Revifes 64PE505
Brown Bank, Frisian Front and Borkum reef grounds

Cruise report

04 – 15 July 2022, RV Pelagia

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Texel, 15 July 2022

Introduction

This cruise was carried out for the ReViFES project. The rationale behind this cruise and project is to find out what the scale of ecosystem services of reef structures are in the North Sea. The initial focal area was the Brown Bank, an areas west of the Dutch coast near the Dutch-UK border, characterised by a shallow sand bank (~20 m deep) flanked by deep troughs (~40 m) in an otherwise ~30 m deep region. In 2017-2019 a Sabellaria spinulosa reef was observed (van der Reijden et al. 2019; van der Reijden et al. 2021) in the eastern and western trences next to the bank. The revifes team aimed to revisit these reefs and investigate the ecosystem services provided by the reef.

However, the reefs were not observed and the team could not execute the plan. Therefore, an alternative location with recent observations of Sabellaria near the Frisian Front north of Texel (unpublished data Bureau Waardenburg) was surveyed as well. Again, the observed reefs were not detected. Then it was decided to spend the last 6 research days on investigating the Borkum Reef grounds on the border of the Dutch - German continental shelf, situated approximately 20 km offshore (north) from the island of Schiermonnikoog. This site had been studied in 2020 (Witbaard et al. 2021) and 2021 (Coolen et al. 2021).

Equipment

The main equipment used during this cruise was the HD video Hopper frame, CTD, "Crab cages", fish larvae light traps, WP-2 plankton net, 1 mm mesh size ring net (a.k.a. Jelly fish net), CPICS and ISISS zooplankton scanners and the fish finder.

In figure 1&2 the research areas Brown Bank and Borkum Reef Grounds are indicated in the map. In figure 3 the overal cruise track is given. In figure 4-5 a more detailed cruise track in the research areas together with all sample operations is plotted.

List of Participants

Table 1: list of scientic participants and their role.

	Who	Institute	Role
1	Caterina Coral	NIOZ	PhD
2	Joop Coolen	WUR (NIOZ-Guest)	PI, Cruise leader
3	Anton Tramper	NIOZ	Technician
4	Leandra Kornau	WUR (NIOZ intern)	Student
5	Bianka Rasch	NIOZ	Technician
6	Pieter Hovenkamp	NIOZ	PhD
7	Karlijn Doorenspleet	WUR	PhD
8	Lotte Nijsten	Observer	Sound recording

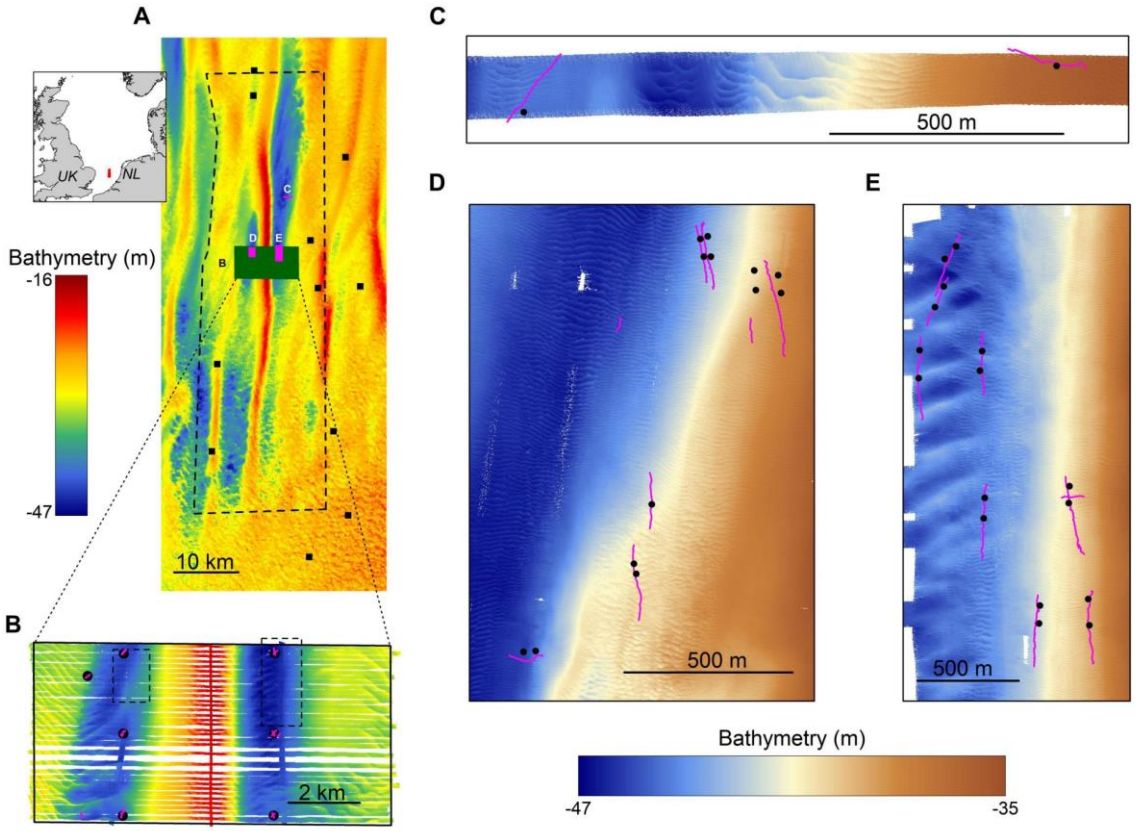

Figure 1: The Brown Bank area (A) with detailed bathymetry (B) and video survey tracks executed in 2017 and 2019 (C-E) (van der Reijden et al. 2021).

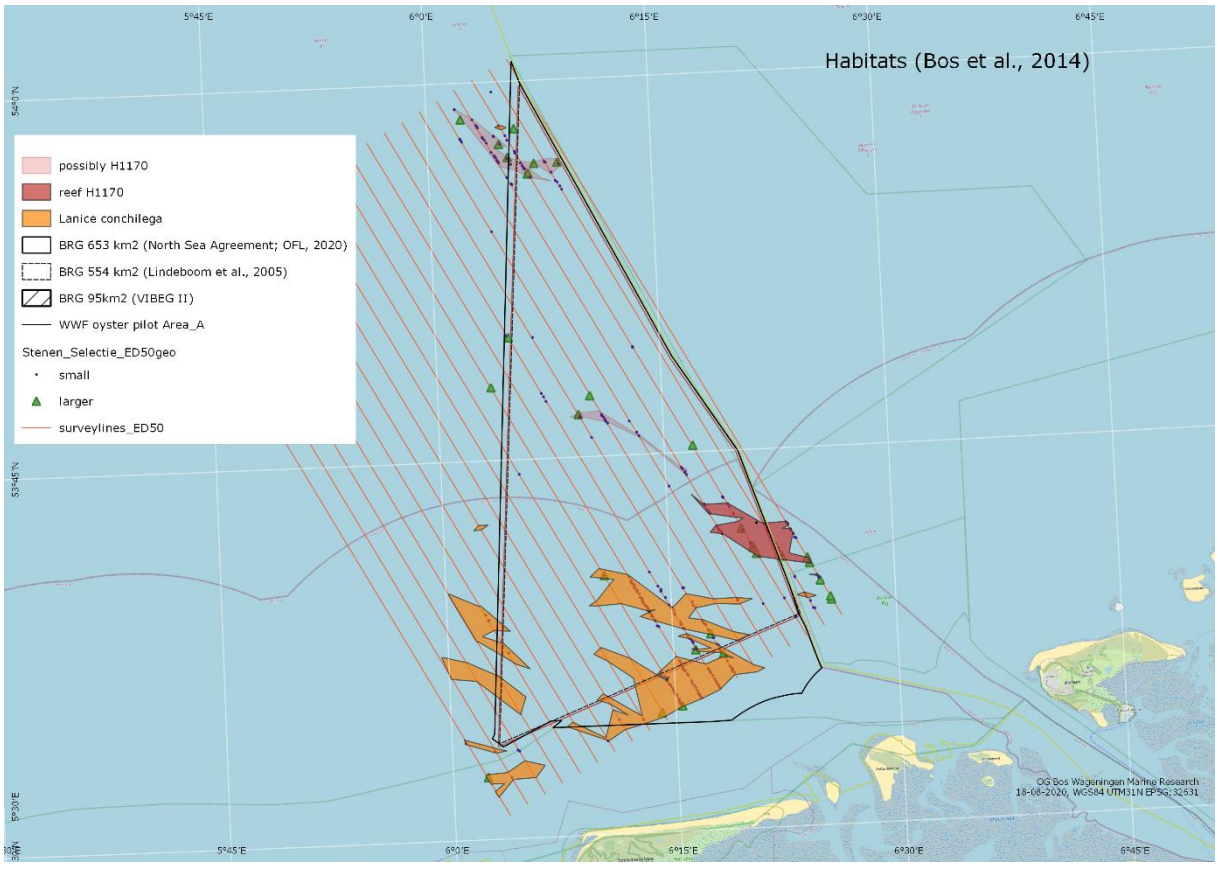

Figure 2. Overview of the Borkum Stones area, situated north of the isle of Schiermonnikoog (Bos et al. 2014).

Verbal account of the activities

Station numbers reported are as stored in the Pelagia ShipsData system. It was decided to give each consecutive cast an increasing cast numbe, continuing the numbering within each station. Notation of samples is made easy as for example the cruise number followed by cast number enables reference to all details in the ShipsData logbook. During this cruise we had 196 unique sampling operations (casts) which are identified as 64PE505#001 to 64PE505#196 (Table 3). The Pelagia log time in the ShipsData system was in UTC which is 2 hours earlier than the actual (Dutch) time at the start of the cruise. Times in this cruise report (other than the ShipsData table) are in CET.

Day 1 – 4 July 2022.

We set sail shortly after breakfast and last deliveries and left the harbor of Texel at 09:30 local time (CET). Weather was winds with 3-4 bft and visibility was good and transit time was used to prepare the crab cages on deck and organize the laboratory setups. Underway CTD samples to collect water for eDNA analysis using the niskin rosette were taken at 10 stations. The vessel arrived at the Brown Bank around 09:00.

Day 2 - 5 July 2022.

Weather was 3-4 bft with 1.5 meter waves. Video transects were performed fully along 2 transect lines (4.1 NM each) and along about half of a third line. The transects started at 8:00 and were finished at 20:00. Only a few clumps of Sabellaria were observed.

Day 3 – 6 July 2022.

Weather was 3-4 bft with 1.5 meter waves. Video transects were performed along the remaining 0.5 transect line from the previous day, with still hardly any Sabellaria observations. Then it was decided to revisit all the transect lines from 2017-2019 to check whether any Sabellaria was left there. No success. Then a last transect from the deep part west of the Brown Bank, towards the shallow area on the Brown Bank, was performed. Still No Sabellaria reefs were observed. At the end of the day 2 WP2 zooplankton samples were taken to confirm the CPICS and ISISS scanner data. Then it was decided to sail back to Texel, pick up a participant that had been in Corona isolation, and then sail to an alternative area where Sabellaria had been observed very recently.

Day 4 – 7 July 2022.

Weather was 6-7 bft with 2.8 meter waves. The vessel was in port on Texel around 08:3 and sailed away again around 09:00. Then the transit towards the Frisian Front started. En route another series of CTD casts with water collection for eDNA was performed. The vessel arrived in the target area around 20:30.

Day 5 – 8 July 2022.

Weather was 5-6 bft with 2 meter waves, decreasing to 1.5 meter in the afternoon. At 4 locations in the region, video transects were performed to confirm the Sabellaria observations from the triple D dredge earlier in the year. Again no Sabellaria was observed. Since this was the last remaining site with previous Sabellaria observations, it was decided to transit to the Borkum Reef Grounds to perform the following measurements on a site at which a rocky reef was known to be present.

Before transit , at the end of the day 2 WP2 zooplankton samples were taken to confirm the CPICS and ISISS scanner data.

Day 6 - 9 July 2022.

Weather was 4-5 bft with 1.5 m waves, increasing to 2 m in the afternoon. In the morning the fish cages were placed, which were mounted with the zooplankton light traps. No bait was added to the cages. Placing the 8 cages took approximately 3 hours. Then a transect of 10 CTD stations was performed, taking approximately 4 hours. Then a series of towed measurements of the CPICS frame was carried out.

Day 7 - 10 July 2022.

Weather was 5-6 bft, with 2.5 m waves, lowering to 1.8 in the afternoon (4-5 bft). The cages were recovered which took 3 hours for 8 cages. The samples from the light traps were processed and ½ of the samples was conserved on formalin, while the other ½ was conserved with ethanol to later allow DNA extraction. In the afternoon the ring net (aka kwallennet) was deployed for 10 minutes from the back deck while the vessel remained stationary, on the extreme ends of the transects, same stations as the locations of the cages earlier that day. The kwallennet deployments took more time than anticipated and only transects A (4 stations, total 10 casts) and B (2 stations, 6 casts) were completed, taking approximately 7.5 hours. The initial casts took more time than the later ones. The later casts took about 20 minutes per deployment. The fish finder was kept active throughout the night while the vessel sailed slow transects across the reef and surrounding sandy seabed.

Day 8 – 11 July 2022.

Weather was 4 bft with 1.5 meter waves. In the morning the fish cages were baited and the baited camera systems activated. The cages were deployed along transect A, which took 2 hours. At station A10 one of the light traps used earlier as well as an NMF built model of a light trap were included in the cage. After this, ring net samples were taken from transect C (6x) and additional samples from stations B1 and B10 (1x each). This was finished at 14:30. The rest of the afternoon was spent with the CPICS and ISIISS scanners on transect C, performing horizontal as well as towjo transects until 20:00. The fish finder was kept active throughout the night while the vessel sailed slow transects across the reef and surrounding sandy seabed.

Day 9 – 12 July 2022.

Weather was 3-4 bft with 0.8 meter waves, reducing further during the afternoon. In the morning the fish cages with camera were recovered. The catches were processed, including weighing and measuring of all specimens. The video data was downloaded and camera's and lights charged again. In the afternoon CTD niskin samples were taken on all stations on transects B and C. Recovery of cages took about 2 hours, CTD sampling on 21 stations took about 8 hours excluding breaks.

Day 10 – 13 July 2022.

Weather was 3-4 bft with 0.8 meter waves, increasing slightly in the afternoon. In the morning WP2 net samples were taken from transects A and B. Then the baited fish cages with baited camera were deployed along transect B. After lunch WP2 samples and ring net samples were taken from transect C, after which CPICS scans were performed along transect D until 20:00

Day 11 – 14 July 2022.

Weather was 3-4 bft with 1 meter waves, increasing to 1.5 in the evening. In the morning the baited cages with camera were recovered and processed, this was finished in 2 hours. Then the last set of additional ring net samples was taken from transect A, this took 1.5 hours. After this the last set of CPICS scans was performed on transect A. Meanwhile the team packed all the equipment and cleaned the labs. Then the return journey started.

Day 12 – 15 July 2022.

The ship arrived back in port at 10:30 local time and the equipment was demobilised from the vessel. The cruise was finished.

Figure 3. Cruise track to, from and in the 3 areas with Brown bank on the lower left, Frisian Front top centre, Borkum Reef Grounds top right.

Underwater drop cam video

Video transects were performed at the Brown Bank and near the Frisian Front. Like the september 2020 and May 2021 cruises, we logged habitat observations approximately every second during the video work. Meanwhile a gps mounted near the A frame from which the video frame was launched, also logged to position every second. Then the video transects were started using the NIOZ hopper frame. Weather condition was moderate to good. Speed at which the footage was taken was about 0.5 knots.

