Centre for Environment Fisheries & Aquaculture Science

Cefas

RESEARCH VESSEL SURVEY REPORT

RV CEFAS ENDEAVOUR
Survey: C END 08 - 2021

STAFF:

Name	Role
Karen Vanstaen	**SIC**
Charlotte Reeve	**2IC**
Chris Firmin	**Shellfish scientist/SIC Nephrops**
Rosslyn McIntyre	**Shellfish scientist**
Jo Uzyczak	**Shellfish scientist**
Chris Popham	**Shellfish scientist**
James Scott	**Phd Student**
Rodney Brash	**Marine Ops Technician**

DURATION:
Friday 14th May 2021 departing from Lowestoft (approx. 1142hrs, GMT) until Fri 28th (approx. 1000hrs, GMT) demobbing in Lowestoft. Tuesday 11th till Thursday 13th – quarantine isolation awaiting COVID PCR negative results prior to survey departure. 10:30

LOCATION:
North Sea and Dogger Bank between latitudes 53.50' North and 55.00' North and longitude 1.0' West and 3.0' East. A total of 57 randomised Underwater TV scallop stations across three beds (TV.4.b.A, TV.4.b.B, TV.4.b.C) and 30 North Sea dredge survey locations on the Dogger bank (4.b.3, 4.b.4, 4.b.5, 4.b.6, 4.b.7), and 23 stations inshore N. Sea (4.b.1, 4.b.2) as shown in Figure 1.

AIMS:

1. To optimise STR camera configuration and deployment for scallop UWTV survey
2. To trial a Rayfin camera system in selected areas testing video quality and frequency and quality of captured stills images as a candidate replacement for the main STR survey camera.
3. Estimate scallop abundance using UWTV in selected un-dredged areas to compliment data collected as part of the wider scallop stock assessment in the region (57 stations)
4. As time permits additional survey areas described by existing dredge survey beds (commercial survey due September) are located both inshore and offshore from the priority 1 sites (Figure 1). Prioritization of offshore Dogger bank sites primary and inshore dredge sites secondary.

Other:

5. Collection of Zooplankton sample at West Gabbard if time permits

6. To carry out trials of continuous flow plankton imager device
7. Take daily water samples from the underway supply for filtering and freezing, used for chlorophyll sampling as part of SLA25

Throughout the survey we will be carrying out continuous underway plankton sampling using the plankton imager.

Throughout the survey we will be collecting underway water samples from the Ferrybox. Water samples will be at 04:00 daily and at 22:00 daily, if time permits.

