Stichting Wageningen Research Centre for Fisheries Research (CVO)

Discard self-sampling of Dutch bottom-trawl fisheries in 2017-2018

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Summary

In the European Union the collection and management of fisheries data is regulated through the Data Collection Framework (DCF) of the European Commission (EC). Within this context, Wageningen Marine Research (WMR) coordinates a discards monitoring programme in collaboration with the Dutch demersal fishing industry. A 'reference fleet' of vessels of which the owners are willing to participate in a self-sampling programme, was recruited in 2009 and has been extended and updated regularly. Annually approximately 160 trips need to be sampled by the reference fleet. Fishermen within the reference fleet are requested to collect discard samples of two separate hauls according to a definite annual sampling plan. In 2017 these trips were in collaboration with the participating vessels evenly divided over the reference fleet. In order to avoid any potential bias in trip selection and to work conform the statistical sound principles as defined in the DCF recast, from 2018 onwards the trips are randomly divided over the reference fleet and any refusals are recorded. After the discard samples are brought to shore, WMR collects and analyses these samples. This report summarizes data that has been collected within this self-sampling monitoring programme in 2017-2018.

In 2017-2018 the reference fleet consisted of 19-20 vessels. In total, 159 and 167 were sampled in 2017 and 2018 respectively. All sampled trips were assigned to their respective metiers post sampling, based on gear type, mesh size and species composition of the catch. Seven different metiers were assigned: beamtrawlers with 70-99 (Eurocutters (i.e. engine power ≤300 hp) and large vessels (i.e. engine power > 300 hp)), 100-119, and ≥120 mm meshes, and otter trawlers with 70-99 mm meshes (targeting Nephrops or Demersal fish) and 100-119 mm meshes.

Observed discard patterns are quite similar between all metiers; dab and undersized plaice are the most frequently discarded fish species. The majority of the benthic, non-fish, discards consisted of echinoderms and crustaceans. In order to monitor annual discard percentages, it is essential that the sampled trips follow the distribution of the fleet; a mismatch between sampling and the distribution of the fleet could indicate a possible bias in the discard estimate. The results shows that sampling effort of the most-intensely sampled metiers (i.e. TBB_DEF_70-99) indeed follows the fleet through space and time. However, for the less frequently sampled metiers this not always appears to be the case

An important element in the reform of the Common Fisheries Policy (CFP) is the obligation to land all catches, i.e. a discard ban. Under this landing obligation all discards of quota regulated species have to be landed. For the demersal fisheries the landing obligation has been phased in over a number years. It is clear that as discarding will continue under various forms of exemptions (high survivability, *de minimis*, prohibited species), a discards monitoring programme remains necessary under the landing obligation. Furthermore, monitoring of BMS needs to be captured in the sampling programme.

Samenvatting

In de Europese Unie wordt het verzamelen en beheren van visserijgegevens gereguleerd doormiddel van de Data Collectie Verordening (DCF) van de Europese Commissie (EC). Binnen deze regulatie, coördineert Wageningen Marine Research (WMR) een discards monitoring programma in samenwerking met de Nederlandse demersale visserij. In dit project wordt gebruik gemaakt van een 'referentie vloot', bestaande uit een groep Nederlandse commerciële vissers die zich willen inzetten voor het onderzoek. Deze referentievloot is in 2009 opgezet en is sindsdien uitgebreid en regelmatig gedeeltelijk vernieuwd. Jaarlijks moeten in totaal ongeveer 160 trips door de referentievloot bemonsterd worden. De vissers van de referentievloot wordt gevraagd om voor specifieke visreizen, die aan het begin van het jaar zijn vastgesteld, een deel van de discards (d.w.z. de vangst die anders overboord zou zijn gegaan) van twee vistrekken aan boord te houden. In 2017 zijn deze bemonsterde reizen in samenwerking met de referentievloot bepaald. Om eventuele bias in de verzamelde gegevens te voorkomen, worden vanaf 2018 de bemonsterde reizen, zoals wordt verzocht in de herziene versie van de DCF, random over de referentievloot verdeeld. De monsters met bijbehorende gegevens over de totale vangst per trek, visserij-inspanning en vispositie worden aangeland en aan WMR overgedragen. WMR zorgt voor de verdere verwerking van de monsters. Voorliggend rapport presenteert de resultaten van het zelfbemonsteringsproject van de Nederlandse demersale vloot opererend in de Noordzee (ICES deelgebied IV) in 2017-2018.

In 2017-2018 bestond de referentievloot uit 19-20 schepen. In totaal zijn 159 en 167 visreizen bemonsterd in respectievelijk 2017 en 2018. Op basis van vistuig, maaswijdte en soorten samenstelling van de vangst zijn alle bemonsterde visreizen naderhand aan een metier groep toegekend. In 2017-2018 zijn zeven verschillende metiers bemonsterd: boomkorschepen vissend met 70-99 (waarbij onderscheid gemaakt wordt tussen Eurokotters (d.w.z. vissend met een motorvermogen ≤ 300 pk) en grote kotters (d.w.z. vissend met een motorvermogen > 300 pk)), 100-119 en ≥120 mm maaswijdte, en otter trawlers vissend met 70-99 (waarbij onderscheid gemaakt wordt tussen schepen die voornamelijk Noorse kreeft vangen en schepen die voornamelijk demersale vis vangen) en 100-119 maaswijdte.

De waargenomen discards patronen zijn vergelijkbaar tussen de verschillende metiers; schar en ondermaatse schol zijn de meest voorkomende soorten in de visdiscards. De meerderheid van de benthos discards bestonden uit stekelhuidigen (verschillende zeestersoorten) en kreeftachtigen (zoals zwemkrabben en Noorse kreeft). Om jaarlijkse discardsschattingen van de Nederlandse demersale vloot te bepalen, is het essentieel dat de bemonstering de vloot representeert in ruimte en tijd; een mismatch tussen de verspreiding van de bemonstering en de vloot kan een mogelijke bias de discardsschattingen te weeg brengen. De resultaten laten zien dat de bemonsteringsinspanning van de meest bemonsterde metier (d.w.z. boomkor metier gericht op tong) de vloot volgt in de ruimte en tijd. Voor de minder bemonsterde metiers is dit echter niet altijd het geval.

Een belangrijk element in de herziening van het Gemeenschappelijk visserij Beleid (GVB) is de verplichting om alle vangsten aan land te brengen. Onder de aanlandplicht moeten alle discards van commerciële soorten die gereguleerd worden door quota aangeland worden. Binnen de demersale visserij is de aanlandplicht tussen 1 januari 2016 en 1 januari 2019 ingevoerd. Het is duidelijk dat onder de aanlandplicht waarbinnen discarden vanwege de verschillende uitzonderingen (hoge overleving, *de minimis*) tot op zekere hoogte zal blijven bestaan, een discards monitoring programma nodig blijft. Tevens moet BMS gemonitored worden.

1. Introduction

Box 1: Data Collection Framework (DCF)
In the European Union (EU) the collection and management of fisheries data is enforced through the Data Collection Framework (DCF) of the European Commission (EC) (EC 1543/2000 and EC 199/2008, from 2017 onwards: EU 2016/1701, EU 2016/1251 and EU 2017/1004). The DCF states which information should be collected, managed and made available by the Member States (MS) for scientific advice regarding the Common Fisheries Policy (CFP). For this purpose all MS are obliged to submit a work plan for data collection in the fisheries and aquaculture sectors on a multiannual basis.

Discarding unwanted organisms in European fisheries is a consequence in mixed fisheries (Feekings et al., 2012). Reasons for discarding are for economic reasons (if there is no commercial value for the species caught) or because of regulatory measures (such as minimum landing size or catch limits (quota)) (Catchpole et al., 2005; Rochet and Trenkel, 2005; Poos et al. 2010). Keeping record of quantities being discarded may improve scientific stock assessments and advice on quota, enabling more accurate estimates of total fishing mortality.

The collection of discard data is enforced through the EC DCF (Box 1). The DCF requires the implementation of at-sea monitoring programmes, which should deliver discard estimates with an acceptable level of precision. In the Netherlands, a "self-sampling programme" is implemented for demersal fisheries in the North Sea. Within this programme discard data are collected for Dutch bottom-trawl fisheries for a number of metiers which are defined in the DCF based on gear type, target species assemblage, and mesh characteristics. To verify the accuracy and objectivity of self-sampling, every year, 10 observer trips are carried out on board fishing vessels that participate in the programme. The relationship from the catches of both observers and self-sampling programme are explored for correlation and systematic differences (Van Helmond et al., in prep). In addition, the observer trips have proven to be of importance for training crew members in sampling of discards. Also, the observer trips are appreciated by members of the reference fleet, it bridges the gap between scientists and crew. The data from these observer trips are solely used for verification and, therefore, excluded from this report.

The aim of this report is to present an overview of the data that has been collected within the Dutch self-sampling programme of bottom-trawl fisheries in 2017 and 2018. The data is used for further analyses within different projects, including stock assessment working groups (ICES, 2019).

1.1 Quality assurance

CVO is certified to ISO 9001:2015 (certificate number: 268632-2018-AQ-NLD-RvA). This certificate is valid until December 15th, 2021. The certification was issued by DNV GL Business Assurance B.V

2. Methods

2.1 Discard self-sampling programme

2.1.1 Reference fleet

A ‘reference fleet’, consisting of 20 vessels in 2017 and 19 vessels in 2018, with protocol-instructed fishers collecting discard samples according to a predefined schedule during their regular commercial operations. Prior to sampling, fishers were provided with all necessary equipment (labels, plastic sampling bags, sealing cable ties, markers, and sampling sheets) and written instructions. Additionally, WMR staff visited the crew in port regularly to evaluate and, when necessary, to reinstruct the sampling protocol.

2.1.2 Sampling and data collection procedures

Annually approximately 160 trips need to be sampled. In 2017 these trips were, in collaboration with the participating vessels, evenly divided over the reference fleet. In order to avoid any potential bias in trip selection and to work conform the statistical sound principles as defined in the DCF recast, from 2018 onwards the trips are randomly divided over the reference fleet and any refusals are recorded.

Operational- and catch data are collected each time the fishing gear is deployed (each ‘haul’) during a particular fishing trip. With each haul the following information was registered: vessel position (at start and end); haul duration; depth; weather conditions; and the volumes of catches and landings. The total volume of discards of each haul was calculated by subtracting the total landings, which was recorded in a logbook, from the total catch volume which was estimated by the skipper/crew.

Within a trip, the crew was instructed to retain a sample, consisting of two boxes of discards (one box equals approx. 40 kg), during two separate hauls, thus collecting a total of approx. 160 kg of discards per trip. These boxes were filled by scooping discards at regular intervals from the end of the processing conveyer belt. Crew members sample the discards while other crew members sort and select the commercial catch. The samples were collected in large plastic bags which were sealed off using a cable tie, labelled and cool-stored until the vessel returns to the port. Back at port, the discard samples were collected by WMR staff and taken to the laboratory for analysis.

Numbers at length were recorded for all fish species, Norway lobster *(Nephrops norvegicus,* hereafter termed *Nephrops*) and edible crab (*Cancer pagurus)*. Numbers without length measurements were recorded for all remaining (benthos) species. Standard data management software was used to enter and subsequently audit all data before the data were stored in the centralised WMR Frisbe database.

2.1.3 Metier classification

All sampled trips were assigned to their respective metiers based on level 6 for the metier classification as defined by the European Union (EU) decision (2010/93/EC Appendix IV) after the trip was executed (Table 1).

Within the Dutch beamtrawl metier (TBB_DEF 70-99 mm), distinction is made based on the vessel’s engine power. Due to national regulations allowing only vessels with an engine power of ≤300 hp (so called “Eurocutters”,) to fish in a marine protected area (“plaice box”) and the Dutch 12-mile Exclusive Economic Zone. To reflect this spatial difference of the fleet -which also has implications on their discarding pattern- in the following analysis, summaries of the discard data are presented separately for Eurocutters (termed TBB_DEF_70-99mm_S300hp) and the remaining part of the beamtrawl fleet fishing (termed TBB_DEF_70-99mm_G300hp; Table 1). The total number of samples per metier is based on fleet composition of the reference fleet.

2.2 Raising procedures

See figure 1 for a flow-chart of the raising procedure. Numbers (at length) were registered for all (fish) species for each sample. The numbers (at length) in the samples were multiplied with the volume ratio between discard sample and total discards to estimate total numbers (at length) within that haul.
Whenever a species was very abundant within the sample, a sub-sample of this species was counted. When subsampling was conducted, the numbers (at length) were multiplied with the sub-sample fraction to estimate total numbers (at length) within the sample.

Next, length/weight-relationships[1] were applied to convert numbers at length to weight for all fish species. Both numbers (fish and benthos) and weights (fish) for the two sampled hauls were summed up. These numbers and weights were then standardized into discards per unit effort rates (expressed in number/hour and kg/hour) by dividing them by the deployment duration (i.e. fishing time). Total numbers and weights per fishing trip were calculated by multiplying the standardized rates with the total duration of all hauls together. It is assumed that the sampled hauls per trip are representative in species composition and variance for all the other hauls within the sampled trip.

2.3 Fleet effort

The fleet effort has been calculated using the WMR Visstat database containing the official Dutch logbook information. In this database, the date and time of port departure and arrival, and other vessel characteristics (such as gear type, engine power, mesh size) are registered for all Dutch fishing vessels over 12 metres. Time between departure and arrival has been multiplied by the engine power of each vessel, resulting in a measure of fishing effort expressed as kWdays. The ratio between fleet effort and sampling effort has been used as an auxiliary variable to estimate total discards by species for the Dutch demersal fleet by metier. Since 2011, total discard data from the reference fleet have been used in several ICES Working Groups for the assessment for stocks in the North Sea, such as plaice, cod, sole, whiting, turbot, brill, *Nephrops* (ICES, 2019). Furthermore, the data is also sent to the STECF Expert working Group on Fisheries Dependent Information (STECF, 2018).

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[1] The L/W relationships for plaice (*Pleuronectus platessa)*, sole (*Solea solea*), turbot (*Scophthalmus maxima*), brill (*Scophthalmus rhombus*) and thickbacksole (*Microchirus variegatus*) are based on WMR data. For all other species these relations are based on literature.

