On the *possibility* of RTCs in the Dutch demersal fishery

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Summary

A short feasibility study on the possibility of Real time closures (RTCs) as a tool for the Dutch demersal fishery to cope with the landing obligation (EU regulation 1380/2013) was carried out by IMARES. The assignment is part of the EVF-project *"Innovatieve discardvermindering in de praktijk"* (Innovative discard reduction in practice).

A literature study was conducted and a short overview of examples of (real time)-closures in Europe as well as known advantages and disadvantages are presented.

Additionally, discard maps were made based on data from the yearly Dutch monitoring and from ongoing VIP projects collecting discards. The overview of RTC systems in other places presented in Table 1 shows that the instalment of RTCs and the data supporting an RTC system is large and extensive, coming from many different sources. Additionally, the design of an RTC system should be so that it is based on sound practical and scientific considerations.

The scale and availability of the Dutch discard monitoring programme is the same as in other RTC programmes in the EU (for example Scotland) (Bailey et al. 2010). The data is aggregated on 1/16th of an ICES rectangle. However, data on temporal and periodic migration and distribution of discarded (flat)fishes in the Dutch demersal fishery has not yet been compiled and is substantial in the design of a RTC system.

If attempts are made to compile lacking data, the success of an RTC system is also dependant on the support it has from the actors how are most affected by these closures: fishermen.

1 Assignment

VISNED has asked IMARES to do conduct a short feasibility study on the possibility of Real time closures (RTCs) as a tool for the Dutch demersal fishery to cope with the landing obligation (EU regulation 1380/2013). This assignment is part of the EVF-project *"Innovatieve discardvermindering in de praktijk"* (Innovative discard reduction in practice).

In this report we present a short overview of examples of (real time)-closures in Europe. Additionally, known advantages and disadvantages are listed. Next we present discard maps that are based on data from the yearly Dutch discard monitoring and ongoing VIP projects collecting discards. Two sources of data are currently available. We discuss the suitability of these maps and the information they deliver as a driver for a possible RTC system.

2 Introduction

The application of Real time closures (RTCs) is a relatively recent development in fisheries management. They can be targeted at specific areas, for example, to protect areas of high abundance, areas where juveniles comprise a higher than average proportion of the catch or areas where catch composition is likely to result in high levels of discards. Additionally, RTCs could be used to "fine tune" quota uptake in multi-species fisheries, reducing discards by encouraging effort to move away to areas where the catch composition is likely to be more appropriate. This means that the practical implementation of RTCs require high volumes of data to be processed quickly.

According to Bailey et al. (2009), RTCs generally enjoy greater confidence from the fishing industry as they are seen to be more responsive to conditions "on the ground"; however their effectiveness is difficult to measure (Bailey et al. 2009). These authors note that internationally, RTCs are generally seen in a positive light by stakeholders from both the environmental and fishing industry lobbies. Effective two-way communication with the industry is essential to ensure buy-in and acceptance by stakeholders from the industry, and to enable administrators to receive feedback on the effectiveness and perception of RTC schemes.

At present in the Netherlands, an RTC-system for the avoidance of cod has been established based on effort and cod catches by the Dutch demersal fleets (vessels in the TR1[1] category fishing with a mesh size of <120mm mesh and vessels in the TR2 category). This RTC-system is implemented in cooperation with the United Kingdom under the EU cod recovery plan. The implementation of these spatial and temporal closures and the data underlying them are far from the data and implementation of the RTCs described by Bailey et al. (2009), as these closures are based on the cod catches of the previous two years.

The ex-ante effectiveness of this RTC-scheme for cod was determined to be marginal (Beare et al. 2011) Temporal and spatial closures of the kind implemented in the Netherlands are not favoured by the Dutch fisheries sector because of their lack of evidence with regard to the effectiveness and the economic consequences. The Dutch implementation of EU cod recovery plan also holds a second component: a move-on system. When vessels in the TR1 category fishing with a mesh size of <120mm mesh and vessels in the TR2 category have a haul with a catch composition that holds more than 5% cod they are requested to sail 5 nautical miles away from their location. This report does not address this move-on system.

RTCs represent an "uncontrolled experiment" as they displace fishing effort, rather than reducing it, and it is not possible to compare their outcomes against a hypothetical situation where they have not been deployed. This makes analysis of their effectiveness particularly difficult. VMS data from fisheries confronted with cod-closure RTCs, shows that compliance with RTCs has been good, that vessels move away from closed areas, in most cases towards areas thought to be of lower cod abundance.

In this report examples of RTCs in the literature are presented. Secondly, known advantages and disadvantages of RTCs are listed. Additionally, data sources that describe catches of juvenile and undersized fish are presented and explored by constructing discard maps, in order to present what data are available that could possibly be relevant when considering RTCs for avoiding discards.

[1] The vessel categories TR1 and TR2 are categories made in the cod recovery plan (Council Regulation (EC) No 1342/2008). The TR1 category includes bottom trawls and seines with a mesh size larger than 100 mm. The TR2 category includes bottom trawls with mesh sizes of 70-99mm. In the Netherlands the gear category TR1 is divided up in cod targeting vessels that have a mesh size of 120<mm (TR1A and TR1B), and TR1 vessels that have cod as bycatch, which have a mesh size of 100 – 119mm (TR1C).

3 Examples of RTCs

RTCs have been implemented to some extent in a number of countries. Precise details of implementation may vary from scheme to scheme and the nature of the feature being protected. However, schemes always have some common features, such as requirements for defined thresholds which trigger RTCs, consistent rules for the size and distribution of closures, and durations which have some relevance to the feature being protected. Studies of the effectiveness of schemes remain incomplete, and many remain unevaluated altogether. A relatively recent study investigating the ex-ante effectiveness of the Dutch cod closure system can be found in Beare et al. (2011).

Although there is no centrally managed system of RTCs within the EU, a number of member states have begun national RTC programmes. The principal aim of European schemes to date has been the reduction of cod mortality in the North East Atlantic and associated seas. However, there is no level-playing field in the EU through the lack of integration of RTC schemes, enforcement and incentivisation across member states. Based on examples in the literature, enforcement of closures are mainly instigated by mixtures of catch sampling, landings per unit effort data and self-reporting by fishers in relation to certain triggers and thresholds.

Most of the examples described below are taken from the EU-study on RTCs (Bailey et al. 2010). For a more elaborate description of the RTC programme example reference is made to this study.

3.1 Overview by country

Table 1

Overview of RTCs characteristics per country

Country	**Who/what is affected?**	**Since?**	**Duration of closure**	**How big is closure?**	**Trigger level**	**Inspection is made by whom?**	**Remarks**
Iceland	Cod bottom trawl, cod longline, and other fisheries	1977 (2000 closures over past 27 years)	At least two weeks		Catch of juveniles exceeds a certain percentage (percentage unknown)	Inspectors	
Faroes	Not stated	1966	7-14 days	Approx.. 1000 km², defined by 6-8 vertices	Numbers of small cod, haddock and saithe exceeding 30% of the catch	Faroe Island Fisheries Inspections	Moved from catch based management of fishery resources and implemented a system of spatial management measures (seasonal closures and RTCs)
Norway (A)	Trawl fishery for cod and haddock	1983	From moment exceedance until results of sampling programme show an acceptably	Varies with several factors	Combined number of undersized fish exceeds 15%	Chartered fishing vessels, with representatives of the Norwegian Directorate of Fisheries	Wide support of Norwegian and Russian fishermen

			low proportion of juveniles				
Norway (B)	Barents Sea shrimp fishery	1983	From moment exceedance until results of sampling programme show an acceptably low proportion of juveniles	Varies with several factors	Bycatch levels of juvenile cod, haddock and Greenland halibut are exceeded	Chartered fishing vessels, with representatives of the Norwegian Directorate of Fisheries	Wide support of Norwegian and Russian fishermen
Norway (C)	Saithe purse seine fishery	1983	From moment exceedance until results of sampling programme show an acceptably low proportion of juveniles	Varies with several factors	Bycatch of undersized fish exceeds 10% by weight in the purse seine fishery	Chartered fishing vessels, with representatives of the Norwegian Directorate of Fisheries	Wide support of Norwegian and Russian fishermen
United States of America (A)	Alaskan Pollock trawl fishery	2008	Unknown, very diverse	Unknown, very diverse	Bycatch of Chum salmon and Chinook salmon	Unknown, very diverse	Regional "Fishery Management Councils" draft the technical management plans
United States of America (B)	Bering Sea fisheries	2008	Unknown, very diverse	Unknown, very diverse	Bycatch of Pacific herring	Unknown, very diverse	Regional "Fishery Management Councils" draft the technical management