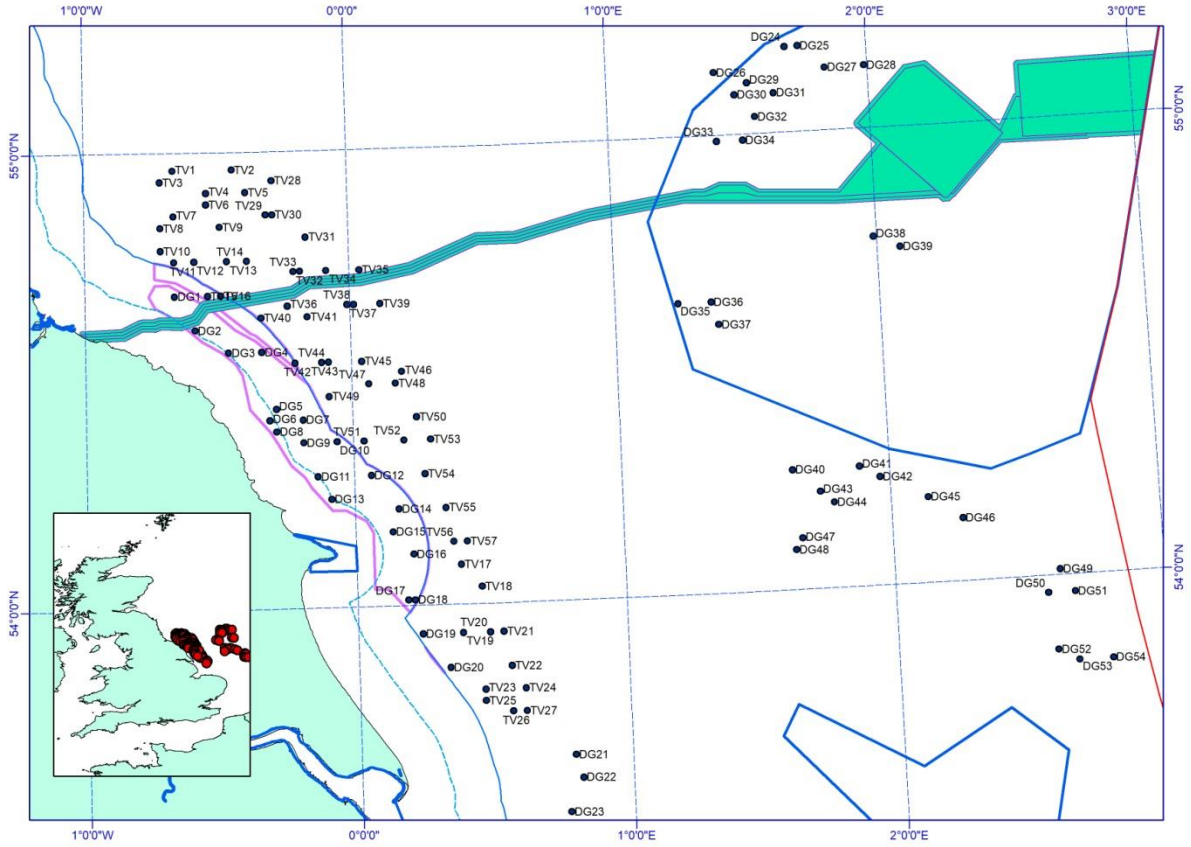


Figure 1. Location of underwater TV scallop survey (TV.4.b.A, TV.4.b.B, TV.4.b.C) and North Sea dredge survey locations on the Dogger bank (4.b.3, 4.b.4, 4.b.5, 4.b.6, 4.b.7), and inshore N. Sea (4.b.1, 4.b.2).

NARRATIVE:

Scientific staff joined the vessel by Wed 12th May 0900 to undertake PCR testing and isolation until negative results returned for all staff and crew. Marine technical operations and contractors completed necessary works to set up camera systems on 12th and 13th to ensure working operations prior to sailing. The vessel sailed from Lowestoft at approx. 1030hrs Friday 14th May, arriving at the first station position at the bottom of the southerly North Sea UWTV grid at 2100hrs (Survey area TV4.b.B).

The STR SeaSpyder drop frame was used throughout the survey and was deployed with a HD video, DSLR-Nikkon stills camera and EMS2 logger (CTDF profiler). Twenty minutes of High-Definition video and HD photo images were recorded at each station.
Deployment of Rayfin HD* and Ultra-4k video and stills with autofocus and rapid stills capability (LED lamp and strobe flash) was trialled in tandem with the STR video during daylight hours where technical and weather parameters allowed the deployment of the Rayfin on a hand-fed umbilical attached to the STR tow wire.
[*Rayfin 4k ultra-HD camera system (1/32500 shutter speed, max frame rate 30 frames/sec, max still rate 4 frames sec. 21 MP zoom/1x10 zoom. Aquorea MK3 LED lamp, 2400 – 15000 lumens, colour 5000k, reaction 109 µsecs. *Ref: Rayfin datasheets*].

Daily CTD drops were performed for multibeam calibration and each station was multi-beamed to observe for any underwater obstructions in the survey tow path prior to tow.

A total of fifty-seven drop camera deployments (including 8 simultaneous STR & Rayfin deployments with manual umbilical feed) were completed over three days on the priority UWTV survey beds (TV.4.b.A, TV.4.b.B, TV.4.b.C). On successful completion, around 1105hrs on the 18th May and the vessel sailed for the survey area North of the Dogger bank (Priority dredge bed 4.b.3).

Prior to arrival on the bank we were made aware of potential (Greenpeace) obstructions (Figure 2) that had been dropped onto the sea bed in the survey area in 2020. We mapped the locations and ensured careful multibeam and EK80 profile review was carried out prior to each deployment to avoid collision with any sub-sea obstructions.