3. Results

In total, 169 trips were sampled in 2017 and 176 trips were sampled in 2018. Trips that were not sampled according to the sampling protocol and/or trips for which essential information was missing were considered invalid and excluded from the analysis. This resulted in 159 and 167 valid trips in 2017 and 2018, respectively. All sampled trips (Table 2b) were assigned to their respective metiers post-sampling, based on gear type, mesh size. Sampling was conducted on board vessels from seven different metiers; beamtrawlers with 80 (engine power > 300 hp and engine power ≤ 300 hp), 100-119 and ≥120 mm meshes, and otter trawlers with 70-99 mm meshes (targeting Nephrops or demersal fish) and 100-119 meshes. It should be noted that for some metiers the results are based on a small number of trips. These results can therefore only be used as an indication for discard patterns, and not as exact estimates.

3.1 TBB_DEF_70-99_G300hp

Within this beamtrawl metier, different types of innovative gears are deployed. Since 2009, fishermen have been switching from traditional beam to pulse trawling. The pulse fishery uses electric stimulation instead of tickler chains to stun fish out of the ground and move them into the net. Pulse gear increases sole catches and decreased fuel use in comparison with the traditional beam trawl gear (van Marlen et al., 2014). Another popular innovate gear within this metier is the sumwing. This device is designed to "fly" over the bottom, whereas traditional beamtrawls have "shoes", steel beam heads that keep space between the beam and the sea floor (van Marlen et al., 2009).

The large (>300hp, often >35m LOA) beamtrawlers make up the majority of the Dutch demersal fishing fleet, with a fleet effort of 24396476 and 26041963 kWdays in 2017 and 2018 respectively (Table 2a). 89 and 102 trips were sampled for this metier in 2017 and 2018, which coincides with a sampling coverage of ~3-4% (Tables 2b,3). Sampling was lowest in quarter 2 (Table 2b). This dip can, to some extent, also be observed in the total fleet effort (Table 2a). Figure 3 shows the distribution of total fleet effort by year and corresponding positions of sampled trawls.

Plaice is the most abundant species in the landings, followed by sole. Turbot, dab and brill, and various other species make up the rest of the landings (Table 4).

Plaice and dab are the most frequently discarded fish species within this fleet (Tables 4,5,8). Plaice is discarded because it is undersized and therefore not allowed to be landed (Figure 4). Dab is discarded because of its low commercial value. Most other fish species that are discarded include smaller flatfishes (e.g. scaldfish (*Arnoglossus laterna*), solenette (*Buglossidium luteum*), sole (*Solea solea*)) or benthic oriented species (e.g. grey gurnard (*Eutrigla gurnardus*)). In addition, the semi-pelagic oriented species (e.g. whiting (*Merlangius merlangus*)) for which no individual quota is available for the demersal fleet, is encountered frequently in the discards (Table 8). The majority of the benthos discards consisted of echinoderms (sand sea star (*Astropecten irregularis*), common starfish (*Asterias rubens*), serpent star (*Ophiura ophiura*), green sea urchin (*Psammechinus miliaris*), sea patato (*Echinocarium cordatum*)) and crustaceans (swimming crab (*Liocarcinus* sp.), angular crab (*Goneplax rhomboides)*) species (Table 9).

3.2 TBB_DEF_70-99_S300hp

Eurocutters (<300hp) are allowed to fish in the Dutch 12-mile Exclusive Economic Zone and the plaice box (Pastoors et al., 2000). This is reflected in the distribution of the fleet effort and the sampling locations (Figure 3). During fall and winter the Eurocutters move a little more offshore than in spring and summer (van der Reijden et al., 2014). This might be a reaction of fishermen on seasonal variation in sole and plaice distribution (Poos & Rijnsdorp, 2007).

23 and 27 trips were sampled for this metier in 2017 and 2018 respectively, which coincides with a sampling coverage of ~3% (Tables 2b,3).

Plaice and sole are the most frequently landed species within this metier (Table 4). Turbot, dab and brill and various other species make up the rest of the landings. Dab and undersized plaice are the most frequently discarded species within this fleet (Tables 4,5,8, Figure 4). Most other fish species that are discarded in both years include undersized sole, undersized whiting, scaldfish and solenette. The three most discarded benthic species in both years include common starfish, serpent star, sand sea star and swimming crab (Table 9).

3.3 TBB_DEF_100-119

The large beam trawlers (>300 hp) fishing with a meshsize of 100-119mm target plaice at the Doggersbank (Figure 3). The large mesh sized beamtrawler metier is a seasonal fishery (Table 2a). 6 trips were sampled for this metier in 2017 and 2018, which coincides with a sampling coverage of ~7-8% (Tables 2b,3).

Plaice is the most frequently landed species within this metier (Table 4). Dab and undersized plaice are the most frequently discard fish species (Tables 4,5,8 and Figure 4). However, the observed discard estimate for plaice is lower than the small mesh sized beamtrawlers; 10%-30% in TBB_DEF_100-119 *vs*. 56%-67% in TBB_DEF_70-99_G300hp (Table 4). The average number per hour discarded starry ray in 2017 was highest within this metier in comparison with the other sampled metiers. This is most likely due to the natural distribution of this species overlapping with this fishery (van Overzee et al., 2019). The discarded benthic species are dominated by the sand seastar followed by the common starfish (Table 9).

3.4 TBB_DEF_>=120

The effort of the large beam trawlers (>300hp) with fishing with a meshsize of 120mm has increased substantially since 2011 (Table 2a, van der Reijden et al., 2014; Table 2). TBB_DEF_>=120 is a seasonal fishery, with peaking effort in spring and summer (quarters 2 and 3). The majority of the effort is concentrated at the Doggersbank and northeast of the Doggersbank (Figure 3). In winter, effort is reduced (Table 2a). This probably reflects a (seasonal) shift towards the deployment of small meshed nets (TBB_DEF_70-99), which target sole (van der Reijden et al., 2014). Sampling coverage of this metier was low; 1 trip in 2017 and 3 trips in 2018 (Table 2b). Therefore, the presented information of discards in this metier can only be used as an indication for discard patterns, and not as exact estimates.

Plaice is the most frequently landed species within this metier (Table 4). Undersized plaice and dab were the most frequently discarded fish species (Tables 4,5,8, Figure 4). The average number per hour discarded starry ray in 2018 was highest within this metier in comparison with the other sampled metiers. This is most likely due to the natural distribution of this species overlapping with this fishery (van Overzee et al., 2019). The two most common discarded benthos species in both years were sand seastar followed by the common starfish. Furthermore, in 2018 the sea patato was frequently discarded (Table 9).

3.5 OTB_MCD_70-99

Even though otter trawlers fishing with small mesh size (OTB_70-99) operate with similar gear, the target species may differ; some target mainly plaice, while others target *Nephrops* with plaice as by-catch. To discriminate between both fisheries, the metiers are classified (post stratified) based on landing data per trip. If *Nephrops* from otter-trawl gears (OTB/OTT) composes more than 30% landings in a trip, this trips is classified as a crustacean (OTB_MCD) targeting metier. If *Nephrops* composes less than 30% of landings, the trip is classified as OTB_DEF. It should be noted that this results in a knowledge deficiency of the initial purpose of the fishing trip (which is probably linked to fishing location), as an unsuccessful trip for *Nephrops* will be classified as OTB_DEF and vice versa. The OTB_MCD_70-99 fishery is a seasonal fishery.

16 and 12 trips were self-sampled for this metier in 2017 and 2018 respectively, resulting in a sampling coverage of ~6-8% (Tables 2b,3). *Nephrops* occur at specific habitats, which to some extent is visualised in the distribution of the total effort of this metier (Figure 3).

This metier lands most *Nephrops* of the sampled demersal metiers (Table 4). Plaice also comprises a large part of the landings (Table 4). The most abundant discards for this metier were dab, and undersized plaice (Tables 4,5,8). This was followed by whiting and grey gurnard (Table 8). Overall, *Nephrops* was the most abundant benthos species in the discards (Table 9). Figure 4 shows that the majority of the discarded *Nephrops* was of marketable size (i.e. above minimum landing size). The harbour crab (*Liocarcinus depurator*) was also frequently discarded benthos species within this metier (Table 9). Furthermore, the common starfish, sand sea star and hermit crab (*Pagurus bernhardus*) belonged to the most frequently discarded benthos species (Table 9).

3.6 OTB_DEF_70-99

21 and 14 trips were sampled for this metier in 2017 and 2018 respectively, resulting in a sampling coverage of ~9-10% (Tables 2b,3).

The sampled trips mainly landed plaice and *Nephrops* (Table 4). The most frequently discarded fish species were, similar to OTB_MCD_70-99; dab and undersized plaice, followed by grey gurnard and whiting (Tables 4,5,8 and Figure 4). Overall, *Nephrops* was the most abundant benthos species that was discarded (Table 9). Figure 4 shows that the majority of the discarded *Nephrops* was of marketable size (i.e. above minimum landing size). Furthermore, the harbour crab and common starfish belonged to the most frequently discarded benthos species (Table 9).

3.7 OTB_DEF_100-119

This metier is a seasonal fishery, with a peak in fleet effort in quarters 2 and 3 (Table 2a). 3 trips were sampled for this metier in 2017 and 2018; only quarters 1 and 2 were sampled for this metier in 2017 and only quarters 2 and 3 were sampled for this metier in 2018 (Table 2b).

This metier targets plaice, at the Doggersbank (Table 4, Figure 3). Dab and undersized plaice are the most frequently discarded fish species, followed by grey gurnard and whiting (whiting only in 2017) (Tables 4,5,8 and Figure 4). Benthos discards are dominated by common starfish (Table 9).

4. Discussion

4.1 Discard patterns

Discard patterns are quite similar between the seven sampled metiers; dab and undersized plaice are the most frequently discarded species. The majority of the benthic, non-fish, discards within the beamtrawl and otter trawl metiers consisted of echinoderms and crustaceans. From 2017 onwards the flyshoot fishery has not been part of the reference fleet (Verkempynck et al., 2018). As discarding patterns of the flyshoot fishery differ from the bottom-trawl fishery (Verkempynck et al., 2018), and the flyshoot fishery represents ~3-4% of the total Dutch demersal fleet effort in 2014-2018 (Verkempynck et al., 2018, Table 2a), efforts are being made to reintroduce this fishery in the monitoring programme.

4.2 Data Collection Framework

The reform of the DCF in 2009 required member states to increase sampling intensity. In order to meet this requirement within an affordable budget, WMR set up the self-sampling programme. Within this programme recruited fishers were willing to retain fractions of their discards during some of their fishing trips. The self-sampling programme has resulted in increased spatial and temporal coverage of the discard sampling of the Dutch demersal fishery. Although an increase of sampling intensity will most likely improve precision levels of discard estimates, it does not necessarily improve their accuracy (Uhlmann et al., 2013). The DCF recast, which came into force in 2017, and its accompanying Commission Decisions tackle this (potential) issue by obliging Member States to implement a sampling design that is established according to statistical sound principles. The correct implementation of a statistically sound sampling scheme should reduce any potential bias in the discard data and therefore increase the representativeness of the data for the entire fleet. Ideally, this would mean that all sampled trips are randomly selected from the Dutch demersal active fleet when sampling its discards, and refusal rates are recorded. In practice, such a random approach will increase the time and effort to collate the discard data enormously. Therefore, working with a reference fleet is a practically desirable alternative option. Where it is important that the reference fleet mirrors the Dutch demersal active fleet with respect to their overall discarding patterns. A first indication on representativeness of the collected data is to visually inspect whether the sampled trips follow the distribution of the fleet through space and time. The results shows that sampling effort of the most-intensely sampled metiers (i.e. TBB_DEF_70-99) indeed follows the fleet through space and time. However, for the less frequently sampled metiers this not always appears to be the case; for example for OTB_DEF_100-119 in Quarter 3 in 2017 and 2018 (Figures 3ab). To be able to solve this issue an increase in sampling intensity is needed, and, consequently, an extension of the reference fleet for these metiers would be necessary.

4.3 Reform of the Common Fisheries Policy

An important element in the reform of the CFP is the obligation to land all catches, i.e. a discard ban. Under this landing obligation all discards of commercial species that are regulated by quota have to be landed and is categorised as Below Minimum Size (BMS). The landing obligation has a particular strong impact on the Dutch demersal fishing industry. For the demersal fisheries the landing obligation has been phased in over a number of years. The gradual phasing-in of the landing obligation in the demersal fishery commenced in 2016, and in January 2019 the landing obligation was fully implemented. It is clear that as discarding will continue under various forms of exemptions (high survivability, *de minimis*, prohibited species), a discards monitoring programme remains necessary under the landing obligation. Furthermore, additional monitoring of BMS needs to be captured in the sampling programme. From 2016 onwards, BMS sampling has been included in the sampling protocol. So far, BMS has been observed sporadically in the self-sampling trips in 2017 and 2018.

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5. Tables and Figures

Table 1: List of Dutch bottom-trawl metiers sampled in 2017. Note that not all metiers are sampled for discards each year. These have been classified according to European Union (EU) definitions (2008/949/EC Appendix IV) requiring information about gear type (i.e. demersal beam – TBB; otter trawl - OTB/OTT), target species assemblage (i.e. demersal fish - DEF, mixed crustaceans and demersal fish – MCD; level 5), mesh size ranges (in mm; level 6), further specifications, and regulated gear groups as outlined in Annex 1 of the cod management plan 1342/2008.

Level 4	**Level 5**	**Level 6**	
Gear type	**Target assemblage**	**Mesh size**	**Regulated gear group**
TBB (> 300 hp)*	DEF	70-99 **	BT2
TBB (≤ 300 hp)*	DEF	70-99 **	BT2
TBB	DEF	100-119	BT2
OTB***	MCD	70-99	TR2
OTB***	DEF	70-99	TR2
OTB***	DEF	100-119	TR1
OTB***	DEF	≥120	TR1

* Note that the TBB metier is further subdivided on a national level in the Netherlands based on engine size (horse power, hp): vessels with ≤ 300hp engine power are so called “Eurocutters”.