							plans
EU/Norway	Diverse fisheries except pelagic trawls, purse seines, driftnets and jiggers targeting herring, mackerel, horse mackerel, as well as pots and scallop dredges. Gillnets may be used if the mesh size is in accordance with technical regulations applicable in the fisheries for cod, haddock, whiting and saithe.	2009	Automatically after 21 days	Unknown	Juvenile percentage of cod, haddock, saithe and whiting exceeds 15% by weight of a 200kg sample – if quantity of cod exceeds 75% if total sample, trigger is set at 10%	Unknown	
France (North Sea)	Unknown	2009	21 days	20 square nm in size and bounded by four points, maximum of three simultaneous closures or two if RTCs are spaced less than 20 miles apart	Weight of cod, haddock, whiting and saithe exceeding 15% of sampled weight of fish from at sea inspections, or 10% if cod represents greater than 75% of the four named species	French control authority	Applies to fish above minimum landing size
France (Eastern Channel (VIId))	Unknown	2009	21 days	20 square nm in size and bounded by four points, maximum of three simultaneous closures or two if RTCs are spaced less than 20 miles	At sea inspection recording a catch rate of over 60 cod per hour of over 50 cm in length	French control authority	Applies to fish above minimum landing size
England and Wales	All UK vessels which may catch cod in these areas, and vessels of other member states were asked	2009	21 days, or 14 days for closures within 12 nm	North Sea (ICES division IV, south of 56N) is split into 3 divisional-areas and the	Initially when a rate of 10 mature (50cm+) cod per hour towed are	Marine and Fisheries Agency (MFA)	Skippers are informed via a dedicated page on the MFA website,

	to respect these closures		of the coast	9 RTCs are spread through the 3 divisional areas, RTCs are 7.5 nm square around the sampling point or VMS cell, and incorporate the Commercial Impact Zone system whereby no more than 3 closures can be established inside a circle of 50 nm diameter	sampled, nowadays trigger is based on historical Landings per Unit Effort (LPUE) data according to logbook entries and cross-referenced with VMS data from June 2007 and June 2008. These RTCs are reviewed and updated each month based on the LPUE data from the equivalent period in 2007 and 2008		Skippers could also inform managers of areas of high cod abundance via a dedicated email address, fax or phone line
Scotland		2008	21 days, but there is also an established period of "grace"	Area of 56 square nm (typically a 7.5 by 7.5 nm square, although there is no requirement for the closures to be square, and they may be defined by up to six vertices)	2 means of triggering a RTC: (1) Observation made during compliance boardings of vessels, where a catch of cod exceeding a threshold level (40 cod of all sizes per hour fished) (2) landings rate per unit effort (LPUE) based on landings declarations and a measure of fishing effort derived from VMS data	Catch rates reported by skippers, Marine Scotland (Science) (MS(S)) observers or a team of observers employed by the Scottish Fishermen's Federation (SFF)	Component of the Scottish "Conservation Credits" scheme

4 Advantages and Disadvantages of RTCs

Table 2 presents a list of several general advantages and disadvantages of RTCs as found in Bailey et al. 2010.

Table 2
Advantages and disadvantages of RTCs

Advantages	**Disadvantages**
Immediate and command respect for being relevant to what is happening at the time	Rely on behaviours of vessels after the implementation
Responsive	Presently only as good as the inspection rate and/or the information gained from landings data
Simple to implement and, using VMS, to observe compliance	Avoidance of RTCs may require increased time for steaming between fishing events, lowering fuel efficiency
Potentially act as an ongoing reminder of the need to avoid cod	Results in a displacement of effort onto other species
Can be tailored to stock requirements	Implementation and administration carries a significant overhead
Given adequate technical and logistic support the measure is straightforward and efficient to implement	Currently implemented on a state by state basis, no overall coordination or compulsion to comply with RTCs proposed by other states
Relatively easy to monitor and assess	

5 Suitability of the Dutch discard monitoring programme and discard sampling from the VIP-projects as basis for RTCs

Current systems of output controls such as TAC limits are difficult to implement in multispecies fisheries where there are multiple components of the catch which fishers are targeting, such as the beam trawl fishery in the southern North Sea, which targets plaice and sole. These species may have different levels of quota uptake or allocation. It is possible to imagine a scheme whereby if catch uptake of one species nears its quota limits, RTCs could be deployed in areas where catch composition information suggests this species is abundant, relative to other species in the fishery, as a means of reducing mortality and avoiding discards.

In the Netherlands a discards monitoring programme (in accordance with the DCF requirements) is operational that combines information obtained from observer trips with information derived from a self-sampling scheme in collaboration with fishermen in a reference fleet. Additionally, in 2015, the CVO has started a series of trips where all discards during that trip are collected and information is supplied for possible exemptions under the landings obligation. What follows is a trial of the information that is currently available and its potential to establish a system of RTCs based on that information.

5.1 Dutch discard monitoring programme

Firstly, only discard data of part of the demersal fleet, namely the beam trawlers (greater and smaller than 300 hp) operating nets with a cod end mesh sizes from 70 to 99 mm, are used for analysis as they represent this part of the Dutch demersal fleet that has the greatest chance of obtaining a large part of discards in their catch since they are operating in areas with a high abundance of juvenile fish (southern North Sea). Figure 1a-b shows the total effort per quarter of the Dutch beam trawl fleet with small mesh sizes. The sampling and raising procedure is described in detail by van der Reijden et al. (2014).

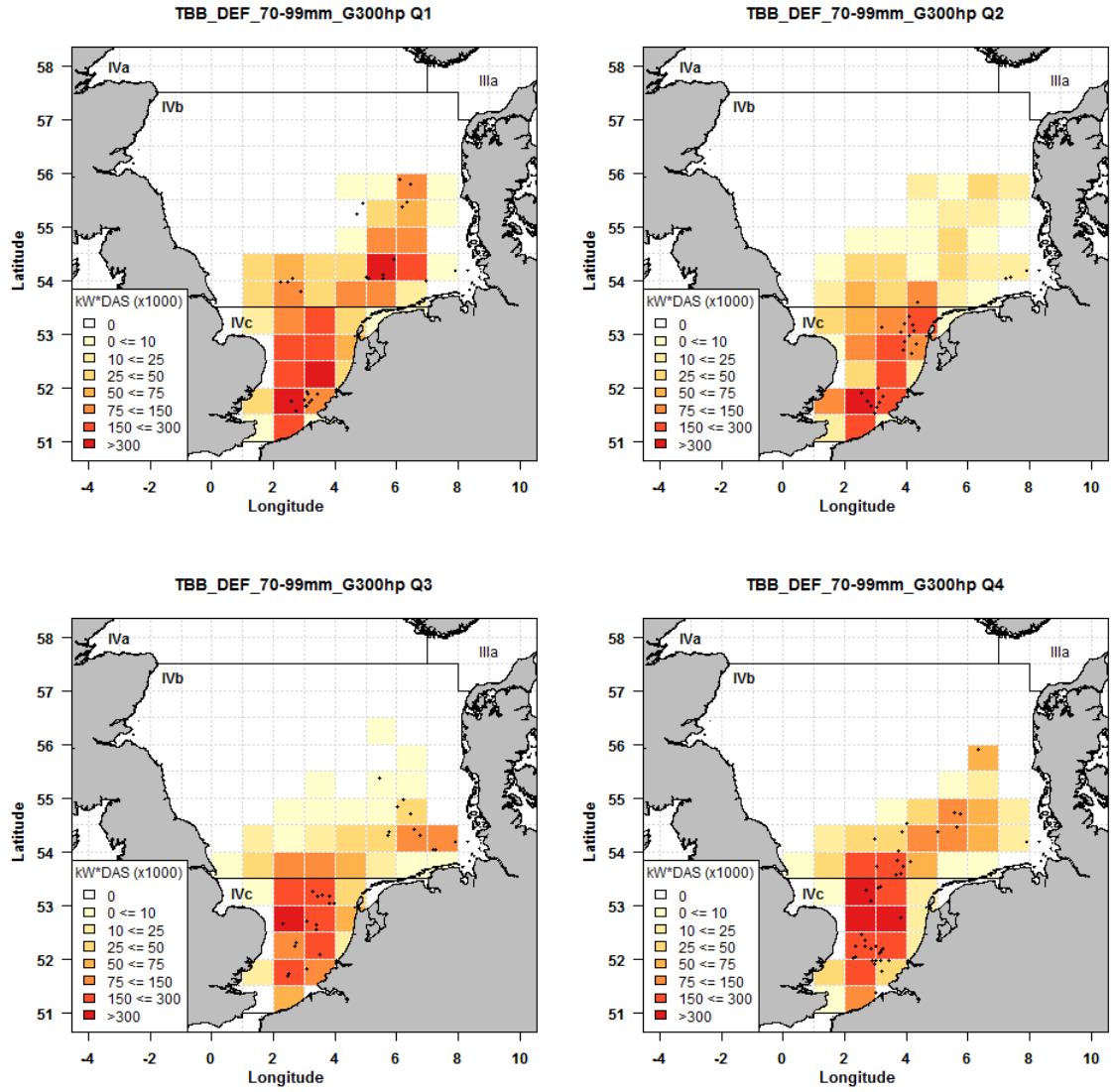


Figure 1a. *Distribution of total effort (in kw*days (x1000) at sea, shaded colours per ICES rectangle) and positions of sampled trawls (black dots) in 2013 per quarter for TBB_DEF_70-99mm_>300hp.*