On basis of the timestamp logged while recording the video observations, positions different habitats were obtained by combining the timestamps of observation and position with a R script. This included a correction for the distance between the gps and the estimated position of the video hopper frame on the seabed, while taking the bearing of the vessel into account.

The video tracks are shown in Figures 4 (Brown Bank) and 5 (Frisian Front). Since the rocky reefs of the Borkum Reef Grounds were known, no video survey was performed there.

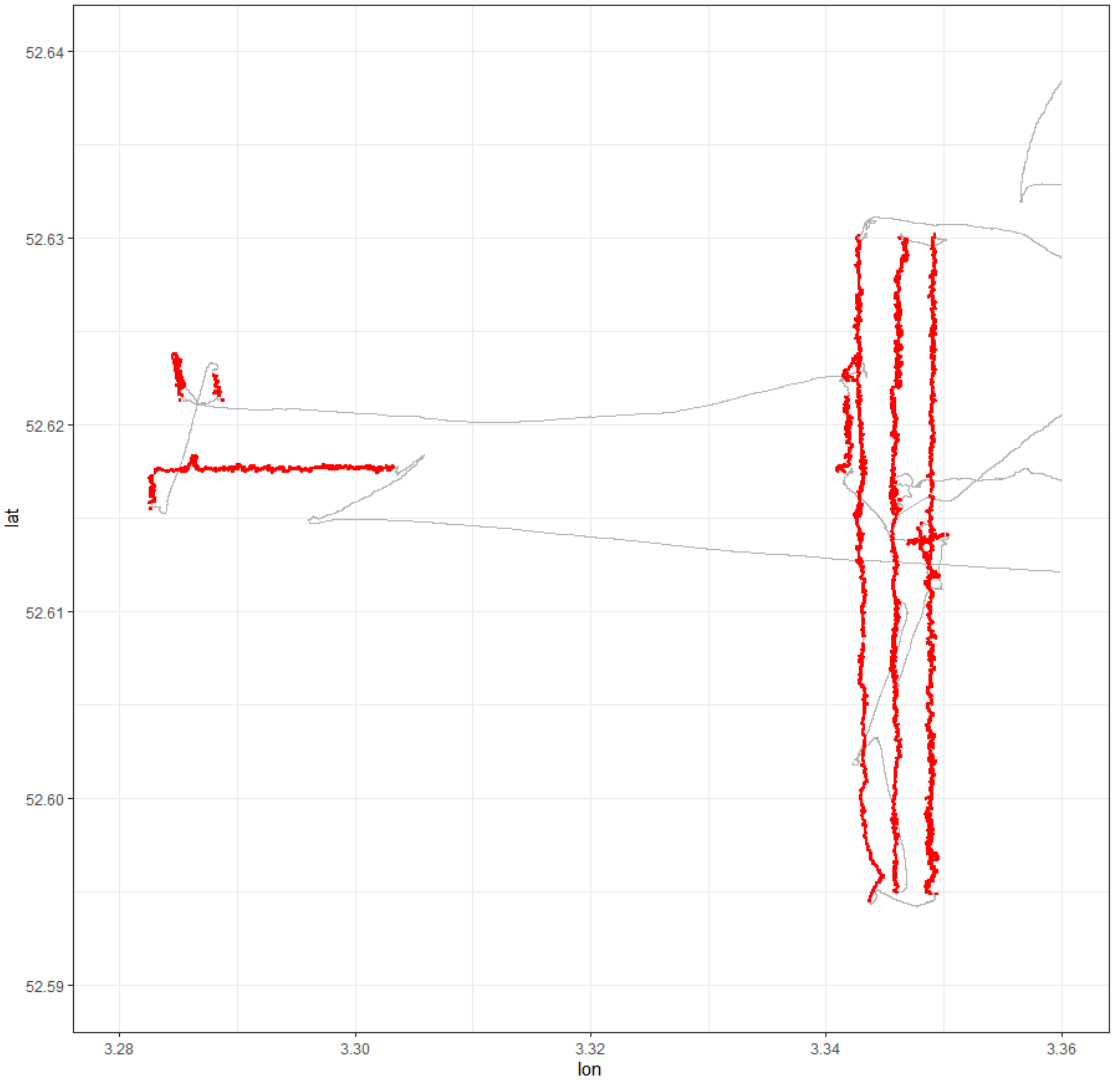

Figure 4. Video tracks near the Brown Bank with seabed in sight and scored (red dots), with cruise track in grey.

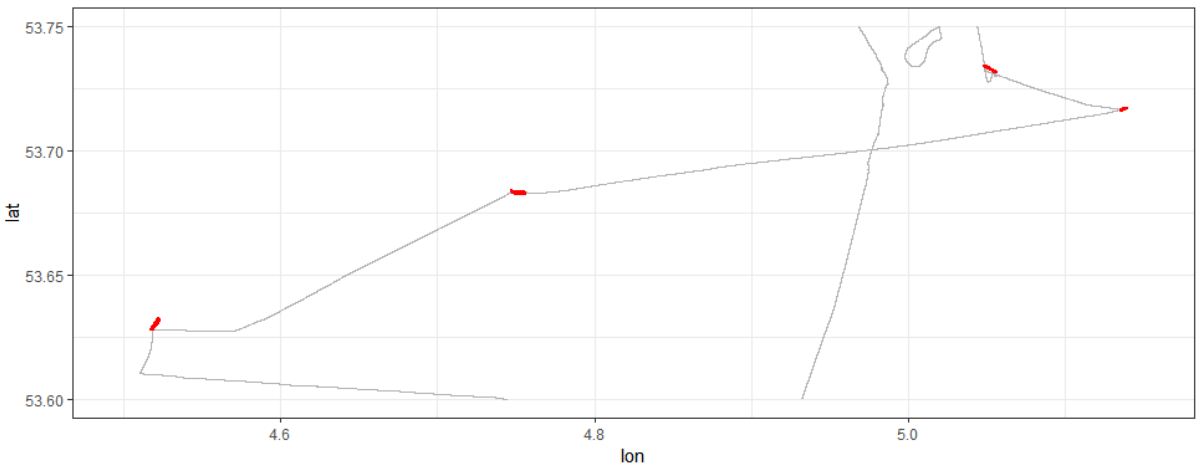

Figure 5. Video tracks near the Frisian Front with seabed in sight and scored (red dots), with cruise track in grey.

Figure 6: Video room where the video hopper stream was monitored and observations logged continuously during each deployment. Seabed view visible in top left.

Fish cages

To get an idea of the biodiversity of mobile bottom fauna, fish/crab cages were placed at the seafloor. Three types of cages or fykes were used. Large cages with meshsize of 2×2 cm which were 150 × 150 × 75 cm. Middle sized cages of 60×40×30cm also with 2cm mesh and small fykes with a mesh of .5cm. Additionally a whelk pot was mounted to each large cage, made of plastic jerrycans out of which a hole was carved which was mounted with a wire mesh entrance that should trap whelks after entering the pot. However, the whelk pots kept breaking loose during recovery when testing the light traps, so it was decided to remove the whelk pots from the baited deployments. All traps were baited with frozen mackerel.

The sets were deployed with the side A frame. Two Benthos glass spheres were used to keep the line upright. At the surface the position was marked by a float equipped with a radar reflector and a flashlight, followed with a series of hard plastic floats in a trail behind the first float. This was added to the setup after in 2021 a float was lost and the cage had to be dredged up. The trailing floats now should remain at least partly afloat, making recovery of the cage easier. Each cage was deployed for ±24 hours. The cages with bait were placed once along transect line A and B in the north of the reef.

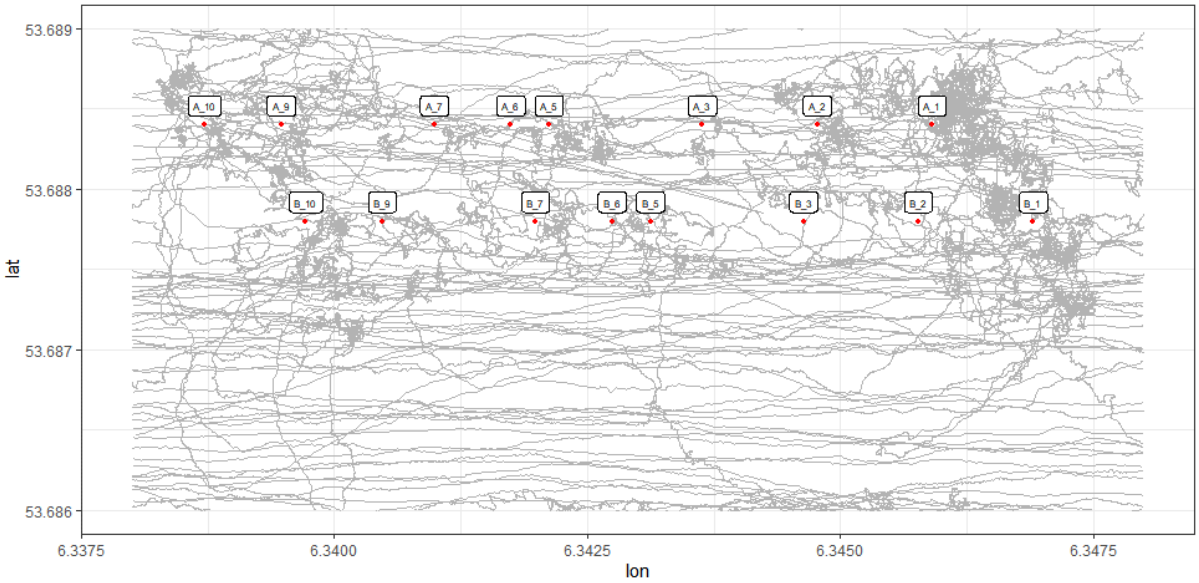

Figure 7. Deployment positions of the baited fish cages as station numbers (red dots) with cruise track in background (grey line).

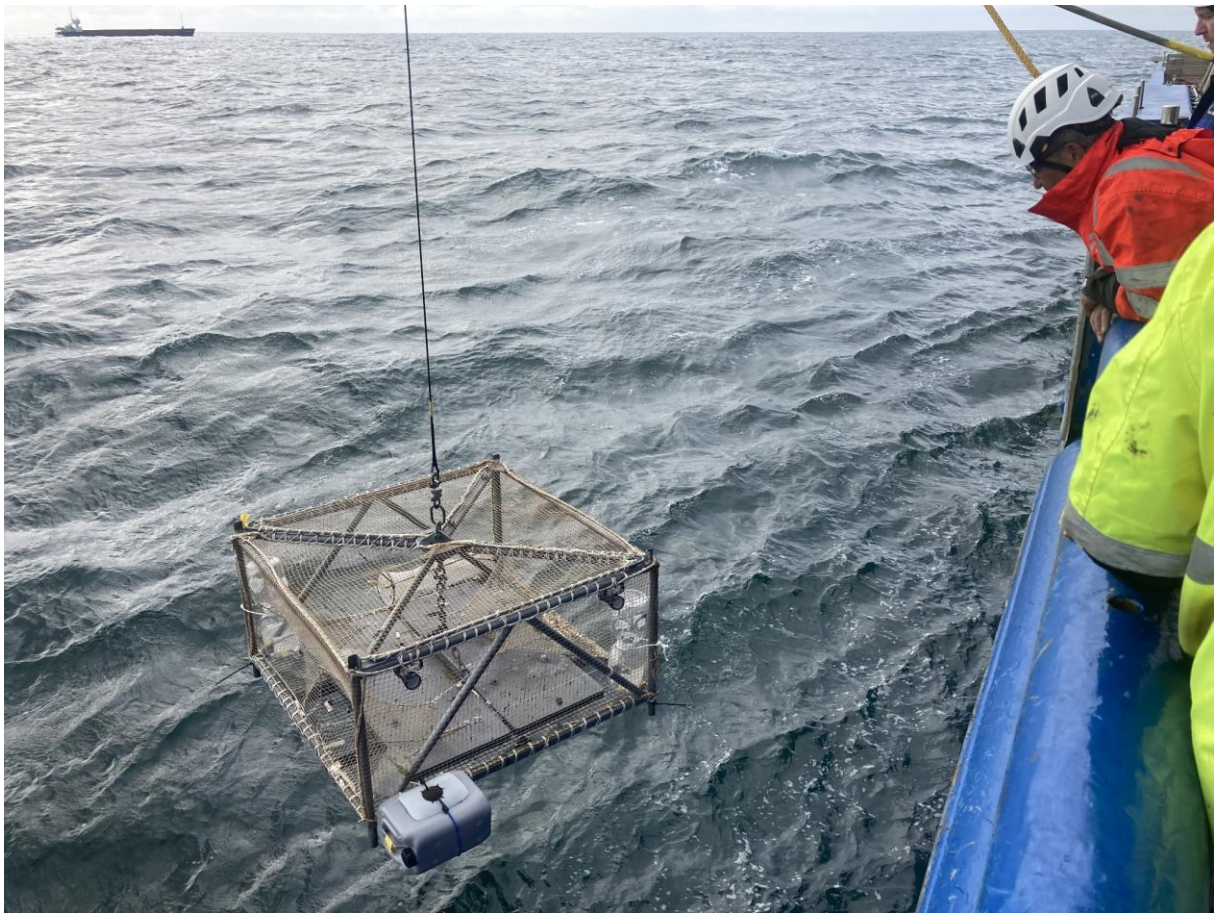

Figure 8. Large cage being deployed with light traps visible inside and whelk pot on the front outside.

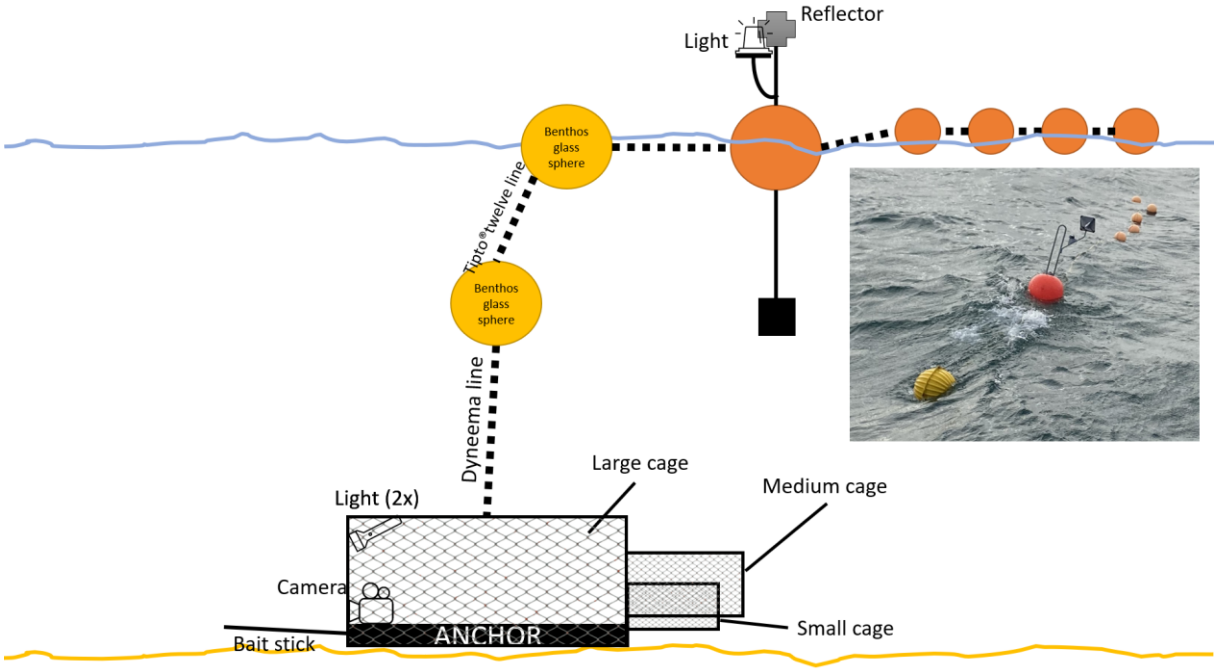

Figure 9: Schematic of the cage setup (not to scale). Inset photo: Benthos glass sphere visible in front (yellow), which is attached to the line towards the cage (not visible) and followed by the large orange float and 5 yellow hard plastic smaller floats.

