Cod monitoring

Results 2014, quarter 1.

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1. Introduction

The Cod monitoring program is part of the Dutch cod avoidance plan developed by the Dutch Government together with the Dutch fishing sector. The aim of this cod monitoring program is to provide information on the Catch per Unit Effort (CpUE) in the TR fleet (bottom trawls and seines). This is needed in order to calculate a conversion factor between the CpUE of the TR and the BT (beam trawl)[1] gears. The transition of kW-days between gears is regulated by the European cod recovery plan (EC 423/2004 and EC 1342/2008) and depends on the yearly CpUE-ratio of cod between the respective gear groups.

In the Dutch cod avoidance plan, the Dutch government distinguishes between otter/pair trawlers that are directed to cod (TR1AB[2]) and those for which cod is bycatch (i.e. TR1C and TR2). The kW-days transition only applies to the second group, fisheries for which cod is bycatch (Table 1). For the kW-days transition between the BT and the TR gears for which cod is bycatch (TR1C and TR2) a conversion factor of 3:1 is used in the Netherlands. This is different than stated in the European Cod Recovery Plan and therefore the ratio should be substantiated for.

Between 2011 and 2013, the monitoring program existed of an extended analysis of self-reported cod catch data (both landings and discards) in combination with the regular DCF discard monitoring program, an extra observer program and the CCTV-project in TR-fisheries (see Kraan *et al*. (2012 and 2013)). Over the years, the ministry of Economic Affairs and IMARES drew the conclusion that monitoring cod discards via the self-reporting scheme requested un-proportional high effort of the TR-skippers while discards were hardly affecting CpUE rates (Ministry of Economic Affairs (2014)). Therefore, it was agreed upon a yearly analysis of the EU-logbook (hereafter logbook) data in combination with VMS-data, which is readily available. However, to remain updated, an overview of fishing activity, cod catches and cod Landings per Unit Effort (LpUE) of all four gear types per quarter is requested by the ministry of Economic Affairs. This report presents the results of the first quarter in 2014.

[1] And other gears (gillnets, trammel nets and longlines) which are not relevant for this report.

[2] Some fishermen fishing with TR gear, 120^{+} mesh size are targeting plaice with cod as minor by-catch.

2. Materials and Methods

In this section, the data sources and the final output are described. See Appendix A. Extended Material and Methods for a detailed description of the method to link VMS and logbook data.

2.1 Logbook data

All fishermen are obliged to report their activities on a daily basis. This includes location, gear used, vessel characteristics and estimated landing quantities (in kg). These quantities are an estimation and therefore deviate from auction data. Moreover, fishermen do not have to report catches for species with a trip-total quantity below 50 kg. As cod is a by-catch species, trips with cod landings lower than 50 kg can be expected. Therefore, the cod catches in this report are an underestimation of the total catches. Second, fishermen report all landings and vessel characteristics online and the data are immediately imported in the database of the Dutch Government. The logbook data cannot be validated or checked by IMARES on correctness of the data. Therefore, records with a type-error in the gear description will not be recognised as ‘wrong’, but will wrongly be taken into consideration.

2.2 VMS data

All ships over 12 meters are obliged to participate in the Vessel Monitoring System (VMS). This system sends an update to a satellite, containing time and date, position, speed and name of the vessel. All these records are registered by the Dutch government. IMARES has permission to work with these data.

2.3 Value maps

All value maps show data for quarter 1, summed for all gears together and for all gears separately. To facilitate the comparison between quarterly and yearly spatial distribution, values of fishing activity and landings in quarter 1 are multiplied by 4. By doing so, fishing activity and landings per quarter have similar value ranges as yearly fishing activity and landings value ranges.

3. Results

3.1 Fishing activity

Fishing activity was calculated for all gears together (figure 1) and for each gear separately (figure 2) (table 1). Fishing activity is displayed in kW-days, which represents days at sea multiplied with the engines power, as the day-transition is applied to kW-days. Most fisheries are concentrated in the Southern part of the North sea.

