

# 08

## CHAPTER



# Fisheries activities change in the vicinity of offshore wind farms

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Changes in fisheries activity in the vicinity of the wind farms were described based on Vessel Monitoring System (VMS) data of commercial vessels and ship-based survey data of recreational fishing vessels for the period 2010-2011. The VMS density maps show increases in the number of registrations north of the Thorntonbank Phase 3, west of the Thorntonbank Phase 2, and south of the operational turbines at the Bligh Bank. A slight decrease was seen south of the Thorntonbank. Concentrations of recreational fisheries activity at the wind farms were reduced in 2010-2011: observations of anglers decreased and the link with wind farms seemed mostly gone.

## INTRODUCTION

In the Belgian part of the North Sea (BPNS), the construction of offshore wind farms has given rise to the establishment of areas closed to commercial fishing activity. Following such closures, different effects on both the ecosystem and on patterns of fishing activity have been observed (e.g. Murawski et al, 2000; Grizzle et al, 2009) and can therefore also be expected to manifest themselves in the BPNS. These effects comprise (1) the establishment or recovery of spawning and nursing grounds, (2) the recovery of benthic communities and diversity within the area, and (3) edge effects<sup>1</sup> (also known as fringe effects) along the borders resulting from displacement of fisheries activities and changes in fishing intensity (Anonymous, 2004). The latter effect can be evaluated using VMS data of trawlers

and ship-based survey observations of recreational fisheries originating from the Belgian part of the North Sea.

VMS data originate from a fishing vessel monitoring system (VMS), which is a program of fisheries surveillance in which satellite transmission equipment installed on fishing vessels provides information about the vessels' position and activity. This is different from traditional monitoring methods, such as surface and aerial patrols, on-board observers, logbooks or dockside interviews. VMS data constitute a cost-effective tool for the successful monitoring, control and surveillance of fisheries activities. In this respect, they are an excellent tool for monitoring compliance with closed-area regulations and for investigating changes in fisheries distribution and effort in the vicinity of such closed areas. Since 2005, all European Community vessels automatically transmit vessel identification, date, time, position, course and speed either hourly or every 2 hours.

Recreational and small-scale fisheries (vessels <15m) are not subject to VMS surveillance. Since these fishery types have been estimated to represent a meaningful proportion of total fishing effort in the BPNS (Depestele et al, 2008; Lescrauwaet et al, 2013), other ways of estimating fishing effort by these small vessels have to be considered. In this respect, visual surveys are complementary to VMS data, since they can provide an estimate of the spatial distribution and the presence of hot spots of small scale fishing activities (Maes et al, 2005; Goffin et al, 2007; Depestele et al, 2008).

The aim of the described analysis was to investigate changes in fisheries activity in the vicinity of the existing wind farms at the BPNS based on Vessel Monitoring System (VMS) data and ship-based survey data.

<sup>1</sup> **Edge effects** relate to the influence that a habitat edge can have in determining species composition and processes within a habitat. Edge effects can be considered as, or to influence, patterns in biological and physical parameters such as species richness, predation, food availability, disturbance and temperature (Murcia, 1995)



Fishing vessel trawling near a wind farm

## DATA SOURCES AND ANALYTICAL METHODS

Aerial and ship-based surveys show that especially Belgian and Dutch, but also French, British and Danish fishing vessels operate within the Belgian Part of the North Sea (Depestele et al, 2008). These are mostly trawlers, but gill and trammel netters, long liners and bottom seiners were also observed in the area. Recently, Belgian Vessel Monitoring System (VMS) data (2006 – 2011) have been made available by the Belgian Sea Fisheries Service<sup>2</sup> for scientific research related to fisheries management. British data (2007 – 2011) were made available by the British Marine Management Organization, and Dutch data (2010 – 2011) were made available by the Dutch Ministry of Economic Affairs. Danish and French data were not available, but since they mainly reflect pelagic and trammel net fisheries (Depestele et al, 2008), their absence will not have a significant impact on the results.

