RV BELGICA CRUISE 2023/01 - PROGRAM

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Monitoring: 14/02/2023 – 19/02/2023

1. GENERAL FORM RV BELGICA 2023

1.	Cruise number		2023/01
2.	Date/time	Zeebrugge ETD	14/02/2023: 10h00 **All scientists present at <u>08h30</u>**
		Zeebrugge ETA	19/02/2023: 14h00
3.	Chief Scientists		Michael Fettweis Céline Taymans (2nd Chief Scientist)
	Participating institutes		RBINS-OD Nature, INBO, Ugent, VLIZ
4.	Geographical area		Belgian part of the North Sea
	DIPCLEAR necessary		NO
5.	Scientific personnel		14 - 19/02/2023: 20
6.	Intervention required of: - Marine scuba team - Marine medical assistance - Pilot		 NO NO NO
7.	Necessary infrastructure onboard or on the quay to embark or disembark equipment. Mobilization Zeebrugge, 14/02/2023, 08h00 Demobilization Zeebrugge, 19/02/2023, 14h00		 ship's crane ship's crane
8.	Logistic assistance for CTD, data acquisition (MDM 500) or other.		Start-up MDM 500
9.	Remarks: None		

General remarks c/o RBINS-OD Nature-Measurement Services Ostend:

i) Bed linen and towels are available on the ship.

ii) All scientists involved in deck operations need to wear appropriate safety clothing such as safety shoes/boots, gloves etc. Only safety helmets and life vests are available on board.

iii) Please note that scientists are invited to bring their own mobile devices. The RV Belgica mobile phone/sat phone will be only made available in exceptional circumstances such as communications related to operational aspects of the ongoing campaign and in case of an emergency.

iv) All participants are requested to settle their account (daily meal fee: 6€ for lunch & 6€ for dinner) aboard via digital payment prior to disembarkation. Cash payments are not allowed. Drinks and snacks are free of charge, but soft drinks have a suggested limit of 3 consumptions per day per person.

v) Following governmental and contractual regulations smoking on the ship is only allowed at the designated location, near the muster station. Smoking on other locations is prohibited, e.g. science hangar and other locations on outer decks.

vi) It is prohibited to bring and use any kind of illegal drugs onboard. In case of violation, criminal prosecution will be initiated and any further access to the ship will be denied.

vii) It is not allowed to bring and use alcoholic drinks onboard. It is also not allowed to bring food onboard or take food/drinks from board unless agreed upon by the Master and crew (cfr. special dietary requirements).

viii) It is no longer allowed to park on the quays of the Naval Base in Zeebrugge. Any violation will lead to a fine of 120 €. Please use the dedicated parking lots (ZZ or ZZZ (long term)) on the base. The guards can give information on the correct locations. For long stays (> 3 days/3 nights) a document has to be filled in and be placed clearly visible on the dashboard of the car and the car keys must be handed over to the guards of the base in a closed envelope (see document sent with this program).

ix) Via the VSAT broadband internet connection and the WIFI available onboard you can connect to your e-mail clients and surf the internet. But please keep in mind that the bandwidth is limited and that any abuse will lead to restricted internet access.

x) All participants embarking on RV Belgica should be in good health allowing them to perform their activities at sea without being an extra safety risk and/or possibly causing a loss of ship time. When in doubt of a participant's medical situation the Chief Scientist or person in question should contact the Coordinator RV Belgica prior to the campaign. The Coordinator RV Belgica will consult and decide with the Master RV Belgica if the person in question can embark on the RV Belgica campaign.

xi) All scientists need to clean their cabins and the used labs at the end of the campaign. Cleaning products and material will be provided.

xii) Scientists are not allowed to enter non-authorized areas (see indications), incl. access to galley and provision rooms.

xiii) If you have any questions address the Master and crew.

For approval RBINS-OD Nature: 10/02/2023

L. NAUDTS, Dr.-Advisor
Coordinator RV BELGICA

2. LIST OF PARTICIPANTS

Institute	NAME	Gender	14-19/02/2023
ODNature-BGCMonit, BG-Part & ZEROIMPACT	Michael Fettweis	M	x
	Céline Taymans	F	x
	Wim Vanhaverbeke	M	x
	Kevin Hindryckx	M	x
	Tjorven Ditillieu	M	x
	Nore Wagemans	F	x
	Nicky Jespers	M	x
	Tom Scholdis	M	x
	Bob Rumes	M	x
	Alain Norro	M	x
	Jeroen Venderickx	M	x
	Aaron Kolder	M	x
	Silvia Paoletti	F	x
UGent	Auria Kallend	F	x
VLIZ	Jens Dujardin	M	x
	Estelle Bertimes	F	x
INBO	Nicolas Vanermen	M	x
	Wouter Courtens	M	x
Divers	Pierre Van de Steen	M	x
	Patrick Hendricks	M	x
		Total participants:	20

From 14-15/02/2023: 3 persons from Belgian Defence (2 VIPs) will embark and disembark via RHIB/patrol vessel.

3. SCIENTIFIC OBJECTIVES

RBINS-OD Nature - BGCMonit (MF)

The BGCMonit activity integrates various monitoring activities carried out by OD Nature within legal obligations (MONIT, MOMO) and projects (MOMO, EUNOSAT). Currently the frequency, the parameters and the position of sampling in the water column are not uniform, which is caused by the different objectives of the monitoring. This has been the case since the 1970's because measurement campaigns were mainly project driven. The aim of the monitoring is to combine the different efforts and to adapt the monitoring frequency and monitoring stations. This strategy will optimize the sampling effort for all teams involved (MUMM, SUMO, ECOCHEM, REMSEM), secure the legal obligations and validation protocols, challenge state-of-the-art scientific questions and build a comprehensive dataset linking all parameters.

The "MOMO" project is part of the general and permanent duties of monitoring and evaluation of the effects of all human activities on the marine ecosystem to which Belgium is committed following the OSPAR-convention (1992). The goal of the project is to study the cohesive sediments in the Belgian part of the North Sea 'BPNS' using numerical models as well as by carrying out of measurements. Through this, data will be provided on the transport processes which are essential in order to answer questions on the composition, origin and residence of these sediments on the BPNS, the alterations of sediment characteristics due to dredging and dumping operations, the effects of the natural variability, the impact on the marine ecosystem, the estimation of the net input of hazardous substances and the possibilities to decrease this impact as well as this in-put.

The "MONIT" project is part of the continuous surveillance and evaluation of the quality of the marine environment in the region of the Belgian Part of the North Sea (BPNS) in the framework of the national obligations toward the Joint Assessment and Monitoring Programme (JAMP) of the OSPAR commission and the Water Framework Directive (WFD) of the EC (2000/60/EC) and the Marine Strategy Framework Directive (MSFD). RBINS-OD Nature-Ecochem determines nutrients, salinity, suspended matter, dis-solved oxygen, DOC, TOC and POC, chlorophyll a and b, phaeophytine a and

b, TEP, inorganic carbon parameters (total Alkalinity, pH, Dissolved Inorganic Carbon (DIC), optical parameters and organic contaminants in the water column. Phytoplankton biomass and species composition as well as benthos species composition and biomass are also determined as part of the monitoring program. The other determinants (e.g. heavy metals and organic contam-inants) in sediment and biota are determined in collaboration with ILVO Fisheries. Quality assurance and quality con-trol during sampling and in the laboratory receive a high priority within the project, as ECOCHEM is ISO17025:2017certified for the majority of the parameters determined. In addition, the amount of microplastics is measured by RBINS-OD Nature-MUMM in the marine environment: seawater and sediment.
Within the "JMP-EUNOSAT" project, RBINS is developing a coherent satellite-based chlorophyll-a product for the Greater North Sea region requiring regional validation to quantify the suitability of the remote sensing product for eutrophication monitoring. With the launch of the next generation of optical satellites it is key to collect in situ data to validate the new satellite water quality products used in an operational monitoring service. The validation of satellite products is based on match ups between in situ and satellite measurements. With this document the satellite overpasses of three satellites are provided: Landat-8, Sentinel-2 and Sentinel-3. Guidelines for in situ measurements are also provided below.