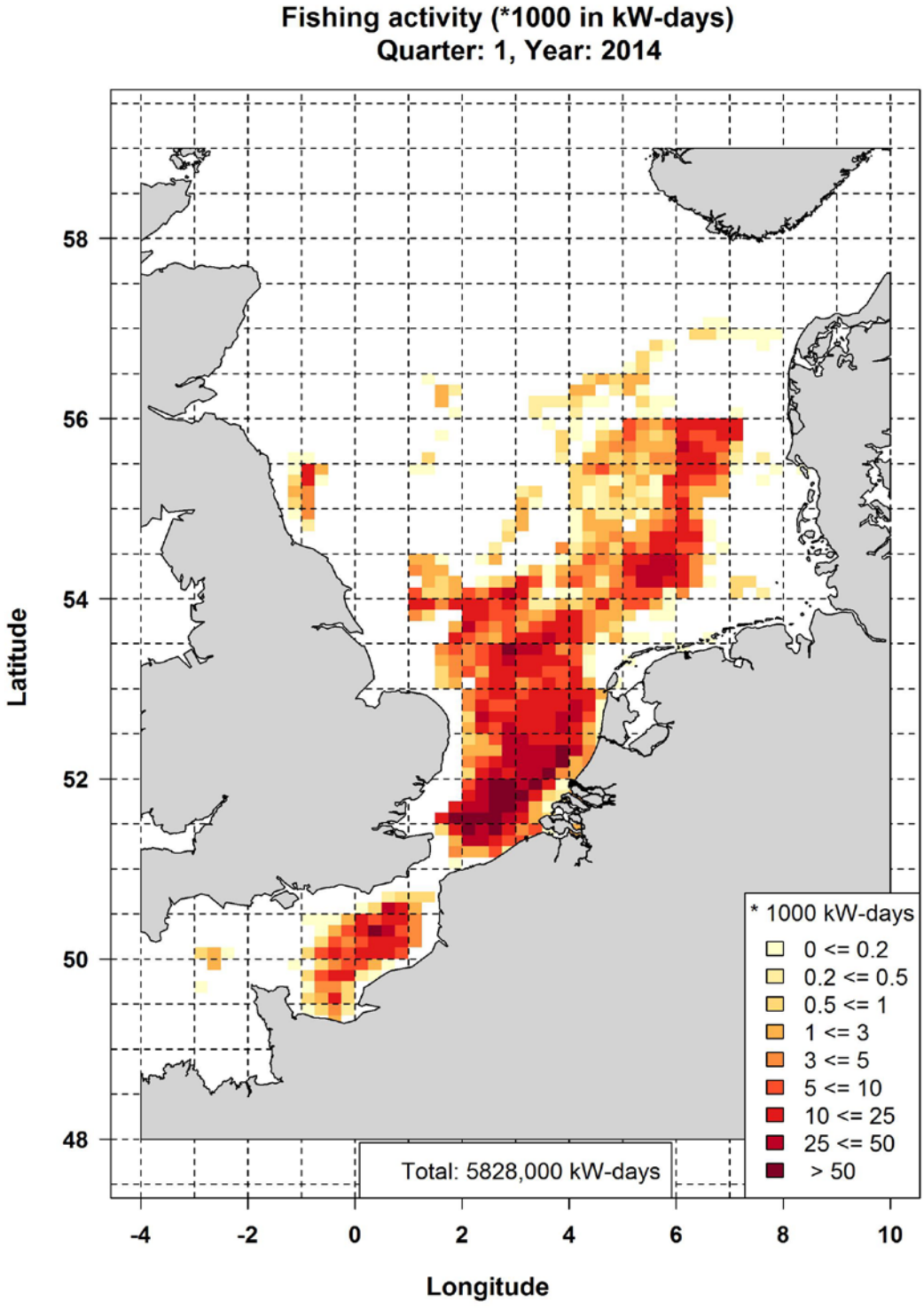

Figure 1. *Fishing activity (in *1000 kW-days) for all TR and BT2 gears together in quarter 1 in 2014.*

Fishing activity is dominated by BT2 gears, with only a small contribution of TR gears (figure 2, table 1). From figure 2 and table 1 we can see that TR vessels hardly use a large mesh size (TR1AB) in the 1st quarter of the year, this is consistent with Kraan 2013, Kraan 2014, which also recognised that TR1AB are mainly active in summer.