Since metadata about fishing gear and engine power were not available for the majority of the data, speed filters could not easily be applied and no distinction could be made between fishing, steaming or other activities. Consequently, the analysis is limited to “fishing vessel presence” rather than representing “fishing intensity”. Only the results on the years 2010-2011 are presented.

All data were plotted on BPNS maps representing the number of VMS registrations per 3 km<sup>2</sup> grid cell, since this proved to be an adequate resolution for VMS data with a 2 hour interval (Mills et al, 2007). The data were processed and visualized using Microsoft Access and ArcView 10.0 (ESRI Inc, 2010). The data on small-scale and recreational activities originate from intensive ship-based seabird surveys performed by the Research institute for Nature and Forest (INBO). During these surveys, observation records of vessels are standardized,. For more details on the methodology see chapter 5. All data were again plotted on BPNS maps per 3 km<sup>2</sup> grid cell.

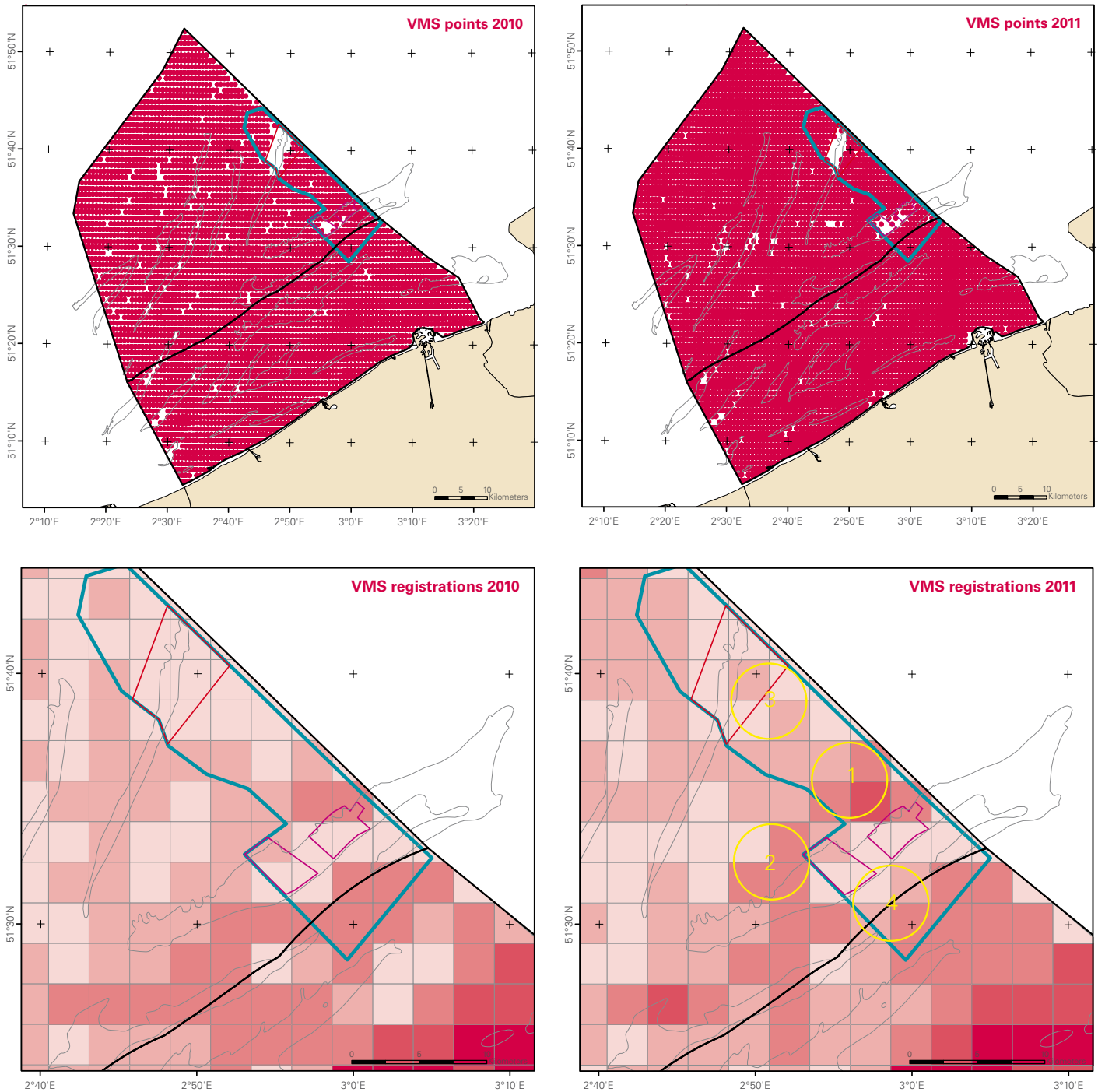
<sup>2</sup> All primary data on vessels sailing under the Belgian flag were supplied by the Department of Agriculture and Fisheries – Sea Fisheries Service / Departement Landbouw en Visserij – Dienst Zeevisserij