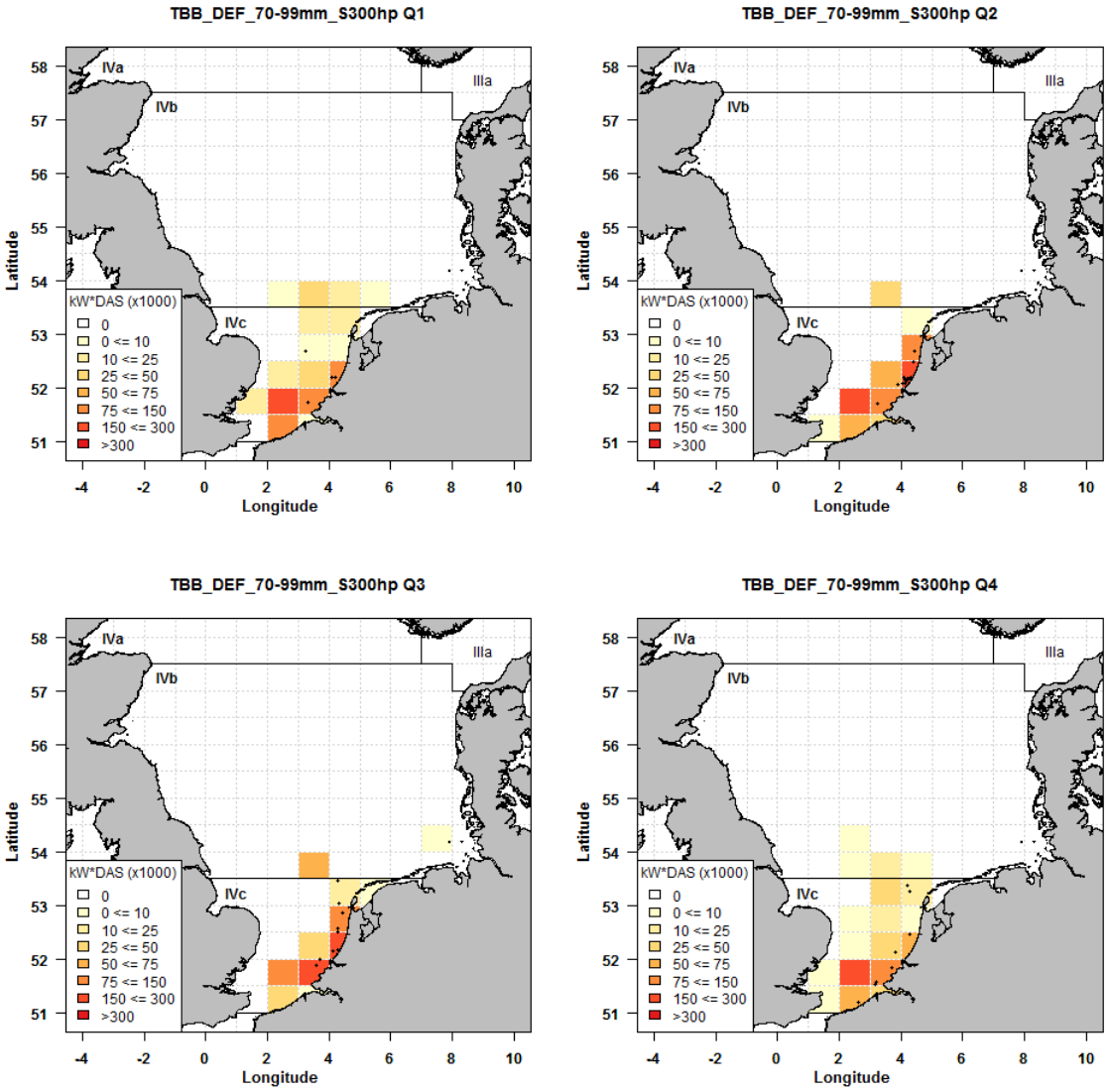


Figure 1b. *Distribution of total effort (in kw*days at sea, shaded colours per ICES rectangle) and positions of sampled trawls (black dots) in 2013 per quarter for TBB_DEF_70-99mm_<=300hp.*

Discarded weights from the haul level were raised to the trip level and were then aggregated for all fish caught, for plaice, sole, dab, and cod into 1/16 of an ICES square (the same aggregation level as the Scottish RTC system). Figure 2 presents an overview of all the hauls from 2013 and how much discards are pulled from the sea. The overview generally follows the effort observed in the Dutch demersal fleet.

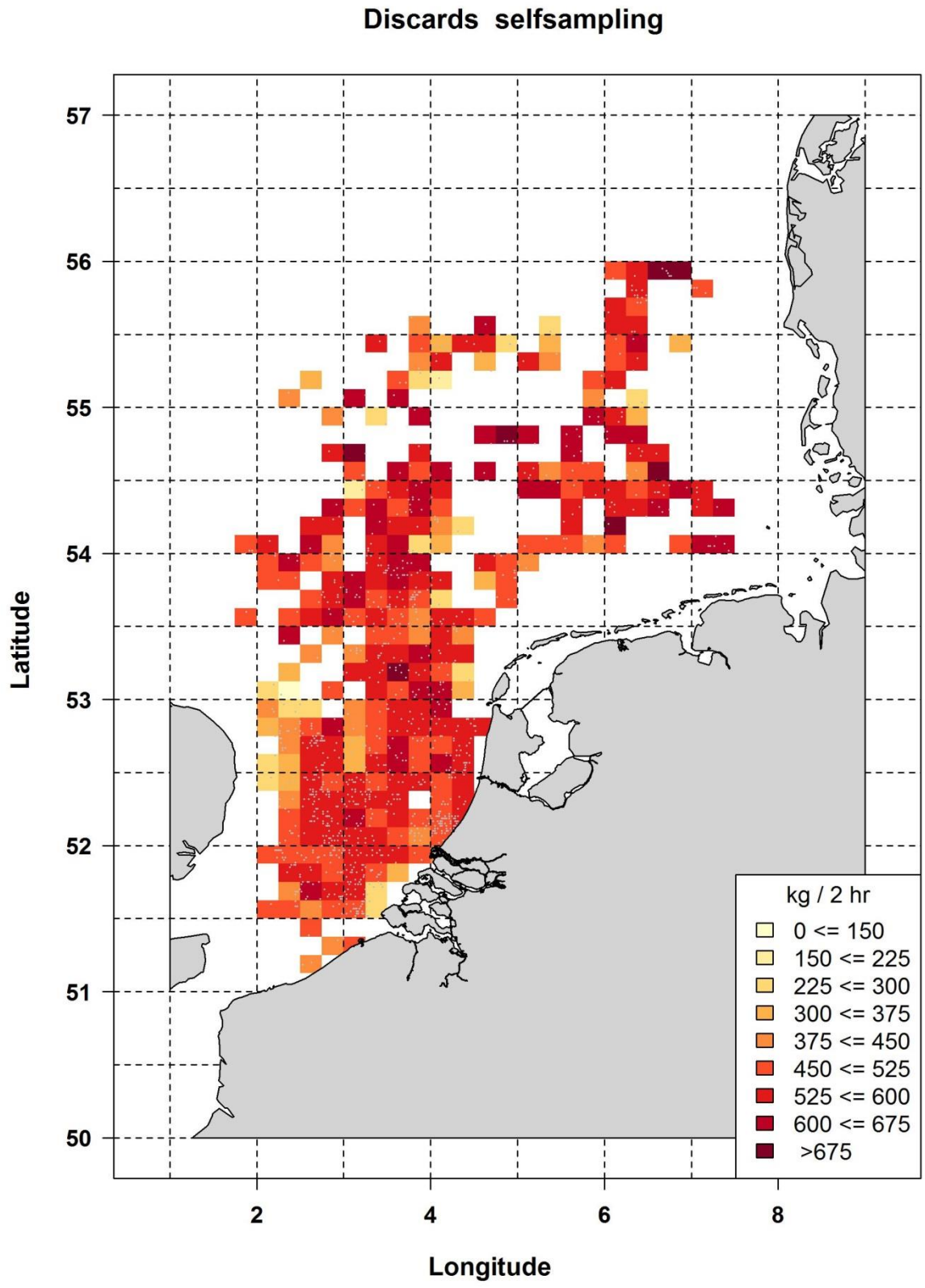


***Figure 2**: Location of all hauls sampled in 2013 under the Dutch discard monitoring programme – grey points are position of hauls –Rectangles are coloured according to the amount of discards caught per haul.*

Discard maps are available for several species (cod, sole, plaice, and dab) per quarter. Only some of the discard maps are discussed here. All other discard maps have been added to the appendix.

The sole fishery takes place in the southern North sea, mainly in the winter (1st and 4th quarter). Figure 3 a-b show the average discarded sole per haul. The amount of sole discarded is low in both quarters and the main fishing ground is clearly represented.