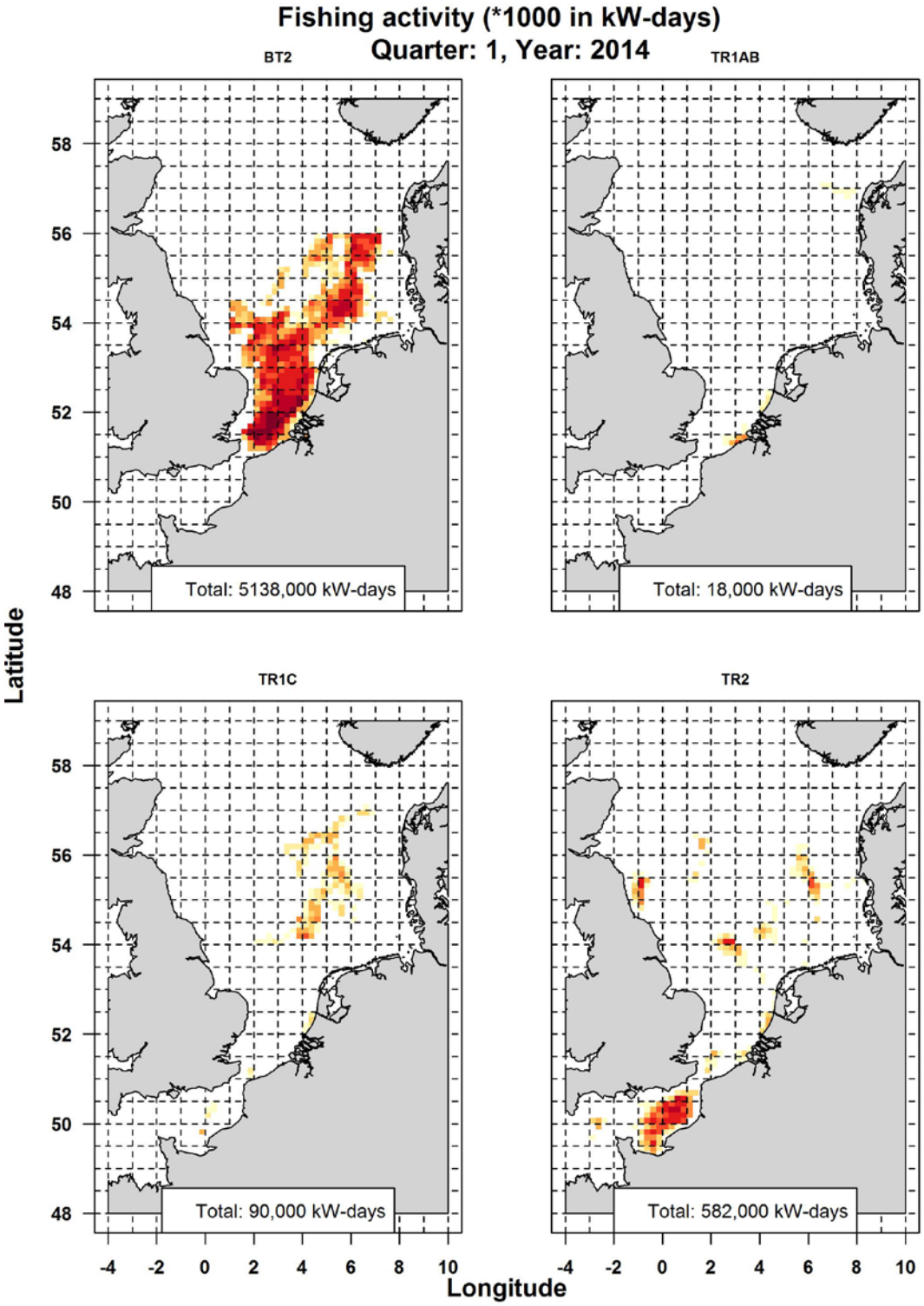

Figure 2. *Fishing activity (in kW-days/1000) for the BT2, TR1AB, TR1C and TR2 gear types separately. Colour index is similar to figure 1. The box underneath each map shows the total fishing activity (in kW-days) per gear for this quarter.*

3.2 Cod landings

Most landed cod was caught in the areas called “Vlakte van Raan” (between 51° and 51.5° N and 3° and 4° E) and “The Falls” (between 51° and 52° N and 2° and 3° E) (figure 3).

