

ReViFES (N2111 Navicula)- Voordelta

Cruise report

27 May – 4 June 2021, RV Navicula

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Affiliations:

- 1: Aquatic Ecology and Water Quality Management group, Wageningen University
- 2: Wageningen Marine Research
- 3: Royal Netherlands Institute of Sea Research (NIOZ)
- 4: The Fieldwork Company
- 5: Bureau Waardenburg



Texel, 18 October 2021



WAGENINGEN
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Bureau Waardenburg
Ecology & Landscape

the fieldwork company

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 focal area was the Voordelta shellfish reef close to the coast of Ouddorp, province of South Holland, the Netherlands. Aim of the project is to compare biodiversity and ecosystem functioning of reef structures such as shellfish reefs to the surrounding area without reef like structures.

Due to the COVID-19 crisis, the number of scientists on board was limited to 3 continuously and an additional maximum 2 scientist on deck during the day.

Equipment & Sample sharing

The main equipment used during this cruise was the BRUCE TowCam, Box corer, "Crab cages", plankton net, turbidity loggers, and niskin bottles. In figure 1 the research area is indicated in the map. In figure 2 the overall cruise track is given. In figure 3 a more detailed cruise track in the research area together with all sample operations is plotted.

List of Participants

Table 1: list of participants and their main research topic, 1-3 joined continuously, 4-8 joined for 1 or 2 days.

	Who	Institute	Topic
1	Caterina Coral	NIOZ	PhD.
2	Joop Coolen	WUR (NIOZ-Guest)	PI, Cruise leader
3	Niels de Vreede	WUR	Student
4	Jan van Dalfsen	The Fieldwork Company	PI
5	Maarten Zwarts	The Fieldwork Company	PI
6	Tjeerd Bouma	NIOZ	PI
7	Karin Didden	Bureau Waardenburg	PI
8	Rebecca Bakker	Bureau Waardenburg	Analist



Figure 1. Overview of the research area (red box), situated south of the island of Goeree Overflakkee.

Verbal account of the activities

Day 1 – 27 May 2021.

Weather was 5 bft with 1-1.5 meter waves. This day two persons from the Fieldwork Company joined to train the Revifes team to operate the BRUCE and to perform the two days of video survey with them. The sea state was not suitable to allow a safe passage of the vessel outside the island of Schouwen Duiveland. Therefore the video system was tested in the Eastern Scheldt. The bouyancy was optimised to film very close to the seabed which was needed since high turbidity was expected. The final succesful test took place in the harbour, where currents were neglectable, as was expected to be the case in the research area. All material was then ready for the video survey the next day.

Day 2 - 28 May 2021.

Weather was 2-3 bft with 0.5 meter waves. Again the two persons working with the BRUCE joined. The vessel sailed to the research area, which took 3 hours. In the area, all 4 planned transects from east to west were carried out, as well as an additional transect parallel to and in the middle of transects C and D. Since on the D transect no reef was observed, the additional transect was named D for the remainder of the cruise.

Turbidity varied strongly, forcing the team to suspend the video frame very close to the seabed (estimated 20 cm). This resulted in the weights of the A frame cable hitting the seabed, causing particle clouds in the water, increasing the turbidity even further, but only shortly. However, on most transect the seabed type could be determined so the primary aim, to localise the reef, was attained.

In total, the work took about 5 hours, resulting in 5 transects, each with a length of approximately 600 meters. In total 224 minutes of video footage were collected from all the 5 transects. At the end of the day the vessel sailed back to port, taking about 3 hours. The BRUCE video system was demobilised and the Fieldwork Company team left.

Day 3 – 29 May 2021.

Weather was 3-4 bft with 0.4 meter waves. The vessel sailed to the research area, which took 3.5 hours. In the morning the 6 cage sets were placed on transect A. This took approximately 1 hour. In the afternoon box coring started and all 10 stations of transect c were cored. This took approximately 4 hours, which is quite long due to the limited number of people on deck and since all boxes were dismounted from the box corer for every sample to allow the acquisition of sediment cores and protography of the top layer. Oysters dominated the sample on station 1 and mussels on station 2, while sand was found on all remaining stations. At night the vessel stayed anchored in the area.

Day 4 – 30 May 2021.

Weather was 3-4 bft with 0.4 meter waves. Day guest Tjeerd Bouma (NIOZ) joined on deck to day to help with box coring and catch processing. Between 8 and 10:30 transect D was box cored (taking 2.5 hours). Then the recovery of the cages started. Cages were recovered one at the time, the catch removed, cage cleaned, rebaited and then redeployed at the same station number on the next transect, which was transect B. Recovery and deployment of all cages took about 4 hours. At night the vessel stayed anchored in the area.

Day 5 – 31 May 2021.

Weather was 3 bft with 0.3 meter waves. Day guest Karin Didden (Bureau Waardenburg) joined on deck to day to help with box coring and catch processing. Before work started it was noted that the buoys of station B1 were missing. They were spotted on the horizon and recovered. Later the cage was dredged around the planned recovery time, which was succesful and the cage was emptied and processed along with the rest of the cages. Later a crew member discovered that the Cotter clips that were used to secure the bolt in the shackle connecting the down line to the buoy, was rather thin and could fall out spontaneously. It was decided to start using thicker Cotter clips to prevent the problem from repeating.

Between 8 and 10:45 transect A was box cored (taking 2.75 hours). Cages were recovered one at the time, the catch removed, cage cleaned, rebaited and then redeployed at the same station number on the next transect, which was transect C. Recovery and deployment of all cages went very efficient and took about 3.5 hours. At night the vessel stayed anchored in the area.

Day 6 – 1 June 2021.

Weather was 3 bft with 0.3 meter waves. Day guest Bebecca Bakker (Bureau Waardenburg) joined on deck to day to help with box coring and catch processing. Box coring transect B went very efficient and within 2.15 hours all samples had been taken. The cages were recovered in an altered order, starting with C1, then C10 down to C3, against the wind direction. At 14:00 all cages were on deck and it was decided to take the water samples of transect A, ahead of schedule. Due to the limited depth in the area, at low tide the vessel stirred up sediment with every manoeuvre, which was expected to influence the water samples. Therefore the Navicula went at anchor outside the area and the water samples were taken by filling a bottle by hand, below the surface of the water, from the inflatable boat. On board all water samples were processed for stable isotope material collection, SPM and chlorofyll samples as well as for NP and Si analysis. At night the vessel stayed anchored in the area.

Day 7 - 2 June 2021.

Weather was 1-2 bft with 0.2 meter waves. The water sampling method was reconsidered and it was decided to take water samples from near the seabed with the niskin bottle from the vessel, at high tide. This worked well and no sediment disturbance was observed. Water from transects C and B was sampled and processed. Then all cages were recovered, cleaned and stored on deck. In the afternoon, at low tide, zooplankton samples were taken from the inflatable boat from all stations 1 and 10.

Day 8 – 3 June 2021

Weather was 3 bft with 0.5 meter waves. Water sampling was completed by taking near bottom samples with the niskin bottle from transects D and A. After this, all stations from transects A,B and C were box cored again and the samples sieved on 1 mm mesh. The remainder was conserved on 4% formaldehyde. At 16:00 the vessel started the journey back to port.

Day 9 – 4 June 2021

The ship was demobilised and cleaned and the scientist team left for their journey home.

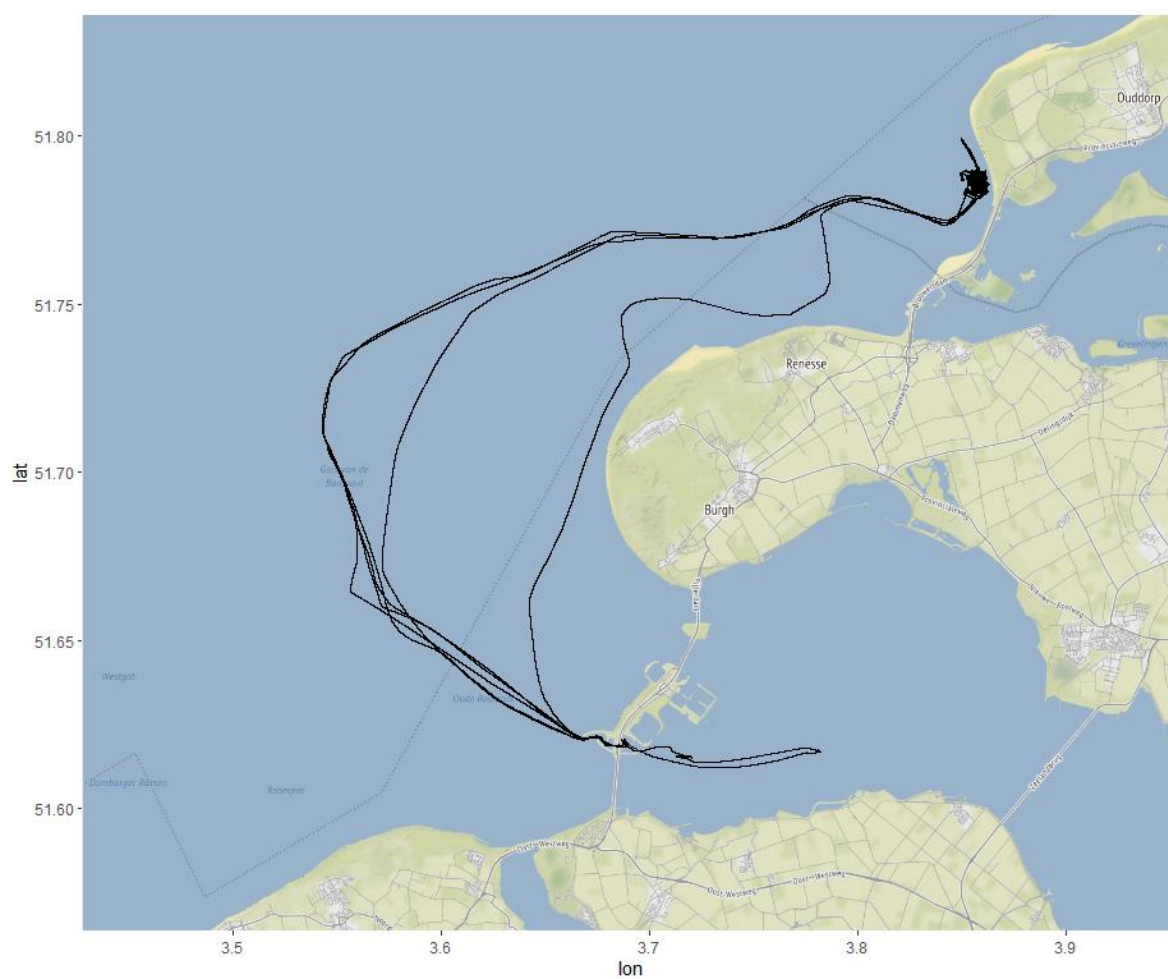


Figure 2. Cruise track to, from and in the research area (upper right) during all days.