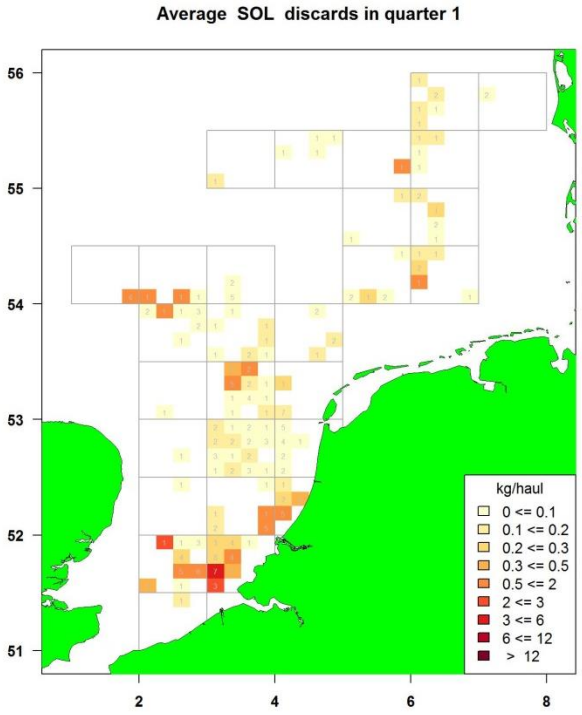
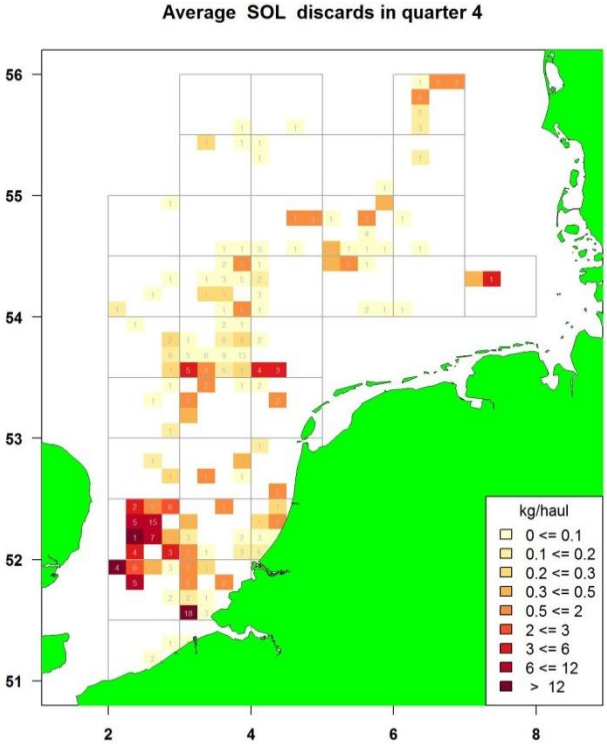


Figure 3a: *Average discarded sole per haul in quarter 1 for the beam trawl fleet with small mesh sizes.*



1.

Figure 3b: *Average discarded sole per haul in quarter 4 for the beam trawl fleet with small mesh sizes.*

However, the amount of discards change when we look at the discards of plaice in the same situation (Fig. 4a-b). Plaice is discarded relatively more.

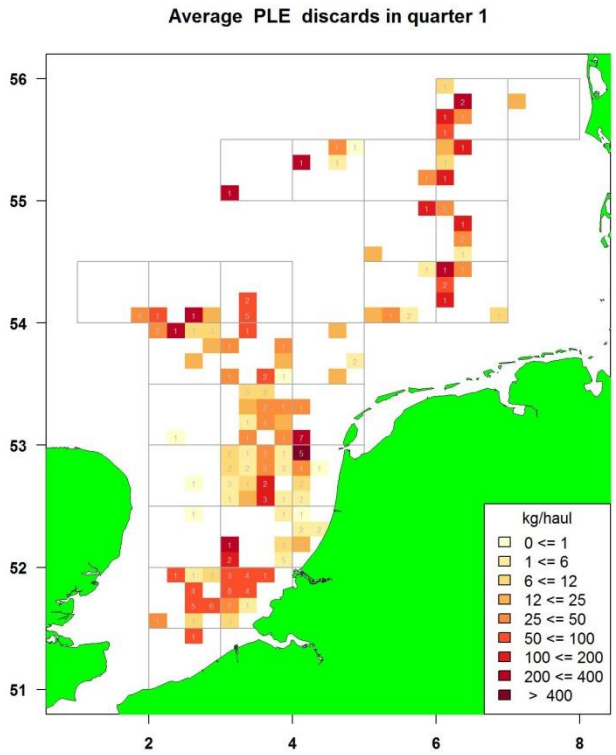


Figure 4a: *Average discarded plaice per haul in quarter 1 for the beam trawl fleet with small mesh sizes.*

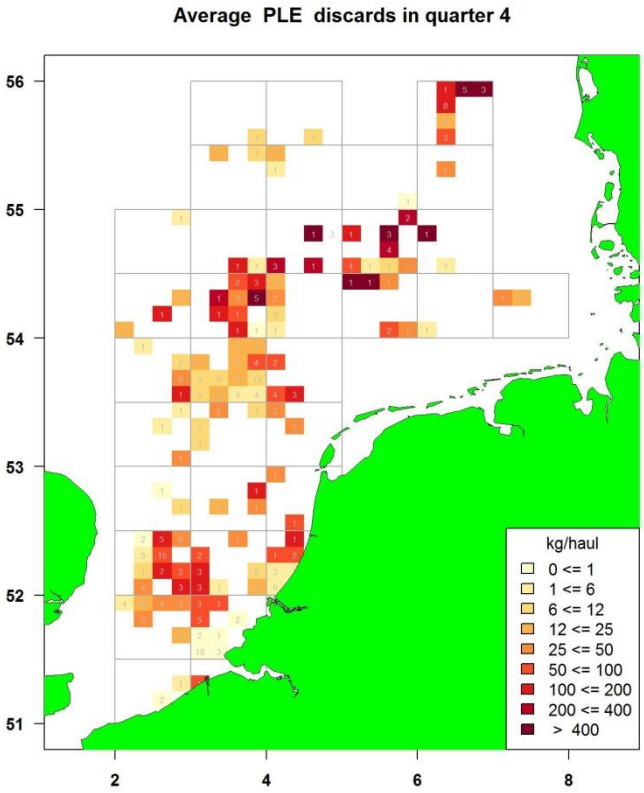


Figure 4b: *Average discarded plaice per haul in quarter 4 for the beam trawl fleet with small mesh sizes.*

5.2 Discard sampling from the VIP projects

The CVO has started several projects to supply information to possible exemptions under the landing obligation. During one of these projects fishing trips were organised where, during several days, all discards were collected and kept on board. Three of those trips are analysed here. We compared their results to the information from the Dutch discard programme and their suitability as a basis for an RTC system. Figure 5 shows the locations of the hauls that were sampled.

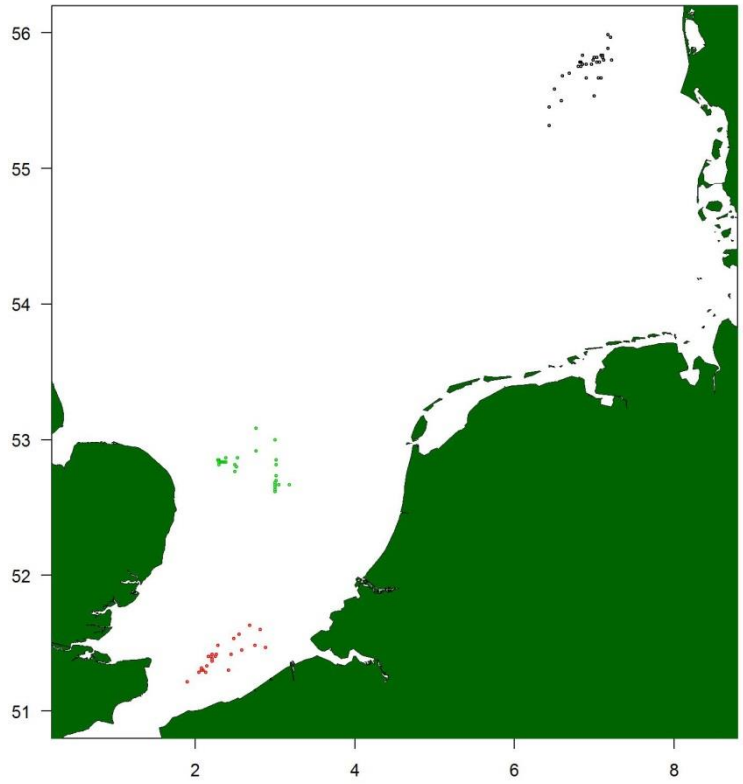


Figure 5: *Locations of the sampled hauls from three fishing trips (each colour represents a trip). Black scatters are haul positions of UK246, red: ARM22 and green TX1.*

Since discards were not collected per species a comparison of discards per species was not possible. However total discards were weighed during the trips and landings of main commercial species, sole and plaice, were registered. Fig 6 shows the spatial variation of discards, plaice & sole landings and the ratio between landings and discards. The amount of discards compared with the sum of plaice and sole landings, increases from south (ARM22=3) to north (UK246=0.5). Figure 7 shows a comparison of the amount of discards over the different trips. It is clear that the average amount of discards per two hours is different over all three trial fishing trips (Fig.7). Figure 8 shows the differences in average sole and plaice landings per two hours. There is a clear difference that is consistent with the main fishing grounds of sole and plaice.

