Newsletter 1

April 2018

DISCLOSE

DISCLOSE is an acronym for DIstribution, StruCture and functioning of LOw-resilience benthic communities and habitats of the Dutch North SEa; a four-year research project wrapping up in March 2020. DISCLOSE aims to map the habitats of the Dutch North Sea using a combination of techniques. The project – a collaboration between the Delft University of Technology, the Royal Netherlands Institute for Sea Research (NIOZ), the University of Groningen, and the North Sea Foundation – is funded by the Gieskes-Strijbis Fonds.

Mapping seabed habitats

In this newsletter:

Habitat map of the North Sea

DISCLOSE is at the halfway point. Project manager Dick Simons of the TU Delft is satisfied with the progress. "The three PhD students work together excellently. Their differing strengths create a good synergy for the ultimate goal: a habitat map of the Dutch North Sea."

Dick Simons (TU Delft):
'The combined data is invaluable.'

The combination of methods makes DISCLOSE multidisciplinary, experimental, and innovative, says Simons. The research project brings together three different realms: that of acoustic mapping, marine biology, and ecology. As Professor of Acoustic Remote Sensing at the TU Delft, Simons is of the first group. "Combining these methodologies creates a new method to map the biology of the seafloor" says Simons. The research project - funded by the Gieskes-Strijbis Fonds - started in March 2016. Three PhD students started working at that time: Leo Koop from TU Delft, Sarah O'Flynn from NIOZ and Karin van der Reijden from the University of Groningen; each bringing their expertise to bear.

Levels of scale

According to Simons, a fundamental aspect of the DISCLOSE method is the different scales at which the researchers are investigating the seabed. "At TU Delft, we study the seabed on a large scale to distinguish between sediments such as mud, sand, and gravel. With our self-developed ultrasonic techniques, we can map dozens of square kilometers in one day. Subsequently, the marine biologists of NIOZ and the ecologists of the University of Groningen determine the biology per sediment type. They do so on a smaller scale with multiple techniques, including cameras, Box Corers, and Sediment Profile Imagery." The combined data is invaluable, he says. "If we chart the biological community for each sediment type, we can compile a habitat map of the North Sea with acoustic data."

A busy sea

Such a habitat map of the North Sea is urgently needed, it is remarkable that it does not already exist says Simons. "On land this would be unthinkable. The North Sea is used very intensively by fisheries, shipping, pipelines, and wind farms. Should the ecological consequences of all these disturbances not be accurately known?". Something that is currently not the case. "We also want to find out how resilient the species within different habitat types are. Hopefully we can conduct measurements before and after a disturbance."
DISCLOSE not only brings different disciplines together, but also science and nature protection. In Simons' view the North Sea Foundation adds a valuable perspective to the project. Universities are increasingly contributing to solving social problems. Furthermore, nature conservation benefits from a habitat map based on independent scientific knowledge.

When it all comes together

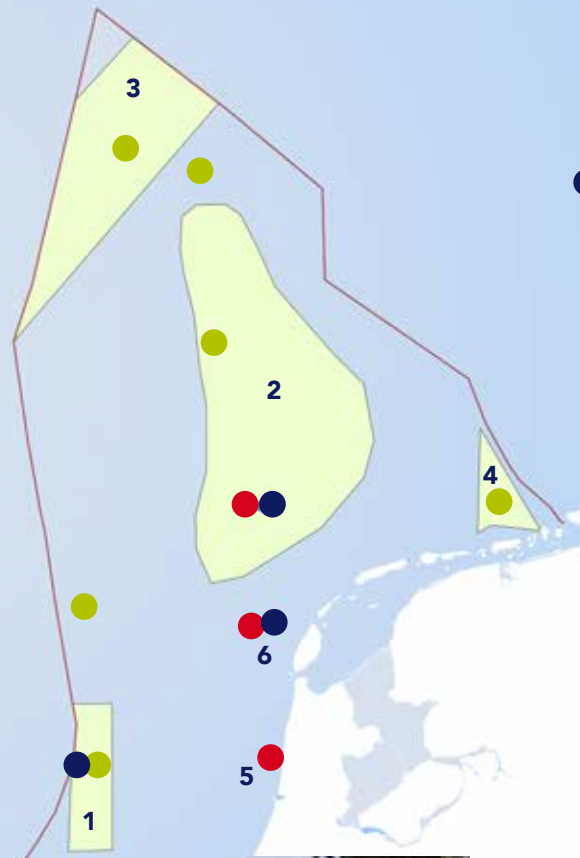
Simons is pleased with the progress. He sees the different expertise fields of the project coming together nicely. "We are on track with three successful expeditions in 2017 and several scientific articles in the review stages. Numerous additional publications are also actively being worked on." Until the summer, the PhD researchers will not return to the North Sea. "For the time being, they have enough data to keep them busy through the spring."

Expeditions to the North Sea

The year 2017 was dominated by field work. The DISCLOSE team went to the North Sea three times. In total, the researchers spent a month and a half at sea. Karin van der Reijden of the University of Groningen recalls the expeditions.

