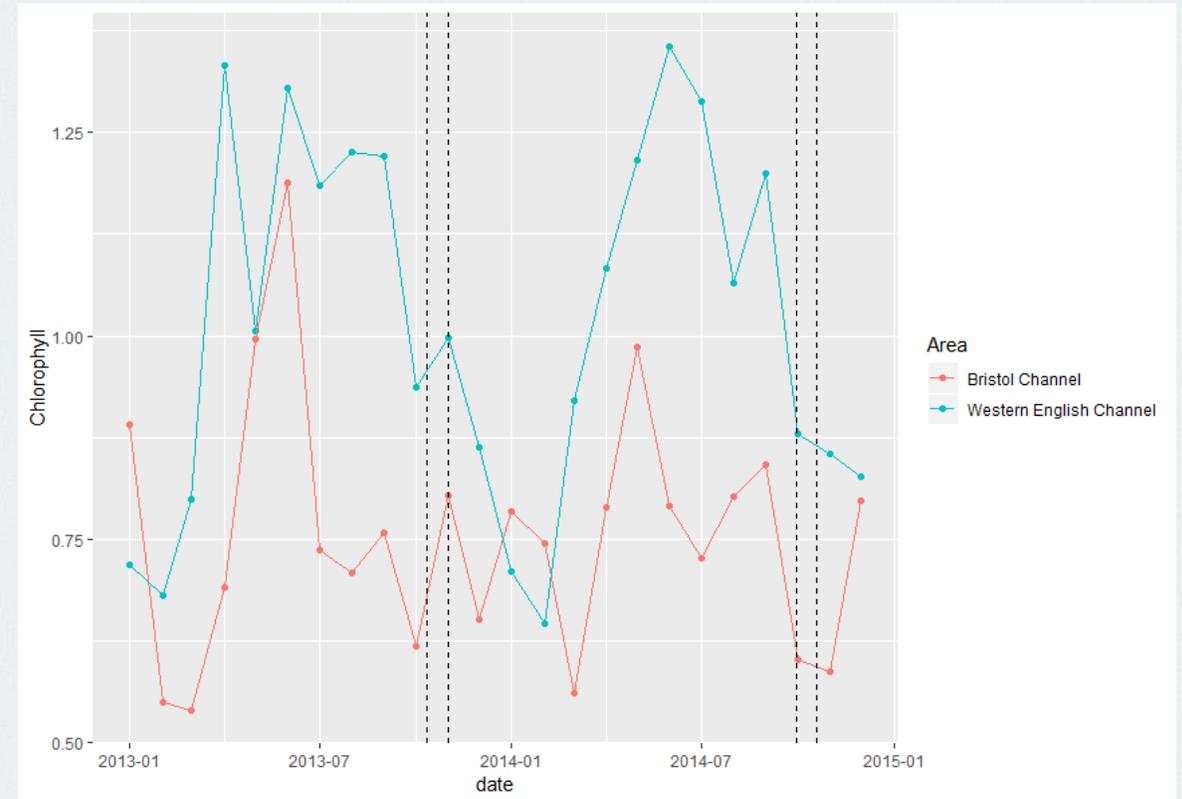