Figure 10: Part of the catch from the baited cages, with Lobster (Homarus gammarus) and Edible Crab (Cancer pagurus).

Baited Remote Underwater Video (BRUV)

During deployment of the baited cages, a baited video system (BRUV) consisting of a gopro hero 7 and two LetonPower BB27-1/S high power 20.000 lm led video flood lights, baited with mackerell in a stocking on the end of a bamboo stick were added to the cages. The gopro was mounted on the bottom grating using a pipe clamp, which was placed onside the net, but the gopro was added to the clamp trough the net so the gopro lens was outside the net, while the profile of the camera remained safely inside the steel frame of the cage. The lights were mounted near the corners on the top part of the same cage side, placed inside the net on the top pipe of the cage, mounted with hose clamps around the lights handle bar and the cage pipe. The net was then fixed tightly in front of the lights glass to prevent shadow from the light shining trough the net. The lights initially had a horizonal position, but this proved to cast a shadow in front of the camera, therefore, during the second deployment, the lights were oriented in a downward angle of approximately 45°. Before deployment the lights were swithed on with the lowest setting of white light. All camera's were given the same number as the cage number (1-8) so camera can easily be matched to cage and station number.

Rechargin the batteries (all together at the same time) after recovery took 8-10 hours. Copying all gopro footage (one gopro at the time) to an external hard drive took about 8 hours, including a backup copy on a second hard drive.

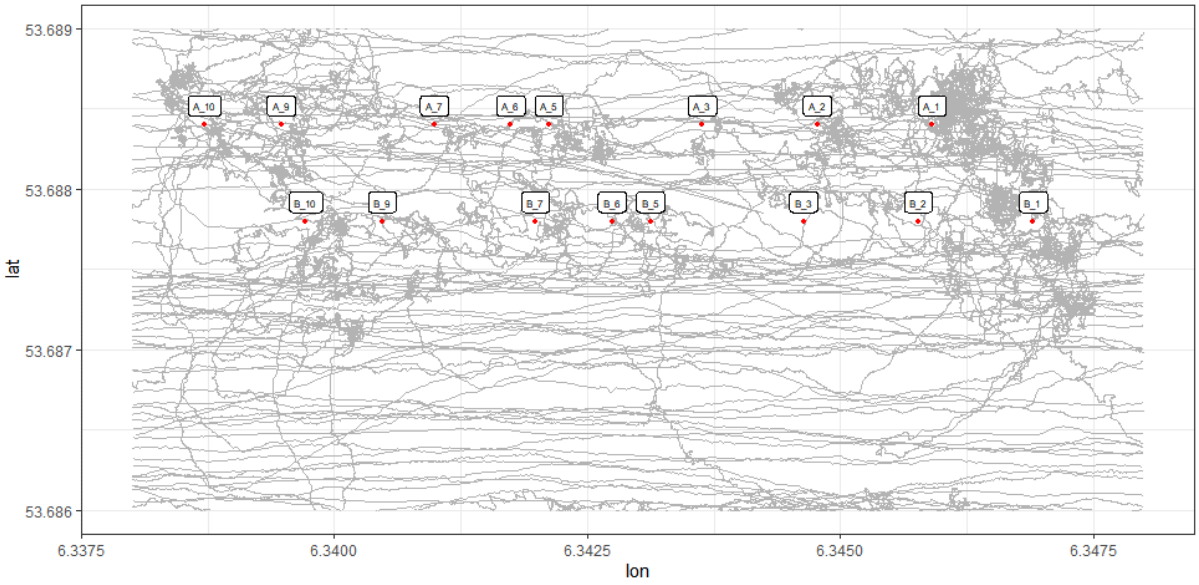

Figure 11. Deployment positions of the baited traps as part of the baited cages, as station numbers (red dots) with cruise track in background (grey line).

Figure 12: Gopro with bait stick (bottom centre) and LetonPower lights (top right and left) mounted on the cage, shortly before deployment.

Figure 13. Left: Gopro mounted on the outside of the cage net, with hose clamp inside the net. Right: detail of the light as mounted on the cage, with tywrap locking the cage net in front of the light.

Figure 14. Left: The bamboo stick holding the sock with mackerel was positioned 30 cm from the camera mount. Right: Battery positioning in video lights, with lamp head vidible in the top.

Figure 15. Examples of species attracted to the baited camera.

Light traps

Light traps have been deployed at the seafloor for 24 hours in order to collect fish larvae. The traps were built using two plastic bottles connected to each other and adapted with a total of four funnels with an entrance size of about 0.9 cm. An emergency diving light was used as attraction light and placed in the top part of the trap, near the entrances. The color of the light was white.

Two traps were placed in each cage at two opposite corners, the cages were unbaited and were used for this activity as landers. A total of four cages was deployed on the reef at stations A1, A2, B1 and C1, and four cages were deployed on the reference, at stations A9, A10, B10, C10. Overall, 8 light traps were placed on the reef and 8 on the reference area.

Once recovered onboard, the traps were detached from the cages and placed on a plastic tray, in order to collect any water to be filtered for eDNA analysis. The sample was then collected into a 200/250 um mesh and rinsed with filtered seawater. After collection, the samples were transferred into 250 ml jars and fixed. 50% of the samples were fixed using 4% formalin diluted with milliQ water, while the other 50% was fixed in 70% ethanol, to allow for future analysis of the DNA.

Water for eDNA was processed as described in the section ‘water sampling’ however for these samples, combusted GFF filters (from the plankton lab) were used. Because of the sediment in the sample, 300-500 ml was filtered for each of the tree replicates that were filtered per sample. Samples were stored in plastic nutrient vials (cleaned using 24h 10% chloride bath) containing 80% ethanol and stored in the fridge at 5 °C. Processing took approximately 5 hours.

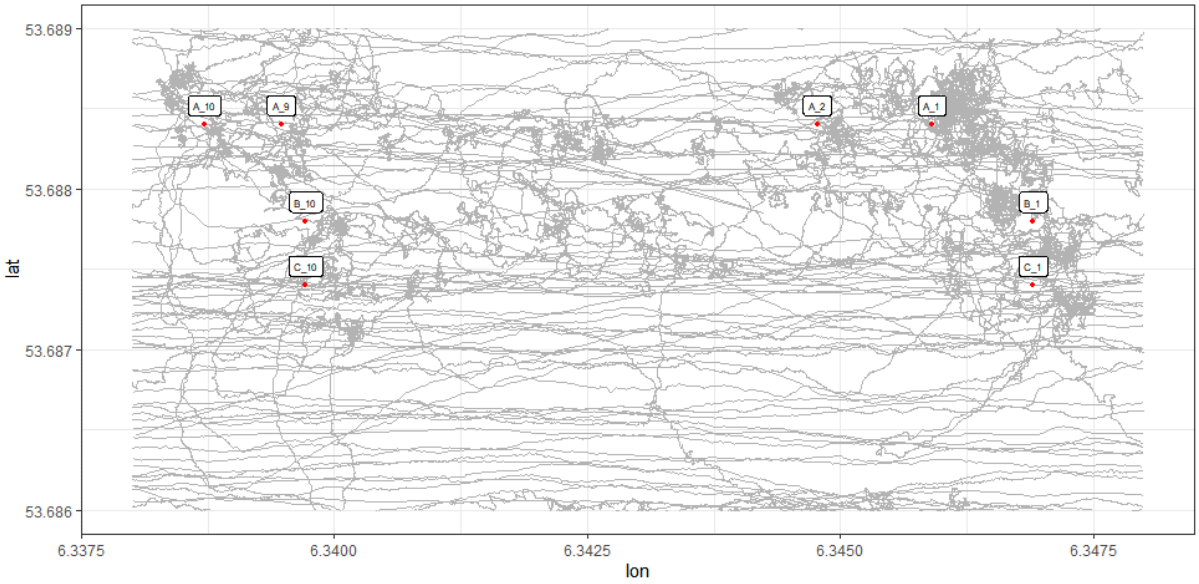

Figure 16. Deployment positions of the light traps in unbaited fish cages as station numbers (red dots) with cruise track in background (grey line).

Figure 17. The light traps, left: as built, right: during recovery after 24 hours fishing inside a fish trap.

Water sampling for eDNA

At each of the stations 1-9 and 11 in transects A-B-C a CTD cast was performed, collecting 3 niskin bottles near the seabed and near the water surface. These samples were filtered for eDNA identification. A CTD cast was also performed at 10 stations in transect towards the brown bank and the Frisian front. Water from the niskins was collected in 2L thoroughly rinsed plastic containers using gloves to prevent contamination. Samples were processed using two pump set-ups that were used in parallel for either the bottom or the surface sample. During sample processing gloves were used at all times. Filter holders and bottles were extensively rinsed with fresh water from the tap (chloride containing) and Millipore water between samples. 1200-2000 ml of water was filtered on a 0.45 uM cellulose nitrate filter and after filtering folded using chloride cleaned tweezers and stored in a 1.5 ml screw cap containing RNA/DNA shield. Samples were kept in the fridge. When working with two people, one station (6 samples) could be processed in 15 to 20 minutes. The time needed for the transects towards the reefs took approximately 12 hours including transit time. At the Borkum reef grounds, CTD cast and processing of the filters took around 5 hours including delays at the bridge. CTD casts of transect B and C together took approximately 9 hours including breaks. The water samples were processed in approximately 11 hours.

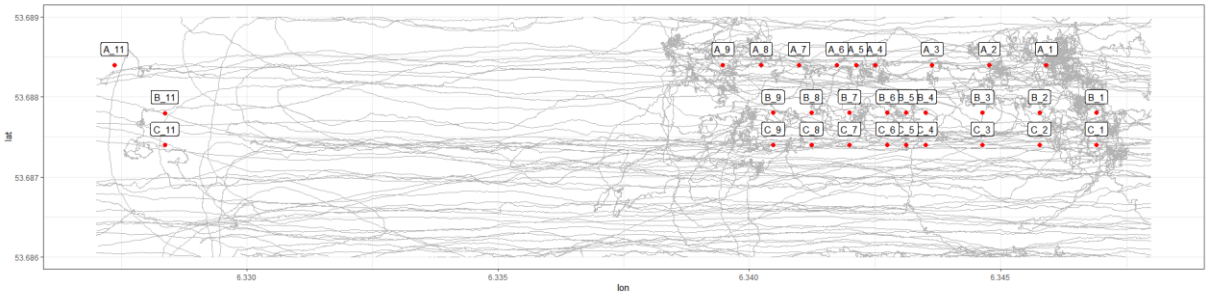

Figure 18. Positions of the CTD deployments with their station numbers at the Borkum Reef Grounds

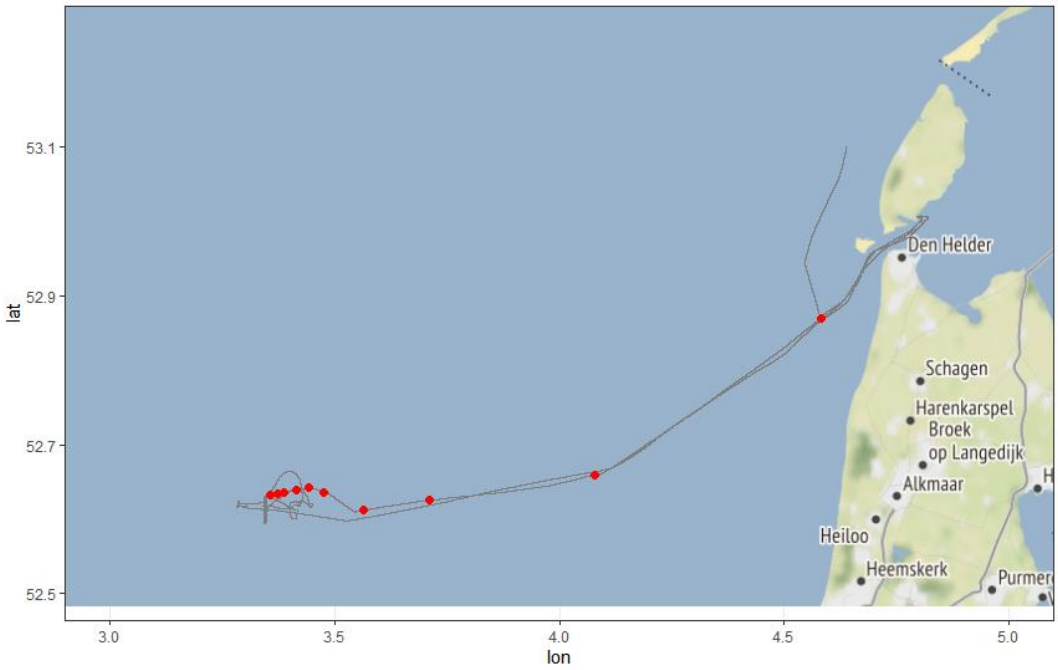

Figure 19. positions of the CTD deployments along a transect towards the brown bank.

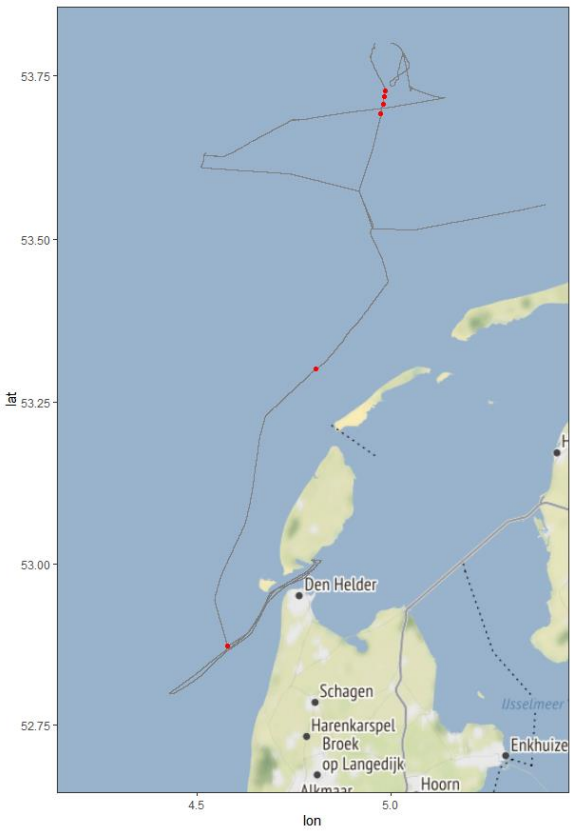

Figure 20. positions of the CTD deployments along a transect towards the Frisian Front.