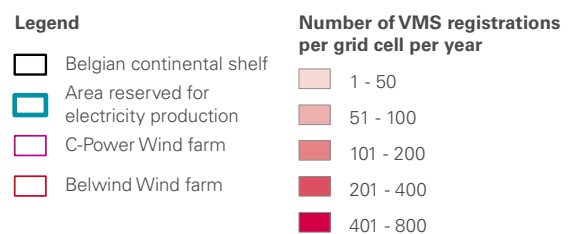
## RESULTS AND CONCLUSIONS

When plotting all VMS registrations on the BPNS map (Figure 1), we clearly see that fishing vessels, mostly trawlers, are virtually everywhere, except in the wind farms that are either operational or under construction. As more turbines are installed, the areas without trawlers enlarge on the map. Still, intrusions in the wind farms and their safety buffers are regularly reported (Anonymous, 2011), and are visible on the map as VMS registrations within the concessions.

**Figure 1.** Maps showing unprocessed VMS registrations as dots (2010-2011).



**Figure 2.** BPNS maps representing the number of VMS registrations per 3 km<sup>2</sup> grid cell for the years 2010-2011 for fishing vessels sailing under the Belgian, Dutch or British flag. Colors represent a gradient in numbers of VMS registrations per grid cell per year. Circles and numbers represent areas in the vicinity of the wind farms with an increase or a decrease in number of VMS registrations.