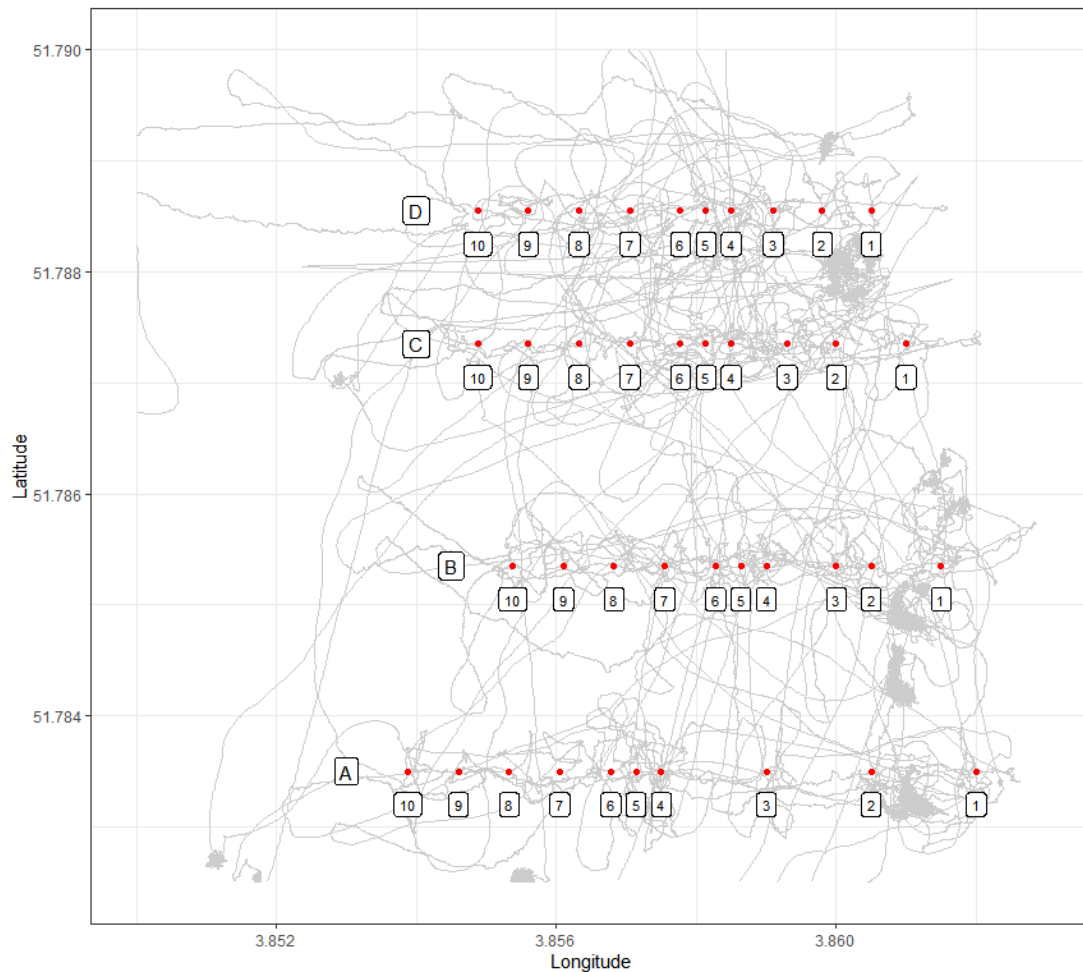


Figure 3. All stations (red dots, with numbers [1-10] below dots) with transect code on left (A-D). The grey lines indicate ship movements in the area.

Underwater video.

During the first 2 days video surveys were planned. On the first day the seastate was still too high for the vessel to enter the research area. Therefore the video system was tested in the Eastern Scheldt to set it up and make sure all was in working condition. On day 2, 5 video transects were performed.

The BRUCE TowCam video system was used. This is composed of an aluminium frame with floaters on top and weights on the bottom. It was attached via 3.5 m ropes to a 51 kg weight that was attached to the A frame cable. The aluminium frame was slightly buoyant, but to its bottom steel chains were attached, which caused a negative buoyancy. When the frame approached the seabed, the chains lay partly on the bottom and the negative buoyancy from the chains balanced the positive buoyancy of the floats, causing the frame to stabilise at a height of approximately 20 cm above the seabed. In this manner a stable video feed was delivered to the video room which was placed in a 10 ft container on deck. The frame was mounted with video lights and 4 lasers in a square of 30*30 cm. The lasers will be used during post-cruise video-analysis to calibrate the dimensions of objects and fauna on the footage.

During the video survey an external GPS attached to a laptop with oziexplorer software, logged the vessel position at 1 second intervals. Since the distance from the GPS antenna and the A-frame was 18 meters, and the video frame was towed at approximately 7 meters behind the vessel, all positions

were corrected using an R script in which the estimated distance and bearing estimated by differences between logged positions, was converted in a deviation from the logged coordinate. This resulted in an updated coordinate for all logged coordinates.

These positions were combined with the seabed observations recorded during the video survey, on the basis of the timestamp. This way positions of all seabed observations could be attained and processed at night to plan the transects and stations for the next days. All further sampling as well as the placement of the cages was based on these.

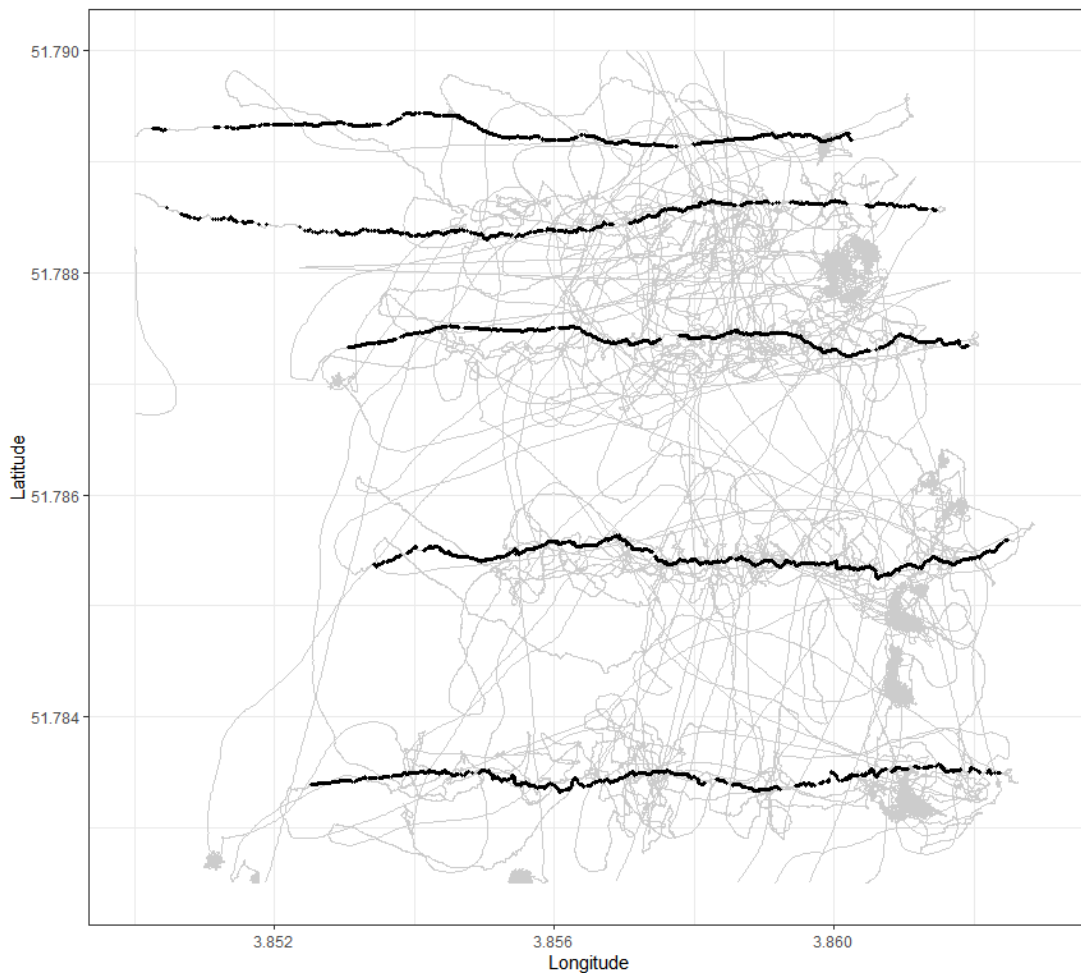


Figure 4. Video tracks with seabed habitat type scored (black dots).

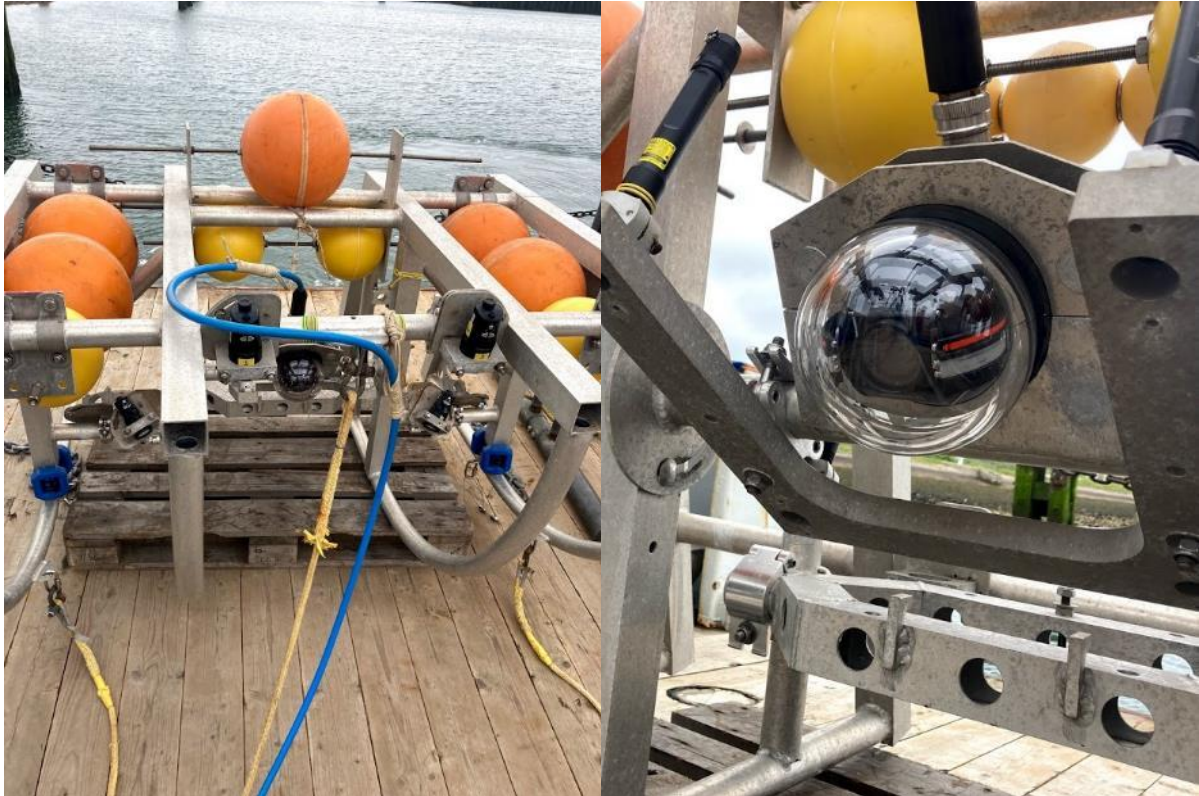


Figure 5. BRUCE TowCam video frame (left) with camera visible in the middle. The blue cable is the video connection to the surface, orange and yellow balls are floats, weights can be seen as blue objects on the left and right bottom. Right: detail of the Kongsberg video camera, with laser pointer visible in the top left (black rod).

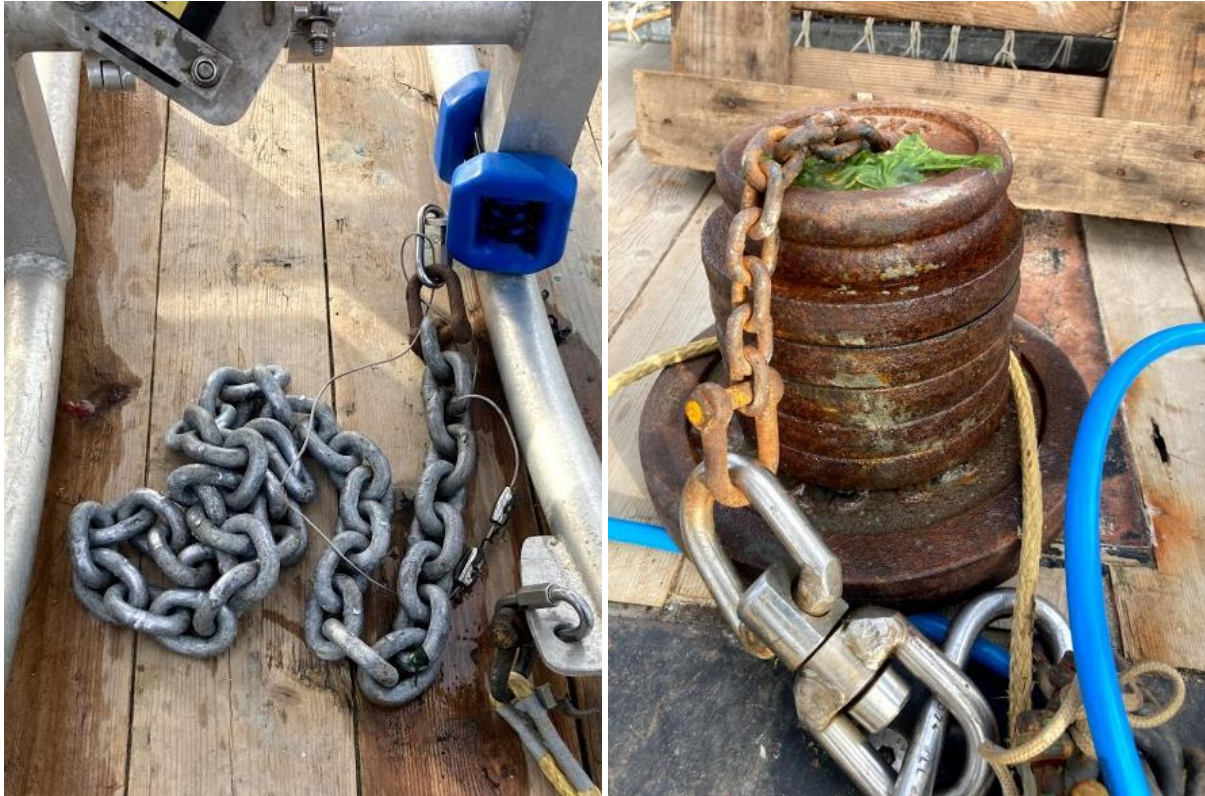


Figure 6. Left: seabed chain as connected on both sides of the bottom of the frame. Right: 51 kg weigh as connected to the A frame cable.



