

RESEARCH VESSEL SURVEY REPORT

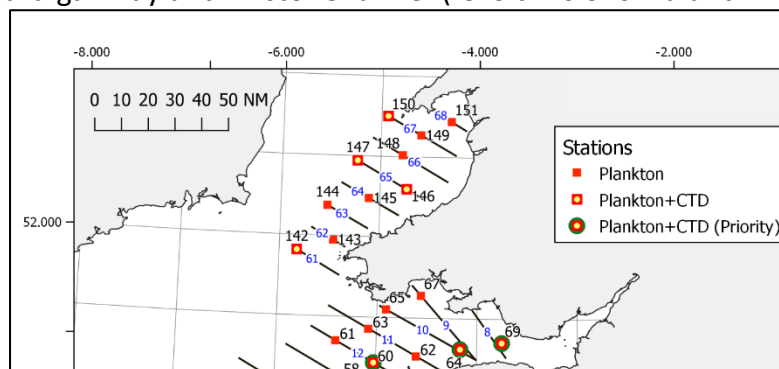
RV CEFAS ENDEAVOUR
Survey: C END 3b - 2023

STAFF:

Name	Role
Jeroen van der Kooij	SIC/Acoustics
Fabio Campanella	SIC/Acoustics
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Amy Mace	Zooplankton
Aimee Cuskeran	Zooplankton
Louise Straker Cox	Fish
Ian Woodgate	Population structure
Peter Howlett	ML Observer
Robin Langdon	ML Observer

DURATION: 13-17th March (5 days)

LOCATION: Cardigan Bay and Bristol Channel (ICES divisions 7.a and 7.f, respectively)



AIMS:

1. To carry out a one-off integrated pelagic survey in Cardigan Bay in March (postponed from October 2022 due to technical issues) for the Welsh Government; estimate the biomass of-, and gain insight into the populations of the small pelagic fish community including sprat (*Sprattus sprattus*), sardine (*Sardina pilchardus*), mackerel (*Scomber scombrus*), anchovy (*Engraulis encrasicolus*), horse mackerel (*Trachurus trachurus*). Timing of the survey is focussed on presumed spawning period of sprat.
 - a. To carry out a fisheries acoustic survey during daylight hours only using five operating frequencies (38, 70, 120, 200 and 333 kHz) to map and quantify the small pelagic species community.

- b. To conduct approximately eight trawls targeting small pelagic species using a 20x40m VDK herring (mid-water) trawl in order to obtain information on:
 - Species and size composition of acoustic marks
 - Age-composition and distribution, for small pelagic species
 - Length weight and maturity information of pelagic species
2. To collect biological data (size, weight, age and maturity) on range of data-limited fish species, including European seabass (*Dicentrarchus labrax*), garfish (*Belone belone*), saury pike (*Scomberesox saurus*).
3. To collect plankton samples using two ring-nets with 80 µm, and 270 µm mesh sizes at fixed stations (red squares on map above). Carried out at night by vertical haul:
 - a. Ichthyoplankton (eggs and larvae, 270 µm) of pelagic species will be identified, counted and (in case of clupeids) staged and measured onboard (where possible) to identify spawning areas.
 - b. Zooplankton (80 µm) will be stored for zooscan analysis back in the lab.
4. Water column sampling (yellow stations on map below). At fixed stations along the acoustic transect, a CTD (either an ESM2 profiler or a Seabird mounted on a Rosette sampler) will be deployed to obtain measurements of environmental properties within the water column. Water column profile and water samples will provide information on chlorophyll concentration, dissolved oxygen, salinity, temperature, turbidity, and dissolved inorganic nutrients concentration as well as the relevant QA/QC samples for calibration of the equipment. Water samples will be collected and fixed on board for analysis post-survey. Samples for analysis of the phytoplankton and microzooplankton communities will also be collected at the subsurface at fixed sampling stations.
5. Seabirds and Marine Mammals. Locations, species, numbers and activities observed will be recorded continuously during daylight hours by two Marinelife observers located on the bridge.
6. Ferrybox Continuous CTD/Thermo-salinograph. Continuously collect oceanographic data at 4 m depth during steaming, including chlorophyll concentration (from calibrated fluorescence).
7. Genomic sampling of particular fish species to improve the methodology to assess finfish, pelagic, data-limited, and non-quota UK priority stocks (E. Garnacho/David Murray - Cefas).
8. Record macro-litter observations in the trawl (B. Silburn - Cefas)
9. Photograph (*in situ*), collect (freeze) any isopod and crustacean ecto-parasites (P. Barry – Cefas)