** Note, that due to regulation vessels within this metier do not fish with a mesh size < 80 mm.

*** In this report, all OTB should be read as OTB/OTT/QUA, as in logbook in the Netherlands data otter (OTB), pair trawl (OTT), and quadrig gear can be used interchangeably.

Table 2a. Summary of the total effort (in kWdays) for the fleet in **2017-2018**, for each quarter and year.

	2017					**2018**				
Metier	Q1	Q2	Q3	Q4	**Total**	Q1	Q2	Q3	Q4	**Total**
OTB_DEF_>=120	305	24352	2731	23827	**51215**	15464	43035	102378	45257	**206134**
OTB_DEF_100-119	60886	255239	367721	49719	**733565**	58946	560398	432563	6445	**1058352**
OTB_DEF_70-99	88418	54181	17402	58862	**218863**	130670	63835	34111	58666	**287282**
OTB_MCD_100-119	1894	2772	17377	3673	**25716**	NA	NA	2645	12544	**15189**
OTB_MCD_70-99	106138	241325	284193	90918	**722574**	19451	30623	206005	119972	**376051**
SSC_DEF_>=120	NA	31394	124034	15024	**170452**	NA	35141	125885	13975	**175001**
SSC_DEF_100-119	807	109720	223246	9403	**343176**	2678	66005	207968	37009	**313660**
SSC_DEF_70-99	16189	271448	227237	116765	**631639**	59686	292798	174738	81687	**608909**
TBB_DEF_>=120	20064	1556548	1262881	240278	**3079771**	118721	1929973	1067578	259490	**3375762**
TBB_DEF_100-119	295585	559193	286930	250518	**1392226**	4538	342778	422383	44656	**814355**
TBB_DEF_70-99_G300hp	7186600	4675045	5651267	6883564	**24396476**	7784455	4654971	6393664	7198873	**26031963**
TBB_DEF_70-99_S300hp	244456	279934	104768	168562	**797720**	225683	300123	138521	143318	**807645**
TBB_MCD_70-99	6367	11690	22456	16392	**56905**	2021	3954	40480	14347	**60802**
Total	8028882	8093791	8594351	7927505	**32644529**	8422313	8323634	9350221	8037792	**34133960**

Table 2b. Summary of the total number of valid self-sampled trips per metier for **2017-2018** for each quarter and year.

	2017					**2018**				
Metier	Q1	Q2	Q3	Q4	**Total**	Q1	Q2	Q3	Q4	**Total**
OTB_DEF_100-119	1	2	NA	NA	**3**	NA	1	2	NA	**3**
OTB_DEF_70-99	2	8	1	10	**21**	1	5	5	3	**14**
OTB_MCD_70-99	1	3	12	NA	**16**	1	NA	8	3	**12**
TBB_DEF_>=120	NA	1	NA	NA	**1**	1	2	NA	NA	**3**
TBB_DEF_100-119	2	3	1	NA	**6**	1	1	4	NA	**6**
TBB_DEF_70-99_G300hp	21	9	22	37	**89**	27	21	24	30	**102**
TBB_DEF_70-99_S300hp	7	5	1	10	**23**	5	7	2	13	**27**
Total	34	31	37	57	**159**	36	37	45	49	**167**

Table 3. Sampling and fleet effort (in kWdays) of sampled metiers, and sampling coverage (% of kWdays) per self-sampled metier for **2017-2018**.

Year	**Metier**	**Sampling effort (kWdays)**	**Fleet effort (kWdays)**	**Sampling coverage kWdays (%)**
2017	OTB_DEF_100-119	5233	733565	0.71
	OTB_DEF_70-99	20325	218863	9.29
	OTB_MCD_70-99	58051	722574	8.03
	TBB_DEF_>=120	19024	3079771	0.62
	TBB_DEF_100-119	109839	1392226	7.89
	TBB_DEF_70-99_G300hp	722602	24396476	2.96
	TBB_DEF_70-99_S300hp	24297	797720	3.05
2018	OTB_DEF_100-119	7638	1058352	0.72
	OTB_DEF_70-99	28866	287282	10.05
	OTB_MCD_70-99	22832	376051	6.07
	TBB_DEF_>=120	19063	3375762	0.56
	TBB_DEF_100-119	53459	814355	6.56
	TBB_DEF_70-99_G300hp	952444	26031963	3.66
	TBB_DEF_70-99_S300hp	21754	807645	2.69

Table 4. Average weights (in kg) per hour of discarded (Dis) and landed (Lan) commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod (COD), whiting (WHG) and *Nephrops* (NEP) by metier for **2017-2018**. N= number of sampled trips; *) Metier not sampled.

Year	Metier	N	Dis BLL	Lan BLL	Dis COD	Lan COD	Dis DAB	Lan DAB	Dis NEP	Lan NEP	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis TUR	Lan TUR	Dis WHG	Lan WHG
2017	OTB_DEF_100-119	3	0	0.17	0.003	0	4.81	2.17	0.14	5.99	6.83	119.06	0	0.381	0.08	3.33	2.31	0
	OTB_DEF_70-99	21	0.10	0.83	0.25	0.24	37.45	0.14	22.19	30.15	32.37	30.97	0.04	0.46	0.08	2.08	7.17	0.20
	OTB_MCD_70-99	16	0.02	1.47	0.34	0.19	54.56	0.31	27.47	33.71	28.90	14.22	0	0.50	0.08	3.65	10.38	0.02
	TBB_DEF_>=120	1	0	0	0	0	49.16	0	0	0	58.73	267.14	0	1.46	0	9.03	0	0
	TBB_DEF_100-119	6	0	1.58	0	0	22.96	1.06	0	0	28.47	248.47	0	0	0	1.43	0	0
	TBB_DEF_70-99_G300hp	89	0.24	2.79	0.12	0.25	41.81	2.30	0.20	0.51	91.84	64.92	3.13	30.97	0.79	6.05	5.00	0.41
	TBB_DEF_70-99_S300hp	23	0.37	0.72	0.13	0.06	28.46	0.90	0.02	0.02	51.51	12.25	5.29	18.09	0.44	1.90	4.27	0.20
2018	OTB_DEF_100-119	3	0	0.34	0.11	0	23.28	1.08	0	0	59.06	70.31	0.03	0	3.94	5.62	0	0
	OTB_DEF_70-99	14	0.09	1.18	0.10	0.74	70.35	0.47	13.74	25.43	58.59	25.84	0	0.53	0.82	3.64	4.81	1.37
	OTB_MCD_70-99	12	0	1.23	0.001	0.38	92.50	0.24	72.02	38.00	83.82	20.59	0	0.49	0.47	3.24	7.76	0.05
	TBB_DEF_>=120	3	0	8.38	0	0	17.62	5.68	0.04	0	59.30	216.01	0.09	35.37	0.16	9.03	0.46	0
	TBB_DEF_100-119	6	0.44	1.11	0	0	51.01	4.61	0	0	67.47	160.70	0	0	0.80	6.76	0.03	0
	TBB_DEF_70-99_G300hp	102	0.20	2.03	0.03	0.14	46.62	2.74	0.17	0.42	90.92	44.90	2.69	25.01	0.61	4.92	6.72	0.09
	TBB_DEF_70-99_S300hp	27	0.33	0.89	0.01	0.43	46.27	2.66	0.08	0.11	64.31	28.69	3.25	12.63	0.37	3.62	2.05	0.06

Table 5. Average numbers per hour of discarded (commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod (COD), whiting (WHG) and *Nephrops* (NEP) by metier for **2017-2018**. N= number of sampled trips. *) Metier not sampled.

Year	Metier	N	BLL	COD	DAB	NEP	PLE	SOL	TUR	WHG
2017	OTB_DEF_100-119	3	0	0.06	75.57	7.27	44.62	0	0.16	30.95
	OTB_DEF_70-99	21	0.2	1.69	644.93	1060.7	265.77	0.24	0.17	100.97
	OTB_MCD_70-99	16	0.11	2.23	915.4	1295.21	268.85	0	0.17	154.06
	TBB_DEF_>=120	1	0	0	638.85	0	433.5	0	0	0
	TBB_DEF_100-119	6	0	0	309.6	0	217.78	0	0	0
	TBB_DEF_70-99_G300hp	89	1.11	1.17	814.03	8.88	1034.54	41.62	2.32	72.91
	TBB_DEF_70-99_S300hp	23	2.39	0.98	476.1	1.16	630.58	87.61	1.76	59.05
2018	OTB_DEF_100-119	3	0	0.28	262.58	0	385.64	0.28	13.65	0
	OTB_DEF_70-99	14	0.4	0.44	1156.62	627.61	585.18	0	3.01	64.14
	OTB_MCD_70-99	12	0	0.22	1409.37	3330.68	755.06	0	1.8	95.17
	TBB_DEF_>=120	3	0	0	271.59	0.48	647.82	0.38	0.46	5.58
	TBB_DEF_100-119	6	2.19	0	626.6	0	578.97	0	2.96	0.35
	TBB_DEF_70-99_G300hp	102	1.05	0.21	783.19	6.93	994.54	34.7	2.14	81.91
	TBB_DEF_70-99_S300hp	27	2.87	0.2	741.18	4.46	764.58	56.29	1.56	29.52

Table 6a. Average weights (kg) per hour of discarded (Dis) and landed (Lan) commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod (COD), whiting (WHG) and *Nephrops* (NEP) by metier and quarter (Q) in **2017.**

Metier	Q	N	Dis BLL	Lan BLL	Dis COD	Lan COD	Dis DAB	Lan DAB	Dis NEP	Lan NEP	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis TUR	Lan TUR	Dis WHG	Lan WHG
OTB_DEF_100-119	1	1	0	0.50	0	0	1.60	6.50	0	17.97	6.63	357.17	0	1.14	0	10.00	0.12	0
OTB_DEF_70-99	1	2	0	8.68	0.04	2.56	4.56	1.50	9.81	316.58	34.23	325.18	0	4.85	0.17	21.83	11.32	2.05
OTB_MCD_70-99	1	1	0	23.50	0.05	3.01	10.71	4.93	29.97	539.39	9.51	227.53	0	7.99	0	58.34	10.40	0.40
TBB_DEF_100-119	1	2	0	4.75	0	0	11.92	3.17	0	0	23.84	745.42	0	0	0	4.29	0	0
TBB_DEF_70_99_G300hp	1	21	0.21	11.82	0.18	1.06	52.11	9.73	0.48	2.15	79.55	275.13	2.51	131.24	1.02	25.64	6.72	1.73
TBB_DEF_70_99_S300hp	1	7	0.71	2.37	0.08	0.19	30.31	2.95	0.04	0.05	58.92	40.24	6.71	59.43	0.74	6.24	2.34	0.66
OTB_DEF_100-119	2	2	0	0.25	0.01	0	6.41	3.25	0.21	8.99	6.93	178.58	0	0.57	0.12	5.00	3.41	0
OTB_DEF_70-99	2	8	0	2.17	0.26	0.64	50.21	0.37	22.97	79.14	22.37	81.29	0.10	1.21	0	5.46	11.90	0.51
OTB_MCD_70-99	2	3	0	7.83	1.07	1.00	37.25	1.64	24.35	179.80	20.66	75.84	0	2.66	0.32	19.45	16.95	0.13
TBB_DEF_>=120	2	1	0	0	0	0	49.16	0	0	0	58.73	267.14	0	1.46	0	9.03	0	0
TBB_DEF_100-119	2	3	0	3.17	0	0	25.27	2.11	0	0	26.72	496.95	0	0	0	2.86	0	0
TBB_DEF_70_99_G300hp	2	9	0.22	27.58	0.26	2.46	37.59	22.71	0	5.01	93.68	641.96	3.58	306.22	1.08	59.82	6.31	4.03
TBB_DEF_70_99_S300hp	2	5	0.56	3.31	0.08	0.27	41.28	4.13	0	0.07	52.51	56.33	5.03	83.21	0.15	8.73	2.38	0.92
OTB_DEF_70-99	3	1	0	17.37	0	5.11	15.73	3.00	0.82	633.16	12.28	650.36	0	9.70	0.76	43.67	1.81	4.11
OTB_MCD_70-99	3	12	0.03	1.96	0.18	0.25	62.55	0.41	28.04	44.95	32.57	18.86	0	0.67	0.02	4.86	8.74	0.03
TBB_DEF_100-119	3	1	0	9.50	0	0	38.12	6.34	0	0	43.00	1490.84	0	0	0	8.58	0	0
TBB_DEF_70_99_G300hp	3	22	0.35	11.28	0.12	1.01	62.17	9.29	0	2.05	106.79	262.62	2.94	125.27	0.79	24.47	1.03	1.65
TBB_DEF_70_99_S300hp	3	1	0	16.57	0.45	1.36	9.21	20.63	0	0.37	73.76	281.66	17.29	416.04	0.12	43.67	0.27	4.62
OTB_DEF_70-99	4	10	0.21	1.74	0.31	0.51	35.99	0.30	26.18	63.32	42.00	65.04	0	0.97	0.06	4.37	3.09	0.41
TBB_DEF_70_99_G300hp	4	37	0.21	6.71	0.04	0	24.88	5.52	0.21	1.22	89.48	65.04	3.49	74.49	0.58	14.55	6.06	0.98
TBB_DEF_70_99_S300hp	4	10	0.06	1.66	0.16	0.14	22.68	2.06	0.02	0.04	43.59	28.17	3.22	41.60	0.40	4.37	6.97	0.46

Table 6b. Average weights (kg) per hour of discarded (Dis) and landed (Lan) commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod (COD), whiting (WHG) and *Nephrops* (NEP) by metier and quarter (Q) in **2018.**