Figure 7. Left: On deck video control system. Right: The video frame enters the water, with 51 kg weight visible in front.

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 in 6 sets. Large cages with meshsize of 2×2 cm which were 150 × 150 × 75 cm. The large cages had a single entrance hole on one side and a pair of entrance holes on the opposite side. 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. All traps were baited with canned mackerel. Since there are seal colonies in the vicinity of the research area, steel grating with a 20*20 cm mesh was mounted on the outside of both sides of the cages where entrance holes were present.

The sets were deployed with the back A frame of the vessel. At the surface the position was marked by a float equipped with a radar reflector and a flashlight. Each cage was deployed for ±24 hours.

The cages were deployed along the transect lines, each time all 6 cages in 1 of the transects, at stations 1, 3, 4, 5, 6 and 10.

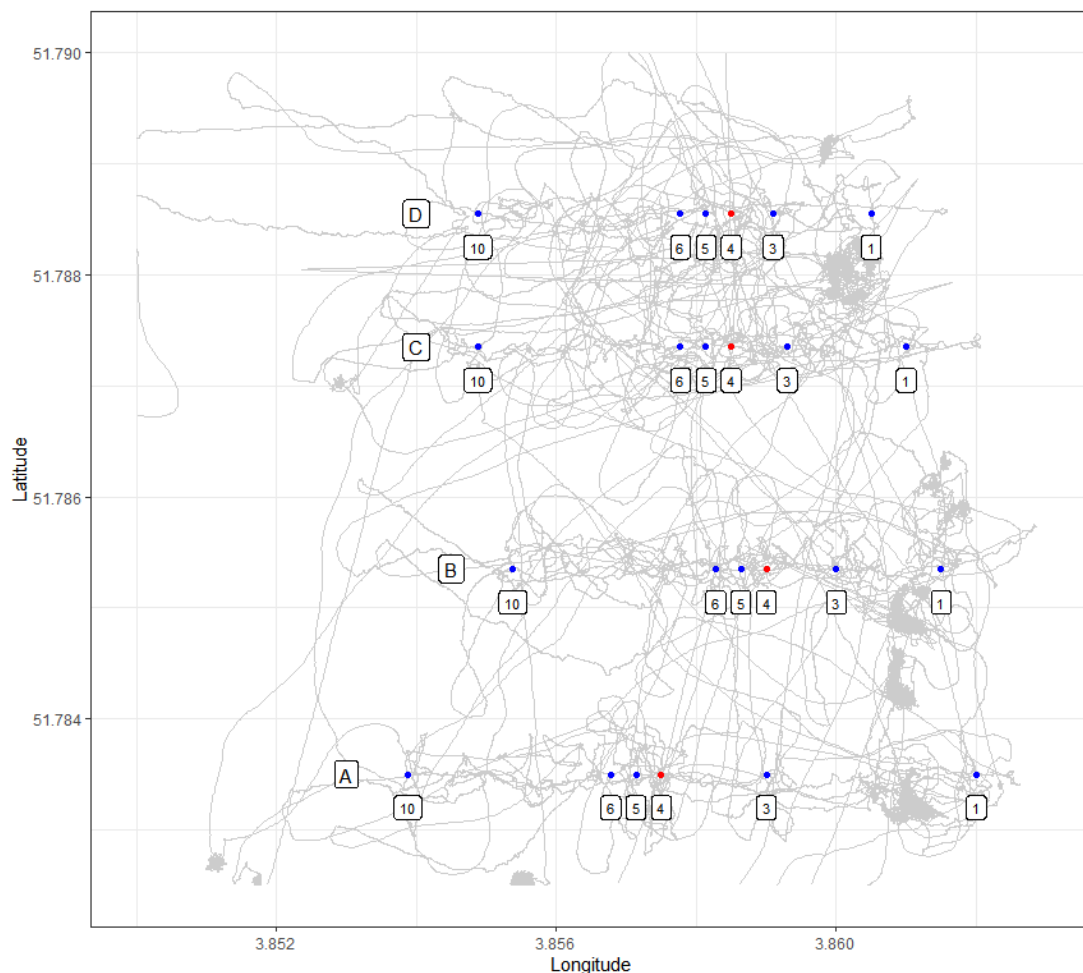


Figure 8. Deployment positions of the crab cages. Locations were planned based on the video transect. Red dots: the edge of the reef as defined during the video survey. Stations 1-3 were considered to be on the reef.

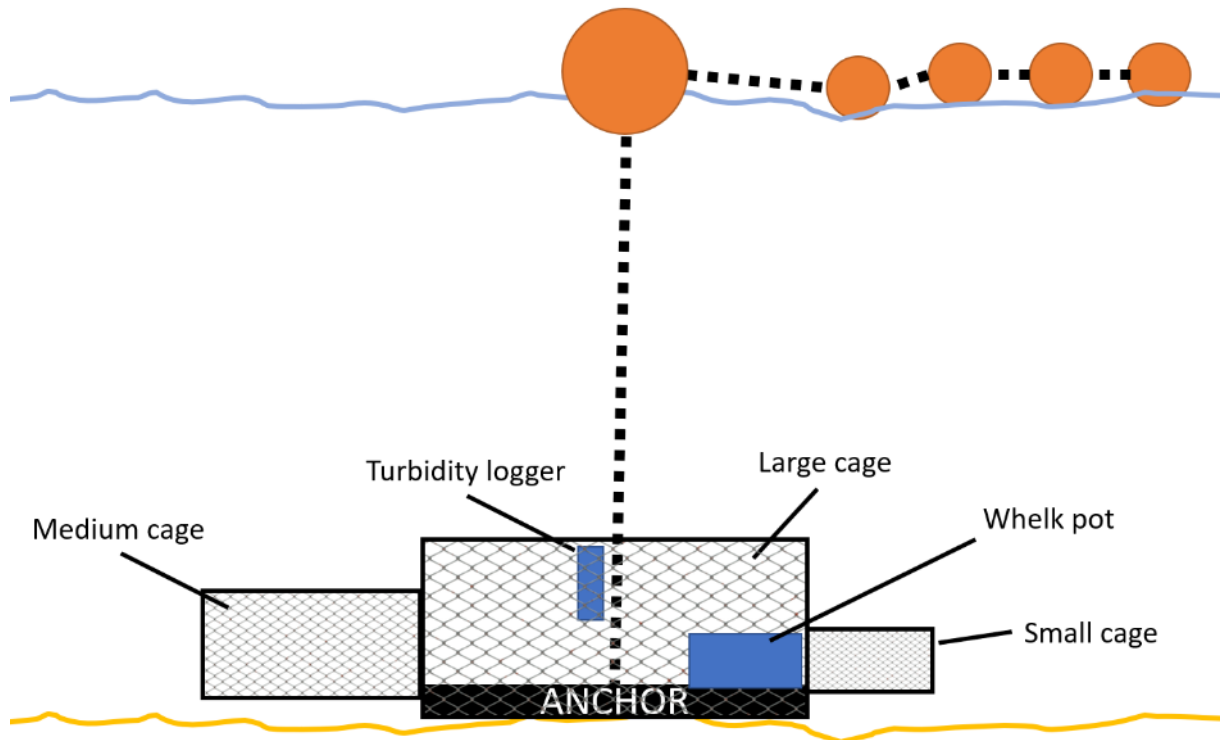


Figure 9. Schematic setup of the fish cages in shallow water as applied during the cruise.



Figure 10. Large bottom cage with on the left front a whelk pot attached, on the left back a small fyke attached and in the right front a medium sized cage.



Figure 11. Steel grating in front of the entrance holes of a cage.



Figure 12. Entrance hole types on the large cages, left: single hole, right: double holes. All large cages held both holes. Steel grating was not mounted yet at the time of this picture.



Figure 13. the top of the large cages composed of two large lids (left) that could be opened to remove caught efficiently. When closed the lids were held in place by a Cotter clip (right).

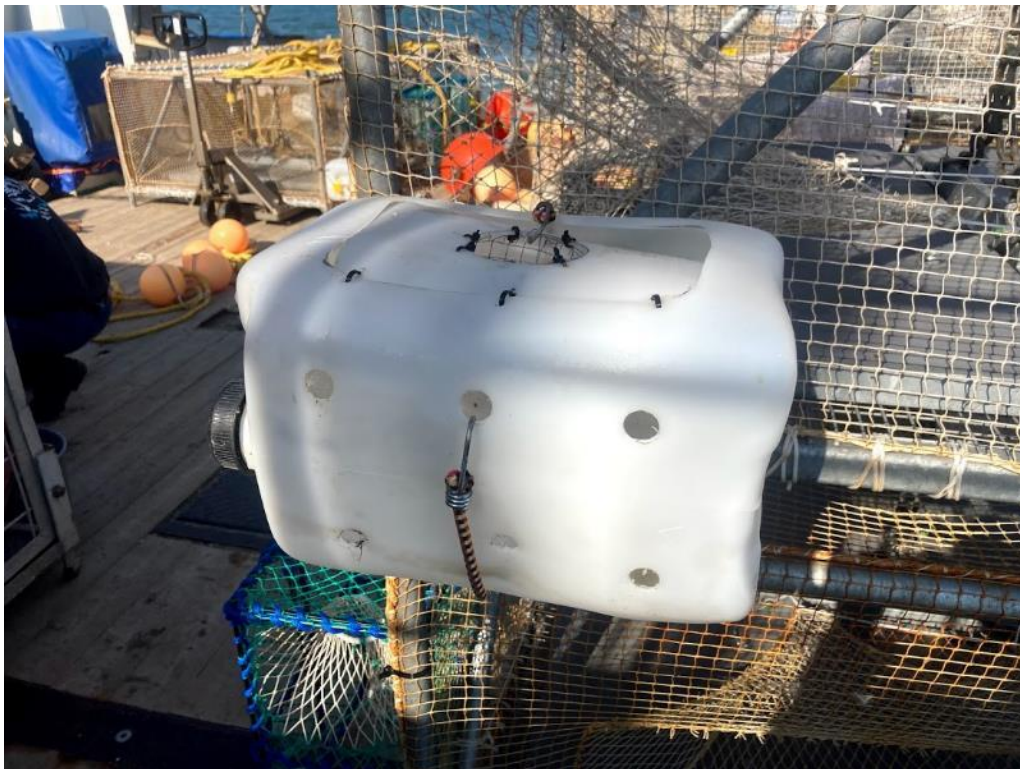


Figure 14. Whelk pot mounted on the outside of the large cage. The entrance hole with steel wire mesh is visible on the top in the centre of the lid.



Figure 15. Medium sized (left) and small sized cages (right) mounted on the outside of the large cage.

Turbidity loggers

Turbidity and Chl_a loggers (ALEC instruments ACLW-CMP or JFE-Advantech ACLW2-USB) were mounted on one of the horizontal top bars inside the cage, pointing downwards to measure of the passing water. ACLW2-USB were set to measure once every 60 seconds. ACLW-CMP were set at 1 measurement every 30 seconds throughout each deployment of a cage. Loggers were mounted on cages placed at stations 3,4,5,10.



Figure 16. Chl_a and turbidity logger mounted hanging from one of the bars inside the large cage.