Expedition 1: *'Experimenting and gaining experience'* (May 31 - June 15)

"The first time we piggybacked on other research expeditions on the RV Pelagia, the research vessel of the NIOZ (Royal Netherlands Institute for Sea Research). They had planned research in the North Sea and during the spare time we tested our equipment. We visited three places: the Central Oyster Grounds, a location off the coast of Egmond aan Zee and a location off the coast of Texel."



Expedition 2: *'A grand tour of the North Sea'* (July 31 - August 16)

"For the second cruise, we joined an expedition organized by OCEANA, an international organization that focuses on protecting the seas. In the two and a half weeks that we were onboard we visited six different locations. We went on a 'grand tour of the North Sea', getting sparse data from many areas. The most important find: Ross worm reefs at the Brown Bank (see page 4)."

Karin van der Reijden (University of Groningen):

'We went on a grand tour of the North Sea.'

Expedition 3: *'Focused research'* (26 October - 5 November)

"Again, we joined the RV Pelagia. This time the ship was dedicated for DISCLOSE specific research for one week. We set out for the Central Oyster Grounds, the previously visited location near Texel, and of course, the Brown Bank, to further study our discovery."

Brown Bank **1**
Central Oyster grounds **2**
Dogger bank **3**
Borkumse Stones **4**
Off the coast of Egmond aan Zee **5**
For Texel **6**

— Study area: the Dutch Continental Shelf

Unique ross worm reefs at the Brown Bank

DISCLOSE, together with OCEANA, made a special discovery: the presence of Ross worm reefs on the Brown Bank. Christiaan van Sluis from the North Sea Foundation explains why this is so special.

How special is this find?

"Very special, a unique find for the Dutch North Sea. Until one hundred years ago, a large part of the North Sea bottom was covered with oyster reefs, stones, peat remnants, Ross worms and other reef-like structures. Now the vast majority consists of sand and mud. Ross worm reefs are still found in neighboring countries, such as England and Belgium but in Dutch waters they were thought to have disappeared. Although there were instances of individual Ross worms they did not form any reefs. At least, that is what we thought until recently. "

Christiaan van Sluis (North Sea Foundation):

'Ross worm reefs enrich biodiversity and are known as ecosystem engineers.'

Where did you find the reefs?

"At the Brown Bank, a dynamic sandbank, in the middle between the Dutch and English coasts. The reefs where discovered by chance during the OCEANA expedition this past August. The site was visited again and investigated further in early November."

What is a Ross worm reef?

"A Ross worm reef is a kind of "sand worm" *(Sabellaria spinulosa)* reef. The worms live in tubes that they build from glued grains of sand. When thousands of these sand tubes are formed together they create a reef."

How valuable are Ross worms?

'Very valuable. Ross worm reefs enrich biodiversity and are known as ecosystem engineers. That is, they create their own environment that benefits other animals. These reefs attract a lot of other life such as crabs, anemones, shrimp, and fish because the reefs provide solid structures, shelter against currents, and diversified food sources."

Are Ross worms protected?

"Not yet, actually. From the perspective of protection Ross worm reefs may fall between the cracks. In Dutch waters these reefs are not protected under European regulations such as Natura 2000 (N2000) nor under the Marine Strategy Framework Directive (MSFD). However, both mention the importance of biogenic structures. The reason the habitat type is missing in N2000 and the MSFD frameworks is because it was thought that the habitat did not occur. From OSPAR, a convention aiming for protection of the North East Atlantic, Ross worm reefs are designated as declining and threatened habitats. Protection against seabed fishing is recommended. After all, the reefs are vulnerable to physical disruption. This may offer an opening for protection under Natura 2000 or the MSFD.

Six methods

DISCLOSE maps the seabed of the Dutch North Sea. Three researchers apply six different methods, here is an overview.

Within this towed frame are **two cameras**; a forward-facing video camera, and a still image camera that points downward. The frame slides like a sled over the seabed. More than twenty videos have been recorded thus far. Starfish, crabs, hermit crabs, and sharks show their face as the cameras pass by.

The **Box Corer** is heavy. The device goes overboard, is placed on the seabed, after which the mechanism takes an undisturbed sample of the top layer of sediment. The sheer weight of the device pushes the sampling cylinder into the ground. The result: a cylinder with 30 cm of seabed. The sample is sieved to reveal the captured benthic animals. Our laboratory is currently full of beakers containing our benthic animals samples.

The **Van Veen Grab** takes a bite out of the seabed like an excavator.

This **Sediment Profile Imaging** (SPI) camera takes a picture of the profile of the seabed. After contact with the bottom, a glass camera housing pierces into the seabed and takes a photograph showing the various soil layers. The SPI images show twenty centimeters of soil and ten centimeters of sea water. A total of forty seabed profiles have been photographed to date.

SPI-picture of the North Sea bottom

The **multibeam echosounder** is mounted on the bottom of the ship. The device emits sound waves at different angles and records the echo that bounces off the seafloor and returns to the sonar. The acoustic data provides information about the depth and offers an indication of the sediment type.