Metier	Q	N	Dis BLL	Lan BLL	Dis COD	Lan COD	Dis DAB	Lan DAB	Dis NEP	Lan NEP	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis TUR	Lan TUR	Dis WHG	Lan WHG
OTB_DEF_70-99	1	1	0	16.5	0	10.36	5.25	6.58	1.78	356.05	5.97	361.71	0	7.43	0	51.01	17.05	19.23
OTB_MCD_70-99	1	1	0	14.77	0	4.52	100.85	2.88	3.1	456.05	29.3	247.12	0	5.83	0	38.83	11.96	0.61
TBB_DEF_>=120	1	1	0	25.15	0	0	19.14	17.03	0	0	79.69	648.02	0	106.1	0	27.1	1.18	0
TBB_DEF_100-119	1	1	0	6.63	0	0	4.58	27.67	0	0	20.37	964.22	0	0	0	40.58	0	0
TBB_DEF_70-99_G300hp	1	27	0.21	7.67	0.07	0.52	42.15	10.33	0.14	1.57	54.24	169.62	2.73	94.5	0.48	18.59	10.21	0.34
TBB_DEF_70-99_S300hp	1	5	0.02	4.82	0	2.33	44.35	14.39	0.08	0.61	25.67	154.92	2.7	68.2	0.15	19.57	0.96	0.33
OTB_DEF_100-119	2	1	0	1.02	0	0	17.28	3.25	0	0	14.47	210.93	0	0	0.11	16.87	0	0
OTB_DEF_70-99	2	5	0	3.3	0.21	2.07	54.61	1.32	3.41	71.21	64.39	72.34	0	1.49	0.55	10.2	6.1	3.85
TBB_DEF_>=120	2	2	0	12.58	0	0	16.86	8.51	0.06	0	49.1	324.01	0.14	53.05	0.23	13.55	0.1	0
TBB_DEF_100-119	2	1	0	6.63	0	0	5.81	27.67	0	0	48.02	964.22	0	0	0	40.58	0	0
TBB_DEF_70-99_G300hp	2	21	0.09	9.86	0	0.67	42.45	13.28	0.01	2.02	101.86	218.08	2.28	121.49	0.86	23.9	4.53	0.43
TBB_DEF_70-99_S300hp	2	7	0.25	3.44	0	1.66	35.53	10.28	0	0.44	59.32	110.66	5.51	48.71	0.06	13.98	1.13	0.24
OTB_DEF_100-119	3	2	0	0.51	0.17	0	26.27	1.63	0	0	81.36	105.46	0.05	0	5.85	8.44	0	0
OTB_DEF_70-99	3	5	0.21	3.3	0.06	2.07	101.7	1.32	12.5	71.21	72.71	72.34	0	1.49	1.75	10.2	2.17	3.85
OTB_MCD_70-99	3	8	0	1.85	0	0.56	67.15	0.36	86.15	57.01	56.08	30.89	0	0.73	0.57	4.85	9.28	0.08
TBB_DEF_100-119	3	4	0.66	1.66	0	0	73.92	6.92	0	0	84.11	241.06	0	0	1.2	10.14	0.05	0
TBB_DEF_70-99_G300hp	3	24	0.28	8.63	0.01	0.59	75.74	11.62	0.08	1.77	104.83	190.82	1.35	106.31	1	20.91	2.73	0.38
TBB_DEF_70-99_S300hp	3	2	0.53	12.05	0	5.82	139.96	35.97	0	1.52	106.78	387.3	0.89	170.5	3.03	48.92	0.03	0.84
OTB_DEF_70-99	4	3	0.06	5.5	0	3.45	66.04	2.19	37	118.68	42.93	120.57	0	2.48	0	17	3	6.41
OTB_MCD_70-99	4	3	0	4.92	0	1.51	157.33	0.96	57.32	152.02	175.99	82.37	0	1.94	0.38	12.94	2.31	0.2
TBB_DEF_70-99_G300hp	4	30	0.2	6.9	0.04	0.47	30.27	9.3	0.39	1.41	105.15	152.66	4	85.05	0.24	16.73	8.3	0.3
TBB_DEF_70-99_S300hp	4	13	0.45	1.85	0.03	0.9	38.38	5.53	0.13	0.23	75.32	59.58	2.6	26.23	0.2	7.53	3.28	0.13

Table 7a. Average numbers per hour of discarded (Dis) commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod (COD), whiting (WHG) and *Nephrops* (NEP) by metier and quarter (Q) in **2017**.

Metier	**Q**	**N**	**BLL**	**COD**	**DAB**	**NEP**	**PLE**	**SOL**	**TUR**	**WHG**
OTB_DEF_100-119	1	1	0	0	21.29	0	43.27	0	0	0.64
OTB_DEF_70-99	1	2	0	0.95	57.05	450.01	259.96	0	0.32	126.47
OTB_MCD_70-99	1	1	0	0.66	138.05	1669.07	73.45	0	0	92.06
TBB_DEF_100-119	1	2	0	0	133.05	0	169.57	0	0	0
TBB_DEF_70_99_G300hp	1	21	1.13	3.15	909.43	21.17	954.11	32.09	2.22	103.31
TBB_DEF_70_99_S300hp	1	7	4.5	1.31	453.14	2.58	613.92	110.60	2.68	42.44
OTB_DEF_100-119	2	2	0	0.09	102.71	10.91	45.29	0	0.25	46.10
OTB_DEF_70-99	2	8	0	2.64	915.85	1077.63	193.70	0.63	0	159.48
OTB_MCD_70-99	2	3	0	8.77	701.37	1014.43	200.54	0	0.68	285.83
TBB_DEF_>=120	2	1	0	0	638.85	0	433.50	0	0	0
TBB_DEF_100-119	2	3	0	0	339.16	0	205.44	0	0	0
TBB_DEF_70_99_G300hp	2	9	1.18	1.92	671.31	0	1196.96	45.62	3.05	73.65
TBB_DEF_70_99_S300hp	2	5	3.84	0.94	635.44	0	766.13	69.63	0.50	31.65
OTB_DEF_70-99	3	1	0	0	263.49	29.52	120.00	0	1.75	31.90
OTB_MCD_70-99	3	12	0.15	0.72	1033.69	1334.25	302.21	0	0.05	126.28
TBB_DEF_100-119	3	1	0	0	574.01	0	351.20	0	0	0
TBB_DEF_70_99_G300hp	3	22	1.51	0.67	1240.65	0	1166.61	39.52	3.04	15.11
TBB_DEF_70_99_S300hp	3	1	0	3.14	278.12	0	1364.68	282.65	1.57	9.78
OTB_DEF_70-99	4	10	0.41	1.25	583.91	1272.42	339.15	0	0.12	55.96
TBB_DEF_70_99_G300hp	4	37	0.83	0.17	540.94	9.35	962.16	47.30	1.78	89.84
TBB_DEF_70_99_S300hp	4	10	0.42	0.54	432.29	0.87	501.06	61.00	1.75	89.31

Table 7b. Average numbers per hour of discarded (Dis) commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod (COD), whiting (WHG) and *Nephrops* (NEP) by metier and quarter (Q) in **2018**.

Metier	Q	N	BLL	COD	DAB	NEP	PLE	SOL	TUR
OTB_DEF_70-99	1	1	0	0	92.91	102.18	55.19	0	0
OTB_MCD_70-99	1	1	0	0	1903.24	170.49	338.33	0	0
TBB_DEF_>=120	1	1	0	0	319.2	0	890.4	0	0
TBB_DEF_100-119	1	1	0	0	54.53	0	157.61	0	0
TBB_DEF_70-99_G300hp	1	27	1.15	0.45	721.11	4.69	675.17	36.59	1.77
TBB_DEF_70-99_S300hp	1	5	0.2	0.07	610	1.95	312.3	46.1	0.59
OTB_DEF_100-119	2	1	0	0	227.76	0	99.45	0	0.47
OTB_DEF_70-99	2	5	0	1.04	1027.72	165.5	640.02	0	2.18
TBB_DEF_>=120	2	2	0	0	247.78	0.73	526.53	0.56	0.69
TBB_DEF_100-119	2	1	0	0	97.57	0	389.65	0	0
TBB_DEF_70-99_G300hp	2	21	0.27	0.02	733.29	0.14	1161.81	29.56	2.85
TBB_DEF_70-99_S300hp	2	7	1.39	0	576.82	0	696.65	79.82	0.26
OTB_DEF_100-119	3	2	0	0.42	279.99	0	528.74	0.42	20.25
OTB_DEF_70-99	3	5	0.86	0.2	1573.28	494.58	768.75	0	6.24
OTB_MCD_70-99	3	8	0	0.33	1053.61	4030.37	586.11	0	2.22
TBB_DEF_100-119	3	4	3.28	0	901.87	0	731.64	0	4.45
TBB_DEF_70-99_G300hp	3	24	1.11	0.02	1206.8	2.49	1073.75	15.47	3.46
TBB_DEF_70-99_S300hp	3	2	2.41	0	2175.07	0	1478.68	13.54	10.82
OTB_DEF_70-99	4	3	0.42	0	1031.59	1794.63	364.5	0	0
OTB_MCD_70-99	4	3	0	0	2193.43	2518.24	1344.5	0	1.27
TBB_DEF_70-99_G300hp	4	30	1.47	0.27	535.1	17.26	1101.52	51.99	0.93
TBB_DEF_70-99_S300hp	4	13	4.77	0.4	659.53	8.5	865.24	54.11	1.22

Table 8a. Average numbers per hour of discarded fish species in Dutch demersal fisheries by metier in **2017**.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Agonus cataphractus	0	0.31	0.77	3.94	0.72	5.95	49.83
Alosa fallax	0	0	0	0	0	0.02	0
Amblyraja radiata	1.18	1.62	0.11	0	5.47	0.66	0.62
Ammodytes sp.	0	0	0	6.64	3.7	2.63	1.5
Ammodytes tobianus	0	0	0	0	0.5	0	0
Arnoglossus laterna	3.74	11.26	7.12	3.32	2.15	69.64	38.28
Belone belone	0	0	0	0	0	0	0
Buglossidium luteum	1.1	2.71	3.65	21.89	3.82	68.78	24.91
Callionymus lyra	0.43	11.06	9.15	8.61	1.32	26.9	24.38
Callionymus reticulatus	0	0	0	0	0	0.24	0.15
Chelidonichthys cuculus	0	0	0	0	0	0.64	0
Chelidonichthys lucerna	0	4.05	0.55	3.32	0	6.72	7.12
Ciliata mustela	0	0	0	0	0	0	0.3
Clupea harengus	0.18	0.54	0.03	0	0	1.04	0.12
Dicentrarchus labrax	0	0	0	0	0	0.38	0.18
Echiichthys vipera	0	0	0	0	0	19.29	1.16
Enchelyopus cimbrius	0	4.14	3.84	0	0	1.22	0.2
Entelurus aequoreus	0	0	0	0	0	0	0
Eutrigla gurnardus	41.35	116.09	83.59	34.33	14.93	47.26	15.3
Gadus morhua	0.06	1.69	2.23	0	0	1.17	0.98
Glyptocephalus cynoglossus	0	3.94	0.77	0	0	0.02	0
Gobius niger	0	0	0	0	0	0	0
Hippoglossoides platessoides	0.06	12.46	5.62	0	0.62	0.27	0
Hyperoplus lanceolatus	0	0	0	0	0.11	2.54	0.32
Leucoraja naevus	0	0	0	0	0	0	0
Limanda limanda	75.57	644.93	915.4	638.85	309.6	814.03	476.1
Linophryne coronata	0	0	0	0	0	0	0
Liparis liparis liparis	0	0	0	0	0	0	0
Lophius piscatorius	0	0.15	0	0	0.21	0.02	0
Melanogrammus aeglefinus	0	0.17	0.01	0	0	0.02	0
Merlangius merlangus	30.95	100.97	154.06	0	0	72.91	59.05
Microchirus variegatus	0	0	0	0	0	0.14	0
Microstomus kitt	0.42	7.51	4.52	0	28.91	6.17	2.52
Molva molva	0	0	0	0	0	0	0

Table 8a. Continued.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Mullus surmuletus	0	0.58	0.56	0	0	3.14	0.48
Mustelus sp.	0	0.12	0.15	0	0	0.49	0
Myoxocephalus scorpius	0	0.15	0.75	0	0.06	0.87	7.63
Parablennius gattorugine	0	0	0	0	0	0	0.09
Pegusa lascaris	0	0	0	0	0	0.06	0
Phrynorhombus norvegicus	0	0.55	0.14	0	0	0.17	0
Platichthys flesus	0	0.09	0	0	0	0.27	3.82
Pleuronectes platessa	44.62	265.77	268.85	433.5	217.78	1034.54	630.58
Pomatoschistus sp.	0	0.07	0	0	0	1.22	0.68
Raja brachyura	0	0	0	0	0	1.17	0
Raja clavata	0	0.06	0	0	0	4.65	1.01
Raja montagui	0.13	2.2	0.88	0	0.76	6.27	0.99
Sardinops sagax	0	0	0	0	0.21	0	0
Scomber scombrus	0	0.27	0.23	0	0	0.05	0
Scophthalmus maximus	0.16	0.17	0.17	0	0	2.32	1.76
Scophthalmus rhombus	0	0.2	0.11	0	0	1.11	2.39
Scyliorhinus canicula	0	0.8	0.75	0	0	4.41	0.26
Solea solea	0	0.24	0	0	0	41.62	87.61
Sprattus sprattus	0	0.05	0.08	0	0	0.48	0
Squalus acanthias	0.06	0.03	0	0	0	0	0
Symphodus melanocercus	0	0	0	0	0	0	0
Syngnathus acus	0	0	0	0	0	0.06	0.18
Syngnathus rostellatus	0	0	0	0	0	0	0
Trachinus draco	0	0	0	0	0	0.54	0.06
Trachurus	0	0.02	0	0	0	0.01	0.05
Trachurus esmarkii	0	0	0.06	0	0	0	0
Trisopterus luscus	0	0.26	0.14	0	0	6.16	5
Trisopterus minutus	0	0	0.43	0	0	2.01	0
Zeus faber	0	0	0	0	0	0.05	0