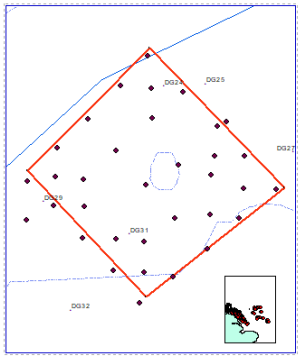


Figure 2. Advised location of possible large seabed obstructions (3t rocks) with potential to impact survey gear.

The vessel commenced operations in survey bed (DG.4.b.3.) at 1648hrs on 18th May carrying out CTD dip followed by multibeam to carefully scan for obstructions in planned tow locations.

In the Northern Dogger bank site, 13 STR drop camera with 6 Rayfin deployments were successfully completed on survey beds (4.b.3 and 4.b.5) prior to the vessel sailing for the southerly Dogger bank survey areas (DG.4.b.4, 4.b.6 and 4.b.7). At these sites, a further 17

STR deployments were completed. Following completion of the remaining stations on the Dogger bank, and with increased inclement weather conditions, we proceeded to steam inshore to the Southerly end of the Nephrops UWTV ground for commencement of this survey in the early hours of Fri 21st May. The aim was to carry out further Scallop Rayfin and STR deployments on the inshore dredge sites after completion of the Nephrops survey, time and weather allowing. However due to these criteria alongside additional equipment failure and down time we were unable to complete any further scallop sites during this survey period on return to Lowestoft.

The vessel docked in Lowestoft at approx. 1040hrs on the 28th May 2021.

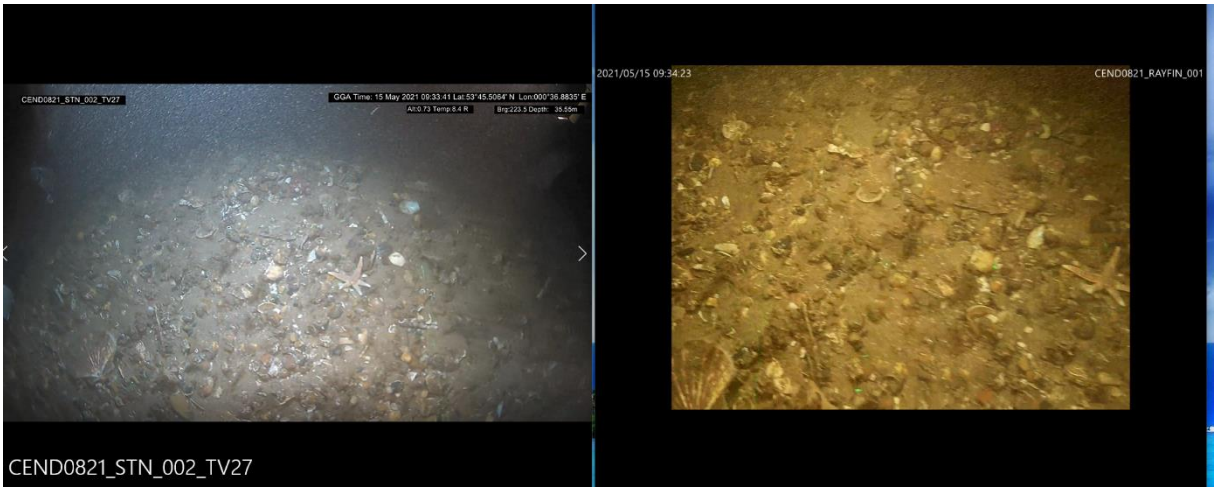
Preliminary stations with Scallop presence/absence is plotted in Figure 3. Approximate estimates of scallop abundance will be calculated following shore side recounts and further analysis of Rayfin footage and data QC processes applied.

RESULTS:

1. HD video and numerous still photo images were recorded for 20-minute transects at a total of 57 TV stations and 30 Dredge stations using STR UWTV and stills techniques. A 20-minute transect at 0.4 knots equates to an observed area of approximately 250m^2. 18 STR stations were co-deployed with the Rayfin camera to test the two systems in tandem.