RBINS-OD Nature/UGent/VLIZ - BG-PART (XD, MF)

BG-Part studies the mutual interactions between plankton and suspended particulate matter (SPM) along the onshore to offshore gradient on the Belgian Continental Shelf (BCS). The concentration and composition of SPM as well as the availability of nutrients and light are essential components of primary production and thus of ecosystem functioning and habitability of marine environments. Over the past decades, the North Sea has been subject to intense changes in SPM concentration and biological activities including primary production, which have caused environmental alterations with potential knock-on effects on the marine food-web. These effects may be further enhanced by rising water temperature, changing weather patterns and sea level rise. Given these changes, a thorough understanding of how plankton and SPM dynamics interact is essential to predict the habitability on the BCS and to implement future mitigation and adaptation measures through policies.

RBINS-OD Nature - ZEROIMPACT (IS)

ZEROimpact aims to develop an innovative, sustainable, and automatic method to detect marine species based on environmental DNA (eDNA). The project is a methodological study with practical applications for biodiversity monitoring, sea fishing and aquaculture, in particular; 1/ support to stock assessments of commercial fish species, 2/ more accurate calibration of spawning periods of commercial fish species and spawning periods of shellfish, 3/ detection of toxic algae and harmful parasites in relation to shellfish culture at sea, 4/ monitoring biodiversity (animals and phytoplankton) to support science and policy (achieving Good Environmental Status according to the Marine Strategy Framework Directive (MSFD, Directive 2008/56/EC) and Natura 2000 conservation objectives).

RBINS-OD Nature-WITSE (CT, DVDE)

The WITSE project is part of the long term monitoring program (WinMon.BE) studying the effects of the installation and exploitation of offshore wind farms on the marine ecosystem in the Belgian part of the North Sea. The monitoring is coordinated by ODNature. More specifically, the WITSE project focusses on the effects of wind farms on the water column hydrodynamics, and the associated movement of suspended sediment evidenced in Rumes et al (2013) for the NORTHWESTER 2 et MERMAID wind farms. Indeed, sediment plumes have been observed around the monopile foundations via satellite imagery (Van Hellemont and Ruddick, 2014) but also measured *in situ* (Baeye and Fettweis, 2015). Cause(s) and potential consequence(s) of such phenomenon however remain to be established. Few hypothesis have been suggested (modification of the turbulence regime, fouling fauna influence), but need to be further investigated.

RBINS-OD Nature-CODEVCO & WINMON-ZZD (BR)

In the framework of the assessment of the effects of the operation of a sea farm (combined aquaculture) on small cetaceans, the RBINS uses Passive Acoustic Monitoring Devices: porpoise detectors (C-PoDs). A C-PoD consists of a hydrophone, a processor, batteries and a digital timing and logging system, and has an autonomy of up to four months (www.chelonia.co.uk). Data obtained provide an indication of the presence of harbor porpoises in the vicinity of the device, up to a distance of approximately 300 m. Data obtained from one PoD can give an indication of presence/absence of porpoises, and can be compared to data obtained from PoDs moored at other locations – as such, the presence of porpoise in and near the sea farm area can be compared to the presence of porpoises in reference areas as well as compared throughout the year.

RBINS-OD NATURE OUTFLOW (AN)

The OUTFLOW project will investigate how the presence of offshore wind farms affects the spatial redistribution of organic matter through the presence of fouling fauna. This fauna filters organic matter from the water column and

repacks it as faecal pellets that are deposited on the sea floor. OUTFLOW will develop tracers for these pellets and use the tracer to track the fate of deposited pellets in the benthic food web, mineralization and burial processes. Upscaling towards the scale of wind farms, and multiple wind farms in the North Sea will be done through ecological and oceanographic modelling and data collected during this campaign. We will cooperate with RV Simon Stevin, the VLIZ robotic centre and RV Pelagia to perform simultaneous measurements on both sides and within the offshore wind farm zone at the Belgian-Dutch border to estimate a Suspended Particulate Matter budget for the cross-border area

RBINS-OD Nature PURE-WIND and MONWIN (AN)

The PURE-WIND project studies the underwater sound emitted by the production of energy at sea. For our area, this is the operational noise of wind farms. The project will qualify the noise and its effects on marine fauna.
The program MONWIN focuses on ambient sound featuring our zone of the North Sea and will focus on the same mooring location than PURE-WIND for 2023.

INBO (NV)

Based on the results of standardized ship-based seabird counts, the Research Institute for Nature and Forest (INBO) investigates the effects of offshore wind farms as well as a future sea farm on the presence and distribution of seabirds. To this end, INBO performs surveys along a fixed monitoring route through an impact and control area, thus following a BACI set-up.

RBINS-OD Nature-KP (ICOS)

The AUMS (Autonomous Underway Measurement System) system is inspired by the success of similar systems deployed on various ships of opportunity in the framework of the European Union FerryBox project (www.ferrybox.org). The instrumentation will greatly enhance the continuous oceanographic measurements made by RV Belgica by taking advantage of the significant technological improvements since the design of the existing (salinity, temperature, fluorescence) systems (cfr. ICOS Standards). In particular, many new parameters can now be measured continuously including important ecosystem parameters such as nitrate, ammonia, silicate, dissolved oxygen and CO2, turbidity, alkalinity and phytoplankton pigments. In addition, the new equipment allows automatic acquisition and preservation of water samples, rendering RV Belgica operations significantly more efficient by reducing onboard human resources. Data will be available in near real-time via RBINS-OD Nature's public website (http://odnature.naturalsciences.be/belgica/en/odas) and following quality control, from the Belgian Marine Data Centre. Since 2015, the AUMS data are also delivered to the EC ESFRI project ICOS.

4. RESEARCH AREA – SAMPLING STATIONS

4.1. RBINS-OD Nature BGCMonit, BGPart

1) Recuperation and deployment of tripod at MOW1

The tripod deployed at MOW1on 13 December 2022 will be recuperated and replaced, see Table 1.

Table 1: Position and time of tripod recuperation and deployment

ID	Date (local time)	Lat_wgs84	Lon_wgs84
MOW1	14/02 10h30	51°N 21.663	3°E 6.897

Table 2: Position and time of tidal cycles and additional stations.

ID	Date (local time)	Lat_wgs84	Lon_wgs84
MOW1	14/02 14h00 – 15/02 02h00	51°N 21.50'	3°E 07.50'
W05	15/02 19h00 – 16/02 01h00	51°N 25.00'	2°E 48.50'
W08	16/02 20h00 – 17/02 02h00	51°N 27.61'	2°E 20.91'

2) Tidal cycle measurement at MOW1, W05 and W08

Tidal cycle measurements are planned at MOW1 and half tidal cycles at W05 and at W08 (see Tables 1 to 3, and Figure 1). The cycles are also used to calibrate OBS's and LISST's sensors with in situ SPM concentration from filtration. Further additional parameters will be analysed (CSP, LoI, phytoplankton, zooplankton, DNA) from water samples in the framework of BGPart and ZEROIMPACT. Water samples will be taken with Niskin bottles every hour (MOW1 and

CODEVCO) and every 1.5 hours (W05) and every 2 hours (W08) near the surface and near the bed. A CTD-OBS-LISST profile is taken every 20 or 30 minutes with SBE09 STD-system. Vertical profiling should be carried out as slow as possible with every 2 m a break of about 30s. Every hour (1.5 hours) the SBE 09 STD-system is taken on board and the water is filtered on board for SPM, POC/PON, DOC/DON, TEP, CSP, pigments, hydrophobic chemical pollutants every 2 hours (PAHs, PCBs and at MOW1 only), DO, TA, DIC pH, nutrients. SPM will also be sampled with the centrifuge. A Van Veen sample is taken in all stations except at Codevco. For station CODEVCO, a LISST-HOLO (if available) will be used during the CTD profiling.