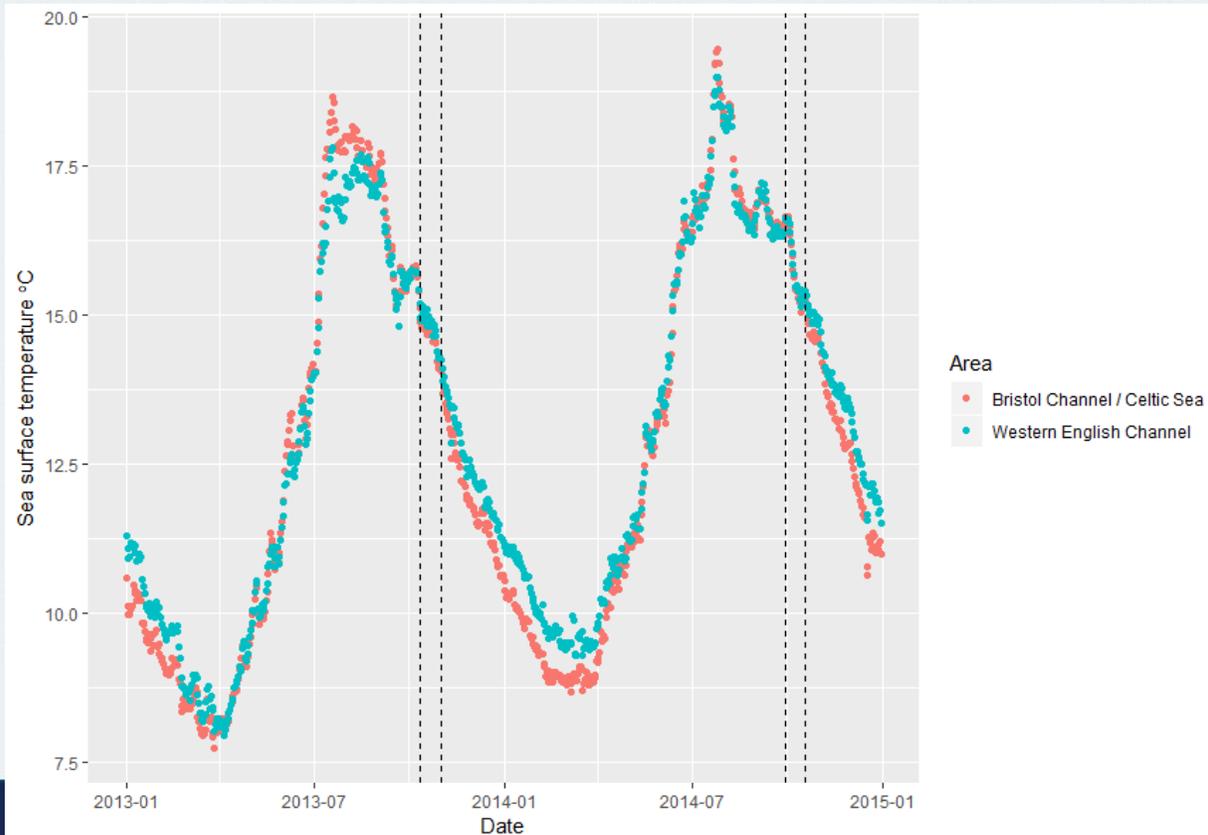