   Provisional scallop densities in the un-dredged UWTV beds were typically low, with most presence along the Eastern edge of the identified commercial dredge area (Figure 3). Biomass estimates and abundance will be calculated when counts and QC completed shore side and data can be used to inform the wider scallop stock assessment project.
   Presence and abundances were visually more numerous in the most Northern Dogger back bed with highest abundance seen on shell/cultch-dominated substrates in limited delineations between the predominant sand beds.

   Example footage of field of view on the two systems in tandem (with a visible scallop in the bottom left-hand corner) is shown below in **pictures 1a and b.**



Picture 1a and b. Example screen shots from STR video (a) and Rayfin (b) camera systems.

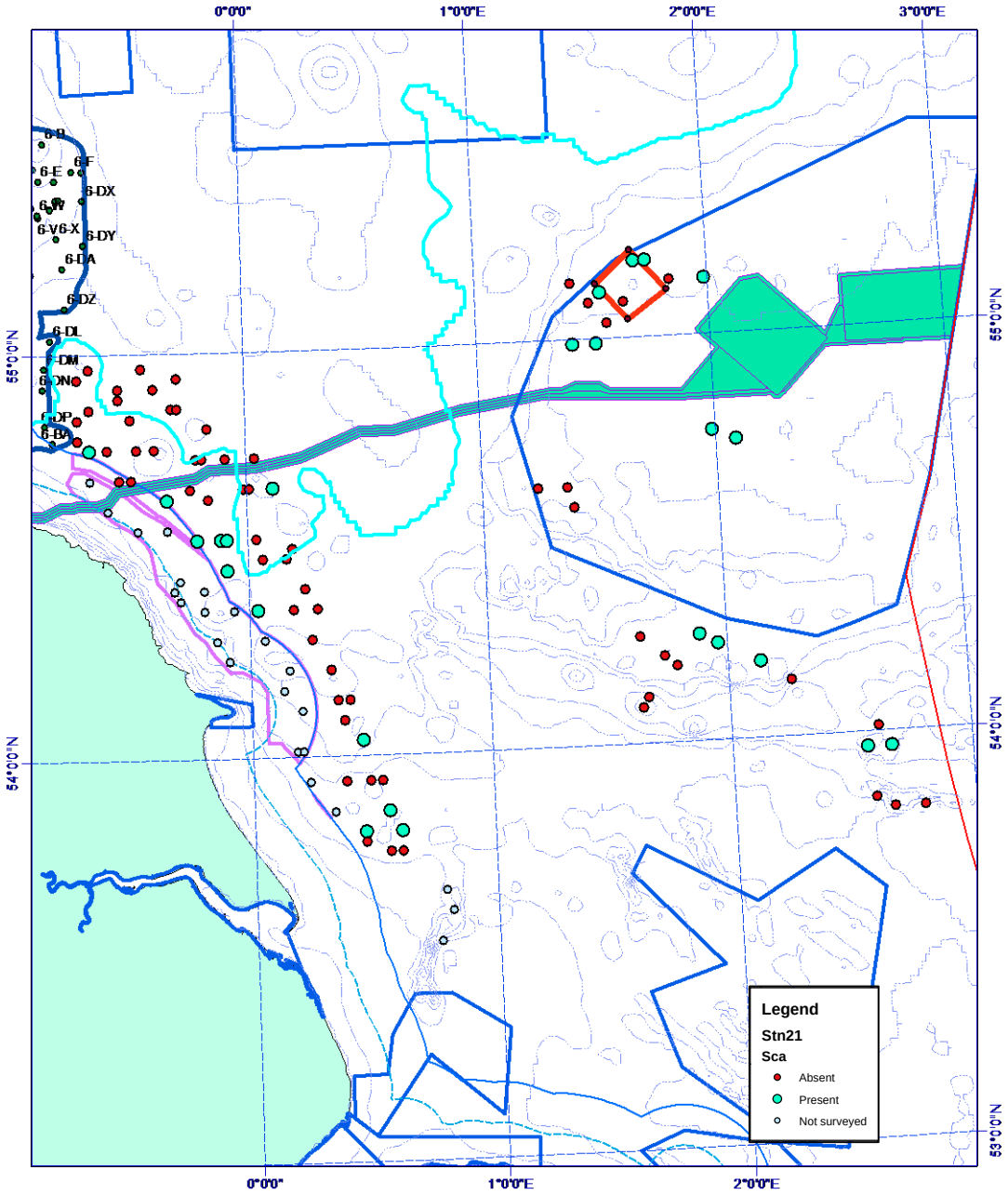


Figure 3. Provisional maps of scallop presence (abundance numbers/100m^2 to follow shore-side QC) from underwater TV survey in scallop survey beds B and E in Western English Channel. Station number indicated.