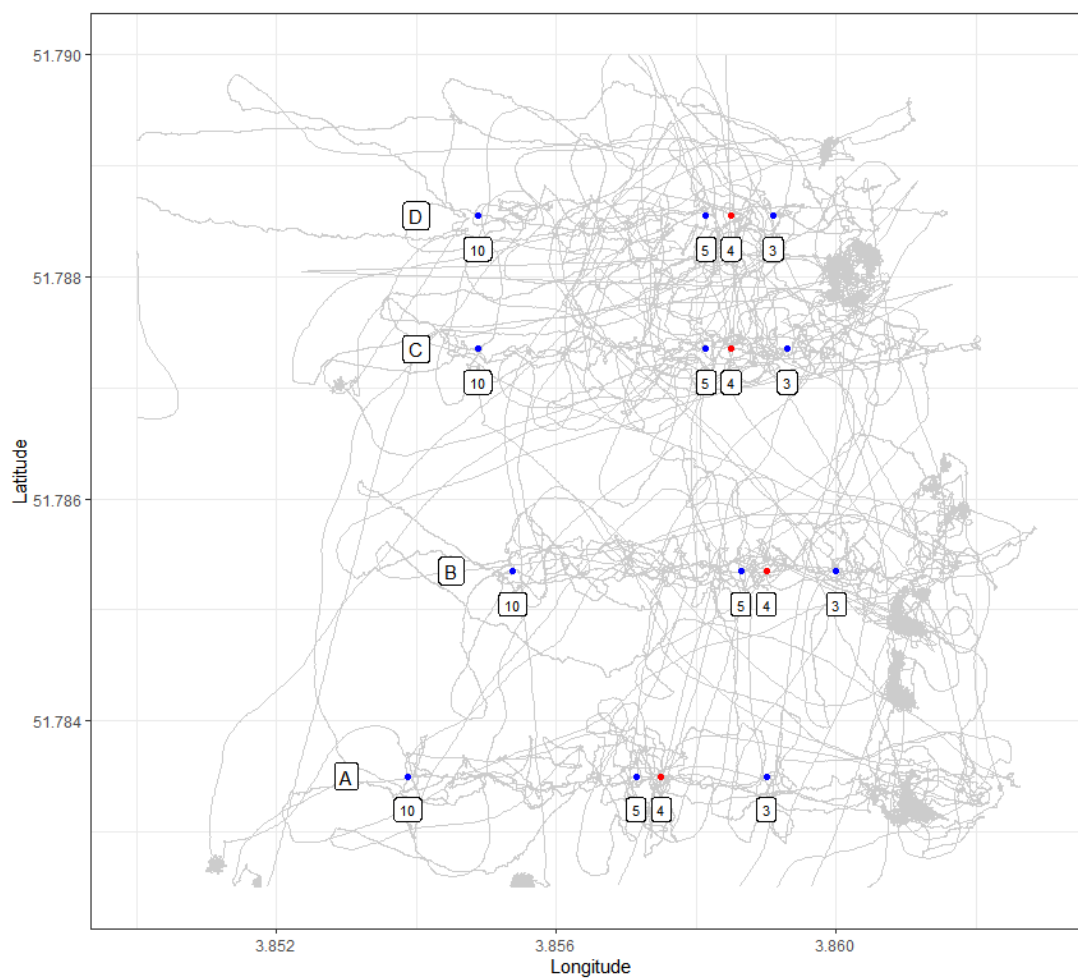


Figure 17: Dots: deployment locations of turbidity loggers inside cages (red dots = edge of reef).

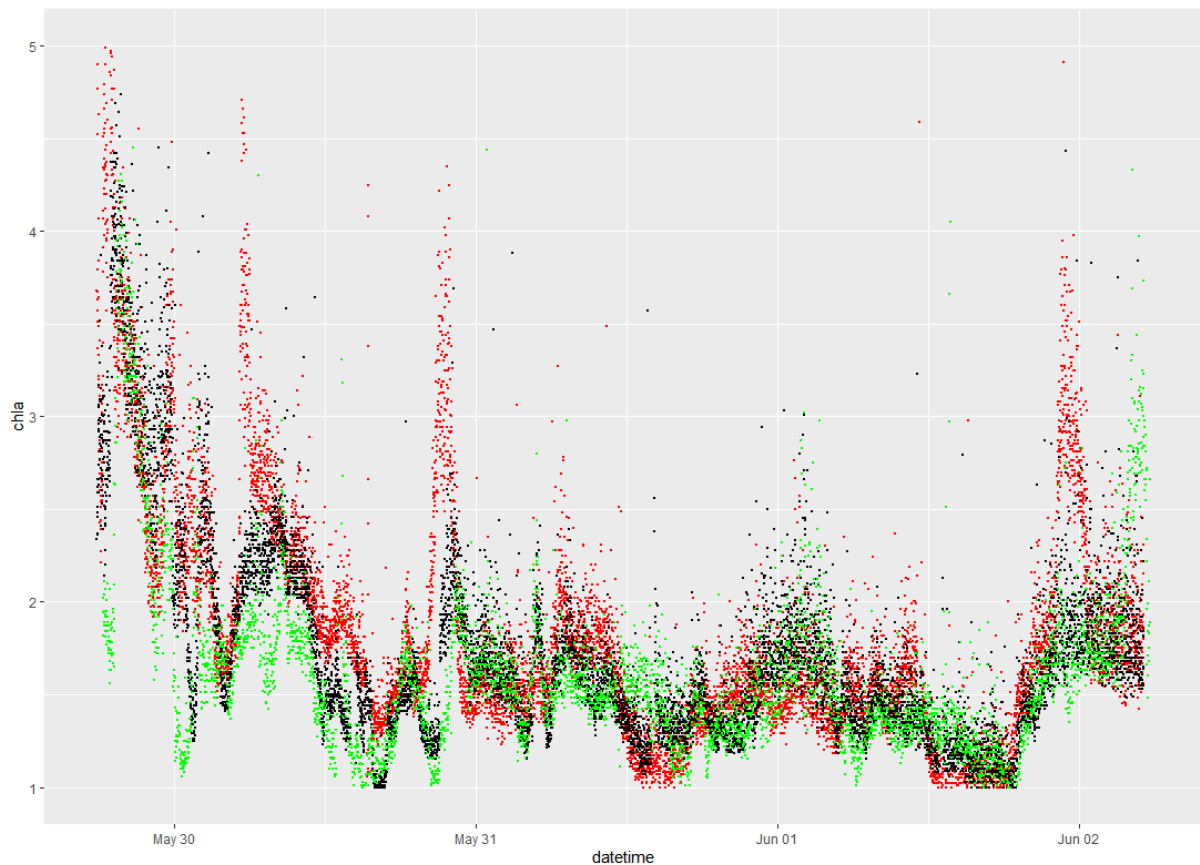


Figure 18: raw impression of the logger data, which have not been processed, from 3 stations. Red: station 10, black: station 5, green: station 1.

Stable isotopes infauna, diatoms, and sediment composition

From every of the 10 stations in each transect, a box corer sample was taken with the K6 NIOZ box corer. The box was dismounted from the corer intact to allow sub sampling. On stations 1 and 10 of each transect, first the water above the sediment in the box was siphoned into 2*2.5 L bottles for filtering with a gff filter to collect suspended material for stable isotope analysis (xPOM). At stations 2-9 the water was also removed but not used for further analysis. Then on every station the surface layer was photographed, a measurement was taken with a Benthotorch and two 32mm (internal diameter) cores were taken from the sediment for sediment grainsize (0-5 cm & 5-10cm) (Table 2) and samples for carbon and chlorophyll analyses (1 cm layers) (Table 3). At stations 1 and 10, the remainder of the sediment was washed over a 2 and 5 mm screen and larger macrofauna was collected for isotope analyses. On stations 2-9 the sediment was discarded.

Unforeseen good weather conditions made the acquisition of additional box corer samples possible. Therefore, on the last day, every station in transects A-B-C was sampled again, the box emptied directly in a 1 mm mesh size seive and the content rinsed, photographed and stored on formaldeyde. These samples will later be processed to assess biodiversity patterns on the gradient away from the reef.



Figure 19. Left: The K6 box corer, right: example of a sample (C10) from a site 250 from the reef, with the colour coded label placed in every photograph.



Figure 20: top view of a mussel dominated sample (left) and side view of the same sample with box removed (right) and with red corks of sediment sub cores visible.

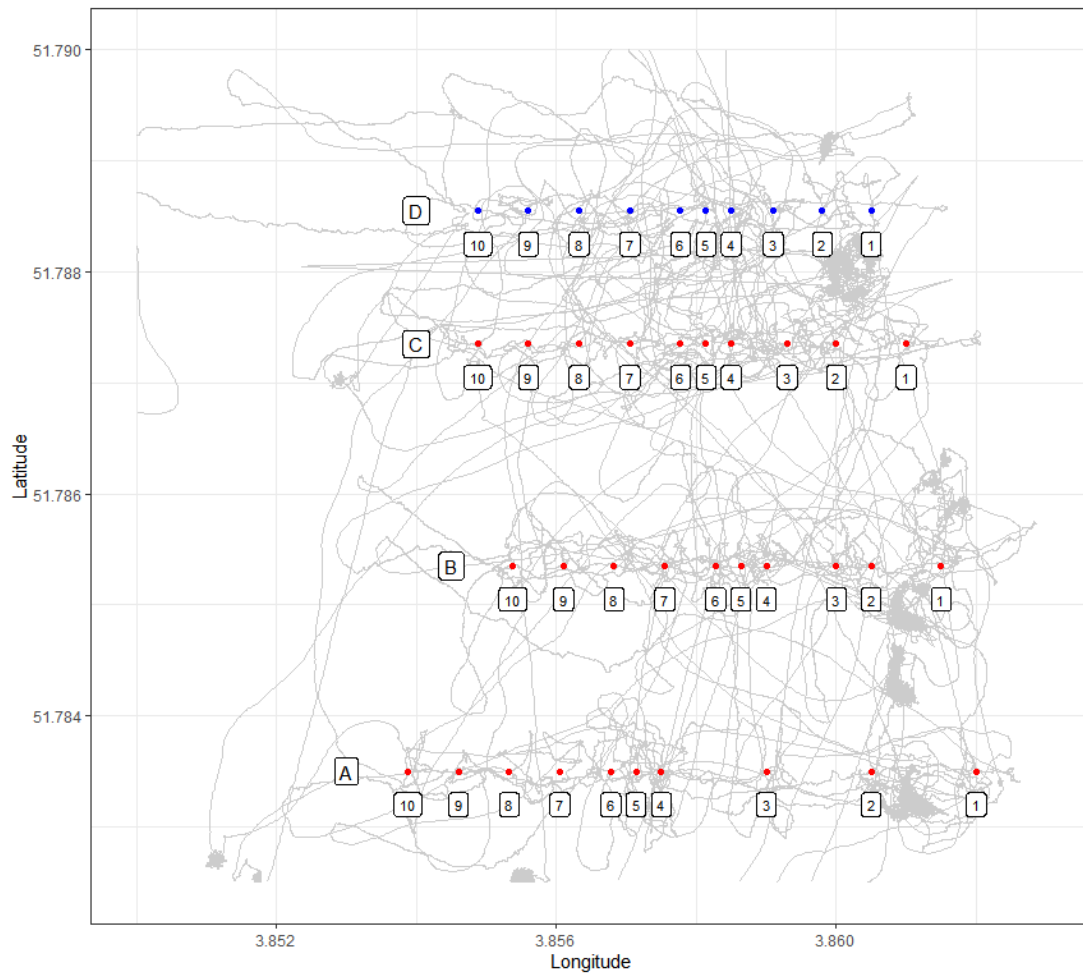


Figure 21. Stations at which box cores were taken. Red stations: additional biodiversity box corer taken. At all stations 1 and 10 tissue and diatom samples were also collected from the box corer sediment for stable isotope analysis.



Figure 22. Diatom sample from the top layer of sediment in the box corer, covered with a 50 μ m mesh which is covered by glass pearls.

Table 2. overview of samples taken for sediment grainsize analyses.