Table 8b. Average numbers per hour of discarded fish species in Dutch demersal fisheries by metier in **2018**.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Agonus cataphractus	0	0.38	0.23	0	0.49	5.49	5.81
Alosa fallax	0	0	0	0	0	0.08	0.06
Amblyraja radiata	0.58	0.58	0.5	12.23	1.44	0.34	0.44
Ammodytes sp.	0	0	0	17.48	0.49	1.64	3.3
Ammodytes tobianus	0	0	0	0	0	0.16	0
Arnoglossus laterna	0.13	22.8	15.6	42.56	3.22	46.05	37.11
Belone belone	0	0	0	0	0	0	0.05
Buglossidium luteum	0.58	5.7	3.69	28.39	11.2	48.48	37.5
Callionymus lyra	0	21.7	12.63	8.01	4.38	23.16	10.82
Callionymus reticulatus	0	0	0	0	0	0.02	0.03
Chelidonichthys cuculus	0	0	0.16	0	0	1.7	0
Chelidonichthys lucerna	0	0.21	0.61	0	0	6.15	3.4
Ciliata mustela	0	0	0	0	0	0.13	0.02
Clupea harengus	0	0.3	3.41	0	0.08	0.96	0.6
Dicentrarchus labrax	0	0	0	0	0	0.05	0
Echiichthys vipera	0	0	0	0	0	18.78	1.99
Enchelyopus cimbrius	0	2.42	4.84	0	0	2.06	1.21
Entelurus aequoreus	0	0	0	0	0	0.05	0.01
Eutrigla gurnardus	62.41	98.63	123.72	89.06	28.34	44.12	22.64
Gadus morhua	0.28	0.44	0.22	0	0	0.21	0.2
Glyptocephalus cynoglossus	0	3.04	6.15	0	0	0.09	0
Gobius niger	0	0	0	0	0	0.07	0
Hippoglossoides platessoides	0.67	13.65	19.88	8.79	0.07	0.5	0.23
Hyperoplus lanceolatus	0	0	0	9.24	0.49	2.31	0.1
Leucoraja naevus	0.25	0	0	0	0	0.03	0
Limanda limanda	262.58	1156.62	1409.37	271.59	626.6	783.19	741.18
Linophryne coronata	0	0	0	0	0	0.07	0
Liparis liparis liparis	0	0	0	0	0	0.05	0.12
Lophius piscatorius	0	0.05	1.37	0.48	0.31	0.02	0.12
Melanogrammus aeglefinus	0	0	0.16	0	0	0.01	0
Merlangius merlangus	0	64.14	95.17	5.58	0.35	81.91	29.52
Microchirus variegatus	0	0	0	0	0	0.12	0
Microstomus kitt	10.42	6.9	14.63	6.21	9.92	7.69	9.57
Molva molva	0	0.07	0	0	0	0	0

Table 8b. Continued.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Mullus surmuletus	0	1.3	2.04	0	0	12.76	1.53
Mustelus sp.	0	0	0	0	0	0	0
Myoxocephalus scorpius	0	0	0	0	0	0	0
Parablennius gattorugine	0	0	0	0	0	0	0
Pegusa lascaris	0	0	0	0	0	0.1	0
Phrynorhombus norvegicus	0	0.64	0.47	0	0	0.05	0
Platichthys flesus	0	0.1	0	0	0	1.62	4.1
Pleuronectes platessa	385.64	585.18	755.06	647.82	578.97	994.54	764.58
Pomatoschistus sp.	0	0	0	0	0	0.39	0.93
Raja brachyura	0	0	0	0	0	0.95	0
Raja clavata	0	0.11	0	0	0.25	3.03	0.24
Raja montagui	3.13	0.57	1.32	0	0.31	6.09	0.27
Sardinops sagax	0	0	0	0	0	0	0
Scomber scombrus	0	0	0	0	0	0.03	0
Scophthalmus maximus	13.65	3.01	1.8	0.46	2.96	2.14	1.56
Scophthalmus rhombus	0	0.4	0	0	2.19	1.05	2.87
Scyliorhinus canicula	0.48	0.63	1.07	0.38	0.31	5.61	0.18
Solea solea	0.28	0	0	0.38	0	34.7	56.29
Sprattus sprattus	0	0.43	0.79	0	0	0.6	1.1
Squalus acanthias	0	0	0	0	0	0	0
Symphodus melanocercus	0	0	0	0	0	0.11	0
Syngnathus acus	0	0	0	0	0	0.02	0.31
Syngnathus rostellatus	0	0	0	0	0	0	0.16
Trachinus draco	0	0	0	0	0	0.92	0
Trachurus trachurus	0	0	0	0	0	0.11	0.11
Trachurus esmarkii	0	0	0	0	0	0	0
Trisopterus luscus	0	0.17	0.26	0	0	8.22	1.11
Trisopterus minutus	0	0.2	0	0	0	0.84	0.06
Zeus faber	0	0	0	0	0	0.04	0

Table 9a. Average numbers per hour of discarded benthos species in Dutch demersal fisheries by metier in **2017**.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Abra alba	0	0	0	0	0	0	46.34
Abra prismatica	0	0.88	0	0	0.22	1.35	0
Acanthocardia echinata	0.06	0.77	0.19	0	2.39	21.09	9.00
Adamsia carciniopados	0	0	0	0	0	0.31	0
Aequipecten opercularis	0	1.19	0.34	0	1.05	5.56	9.16
Alcyonidium diaphanum	0	0	0.13	0	0.65	4.11	0.03
Alcyonium digitatum	0.66	1.04	1.04	0	2.62	9.24	3.73
Alitta virens	0	0.07	0.11	0	0.65	0.23	0
Alloteuthis subulata	0.06	0.37	0.30	0	0.16	0.43	0.29
Anthozoa	0.04	0.87	1.14	0	0	3.68	5.96
Aphrodita aculeata	11.46	63.99	20.62	0	39.99	64.33	17.48
Aporrhais pespelecani	0	0	0	0	0.05	0	0
Arctica islandica	0.28	0.95	0.03	0	1.89	1.46	0.06
Ascidiella scabra	0	0.85	0	0	0	1.02	1.30
Asterias rubens	38.65	170.84	78.92	1906.57	153.65	983.59	2359.00
Astropecten irregularis	19.10	63.57	49.59	3216.24	1177.18	3059.22	621.26
Atelecyclus	0	0	0	0	0	0	0
Atelecyclus rotundatus	0	0.02	0	0	0	0.14	0
Aurelia aurita	0	0	0	0	0	0	0.16
Buccinum undatum	0.81	1.23	0.45	0	11.26	17.60	4.97
Cancer bellanius	0	0	0	0	0	0	0
Cancer pagurus	0.70	6.00	4.10	104.56	1.05	2.80	1.33
Carcinus maenas	0	0	0	0	0	0	0.31
Carnosa	0	0	0	0	0.05	0	0
Chamelea striatula	0	0	0	0	0	0.97	0.30
Chrysaora hysoscella	0	0	0	0	0	0.38	0
Colus gracilis	0	0	0	0	0	0	0
Corbicula fluminea	0	0	0	0	0	0.06	0
Corystes cassivelaunus	0.06	7.75	2.20	481.15	98.71	78.08	26.39
Crangon crangon	0	0	0	0	0	0.06	2.33
Crangonidae	0	0	0	0	0	0	0
Crassostrea gigas	0	0	0	0	0	0	0.09
Crepidula fornicata	0	0.30	0.26	0	0.21	1.19	20.76
Cyanea lamarckii	0	0	0	0	0	0	0

Table 9a. Continued.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Cyanea sp.	0	0	0	0	0	0	0
Dendronotus frondosus	0	0	0	0	0	0	0
Diogenes pugilator	0	0	0	0	0	0	3.25
Donax	0	0	0	0	0	0	0
Donax vittatus	0	0	0	0	0.10	0.38	0.22
Dosinia exoleta	0	0	0	0	0.11	0	0
Dosinia lupinus	0	0	0	0	0	0	0
Dosinia sp.	0	0	0	0	0	0.69	0
Dromia personata	0	0	0	0	0	0	0
Ebalia sp.	0	0	0	0	0	0	0
Echinidae	0	0	0	0	0	0	0
Echinocardium cordatum	1.77	16.05	6.84	0	4.77	571.93	120.06
Echiurus echiurus	0	0	0	0	0	0	0
Ectopleura larynx	0	0	0	0	0	0.68	0.30
Eledone cirrhosa	0	0	0	0	0	0	0
Ensis leei	0	0	0	0	0	0.01	1.24
Ensis siliqua	0	0	0	0	0	0	3.04
Ensis sp.	0	0	0	0	0	0	0.03
Euspira catena	0	0	0	0	0.49	9.98	12.17
Euspira nitida	0	0	0	0	0	0	0
Flustra foliacea	0	0.14	0.33	0	0.30	1.08	1.66
Flustra sp.	0	0	0	0	0	0	0
Gari fervensis	0	0	0	0	0.44	0	0
Gibbula cineraria	0	0	0	0	0	0.10	0
Gibula sp.	0	0	0	0	0	0	0
Glycymeris glycymeris	0	0	0	0	0	0.01	0
Goneplax rhomboides	0.92	14.47	25.08	0	0	53.69	29.39
Gymnolaemata	0	0	0	0	0	0	0
Halecium halecinum	0	0	0.18	0	0.22	0.80	0.29
Halichondria panicea	0.91	1.04	1.96	0	6.17	2.34	0.41
Holothuroidae	0	0	0	0	0	0	0
Homarus gammarus	0	0	0	0	0	0.04	0
Hyas araneus	0	0	0	0	0	0.04	0
Hyas coarctatus	0	0	0.26	0	0	0.34	0
Hyas sp.	0	0	0	0	0.08	0.49	0

Table 9a. Continued.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Hydrobia sp.	0	0	0	0	0	0	0
Hydrozoa	0	0	0	0	0	0.02	0
Inachus dorsettensis	0	0	0	0	0	0.14	0
Inachus sp.	0	0	0	0	0	0.09	0
Laevicardium crassum	0	0	0	0	0	0.36	0.09
Lanice conchilega	0	0	0	0	0	0	0
Lepadidae	0	0	0	0	0	0.04	0
Liocarcinus depurator	11.77	166.61	212.58	86.32	0.88	215.21	493.77
Liocarcinus holsatus	20.06	53.73	53.74	134.49	23.37	414.16	699.56
Liocarcinus marmoreus	0	0	0	0	0	8.57	20.06
Liocarcinus navigator	0	0	0	0	0	0.13	5.83
Liocarcinus pusillus	0	0	0	0	0	0.05	0
Lithodes maja	0	0	0	0	0	0.11	0
Loliginidae	0	0	0	0	0	0	0
Loligo forbesii	0	0.50	0.04	0	0	0.83	0.06
Loligo sp.	0	0	0.17	0	0	0.15	0.05
Loligo vulgaris	0	0	0	0	0	0.16	0
Luidia sarsii	0.06	0.67	0.48	0	0.91	0.61	0.14
Lutraria lutraria	0	0	0	0	0	0.05	0.57
Macropodia rostrata	0	0	0	0	0	11.14	18.71
Macropodia tenuirostris	0	0	0	0	0	0	0.08
Mactra sp.	0	0	0	0	0	0	0.06
Mactra stultorum	0	0	0	10.79	0.10	18.39	1.13
Maja	0	0	0	0	0	0	0
Maja squinado	0	0	0	0	0	0.71	0.59
Meiosquilla	0	0	0	0	0	0	0
Metridium dianthus	0	0	0	0	0	0.30	0.01
Mya arenaria	0	0	0	0	0	0	0.03
Mya truncata	0	0.17	0.09	0	0	0	0.45
Mytilus edulis	0	0	0.16	0	0	3.87	26.20
Nassarius incrassatus	0	0	0	0	0	0	0
Nassarius nitidus	0	0	0	0	0	0	1.36
Nassarius reticulatus	0	0	0	0	0	0.01	7.96
Nassarius sp.	0	0	0	0	0	0	0

Table 9a. Continued.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Necora puber	0	0.54	0.12	0	0	15.58	13.76
Nemertesia antennina	0	0	0	0	0	0.23	0
Nemertesia sp.	0	0	0.11	0	0	0.25	0.74
Nephrops norvegicus	7.27	1060.70	1295.21	0	0	8.88	1.16
Neptunea antiqua	0.22	1.44	0.22	0	0.55	0.56	0
Nereis sp.	0	0	0.17	0	0	0	0
Nucula nucleus	0	0	0	0	0	0.04	0
Ophiothrix fragilis	0.61	0.21	2.35	0	0.99	1.03	0.43
Ophiura albida	0	18.80	11.49	0	0.11	6.00	97.36
Ophiura ophiura	0	0.53	1.04	0	2.66	207.37	1539.59
Pagurus bernhardus	5.74	62.36	28.95	149.02	81.85	116.53	137.69
Pagurus prideaux	0	0	0	0	0	1.00	0.03
Palaemon elegans	0	0	0	0	0	0	0.11
Palaemon serratus	0	0	0	0	0	0	0.02
Palaemon sp.	0	0	0	0	0	0	0.09
Pandalus montagui	0	0	0	0	0	0	0
Pecten maximus	0	0	0	0	0.29	0.11	0
Phitisica marina	0	0	0	0	0	0	0
Pilumnus hirtellus	0	0	0	0	0	0.03	0
Pinnotheres pisum	0	0	0	0	0	0.06	0
Pirimela denticulata	0	0	0	0	0	0.02	0
Pisidia longicornis	0	0.07	0	0	0.05	6.91	0
Platyhelminthes	0	0	0	0	0	0.02	0
Porifera	0	0	0	0	0	0	0
Portumnus latipes	0	0	0	0	0	0.01	0
Psammechinus miliaris	0	0.04	0.06	0	0.44	104.10	330.89
Rhizostoma pulmo	0	0	0	0	0	0	0.09
Rossia macrosoma	0	0	0	0	0	0.02	0
Sabellaria	0	0	0	0	0	0.10	0
Sabellaria alveolata	0	0	0	0	0	1.02	0
Scalibregma inflatum	0	0.10	0	0	0.08	0.05	0
Scrobicularia plana	0	0	0	0	0	0	0
Sepia officinalis	0	0	0	0	0	0.79	0
Sepiola atlantica	0	0	0	0	0	0.03	0
Sepiola sp.	0	0.01	0.06	0	0	0	0

Table 9a. Continued.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Solen marginatus	0	0	0	0	0.05	0.29	0
Spatangus purpureus	0	0	0	0	0	0.11	0
Spisula elliptica	0	0	0	0	0	0.13	1.84
Spisula solida	0	0	0	0	0	4.14	0.51
Spisula sp.	0	0	0	0	0	0.46	0.23
Spisula subtruncata	0	0	0	0	0	1.15	500.29
Suberites ficus	0	0	0	0	0	0.02	0
Thia scutellata	0	0	0	0	0	0	0.02
Tubularia indivisa	0	0	0	0	0	0.63	0.64
Tubularia sp.	0	0	0	0	0	0.03	0
Turritella communis	0	0	0.10	0	0	0.07	0.09
Urticina felina	0	0	0	0	0	0	0.02
Venerupis corrugata	0	0	0	0	0	0.02	0.29
Xantho pilipes	0	0	0	0	0	0.04	0

Table 9b. Average numbers per hour of discarded benthos species in Dutch demersal fisheries by metier in **2018**.