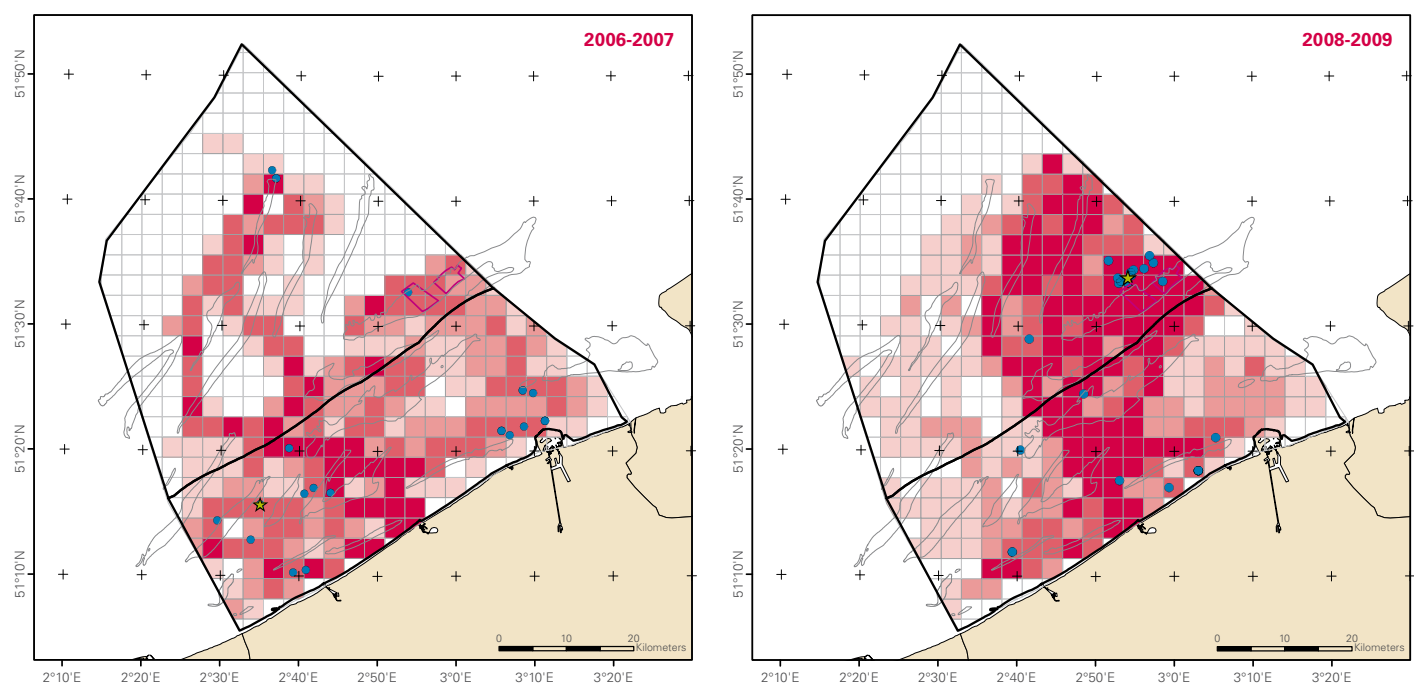


The VMS density maps show that the number of VMS registrations per grid cell generally decreases from the coast to the off shore areas. In the vicinity of the existing wind farms, some changes were observed in vessel presence between 2010 – 2011. An increase in the number of registrations can be seen north of the Thorntonbank Phase 3 (zone 1 on Figure 2, 97% increase in encircled area), for which turbines were constructed from April 2011 onwards (Brabant et al, 2012b). A similar increase was seen west of the Thorntonbank Phase 2 (zone 2 on Figure 2, 55% increase in encircled area), constructed in the same period. At the Bligh bank, a slight increase was seen south of the operational turbines (zone 3 on Figure 2, 39% increase in encircled area). A slight decrease in the number of VMS registrations was seen south of the Thorntonbank (zone 4 on Figure 2, 19% decrease in encircled area). A comparison of the data of the different flag states indicates that these changes were mostly due to the activity of Dutch vessels in the area.

The results of the current analysis and of earlier analyses based on Belgian VMS data from 2006 – 2009 (Vandendriessche et al, 2011) indicate that the presence of wind farms has an effect on the activity of fishing vessels in the area, and that the permanent closure of the concessions has resulted in a moderate increase in activity in the areas surrounding the concessions. This might either be a redistribution effect or it may indicate a local change in the availability of commercially interesting fish species. Results on the presence of demersal fish in the vicinity of wind farms (see chapter 10) showed no major differences concerning the species of commercial interest, so the observed changes in fishing vessel presence are likely the result of a redistribution process.

An increased trawling activity may result in effects with regard to soft-bottom macrobenthos, epibenthos and demersal fish, the so-called edge effects. Analysis of biological data, however, has indicated that these are minimal at present (see chapter 10).