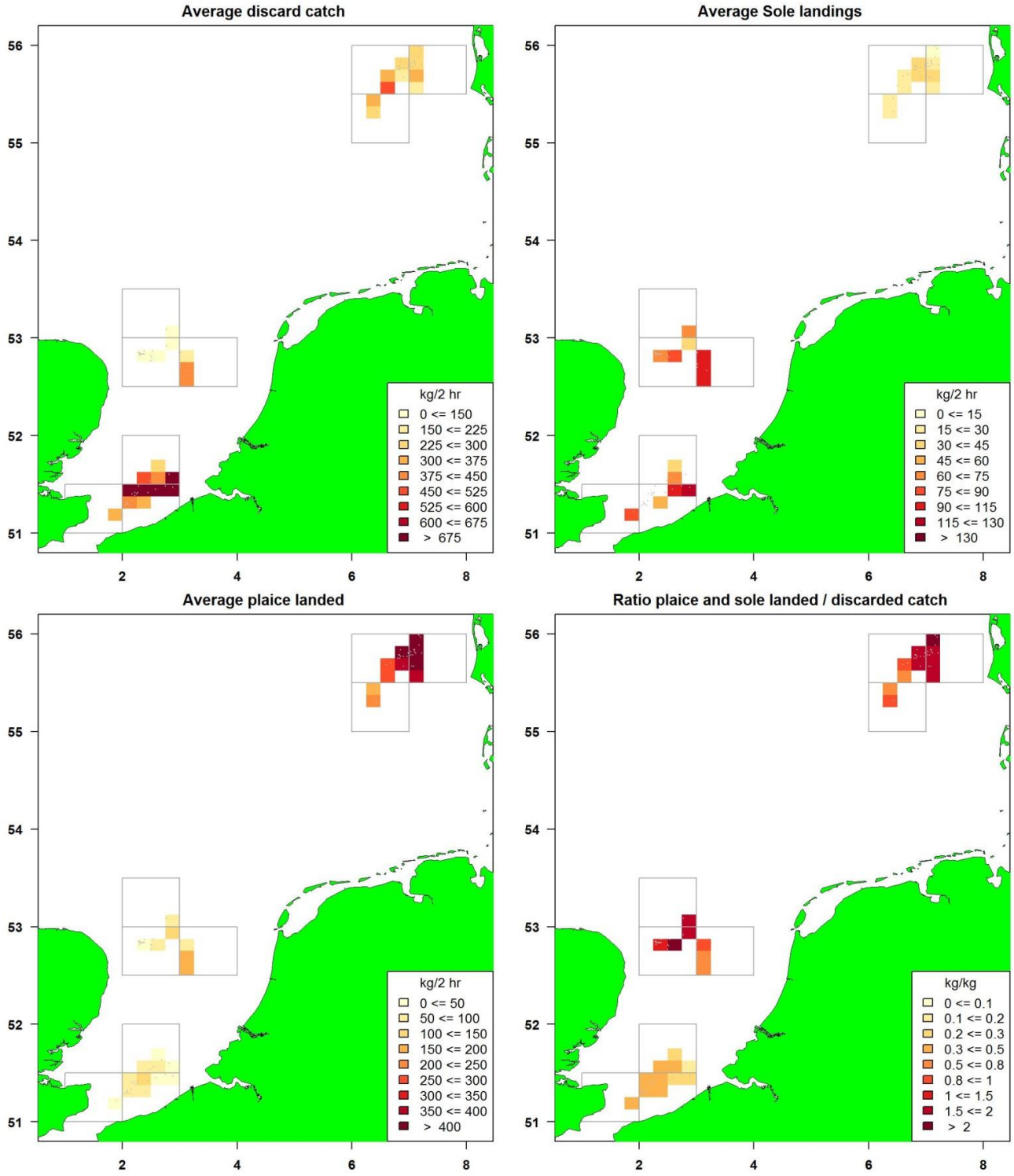


Figure 6: *Spatial information of the three trial fishing trips: Average discards, sole & plaice landings (kg) per 2 hour haul, calculated per 1/16 ICES rectangle. The forth figure shows the spatial distribution of the ratio plaice+sole landed and de discarded catch.*

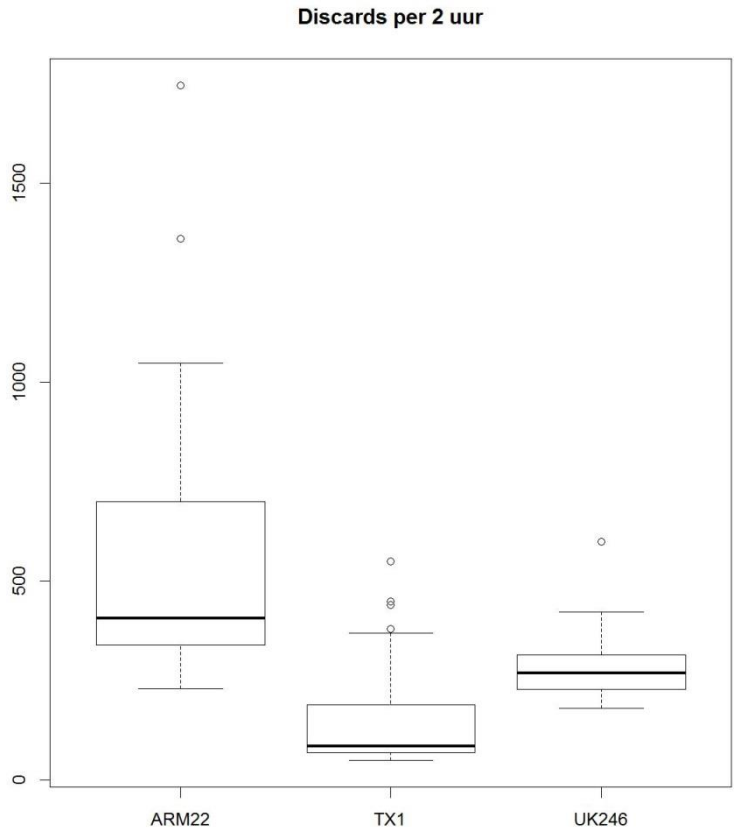


Figure 7: *Average amount of discards per two hours fishing over three trial fishing trips.*

This is also illustrated in the amount of sole and plaice landings over the three trial fishing trips (Fig. 7).

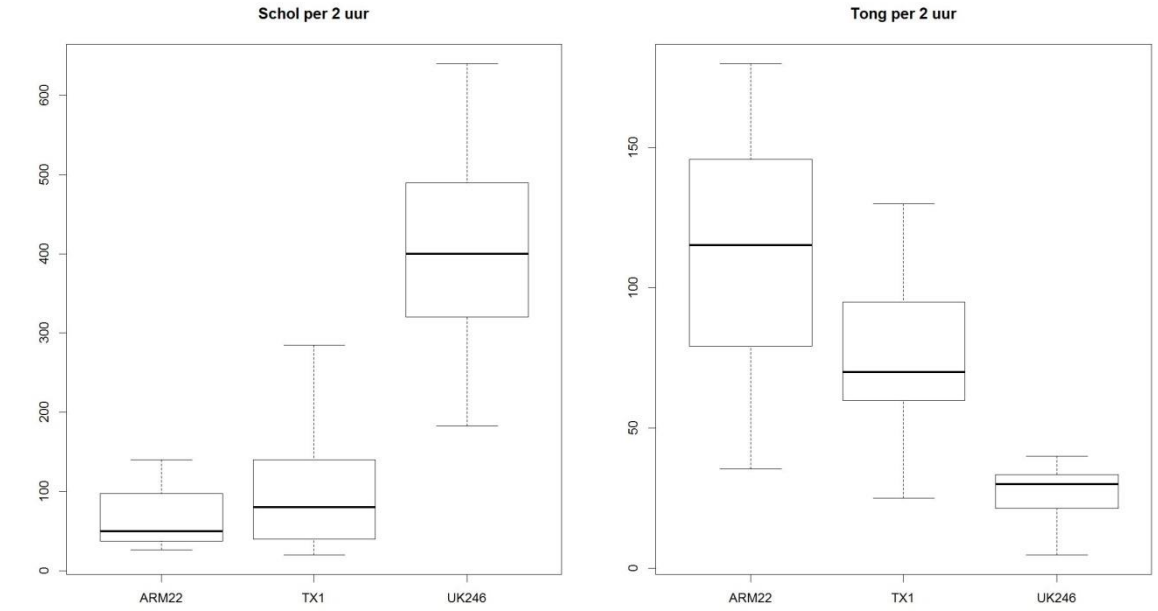


Figure 8: *Average amount of plaice and sole caught per two hours fishing over three trial fishing trips.*

5.3 Discussion

The question whether the data that is currently available from the Dutch discard monitoring programme and the discard sampling from the VIP projects is adequate as a basis for the establishment of a RTC system is not answered in this report.