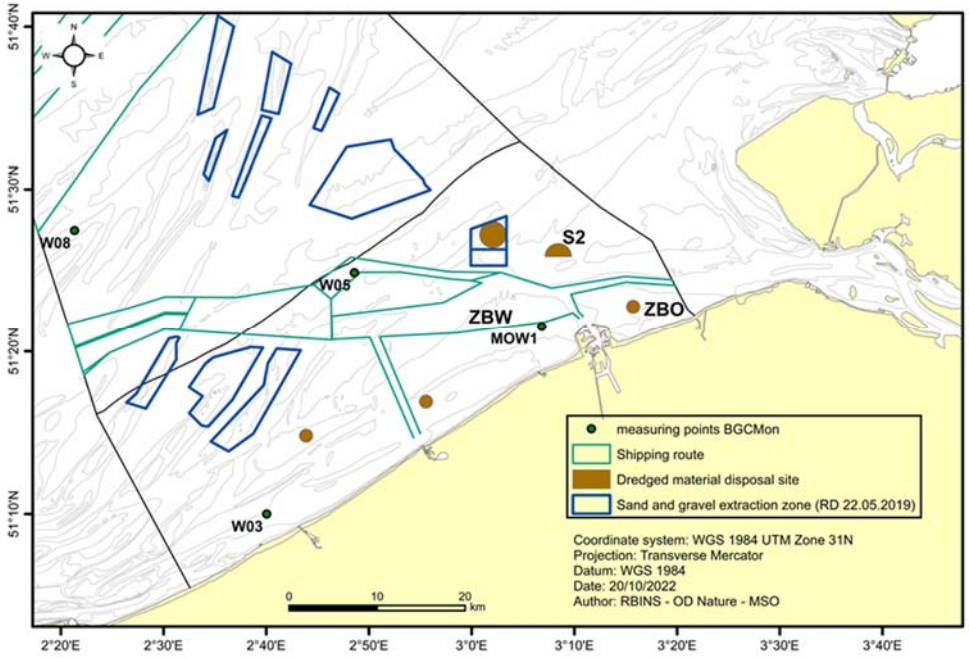

Figure 1: Sampling stations for BGCMonit, BG-Part and ZEROIMPACT

Table 3: List of monitoring stations (water sampling during tidal cycles, ½ tidal cycles or one timestamp)

Station Name*	Longitude	Latitude	MDM-500	In situ Instrument	Water: Niskin	Sediment: Van Veen/Reineck
MOW1	3°07'.500’	51°21.500’	X	X	X	X
W05	2°48.500’	51°25.000’	X	X	X	X
W08	2°20.910’	51°27.610’	X	X	X	X

3) Transect measurements between MOW1 and W05

Multibeam and ADCP measurements are planned along a transect between MOW1 and W05, see Figure 2. The transect should be sailed at low speed.

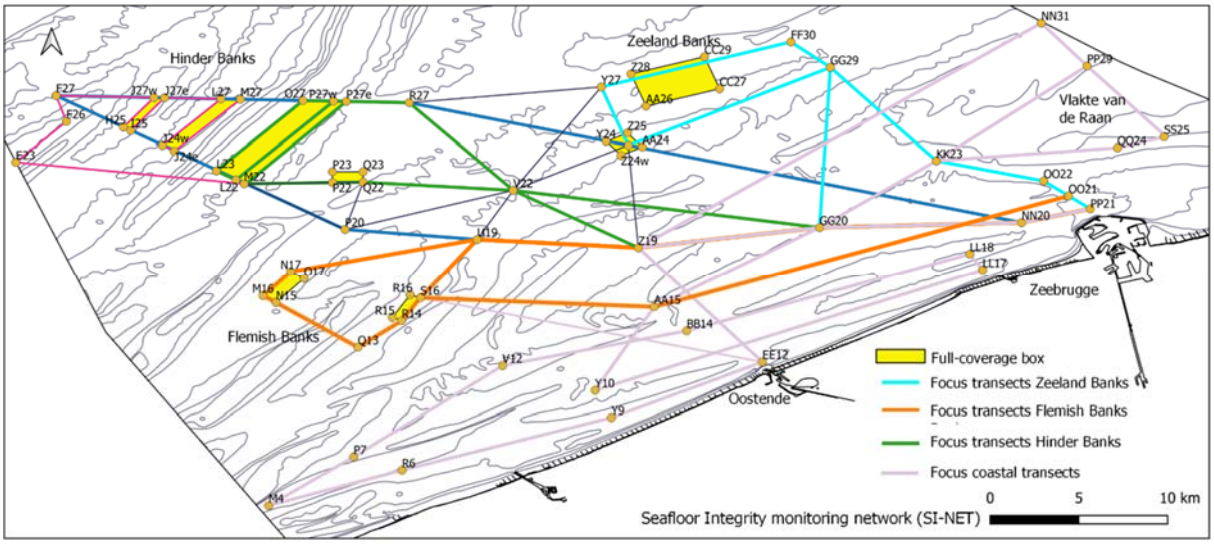

Figure 2: Transect MOW1 (NN20)-W05 (Z24e) is along the blue line (NN20: 51°N 21.50, 3°E 7.500; Z24e: 51°N 24.733, 2°E 48.171).

4.2. RBINS-OD NATURE WITSE

The monitoring strategy within the WITSE project relies mainly on lander data. Two tripods and one ADCP bottom frame will be installed on the seabed, to capture gradient and spatial patterns of turbidity, acoustic backscatter and particle size around a turbine. The region of interest is the Northwester wind farm. The site and the placement of tripods foreseen is presented in Figure 3. It should be noted that tripod locations may change based on the captain allowance in terms of safety distance from the monopile.

In order to calibrate the sensors installed on the tripod, a 8 hour cycle (to cover HW, LW, and maximum currents) of water sampling with the CTD rosette will be executed. Water samples will be taken with Niskin bottles every hour near the surface and near the bed. A CTD-OBS-LISST profile is taken every 20 or 30 minutes with SBE09 STD-system. Vertical profiling should be carried out as slow as possible with every 2 m a break of about 30s. Every hour (1.5 hours) the SBE09 STD-system is taken on board and the water is filtered on board for SPM, POC/PON, DOC/DON, TEP, pigments. The coordinate of the half tidal cycle remains to be defined, but will be in the direct vicinity, to calibrate the sensors on the tripods.
In parallel of the filtration cycles envisaged, suspended particles will be collected with the centrifuge on board. Few grams will be necessary, hence several cubic meters of water will need to be centrifuged.