2. Confirmation of the tow speed of ~0.4 knots to provide readable TV footage whilst maximising ground coverage and retaining visibility of scallops. Increased speed reduced the efficacy of the autofocus function on the camera rendering faster speeds with increased pixilation and reduction of fine detail. Deployment speed specification of 0.4 was used throughout the survey. Slower speeds are required with the drop camera vs the sledge due to it sensitivity to variations in flying altitude with sea movement and heave on the tow umbilical.

3. Images from the Rayfin provided clear stills and video images when stationary. Moving video and images on the Rayfin were not always superior to the STR system when travelling at speeds greater than 0.5 knots or altitudes greater than ~1.2m (~0.7m) above seabed due to perceived impact on autofocus settings. Analysis onshore will define the parameters of this further.

4. The ability to take rapid stills in quick succession was tested with the Rayfin and image rates of 4 frames per second to 1 per second equating to approx. 2-5cm over the ground trialled. These will be reviewed using specific frame viewing software on shore-side to view the stills in real time and will offer exciting new parameters to the review process.

5. Within the tows, review on maximum height for video and stills were trialled. The essential criteria were to have optimum clarity with a maximal field of view (as determined by altitude of flying). Provisional optimal heights for drop camera flying were within the range of 0.25 to 0.75 m with visible effective focal range up to ~ 1.25m (with caveats of speed over ground and focus applied).

6. Different light configurations and settings were tested on the Rayfin to optimise the visibility of scallops. Optimal pre-set light settings on the Rayfin were determined to be 'Incandescent' which provided a cool-blue tone to the image which accentuated white and orange colour ranges (primary scallop shell and mantle colours when visible). Manual settings that reduced the saturation in the red field and increased green/blue assisted in the observation of scallops.

7. The use of strobe lighting for maximum lighting of the field of camera view was not continued due to the visual disturbance to the winch operator flying the system. In operation they are required to visually assess flying altitude and make fine winch alterations when required and it was deemed as not workable to view the footage in real time whilst using continuous strobe. The light from the frame mounted LED lights provided sufficient illumination for a clear image when within optimum altitude ranges.

8. Stored imagery taken on this survey will be investigated at the laboratory and the potential to develop this system for future scallop surveys examined. Of particular interest is the further utility of rapid HD stills images stitched into a mosaic to allow fine detail inspection critical to identify scallop signatures when recessed or covered with sand during UWTV survey.

   Several technical issues were encountered and as many as possible resolved by Cefas marine engineers during survey, however an update to the Rayfin software was identified as critical for synchronisation of program clocks to ships time and program features for both Rayfin and STR. Some further suggestions and optimisations are listed below for implementation prior to next survey deployment.

Implement for next survey:

- Onboard heave compensated winch on drop frame deployments to reduce altitude changes and maximise optimum visual height. (Winch available at Pinbush).
- Additional line laser to create 3-sided box for field of view. Side laser mounts to be in line with maximum frame width to increase field or view area.
- Update of STR/Rayfin software systems to optimise synchronisation with ships timing and GPS systems.
- Investigate hire of fresh water lens and lower lighting mount to reduce reflection from suspended particles, plankton and marine snow, clarifying field of view.
- Fabricated neutrally buoyant drop frame/video/ROTV with thrusters, fibre-optic subsea mux (e.g. McCartney Mux Nexus 6, Rayfin, Imenco, Bowtech, Cathex systems) to allow standardised review altitude, stable field of view platform with height of consistency for focus. In-frame heave-compensated camera frame mount could allow deployment in more varied weather if heave-compensating winch not in use on umbilical. Marine Ops to undertake fabrication this FY.
- Trial image stitching software to allow mosaic replay review of stills post-processing.
- Utility of overlays (and tower) to include altitude and speed over ground on locational fixes.