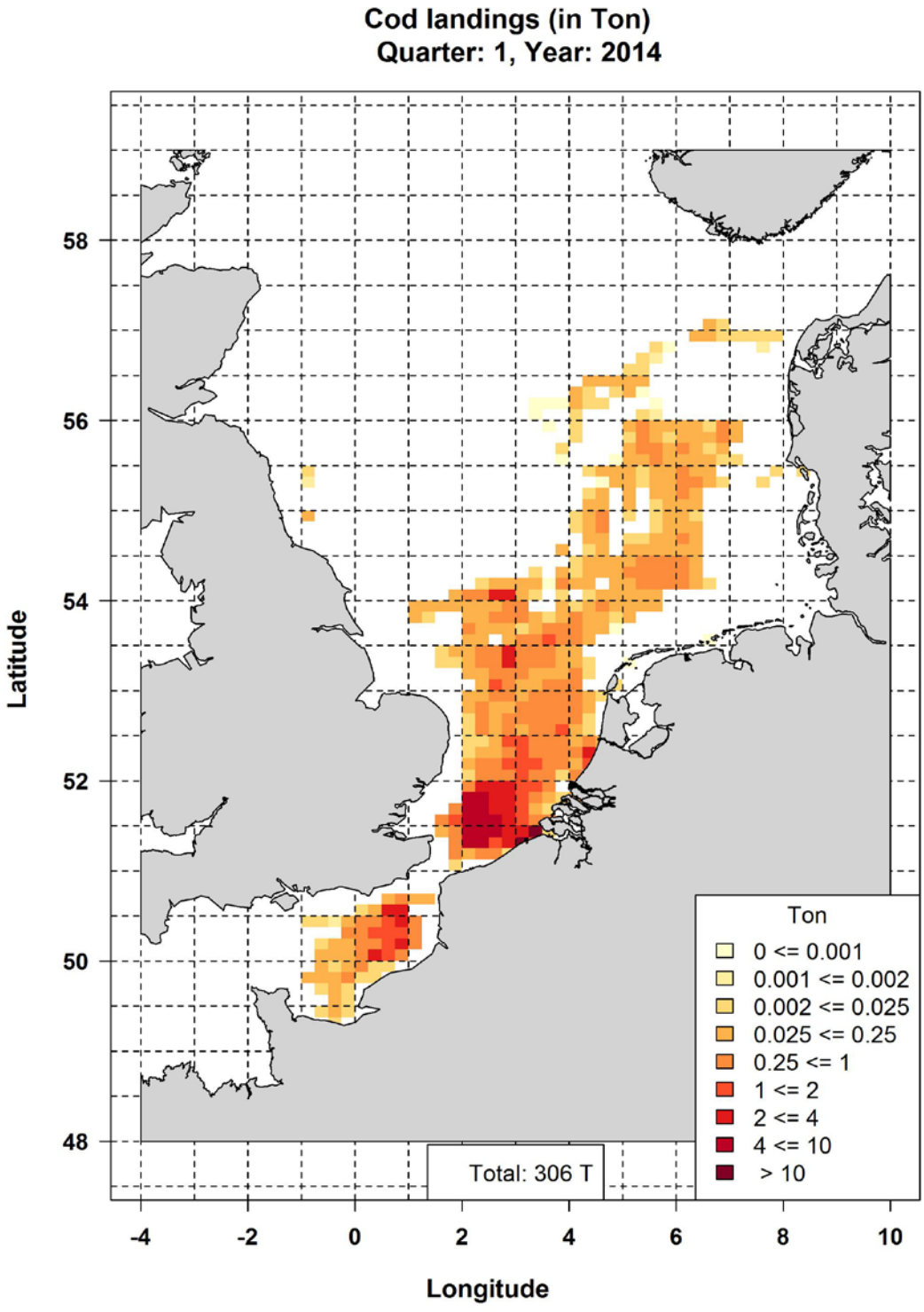

Figure 3. *Cod landings (in Ton) for all TR and BT2 gears together in quarter 1 in 2014.*

In the first quarter, most landed cod was caught by BT2 gears (figure 4, table 1). The TR1C gears caught in total the least (table 1). The TR1AB gears are concentrated near the “Vlakte van Raan” and responsible for the high catches observed in that area. The BT2 gears are responsible for the high catches in “The Falls”.