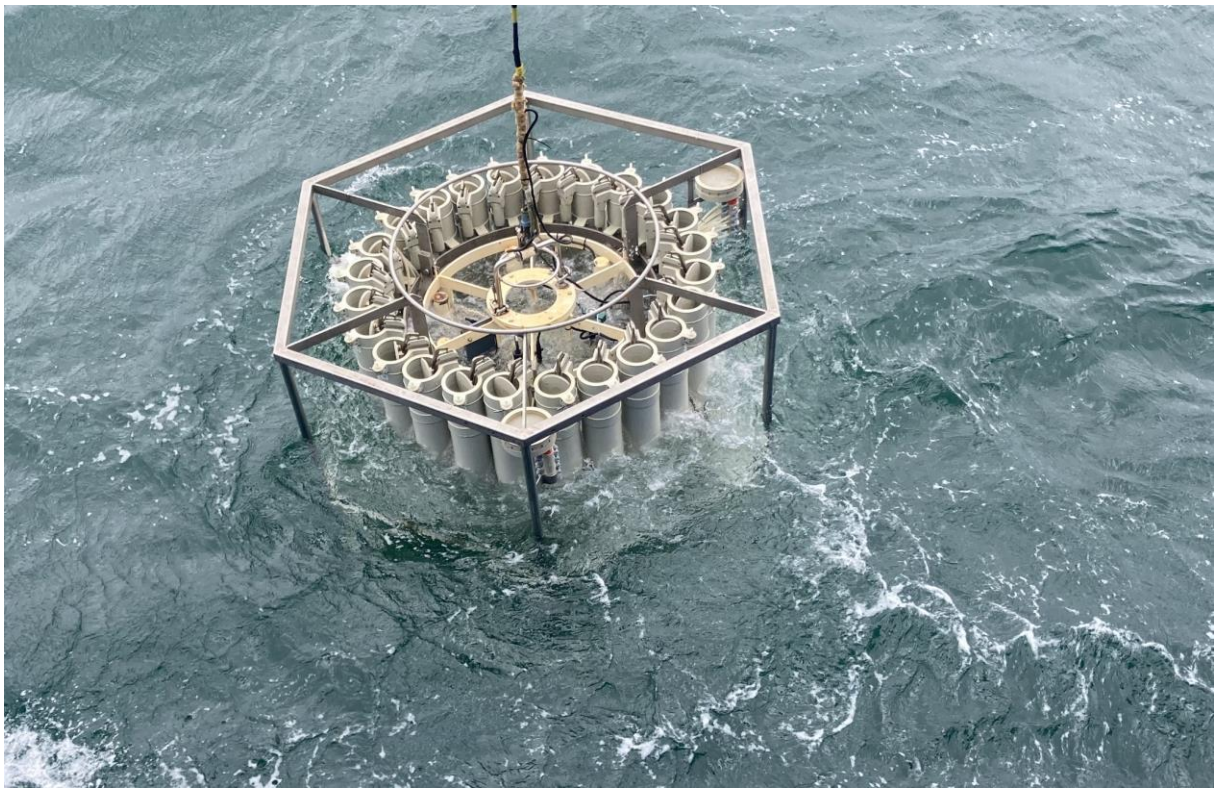

Figure 21. CTD frame with niskin bottles visible in open position, during deployment.

Zooplankton net WP2

At the same stations as the cages, a zooplankton sample was taken using a WP2 net with a mesh size of 200 microns, in order to exclude the phytoplankton fraction. The net was weighed down and lowered approximately 2 meters above the seabed and then pulled back to the surface.

On board large zooplankton was removed from the sample and processed separately, then the remaining planton was seived and conserved.

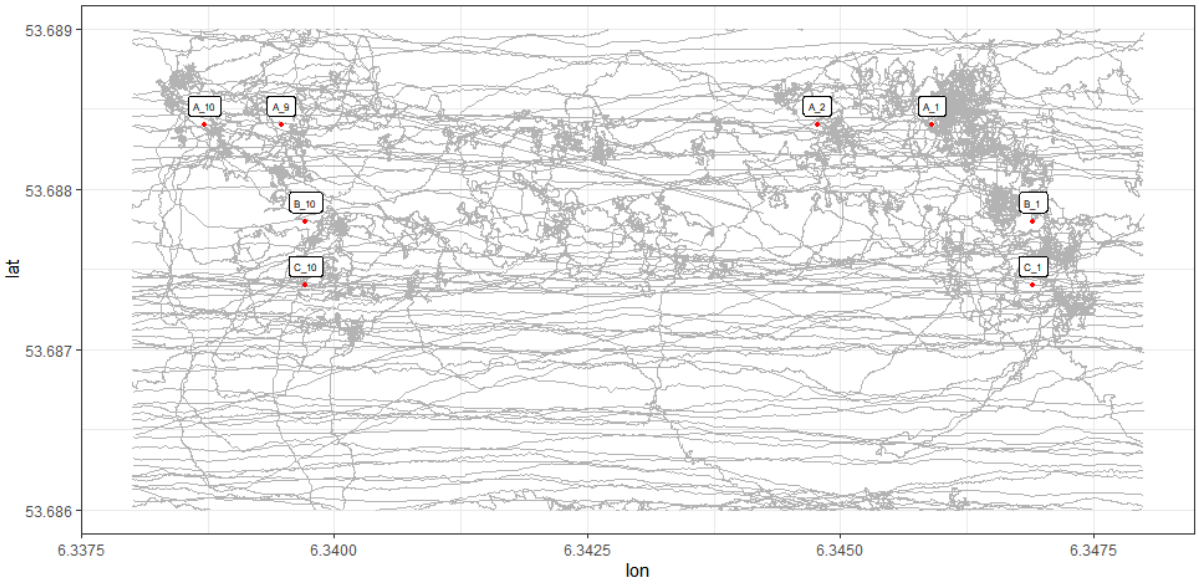

Figure 22. Positions of the plankton samples with their station numbers.

Figure 23. Small mesh zooplankton net (WP2) being rinsed with seawater during recovery.

Fish larvae net

At the same stations as the cages, zooplankton samples were taken using a plankton net with a mesh size of 1000 microns, aiming to catch larger plankton species including fish larvae. The net was lowered behind the vessel while the vessel remained stationary. The current then forced the water trough it, while the net was forced down by the depressor below it. The net was lowered to as close to the seabed as possible and was kept there for 5 minutes. After that it was raised to half of the water depth, where it was kept for another 5 minutes before it was hauled back on deck. A flow counter measured the total volume of water that passed the net during each deployment.

All stations were sampled a minimum of 3 times and samples processed using 3 different methods:

1. For the DNA work, water of the recovered ring net was interepted using a (chloride cleaned) funnel and 2 L container for eDNA. Water was processed according to processing described in 'water sampling' but the sample was first seaved on a 100uM seave (thoroughly rinsed) and filtered over a 1.2 uM cellulose nitrate filter. For the molecular work, a plankton sample of each station was processed by collecting all the fish larvae >0.5 cm on a white board. Larvae were arranged based on species and size for photo measurements of densities and diverisity. The complete sample (including everything not identified as fish larvae) was stored at -20°C in a plastic bag.
2. Once on deck, the samples were washed with 250 um filtered seawater and collected into a white tray. Jellyfish and comb jellies were manually removed from the samples when possible. The remaining sample was then collected into a 250um mesh, further aggregated with filtered seawater and then transferred into a plastic jar for fixation in 4 % formalin.
3. In order to quantify the abundance of macrozooplankton, samples were processed as follows:
    i. The full sample was sieved on a 1mm sieve and the total biovolume was measured;
    ii. Scyphozoans and ctenophores were counted and their size was measured per individual. For highly abundant species, only a volumetric subsample of the species was counted and measured.
    iii. After removing the scyphozoans and ctenophores, the remaining sample was stored on 4% formalin.

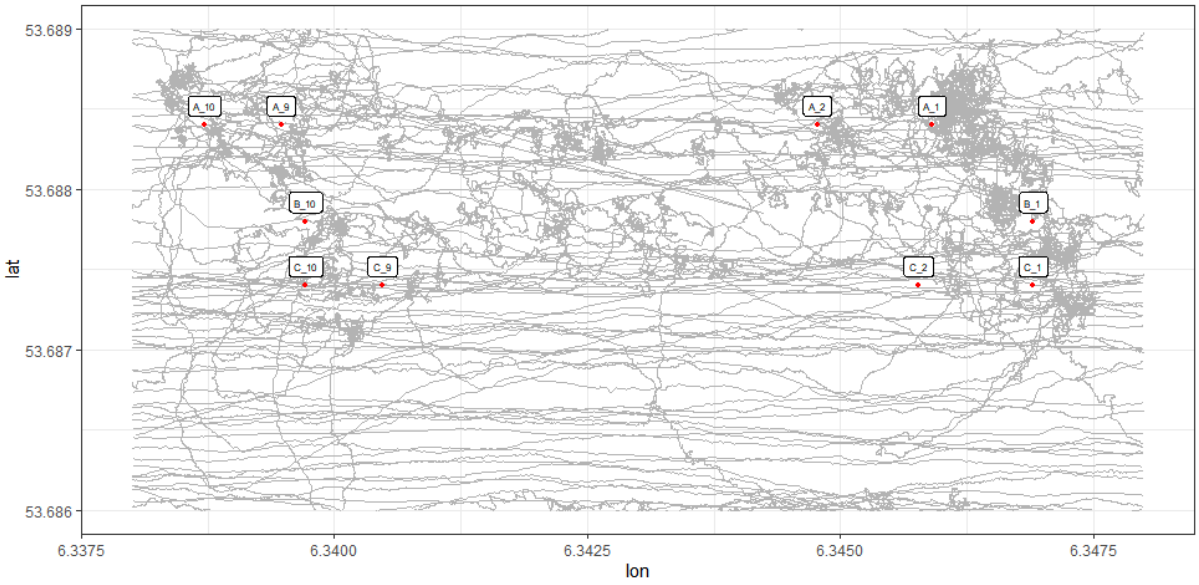

Figure 24. Positions of the plankton samples with their station numbers.

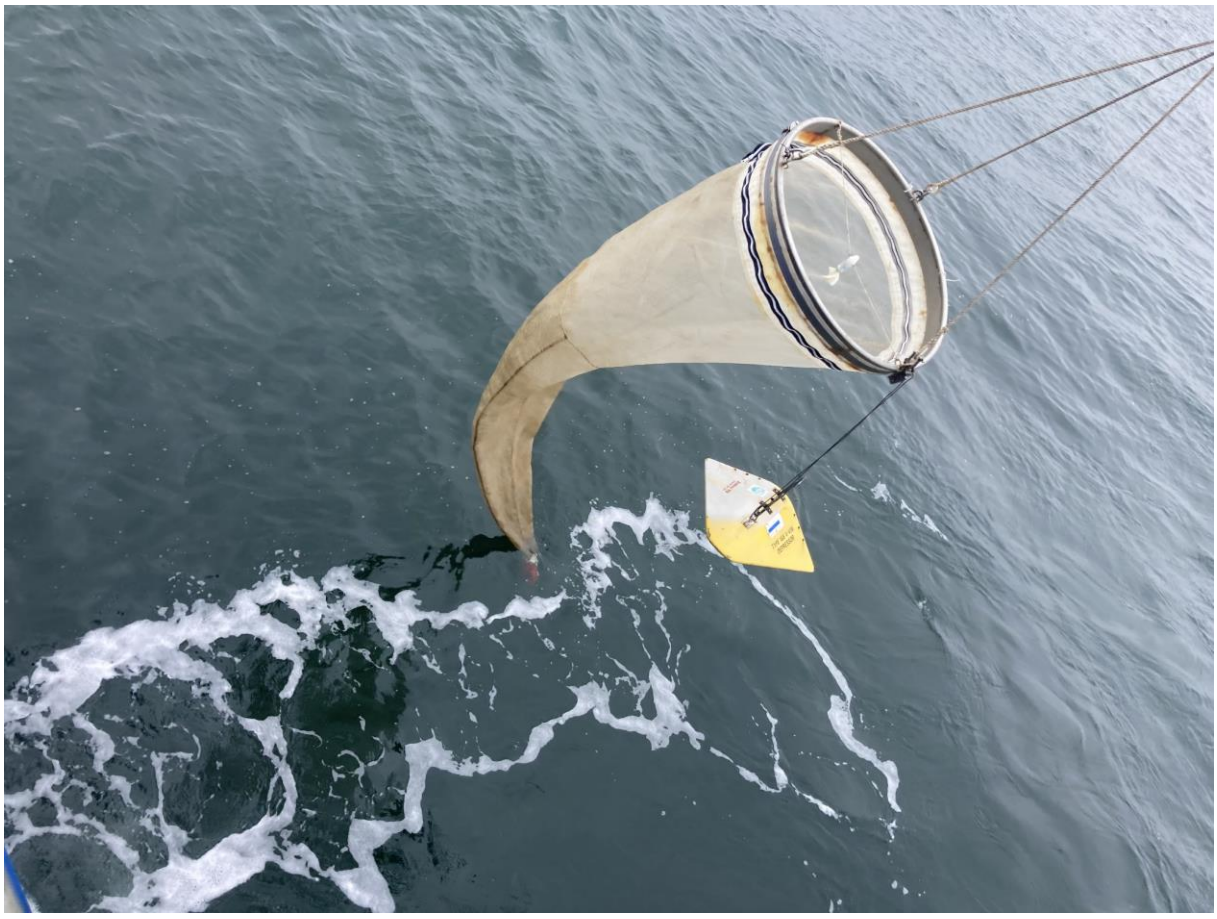

Figure 25. Large mesh zooplankton net being deployed.

Cpics & ISIIS scan

The CPICS is an underwater camera that produces darkfield colour images at 8 fps at ±10 L h^{-1} and ISIIS is a shadowgraph imager that takes grayscale images at 5 fps at ±10,000 L h^{-1} of deployment time.

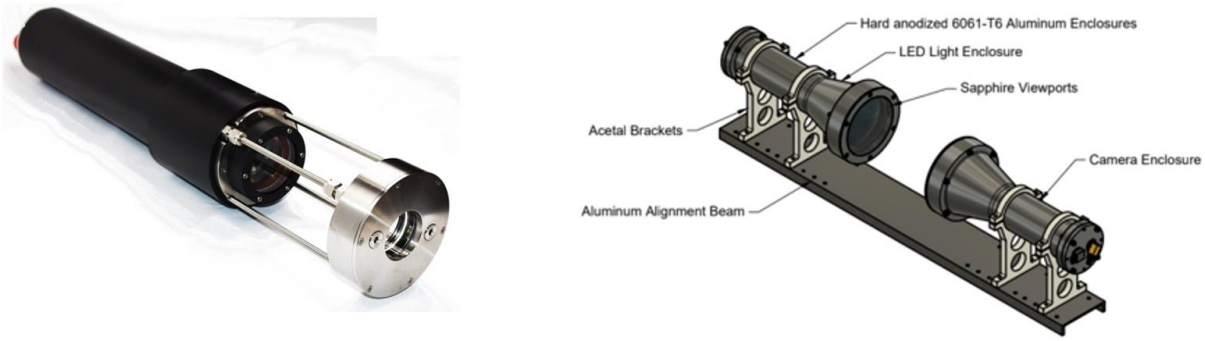

Figure 26: CPICS (left) and ISIIS (right) zooplankton scanners.