The overview of RTC systems in other places presented in Table 1 shows that the instalment of RTCs and the data supporting an RTC system is large and extensive, coming from many different sources. Additionally, the design of an RTC system should be so that it is based on sound practical and scientific considerations.

The scale and availability of the Dutch discard monitoring programme is the same as in other RTC programmes in the EU (for example Scotland) (Bailey et al. 2010). The data is aggregated on 1/16th of an ICES rectangle.

However, data on temporal and periodic migration and distribution of main discarded (flat)fishes in the Dutch demersal fishery has not yet been compiled. This should inform the decision on, for instance, how big closures should be made to avoid catching discards in an area and is substantial in the design of a RTC system.

If attempts are made to compile lacking data, the success of an RTC system is also dependant on the support it has from the actors how are most affected by these closures: fishermen.

6 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 September 2018. 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

Bailey et al., 2010, Real Time Closures of Fisheries, IP/B/PECH/IC/2009-091

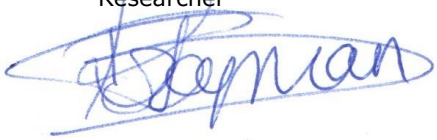
van der Reijden et al., 2014, Discard self-sampling of Dutch bottom-trawl and seine fisheries in 2013, Report / Centrum voor Visserijonderzoek 14.007

Justification

Report C012/16
Project Number: 4311100011

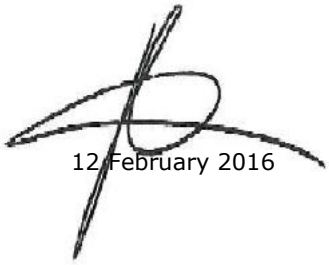
The scientific quality of this report has been peer reviewed by the a colleague scientist and a member of the Management Team of IMARES.

Approved: B.K. Trapman MSc
Researcher

Signature: 

Date: 12 February 2016

Approved: Dr. ir. N.A. Steins
Interim MT member

Signature: 

Date: 12 February 2016

Annex 1

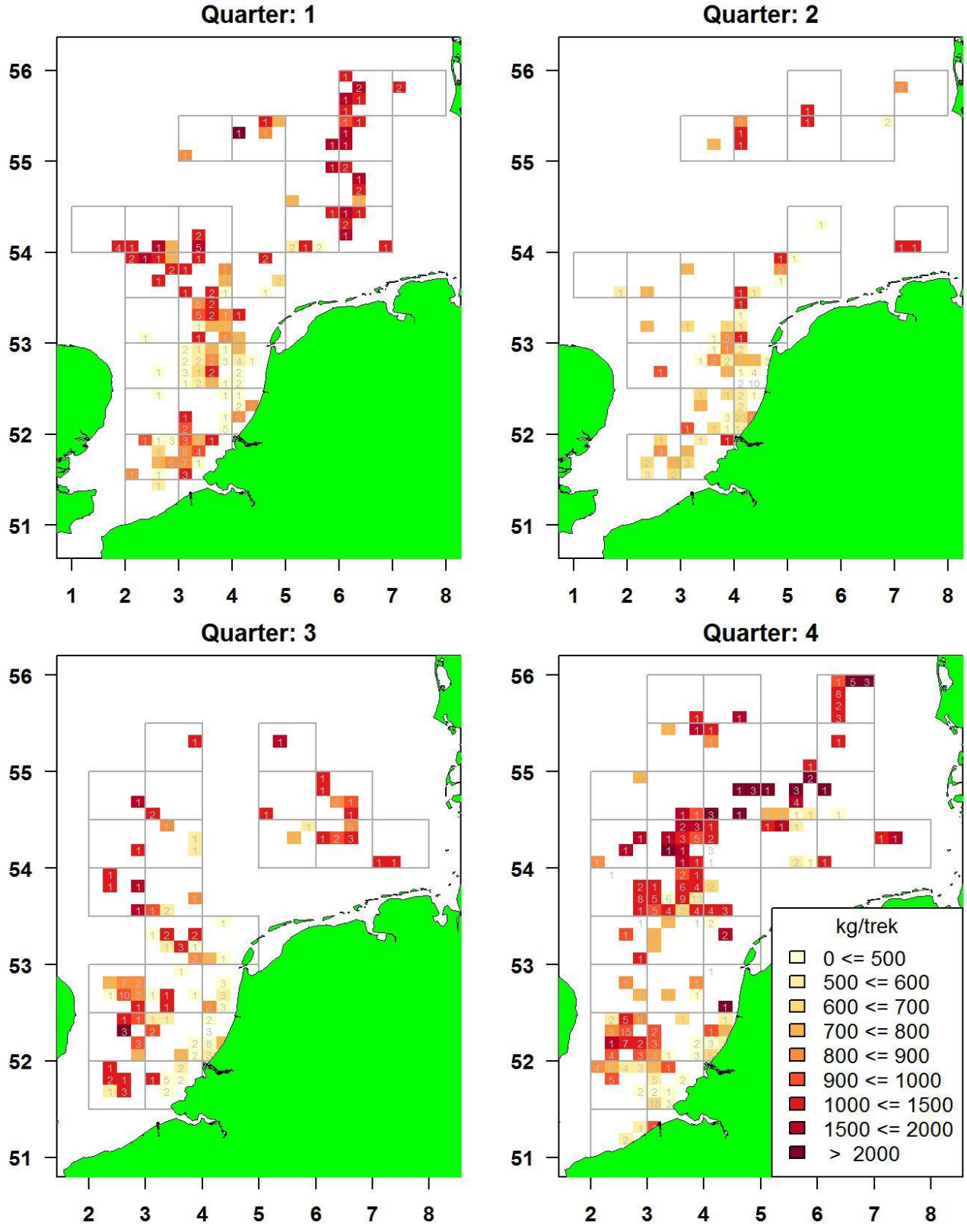


Figure 1: *Average catch per haul, per quarter for beam trawlers with small mesh sizes.*

