

BENEATH THE SURFACE OF THE WADDEN SEA:

'Protection still needs to be made much better'

Huge mussel beds and large numbers of flatfish have surprised the researchers studying underwater life in the Wadden Sea over the past year. The area needed some good news for a change. Numbers of migratory fish have been declining for years, and the impact of climate change and human activities remains significant.

TEXT KOEN JANSSEN ILLUSTRATION NICOLLE FULLER, SAYOSTUDIO





PHOTO SWIMWAY WADDENZEE

PHOTO KOEN MOONS

Research in the Swimway project on how fish use different areas in the Wadden Sea.

I went out onto the Wadden Sea with two divers recently, just off the coast of Texel,' says marine ecologist Martin Baptist. He wanted to learn more about how well-established *Sabellaria* is, a rare underwater worm that builds reefs. 'The divers were complaining a bit. "Do we really have to dive in the Wadden Sea, Martin? The water's murky and almost nothing lives there." They came back up a bit later with broad smiles on their faces. They'd seen some beautiful sponges, sea squirts and sea anemones. They were full of how great it was down there.'

Baptist and his colleagues from Wageningen Marine Research can be found regularly in the waters of the Wadden Sea, gathering as much information as possible about the state of nature in the area. They monitor parameters such as the number of fish, shellfish and seals. Some of those counts have been running since the 1960s, giving researchers a broad picture of how populations and habitats are developing.

Much of the life in the Wadden Sea is invisible to us, beneath the surface of the waters. That raises the question of what the actual status of the underwater life is and how we can find out.

'I'd say things are going better than in the past,' says Baptist. 'Fifty years ago, the situation here was really awful. Pesticides like DDT and PCBs were affecting the reproduction of birds and seals. There was much more pollution with heavy metals and chemicals, in part due to factories discharging potato starch. There were even plans for reclaiming the area and using it for agriculture

and industry. Fortunately, the protection has been improved a lot since then.'

The area's ecological value is unique thanks to natural factors such as tides, storms and the interaction between fresh and salt water, as well as the unusual mixed landscape of salt marshes, dunes and tidal mud flats. The high productivity of shellfish and crustaceans provides a plentiful food supply for fish, birds and seals. The Wadden Sea is vitally important to many animals. It is a Natura 2000 area and it was granted UNESCO World Heritage status in 2009.

'But the protection still needs to be made much better,' continues Baptist. There are species of migratory fish, breeding birds and migratory birds whose numbers have been falling steeply for decades. 'Other species have migrated to the Wadden Sea from warmer regions and are doing well. Is that a good thing, though? Not really, because the warming is the result of human activities.'

RECOVERY OF FLATFISH

Ingrid Tulp, an ecologist from Wageningen Marine Research, was pleasantly surprised by the underwater life in the Wadden Sea this year. 'I've been going there with colleagues for 20 years to monitor the growth of tongue, sole, plaice and other marine animals. I was genuinely astonished by what I saw at the end of this year. We'd almost lost the plaice and dab here, like other flatfish, but this time we saw lots of fish. Dab were actually the commonest species!'

The Wadden Sea could use some good news, given that

the Quality Status Report (QSR, a report published every four to six years on the ecological status of the Wadden Sea) also shows that fish stocks have been plummeting over the past few decades. This research is carried out jointly by Wageningen with partners from Germany and Denmark, the other two countries that border the Wadden Sea. For years, the QSR has been showing that numbers of migratory fish are declining, as are the populations of lesser-known creatures such as the armed bullhead and the seasnail. Plaice, dab and red gurnard have recently shown cautious signs of recovery.

Tulp believes that climate change is one of the reasons why many species are struggling: 'Fish are cold-blooded; their energy metabolism is directly affected by the temperature. The warmer the water gets, the more energy they need. And therefore the more food. Other possible causes include bycatch in shrimp fishing, as well as the effects of sand extraction and dredging. However, we don't know enough about that yet.' It is also unclear as yet why some populations have been on the rise again in recent years. 'That poses a puzzle for us because it doesn't seem to correspond to the rising temperature.'