Table 4: List of monitoring stations

Station Name*	Longitude	Latitude	MDM -500	Water: Niskin	Tripod / subsea station installation	Sediment: Van Veen
NW2F04A	2°44.964 E	51° 39.467 N	X		X	
NW2F04B	2°44.709 E	51° 39.358 N	X		X	
NW2F04C	2° 45.200 E	51° 39.502 N	X		X	
NW2F04D	2° 45.011 E	51° 39.421 N	X	X		X

4.3 RBINS-OD NATURE CODEVCO & WINMON-ZZD

1) Porpoise detector recovery for the CODEVCO monitoring
Recovery of six mini-tripods with porpoise detectors inside and near the CODEVCO zone (Table 5 & Figure 4-5). The mini-tripods will be recovered by a combination of RHIB (activate acoustic release, recover buoy, untie rope from buoy and pass on to the main vessel). Permission of CODEVCO operator is needed.
Conditions for recovery: daylight, wave height less than 1.5m, permit from the operator. Time needed for recovery ~4h for the six moorings. We need 2 scientists in the RHIB for the recovery. Use of deck hose to clean the tripods post recovery.

Table 5: Mooring positions Mini-tripods with porpoise detector

ID	Lat_WGS84	Long_WGS84
CODEVCO_POD1	2° 40,089'	51° 10,980'
CODEVCO_POD2	2° 38,052'	51° 10,509'
CODEVCO_POD3	2° 38,198'	51° 10,181'
CODEVCO_POD4	2° 37,289'	51° 9,967'
CODEVCO_POD5	2° 38,435'	51° 9,700'
CODEVCO_POD6	2° 38,261'	51° 10,701'

4.4. RBINS-OD Nature PURE-WIND and MONWIN

A small tripod will be recovered in position 51° 40,58N// 002° 48,66 E and a similar tripod deployed in the same position, see Figure 4.

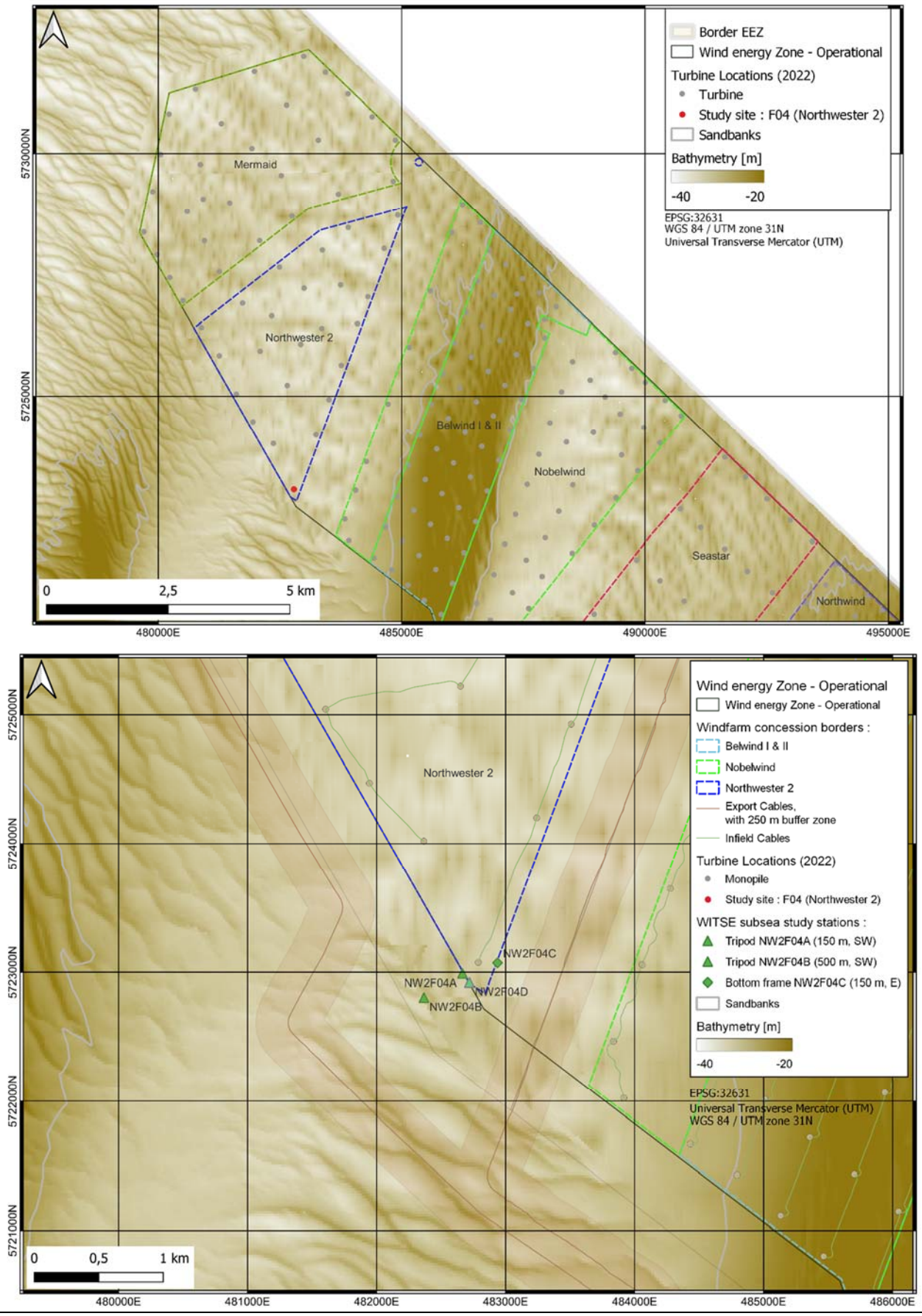

Figure 3: Study site selected. Above: pile (red) around which deployments are planned in the Northwester 2 wind farm. Below: detail with positions of landers (reference : Bathymetry base map from Flanders Hydrography; geographical items from the MSFD).