Date	Vessel Position ID	Core ID	Sample ID: 0 - 5 cm	Sample ID: 5 - 10 cm	Notes
29-5-2021	C01	L	SC3001	SC3002	Oysters - 5-6cm
29-5-2021	C02	C	SC3003	SC3004	Mussels
29-5-2021	C03	L	SC3005	SC3006	Sand
29-5-2021	C04	A	SC3007	SC3008	Sand
29-5-2021	C05	R	SC3009	SC3010	
29-5-2021	C06	S	SC3011	SC3012	
29-5-2021	C07	N	SC3013	SC3014	
29-5-2021	C08	A	SC3015	SC3016	
29-5-2021	C09	K	SC3017	SC3018	
29-5-2021	C10	P	SC3019	SC3020	
30-5-2021	D01	R	SC3021	SC3022	Oysters - 5-6cm
30-5-2021	D02	R	SC3023	SC3024	Shell sediment
30-5-2021	D03	A	SC3025	SC3026	
30-5-2021	D04	F	SC3027	SC3028	
30-5-2021	D05	E	SC3029	SC3030	
30-5-2021	D06	N	SC3031	SC3032	
30-5-2021	D07	K	SC3033	SC3034	
30-5-2021	D08	D	SC3035	SC3036	
30-5-2021	D09	Q	SC3037	SC3038	
30-5-2021	D10	T	SC3039	SC3040	
31-5-2021	A01	A	SC3041	SC3042	Oysters - 5-6cm
31-5-2021	A02	O	SC3043	SC3044	Mussels
31-5-2021	A03	N	SC3045	SC3046	Mussels
31-5-2021	A04	L	SC3047	SC3048	Coarse sediment
31-5-2021	A05	S	SC3049	SC3050	
31-5-2021	A06	Q	SC3051	SC3052	
31-5-2021	A07	S	SC3053	SC3054	
31-5-2021	A08	A	SC3055	SC3056	
31-5-2021	A09	J	SC3057	SC3058	
31-5-2021	A10	K	SC3059	SC3060	
1-6-2021	B01	A	SC3061	SC3062	Oysters
1-6-2021	B02	T	SC3063	SC3064	Mussels - 7.5cm
1-6-2021	B03	Q	SC3065	SC3066	
1-6-2021	B04	S	SC3067	SC3068	
1-6-2021	B05	E	SC3069	SC3070	
1-6-2021	B06	F	SC3071	SC3072	
1-6-2021	B07	P	SC3073	SC3074	
1-6-2021	B08	Q	SC3075	SC3076	
1-6-2021	B09	A	SC3077	SC3078	SC3077 - fell and caught in hand without breaking the core
1-6-2021	B10	E	SC3079	SC3080	

Table 3 Overview of samples taken for Carbon and chlorophyll analyses.

Date	Station	Position	Core ID	Sample ID: 0-1 cm	Sample ID: 1-2 cm	Sample ID: 2-3 cm	Sample ID: 3-4 cm	Sample ID: 4-5 cm	Sample ID: 5-10 cm	Sample ID: 10-15 cm	Sample ID: 15-20 cm	Notes
29-5-2021	C01	Reef - oysters	P	CC3001	CC3002	CC3003	CC3004	CC3005	CC3006	-	-	Only 12.5 cm
29-5-2021	C02	Reef - mixed	H	CC3007	CC3008	CC3009	CC3010	CC3011	CC3012	CC3013	-	Only 15 cm
29-5-2021	C03	Reef - mussels	P	CC3014	CC3015	CC3016	CC3017	CC3018	CC3019	CC3020	CC3021	Only 17.5 cm
29-5-2021	C04	Reef - edge	T	CC3022	CC3023	CC3024	CC3025	CC3026	CC3027	CC3028	CC3029	Sand
29-5-2021	C05	25m from edge	D	CC3030	CC3031	CC3032	CC3033	CC3034	CC3035	CC3036	CC3037	
29-5-2021	C06	50m from edge	M	CC3038	CC3039	CC3040	CC3041	CC3042	CC3043	CC3044	CC3045	Only 15.5 cm
29-5-2021	C07	100m from edge	L	CC3046	CC3047	CC3048	CC3049	CC3050	CC3051	CC3052	CC3053	
29-5-2021	C08	150m from edge	E	CC3054	CC3055	CC3056	CC3057	CC3058	CC3059	CC3060	-	Only 14.5 cm
29-5-2021	C09	200m from edge	F	CC3061	CC3062	CC3063	CC3064	CC3065	CC3066	CC3067	CC3068	Only 18.3 cm
29-5-2021	C10	250m from edge	X	CC3069	CC3070	CC3071	CC3072	CC3073	CC3074	CC3075	CC3076	
30-5-2021	D01	Reef - oysters	R	CC3077	CC3078	CC3079	CC3080	CC3081	CC3082	CC3083	-	Only 12 cm
30-5-2021	D02	Reef - mixed	N	CC3084	CC3085	CC3086	CC3087	CC3088	CC3089	CC3090	CC3091	Only 17.5 cm - shell sediment
30-5-2021	D03	Reef - mussels	L	CC3092	CC3093	CC3094	CC3095	CC3096	CC3097	CC3098	CC3099	
30-5-2021	D04	Reef - edge	S	CC3100	CC3101	CC3102	CC3103	CC3104	CC3105	CC3106	CC3107	
30-5-2021	D05	25m from edge	P	CC3108	CC3109	CC3110	CC3111	CC3112	CC3113	CC3114	CC3115	Only 19.5 cm
30-5-2021	D06	50m from edge	R	CC3116	CC3117	CC3118	CC3119	CC3120	CC3121	CC3122	CC3123	
30-5-2021	D07	100m from edge	O	CC3124	CC3125	CC3126	CC3127	CC3128	CC3129	CC3130	CC3131	
30-5-2021	D08	150m from edge	F	CC3132	CC3133	CC3134	CC3135	CC3136	CC3137	CC3138	-	Only 15.5 cm
30-5-2021	D09	200m from edge	A	CC3139	CC3140	CC3141	CC3142	CC3143	CC3144	CC3145	CC3146	Only 18 cm
30-5-2021	D10	250m from edge	M	CC3147	CC3148	CC3149	CC3150	CC3151	CC3152	CC3153	CC3154	Only 18 cm
31-5-2021	A01	Reef - oysters	P	CC3155	CC3156	CC3157	CC3158	CC3159	CC3160	CC3161	CC3162	Oysters - Only 17 cm
31-5-2021	A02	Reef - mixed	F	CC3163	CC3164	CC3165	CC3166	CC3167	CC3168	CC3169	-	Only 11.5 cm
31-5-2021	A03	Reef - mussels	M	CC3170	CC3171	CC3172	CC3173	CC3174	CC3175	CC3176	-	Only 12 cm
31-5-2021	A04	Reef - edge	T	CC3177	CC3178	CC3179	CC3180	CC3181	CC3182	CC3183	-	CC3182 has 5.4 cm
31-5-2021	A05	25m from edge	R	CC3184	CC3185	CC3186	CC3187	CC3188	CC3189	CC3190	CC3191	Only 17.3 cm
31-5-2021	A06	50m from edge	E	CC3192	CC3193	CC3194	CC3195	CC3196	CC3197	CC3198	CC3199	Only 18 cm
31-5-2021	A07	100m from edge	L	CC3200	CC3201	CC3202	CC3203	CC3204	CC3205	CC3206	CC3207	Only 16.5 cm

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Date	Station	Position	Core ID	Sample ID: 0-1 cm	Sample ID: 1-2 cm	Sample ID: 2-3 cm	Sample ID: 3-4 cm	Sample ID: 4-5 cm	Sample ID: 5-10 cm	Sample ID: 10-15 cm	Sample ID: 15-20 cm	Notes
31-5-2021	A08	150m from edge	C	CC3208	CC3209	CC3210	CC3211	CC3212	CC3213	CC3214	-	Only 14.4 cm
31-5-2021	A09	200m from edge	P	CC3215	CC3216	CC3217	CC3218	CC3219	CC3220	CC3221	-	Only 14.8 cm
31-5-2021	A10	250m from edge	O	CC3222	CC3223	CC3224	CC3225	CC3226	CC3227	CC3228	CC3229	
1-6-2021	B01	Reef - oysters	C	CC3230	CC3231	CC3232	CC3233	CC3234	CC3235	CC3236	CC3237	
1-6-2021	B02	Reef - mixed	M	CC3238	CC3239	CC3240	CC3241	CC3242	CC3243	CC3244	CC3245	Mussels - Only 16.3 cm
1-6-2021	B03	Reef - mussels	O	CC3246	CC3247	CC3248	CC3249	CC3250	CC3251	CC3252	CC3253	
1-6-2021	B04	Reef - edge	L	CC3254	CC3255	CC3256	CC3257	CC3258	CC3259	CC3260	CC3261	
1-6-2021	B05	25m from edge	R	CC3262	CC3263	CC3264	CC3265	CC3266	CC3267	CC3268	-	Only 11 cm
1-6-2021	B06	50m from edge	N	CC3269	CC3270	CC3271	CC3272	CC3273	CC3274	CC3275	CC3276	Only 18.5 cm - contains a lot of organic matter
1-6-2021	B07	100m from edge	D	CC3277	CC3278	CC3279	CC3280	CC3281	CC3282	CC3283	-	Only 14.4 cm
1-6-2021	B08	150m from edge	T	CC3284	CC3285	CC3286	CC3287	CC3288	CC3289	CC3290	CC3291	Only 18.2 cm
1-6-2021	B09	200m from edge	S	CC3292	CC3293	CC3294	CC3295	CC3296	CC3297	CC3298	CC3299	
1-6-2021	B10	250m from edge	F	CC3300	CC3301	CC3302	CC3303	CC3304	CC3305	-	-	?

Table 4 overview of all measurements taken with the benthotorch

Date	Vessel position ID	Station	diatoms.ug.cm2	green.algae.ug.cm2	cyanob.ug.cm2	Remarks
29-5-2021	C1	Reef - oysters	0.07	0.00	0.01	oysters
29-5-2021	C2	Reef - mixed	0.09	0.00	0.01	mussels
29-5-2021	C3	Reef - mussels	0.03	0.00	0.01	sand
29-5-2021	C4	Reef - edge	0.07	0.00	0.00	sand
29-5-2021	C5	25m from edge	0.80	0.00	0.19	sand
29-5-2021	C6	50m from edge	0.36	0.00	0.08	sand
29-5-2021	C7	100m from edge	0.17	0.00	0.01	sand
29-5-2021	C8	150m from edge	0.51	0.00	0.11	sand
29-5-2021	C9	200m from edge	0.58	0.00	0.15	sand
29-5-2021	C10	250m from edge	0.65	0.00	0.15	sand
30-5-2021	D01	Reef - oysters	0.18	0.00	0.03	shelly mud and oysters
30-5-2021	D02	Reef - mixed	0.14	0.00	0.02	shelly mud no visible oysters or mussels
30-5-2021	D03	Reef - mussels	0.24	0.00	0.05	
30-5-2021	D04	Reef - edge	0.22	0.00	0.03	
30-5-2021	D05	25m from edge	0.58	0.00	0.03	
30-5-2021	D06	50m from edge	0.33	0.00	0.07	
30-5-2021	D07	100m from edge	0.50	0.00	0.09	
30-5-2021	D08	150m from edge	0.57	0.00	0.14	
30-5-2021	D09	200m from edge	0.37	0.00	0.06	
30-5-2021	D10	250m from edge	0.31	0.00	0.07	
30-5-2021	A01	Reef - oysters	0.10	0.00	0.01	
30-5-2021	A02	Reef - mixed	0.31	0.00	0.05	
30-5-2021	A03	Reef - mussels	0.64	0.00	0.11	
30-5-2021	A04	Reef - edge	0.26	0.00	0.04	
30-5-2021	A05	25m from edge	0.14	0.00	0.02	
30-5-2021	A06	50m from edge	0.21	0.00	0.03	
30-5-2021	A07	100m from edge	0.81	0.00	0.16	
30-5-2021	A08	150m from edge	0.19	0.00	0.03	

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Date	Vessel position ID	Station	diatoms.ug.cm2	green.algae.ug.cm2	cyanob.ug.cm2	Remarks
30-5-2021	A09	200m from edge	0.01	0.00	0.00	
30-5-2021	A10	250m from edge	0.19	0.00	0.03	
31-5-2021	B01	Reef - oysters	0.17	0.00	0.04	
31-5-2021	B02	Reef - mixed	0.17	0.00	0.04	
31-5-2021	B03	Reef - mussels	0.23	0.00	0.05	mussel dominated
31-5-2021	B04	Reef - edge	0.74	0.00	0.13	
31-5-2021	B05	25m from edge	0.04	0.00	0.02	mussel dominated
31-5-2021	B06	50m from edge	0.65	0.00	0.17	shelly sand
31-5-2021	B07	100m from edge	0.20	0.00	0.03	sand
31-5-2021	B08	150m from edge	0.32	0.00	0.06	sand
31-5-2021	B09	200m from edge	0.43	0.00	0.09	sand
31-5-2021	B10	250m from edge	0.43	0.00	0.10	

Water sampling

The water sampling was carried out using a niskin bottle deployed from the crane on the vessel. It was lowered until the weight hit the seabed and then lowered very slightly to attain a height above seabed of 50 cm at the bottom of the niskin.