Chlorophyll



Pelagic survey

- Additionally we look at satellite data to put the survey into context over the rest of the year



▲ Monthly average chlorophyll concentrations in the Bristol Channel/ Celtic Sea survey area and the Western English Channel survey area, determined from CMEMS product `OCEANCOLOUR_ATL_CHL_L3_REP_OBSERVATIONS_009_067-daily`.

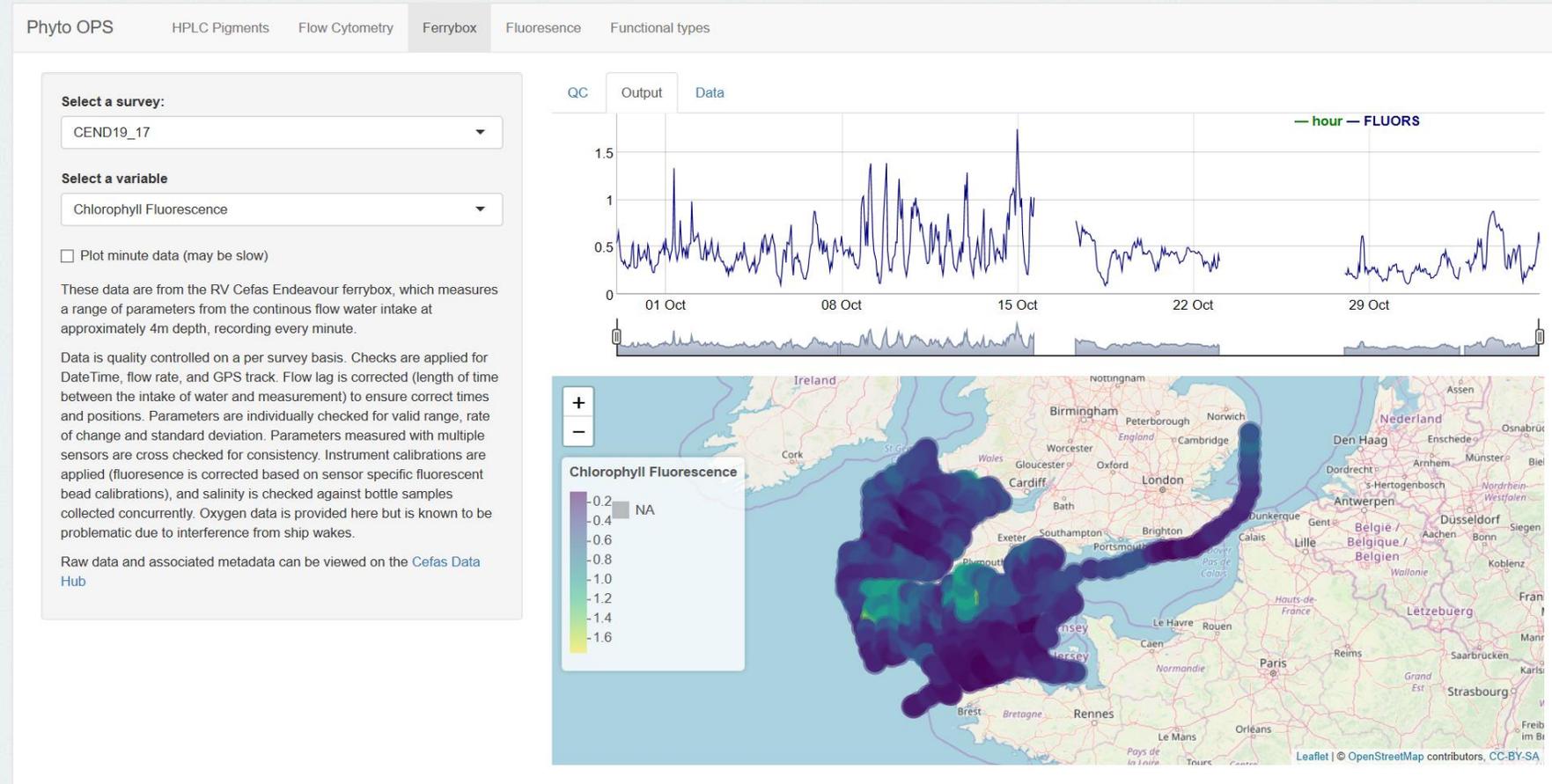
◀ Daily sea surface temperature in the Bristol Channel/ Celtic Sea survey area and the Western English Channel survey area, determined from CMEMS product `SST_GLO_SST_L4_NRT_OBSERVATIONS_010_001-daily`.

Future development

- Ferrybox is from 2009 and in need of replacement – will happen in next year
- Will add AOA for algae and CDOM
- Integration of water sampler
- Development of QC/QA procedure and publication of QCed data
- App to view ferrybox data in real time
- PhytoOPS app

PhytoOPS – poster at top of stairs

- Ferrybox data once QCed will be available on the [Cefas data hub](https://openscience.cefas.co.uk) to download.
- PhytoOPS – Phytoplankton Observations Products and Services is a shiny app where data from ferrybox, HPLC and flow cytometry can be explored and visualised
- <https://openscience.cefas.co.uk>



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