Figure 4: Mini-tripod with porpoise detector

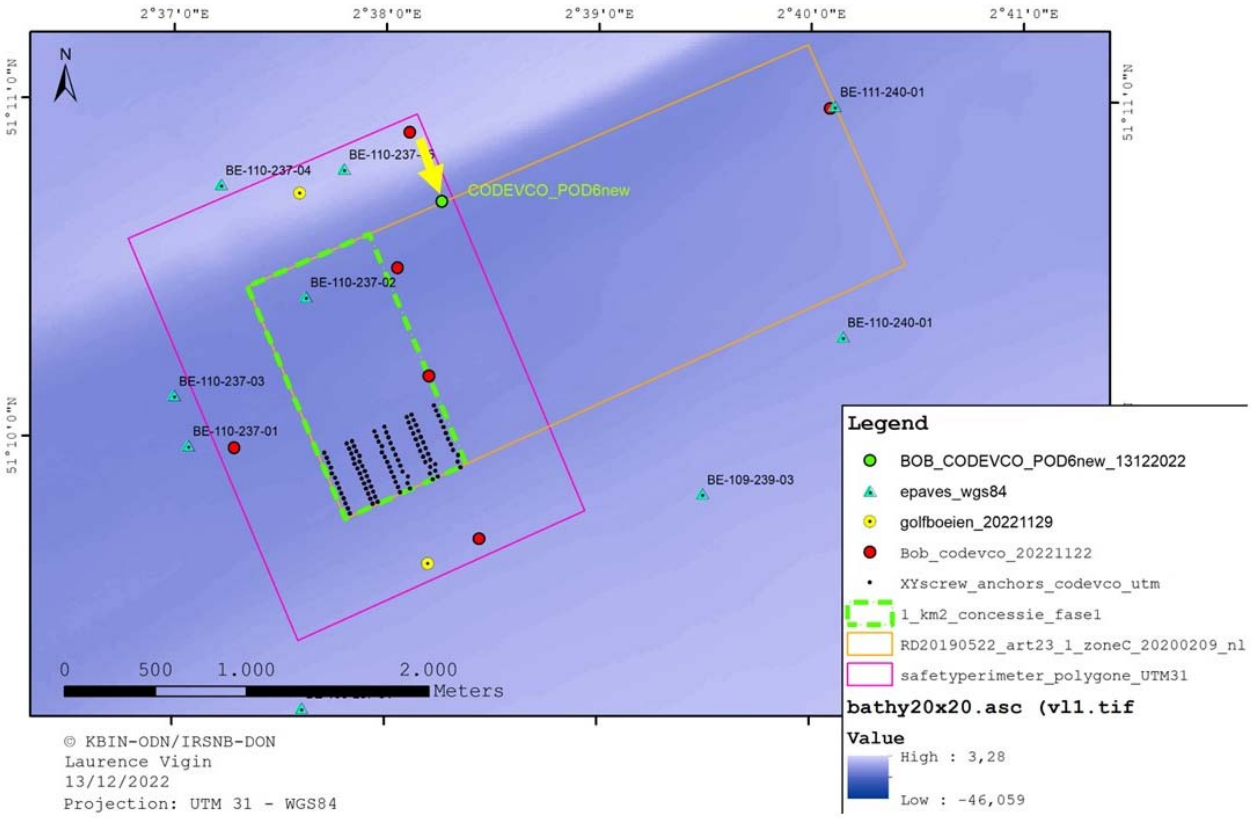

Figure 5: Mooring positions of the Mini-tripods with porpoise and fish detectors (red) showing the adapted location of CODEVCO_POD6 (green).

4.5. RBINS-OD Nature OUTFLOW

Diving operations will be performed at pile D5 in C-Power, see Table 6.

Table 6: Position of the sites where the scientific diving takes place – targeted turbines

ID	Lat_WGS84	Long_WGS84
C-Power D5	51° N 32.88’	02° E 55.77’

4.6 INBO

Figure 6 displays the two seabird monitoring routes across the Belgian offshore wind farm concession zone. These should be sailed at a speed of about 10 knots and are each 74 nautical miles in length. Seabird counting is possible from half an hour after sunrise until half an hour before sunset. The waypoint coordinates are listed in Tables 7 & 8.

Figure 7 displays the CODEVCO monitoring route across and near the project area of the future sea farm (zone C) in front of Nieuwpoort. This route is 12 nautical miles in length and should be sailed at a speed of 10 knots, while point counts are performed during 20 minutes. The direction of the monitoring route is of no importance, and can be chosen depending on prior activities and efficiency. All coordinates are listed in Table 9.

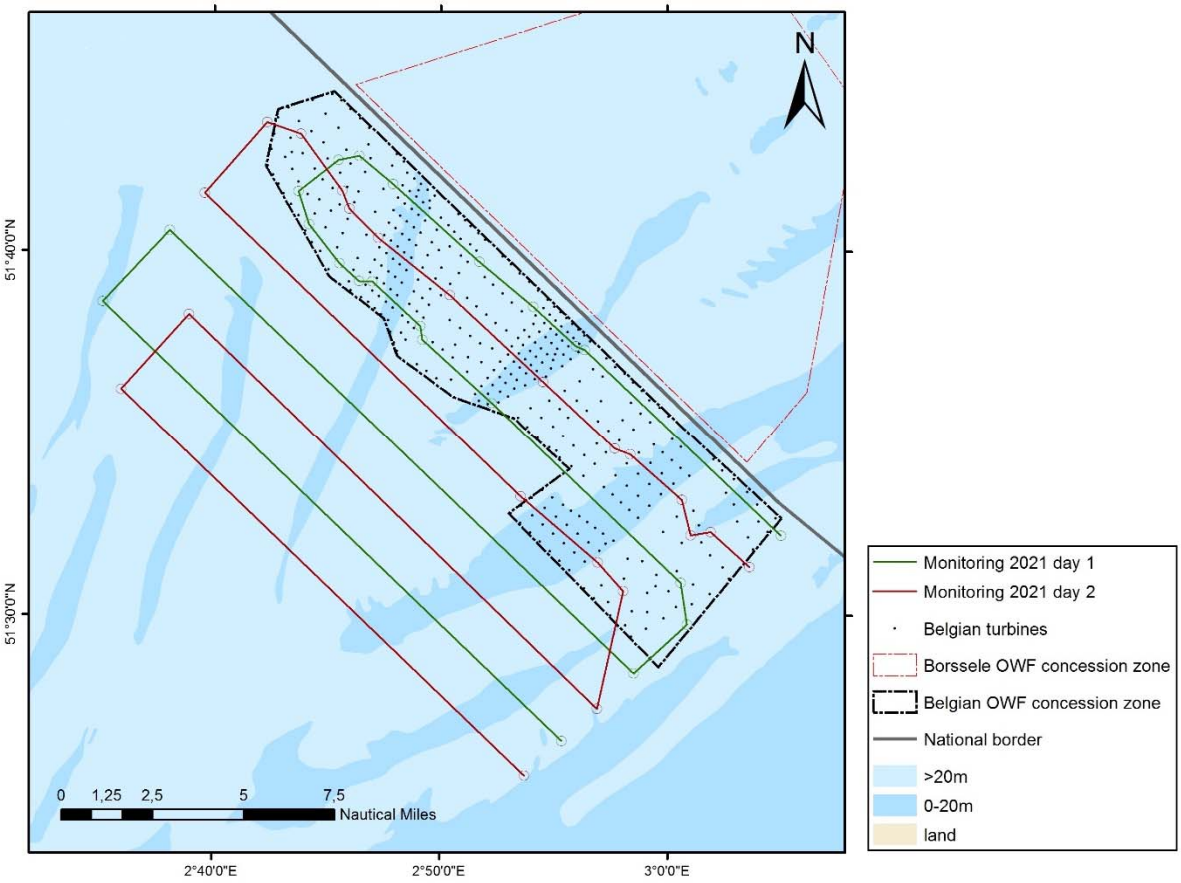

Figure 6: WINMON monitoring track.

Table 7: Waypoint coordinates of the WINMON seabird monitoring track day 1.

WP	Latitude	Longitude
1	51° 32.195'	3° 5.001'
2	51° 37.311'	2° 56.372'
3	51° 37.415'	2° 55.977'
4	51° 38.491'	2° 54.09'
5	51° 39.729'	2° 51.718'
6	51° 41.851'	2° 47.915'
7	51° 42.623'	2° 46.414'
8	51° 42.511'	2° 45.505'
9	51° 41.654'	2° 43.745'
10	51° 40.755'	2° 44.204'
11	51° 39.686'	2° 45.556'
12	51° 39.189'	2° 46.412'
13	51° 39.18'	2° 46.998'
14	51° 37.965'	2° 49.11'
15	51° 37.591'	2° 49.212'
16	51° 35.845'	2° 52.286'
17	51° 30.898'	3° 0.575'
18	51° 29.766'	3° 0.865'
19	51° 28.427'	2° 58.525'
20	51° 40.58'	2° 38.065'
21	51° 38.616'	2° 35.125'
22	51° 26.576'	2° 55.363'

Table 8: Waypoint coordinates of the WINMON seabird monitoring track day 2.