Both systems were mounted on the Hopper camera frame during video survey activities, and were deployed on a newly designed frame that allows for towing behind the vessel at ±2 knots. Each system can run autonomously for several hours on a battery package. The CPICS is optimal for imaging living and non-living particles of 100-1,000um and the ISIIS for living particles of 300 um - 2 cm. During all deployments, a separate autonomous CTD instrument was mounted that measures depth, temperature, salinity, turbidity, oxygen concentration and chlorophyll-a so that these environmental data can be linked to the imaged particles. The towed frame was also mounted with a real-time depth sensor and was stabilized with a depressor.

The towed deployments were performed on Borkum Reef Grounds on 3 parallel transects A, C and D of approximately 1.5km. The transects passed stations 1-10 and started and finished well outside of the reef area. During a deployment, a transect was sailed up and down continuously for 2 – 3 hours at 1.5 to 2 knots, with the exact sailing time and speed depending on current and wind. The frame was either towed in a 'jowjo' profile, continuously raising and lowering the frame between surface and bottom (3 - 5m above the bottom as a safety margin depending on wave conditions) with a vertical speed of approximately 5 meters per minute, or in a fixed depth profile at 5 – 6 m below the surface or in a fixed depth profile at 3 – 5m above the bottom. Each transect was covered with at least one (A), but if time allowed multiple casts (C & D) of each of these profiles. In this way, the horizontal and vertical as well as the temporal variation in the zooplankton composition can be analyzed.

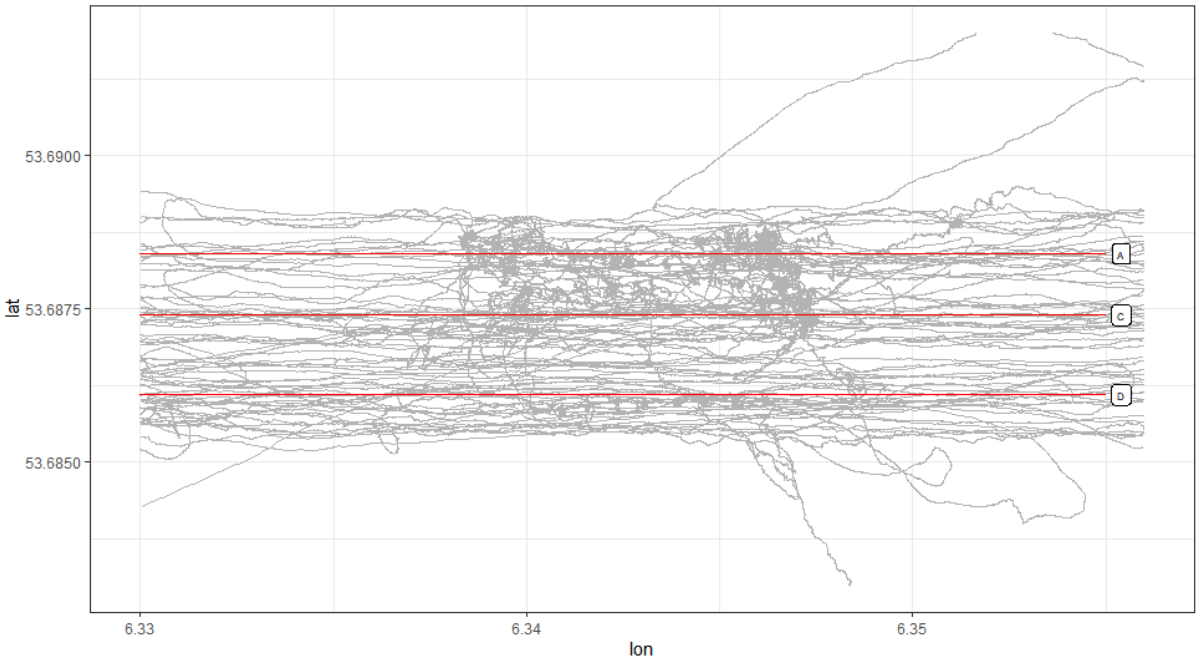

Figure 27: CPICS transects A-C-D as performed.

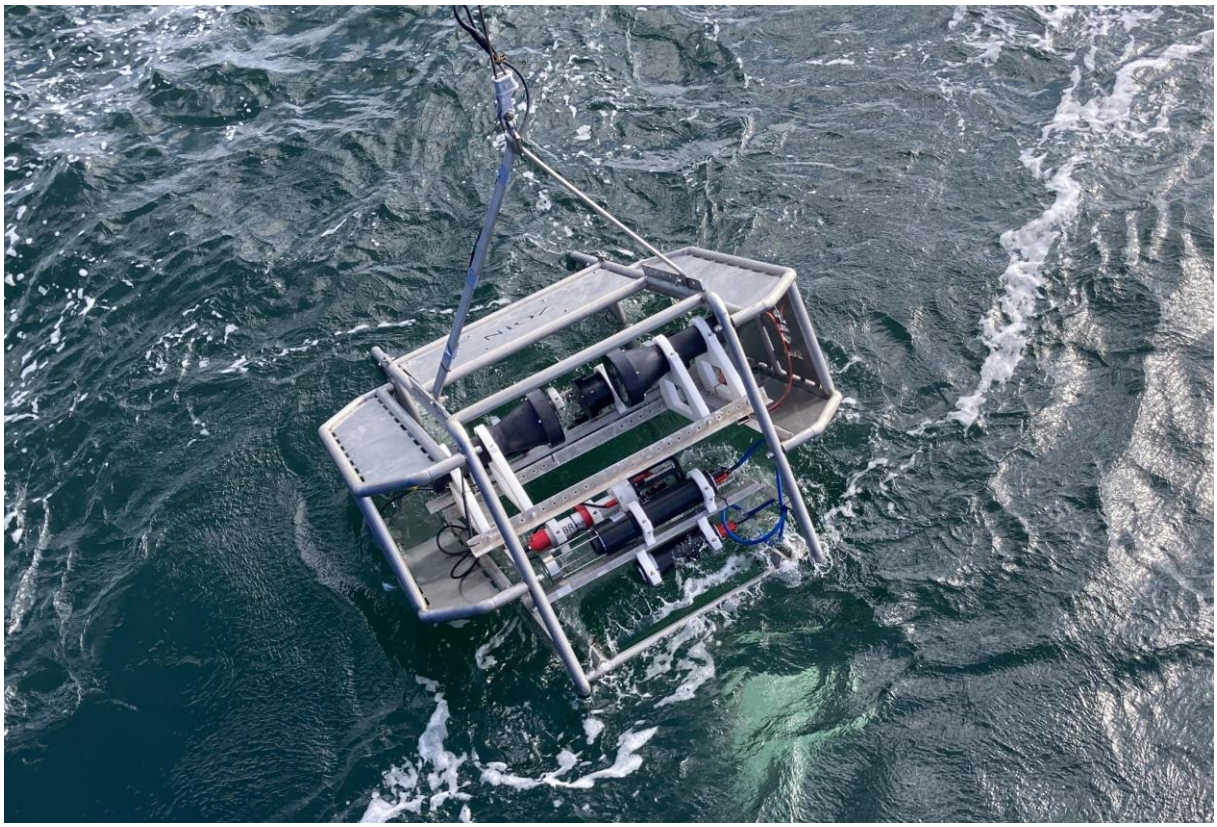

Figure 28: CPICS frame is lowered in the water for one of the horizontal of jowjo transects.

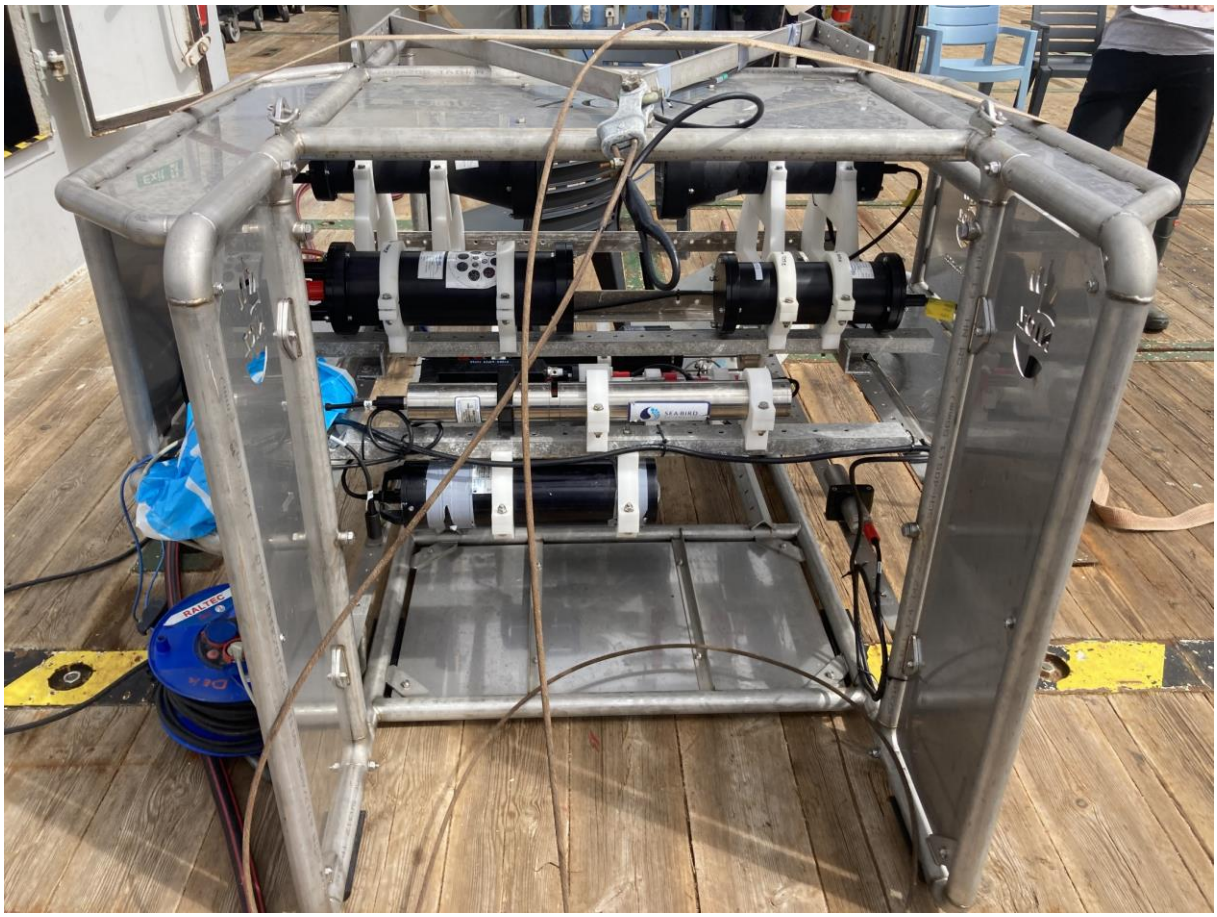

Figure 29: CPICS frame on deck ready for deployment.

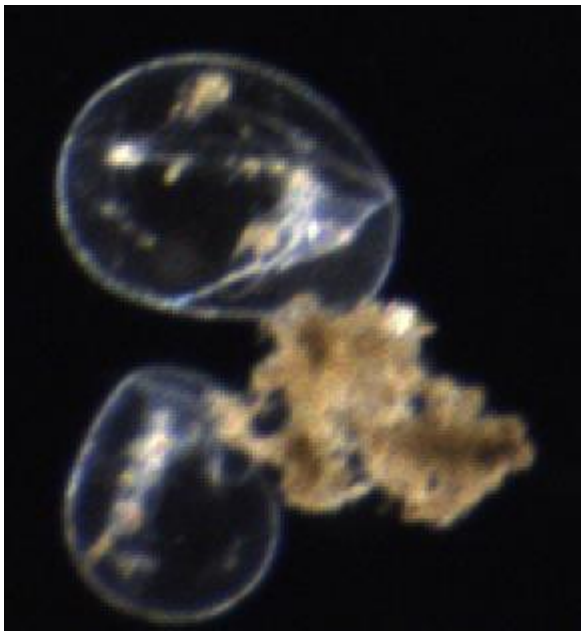

Figure 30: An image from CPICS showing Noctiluca Scintillans feeding on detritus, Borkum Grounds 11th of July. True size 1.31 mm x 1.42 mm

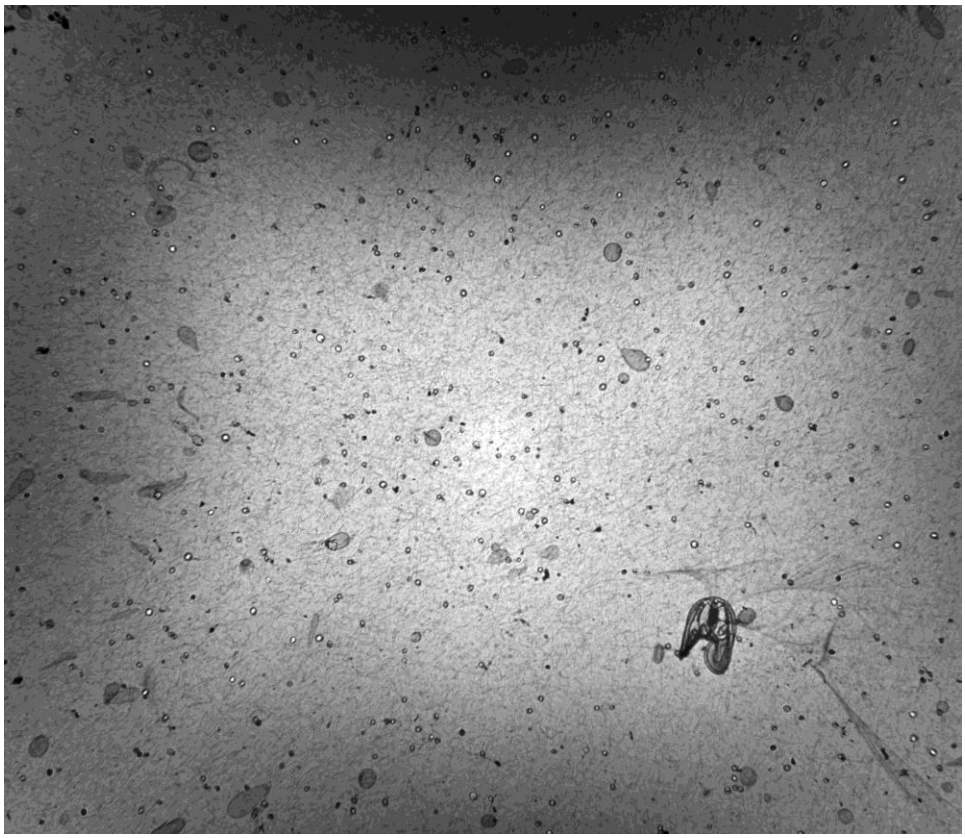

Figure 31: A raw image from ISIIS showing a.o. a juvenile ctenophore, Borkum Grounds 11th of July. True size 8.83 cm x 7.64 cm

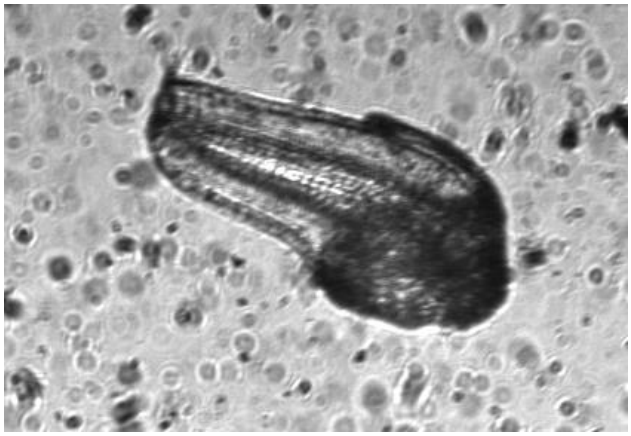

Figure 32: A cropped selection of an image from ISIIS showing a fish larva from Bruine Bank, 5th of July. True size 7.2 mm x 4.9 mm

Fish finder sonar

Most nights at the Borkum Reef Grounds and during the day when activities required a slow sailing speed, the area of covering the transects, were scanned using a Kongsberg Simrad EK80 fish finder sonar mounted on the measurement pole on the vessel. This was performed sailing overlapping transects, providing full cover of the whole site. Sonar settings resulting in data with the highest possible details were used. These data will later be used to assess the presence of fish and large plankton in the water column along the transects.