NARRATIVE:

Staff travelled down on 12 March and joined the vessel by 1800h. Weather conditions (force 9 wind and 6m swell) prevented sailing at planned time later that evening. The earliest next available sailing time of 0800h on 14 March was agreed in liaison with the pilot. Prior to sailing, during the morning of 13 March, relevant staff were inducted, after which a muster drill was conducted, followed by the survey debrief. At 0745h on 14 March, the pilot boarded and by 0800h the RV Cefas Endeavour commenced its transit to Cardigan Bay. During the steam it became apparent that a small favourable weather window, previously forecasted for the morning of 15 March and earmarked for calibration of the echosounders, had closed. At this point no suitable conditions were forecasted for the rest of the survey

which meant that calibration was likely postponed until a future survey. The time was spent setting up the gear in preparation for the next day. At approximately 0630h on 15 March the vessel started running the first acoustic transect 67 (from NW to SE) under good weather conditions. During the morning, the RV was alerted that a large area in the centre of the Bay would be inaccessible due to fire exercise by the MOD, affecting Wednesday 15 and Thursday 16 March from 1200h-1600h. Therefore, after completion of transect 67, the vessel steamed to transect 64 (instead of 66), outside the firing zone. The first trawl was conducted inshore and a second trawl offshore, after transect 64 was completed. Few fish schools were observed during the day and both catches were small. Overnight plankton and CTD stations 148, 149, 151 and 150 were completed despite freshening conditions. On Thursday 16 March at 0650h transect 66 was started (offshore), followed by transect 65. Weather conditions had continued to freshen to 40 knots and no trawls could safely be conducted. Due to some careful planning the RV was able to survey in the firing zone before exercises commenced shortly after mid-day. Observations of fish schools on the echosounders remained very low and the vessel therefore continued to survey transect 63, after which the vessel sampled plankton and CTD stations 144, 147, 146, 145 and 143 overnight. At 0633h acoustic transect 62 commenced inshore, with the remaining plankton and CTD station 142 sampled during the day prior to run transect 61. Again, no fish schools were observed on either transect apart from a little patch of small schools to which we returned after completing transect 61, the end of the Cardigan Bay survey area. The remainder of the daylight was used to survey the Welsh component of transect 10 in the Bristol Channel after which the vessel waited off Swansea until the pilot joined and the vessel docked at 0215h on 18 March.

PRELIMINARY RESULTS and METADATA:

Despite periods of fresh conditions, good quality acoustic data were recorded along transects 61-67 and part of transect 10 in the Bristol Channel. However, processing was postponed pending completion of a valid calibration (October). Therefore, no density distribution maps or biomass information is presented here (survey aims #1). Very few fish schools were observed in the acoustic data and this, as well as adverse weather and restricted access to parts of the survey due to firing range drills, contributed to only three trawls being conducted (Fig 1).

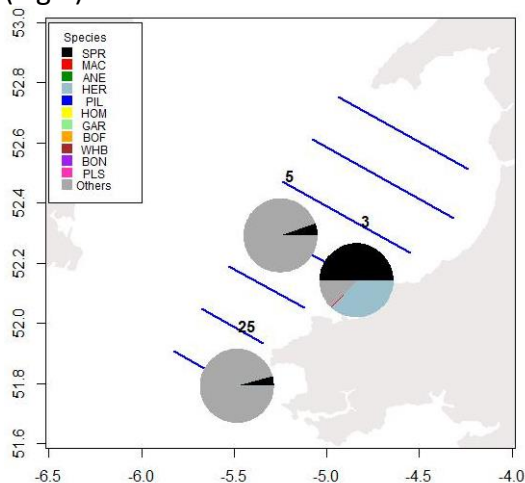


Figure 1. Overview map with Cardigan Bay survey area , showing seven completed transects (blue) and location and relative catch composition of trawls (pie charts). Three letter codes: SPR=sprat, MAC=mackerel, ANE=anchovy, HER=herring, PIL=sardine, HOM=horse mackerel, GAR=garfish, BOF=boarfish, WHB=blue whiting, BON=bonito, PLS=pearlside.