WP	Latitude	Longitude
1	51° 31.331'	3° 3.596'
2	51° 32.294'	3° 1.911'
3	51° 32.204'	3° 1.018'
4	51° 33.175'	3° 0.632'
5	51° 34.435'	2° 58.358'
6	51° 34.587'	2° 57.68'
7	51° 36.427'	2° 54.527'
8	51° 38.807'	2° 50.425'
9	51° 40.384'	2° 47.246'
10	51° 41.181'	2° 45.987'
11	51° 41.669'	2° 45.664'
12	51° 43.228'	2° 43.835'
13	51° 43.546'	2° 42.344'
14	51° 41.592'	2° 39.607'
15	51° 33.274'	2° 53.556'
16	51° 31.468'	2° 56.943'
17	51° 30.673'	2° 58.052'
18	51° 27.457'	2° 56.915'
19	51° 38.277'	2° 38.923'
20	51° 36.212'	2° 35.959'
21	51° 25.628'	2° 53.709'

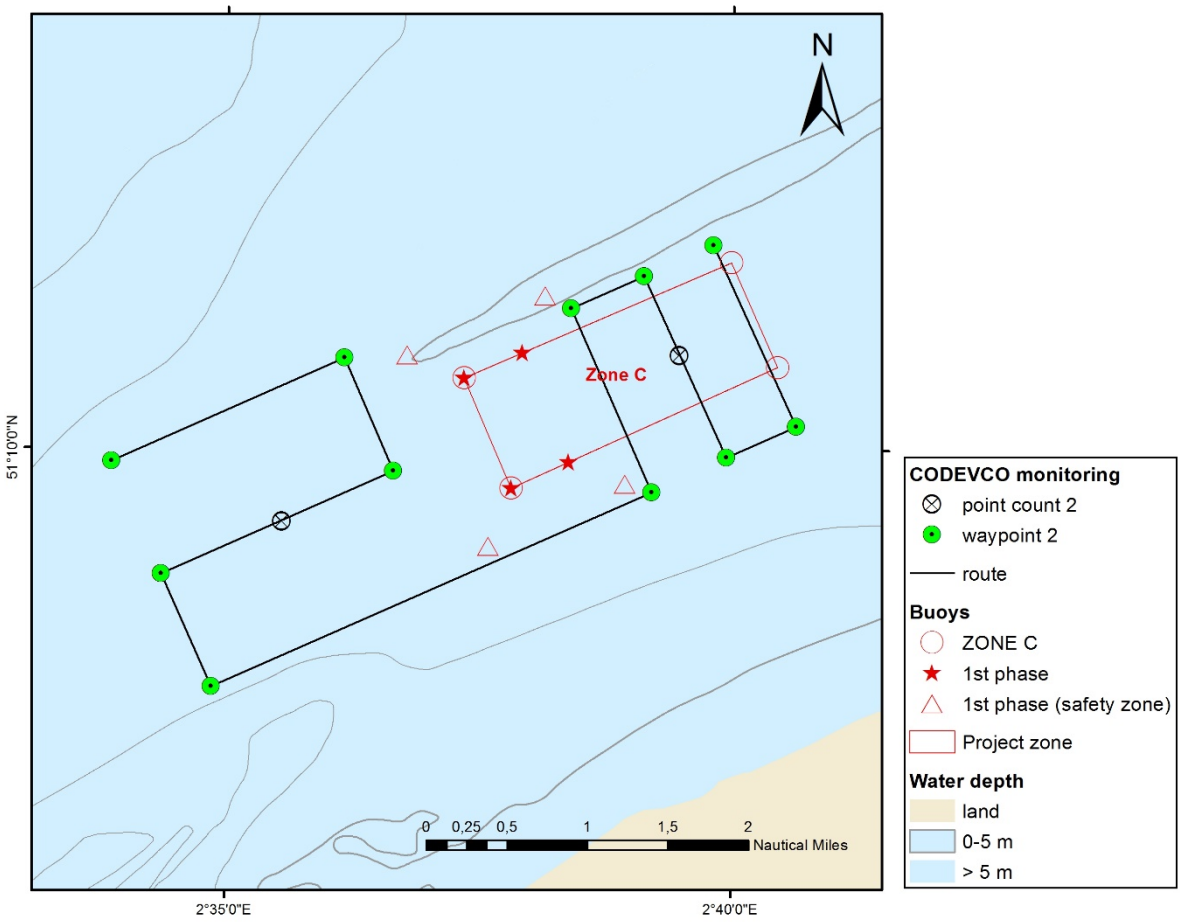

Figure 7: CODEVCO monitoring track.

Table 9: Coordinates for the CODEVCO seabird monitoring.

Type	ID	Latitude	Longitude
Point count	1	51° 9.549'	2° 35.551'
Point count	2	51° 10.589'	2° 39.471'
Waypoint	1	51° 9.919'	2° 33.864'
Waypoint	2	51° 10.567'	2° 36.165'
Waypoint	3	51° 9.864'	2° 36.651'
Waypoint	4	51° 9.221'	2° 34.362'
Waypoint	5	51° 8.521'	2° 34.86'
Waypoint	6	51° 9.739'	2° 39.205'
Waypoint	7	51° 10.879'	2° 38.401'
Waypoint	8	51° 11.08'	2° 39.12'
Waypoint	9	51° 9.955'	2° 39.941'
Waypoint	10	51° 10.15'	2° 40.632'
Waypoint	11	51° 11.275'	2° 39.806'

5. OPERATIONAL COURSE

All times are given in local time. All coordinates in WGS84. HW and LW are given for Zeebrugge. Sunrise and sunset are at 8h00 and 18h00 respectively. Tentative program; priority or observations may change according to tidal and weather conditions and/or technical constraints.

Tuesday 14th of February

HW 07h07 & 19h47; LW 00h48 & 13h32

08h00	Embarkation of equipment
10h00	Departure from Zeebrugge
10h30	Replacement of tripod at MOW1
13h00	Arrival VIPs
14h00	Start of tidal cycle measurement at MOW1

Wednesday 15th of February

HW 08h19 & 21h09; LW 02h01 & 15h02

02h00	End of tidal cycle measurement at MOW1
02h00-06h00	ADCP transit along MOW1-W05 and further to WINMON area
08h00-16h00	WINMON bird monitoring
13h00	Departure VIPs
16h00-18h00	Transit to W05
18h00	Start of ½ tidal cycle at W05

Thursday 16th of February

HW 09h46 & 22h34; LW 03h46 & 16h23

00h00	End of cycle at W05
08h00-17h00	WINMON bird monitoring
08h00-17h00	Recuperation and deployment of MONWIN and PURE-WIND tripod during bird monitoring, when in vicinity
17h00-20h00	Transit to W08
20h00	Start of ½ tidal cycle at W08

Friday 17th of February

HW 11h07 & 23h43; LW 05h03 & 17h30

02h00	End of cycle at W08
04h00	Transit towards Northwester 2, monopile F04
07h00	DP system positioning / Preparation tripod on deck (1h before sunrise)
07h30	Deployment of bottom frame at location NW2F04C (125 m from F04, East : 2° 45.180 E; 51° 39.504 N)
08h00	Deployment of tripod at location NW2F04A (150 m from F04, South west : 2°44.979 E; 51° 39.469 N)
09h00	Deployment of tripod at location NW2F04B (500 m from F04, South west : 2°44.709 E; 51° 39.358 N)
10h00-18h00	Tidal cycle (covers HW & LW), Van Veen sample during tidal cycle
18h00	Transit towards CODEVCO area along MOW1-W05 line

Saturday 18th of February

HW 12h08; LW 06h05 & 18h27

08h00-12h00	Mini-tripod recovery in CODEVCO area
12h00-17h00	Bird monitoring in CODEVCO area

Sunday 19th of February

HW 00h35 & 12h57; LW 06h56 & 19h14

10h57-12h00 Diving operation at D5 in C-Power.