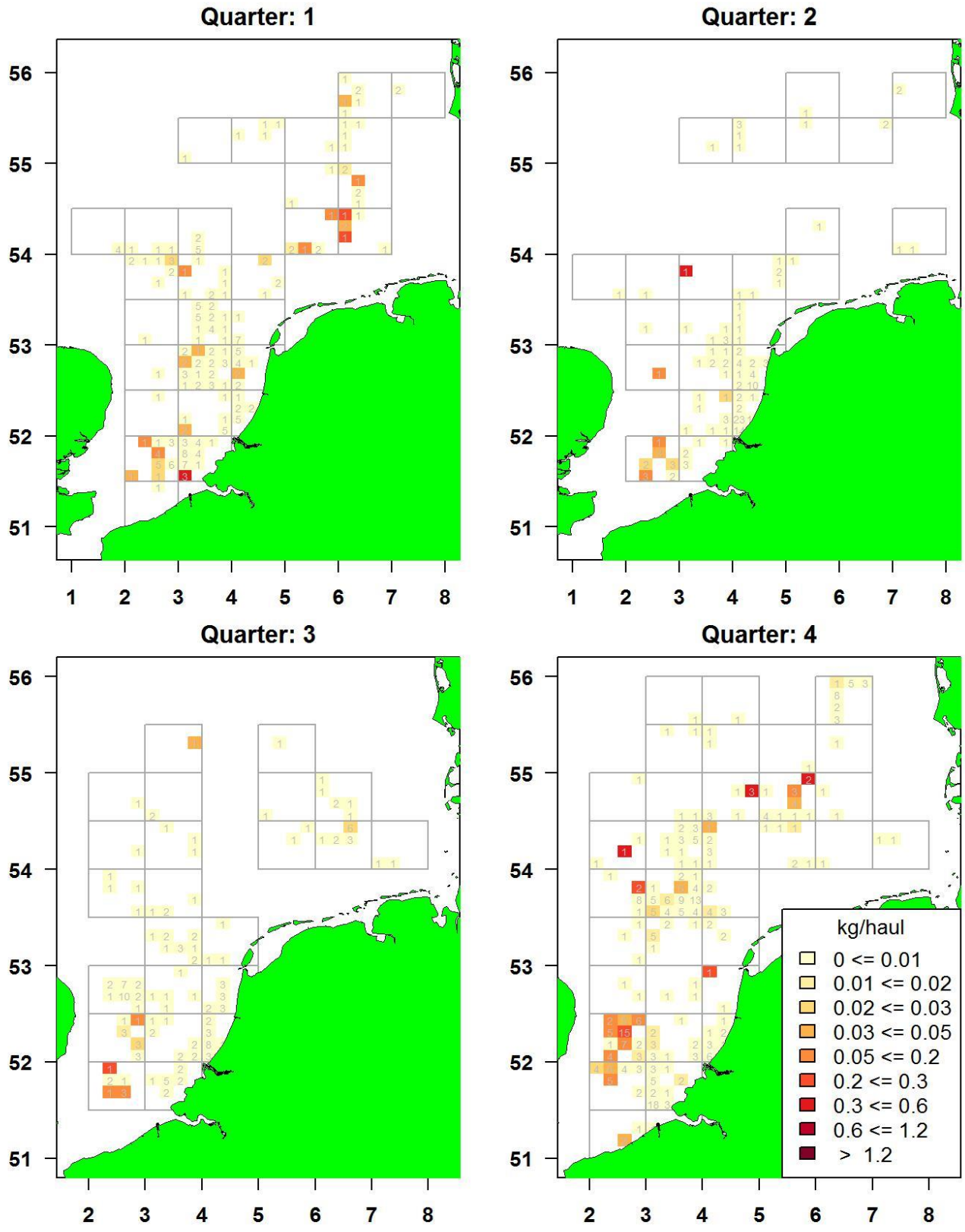


Figure 2: *Average discards of cod per haul, per quarter for beam trawlers with small mesh sizes.*

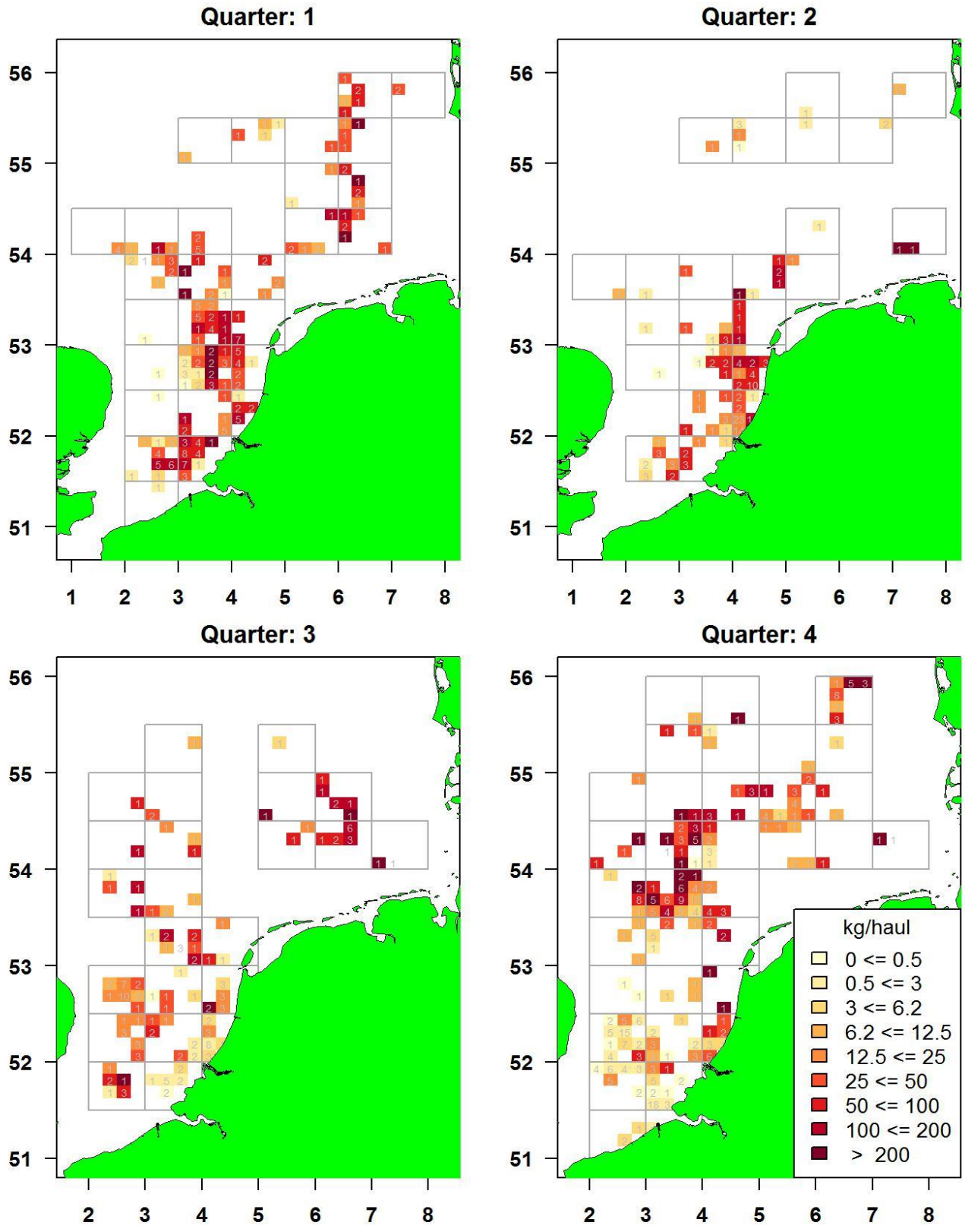


Figure 3: *Average discarded dab per haul, per quarter for beam trawlers with small mesh sizes.*

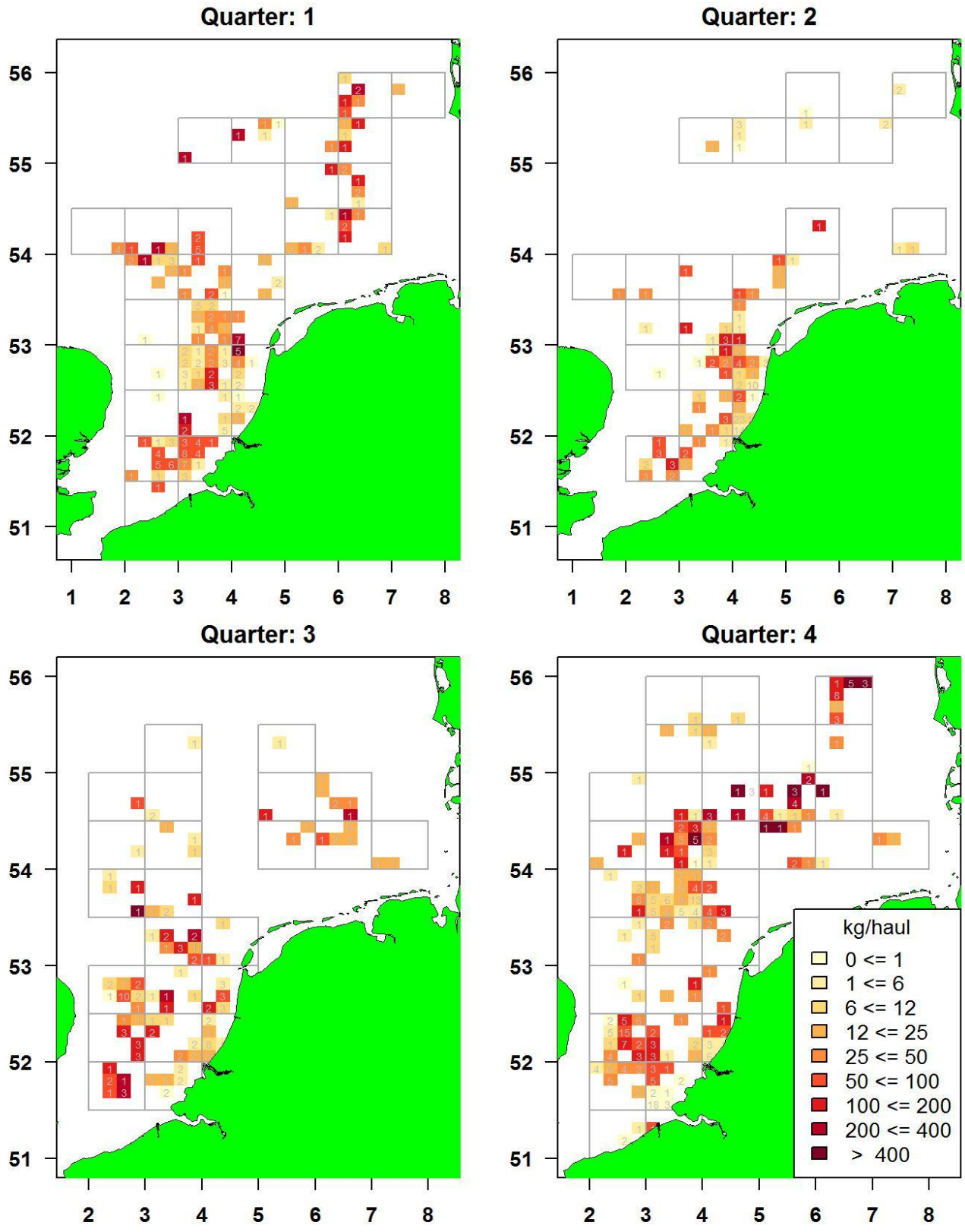


Figure 4: *Average discarded plaice per haul, per quarter for beam trawlers with small mesh sizes.*