EXPENSIVE FIELDWORK

Fish research has often been neglected in science, Tulp reckons. 'It's technically trickier because it's done underwater, which means expensive fieldwork using boats. Using volunteers, as is commonplace in bird research, is also more awkward. On top of that, fish are more difficult to track than bottom-dwelling creatures, and visibility in the Wadden Sea is pretty limited.'

The last while, Wageningen researchers have bridged some of the knowledge gaps through the five-year Swimway research project. Five PhD candidates were involved in this project, which also included the University of Groningen (RUG), the Royal Netherlands Institute for Sea Research (NIOZ), the Wadden Association, the Dutch Angling Association and the Directorate-General for Public Works and Water Management. The PhD candidates each had their own research project, for instance on the functioning of natural salt marshes and shell banks for the lifecycles of fish, or the movement of schooling species such as herring and sprat.

'In one of the studies, we tracked large fish species

'Some populations are increasing, which is a mystery to us'

such as sea bass and mullet,' says Tulp. 'We implanted acoustic transmitters in fish and fitted receivers to buoys at around 120 locations in the Wadden Sea. If that fish went near a receiver, its location was detected. As well as our Wadden Sea network, there are also networks outside the Netherlands, for instance off the Belgian coast and near the south coast of England.' Knowledge about where fish are and how they use their habitat is important for spatial planning measures, according to Tulp. 'It lets us determine the periods when particular parts of the Wadden Sea are important and gives us a better understanding of how fish utilize different habitats. That's important information for management issues such as dredging or fishing.'

7,000 HECTARES OF MUSSELS

Karin Troost, a marine ecologist from Wageningen Marine Research, was also pleasantly surprised by what she found during the annual shellfish inventory in the spring of 2025. She made the national news when she counted 7,000 hectares of mussel beds on the tidal mudflats. This was a huge increase over previous years, when the area fluctuated at around 2,000 hectares. 'In the summer of 2024, we had already noted that a significant amount of seed mussels had settled. The whole place turned black with these teeny mussels – it was like asphalt.'

Troost and her fellow researchers have been keeping track of mussels, cockles, Japanese oysters and other shellfish for years, but they have no instant explanation for the rising mussel numbers. 'It's always pretty complex with shellfish. It depends on various factors, such as temperature, food and predators. When all conditions are at the optimum, one species can suddenly peak. Mussel larvae are often eaten by predators such as shrimps after they settle on the seabed, and there weren't many shrimps in 2024. Which might in turn be due to lots of whiting off the coast, as that fish species enjoys eating shrimp. But why were there so many whiting? It is very difficult to determine the exact cause of such a change.'

Moreover, conditions in the Wadden Sea are changing because of climatic effects. Whereas it used to be severe winters that had a major impact on cockle numbers, >



PHOTO NORTHMEDIA

MARTIN BAPTIST

Marine ecologist,
Wageningen Marine Research

**INGRID TULP**

Marine ecologist,
Wageningen Marine Research



PHOTO HENNY RAOSTAAN

KARIN TROOST

Marine ecologist,
Wageningen Marine Research

nowadays mortality is more common during hot summers. ‘The rules that applied in the past are less relevant now,’ says Troost.

In addition to climate change, other human activities can have disruptive roles in the ecosystem, including gas and salt extraction, tourism and fishing. ‘The fishing industry is sometimes a bit of an easy target,’ says Troost. ‘I’m not going to say that it has no impact on the Wadden Sea, but it’s one particular activity that governments happen to find easy to impose restrictions on. Dredging and salt or gas extraction often involve bigger social and financial interests.’

Mechanical cockle harvesting, in which cockles are sucked from the seabed using a kind of gouge, has been banned since 2005. Since then, cockles have only been collected manually. Mussel fishing on the tidal mudflats has been phased out since the 1990s, after almost all the mussel beds had disappeared due to storms, fishing and a lack of new growth. In 2008, a Mussel Covenant was signed in which mussel farmers, the government and nature conservation organizations agreed to phase out the fishing of seed mussels – the young mussels measuring one to two centimetres in size – from the seabed and to catch them using alternative methods instead. Ropes, known as mussel seed collectors, are hung out that the drifting larvae attach themselves to. This seed is then cultivated elsewhere in the Wadden Sea and in the Eastern Scheldt. ‘So far, they’ve managed to cut bottom-disturbing mussel seed fishing by half,’ says Troost. ‘The aim is 100 per cent, but mussel farming has to remain viable. And enough space needs to be found for those collector set-ups.’