14h00 Arrival in Zeebrugge

- End of the campaign -

6. OCCUPATION OF SCIENTIFIC SPACES

Deck 9: Crow's Nest	INBO
Deck7: Wheelhouse – Chief Scientist Desk	
Deck 6: Operational Center	RBINS-OD NATURE
Deck 6: Scientific Lab	
Deck 6: Forward Deck	
Deck 4: Lab 1	VLIZ
Deck 4: Lab 2	
Deck 4: CTD Hangar	RBINS-OD NATURE
Deck 4: Wet Lab	RBINS-OD NATURE, UGENT
Deck 4: Science Hangar	RBINS-OD NATURE, UGENT, VLIZ
Deck 4: Diver's Store	RBINS-OD Nature
Deck 4: Starboard Deck	RBINS-OD Nature
Deck 4: Aft Deck	RBINS-OD Nature
Deck 4: Seismic Room	
Deck 4: Aerosol Lab	
Deck 3: Clean Lab 3	
Deck 3: Wet Fish Lab	
Deck 3: Dry Fish Lab	
Deck 3: Freezer Room -20°C	
Deck 3: Cool Room +4°C	
Deck 3: Scientific Store	
Deck 2 & 1: AUMS Lab	RBINS-OD Nature

7. USE OF INFRASTRUCTURE AND INSTRUMENTATION

Equipment RV BELGICA:

24 bottle rosette with SBE9plus CTD with DO sensor, turbidity sensor and altimeter
RDI Workhorse Mariner 600 kHz ADCP on drop keel
GEA Westfalia seawater centrifuge
Sea-Bird SBE21 thermosalinograph
AUMS (Autonomous Underway Measurement System)
Milli-Q wet lab
Diving compressor
RHIB

Equipment RBINS-OD Nature:

Van Veen grap sampler with receptable
Instrumented tripods
ADCP bottom mount
LISST-200X particle size analyzer

8. SAMPLING - ON BOARD ANALYSIS

RBINS-OD Nature-BGCMonit & BGPart

On board filtration for SPM, POC, PON, TEP, pigments, TA-DIC, DOC and nutrients
On board filtration for CSP, LoI
On-board analysis of phytoplankton by flowcytometry

9. AUTOMATIC DATA ACQUISITION: continuous measurements

Instrument	Telegram	MDM ID	Parameter	Acquisition rate MDM500	
				standard	extra
				10 sec.	1 sec.
Seapath 380-R3 GNSS receiver with MGC motion sensor	ZDA	4701001	Time (HHMMSS.SSS)	x	
	ZDA	4701002	Time zone (HH)	x	
	GGA	4702001	Time (HHMMSS.SSS)	x	
	GGA	4702002	Latitude (D.D)	x	
	GGA	4702003	Latitude (N/S)	x	
	GGA	4702004	Longitude (D.D)	x	
	GGA	4702005	Longitude (E/W)	x	
	GGA	4702006	Quality (#)	x	
	GGA	4702007	Number of Satellites (#)	x	
	VTG	4704001	True heading (deg)	x	
	VTG	4704002	Magnetic heading (deg)	x	
	VTG	4704003	Ground speed (kn)	x	
	HDT	4705001	True heading (deg)	x	
	SXN23	4707001	Pitch (deg)	x	
	SXN23	4707002	Roll (deg)	x	
	SXN23	4707003	Heading (deg)	x	
	SXN23	4707004	Heave (m)	x	
Saab R5 GNSS system #1	GGA	4204001	Time (HHMMSS.SSS)	x	
	GGA	4204002	Latitude (D.D)	x	
	GGA	4204003	Latitude (N/S)	x	
	GGA	4204004	Longitude (D.D)	x	
	GGA	4204005	Longitude (E/W)	x	
	GGA	4204006	Quality (#)	x	
	VTG	4205001	True heading (deg)	x	
	VTG	4205002	Magnetic heading (deg)	x	
	VTG	4205003	Ground speed (kn)	x	
Saab R5 GNSS system #2	GGA	4304001	Time (HHMMSS.SSS)	x	
	GGA	4304002	Latitude (D.D)	x	
	GGA	4304003	Latitude (N/S)	x	
	GGA	4304004	Longitude (D.D)	x	
	GGA	4304005	Longitude (E/W)	x	
	GGA	4304006	Quality (#)	x	
	GGA	4304007	Number of Satellites (#)	x	
	VTG	4305001	True heading (deg)	x	
	VTG	4305002	Magnetic heading (deg)	x	
	VTG	4305003	Ground speed (kn)	x	
Navigat 200 gyro #1	HDT	3601001	True heading (deg)	x	
	ROT	3602001	Rate of turn (deg/s)	x	
Navigat 200 gyro #2	HDT	5301001	True heading (deg)	x	
	ROT	5302001	Rate of turn (deg/min)	x	
IMU-108 motion sensor #1	EM3000	6701001	Pitch (deg)	x	
	EM3000	6701002	Roll (deg)	x	
	EM3000	6701003	Heave (m)	x	
	EM3000	6701004	Heading (deg)	x	

Instrument	Telegram	MDM ID	Parameter	Acquisition rate MDM500	
				standard	extra
				10 sec.	1 sec.
	EM3000	6701005	Status	x	
IMU-108 motion sensor #2	EM3000	6601001	Pitch (deg)	x	
	EM3000	6601002	Roll (deg)	x	
	EM3000	6601003	Heave (m)	x	
	EM3000	6601004	Heading (deg)	x	
	EM3000	6601005	Status	x	
Skipper EML224 doppler log	VHW	3502001	True heading (deg)	x	
	VHW	3502002	Magnetic heading (deg)	x	
	VHW	3502003	Speed (kn)	x	
	VHW	3502004	Speed (km/h)	x	
	VBW	3503001	Longitudinal water speed (kn)	x	
	VBW	3503002	Transversal water speed (kn)	x	
	VBW	3503003	Longitudinal ground speed (kn)	x	
	VBW	3503004	Transversal ground speed (kn)	x	
Skipper ESN200 echosounder	DBT	3701001	Depth from transducer (m)	x	
	DBS	3702001	Depth from surface (m)	x	
	DBK	3703002	Depth from keel (m)	x	
	DPT	3704003	Depth (m)	x	
	DPT	3704004	Offset (m)	x	
Kongsberg EM 2040D depth	DPT	4101001	Depth (m)	x	
	DPT	4101002	Offset (m)	x	
Kongsberg ME70 depth	DPT	8501001	Depth (m)	x	
	DPT	8501002	Offset (m)	x	
Kongsberg EK80 echosounder	CHAN1	1701001	Depth (m)	x	
	CHAN1	1701002	Hardness (dB)	x	
	CHAN1	1701003	Density (m2/nmi2)	x	
	CHAN2	1702001	Depth (m)	x	
	CHAN2	1702002	Hardness (dB)	x	
	CHAN2	1702003	Density (m2/nmi2)	x	
	CHAN3	1703001	Depth (m)	x	
	CHAN3	1703002	Hardness (dB)	x	
	CHAN3	1703003	Density (m2/nmi2)	x	
	CHAN4	1704001	Depth (m)	x	
	CHAN4	1704002	Hardness (dB)	x	
	CHAN4	1704003	Density (m2/nmi2)	x	
	CHAN5	1705001	Depth (m)	x	
	CHAN5	1705002	Hardness (dB)	x	
	CHAN5	1705003	Density (m2/nmi2)	x	
	CHAN6	1706001	Depth (m)	x	
	CHAN6	1706002	Hardness (dB)	x	
	CHAN6	1706003	Density (m2/nmi2)	x	
Kongsberg EM304 depth	DPT	6901001	Depth (m)	x	
	DPT	6901002	Offset (m)	x	
Campbell Scientific weather station #1	MWV	6801001	Wind angle (deg)	x	
	MWV	6801002	Wind angle (R/T)	x	
	MWV	6801003	Wind speed (m/s)	x	
	XDR	6802001	Air temperature (degC)	x	
	XDR	6802002	Relative humidity (%)	x	
	XDR	6802003	True Wind speed (m/s)	x	
	XDR	6802004	True Wind direction (deg)	x	
	XDR	6802005	Air pressure (hPa)	x	
	XDR	6802006	Solar radiation density (W/m2)	x	
	XDR	6802007	Solar radiation total (J/m2)	x	
Campbell Scientific weather station #2	MWV	7801001	Wind angle (deg)	x	
	MWV	7801002	Wind angle (R/T)	x	
	MWV	7801003	Wind speed (m/s)	x	
	XDR	7802001	Air temperature (degC)	x	
	XDR	7802002	Relative humidity (%)	x	
	XDR	7802003	True Wind speed (m/s)	x	
	XDR	7802004	True Wind direction (deg)	x	
	XDR	7802005	Air pressure (hPa)	x	
	XDR	7802006	Solar radiation density (W/m2)	x	
	XDR	7802007	Solar radiation total (J/m2)	x	
	SBETSG	6501001	Scan count (#)	x	