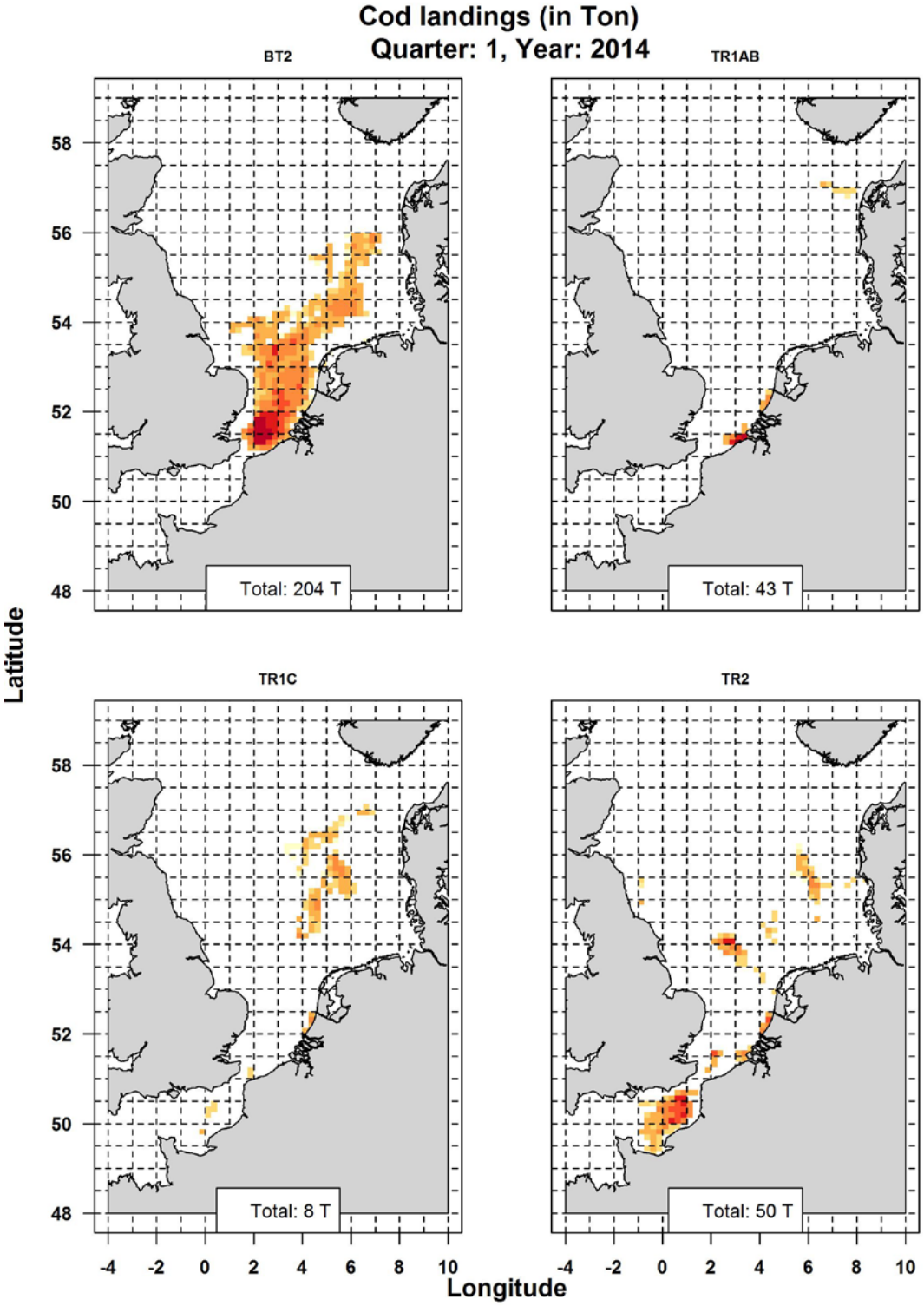

Figure 4. *Cod landings (in Ton) for the BT2, TR1AB, TR1C and TR2 gear types separately. Colour index is similar to figure 3. The box underneath each map shows the total cod landings (in Ton) per gear for this quarter.*

3.3 Cod LpUE

Per 1/16th ICES rectangle, the cod landings per unit effort (LpUE) can be calculated by dividing the cod catch (in kg) by the fishing effort (in kW-days) (figure 5).