Metier / **Species**	**OTB_DEF_100-119**	**OTB_DEF_70-99**	**OTB_MCD_70-99**	**TBB_DEF_>=120**	**TBB_DEF_100-119**	**TBB_DEF_70-99_G300hp**	**TBB_DEF_70-99_S300hp**
Abra alba	0	0	0	0	0	0	14.92
Abra prismatica	0	0	0	0	0	4.51	0.71
Acanthocardia echinata	0	2.13	1.23	0	3.21	7.29	64.63
Adamsia carciniopados	0	0	0	0	0	4.84	0
Aequipecten opercularis	0	2.06	1.48	0	0.58	15.69	0.70
Alcyonidium diaphanum	1.97	0	0.34	0	5.40	2.04	0.06
Alcyonium digitatum	13.12	2.37	3.61	1.50	2.27	16.95	0.86
Alitta virens	0	0	0.37	0.48	0.13	0.02	0.79
Alloteuthis subulata	0	0.17	0.16	0	0.07	0.26	0.15
Anthozoa	0	0.17	0.60	0	0.70	4.28	1.58
Aphrodita aculeata	15.30	163.64	46.54	23.71	8.76	65.55	22.03
Aporrhais pespelecani	0	0	0	0	0	0	0
Arctica islandica	0	0.10	0.21	54.24	0.88	2.95	1.17
Ascidiella scabra	0	0	0	0	0	0.33	0
Asterias rubens	146.52	576.12	325.91	226.42	931.76	987.62	2146.45
Astropecten irregularis	8.56	188.31	81.90	3023.37	1470.53	2200.98	2185.11
Atelecyclus	0	0	0	0	0	0.02	0
Atelecyclus rotundatus	0	0	0	0	0	0.95	0
Aurelia aurita	0	0	0	0	0	0	4.44
Buccinum undatum	2.37	2.42	0.97	0	5.32	42.12	8.32
Cancer bellanius	0	0	0	0	0	0.04	0
Cancer pagurus	2.82	4.12	10.42	11.98	8.88	3.79	0.69
Carcinus maenas	0	0	0	0	0	0	2.73
Carnosa	0	0	0	0	0	0	0
Chamelea striatula	0	0	0	0	0	0.14	0.07
Chrysaora hysoscella	0	0	0	0	0	0	0.12
Colus gracilis	0	0	0.16	0	0	0	0
Corbicula fluminea	0	0		0	0	0	0
Corystes cassivelaunus	7.40	57.14	2.71	4.69	66.52	86.36	230.66
Crangon crangon	0	0	0	0	0	0.96	28.87
Crangonidae	0	0	0	0	0	0.02	0
Crassostrea gigas	0	0	0	0	0	0	0
Crepidula fornicata	0	0	0	0	0	8.67	20.01
Cyanea lamarckii	0	0	0	0	0	0	0

Table 9b. Continued.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Cyanea sp.	0	0	0	0	0	0.04	0
Dendronotus frondosus	0	0	0	0	0	0.01	0
Diogenes pugilator	0	0	0	0	0	0.29	10.04
Donax	0	0	0	0	0	0	0.01
Donax vittatus	0	0.17	0	0	0	0.03	0.51
Dosinia exoleta	0	0	0	0	0	0	0
Dosinia lupinus	0	0	0	1.80	0	0.02	0
Dosinia sp.	0	0	0.39	0	0	0.08	0.24
Dromia personata	0	0	0	0	0	0.14	0
Ebalia sp.	0	0	0	0	0	0.20	0
Echinidae	0.31	0	0	0	0	0	0
Echinocardium cordatum	0	28.81	10.40	3580.28	1.63	187.46	139.40
Echiurus echiurus	0	0	0	0	0	0.06	0
Ectopleura larynx	0	0	0	0	0	0.86	0
Eledone cirrhosa	0	0.07	0	0	0	0	0
Ensis leei	0	0	0	0	0	0	0.72
Ensis siliqua	0	0	0	0	0	0	0
Ensis sp.	0	0	0	0	0	0.12	3.03
Euspira catena	0.16	0	0	0	1.93	13.39	5.28
Euspira nitida	0	0	0	0	0	0.02	5.05
Flustra foliacea	1.23	1.00	0.10	1.87	4.29	3.04	0.33
Flustra sp.	0	0	0	0	0	0.01	0
Gari fervensis	0	0	0	0	0	0.03	0.02
Gibbula cineraria	0	0	0	0	0	0	0
Gibula sp.	0	0	0	0	0	0.02	0
Glycymeris glycymeris	0	0	0	0	0	0.09	0
Goneplax rhomboides	0	23.73	24.34	10.94	0	476.74	11.28
Gymnolaemata	0	0	0	0	0	0.03	0
Halecium halecinum	0.86	1.84	0.16	0	0.73	2.35	0.51
Halichondria panicea	12.30	0.37	5.05	0	2.93	0.76	2.99
Holothuroidae	0	0.21	0	0	0	0.09	0
Homarus gammarus	0	0	0	0	0	0.02	0
Hyas araneus	0	0	0	0	0	0.72	0
Hyas coarctatus	0	0	0.37	0	0	0.82	0.08
Hyas sp.	0	0	0.74	0	0	0.03	0

Table 9b. Continued.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Hydrobia sp.	0	0	0	0	0	0.24	0
Hydrozoa	0	0	0	0	0	0.31	0.06
Inachus dorsettensis	0	0	0	0	0	4.03	0.21
Inachus sp.	0	0	0	0	0	0.03	0
Laevicardium crassum	0	0	0	0.93	0	1.20	0.10
Lanice conchilega	0	0	0	0	0	0.87	0
Lepadidae	0	0	0	0	0	0	0
Liocarcinus depurator	7.93	259.38	164.97	160.39	52.03	121.61	173.88
Liocarcinus holsatus	6.97	45.11	52.33	122.23	70.61	324.04	947.71
Liocarcinus marmoreus	0	0	0	3.73	3.95	7.94	15.86
Liocarcinus navigator	0	0	0	0	0	0	0.08
Liocarcinus pusillus	0	0	0	0	0	0	0
Lithodes maja	0	0	0	0	0	0	0
Loliginidae	0	0	0	0	0	0.01	0
Loligo forbesii	0	0	0	0	0	0.33	0.24
Loligo sp.	0	0	0	0	0	0.24	0.06
Loligo vulgaris	0	0	0	0	0	0.10	0.02
Luidia sarsii	0	0	0	5.06	1.40	0.54	1.18
Lutraria lutraria	0	0	0.22	0	0	0.24	0.34
Macropodia rostrata	0	0	0	0	0	12.38	9.04
Macropodia tenuirostris	0	0	0.37	0	0	0.01	0.06
Mactra sp.	0	0	0	0	0	0.13	0
Mactra stultorum	0	0.17	0.16	0	0.07	6.43	0.70
Maja	0	0	0	0	0	0.09	0
Maja squinado	0	0	0	0	0	0.66	0
Meiosquilla	0	0	0	0	0	0.02	0
Metridium dianthus	0	0	0	0	0	0.21	0
Mya arenaria	0	0	0	0	0	0	0.28
Mya truncata	0	0.20	0.94	0	0	0.04	0.08
Mytilus edulis	0	0	0	0	0	4.37	98.46
Nassarius incrassatus	0	0	0	0	0	0.06	0
Nassarius nitidus	0	0	0	0	0	0	7.74
Nassarius reticulatus	0	0	0	0	0	0	9.12
Nassarius sp.	0	0	0	0	0	0	0.19

Table 9b. Continued.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Necora puber	16.76	0.52	0.70	0	0	25.78	5.44
Nemertesia antennina	0	0	0	0	0	4.09	0
Nemertesia sp.	0	0	0	0	0	2.28	0
Nephrops norvegicus	0	627.61	3330.68	0.48	0	6.93	4.46
Neptunea antiqua	0	0.49	2.99	0	0.07	0.12	0.18
Nereis sp.	0	0.10	0	0	0	0	0.13
Nucula nucleus	0		0	0	0	0	0
Ophiothrix fragilis	11.92	0.36	5.76	0	4.08	0.55	0.36
Ophiura albida	0.67	15.50	6.28	0	0	5.01	57.14
Ophiura ophiura	2.58	6.74	6.22	0	0.13	223.45	1239.89
Pagurus bernhardus	8.97	80.07	180.95	99.16	32.62	87.11	142.32
Pagurus prideaux	0	0	0	0	0	5.52	0
Palaemon elegans	0	0	0	0	0	0	0
Palaemon serratus	0	0	0	0	0	0.01	0
Palaemon sp.	0	0	0	0	0	0	0
Pandalus montagui	0	0	0	0	0	0.03	0
Pecten maximus	0	0	0	0	0	0.08	0
Phitisica marina	0	0	0	0	0	0.01	0
Pilumnus hirtellus	0	0	0	0	0	0.74	0
Pinnotheres pisum	0	0	0	0	0	0	0
Pirimela denticulata	0	0	0	0	0	0	0
Pisidia longicornis	0	0	0	0	0	0.16	0.12
Platyhelminthes	0	0	0	0	0	0	0
Porifera	0	0	0	0	0	0.01	0
Portumnus latipes	0	0	0	0	0	0.02	0
Psammechinus miliaris	0	0.47	0.39	0	0	321.84	87.90
Rhizostoma pulmo	0	0	0	0	0	0.04	0.44
Rossia macrosoma	0	0	0	0	0	0	0
Sabellaria	0	0	0	0	0	0.67	0
Sabellaria alveolata	0	0	0	0	0	3.99	0.26
Scalibregma inflatum	0	0	0.87	0	0	0.10	0
Scrobicularia plana	0	0	0	0	0	0	0.05
Sepia officinalis	0	0	0	0	0	1.48	0
Sepiola atlantica	0	0	0	0	0	0	0
Sepiola sp.	0	0	0	0	0	0	0

Table 9b. Continued.

Metier / Species	OTB_DEF_100-119	OTB_DEF_70-99	OTB_MCD_70-99	TBB_DEF_>=120	TBB_DEF_100-119	TBB_DEF_70-99_G300hp	TBB_DEF_70-99_S300hp
Solen marginatus	0	0	0	0	0.49	0.04	0.62
Spatangus purpureus	0	0	0	0	0	0.39	1.89
Spisula elliptica	0	0	0	0	0	0.20	0.06
Spisula solida	0	0	0	0	0	0.23	0.54
Spisula sp.	0	0	0	0	0	0	0
Spisula subtruncata	0	0	0	0	0.25	1.19	21.62
Suberites ficus	0	0	0	0	0	0	0
Thia scutellata	0	0	0	0	0	0	0
Tubularia indivisa	0	0	0	0	0	0.59	0.30
Tubularia sp.	0	0	0	0	0	0.08	2.39
Turritella communis	0	0	0	0	0	0	0
Urticina felina	0	0	0	0	0	0	0
Venerupis corrugata	0	0	0	0	0	0	0.95
Xantho pilipes	0	0	0	0	0	0	

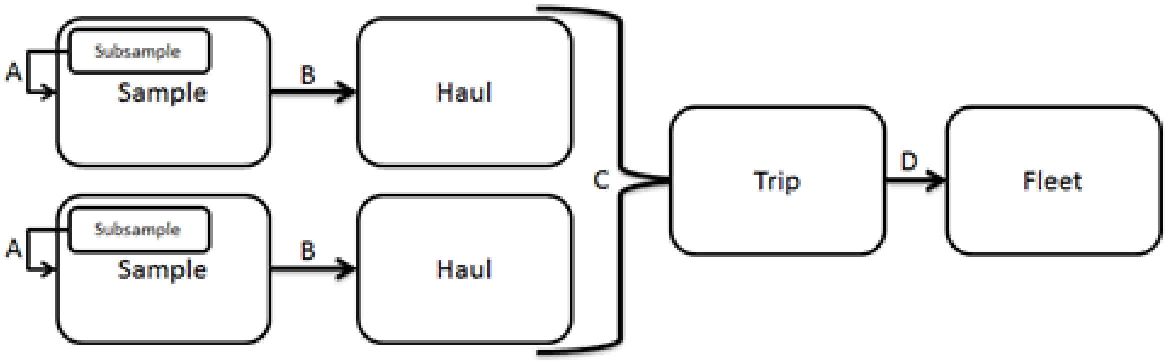
Table 10a. Average weights (kg) and numbers per hour of landed (L) and discarded (D) plaice (PLE) and sole (SOL) in the beamtrawl fisheries (TBB_DEF_70-99_>221kW) between 1976 and 2018. Nm, not measured; n/a, not available. (Before 2009, data is based on observer trips. 2009 and onwards is based on self-sampling trips.)