Since during the work prior to water sampling, it was noticed that with maneuvering the vessel, the screw water appeared to dislodge a lot of material from the seabed, increasing the turbidity, it was decided to sample only during high tide with minimum vessel movements. On board the following sub samples were taken:

1. **SPM:** Approximately 1.000 ml were filtered over a pre-combusted Whatman GF/F glass fiber filter using a vacuum pump as a measure of water turbidity as weight per volume.
2. **Chlorophyll A:** Approximately 900 ml were filtered over a Whatman GF/F filter using a vacuum pump, to measure concentration of ChlA in the water.
3. **wPOM:** for food web analysis. Approximately 2.000 ml were filtered over a pre-combusted Whatman GF/F glass fiber filter using a vacuum.
4. **Nutrient analysis** 2*5 ml was filtered via 0.2 um acrodisk filter, stored in two 5 ml pony vials filled to <80% of which 1 is frozen in -20°C (for N and P analysis) and 1 is stored at 4°C (for Si analysis). These samples should not be stored in freezers or fridges in which fish are stored.

Furthermore, a **water sample** was taken **from the K6 box core** at station 1 and 10 of each transect and was filtered as described above to obtain wPOM for the stable isotope analysis. This will provide samples from different locations in each reef but above all will allow sampling a mix of water and diatoms/sediment, generally present in the top sediment layer, which will be disturbed by the coring itself.



Figure 23: Left: the niskin bottle setup, right: the water filtration equipment during sample processing.

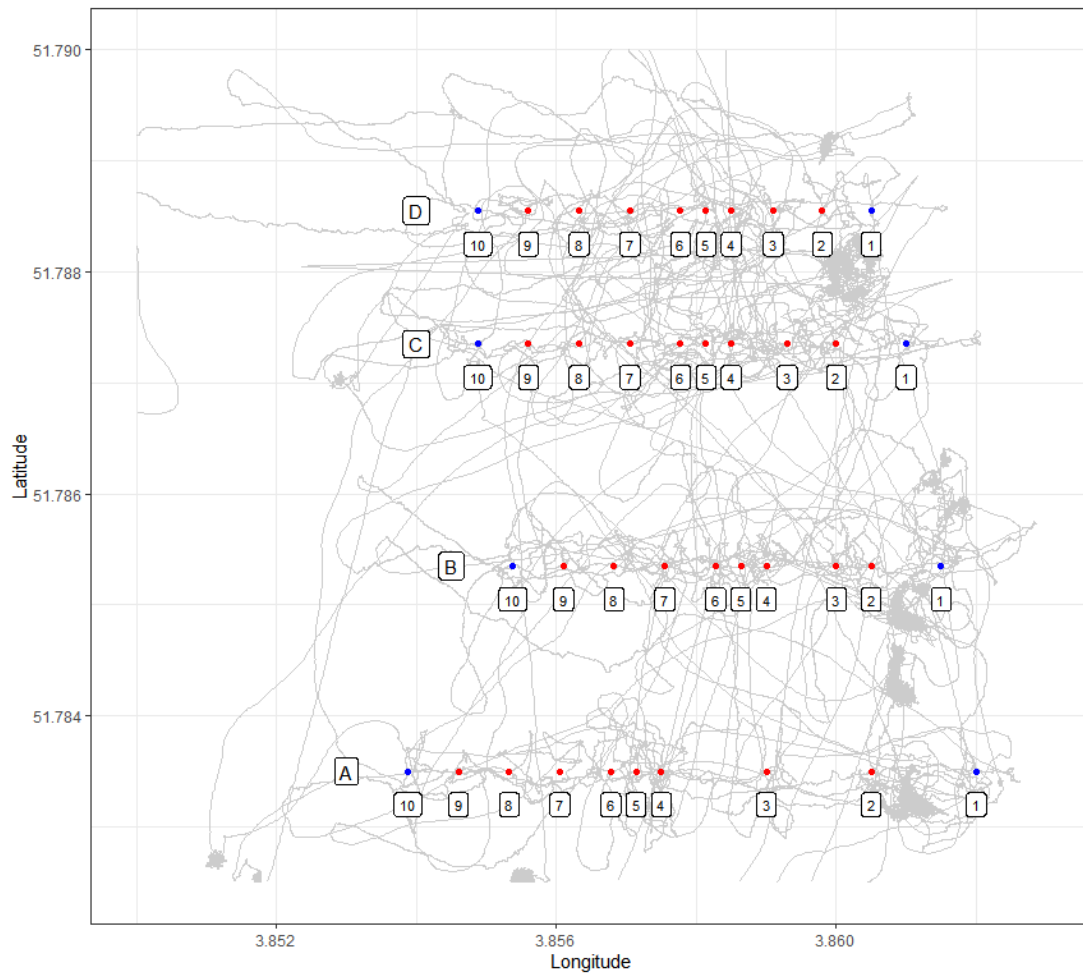


Figure 24. Positions of the niskin deployments (dots) with their transect letter and station number. Blue dots: all types of water samples taken, red dots: only SPM, Chl_A and Nutrient samples taken. Transect A was sampled from the surface as well as on the bottom.

Table 5. Water samples

Date	Transect and station	Vol SPM filtered (mL)	Weight SPM	SPM Sample ID	Vol ChIA filtered (mL)	ChIA Sample ID	POM Sample ID (isotope ID)	Nutrient ID (N and P)	Nutrient ID (Si)	Remarks
1-6-2021	A1	500	123.3	SPM3001	325	ChIA3001	SI 3179	N3001	N3011	Surface water - Reef Oyster
1-6-2021	A2	650	124.4	SPM3002	300	ChIA3002	SI3177	N3002	N3012	Surface water - Reef Oyster + Mussels
1-6-2021	A3	700	123.5	SPM3003	400	ChIA3003	SI3180	N3003	N3013	Surface water - Reef Mussels
1-6-2021	A4	990	121.5	SPM3004	900	ChIA3004	-	N3004	N3014	Surface water - Reef Edge
1-6-2021	A5	890	124.1	SPM3005	1000	ChIA3005	-	N3005	N3015	Surface water - 25 m from edge
1-6-2021	A6	1010	122.9	SPM3006	900	ChIA3006	-	N3006	N3016	Surface water - 50 m from edge
1-6-2021	A7	950	123.3	SPM3007	900	ChIA3007	-	N3007	N3017	Surface water - 100 m from edge
1-6-2021	A8	950	124.0	SPM3008	900	ChIA3008	-	N3008	N3018	Surface water - 150 m from edge
1-6-2021	A9	1000	124.7	SPM3009	900	ChIA3009	-	N3009	N3019	Surface water - 200 m from edge
1-6-2021	A10	500	123.9	SPM3010	400	ChIA3010	SI3181	N3010	N3020	Surface water - 250 m from edge
2-6-2021	C01	1100	124.5	SPM3011	900	ChIA3011	SI3182	N3021	N3031	Bottom water - Reef Oyster
2-6-2021	C02	900	124.6	SPM3012	900	ChIA3012	-	N3022	N3032	Bottom water - Reef Oyster + Mussels
2-6-2021	C03	1000	124.5	SPM3013	900	ChIA3013	-	N3023	N3033	Bottom water - Reef Mussels
2-6-2021	C04	1000	124.0	SPM3014	900	ChIA3014	-	N3024	N3034	Bottom water - Reef Edge
2-6-2021	C05	1000	125.2	SPM3015	900	ChIA3015	-	N3025	N3035	Bottom water - 25 m from edge
2-6-2021	C06	1000	125.2	SPM3016	900	ChIA3016	-	N3026	N3036	Bottom water - 50 m from edge
2-6-2021	C07	1000	124.6	SPM3017	900	ChIA3017	-	N3027	N3037	Bottom water - 100 m from edge
2-6-2021	C08	1000	125.6	SPM3018	900	ChIA3018	-	N3028	N3038	Bottom water - 150 m from edge
2-6-2021	C09	1000	124.4	SPM3019	900	ChIA3019	-	N3029	N3039	Bottom water - 200 m from edge
2-6-2021	C10	1000	123.0	SPM3020	900	ChIA3020	SI3183	N3030	N3040	Bottom water - 250 m from edge
2-6-2021	B01	1000	125.0	SPM3021	900	ChIA3021	SI3184	N3041	N3051	Bottom water - Reef Oyster
2-6-2021	B02	1000	126.3	SPM3022	900	ChIA3022	-	N3042	N3052	Bottom water - Reef Oyster + Mussels
2-6-2021	B03	1000	124.7	SPM3023	900	ChIA3023	-	N3043	N3053	Bottom water - Reef Mussels

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Date	Transect and station	Vol SPM filtered (mL)	Weight SPM	SPM Sample ID	Vol ChlA filtered (mL)	ChlA Sample ID	POM Sample ID (isotope ID)	Nutrient ID (N and P)	Nutrient ID (Si)	Remarks
2-6-2021	B04	1000	128.0	SPM3024	900	ChlA3024	-	N3044	N3054	Bottom water - Reef Edge
2-6-2021	B05	1000	125.9	SPM3025	900	ChlA3025	-	N3045	N3055	Bottom water - 25 m from edge
2-6-2021	B06	1000	125.5	SPM3026	900	ChlA3026	-	N3046	N3056	Bottom water - 50 m from edge
2-6-2021	B07	1000	123.9	SPM3027	900	ChlA3027	-	N3047	N3057	Bottom water - 100 m from edge
2-6-2021	B08	1000	127.5	SPM3028	900	ChlA3028	-	N3048	N3058	Bottom water - 150 m from edge
2-6-2021	B09	1000	127.5	SPM3029	900	ChlA3029	-	N3049	N3059	Bottom water - 200 m from edge
2-6-2021	B10	1000	124.4	SPM3030	900	ChlA3030	SI3185	N3050	N3060	Bottom water - 250 m from edge
3-6-2021	D01	1000	125.1	SPM3031	900	ChlA3031	SI3232	N3061	N3071	Bottom water - Reef Oyster
3-6-2021	D02	1000	125.3	SPM3032	900	ChlA3032	-	N3062	N3072	Bottom water - Reef Oyster + Mussels
3-6-2021	D03	1000	125.8	SPM3033	900	ChlA3033	-	N3063	N3073	Bottom water - Reef Mussels
3-6-2021	D04	1000	127.2	SPM3034	900	ChlA3034	-	N3064	N3074	Bottom water - Reef Edge
3-6-2021	D05	1000	127.1	SPM3035	900	ChlA3035	-	N3065	N3075	Bottom water - 25 m from edge
3-6-2021	D06	1000	126.9	SPM3036	900	ChlA3036	-	N3066	N3076	Bottom water - 50 m from edge
3-6-2021	D07	1000	127.5	SPM3037	900	ChlA3037	-	N3067	N3077	Bottom water - 100 m from edge
3-6-2021	D08	1000	128.3	SPM3038	910	ChlA3038	-	N3068	N3078	Bottom water - 150 m from edge
3-6-2021	D09	1000	128.1	SPM3039	900	ChlA3039	-	N3069	N3079	Bottom water - 200 m from edge
3-6-2021	D10	1000	126.0	SPM3040	900	ChlA3040	SI3233	N3070	N3080	Bottom water - 250 m from edge
3-6-2021	A01	1000	127.0	SPM3041	1000	ChlA3041	SI3234	N3081	N3091	Bottom water - Reef Oyster
3-6-2021	A02	1010	128.5	SPM3042	900	ChlA3042	-	N3082	N3092	Bottom water - Reef Oyster + Mussels
3-6-2021	A03	1000	236.6	SPM3043	900	ChlA3043	-	N3083	N3093	Bottom water - Reef Mussels
3-6-2021	A04	1000	128.7	SPM3044	1000	ChlA3044	-	N3084	N3094	Bottom water - Reef Edge
3-6-2021	A05	1100	127.0	SPM3045	1000	ChlA3045	-	N3085	N3095	Bottom water - 25 m from edge
3-6-2021	A06	1000	128.8	SPM3046	1000	ChlA3046	-	N3086	N3096	Bottom water - 50 m from edge
3-6-2021	A07	1000	128.3	SPM3047	1000	ChlA3047	-	N3087	N3097	Bottom water - 100 m from edge
3-6-2021	A08	1100	125.7	SPM3048	1000	ChlA3048	-	N3088	N3098	Bottom water - 150 m from edge

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Date	Transect and station	Vol SPM filtered (mL)	Weight SPM	SPM Sample ID	Vol ChlA filtered (mL)	ChlA Sample ID	POM Sample ID (isotope ID)	Nutrient ID (N and P)	Nutrient ID (Si)	Remarks
3-6-2021	A09	1000	127.4	SPM3049	1100	ChlA3049	-	N3089	N3099	Bottom water - 200 m from edge
3-6-2021	A10	1000	125.6	SPM3050	1000	ChlA3050	SI3235	N3090	N3100	Bottom water - 250 m from edge

Zooplankton net

A stations 1 and 10 of each transect, a zooplankton sample was taken using a NHBS 25 cm diameter and 55 cm long plankton net with a mesh size of 250 microns, in order to exclude the phytoplankton fraction. The net protected on the outside by a large mesh fishing net to prevent damage when sampling on the reef. It was weighed down and lowered to approximately 1.5 meters (top of net) above the seabed and then pulled back to the surface. The sampling was performed from the inflatable boat at low tide, during wind free conditions. On board the plankton sample was stored in - 20°C.