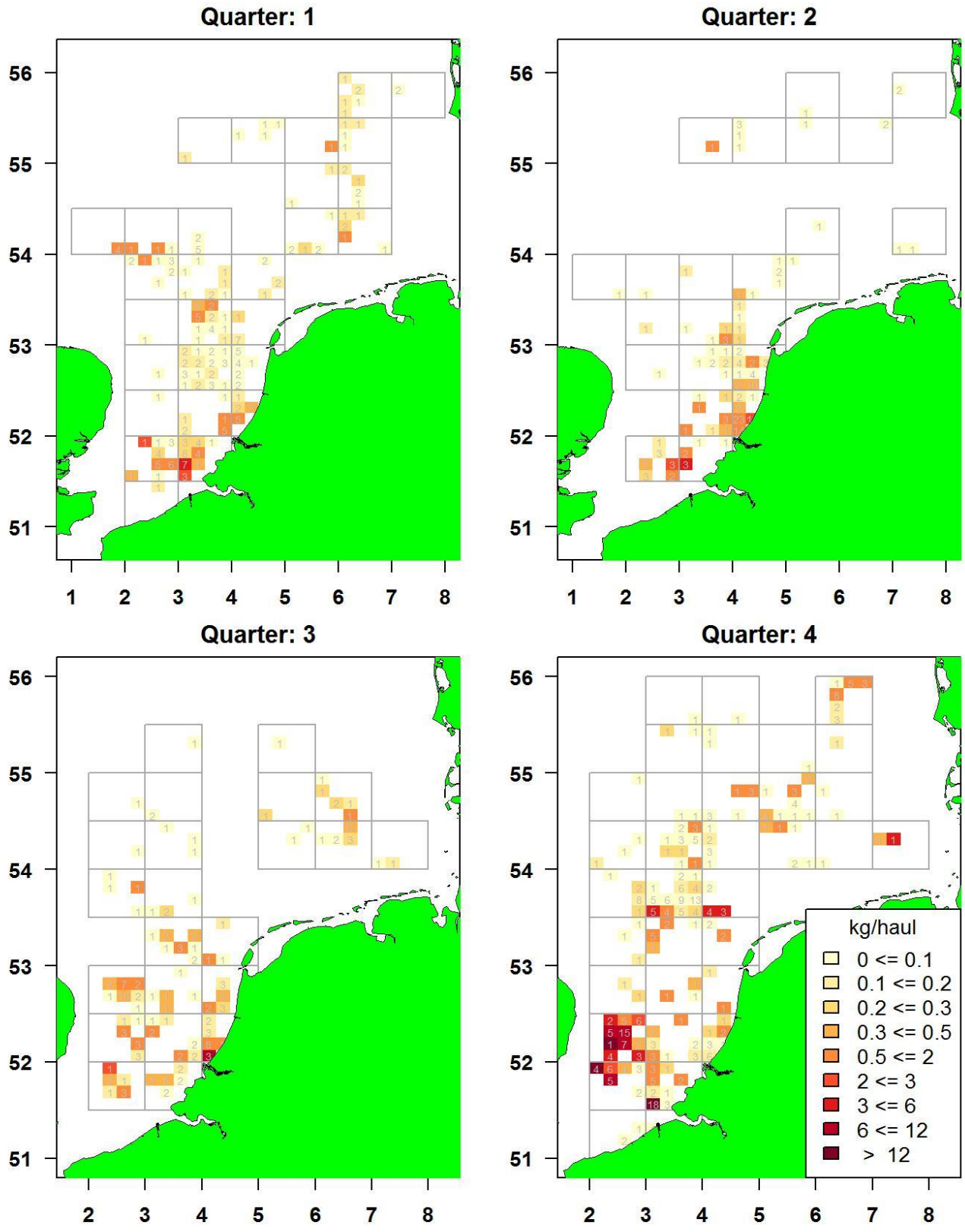


Figure 5: *Average discarded sole per haul, per quarter for beam trawlers with small mesh sizes.*

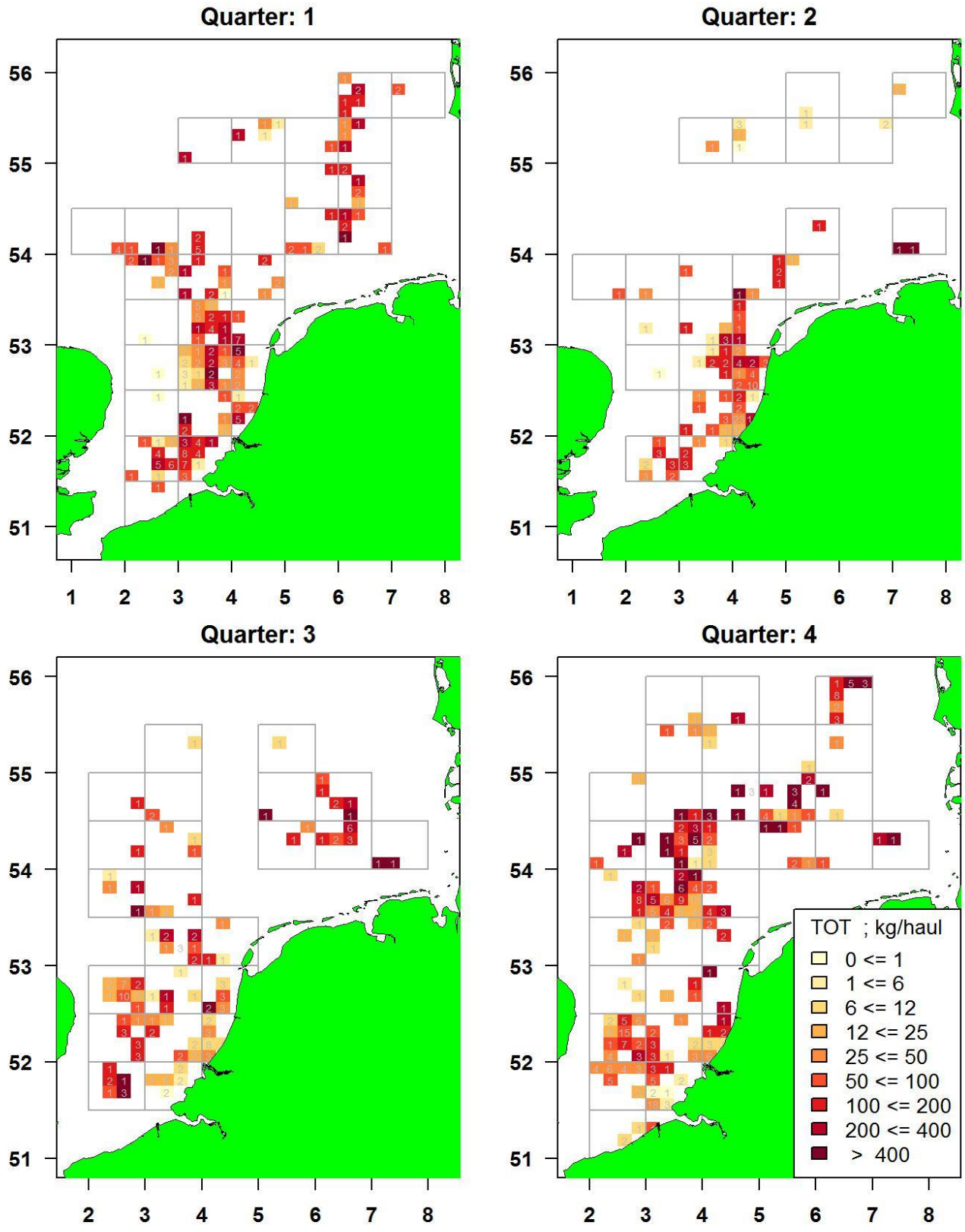


Figure 6: *Average total amount of discards per haul, per quarter for beam trawlers with small mesh sizes.*

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IMARES (Institute for Marine Resources and Ecosystem Studies) is the Netherlands research institute established to provide the scientific support that is essential for developing policies and innovation in respect of the marine environment, fishery activities, aquaculture and the maritime sector.

The IMARES vision

'To explore the potential of marine nature to improve the quality of life'

The IMARES mission

- To conduct research with the aim of acquiring knowledge and offering advice on the sustainable management and use of marine and coastal areas.
- IMARES is an independent, leading scientific research institute

IMARES Wageningen UR is part of the international knowledge organisation Wageningen UR (University & Research centre). Within Wageningen UR, nine specialised research institutes of the DLO Foundation have joined forces with Wageningen University to help answer the most important questions in the domain of healthy food and living environment.