Trawl catches were relatively small but provided useful information on species composition and biological samples from the dominant pelagic fish (Table 1). Sprat *Sprattus sprattus* was the dominant small pelagic fish species, followed by herring *Clupea harengus* with a few individuals of anchovy and sardine. A summary of the biological sampling conducted for each of the pelagic

species is provided (Table 1). Due to the limited trawl catches and some logistic issues, genomic samples were collected from only 12 specimen of sprat (Survey aim #7). Macro-litter was recorded from the trawl catches (Survey aim #8); none of the relevant data-limited species were caught in trawls so survey aim #2 was not completed, and neither was survey aim #9 (parasites). Three sandeels (Table 1), were collected for further identification in the lab and both length and weight were taken of the three specimens of pearlside.

Table 1 Summary of lengths measured and biological parameters (including weight, age, maturity) collected for small pelagic species.

Species	Scientific name	Measured	Biological samples
Sprat	<i>Sprattus sprattus</i>	502	90
Herring	<i>Clupea harengus</i>	210	113
Anchovy	<i>Engraulis encrasicolus</i>	10	9
Sardine	<i>Sardine pilchardus</i>	2	2
Sandeels	<i>Ammodytes sp.</i>	3	-
Pearlside	<i>Maurolicus muelleri</i>	3	-
Mackerel	<i>Scomber scombrus</i>	1	1

All ten planned mesozoo- and ichthyoplankton stations were successfully sampled (Survey aims #3; Table 2). Mesozooplankton samples will be processed by zooscan in the lab. Ichthyoplankton sample processing will be completed in the lab using microscopy. The most notable observations from preliminary analysis of the ichthyoplankton samples aboard were the presence of good numbers of sprat eggs and sandeel larvae.

As planned, at four of the plankton stations, the ESM2 oceanographic logger with additional water sampling by Niskin bottle (Survey aim #4) was conducted (Table 2). The ferrybox system (Survey aim #6) was running continuously and results on surface oceanographic conditions will be mapped once calibrated with discrete water samples.

Table 2. Number of samples collected, and number of profiles carried out during PELTIC 3B/23.

	Total
Salinity (surface and bottom)	9
Dissolved oxygen (triplicates)	4
Chlorophyll/Pigments analysis (HPLC - duplicates)	4
Inorganic nutrients (two methods)	11
Phytoplankton	4
Microzooplankton	4
Mesozooplankton (80 µm)	10
Mesozooplankton (270 µm)	10
CTD profiles with ESM2 logger	4
CTD profiles with SAIV MiniCTD	10

MARINElife mammal and bird observers (Survey aim #5) spent a total of 16.5 hours over three days surveying the seven transects in Cardigan Bay plus a further 1.8 hours on transect 10 in the outer Bristol Channel. A total of 1513 birds of 14 species were recorded during the survey period, with 86% comprising just three species: Kittiwake (244), Guillemot (447), Razorbill (274) and unidentified auks (342). A total of 21 cetaceans in six different encounters were

recorded over the three days: 20 Common Dolphin *Delphinus delphis* and one Harbour Porpoise *Phocoena phocoena*. The observer results were compromised by weather conditions during the survey as both average wind speed (force 5.3) and sea state (5) conditions were above the threshold for reliable data collection. Sea states of more than four adversely impact sightings of cetaceans as it becomes more difficult for a surveyor to pick out more distant animals. Similarly for seabirds the counts of species such as Guillemot and Razorbill – which make up a large percentage of the birds recorded during the survey in Cardigan Bay – and which spend much of their time sat on the sea, are also much reduced. More details will be provided in the full survey report.

Acknowledgement: This survey report was compiled by JvdK with contributions from JS, PH and FC. We would like to thank all scientists, the officers and crew of the RV Cefas Endeavour for their help, support, advice, skill and cooperation, which were critical to the completion of the survey. The survey was funded by the Welsh Government under SRF 83.

Jeroen van der Kooij, Fabio Campanella and Joana Silva
Scientists in Charge
28/03/2023

DISTRIBUTION (restricted pending publication of full report):
Welsh Government