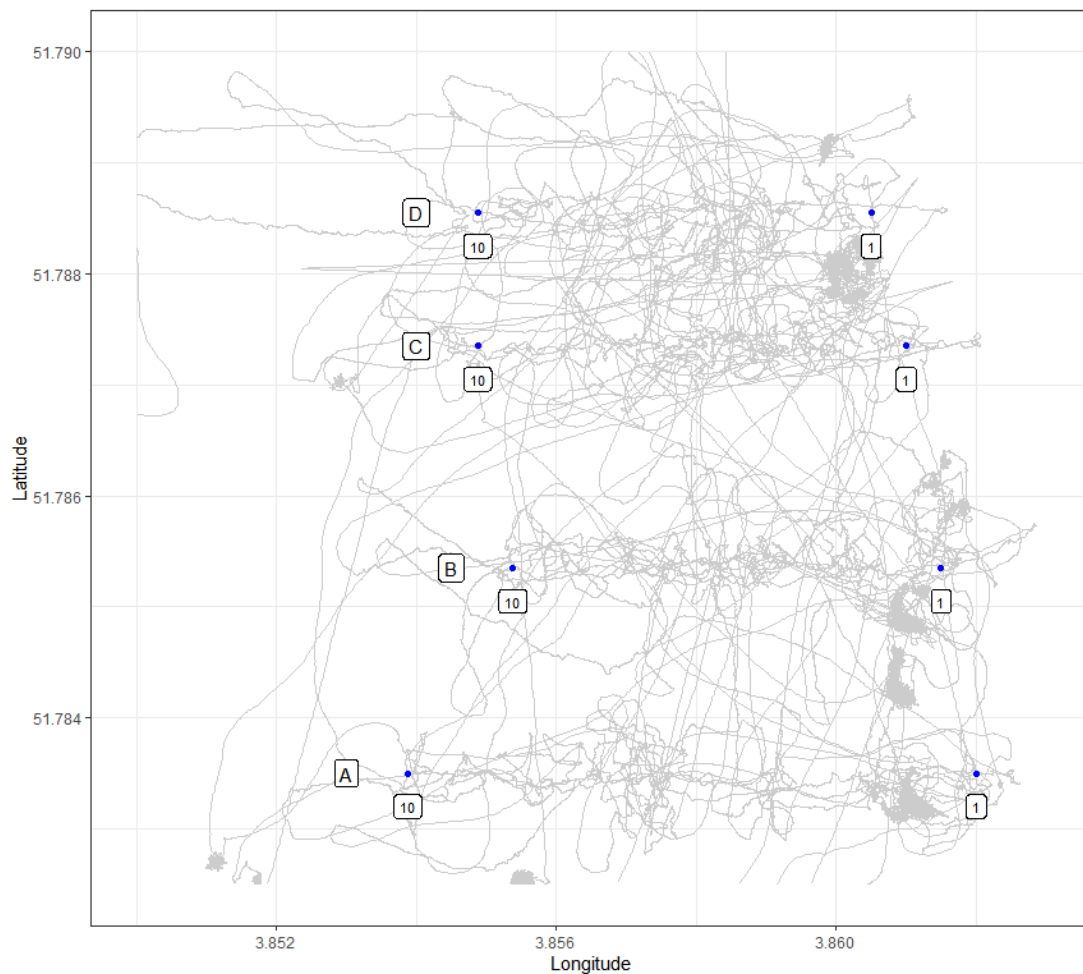


Figure 25. Positions of the plankton samples with transect letters and station numbers.



Figure 26. The plankton net with protective net around it.

Isotope sampling

From both the fykes, boxcores, specimen were collected for stable isotope analyses. In table 4 an overview of the number of kept specimens per area (station 1, reef and station 10, reference) is summarized.

Table 6. overview of the number of collected specimens and species.

vial.nr	date	reef.type	method	Vessel position ID	Water Surface/ Bottom	Species.latin
SI3001	29-5-2021	Oysters	Box Core	C01	Bottom	SPM/POM_Box Core
SI3002	29-5-2021	Oysters	Box Core	C01		Water
SI3003	29-5-2021	Oysters	Box Core	C01		Red Algae
SI3004	29-5-2021	Oysters	Box Core	C01		Red Algae
SI3005	29-5-2021	Oysters	Box Core	C01		Red Algae
SI3006	29-5-2021	Oysters	Box Core	C01		Red Algae
SI3007	29-5-2021	Oysters	Box Core	C01		Neoamphirite frigulus
SI3008	29-5-2021	Oysters	Box Core	C01		Neoamphirite frigulus
SI3009	29-5-2021	Oysters	Box Core	C01		Neoamphirite frigulus
SI3010	29-5-2021	Oysters	Box Core	C01		Neoamphirite frigulus
SI3011	29-5-2021	Oysters	Box Core	C01		Scale worm 1
SI3012	29-5-2021	Oysters	Box Core	C01		Red Algae 2
SI3013	29-5-2021	Oysters	Box Core	C01		Red Algae 2

vial.nr	date	reef.type	method	Vessel position ID	Water Surface/ Bottom	Species.latin
SI3014	29-5-2021	Oysters	Box Core	C01		Branchinoma bombyx ?
SI3015	29-5-2021	Oysters	Box Core	C01		Scale worm 1
SI3016	29-5-2021	Oysters	Box Core	C01		Magallana gigas
SI3017	29-5-2021	Oysters	Box Core	C01		Mytilus edulis
SI3018	29-5-2021	Oysters	Box Core	C01		Sessilia
SI3019	29-5-2021	Oysters	Box Core	C01		Sessilia
SI3020	29-5-2021	Oysters	Box Core	C01		Sessilia
SI3021	29-5-2021	Oysters	Box Core	C01		Hemigrapsus sanguineus
SI3022	29-5-2021	Oysters	Box Core	C01		Hemigrapsus sanguineus
SI3023	29-5-2021	Oysters	Box Core	C01		Hemigrapsus sanguineus
SI3024	29-5-2021	Oysters	Box Core	C01		Hemigrapsus sp
SI3025	29-5-2021	Oysters	Box Core	C01		Hemigrapsus sp
SI3026	29-5-2021	Oysters	Box Core	C01		Gobiidae
SI3027	29-5-2021	Oysters	Box Core	C01		Hemigrapsus sp
SI3028	29-5-2021	Reference	Box Core	C10		Lutraria lutraria
SI3029	29-5-2021	Reference	Box Core	C10		Nephtys sp.
SI3030	29-5-2021	Reference	Box Core	C10		Lanice conchilega
SI3031	29-5-2021	Reference	Box Core	C10		Lanice conchilega
SI3032	29-5-2021	Reference	Box Core	C10		Lanice conchilega
SI3033	29-5-2021	Reference	Box Core	C10		Worm 2
SI3034	29-5-2021	Reference	Box Core	C10		Ensis lei
SI3035	29-5-2021	Reference	Box Core	C10		Box core SPM/POM_Box Core
SI3036	29-5-2021	Reference	Box Core	C10	Bottom	Water
SI3037	29-5-2021	Reference	Box Core	C10		Ensis lei
SI3038	29-5-2021	Reference	Box Core	C10		Ensis lei
SI3039	29-5-2021	Reference	Box Core	C10		Ensis lei
SI3040	29-5-2021	Reference	Box Core	C10		Ensis lei
SI3041	29-5-2021	Reference	Box Core	C10		Lanice conchilega SPM/POM_Box Core
SI3042	30-5-2021	Oysters	Box Core	D01	Bottom	Water
SI3043	30-5-2021	Oysters	Box Core	D01		Lutraria lutraria
SI3044	30-5-2021	Oysters	Box Core	D01		Neoamphirite frigus
SI3045	30-5-2021	Oysters	Box Core	D01		Ruditapes sp
SI3046	30-5-2021	Oysters	Box Core	D01		Pink worm
SI3047	30-5-2021	Oysters	Box Core	D01		Barnacles sp
SI3048	30-5-2021	Oysters	Box Core	D01		Bryozoan
SI3049	30-5-2021	Oysters	Box Core	D01		Barnacles sp
SI3050	30-5-2021	Oysters	Box Core	D01		Anemone sp
SI3051	30-5-2021	Oysters	Box Core	D01		Anemone sp
SI3052	30-5-2021	Oysters	Box Core	D01		Serpulidae
SI3053	30-5-2021	Oysters	Box Core	D01		Anemone sp
SI3054	30-5-2021	Oysters	Box Core	D01		Hemigrapsus sp
SI3055	30-5-2021	Oysters	Box Core	D01		Hemigrapsus sp

vial.nr	date	reef.type	method	Vessel position ID	Water Surface/ Bottom	Species.latin
SI3056	30-5-2021	Oysters	Box Core	D01		Barnacles sp
SI3057	30-5-2021	Oysters	Box Core	D10		Ensis lei
SI3058	30-5-2021	Oysters	Box Core	D10		Ophiuridae
SI3059	30-5-2021	Oysters	Box Core	D10		Nephtys sp. ?
SI3060	30-5-2021	Reference	Box Core	D10		Nephtys sp. ?
SI3061	30-5-2021	Reference	Box Core	D10		Nephtys sp. ?
SI3062	30-5-2021	Reference	Box Core	D10		Nephtys sp. ?
SI3063	30-5-2021	Reference	Box Core	D10		Barnacles sp SPM/POM_Box Core
SI3064	30-5-2021	Reference	Box Core	D10	Bottom	Water
SI3066	30-5-2021	Oysters	Cage	A01		Carcinus maenas
SI3067	30-5-2021	Oysters	Cage	A01		Carcinus maenas
SI3068	30-5-2021	Oysters	Cage	A01		Carcinus maenas
SI3069	30-5-2021	Oysters	Cage	A01		Carcinus maenas
SI3070	30-5-2021	Oysters	Cage	A01		Carcinus maenas
SI3071	30-5-2021	Oysters	Cage	A01		Necora puber
SI3072	30-5-2021	Oysters	Cage	A01		Necora puber
SI3073	30-5-2021	Oysters	Cage	A01		Necora puber
SI3074	30-5-2021	Oysters	Cage	A01		Necora puber
SI3075	30-5-2021	Oysters	Cage	A01		Necora puber
SI3076	30-5-2021	Oysters	Cage	A01		Pandalidae
SI3077	30-5-2021	Reference	Cage	A10		Asterias rubens
SI3078	30-5-2021	Reference	Cage	A10		Asterias rubens
SI3079	30-5-2021	Reference	Cage	A10		Asterias rubens
SI3080	30-5-2021	Reference	Cage	A10		Asterias rubens
SI3081	30-5-2021	Reference	Cage	A10		Asterias rubens
SI3082	30-5-2021	Reference	Cage	A10		Carcinus maenas
SI3083	30-5-2021	Reference	Cage	A10		Carcinus maenas
SI3084	30-5-2021	Reference	Cage	A10		Carcinus maenas
SI3085	30-5-2021	Reference	Cage	A10		Carcinus maenas
SI3086	30-5-2021	Reference	Cage	A10		Carcinus maenas
SI3087	30-5-2021	Reference	Cage	A10		Palaemon serratus
SI3088	30-5-2021	Reference	Cage	A10		Gobiidae SPM/POM_Box Core
SI3089	31-5-2021	Reference	Box Core	A01		Water
SI3090	31-5-2021	Reference	Box Core	A10		Magallana gigas
SI3091	30-5-2021	Reference	Box Core	C10		Diatoms
SI3092	30-5-2021	Oysters	Box Core	C01		Diatoms
SI3093	31-5-2021	Oysters	Box Core	A01		Crepidula furnicata
SI3094	31-5-2021	Oysters	Box Core	A01		Crepidula furnicata
SI3095	31-5-2021	Oysters	Box Core	A01		Orange bryozoan
SI3096	31-5-2021	Oysters	Box Core	A01		Ruditapes sp.
SI3097	31-5-2021	Oysters	Box Core	A01		Ophiura sp
SI3098	31-5-2021	Oysters	Box Core	A01		Electra pilosa