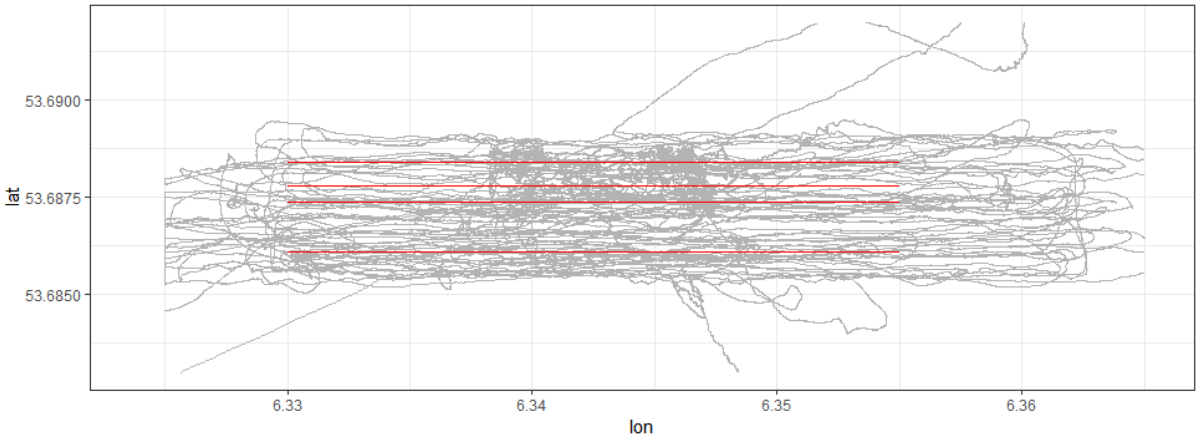

Figure 33: Red lines outline the A-D transects, around and between which sonar scans were executed. Most grey east-west oriented lines indicate sonar measurements. The high concentration of chaotic grey lines indicate the main research area around the reef.

Sound recordings on board

Personal account by Lotte Nijsten.

During the ReVIFES Brown Bank Cruise I made sound recordings of the sea, the research, and the ship, and documented the cruise by using some interviews and sound recordings. I also took photos and recorded a lot of video footage, using a GoPro Hero 8 and a Konica autoreflex camera. The sound recordings were primarily made with a Sound Device 744T, and a M/S set with Sennheiser microphones. I also used a wireless receiver set from Lectrosonics with Lavalier microphones. These are small microphones that are especially useful to amplify certain sounds in noisy and loud environments.

The recordings will be used in a live performance about the North Sea. In the performance we are focusing on the relationship between humans, technology and the sea. During the cruise I recorded a variety of non-narrative sounds like crabs, engines, generators, winches, radio communication,… These sounds will be used to create soundscapes and musical compositions. The interviews and the documentary footage will be used as short, narrative scenes during the performance.

The video's contain footage of the sea, shot from different angles and locations on the ship, footage of the research equipment (CTD in the water, video frame,…) that was used for the different surveys, and some footage of specific research processes.

Figure 34: Lotte captures the sound of the fish cages being handled by crew members

Figure 35: Lotte captures the sound of edible crabs and hermit crabs moving around.

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Table 2: all stations, with coordinates as planned and date it was executed.

Station_name	Type	lon.deg	lon.dec.min	lat.deg	lat.dec.min	Date
transit_1	CTD niskin	4	34.908	52	52.218	4-7-2022
transit_2	CTD niskin	4	4.728	52	39.51	4-7-2022
transit_3	CTD niskin	3	42.708	52	37.512	4-7-2022
transit_4	CTD niskin	3	33.882	52	36.708	4-7-2022
transit_5	CTD niskin	3	28.542	52	38.178	4-7-2022
transit_6	CTD niskin	3	26.61	52	38.538	4-7-2022
transit_7	CTD niskin	3	24.96	52	38.322	4-7-2022
transit_8	CTD niskin	3	23.208	52	38.118	4-7-2022
transit_9	CTD niskin	3	22.338	52	37.998	4-7-2022
transit_10	CTD niskin	3	21.39	52	37.908	4-7-2022
B_start	Video hopper	3	20.5770656	52	37.8	5-7-2022
B_end	Video hopper	3	20.5770656	52	35.7	5-7-2022
C_start	Video hopper	3	20.7541313	52	37.8	5-7-2022
C_end	Video hopper	3	20.7541313	52	35.7	5-7-2022
D_start	Video hopper	3	20.9311969	52	37.8	5-7-2022
D_end	Video hopper	3	20.9311969	52	35.7	5-7-2022
A_west_start	Video hopper	3	17.124	52	37.302	6-7-2022
A_west_end	Video hopper	3	17.085	52	37.422	6-7-2022
B_west_start	Video hopper	3	17.103	52	37.32	6-7-2022
B_west_end	Video hopper	3	17.073	52	37.422	6-7-2022
C_west_start	Video hopper	3	17.283	52	37.29	6-7-2022
C_west_end	Video hopper	3	17.259	52	37.35	6-7-2022
D_west_start	Video hopper	3	16.9515	52	36.93	6-7-2022
D_west_end	Video hopper	3	16.9539	52	37.02	6-7-2022
transit_1_FF	CTD niskin	4	34.818	52	52.428	7-7-2022
transit_2_FF	CTD niskin	4	48.408	53	18.102	8-7-2022
transit_3_FF	CTD niskin	4	58.47	53	41.562	9-7-2022
transit_4_FF	CTD niskin	4	58.812	53	42.438	10-7-2022
transit_5_FF	CTD niskin	4	59.022	53	43.11	11-7-2022
transit_6_FF	CTD niskin	4	59.208	53	43.65	7-7-2022
A_Fries_start	Video hopper	5	3.32478715	53	43.9120701	8-7-2022
A_Fries_end	Video hopper	5	2.89516205	53	44.0564369	8-7-2022
B_Fries_start	Video hopper	5	8.35707704	53	43.0504454	8-7-2022
B_Fries_end	Video hopper	5	7.91280601	53	42.9148833	8-7-2022
E_Fries_start	Video hopper	4	45.3283411	53	40.9900823	8-7-2022
E_Fries_end	Video hopper	4	44.8256492	53	41.0060643	8-7-2022
F_Fries_start	Video hopper	4	31.1167741	53	37.7626463	8-7-2022
F_Fries_end	Video hopper	4	31.0596683	53	37.7137491	8-7-2022
A_1	Light traps placed	6	20.7543457	53	41.3039948	9-7-2022
A_2	Light traps placed	6	20.6862305	53	41.3039977	9-7-2022
B_1	Light traps placed	6	20.8143428	53	41.2679948	9-7-2022
C_1	Light traps placed	6	20.8143409	53	41.2439948	9-7-2022
A_9	Light traps placed	6	20.3683594	53	41.3039977	9-7-2022
A_10	Light traps placed	6	20.3229492	53	41.3039964	9-7-2022

Station_name	Type	lon.deg	lon.dec.min	lat.deg	lat.dec.min	Date
B_10	Light traps placed	6	20.3829524	53	41.2679964	9-7-2022
C_10	Light traps placed	6	20.3829546	53	41.2439964	9-7-2022
A_1	CTD niskin	6	20.8143428	53	41.2679948	9-7-2022
A_2	CTD niskin	6	20.7462285	53	41.2679977	9-7-2022
A_3	CTD niskin	6	20.6781143	53	41.2679994	9-7-2022
A_4	CTD niskin	6	20.61	53	41.268	9-7-2022
A_5	CTD niskin	6	20.5872952	53	41.268	9-7-2022
A_6	CTD niskin	6	20.5645905	53	41.2679999	9-7-2022
A_7	CTD niskin	6	20.519181	53	41.2679994	9-7-2022
A_8	CTD niskin	6	20.4737715	53	41.2679987	9-7-2022
A_9	CTD niskin	6	20.4283619	53	41.2679977	9-7-2022
A_11	CTD niskin	6	19.7018097	53	41.2679426	9-7-2022
A_1	Light traps recovered	6	20.7543457	53	41.3039948	10-7-2022
A_2	Light traps recovered	6	20.6862305	53	41.3039977	10-7-2022
B_1	Light traps recovered	6	20.8143428	53	41.2679948	10-7-2022
C_1	Light traps recovered	6	20.8143409	53	41.2439948	10-7-2022
A_9	Light traps recovered	6	20.3683594	53	41.3039977	10-7-2022
A_10	Light traps recovered	6	20.3229492	53	41.3039964	10-7-2022
B_10	Light traps recovered	6	20.3829524	53	41.2679964	10-7-2022
C_10	Light traps recovered	6	20.3829546	53	41.2439964	10-7-2022
A_1	Ring net	6	20.7543457	53	41.3039948	10-7-2022
A_1	Ring net	6	20.7543457	53	41.3039948	10-7-2022
A_2	Ring net	6	20.6862305	53	41.3039977	10-7-2022
A_2	Ring net	6	20.6862305	53	41.3039977	10-7-2022
A_9	Ring net	6	20.3683594	53	41.3039977	10-7-2022
A_9	Ring net	6	20.3683594	53	41.3039977	10-7-2022
A_10	Ring net	6	20.3229492	53	41.3039964	10-7-2022
A_10	Ring net	6	20.3229492	53	41.3039964	10-7-2022
B_1	Ring net	6	20.8143428	53	41.2679948	10-7-2022
B_1	Ring net	6	20.8143428	53	41.2679948	10-7-2022
B_10	Ring net	6	20.3829524	53	41.2679964	10-7-2022
B_10	Ring net	6	20.3829524	53	41.2679964	10-7-2022
A_1	Baited cage in	6	20.7543457	53	41.3039948	11-7-2022
A_2	Baited cage in	6	20.6862305	53	41.3039977	11-7-2022
A_3	Baited cage in	6	20.6181152	53	41.3039994	11-7-2022
A_5	Baited cage in	6	20.5272949	53	41.304	11-7-2022
A_6	Baited cage in	6	20.5045898	53	41.3039999	11-7-2022
A_7	Baited cage in	6	20.4591797	53	41.3039994	11-7-2022
A_9	Baited cage in	6	20.3683594	53	41.3039977	11-7-2022
A_10	Baited cage in	6	20.3229492	53	41.3039964	11-7-2022
C_1	Ring net 3x	6	20.8143409	53	41.2439948	11-7-2022
C_10	Ring net 3x	6	20.3829546	53	41.2439964	11-7-2022
A_1	Baited cage out	6	20.7543457	53	41.3039948	12-7-2022
A_2	Baited cage out	6	20.6862305	53	41.3039977	12-7-2022

Station_name	Type	lon.deg	lon.dec.min	lat.deg	lat.dec.min	Date
A_3	Baited cage out	6	20.6181152	53	41.3039994	12-7-2022
A_5	Baited cage out	6	20.5272949	53	41.304	12-7-2022
A_6	Baited cage out	6	20.5045898	53	41.3039999	12-7-2022
A_7	Baited cage out	6	20.4591797	53	41.3039994	12-7-2022
A_9	Baited cage out	6	20.3683594	53	41.3039977	12-7-2022
A_10	Baited cage out	6	20.3229492	53	41.3039964	12-7-2022
B_1	CTD niskin	6	20.8143428	53	41.2679948	12-7-2022
B_2	CTD niskin	6	20.7462285	53	41.2679977	12-7-2022
B_3	CTD niskin	6	20.6781143	53	41.2679994	12-7-2022
B_4	CTD niskin	6	20.61	53	41.268	12-7-2022
B_5	CTD niskin	6	20.5872952	53	41.268	12-7-2022
B_6	CTD niskin	6	20.5645905	53	41.2679999	12-7-2022
B_7	CTD niskin	6	20.519181	53	41.2679994	12-7-2022
B_8	CTD niskin	6	20.4737715	53	41.2679987	12-7-2022
B_9	CTD niskin	6	20.4283619	53	41.2679977	12-7-2022
B_11	CTD niskin	6	19.7018097	53	41.2679426	12-7-2022
C_1	CTD niskin	6	20.8143409	53	41.2439948	12-7-2022
C_2	CTD niskin	6	20.7462273	53	41.2439977	12-7-2022
C_3	CTD niskin	6	20.6781136	53	41.2439994	12-7-2022
C_4	CTD niskin	6	20.61	53	41.244	12-7-2022
C_5	CTD niskin	6	20.5872955	53	41.244	12-7-2022
C_6	CTD niskin	6	20.5645909	53	41.2439999	12-7-2022
C_7	CTD niskin	6	20.5191818	53	41.2439994	12-7-2022
C_8	CTD niskin	6	20.4737727	53	41.2439987	12-7-2022
C_9	CTD niskin	6	20.4283637	53	41.2439977	12-7-2022
C_11	CTD niskin	6	19.7018183	53	41.2439426	12-7-2022
A_1	WP2 net x4	6	20.7543457	53	41.3039948	13-7-2022
A_2	WP2 net x4	6	20.6862305	53	41.3039977	13-7-2022
B_1	WP2 net x4	6	20.8143428	53	41.2679948	13-7-2022
A_9	WP2 net x4	6	20.3683594	53	41.3039977	13-7-2022
A_10	WP2 net x4	6	20.3229492	53	41.3039964	13-7-2022
B_10	WP2 net x4	6	20.3829524	53	41.2679964	13-7-2022
B_1	Place cage	6	20.8143428	53	41.2679948	13-7-2022
B_2	Place cage	6	20.7462285	53	41.2679977	13-7-2022
B_3	Place cage	6	20.6781143	53	41.2679994	13-7-2022
B_5	Place cage	6	20.5872952	53	41.268	13-7-2022
B_6	Place cage	6	20.5645905	53	41.2679999	13-7-2022
B_7	Place cage	6	20.519181	53	41.2679994	13-7-2022
B_9	Place cage	6	20.4283619	53	41.2679977	13-7-2022
B_10	Place cage	6	20.3829524	53	41.2679964	13-7-2022
C_1	WP2 net x2	6	20.8143409	53	41.2439948	13-7-2022
C_10	WP2 net x2	6	20.3829546	53	41.2439964	13-7-2022
C_1	Ring net	6	20.8143409	53	41.2439948	13-7-2022
C_2	Ring net	6	20.8143409	53	41.2439948	13-7-2022

Station_name	Type	lon.deg	lon.dec.min	lat.deg	lat.dec.min	Date
C_9	Ring net	6	20.3829546	53	41.2439964	13-7-2022
C_10	Ring net	6	20.3829546	53	41.2439964	13-7-2022
D_start	CPICS frame	6	21.3	53	41.166	13-7-2022
D_end	CPICS frame	6	19.8	53	41.166	13-7-2022
B_1	Recover cage	6	20.8143428	53	41.2679948	14-7-2022
B_2	Recover cage	6	20.7462285	53	41.2679977	14-7-2022
B_3	Recover cage	6	20.6781143	53	41.2679994	14-7-2022
B_5	Recover cage	6	20.5872952	53	41.268	14-7-2022
B_6	Recover cage	6	20.5645905	53	41.2679999	14-7-2022
B_7	Recover cage	6	20.519181	53	41.2679994	14-7-2022
B_9	Recover cage	6	20.4283619	53	41.2679977	14-7-2022
B_10	Recover cage	6	20.3829524	53	41.2679964	14-7-2022
A_1	Ring net	6	20.7543457	53	41.3039948	14-7-2022
A_2	Ring net	6	20.6862305	53	41.3039977	14-7-2022
A_9	Ring net	6	20.3683594	53	41.3039977	14-7-2022
A_10	Ring net	6	20.3229492	53	41.3039964	14-7-2022
A_start	CPICS	6	21.3	53	41.304	14-7-2022
A_end	CPICS	6	19.8	53	41.304	14-7-2022
transit_end	CTD niskin	6	11.202	53	40.14	14-07-2022

Table 3. Overview of all operations during cruise 64PE505. Time in UTC.