Instrument	Telegram	MDM ID	Parameter	Acquisition rate MDM500	
				standard	extra
				10 sec.	1 sec.
Sea-Bird SBE21 thermosalinograph #1	SBETSG	6501004	Temperature SBE21 (degC)	x	
	SBETSG	6501005	Temperature SBE38 (degC)	x	
	SBETSG	6501006	Conductivity (S/m)	x	
	SBETSG	6501007	Salinity (PSU)	x	
	SBETSG	6501008	Density sigma-theta (kg/m3)	x	
	SBETSG	6501009	SV chen millero (m/s)	x	
	SBETSG	6501010	Water flow (m3/h)	x	
	SBETSG	6501015	Alarm	x	
Sea-Bird SBE21 thermosalinograph #2	SBETSG	8101001	Scan count (#)	x	
	SBETSG	8101004	Temperature SBE21 (degC)	x	
	SBETSG	8101005	Temperature SBE38 (degC)	x	
	SBETSG	8101006	Conductivity (S/m)	x	
	SBETSG	8101007	Salinity (PSU)	x	
	SBETSG	8101008	Density sigma-theta (kg/m3)	x	
	SBETSG	8101009	SV chen millero (ms)	x	
	SBETSG	8101010	Water flow (m3/h)	x	
	SBETSG	8101015	Alarm	x	
MiniSVS hull	SSV	5801001	Sound speed (m/s)	x	
	SSV	5801002	Temperature (degC)	x	
	SSV	5801003	Pressure (dBar)	x	
MiniSVS PS drop keel	SSV	5901001	Sound speed (m/s)	x	
	SSV	5901002	Temperature (degC)	x	
	SSV	5901003	Pressure (dBar)	x	
MiniSVS SB drop keel	SSV	7701001	Sound speed (m/s)	x	
	SSV	7701002	Temperature (degC)	x	
	SSV	7701003	Pressure (mBar)	x	
Teledyne OS75 ADCP	DBT	2901002	Depth (m)	x	
	HDT	2902001	True heading (deg)	x	
	VBW	2903001	Longitudinal water speed (m/s)	x	
	VBW	2903002	Transversal water speed (m/s)	x	
	VBW	2903003	Longitudinal ground speed (m/s)	x	
	VBW	2903004	Transversal ground speed (m/s)	x	
Teledyne WHM600 ADCP	DBT	3001002	Depth (m)	x	
	HDT	3002001	True heading (deg)	x	
	VBW	3003001	Longitudinal water speed (m/s)	x	
	VBW	3003002	Transversal water speed (m/s)	x	
	VBW	3003003	Longitudinal ground speed (m/s)	x	
	VBW	3003004	Transversal ground speed (m/s)	x	
Sea-Bird SBE9plus CTD #1	SBECTD	8001001	Scan Count (#)	x	
	SBECTD	8001002	Latitude (D.D)	x	
	SBECTD	8001003	Longitude (D.D)	x	
	SBECTD	8001004	Temperature (degC)	x	
	SBECTD	8001005	Conductivity (S/m)	x	
	SBECTD	8001006	Depth (m)	x	
	SBECTD	8001007	Salinity (PSU)	x	
	SBECTD	8001008	Density sigma-theta (kg/m3)	x	
	SBECTD	8001009	SV chen millero (m/s)	x	
	SBECTD	8001010	Oxygen (mg/l)	x	
	SBECTD	8001011	Turbidity (NTU)	x	
	SBECTD	8001012	Altimeter (m)	x	
	SBECTD	8001013	Bottles fired (#)	x	
	SBECTD	8001014	Descent rate (m/s)	x	
Sea-Bird SBE9plus CTD #2	SBECTD	8301001	Scan count (#)	x	
	SBECTD	8301002	Latitude (D.D)	x	
	SBECTD	8301003	Longitude (D.D)	x	
	SBECTD	8301004	Temperature (degC)	x	
	SBECTD	8301005	Conductivity (S/m)	x	
	SBECTD	8301006	Depth (m)	x	
	SBECTD	8301007	Salinity (PSU)	x	
	SBECTD	8301008	Density sigma-theta (kg/m3)	x	
	SBECTD	8301009	SV chen millero (m/s)	x	
	SBECTD	8301010	Oxygen (mg/l)	x	
	SBECTD	8301011	Turbidity (NTU)	x	
	SBECTD	8301012	Altimeter (m)	x	

Instrument	Telegram	MDM ID	Parameter	Acquisition rate MDM500	
				standard	extra
				10 sec.	1 sec.
	SBECTD	8301013	Bottles fired (#)	x	
	SBECTD	8301014	Descent rate (m/s)	x	
AUMS Oceanpack	SDS1	8801013	Temperature SBE45 (degC)	x	
	SDS1	8801014	Conductivity SBE45 (mS/cm)	x	
	SDS1	8801015	Salinity SBE45 (PSU)	x	
	SDS1	8801016	O2 concentration (umol)	x	
	SDS1	8801017	Air saturation (%)	x	
	SDS1	8801018	Air temperature (degC)	x	
	SDS1	8801019	pH	x	
	SDS1	8801020	pH temperature (degC)	x	
	SDS1	8801021	Turbidity Eco Triplet (NTU)	x	
	SDS1	8801025	Turbidity Campbell (NTU)	x	
	SDS1	8801027	CHL Eco triplet (ug/l)	x	
	SDS1	8801028	CHL-A NanoFlu (ug/l)	x	
	SDS1	8801029	CDOM Eco Triplet (ppb)	x	
	SDS1	8801032	Water flow (l/min)	x	
	SDS1	8801033	CO2 LI-COR (ppm)	x	
	SDS2	8802010	PAR (umol)	x	

10. CHEMICALS

- Triton – 1% – 2l Use: chemistry lab 1 (CASnr 9002-93-1)
- HCL - 25% Use: wet lab
- Liquid nitrogen - 20l - use: wet lab (CASnr: 7727-37-9)
- Neutral buffered formaline – 10% - 1L – use in wet lab or ideally on deck for ventilation (CASnr: CAS No. 50-00-0)
- $HgCl_2$ – use: wet lab
- pH buffer 4, 7, 8, 10 – use wet lab