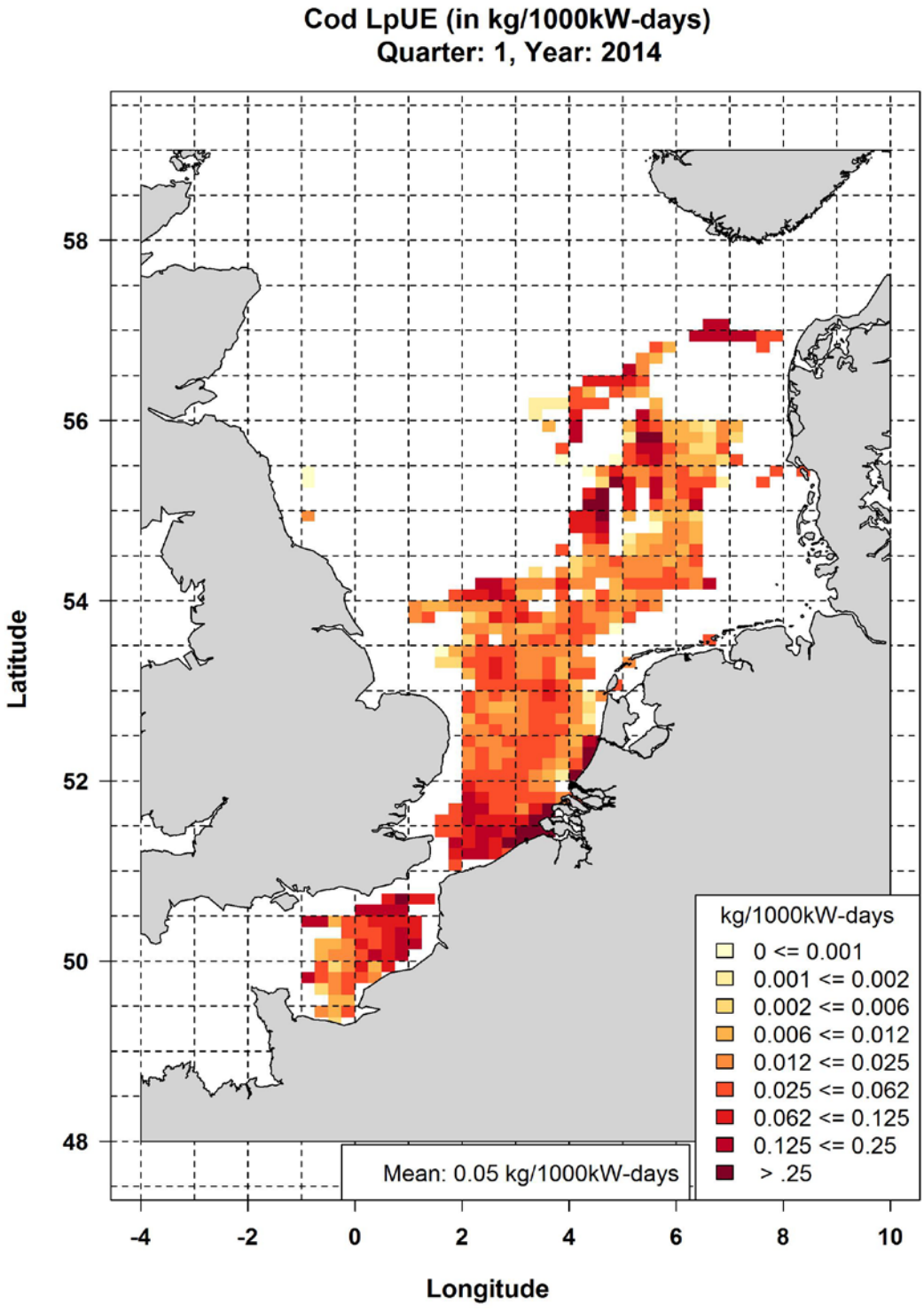

Figure 5. *Cod LpUE (in kg/kW-days) for all TR and BT2 gears together in quarter 1 in 2014.*

The TR1AB gear had the highest landings of cod per unit effort on average (2.33 kg/kW-days) (figure 6, table 1). The BT2 gear have the highest cod landing quantities (figure 4, table 1), but as their total effort is much higher than TR gears, their total landings per unit of effort is much lower than TR gears. Of all cod-as-bycatch fisheries (BT2, TR1C and TR2), the BT2 is using the most selective fishing gear (for not catching cod) or is concentrated in areas with low cod abundance.

