Effects of offshore wind farms on the distribution, diet and condition of plaice *Pleuronectes platessa* in the Belgian part of the North Sea

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Offshore wind farms (OWFs) are built at high speed in European waters to meet the EU 2050 renewable energy production targets. The introduction of hard structures and scour protection layers in sandy environments, such as the Belgian part of the North Sea (BPNS), offers various opportunities for reef-associated fish and invertebrate species. Pouting *Trisopterus luscus* and cod *Gadus morhua,* for example, are locally attracted towards hard substrates of OWFs due to increased food availability, even leading to increased local production. For soft-sediment species such as like flatfish, our knowledge about their behaviour in relation to wind farms is still scarce.

We, therefore, investigated how the presence of OWFs affects the distribution of plaice *Pleuronectes platessa*, a commercially important flatfish species. We looked both at the medium (OWF) and small (turbine) spatial scale. At the wind farm scale, plaice were sampled on the sandy bottom in between the turbines (~ 200 m distance) and in reference zones by means of beam trawl catches following a BACI sampling design. Significantly increased abundances were detected for one of the wind farms, but this was less clear for the other. These results suggest that wind farms can act as refuge areas for plaice, at least under specific conditions. Plaice distribution at the turbine scale was studied by visual diving transects crossing the scour protection layer (SPL) and the surrounding sand around eleven monopile turbines. Four times higher plaice abundances were found on the sandy patches between the rocks of the SPL compared to the surrounding sand. The configuration of the SPL, i.e. an open rock field with sandy patches, facilitating the natural burrowing behaviour of plaice, in combination with increased food and shelter opportunities, are suggested to steer the attraction effect towards the hard substrates. In a next step, we investigated whether the attraction effect resulted in a different diet and/or a better condition of plaice near the turbines. Hence, plaice were sampled at four different locations around one OWF: (1) on the SPL around the turbines, (2) on the sand in between the turbines, (3) in control areas near and (4) further away from the OWF. Stomach and gut content analyses showed a significantly different diet for plaice feeding on the SPL, compared to the other groups. Stomach contents of individuals in the SPL-group were dominated by typical hard-substrate species, clearly showing that those fish fed on the SPL. Furthermore, the higher food availability on the SPL resulted in a significantly higher value of the Fulton's K condition index with heavier fish for a certain length. Additionally, a fatty acid (FA) analysis revealed a different FA profile for the SPL group compared to the control groups outside the OWF. This indicates that plaice present near the turbines not only feed sporadically on fouling organisms, but have an adjusted diet for longer time periods (several weeks), suggesting that plaice might reside on the SPL.

As such, we conclude that plaice is indeed affected by the presence of OWFs, both at small and medium spatial scales, related to the presence of an open rock field with sandy patches in between as scour protection layer, and resulting in a changed feeding behaviour coupled to the presence of hard-substrate fouling fauna.

Keywords: Offshore wind farms (OWFs); Attraction; Condition; Diet; Pleuronectes platessa; North Sea