vial.nr	date	reef.type	method	Vessel position ID	Water Surface/ Bottom	Species.latin
SI3099	31-5-2021	Oysters	Box Core	A01		Anemone sp
SI3100	31-5-2021	Oysters	Box Core	A01		Barnacles sp
SI3101	31-5-2021	Oysters	Box Core	A01		Hemigrapsus sanguineus
SI3102	31-5-2021	Oysters	Box Core	A01		Crepidula furnicata
SI3103	31-5-2021	Oysters	Box Core	A01		Barnacles sp
SI3104	31-5-2021	Oysters	Box Core	A01		Magallana gigas
SI3105	31-5-2021	Oysters	Box Core	A01		Magallana gigas
SI3106	31-5-2021	Oysters	Box Core	A01		Barnacles sp SPM/POM_Box Core
SI3107	31-5-2021	Reference	Box Core	A10		Water
SI3108	31-5-2021	Oysters	Cage	B01		Palaemon serratus
SI3109	31-5-2021	Oysters	Cage	B01		Crangon crangon
SI3110	31-5-2021	Oysters+Mussels	Cage	B02		Gobiidae
SI3111	31-5-2021	Oysters	Cage	B01		Cancer pagurus
SI3112	31-5-2021	Oysters	Cage	B01		Cancer pagurus
SI3113	31-5-2021	Reference	Cage	B10		Carcinus maenas
SI3114	31-5-2021	Oysters	Cage	B10		Carcinus maenas
SI3115	31-5-2021	Oysters	Cage	B10		Carcinus maenas
SI3116	31-5-2021	Oysters	Cage	B10		Carcinus maenas
SI3117	31-5-2021	Oysters	Box Core	A01		Magallana gigas
SI3118	31-5-2021	Oysters	Box Core	A01		Hemigrapsus sanguineus
SI3119	31-5-2021	Oysters	Box Core	A01		Nephtyis sp?
SI3120	31-5-2021	Oysters	Box Core	A01		pink worm worm with clear segments
SI3121	31-5-2021	Oysters	Box Core	A01		Anemone sp
SI3122	31-5-2021	Oysters	Box Core	A01		Red algae foliose
SI3123	31-5-2021	Oysters	Box Core	A01		pink worm
SI3124	31-5-2021	Oysters	Box Core	A01		Anemone sp
SI3125	31-5-2021	Oysters	Box Core	A01		worm like nephtys
SI3126	31-5-2021	Oysters	Box Core	A01		pink worm
SI3127	31-5-2021	Oysters	Box Core	A01		worm like nephtys
SI3128	31-5-2021	Reference	Box Core	A10		Anemone sp
SI3129	31-5-2021	Reference	Box Core	A10		Anemone sp
SI3130	31-5-2021	Reference	Box Core	A10		Anemone sp
SI3131	31-5-2021	Reference	Box Core	A10		Anemone sp
SI3132	31-5-2021	Reference	Box Core	A10		Anemone sp
SI3133	31-5-2021	Reference	Box Core	A10		Ensis lei
SI3134	31-5-2021	Reference	Box Core	A10		Philine quadripartita SPM/POM_Box Core
SI3135	1-6-2021	Oysters	Box Core	B01		Water
SI3136	31-5-2021	Oysters	Box Core	A01		long yellowish worm
SI3137	1-6-2021	Oysters	Box Core	B01		Neoamphirite frigus
SI3138	1-6-2021	Oysters	Box Core	B01		Alitta virens
SI3139	1-6-2021	Oysters	Box Core	B01		Anemone sp

vial.nr	date	reef.type	method	Vessel position ID	Water Surface/ Bottom	Species.latin
SI3140	30-5-2021	Oysters	Box Core	B01		Diatoms
SI3141	30-5-2021	Oysters	Box Core	B01		Diatoms
SI3142	1-6-2021	Oysters	Box Core	B01		Hydrozoa
SI3143	1-6-2021	Oysters	Box Core	B01		Hydrozoa
SI3144	1-6-2021	Oysters	Box Core	B01		Red algae
SI3145	1-6-2021	Oysters	Box Core	B01		Hydrozoa
SI3146	1-6-2021	Oysters	Box Core	B01		Anemone sp
SI3148	1-6-2021	Oysters	Cage	C01		Palaemon serratus
SI3149	1-6-2021	Oysters	Cage	C01		Palaemon serratus
SI3150	1-6-2021	Oysters	Cage	C01		Palaemon serratus
SI3151	1-6-2021	Oysters	Cage	C01		Palaemon serratus
SI3152	1-6-2021	Oysters	Cage	C01		Crangon crangon
SI3153	1-6-2021	Oysters	Cage	C01		Carcinus maenas
SI3154	1-6-2021	Oysters	Cage	C01		Carcinus maenas
SI3155	1-6-2021	Oysters	Cage	C01		Carcinus maenas
SI3156	1-6-2021	Oysters	Cage	C01		Carcinus maenas
SI3157	1-6-2021	Oysters	Cage	C01		Carcinus maenas
SI3158	1-6-2021	Oysters	Cage	C01		Necora puber
SI3159	1-6-2021	Oysters	Cage	C01		Necora puber
SI3160	1-6-2021	Oysters	Cage	C01		Necora puber
SI3161	1-6-2021	Oysters	Cage	C01		Necora puber
SI3162	1-6-2021	Oysters	Cage	C01		Necora puber
SI3163	1-6-2021	Oysters	Cage	C02		Crangon crangon
SI3164	1-6-2021	Oysters	Cage	C02		Crangon crangon
SI3165	1-6-2021	Reference	Cage	C10		Carcinus maenas
SI3166	1-6-2021	Reference	Cage	C10		Carcinus maenas
SI3167	1-6-2021	Reference	Cage	C10		Carcinus maenas
SI3168	1-6-2021	Reference	Cage	C10		Carcinus maenas
SI3169	1-6-2021	Reference	Cage	C10		Carcinus maenas
SI3170	1-6-2021	Reference	Box Core	B10		Ophiura sp
SI3171	1-6-2021	Reference	Box Core	B10		pink worm
SI3172	1-6-2021	Reference	Box Core	B10		Ruditapes sp
SI3173	1-6-2021	Reference	Box Core	B10		Electra pilosa
SI3174	1-6-2021	Reference	Box Core	B10		Lanice conchilega
SI3175	1-6-2021	Reference	Box Core	B10		Lanice conchilega
SI3176	1-6-2021	Reference	Box Core	B10		Lanice conchilega
SI3178	1-6-2021	Reference	Cage	C10		Crangon crangon
SI3177	1-6-2021	Oysters+Mussels	Niskin bottle	A02		SPM/POM_Surface water
SI3179	1-6-2021	Oysters	Niskin bottle	A01		SPM/POM_Surface water
SI3180	1-6-2021	Mussels	Niskin bottle	A03		SPM/POM_Surface water
SI3181	1-6-2021	Reference	Niskin bottle	A10		SPM/POM_Surface water
SI3189	1-6-2021	Reference	Box Core	B10		Diatoms
SI3190	1-6-2021	Oysters	Box Core	B01		Diatoms

vial.nr	date	reef.type	method	Vessel position ID	Water Surface/ Bottom	Species.latin
SI3191	1-6-2021	Reference	Cage	D10		Carcinus maenas
SI3192	1-6-2021	Reference	Cage	D10		Carcinus maenas
SI3193	1-6-2021	Reference	Cage	D10		Carcinus maenas
SI3194	1-6-2021	Reference	Cage	D10		Carcinus maenas
SI3195	1-6-2021	Reference	Cage	D10		Carcinus maenas
SI3196	1-6-2021	Reference	Cage	D10		Crangon crangon
SI3197	1-6-2021	Reference	Cage	D10		Crangon crangon
SI3198	1-6-2021	Reference	Cage	D10		Crangon crangon
SI3199	1-6-2021	Reference	Cage	D10		Crangon crangon
SI3200	1-6-2021	Oysters	Cage	D01		Carcinus maenas
SI3201	1-6-2021	Oysters	Cage	D01		Carcinus maenas
SI3202	1-6-2021	Oysters	Cage	D01		Carcinus maenas
SI3203	1-6-2021	Oysters	Cage	D01		Carcinus maenas
SI3204	1-6-2021	Oysters	Cage	D01		Carcinus maenas
SI3205	1-6-2021	Oysters	Cage	D01		Palaemon serratus
SI3206	1-6-2021	Oysters	Cage	D01		Palaemon serratus
SI3186	2-6-2021	Oysters	Box Core	A01		Hemigrapsus sanguineus
SI3210	2-6-2021	Oysters	Box Core	A01		Pilumnus hirtellus
SI3211	2-6-2021	Oysters	Box Core	A01		Hemigrapsus sp
SI3212	2-6-2021	Oysters	Plankton net	A01		Plankton
SI3213	2-6-2021	Oysters	Plankton net	A01		Plankton
SI3214	2-6-2021	Oysters	Plankton net	A01		Plankton
SI3215	2-6-2021	Oysters	Plankton net	B01		Plankton
SI3216	2-6-2021	Oysters	Plankton net	B01		Plankton
SI3217	2-6-2021	Oysters	Plankton net	C01		Plankton
SI3218	2-6-2021	Oysters	Plankton net	C01		Plankton
SI3219	2-6-2021	Oysters	Plankton net	C01		Plankton
SI3220	2-6-2021	Oysters	Plankton net	D01		Plankton
SI3231	2-6-2021	Oysters	Plankton net	D01		Plankton
SI3222	2-6-2021	Reference	Plankton net	A10		Plankton
SI3223	2-6-2021	Reference	Plankton net	A10		Plankton
SI3224	2-6-2021	Reference	Plankton net	C10		Plankton
SI3225	2-6-2021	Reference	Plankton net	C10		Plankton
SI3226	2-6-2021	Reference	Plankton net	C10		Plankton
SI3227	2-6-2021	Reference	Plankton net	D10		Plankton
SI3228	2-6-2021	Reference	Plankton net	D10		Plankton
SI3229	2-6-2021	Reference	Plankton net	D10		Plankton
SI3230	2-6-2021	Reference	Plankton net	B10		Plankton

Table 7: all stations with coordinates in decimal degrees latitude north and longitude east, WGS84.

Transect	Station_ID	latitude	longitude	Transect	Station_ID	latitude	longitude
A	A_1	51.7835	3.8620	C	C_2	51.7874	3.8600
A	A_2	51.7835	3.8605	C	C_3	51.7874	3.8593
A	A_3	51.7835	3.8590	C	C_4	51.7874	3.8585
A	A_4	51.7835	3.8575	C	C_5	51.7874	3.8581
A	A_5	51.7835	3.8571	C	C_6	51.7874	3.8578
A	A_6	51.7835	3.8568	C	C_7	51.7874	3.8571
A	A_7	51.7835	3.8561	C	C_8	51.7874	3.8563
A	A_8	51.7835	3.8553	C	C_9	51.7874	3.8556
A	A_9	51.7835	3.8546	C	C_10	51.7874	3.8549
A	A_10	51.7835	3.8539	D	D_1	51.7886	3.8605
B	B_1	51.7854	3.8615	D	D_2	51.7886	3.8598
B	B_2	51.7854	3.8605	D	D_3	51.7886	3.8591
B	B_3	51.7854	3.8600	D	D_4	51.7886	3.8585
B	B_4	51.7854	3.8590	D	D_5	51.7886	3.8581
B	B_5	51.7854	3.8586	D	D_6	51.7886	3.8578
B	B_6	51.7854	3.8583	D	D_7	51.7886	3.8571
B	B_7	51.7854	3.8576	D	D_8	51.7886	3.8563
B	B_8	51.7854	3.8568	D	D_9	51.7886	3.8556
B	B_9	51.7854	3.8561	D	D_10	51.7886	3.8549
B	B_10	51.7854	3.8554				