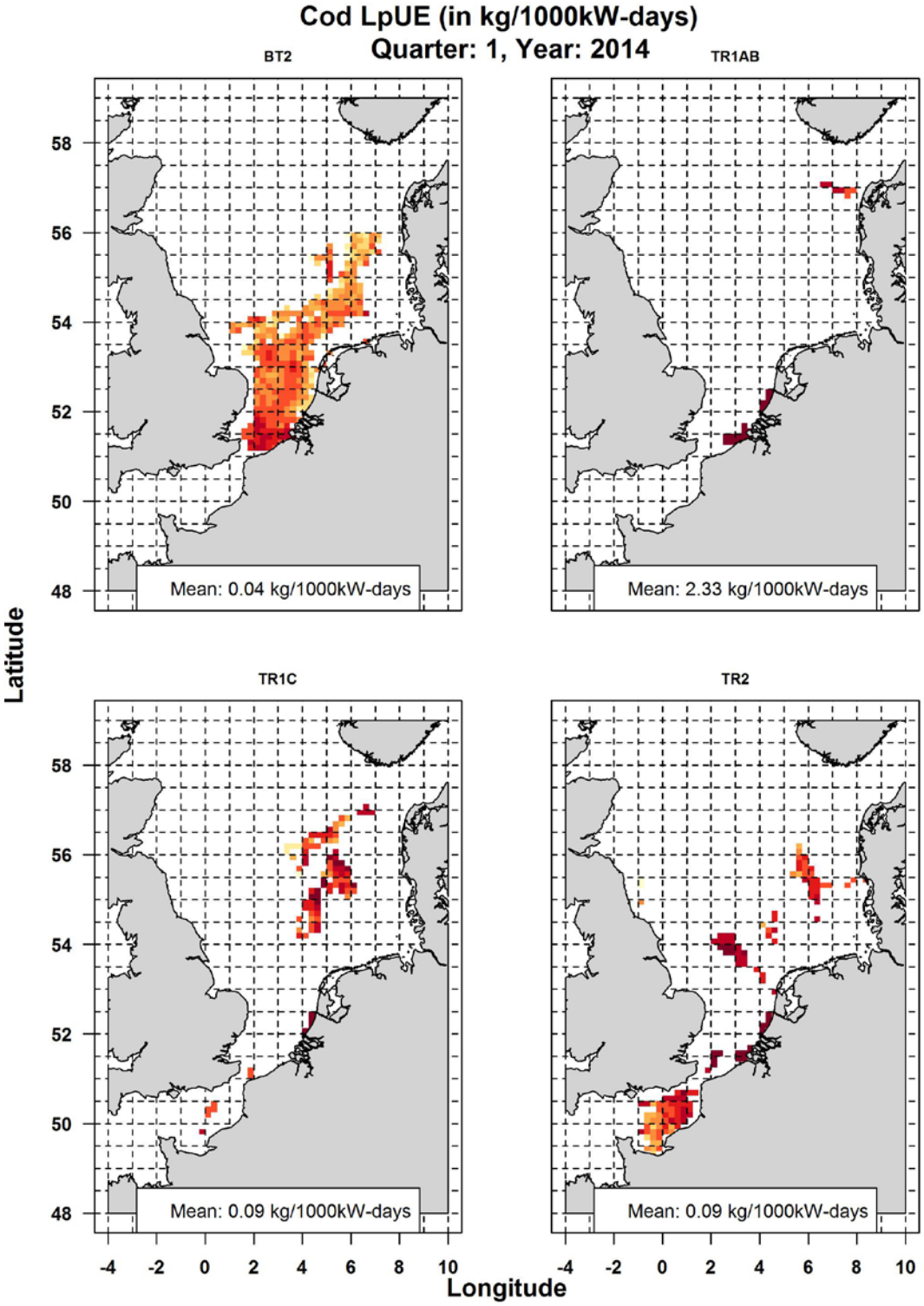

Figure 6. *Cod LpUE (in kg/kW-days) for the BT2, TR1AB, TR1C and TR2 gear types separately. Colour index is similar to figure 5. The box underneath each map shows the total LpUE (in kg per 1000 kW-days) per gear for this quarter.*

4. Summary

The findings of quarter 1 are summarised below. Based on these findings, no conclusions can yet be drawn for the yearly transition of kW-days between BT2 and TR gears.

In quarter 1 the fishing effort of the TR fleet is dominated by the TR2 fleet located in the English Channel (figure 2). The TR1C fleet operates more in the central North Sea and West of Denmark. The TR1AB fleet is not very active in this quarter (0.3% of total fishing activity, see table 1), and comprises with 18.000 kW-days only 2% of TR effort. The effort of the beam trawl fleet is substantially higher (88% of total fishing activity), with most of the fishers probably aiming for sole. This fishery is most active in the Southern part of the North Sea, around the area "The Falls".

The BT2 fleet is responsible for the majority of the cod landings, with 204 tonnes of the 306 tonnes in total, 67% (figure 4, table 1). This is evenly distributed over their fishery locations (figure 6), with no substantial differences in LpUE at locations. As their fishery is centred around "The Falls", most cod caught by the BT2 fleet is caught at "The Falls" as well.

The TR1AB fleet is operating at the "Vlakte van Raan" and near the Skagerrak. As described in the introduction, the TR1AB fleet is seen as a cod-directed fleet, whereas TR2 and TR1C are seen as cod-bycatch fisheries by the Dutch government. The cod LpUE of the TR1AB fleet is much higher than of the other fleets (table 1). With only 0.3% of the total fishing activity, the TR1AB fleet is responsible for 14% of the total cod landings (table 1).

The TR2 fleet in the English Channel has a relative low cod LpUE. Compared to the trips near the "Vlakte van Raan", "The Falls" and the central part of the North Sea where they yield a higher LpUE rate (figure 6).

For facilitating comparisons between quarters, the quarterly totals of fishing activity and cod landings and the quarterly average LpUE are shown in Table 1. If the kW-days transition was determined based on the LpUE in quarter 1, the conversion factor would be 2:1. However, as the conversion factor is determined on yearly LpUE, the calculated factor in this report is only an indicator.

Table 1. A summary of fishing activity (% of total), cod landings (% of total) and average LpUE for the 4 gears separately and the overall total for quarter 1.

	Fishing activity (*1000 kW-days)		Cod Landings (Ton)		Average LpUE (kg per 1000 kW-days)
BT2	5138	(88%)	204	(67%)	0.04
TR1AB	18	(0.3%)	43	(14%)	2.33
TR1C	90	(1.5%)	8	(2.6%)	0.09
TR2	582	(10%)	50	(16%)	0.09
Total	**5828**		**306**		**0.05**

Quality Assurance

IMARES utilises an ISO 9001:2008 certified quality management system (certificate number: 124296-2012-AQ-NLD-RvA). This certificate is valid until 15 December 2015. The organisation has been certified since 27 February 2001. The certification was issued by DNV Certification B.V. Furthermore, the chemical laboratory of the Fish Division has NEN-EN-ISO/IEC 17025:2005 accreditation for test laboratories with number L097. This accreditation is valid until 1th of April 2017 and was first issued on 27 March 1997. Accreditation was granted by the Council for Accreditation.