Date	latitude	longitude	Phase name	Device name	Cast	conductivity	salinity	density	water temperature
4-7-2022 8:49	52.8705	4.5818	STATION 1	CTD with Samples	1_1	4.24	31.4	1022.323	19
4-7-2022 9:10	52.8703	4.5818	STATION 2	CTD with Samples	2_1	4.23	31.3	1022.233	18.9
4-7-2022 11:55	52.6585	4.0778	STATION 3	CTD with Samples	3_1	4.38	33.21	1023.903	18.1
4-7-2022 12:17	52.6585	4.0783	STATION 4	CTD with Samples	4_1	4.39	33.31	1023.983	18.2
4-7-2022 12:54	52.6585	4.0788	STATION 4	CTD with Samples	4_2	4.38	33.34	1024.033	18
4-7-2022 14:42	52.6252	3.7118	STATION 6	CTD with Samples	6_1	4.43	34.46	1025.093	17.1
4-7-2022 15:38	52.6118	3.5647	STATION 7	CTD with Samples	7_1	4.42	34.57	1025.223	16.9
4-7-2022 16:34	52.6363	3.4757	STATION 8	CTD with Samples	8_1	4.42	34.62	1025.293	16.8
4-7-2022 17:03	52.6423	3.4435	STATION 9	CTD with Samples	9_1	4.42	34.64	1025.313	16.7
4-7-2022 17:35	52.6387	3.416	STATION 10	CTD with Samples	10_1	4.41	34.61	1025.293	16.7
4-7-2022 18:04	52.6353	3.3868	STATION 11	CTD with Samples	11_1	4.4	34.61	1025.313	16.6
4-7-2022 18:30	52.6333	3.3723	STATION 12	CTD with Samples	12_1	4.4	34.64	1025.353	16.5
4-7-2022 18:53	52.6318	3.3565	STATION 13	CTD with Samples	13_1	4.39	34.55	1025.273	16.5
5-7-2022 6:23	52.6298	3.3428	STATION 14	Hopper Camera	14_1	4.39	34.78	1025.533	16.3
5-7-2022 10:53	52.5948	3.3488	STATION 15	Hopper Camera	15_1	4.41	34.71	1025.413	16.6
5-7-2022 15:51	52.6302	3.3465	STATION 16	Hopper Camera	16_1	4.4	34.75	1025.483	16.4
6-7-2022 6:03	52.6157	3.3462	STATION 17	Hopper Camera	17_1	4.4	34.76	1025.483	16.5
6-7-2022 9:03	52.6032	3.3443	STATION 18	Hopper Camera	18_1	4.41	34.79	1025.483	16.5
6-7-2022 9:44	52.6103	3.3463	STATION 19	Hopper Camera	19_1	4.41	34.74	1025.433	16.5
6-7-2022 10:40	52.6145	3.348	STATION 20	Hopper Camera	20_1	4.41	34.77	1025.463	16.6
6-7-2022 11:25	52.6137	3.3498	STATION 21	Hopper Camera	21_1	4.42	34.76	1025.443	16.6
6-7-2022 12:22	52.6175	3.342	STATION 23	Hopper Camera	23_1	4.42	34.74	1025.433	16.6
6-7-2022 13:19	52.6227	3.3413	STATION 23	Hopper Camera	23_2	4.42	34.72	1025.393	16.9
6-7-2022 14:10	52.6213	3.2853	STATION 24	Hopper Camera	24_1	4.41	34.76	1025.463	16.5
6-7-2022 14:36	52.6237	3.2847	STATION 25	Hopper Camera	25_1	4.4	34.73	1025.463	16.4
6-7-2022 15:16	52.6215	3.288	STATION 26	Hopper Camera	26_1	4.4	34.73	1025.463	16.5
6-7-2022 15:55	52.6157	3.2832	STATION 27	Hopper Camera	27_1	4.4	34.74	1025.453	16.4
6-7-2022 16:12	52.6172	3.2827	STATION 27	Hopper Camera	27_2	4.4	34.73	1025.453	16.5
6-7-2022 16:12	52.6172	3.2827	STATION 28	Hopper Camera	28_1	4.4	34.73	1025.453	16.4
6-7-2022 18:00	52.6175	3.3038	STATION 29	Ring net	29_1	4.39	34.75	1025.493	16.4
6-7-2022 18:06	52.6178	3.3048	STATION 30	Ring net	30_1	4.39	34.79	1025.543	16.3
7-7-2022 8:41	52.8738	4.5803	STATION 31	CTD with Samples	31_1	4.2	30.76	1021.713	19.7
7-7-2022 12:48	53.3017	4.8068	STATION 33	CTD with Samples	33_1	4.36	33.31	1024.043	17.8
7-7-2022 17:03	53.6927	4.9745	STATION 34	CTD with Samples	34_1	4.39	34.03	1024.753	17.2
7-7-2022 17:31	53.7073	4.9802	STATION 35	CTD with Samples	35_1	4.41	34.19	1024.863	17.2
7-7-2022 17:59	53.7185	4.9837	STATION 36	CTD with Samples	36_1	4.42	34.23	1024.893	17.3
7-7-2022 18:25	53.7275	4.9868	STATION 37	CTD with Samples	37_1	4.42	34.23	1024.883	17.3
8-7-2022 6:10	53.7317	5.0558	STATION 38	Hopper Camera	38_1	4.4	34.01	1024.693	17.3
8-7-2022 7:57	53.7173	5.1392	STATION 39	Hopper Camera	39_1	4.4	34.11	1024.793	17.3
8-7-2022 11:03	53.6832	4.7558	STATION 39	Hopper Camera	39_2	4.43	34.23	1024.863	17.3
8-7-2022 11:33	53.6835	4.747	STATION 40	Hopper Camera	40_1	4.44	34.26	1024.853	17.4
8-7-2022 12:09	53.6827	4.7558	STATION 40	Hopper Camera	40_2	4.45	34.28	1024.863	17.5
8-7-2022 14:20	53.6285	4.518	STATION 42	Hopper Camera	42_1	4.47	34.24	1024.783	17.7
8-7-2022 15:08	53.632	4.5227	STATION 43	Hopper Camera	43_1	4.48	34.28	1024.793	17.9
8-7-2022 16:45	53.6165	4.515	STATION 44	Ring net	44_1	4.5	34.3	1024.753	18
8-7-2022 16:53	53.6147	4.5135	STATION 45	Ring net	45_1	4.49	34.29	1024.763	18
9-7-2022 6:18	53.6883	6.346	STATION 46	Light trap	46_1	4.36	33.01	1023.743	18
9-7-2022 6:24	53.6883	6.3458	STATION 46	Light trap	46_1	4.36	33	1023.723	18.1
9-7-2022 6:44	53.6883	6.3447	STATION 47	Light trap	47_1	4.35	33	1023.753	18.1

Date	latitude	longitude	Phase name	Device name	Cast	conductivity	salinity	density	water temperature
9-7-2022 6:47	53.6883	6.3448	STATION 47	Light trap	47_1	4.35	32.99	1023.733	18
9-7-2022 7:09	53.6877	6.3468	STATION 48(A_3)	Light trap	48_1	4.35	33.01	1023.763	18
9-7-2022 7:13	53.6877	6.347	STATION 48(A_3)	Light trap	48_1	4.35	32.99	1023.743	18.1
9-7-2022 7:35	53.6873	6.347	STATION 49	Light trap	49_1	4.35	33	1023.753	18.1
9-7-2022 7:39	53.6873	6.347	STATION 49	Light trap	49_1	4.35	33.01	1023.763	18.1
9-7-2022 8:01	53.6883	6.3395	STATION 50	Light trap	50_1	4.35	33.01	1023.763	18.1
9-7-2022 8:07	53.6883	6.3395	STATION 50	Light trap	50_1	4.35	33	1023.753	18.1
9-7-2022 8:23	53.6883	6.3388	STATION 51	Light trap	51_1	4.35	33.01	1023.753	18.1
9-7-2022 8:23	53.6883	6.3388	STATION 51	Light trap	51_1	4.35	33.01	1023.753	18.1
9-7-2022 8:39	53.6877	6.3397	STATION 52	Light trap	52_1	4.36	33.02	1023.763	18.1
9-7-2022 8:42	53.6877	6.3397	STATION 52	Light trap	52_1	4.36	33.03	1023.773	18.1
9-7-2022 9:01	53.6873	6.3397	STATION 53	Light trap	53_1	4.36	33.04	1023.783	18
9-7-2022 9:04	53.6873	6.3397	STATION 53	Light trap	53_1	4.35	33.03	1023.773	18.1
9-7-2022 9:31	53.6882	6.3467	STATION 54	CTD with Samples	54_1	4.36	33	1023.723	18.1
9-7-2022 9:55	53.688	6.3452	STATION 55	CTD with Samples	55_1	4.35	32.95	1023.703	18.2
9-7-2022 10:15	53.6883	6.3435	STATION 56	CTD with Samples	56_1	4.35	32.94	1023.693	18.2
9-7-2022 11:07	53.6883	6.3425	STATION 57	CTD with Samples	57_1	4.35	32.89	1023.633	18.2
9-7-2022 11:21	53.6883	6.3422	STATION 58	CTD with Samples	58_1	4.35	32.87	1023.613	18.2
9-7-2022 11:39	53.6883	6.3418	STATION 59	CTD with Samples	59_1	4.35	32.87	1023.613	18.2
9-7-2022 11:56	53.6883	6.3412	STATION 60	CTD with Samples	60_1	4.35	32.87	1023.613	18.2
9-7-2022 12:13	53.6883	6.3403	STATION 61	CTD with Samples	61_1	4.35	32.88	1023.623	18.2
9-7-2022 12:45	53.6883	6.3382	STATION 62	CTD with Samples	62_1	4.36	32.88	1023.603	18.3
9-7-2022 13:15	53.6883	6.3277	STATION 63	CTD with Samples	63_1	4.36	32.9	1023.633	18.3
9-7-2022 13:36	53.6855	6.3337	STATION 64	CPICS ISIIS	64_1	4.36	32.93	1023.643	18.3
9-7-2022 16:36	53.6858	6.3305	STATION 65	CPICS ISIIS	65_1	4.36	32.99	1023.713	18.2
9-7-2022 18:12	53.686	6.346	STATION 66	Sonar	66_1	4.37	32.99	1023.703	18.1
9-7-2022 18:30	53.686	6.3453	STATION 67	Sonar	67_1	4.36	32.99	1023.703	18.2
9-7-2022 18:51	53.686	6.3447	STATION 68	Sonar	68_1	4.36	32.97	1023.693	18.3
9-7-2022 19:09	53.686	6.3438	STATION 69	Sonar	69_1	4.36	32.96	1023.683	18.2
9-7-2022 19:26	53.686	6.343	STATION 70	Sonar	70_1	4.36	32.96	1023.673	18.2
9-7-2022 19:44	53.686	6.3423	STATION 71	Sonar	71_1	4.36	32.97	1023.693	18.2
9-7-2022 20:04	53.686	6.3415	STATION 72	Sonar	72_1	4.36	32.96	1023.693	18.2
9-7-2022 20:24	53.686	6.3408	STATION 73	Sonar	73_1	4.36	32.95	1023.683	18.2
10-7-2022 6:02	53.6882	6.345	STATION 74	Light trap	74_1	4.48	33.05	1023.483	20.9
10-7-2022 6:23	53.6883	6.346	STATION 75	Light trap	75_1	4.49	33.06	1023.453	21
10-7-2022 6:41	53.6872	6.347	STATION 76	Light trap	76_1	4.5	33.07	1023.423	21.1
10-7-2022 7:01	53.6875	6.347	STATION 77	Light trap	77_1	4.34	33.03	1023.803	18
10-7-2022 7:26	53.6877	6.3382	STATION 78	Light trap	78_1	4.34	33.04	1023.813	18
10-7-2022 7:45	53.6883	6.339	STATION 79	Light trap	79_1	4.34	33.04	1023.813	17.9
10-7-2022 8:04	53.6872	6.3393	STATION 80	Light trap	80_1	4.34	33.05	1023.823	17.9
10-7-2022 8:17	53.6877	6.3392	STATION 81	Light trap	81_1	4.34	33.04	1023.823	17.9
10-7-2022 9:25	53.6883	6.3458	STATION 82	Kwallennet	82_1	4.34	32.95	1023.733	18
10-7-2022 9:43	53.6885	6.3458	STATION 83	Kwallennet	83_1	4.34	32.92	1023.703	18
10-7-2022 10:00	53.6887	6.3462	STATION 84	Kwallennet	84_1	4.34	32.93	1023.723	18
10-7-2022 11:25	53.6888	6.3463	STATION 84	Kwallennet	84_2	4.34	32.91	1023.693	18
10-7-2022 11:45	53.6888	6.3463	STATION 84	Kwallennet	84_3	4.34	32.9	1023.683	18.1
10-7-2022 12:10	53.6888	6.345	STATION 87	Kwallennet	87_1	4.34	32.9	1023.693	18.1
10-7-2022 12:48	53.6888	6.34	STATION 87	Kwallennet	87_2	4.34	32.89	1023.673	18
10-7-2022 13:08	53.6888	6.34	STATION 87	Kwallennet	87_3	4.33	32.88	1023.673	18.1
10-7-2022 13:38	53.6885	6.339	STATION 87	Kwallennet	87_4	4.33	32.88	1023.663	18.1