		PLE						**SOL**					
Year/		**Numbers**			**Weight**			**Numbers**			**Weight**		
Period	**N trips**	**L**	**D**	**%D**	**L**	**D**	**%D**	**L**	**D**	**%D**	**L**	**D**	**%D**
1976-1979	21	253	185	42%	108	28	20%	116	8	6%	32	1	4%
1980-1983	24	309	418	57%	99	51	34%	85	24	22%	19	3	15%
1989-1990	6	392	330	46%	104	46	30%	286	83	22%	48	12	20%
1999	3	145	181	55%	42	18	29%	112	16	13%	32	2	5%
2000	12	194	601	76%	50	47	48%	90	25	22%	22	2	10%
2001	4	364	1184	76%	84	89	51%	82	17	17%	17	1	6%
2002	6	263	868	77%	69	71	51%	126	38	23%	18	3	13%
2003	9	196	945	83%	52	70	57%	95	32	25%	20	3	14%
2004	8	158	792	83%	42	57	57%	175	69	28%	31	7	17%
2005	8	143	710	83%	47	51	52%	99	29	23%	20	2	11%
2006	9	166	997	86%	57	67	54%	64	26	29%	16	2	13%
2007	10	214	700	77%	67	57	46%	94	27	23%	22	2	10%
2008	10	169	902	84%	61	69	53%	95	16	16%	23	1	6%
2009	48	189	917	83%	61	76	55%	113	34	23%	25	3	11%
2010	74	201	872	81%	82	68	45%	132	42	24%	22	4	14%
2011	67	Nm	921	n/a	72	85	54%	Nm	50	n/a	23	5	18%
2012	61	Nm	934	n/a	90	87	49%	Nm	72	n/a	29	6	17%
2013	57	Nm	1189	n/a	81	106	57%	Nm	52	n/a	35	5	13%
2014	84	Nm	1191	n/a	81	104	56%	Nm	64	n/a	33	5	14%
2015	69	Nm	1057	n/a	65	95	59%	Nm	51	n/a	36	4	11%
2016	81	Nm	1061	n/a	74	99	57%	Nm	37	n/a	34	3	8%
2017	89	Nm	1035	n/a	65	92	59%	Nm	42	n/a	31	3	9%
2018	102	Nm	995	n/a	45	91	67%	Nm	35	n/a	25	3	11%

Table 10b. Average weights (kg) and numbers per hour of landed (L) and discarded (D) dab (DAB) and whiting (WHG) in the beamtrawl fisheries (TBB_DEF_70-99_>221kW) between 1976 and 2018. Nm, not measured; n/a, not available. (Before 2009, data is based on observer trips. 2009 and onwards is based on self-sampling trips.)

		DAB						WHG					
Year/		**Numbers**			**Weight**			**Numbers**			**Weight**		
Period	**N trips**	**L**	**D**	**%D**	**L**	**D**	**%D**	**L**	**D**	**%D**	**L**	**D**	**%D**
1976-1979	21	12	917	99%	4	65	95%	10	34	78%	3	5	62%
1980-1983	24	31	796	96%	7	60	90%	21	89	81%	5	11	69%
1989-1990	6	15	2147	99%	2	123	98%	5	122	96%	1	17	95%
1999	3	112	1411	93%	13	106	89%	Nm	77	n/a	<1	10	93%
2000	12	28	951	97%	6	49	89%	Nm	117	n/a	2	9	85%
2001	4	125	2268	95%	12	97	89%	Nm	69	n/a	1	9	86%
2002	6	92	934	91%	11	57	84%	14	104	88%	1	7	85%
2003	9	60	1166	95%	8	64	89%	2	40	96%	<1	3	86%
2004	8	54	1037	95%	7	51	87%	0	46	100%	<1	2	92%
2005	8	25	492	95%	6	52	90%	3	18	85%	<1	2	85%
2006	9	46	2335	98%	9	79	90%	Nm	36	n/a	<1	3	74%
2007	10	81	1196	94%	12	62	83%	0	10	100%	<1	3	87%
2008	10	51	905	95%	8	49	87%	0	15	100%	<1	3	93%
2009	48	31	1221	98%	33	62	65%	Nm	58	n/a	<1	5	89%
2010	74	48	1178	96%	10	65	87%	Nm	70	n/a	1	5	82%
2011	67	Nm	1350	n/a	12	74	86%	Nm	54	n/a	3	4	57%
2012	61	Nm	1106	n/a	8	63	89%	Nm	73	n/a	2	6	75%
2013	57	Nm	1543	n/a	8	84	91%	Nm	42	n/a	1	3	75%
2014	84	Nm	1508	n/a	5	79	94%	Nm	79	n/a	1	4	88%
2015	69	Nm	1212	n/a	4	59	94%	Nm	73	n/a	<1	4	95%
2016	81	Nm	1481	n/a	7	73	92%	Nm	61	n/a	<1	4	90%
2017	89	Nm	814	n/a	2	42	95%	Nm	73	n/a	<1	5	92%
2018	102	Nm	783	n/a	3	47	94%	Nm	82	n/a	<1	7	99%

6. Figures



A: $number\ in\ subsample * subsample\ fraction$

B: $number\ in\ sample * \frac{Volume\ of\ (total\ catch\ of\ haul - total\ landings\ in\ haul)}{volume\ of\ discard\ sample}$

C: $sum\ of\ numbers\ in\ both\ samples * \frac{Total\ duration\ all\ hauls\ of\ the\ trip}{Duration\ both\ sampled\ hauls}$

D: $number\ per\ trip * \frac{effort\ (kWDays)\ national\ fleet\ (per\ métier)}{effort\ (kWDays)\ sampled\ trips\ (per\ métier)}$

Figure 1. Flowchart of the raising process

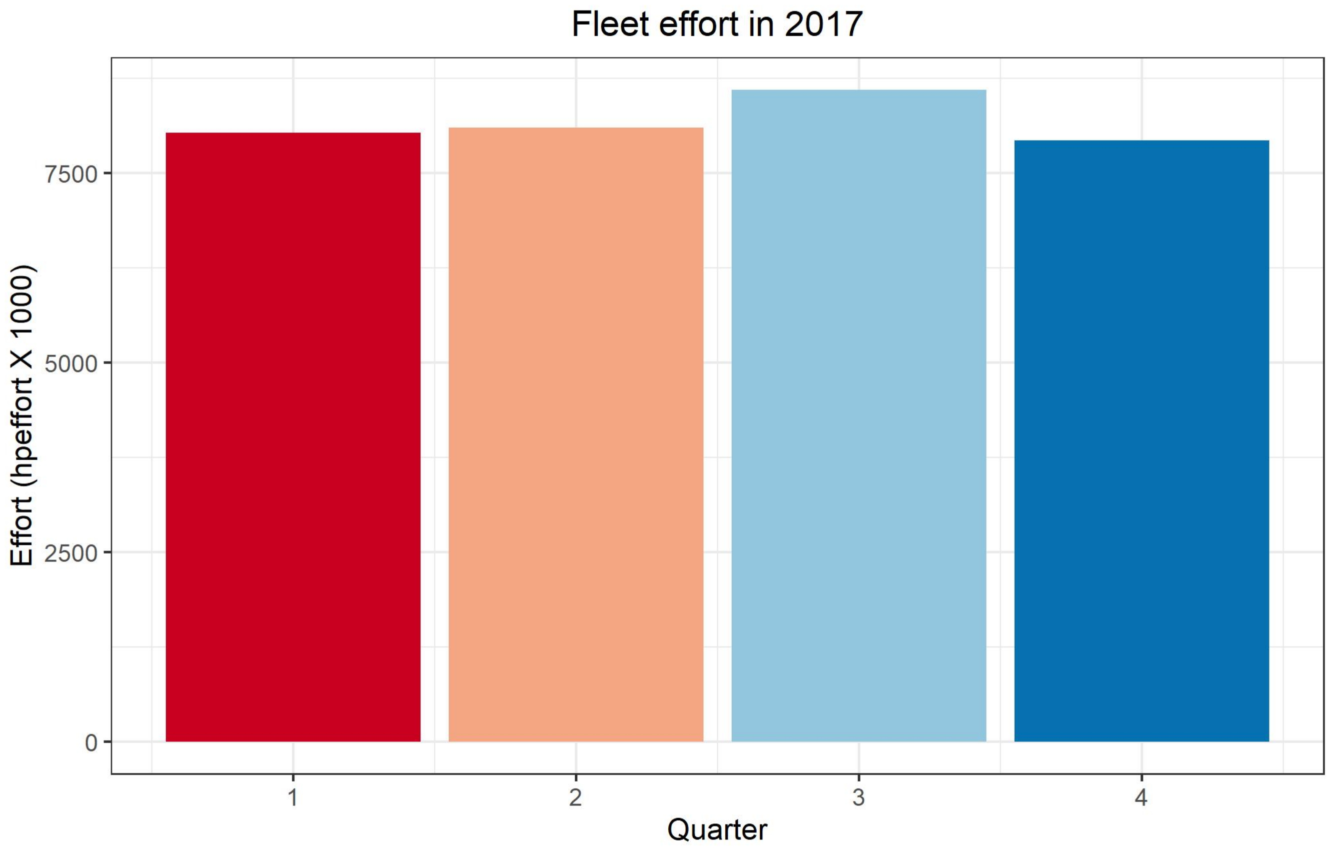


Figure 2a. Effort of the Dutch demersal fleet (in kW*days x 1000) in 2017 per quarter

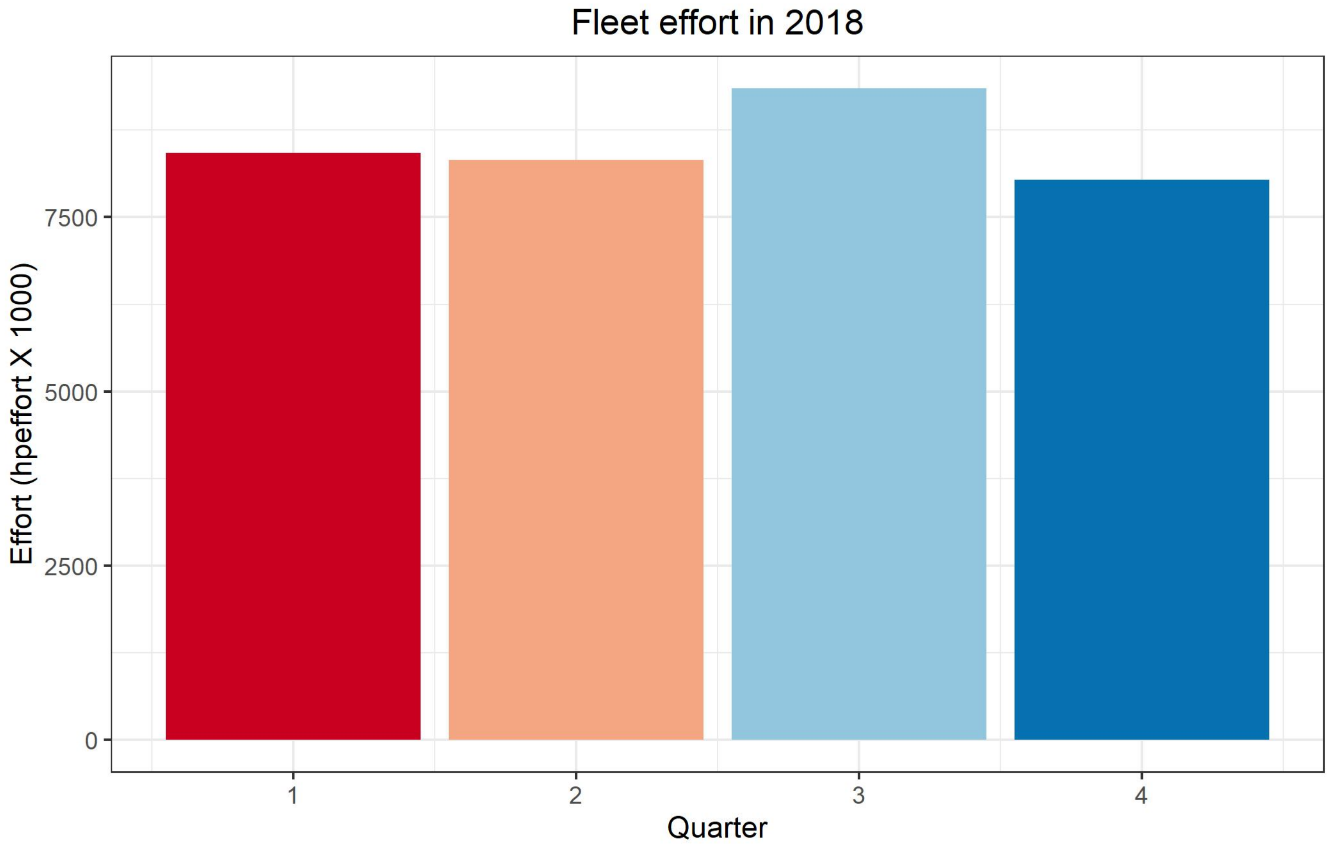


Figure 2b. Effort of the Dutch demersal fleet (in kW*days x 1000) in 2018 per quarter