References

EC 423/2004. Council Regulation (EC) No 423/2004 of 26 February 2004 establishing measures for the recovery of cod stocks. Available at: http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32004R0423

EC 1342/2008. Council Regulation (EC) No 1342/2008 of 18 December 2008 establishing a long-term plan for cod stocks and the fisheries exploiting those stocks and repealing Regulation (EC) No 423/2004. Available at: http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32008R1342

Hintzen, NT, A Coers and KG Hamon (2013) A collaborative approach to mapping value of fisheries resources in the North Sea (part 1: Methodology). IMARES report C001/13. (available at: http://edepot.wur.nl/248628)

Kraan, ML, SS Uhlmann, MAM Machiels, HMJ van Overzee and ATM van Helmond (2013) Monitoring of cod catches in Dutch otter trawls and seines. IMARES report C077/13.

Kraan, ML, MAM Machiels, KJ van der Reijden and AJ Paijmans (2014) Monitoring of cod catches in Dutch otter trawls and seines. IMARES report C105/14.

Ministry of Economic Affairs (2014). “Brief over nieuwe aanpak kabeljauwmonitoring.” Letter. (available at: http://www.rijksoverheid.nl/documenten-en-publicaties/brieven/2014/11/28/brief-over-nieuwe-aanpak-kabeljauwmonitoring.html)

Justification

Rapport C029/15
Project Number: 4308101082

The scientific quality of this report has been peer reviewed by the a colleague scientist and the head of the department of IMARES.

Approved: Ralf van Hal

Signature: 

Date: 13th of February 2015

Approved: Nathalie Steins
Head of department Fisheries

Signature: 

Date: 13th of February 2015

Appendix A. Extended Materials and Methods

Data pre-processing

VMS and logbook data were received from the Ministry of Economic Affairs and stored in a local database at IMARES.

VMS records are considered invalid and are therefore removed from the analyses if they :

- Are duplicates or pseudo-duplicates (indication of malfunctioning of VMS device)
- Identify an invalid geographical position
- Are located in a harbour
- Are located on land
- Are associated with vessel speeds > 20 knots

Logbook records are removed from the analyses when they:

- Are duplicates
- Have arrival date-times before departure date-times
- Overlap with other trips of that vessel

Link VMS and logbook data

VMS and logbook datasets are linked using the unique vessel identifier and date-time stamp in both datasets available. In other words, records in the VMS dataset that fall within the departure-arrival timeframe of a trip described in the logbook are assigned the unique trip number from the logbook record which allows matching both datasets. The following gear types were selected as TR gear: OTB (Otter bottom trawls), OTT (Otter Twin Trawls), PTB (Pair Bottom Trawls), SDN (Danish Seine), SSC (Scottish Seines), SPR (Pair Seine). All TR gears are further divided based on their mesh size, following TR1AB: >=120mm, TR1C: 100 – 119mm, TR2: <100mm. The BT gear is defined as TBB (Beam Trawls) gear type. This consists not only of the traditional beam trawl; all innovative sub-gears like sumwing, pulse and pulswing are included in the BT gear. Next, the BT gear is further classified into categories, based on mesh size. The used geartype BT2 includes all BT vessels operating with a mesh size of 70-99mm.

Define fishing activity

Speed recordings obtained from VMS data are used to create frequency plots of these speeds, where along the horizontal axis the speed in knots is given and the vertical axis denotes the number of times that speed was recorded. In general, 3 peaks can be distinguished in such a frequency plot. A peak near 0 knots, associated with harbour/floating, a peak around the average fishing speed and a peak around the average steaming speed. Using the frequency plots, activity is determined for each VMS-point based on the speed recorded. Activity analyses are performed separately for each gear category.

Spatial distribution

The fishing activity determined from the logbooks (kW-days) and the cod landings recorded in the logbooks (kg), are assigned to those (fishing) VMS records that have vessel id, fishing date and fishing position in common. At the spatial scale of 1/4 degree longitude* an 1/8 degree latitude (1/16 ICES rectangle), the total landings of cod (kg) and fishing activity (kW-days) are calculated. Subsequently LpUE (landings per unit effort) can be calculated for each 1/16 ICES rectangle by dividing the landings by the activity.