Karen Vanstaen
Scientist In Charge
28th May 2021

SEEN IN DRAFT
Master
Senior Fishing Mate

DISTRIBUTION:
SIC, SIC (Nep), 2IC , Marine Ops, Andrew Lawler Program Investigator

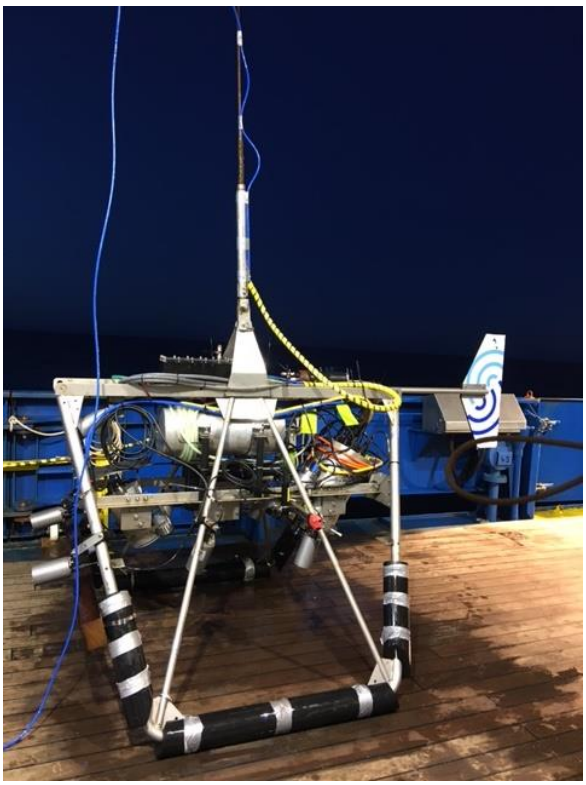
Ewen Bell Snr Fisheries Scientist

Appendix A – STR Drop camera and Survey locations

GEAR:

STR SeaSpyder drop frame camera system with HD video and stills. The drop frame will be towed with the tide at 0.4 knots approximately 0.5m off the seabed for 20 minutes at each site.

Rayfin camera system will be fitted to available frame and trialled at selected sites with hand deployed umbilical attached to main drop frame tow line.



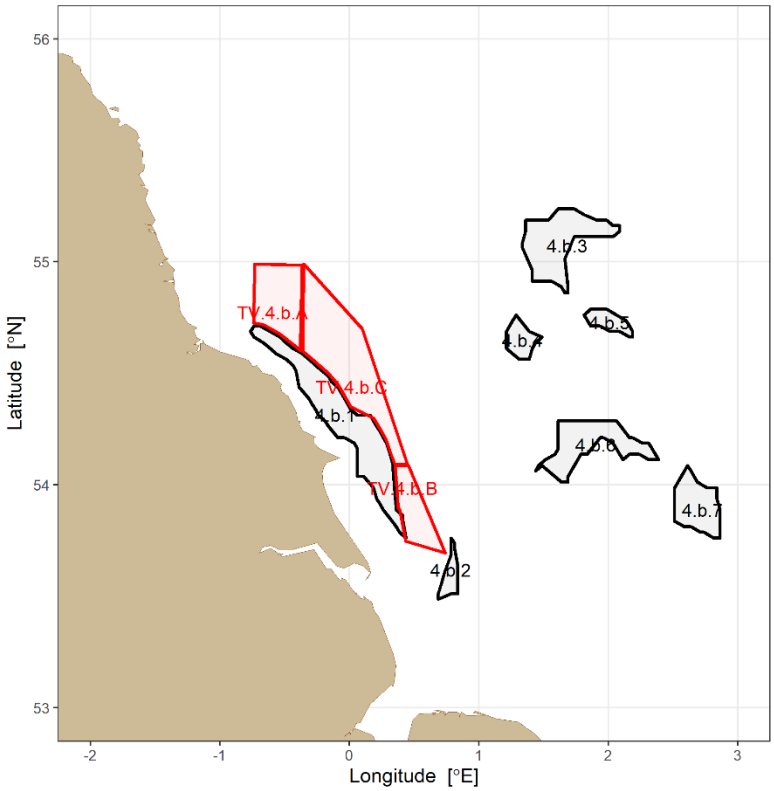


Figure 1. Overview of work area in North Sea – Areas in red are priority 1 survey areas.