DUMPED BYCATCH

In addition, there is shrimp fishing in the Wadden Sea. Its ecological effects have been a hot topic of debate in recent years among nature conservation organizations, fishermen and other stakeholders. These discussions have focused largely on bycatch that is dumped overboard, the impact of seabed disturbance caused by drag-nets and the disruption of bird life.

In collaboration with researchers from NIOZ, RUG and the Wadden Academy, WUR conducted a major study in 2023 into the ecological effects of shrimp fishing on the seabed and life on the seabed. This showed that the

impact on seabed animals is minor in sandy areas but much greater in silt zones. Shrimp fishing also leads to the shrimp being smaller, a decline in plaice stocks due to bycatch, and disturbance of the common scoter, a duck. ‘There are therefore good arguments for regulation, both in the interests of the fishing sector itself and with a view to reducing ecological pressure,’ concludes the research report.

ECOLOGICAL PATIENCE

Since the 1990s, the authorities’ focus has shifted increasingly towards active nature restoration, as well as reducing disturbance. A recurring point of discussion here is whether to introduce structures such as pipes, concrete blocks and dead pear trees with the aim of giving underwater life a boost and thus increasing biodiversity. Tulp: ‘You can’t simply say the more species, the better, though. You create a new habitat and see that various species are drawn to it. That’s then seen as nature restoration, when in fact you have added a new type of habitat. What’s the added value of that?’ Tulp advocates ‘ecological patience’: not being too quick to make artificial interventions and giving nature a chance to recover.

Troost agrees. ‘The Wadden Sea sometimes gets compared to coral reefs, but that’s unjustified. It is quite an extreme zone really, with shallow waters, tides and storms. It’s not at all rich in species, but the production of the species that do live there is very high. If you focus on biodiversity, you’ll be tackling an issue that isn’t a problem in the Wadden Sea.’ Tulp: ‘That high level of food production is precisely what makes it such an important migration area for birds and fish.’

SPRAYING TO RAISE THE MUDFLATS

Baptist would prefer it if intervention was not necessary: ‘As an ecologist, you prefer to leave an area undisturbed – or at most, remove disruptive factors. But we know that won’t work here.’ He refers to the consequences of climate change, for example. The mudflats are currently still rising in step with sea levels, but it is expected that many mudflats will be unable to keep pace any longer from 2050 onwards. As a result, they will be underwater for more of the time and wading birds will have less time to forage. Marshes are becoming vulnerable too,

‘You can’t simply say the more species, the better’

says Baptist: ‘The nests of birds breeding on those salt marshes will therefore get flooded more often. We’re already seeing it happening with oystercatchers and plovers, for instance. Rising sea levels are an anthropogenic problem, which means we have a duty to intervene to protect nature. In this case, we’ll be spraying material onto the mudflats to raise them.’

However, Baptist also has reservations about using artificial concrete reefs. ‘They don’t belong in the Wadden Sea, intrinsically. Ideally, you’d want natural hard substrates such as mussel beds or reefs made by *Sabellaria* sandworms.’ These worms once built huge reefs of interlinked sand tubes, particularly in the German part of the Wadden Sea. They are no longer there, and there are too few larvae to form new reefs. If it was up to Baptist, that would change: ‘You’d introduce a source population that produces lots of larvae, but there’s no project for that yet.’

THE BOAT TO AMELAND

In retrospect, the Wageningen ecologists argue that preventing and curbing human activities in the Wadden Sea has been shown to be the most effective way of protecting underwater life. Important pressure factors have been eliminated, for instance through remediation of polluters, establishing strictly protected nature reserves and banning seal hunting.

This suggests it would therefore be beneficial to make conscious choices about how we use the Wadden Sea, an area where tourism, fishing and dredging all take up a lot of space, according to Tulp. ‘Cruise ships are being built on the Ems, which has to be dredged regularly for them. Should that be what we want? And huge numbers of tourists take the ferry to Ameland. You could also say that we’ll take fewer cars over, so that we don’t have to keep dredging the channel. Or we could adjust the sailing schedule to fit the tides.’ Troost: ‘Whenever humans intervene, you have to ask yourself whether it’s too much.’ ■