

Diving into the secret life of fish

Wadden Sea detectives



Using electronic tags, sound measurements and underwater cameras, researchers from Wageningen and Groningen are embarking on a thorough study of the life of fish in the Wadden Sea, where fish numbers have been falling for years. 'If we find out why, we might be able to turn the tide.'

Photo Peter Verhoog



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'The birds and soil fauna of the Wadden Sea come in for a lot of attention. But we don't know enough about fish,' says Ingrid Tulp, a researcher at Wageningen Marine Research (WMR) and coordinator of the large-scale research project Waddentools – Swimway Waddenzee, which will identify the bottlenecks for fish in the Wadden Sea. WMR has been monitoring the fish stocks for 50 years through the annual Demersal Fish Survey (DFS). 'But this survey is a snapshot and we only catch fish that are near the seabed. We have no idea how fish such as herring, sharks and rays use the Wadden Sea to feed and reproduce, for instance.' Tulp has seen how fish stocks are dwindling. 'If we know where the problems lie, we can give advice on the management measures that are needed to turn the tide. That is important because fish are a major link in the food chain.'

'The fish were always a bit of a poor

relation,' says Tulp. But this research project is changing that. Together with the Royal Netherlands Institute for Sea Research (NIOZ), the University of Groningen (RUG), the Wadden Association – and indirectly the Directorate General for Public Works and Water Management and the angling association Sportvisserij Nederland – Wageningen Marine Research is studying the life cycle – also known as the swimway – of fish. How do they use the Wadden Sea? Where are they found and which habitats do they use, to what end?

High-tech gadgets

The researchers make use of all sorts of high-tech gadgets in this work. 'We've got acoustic methods for recording the movements of schools of fish,' says Tulp. Researchers from the RUG also use special underwater microphones (hydrophones) to record sounds made by fish. This helps them establish whether certain species are found in an area. 'Water is a good conductor of sound,' says

Klemens Eriksson, associate professor of Marine Ecology at the RUG. 'The hard part is filtering out sounds you don't want, like those coming from ships.' The aim is to match the sound recordings with video footage and fish catches in order to learn which sound signals come from which fish species. 'We know the sound signature of a couple of fish species,' says Eriksson. 'We want to find that out for the rest of them too. It is real detective work.'

Tagged fish

The researchers are also using more time-honoured methods such as studying the otoliths (ear bones) of fish. 'From the chemical composition of the ear bones, we can find out the age and

'This is real detective work'



Five PhD students started at Swimway Waddenzee this year, each with their own research question:

growth rate of the fish, as well as when a fish has lived in salt or fresh water,' explains Tulp. Dozens of fish are also being tagged so that the researchers can track them on their journey through the Wadden Sea. Tulp: 'We are also collaborating with other tagging projects, such as *Vissen voor Verbindig* (Fishing for Connections), which is tagging trout. That way we can track each other's fish and collect more data over longer routes.' Tulp is also looking at other animals such as birds and seals, which eat the fish. 'We are working with another Waddentools project *Wij & Wadvogels* (Wadden Sea Birds and Us) to see whether the brooding islands of terns, which feed their young on fish, are well located.' It is too early for Tulp to say whether the project will come up with specific recommendations. 'We are focussing first on the more fundamental questions. For fish, there are only a limited number of buttons you can press when it comes to management, and these are issues of fisheries policy and nature conservation. If our research shows, for example, that climate change is an important factor in the decline of fish populations, it will be a lot trickier.' ■

1 Future (NIOZ/WMR)

Using lab experiments and models, researchers investigate the conditions under which different species of fish grow well; which areas of the Wadden Sea are suitable for different species, and how that changes with different climate scenarios. Researchers in this project also collate the new information from all the sub-projects to determine which processes and habitats pose the biggest problems for the fish.

2 The shores of the Wadden Sea (RUG)

The Wadden Sea is a nursery for a great many fish. From the salt marshes on the shore, a lot of food – such as amphipods and insects – gets swept into the sea for the young fish swimming there. In this study, experiments will be done with different methods of grazing and water management to find out which approach to managing the salt marshes is most beneficial for fish.

3 Large fish (NIOZ/WMR)

Not much is known about the larger fish in the Wadden Sea, such as the sea trout, the European bass or the school shark. GPS doesn't work underwater, so the fish are fitted with an acoustic tag. A network of receivers, attached to buoys, then registers the fishes' movements. Some fish are also fitted with an electronic gadget, a data storage tag (DST) that continuously measures the depth at which they are swimming, their temperature and salt levels. When the fish are caught, the researchers can read the information off the tag.

4 Schools (WMR)

Pelagic fish usually swim in schools. These species, such as the lesser sand eel, the herring and the sprat, are food for fish-eating birds and seals. With the aid of acoustic apparatus on the seabed – echo location – and sonar from ships, the researchers are studying the movements of schools of pelagic fish in tidal inlets where North Sea water flows in and out of the Wadden Sea with the tide. With the data they obtain, the researchers also look at whether the breeding islands created for terns are well located.

5 Shellfish banks (RUG)

Shellfish banks provide shelter and food for young fish. The scientists look at the role played by the sublittoral mussel banks (which are permanently underwater) in the life cycle of fish. Among other things, they film fish and record sounds to find out which fish use the shellfish banks and in which phase of their lives. They also look at the effect of artificial reefs.