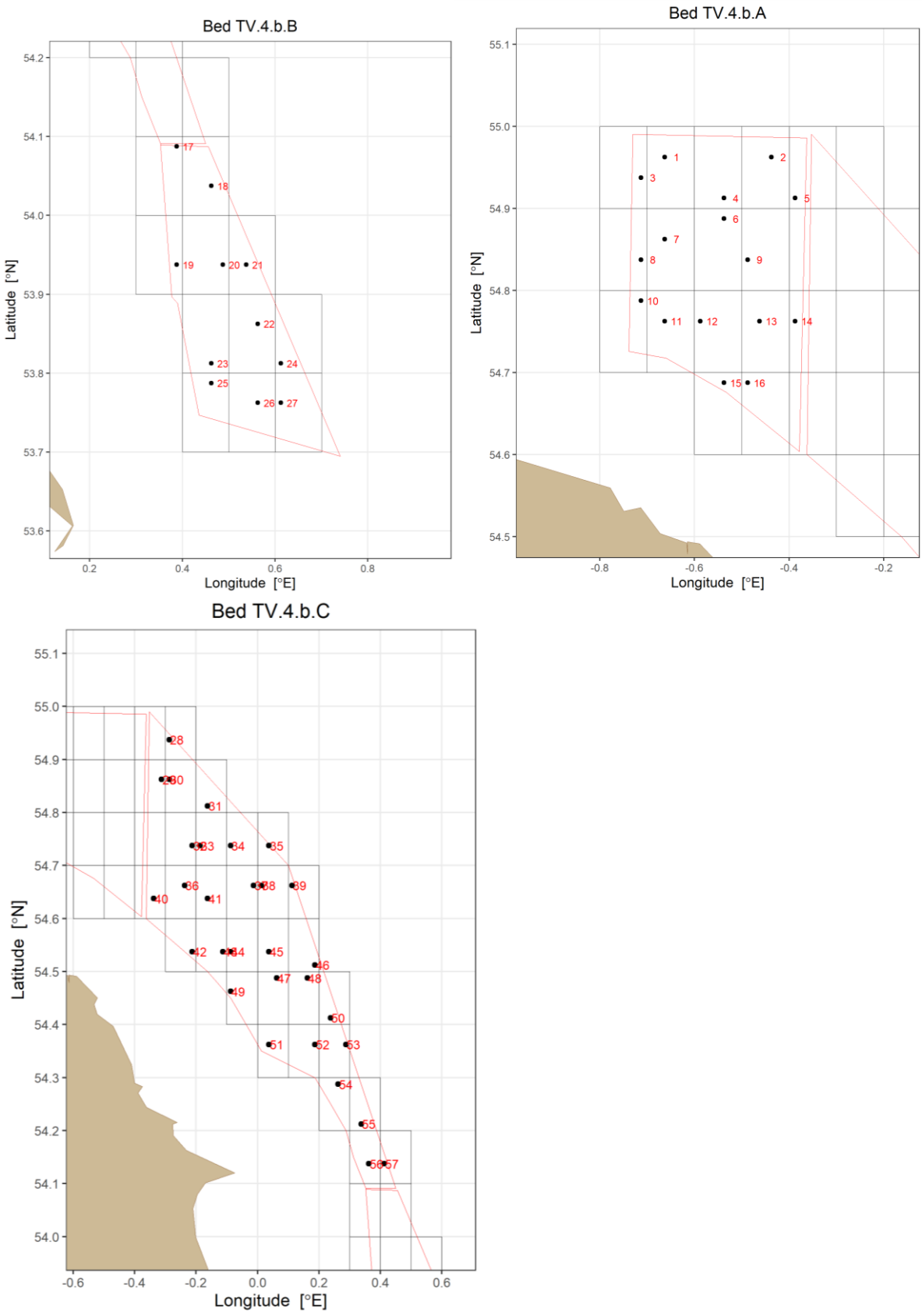


Figure 2. Tow positions in TV beds A, B and C.