The **Side Scan Sonar** looks like a torpedo and is towed behind the ship on a long cable. It sends out a pulse of sound. The 'torpedo' then records the sound that is reflected from along the sea-floor. The device maps the seabed, measuring the smallest relief differences and the structure of the bottom.

Habitat mapping with sound waves

Three PhD students are active within DISCLOSE. Together they map the nature of the North Sea. Each from a unique perspective, with their own techniques. In this section we give the researchers the floor.

This first episode features: Leo Koop

Name:	Leo Koop
Age:	32 years
Employed:	TU Delft, Faculty of Aerospace Engineering
Research:	habitat mapping with remote sensing

At sea Koop adopts a nocturnal circadian rhythm. "Time is extremely expensive on a research vessel and my work is more easily done at night" he explains. Koop looks at the big picture. He scans many square kilometers of the seabed at once. He does so with acoustic remote sensing. "Remote sensing is more commonly known from satellites and aircraft. We put similar techniques to use under water. But instead of capturing light, we send an ultrasonic signal to the seabed and record the sound signal that is reflected." Koop thus obtains two types of data: bathymetry (depth) and backscatter. Gravel, sand, or mud: the backscatter tells him what the seabed is made of.

Combination of sensors

He uses two sensors for the measurements: the multibeam echosounder and the side scan sonar. The first is fixed to the bottom of the vessel, the second is towed behind it like a torpedo. Combining the two techniques is something new. "We aim to improve the resolution and accuracy of maps by using both systems at the same time. Then we can differentiate complex sea beds, such as shellfish banks with a lot of sand."

First publication

Koop has had two years and four expeditions. The fieldwork provided him with four useful datasets that he is currently analyzing. His first DISCLOSE paper is already published. There is additional data from the Cleaver Bank. However, the data is measured with different vessels and equipment. Comparability is of great importance for long-term monitoring. We have managed to combine the datasets.

Leo Koop (TU Delft):

'We aim to improve the resolution and accuracy of maps by using both systems at the same time.'

State of the art technology

He finds the discovery of the sand tube worm reefs at the Bruin Bank spectacular, although they do not compare to the reefs from his home country. Koop comes from Belize, where the immense Mesoamerican Barrier Reef covers almost the entire Belizean coast and stretches into the waters of the neighboring countries; the second largest barrier reef in the world. Acoustic data is the future of underwater mapping, he says. "Satellites map the surface of the land more accurately. That trend continues under water. Within DISCLOSE we work with state of the art technology to investigate the seabed. The knowledge and experience acquired in DISCLOSE will hopefully be applicable to the barrier reef in Belize someday."

“Why we need improved habitat mapping”

DISCLOSE welcomes cooperation. In this column, external parties are interviewed. How do they view the research? Where are opportunities and pitfalls? In this first episode: Anne-Marie Svoboda, policy officer marine waters of the Ministry of Agriculture, Nature and Food Quality.

Anne-Marie Svoboda

DISCLOSE wants to involve the North Sea community in their research. Scientists, users and policy makers: they all were invited to special expert-meetings in 2016. One of them was Svoboda. She applauds the open attitude. “DISCLOSE sought advice and help and informed a broad group of stakeholders. I approve. Otherwise you run the risk of doing double work. You do not want to reinvent the wheel. In an ideal world, every project should operate so openly.” During the expert meetings, many questions came up, such as “In what ways can we strengthen each other?” And “What information do you need?” These are good questions to ask, says Svoboda. She indicates that she would like to receive an invitation for upcoming expert meetings.

Large-scale monitoring

Within the ministry, Svoboda is working on several North Sea dossiers, including the Marine Strategy Framework Directive (MSFD) and the protected areas from Natura 2000. “For the Natura-2000 areas the Dogger Bank and the Cleaver Bank, new habitat maps have recently been delivered. The maps are based on the best available data and provide a basis for policy and management.”
Svoboda is positive about DISCLOSE: “There is always a need to improve mapping methods of the North Sea habitats. The Natura 2000 areas are intensively sampled, but in much of the North Sea sampling is much less intensive. We only look at a small part of the seabed. Hopefully, DISCLOSE will be able to monitor the complete seabed using techniques such as the Side Scan Sonar.”

Higher level of detail

The research project is welcomed by the Ministry. “The North Sea floor is monitored every three years. An optimization of the measuring methods could yield a big benefit.” The existing benthic monitoring can be improved. Her wishes: lower costs and a higher level of detail. “Monitoring at sea is very costly, especially due to ship time and measuring equipment. New or improved measuring methods hopefully make it possible to better detect changes with the same budget.”

Anne-Marie Svoboda (Ministry of Agriculture, Nature and Food Quality):

‘In an ideal world, every project should operate so openly.’

Ross worm reefs

One of the recent results from DISCLOSE is the discovery of Ross worm reefs at the Brown Bank. “These kinds of finds are interesting because biogenic reefs do not occur much anymore in the Dutch North Sea. The Dutch Marine Strategy includes a restoration goal for North Sea nature. In that context, the discovery of the reef is excellent news.”

Colophon
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More information about the project
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