Date	latitude	longitude	Phase name	Device name	Cast	conductivity	salinity	density	water temperature
10-7-2022 13:56	53.6887	6.3398	STATION 87	Kwallennet	87_5	4.34	32.88	1023.663	18.1
10-7-2022 14:11	53.6885	6.3383	STATION 92	Kwallennet	92_1	4.34	32.9	1023.683	18.1
10-7-2022 14:29	53.6887	6.3383	STATION 93	Kwallennet	93_1	4.34	32.89	1023.673	18.1
10-7-2022 14:56	53.688	6.3393	STATION 94	Kwallennet	94_1	4.34	32.92	1023.683	18.1
10-7-2022 15:13	53.688	6.3393	STATION 95	Kwallennet	95_1	4.34	32.93	1023.703	18.1
10-7-2022 15:29	53.688	6.3393	STATION 96	Kwallennet	96_1	4.34	32.94	1023.713	18.1
10-7-2022 16:28	53.6878	6.3465	STATION 97	Kwallennet	97_1	4.35	32.96	1023.723	18.1
10-7-2022 16:45	53.6878	6.3467	STATION 98	Kwallennet	98_1	4.35	32.95	1023.713	18.1
10-7-2022 17:03	53.6878	6.3463	STATION 99	Kwallennet	99_1	4.34	32.96	1023.733	18
10-7-2022 17:12	53.6877	6.3465	STATION 100	Kwallennet	100_1	4.34	32.99	1023.773	17.9
10-7-2022 17:57	53.6888	6.3637	STATION 101	Sonar	101_1	4.34	33.02	1023.803	18
11-7-2022 6:05	53.6885	6.346	STATION 102	Fish cage	102_1	4.34	33.01	1023.783	18
11-7-2022 6:11	53.6883	6.3458	STATION 102	Fish cage	102_1	4.35	33.03	1023.793	18
11-7-2022 6:25	53.6883	6.3447	STATION 103	Fish cage	103_1	4.35	33.05	1023.813	17.9
11-7-2022 6:26	53.6883	6.3447	STATION 103	Fish cage	103_1	4.35	33.04	1023.813	17.9
11-7-2022 6:39	53.6883	6.3437	STATION 104	Fish cage	104_1	4.35	33.02	1023.783	18
11-7-2022 6:42	53.6883	6.3435	STATION 104	Fish cage	104_1	4.35	33.05	1023.813	18
11-7-2022 6:56	53.6883	6.3422	STATION 105	Fish cage	105_1	4.35	33.03	1023.793	18
11-7-2022 7:00	53.6883	6.3422	STATION 105	Fish cage	105_1	4.35	33.03	1023.793	17.9
11-7-2022 7:10	53.6883	6.3418	STATION 105	Fish cage	105_2	4.35	33.01	1023.773	18
11-7-2022 7:14	53.6883	6.3417	STATION 105	Fish cage	105_2	4.35	33.04	1023.793	18
11-7-2022 7:26	53.6883	6.341	STATION 107	Fish cage	107_1	4.35	33.01	1023.773	18
11-7-2022 7:27	53.6883	6.341	STATION 107	Fish cage	107_1	4.35	33.02	1023.773	18
11-7-2022 7:35	53.6883	6.3395	STATION 108	Fish cage	108_1	4.35	32.98	1023.753	18.1
11-7-2022 7:39	53.6883	6.3395	STATION 108	Fish cage	108_1	4.35	33	1023.753	18
11-7-2022 7:50	53.6883	6.3387	STATION 109	Fish cage	109_1	4.35	32.97	1023.743	18.1
11-7-2022 7:53	53.6883	6.3387	STATION 109	Fish cage	109_1	4.35	32.97	1023.733	18.1
11-7-2022 8:35	53.6877	6.3468	STATION 110	Kwallennet	110_1	4.35	32.99	1023.743	18.1
11-7-2022 8:56	53.6877	6.347	STATION 111	Kwallennet	111_1	4.34	32.97	1023.743	18
11-7-2022 9:17	53.6877	6.347	STATION 112	Kwallennet	112_1	4.34	32.95	1023.723	18.1
11-7-2022 9:48	53.6875	6.3398	STATION 113	Kwallennet	113_1	4.34	32.93	1023.703	18.1
11-7-2022 10:07	53.6877	6.34	STATION 114	Kwallennet	114_1	4.34	32.93	1023.693	18.1
11-7-2022 11:17	53.6875	6.34	STATION 115	Kwallennet	115_1	4.35	32.91	1023.663	18.1
11-7-2022 11:46	53.6878	6.34	STATION 116	Kwallennet	116_1	4.35	32.9	1023.653	18.2
11-7-2022 12:22	53.6878	6.3468	STATION 117	Kwallennet	117_1	4.35	32.89	1023.633	18.1
11-7-2022 13:11	53.6885	6.3592	STATION 118	CPICS ISIIS	118_1	4.35	32.9	1023.653	18.1
11-7-2022 16:32	53.6873	6.3555	STATION 119	CPICS ISIIS	119_1	4.36	32.89	1023.623	18.3
11-7-2022 18:07	53.6875	6.331	STATION 120	Sonar	120_1	4.36	32.94	1023.673	18.2
12-7-2022 5:50	53.6882	6.347	STATION 121	Fish cage	121_1	4.35	32.97	1023.723	18
12-7-2022 6:14	53.6883	6.3453	STATION 122	Fish cage	122_1	4.34	32.99	1023.763	18
12-7-2022 6:27	53.6883	6.3442	STATION 123	Fish cage	123_1	4.34	33	1023.773	17.9
12-7-2022 6:45	53.6883	6.3427	STATION 124	Fish cage	124_1	4.34	33.02	1023.793	18
12-7-2022 7:00	53.6883	6.3422	STATION 125	Fish cage	125_1	4.34	33.03	1023.803	18
12-7-2022 7:18	53.6882	6.3413	STATION 126	Fish cage	126_1	4.35	33.05	1023.823	18
12-7-2022 7:30	53.6883	6.34	STATION 127	Fish cage	127_1	4.35	33.07	1023.833	17.9
12-7-2022 7:45	53.6883	6.339	STATION 128	Fish cage	128_1	4.35	33.08	1023.833	17.9
12-7-2022 8:44	53.6878	6.3468	STATION 129	CTD with Samples	129_1	4.35	33.06	1023.813	18
12-7-2022 9:01	53.6878	6.3457	STATION 130	CTD with Samples	130_1	4.35	33.07	1023.813	18
12-7-2022 9:18	53.6878	6.3445	STATION 131	CTD with Samples	131_1	4.36	33.05	1023.793	18
12-7-2022 9:34	53.6878	6.3433	STATION 132	CTD with Samples	132_1	4.36	33.05	1023.793	18.1

Date	latitude	longitude	Phase name	Device name	Cast	conductivity	salinity	density	water temperature
12-7-2022 9:53	53.6878	6.343	STATION 133	CTD with Samples	133_1	4.36	33.03	1023.753	18.1
12-7-2022 11:07	53.6877	6.3423	STATION 134	CTD with Samples	134_1	4.39	32.98	1023.633	18.4
12-7-2022 11:31	53.6878	6.3418	STATION 135	CTD with Samples	135_1	4.4	32.94	1023.573	18.6
12-7-2022 11:49	53.6878	6.341	STATION 136	CTD with Samples	136_1	4.41	32.91	1023.503	18.8
12-7-2022 12:05	53.6878	6.3402	STATION 137	CTD with Samples	137_1	4.42	32.9	1023.473	18.9
12-7-2022 12:26	53.6878	6.3395	STATION 138	CTD with Samples	138_1	4.42	32.84	1023.393	18.9
12-7-2022 13:03	53.6878	6.3282	STATION 139	CTD with Samples	139_1	4.39	32.81	1023.443	18.7
12-7-2022 13:19	53.6875	6.3282	STATION 140	CTD with Samples	140_1	4.44	32.85	1023.363	19.2
12-7-2022 14:12	53.6873	6.3403	STATION 141	CTD with Samples	141_1	4.42	32.79	1023.353	19
12-7-2022 14:28	53.6873	6.3412	STATION 142	CTD with Samples	142_1	4.42	32.79	1023.343	19
12-7-2022 14:45	53.6875	6.342	STATION 143	CTD with Samples	143_1	4.41	32.79	1023.383	18.9
12-7-2022 14:59	53.6873	6.3428	STATION 144	CTD with Samples	144_1	4.42	32.8	1023.363	18.8
12-7-2022 15:12	53.6873	6.3432	STATION 145	CTD with Samples	145_1	4.38	32.81	1023.483	18.4
12-7-2022 15:26	53.6875	6.3437	STATION 145	CTD with Samples	145_2	4.37	32.82	1023.523	18.5
12-7-2022 15:26	53.6875	6.3437	STATION 146	CTD with Samples	146_1	4.37	32.82	1023.523	18.4
12-7-2022 15:40	53.6875	6.3448	STATION 147	CTD with Samples	147_1	4.39	32.84	1023.483	18.6
12-7-2022 16:23	53.6875	6.346	STATION 148	CTD with Samples	148_1	4.38	32.89	1023.543	18.5
12-7-2022 16:40	53.6875	6.3472	STATION 149	CTD with Samples	149_1	4.39	32.89	1023.533	18.6
12-7-2022 17:07	53.6892	6.3633	STATION 150	Sonar	150_1	4.39	32.91	1023.553	18.5
13-7-2022 6:01	53.6885	6.3458	STATION 151	WP2 net	151_1	4.37	32.95	1023.643	18.4
13-7-2022 6:29	53.6885	6.3453	STATION 152	WP2 net	152_1	4.37	32.94	1023.653	18.3
13-7-2022 6:39	53.6885	6.3455	STATION 153	WP2 net	153_1	4.37	32.97	1023.673	18.2
13-7-2022 6:53	53.6885	6.3443	STATION 154	WP2 net	154_1	4.37	33	1023.713	18.2
13-7-2022 7:06	53.6885	6.3443	STATION 155	WP2 net	155_1	4.36	33.01	1023.723	18.1
13-7-2022 7:22	53.6878	6.3465	STATION 156	WP2 net	156_1	4.37	33.04	1023.753	18.1
13-7-2022 7:33	53.6878	6.3463	STATION 157	WP2 net	157_1	4.37	33.06	1023.783	18.1
13-7-2022 7:52	53.6885	6.3392	STATION 158	WP2 net	158_1	4.37	33.08	1023.793	18.1
13-7-2022 8:01	53.6885	6.339	STATION 159	WP2 net	159_1	4.37	33.09	1023.803	18
13-7-2022 8:10	53.6885	6.3383	STATION 160	WP2 net	160_1	4.37	33.1	1023.813	18.1
13-7-2022 8:20	53.6885	6.3383	STATION 161	WP2 net	161_1	4.37	33.11	1023.823	18.1
13-7-2022 8:33	53.6878	6.3393	STATION 162	WP2 net	162_1	4.37	33.09	1023.793	18.1
13-7-2022 8:42	53.6878	6.3392	STATION 163	WP2 net	163_1	4.37	33.09	1023.793	18.2
13-7-2022 9:02	53.6878	6.3468	STATION 164	Fish cage	164_1	4.38	33.09	1023.773	18.2
13-7-2022 9:07	53.6878	6.3468	STATION 164	Fish cage	164_1	4.38	33.08	1023.773	18.2
13-7-2022 9:17	53.6877	6.3458	STATION 165	Fish cage	165_1	4.38	33.03	1023.713	18.3
13-7-2022 9:20	53.6878	6.3457	STATION 165	Fish cage	165_1	4.39	33.03	1023.693	18.4
13-7-2022 9:29	53.6878	6.3447	STATION 166	Fish cage	166_1	4.4	33.04	1023.673	18.5
13-7-2022 9:31	53.6878	6.3447	STATION 166	Fish cage	166_1	4.4	33.04	1023.673	18.5
13-7-2022 9:39	53.6878	6.3432	STATION 167	Fish cage	167_1	4.41	33.04	1023.653	18.6
13-7-2022 9:41	53.6878	6.3432	STATION 167	Fish cage	167_1	4.41	33.06	1023.663	18.6
13-7-2022 9:53	53.6877	6.3428	STATION 168	Fish cage	168_1	4.41	33.03	1023.633	18.6
13-7-2022 9:56	53.6877	6.3428	STATION 168	Fish cage	168_1	4.41	33.05	1023.653	18.6
13-7-2022 10:04	53.6877	6.342	STATION 169	Fish cage	169_1	4.41	33.05	1023.663	18.6
13-7-2022 10:09	53.6877	6.342	STATION 169	Fish cage	169_1	4.41	33.01	1023.613	18.7
13-7-2022 10:16	53.6877	6.3407	STATION 170	Fish cage	170_1	4.41	33.02	1023.623	18.6
13-7-2022 10:22	53.6877	6.3405	STATION 170	Fish cage	170_1	4.41	33.02	1023.623	18.7
13-7-2022 10:28	53.6877	6.3398	STATION 171	Fish cage	171_1	4.41	33.02	1023.613	18.6
13-7-2022 10:34	53.6877	6.3397	STATION 171	Fish cage	171_1	4.41	33.03	1023.623	18.7
13-7-2022 11:47	53.6873	6.347	STATION 172	WP2 net	172_1	4.4	33.05	1023.683	18.4
13-7-2022 12:14	53.6875	6.3473	STATION 173	WP2 net	173_1	4.39	33.05	1023.703	18.3

Date	latitude	longitude	Phase name	Device name	Cast	conductivity	salinity	density	water temperature
13-7-2022 12:25	53.6873	6.3475	STATION 174	WP2 net	174_1	4.49	33.53	1023.963	18.5
13-7-2022 12:42	53.6875	6.3475	STATION 175	Kwallennet	175_1	4.39	33.01	1023.663	18.4
13-7-2022 13:14	53.6873	6.3462	STATION 176	Kwallennet	176_1	4.4	32.99	1023.623	18.5
13-7-2022 13:51	53.6875	6.3407	STATION 177	Kwallennet	177_1	4.4	32.95	1023.583	18.5
13-7-2022 14:15	53.6873	6.34	STATION 178	Kwallennet	178_1	4.39	32.96	1023.603	18.5
13-7-2022 14:36	53.6872	6.3402	STATION 179	WP2 net	179_1	4.39	32.96	1023.613	18.4
13-7-2022 14:43	53.6872	6.3402	STATION 180	WP2 net	180_1	4.38	32.97	1023.633	18.4
13-7-2022 15:03	53.6858	6.3418	STATION 181	CPICS ISIIS	181_1	4.38	32.91	1023.573	18.5
13-7-2022 18:01	53.6883	6.3622	STATION 182	Sonar	182_1	4.39	32.89	1023.533	18.6
14-7-2022 6:01	53.6877	6.3473	STATION 183	Fish cage	183_1	4.38	32.96	1023.643	18.4
14-7-2022 6:20	53.6877	6.346	STATION 184	Fish cage	184_1	4.37	32.95	1023.663	18.2
14-7-2022 6:32	53.6877	6.345	STATION 185	Fish cage	185_1	4.37	32.99	1023.693	18.3
14-7-2022 6:52	53.6877	6.3425	STATION 186	Fish cage	186_1	4.37	32.99	1023.693	18.3
14-7-2022 7:02	53.6877	6.343	STATION 187	Fish cage	187_1	4.37	33	1023.693	18.3
14-7-2022 7:17	53.6877	6.3435	STATION 188	Fish cage	188_1	4.38	33	1023.693	18.3
14-7-2022 7:32	53.6877	6.3402	STATION 189	Fish cage	189_1	4.37	33.01	1023.713	18.3
14-7-2022 7:45	53.6877	6.3408	STATION 190	Fish cage	190_1	4.37	33.02	1023.723	18.3
14-7-2022 8:40	53.6885	6.3382	STATION 191	Kwallennet	191_1	4.37	33.06	1023.753	18.2
14-7-2022 9:02	53.6885	6.339	STATION 192	Kwallennet	192_1	4.37	33.06	1023.763	18.2
14-7-2022 9:24	53.6885	6.3443	STATION 193	Kwallennet	193_1	4.38	33.06	1023.763	18.2
14-7-2022 9:44	53.6885	6.3455	STATION 194	Kwallennet	194_1	4.38	33.07	1023.763	18.2
14-7-2022 10:16	53.6885	6.3567	STATION 195	CPICS ISIIS	195_1	4.38	33.06	1023.743	18.2
14-7-2022 14:26	53.669	6.1867	STATION 196	CTD with Samples	196_1	4.39	32.97	1023.623	18.5