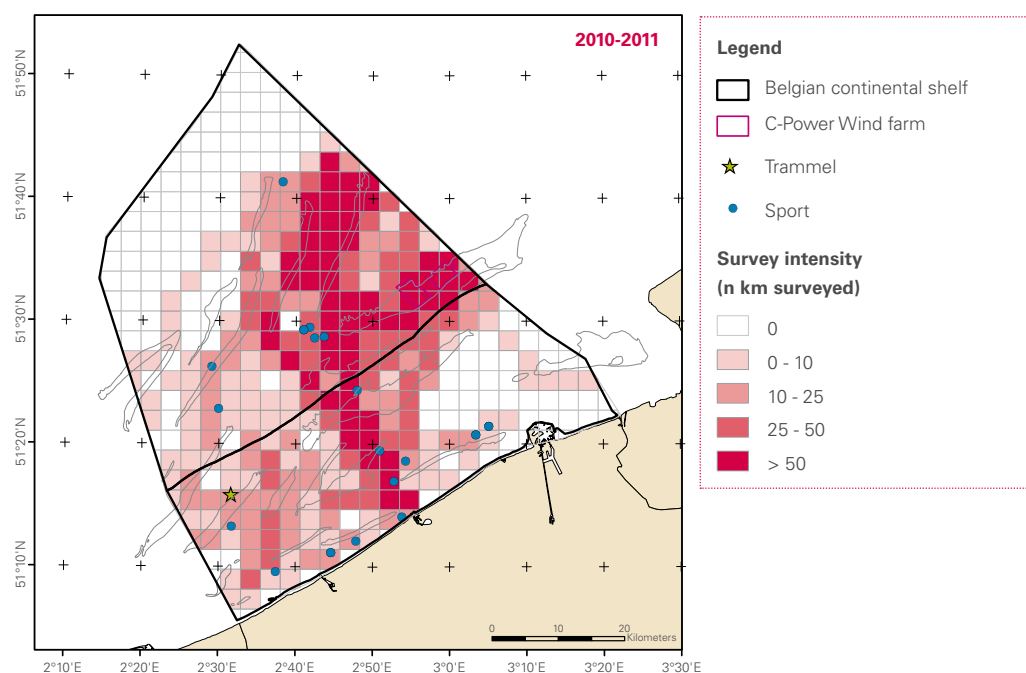
To trace changes in small-scale and recreational fisheries in the vicinity of the wind farms, we compiled ship-based survey data from 2006 to 2011 (Figure 3). These data clearly show a concentration of recreational fisheries (mostly anglers) north of the Thorntonbank gravity based foundations in 2008-2009. This angler activity usually targets pelagic and benthopelagic species, of which high densities are present in the vicinity of the turbines (Reubens et al, 2010; Reubens et al, 2011). Although the intensity of surveys further increased in 2010-2011, observations of anglers decreased and the link with wind farms seemed mostly gone. This might be due to a number of reasons: the wind farms are quite far for angling day trips, there is less fish than expected, anglers have to respect a safety distance and cannot fish as close to the hard substrates and structure as with wrecks, etc. A questionnaire survey among anglers could shed light on this issue.



## FUTURE MONITORING

The analysis of VMS data in the framework of wind farm monitoring so far, was either done on Belgian data, for which metadata were available, or on integrated data of different flag states, without metadata and for a limited time frame. In the first case, speed filters could be applied and métiers could be distinguished but realistic maps could not be drafted since data on foreign vessels were missing. In the second case, more realistic maps could be drafted, but no information on the activity of the vessel (fishing, steaming) and on the fishing gear could be derived. To get a complete picture of the evolution

of fishing activities in relation to the Belgian wind farms, the integration of VMS data, logbook data and metadata of all vessels fishing within the study area since 2006 is required. Hence, scientists and administrators should continue to strive for an international exchange of data, taking into account confidentiality regulations and national and European laws. This can be done in the framework of the Common Information Sharing Environment (CISE) of the European Commission (EC COM 2010 584 final).



**Figure 3.** Point observations of trammel net activity (green stars) and recreational fisheries (blue dots) for the years 2006-2007(left), 2008-2009 (middle) and 2010-2011 (right), based on vessel observations during seabird surveys. The underlying red grid (3 km<sup>2</sup>) represents the survey intensity as the number of kilometers effectively sailed in each grid cell.