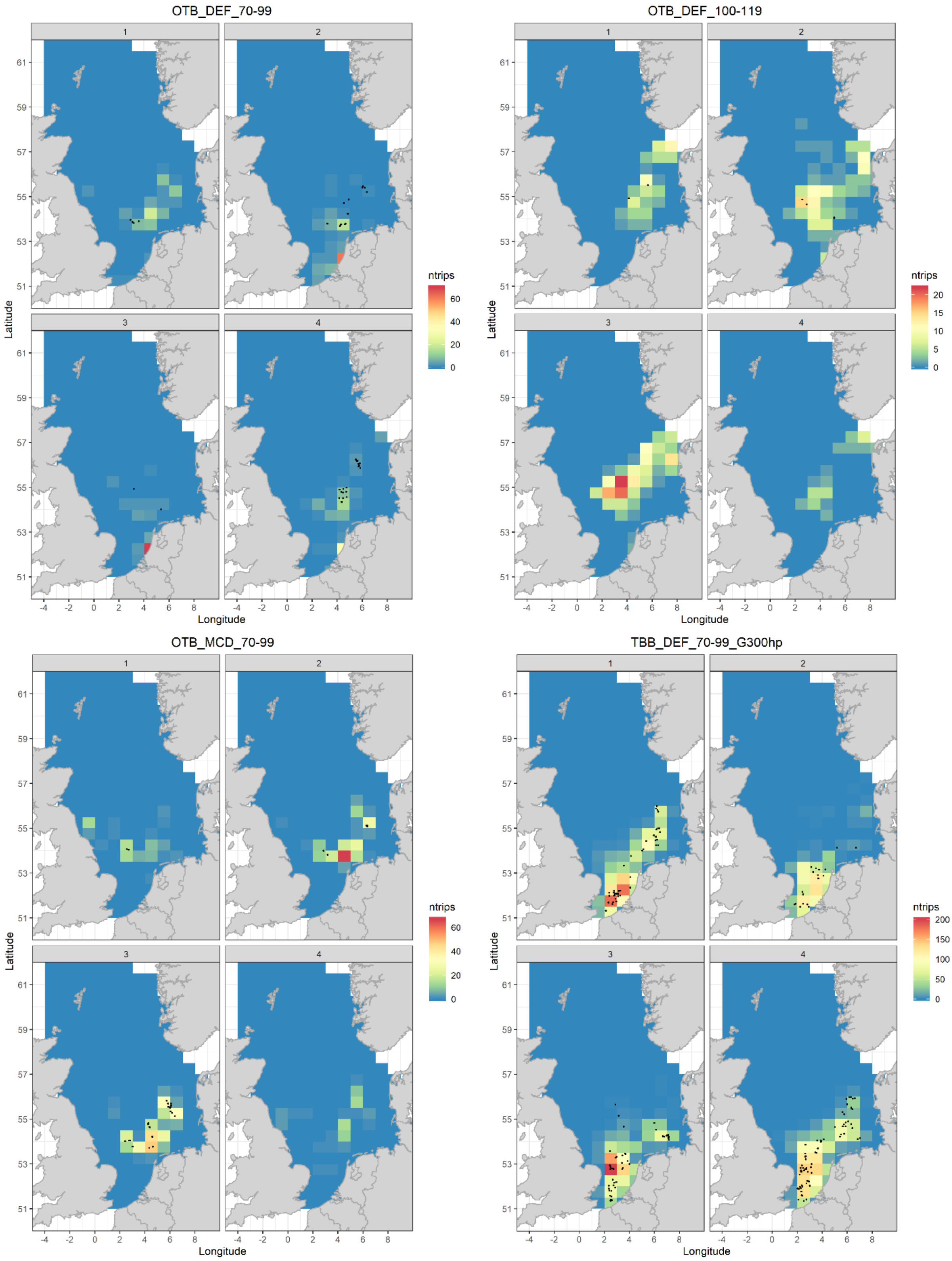
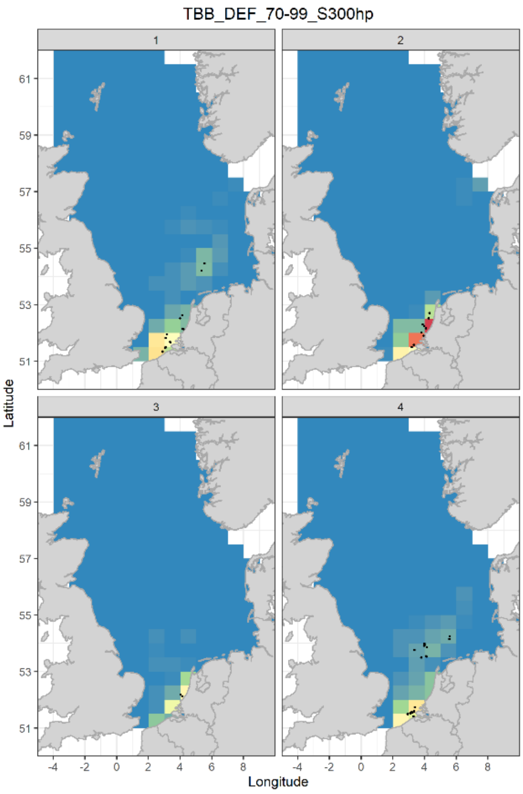
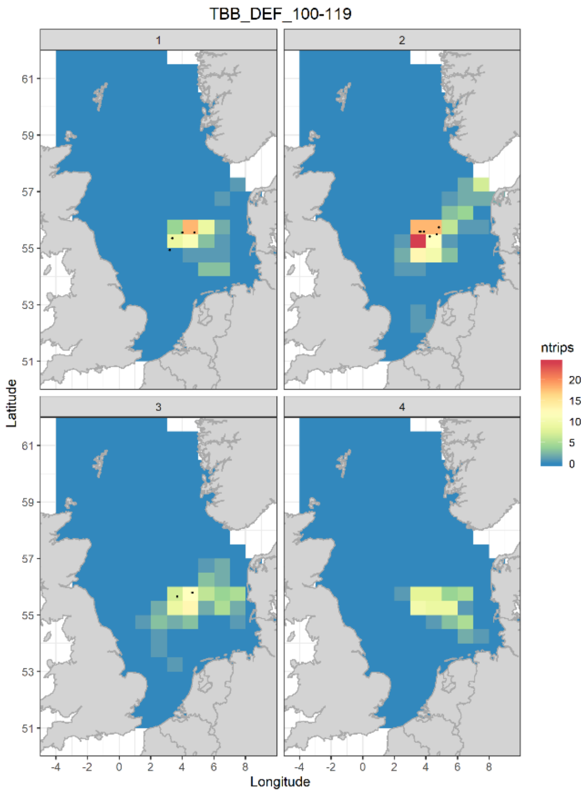


Figure 3a. Distribution of total effort (expressed in number of trips at sea, shaded colours per ICES 1/16 rectangle) and positions of sampled trawls (black dots) for the sampled demersal metiers in **2017** by quarter.





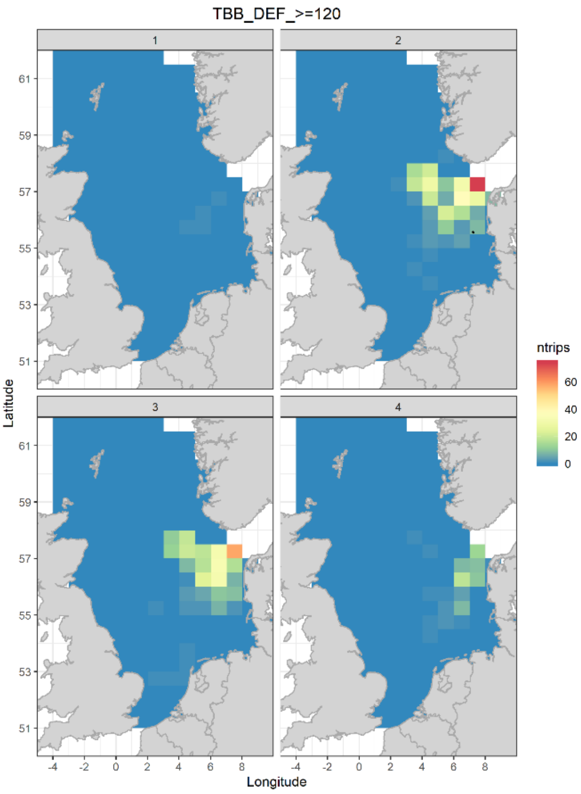


Figure 3a. Continued.

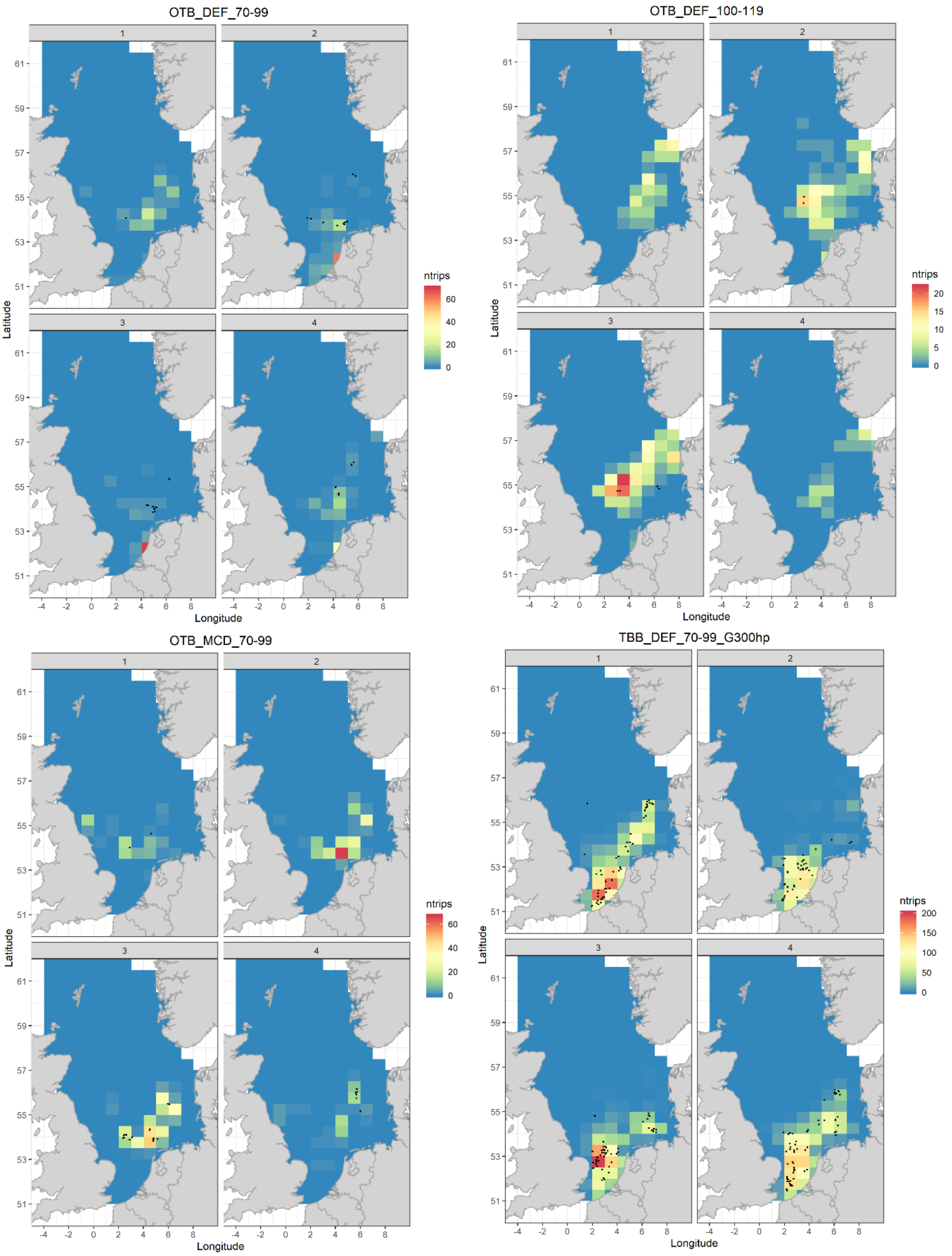


Figure 3b. Distribution of total effort (expressed in number of trips at sea, shaded colours per ICES 1/16 rectangle) and positions of sampled trawls (black dots) for the sampled demersal metiers in **2018** by quarter.

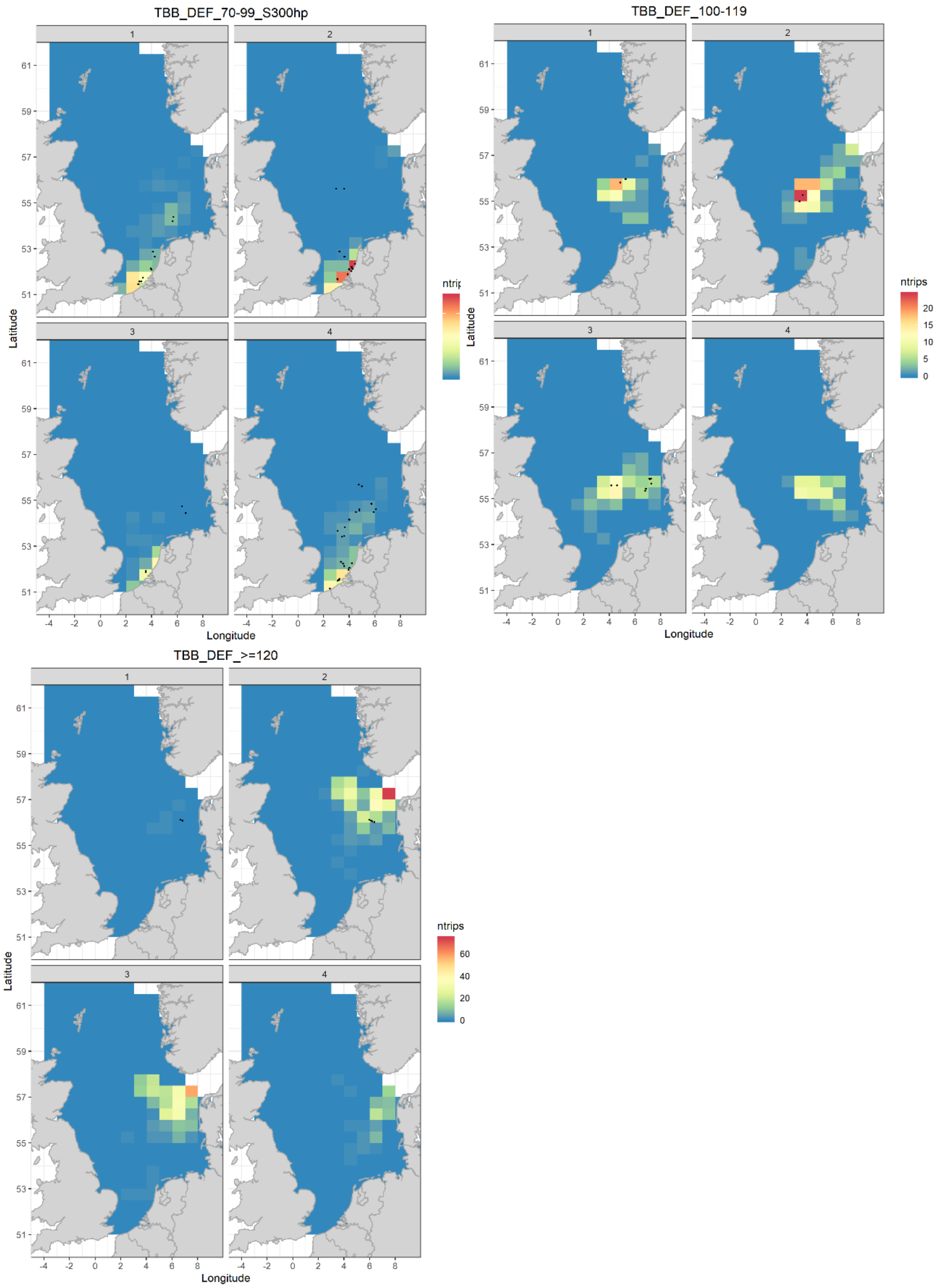


Figure 3b. Continued.

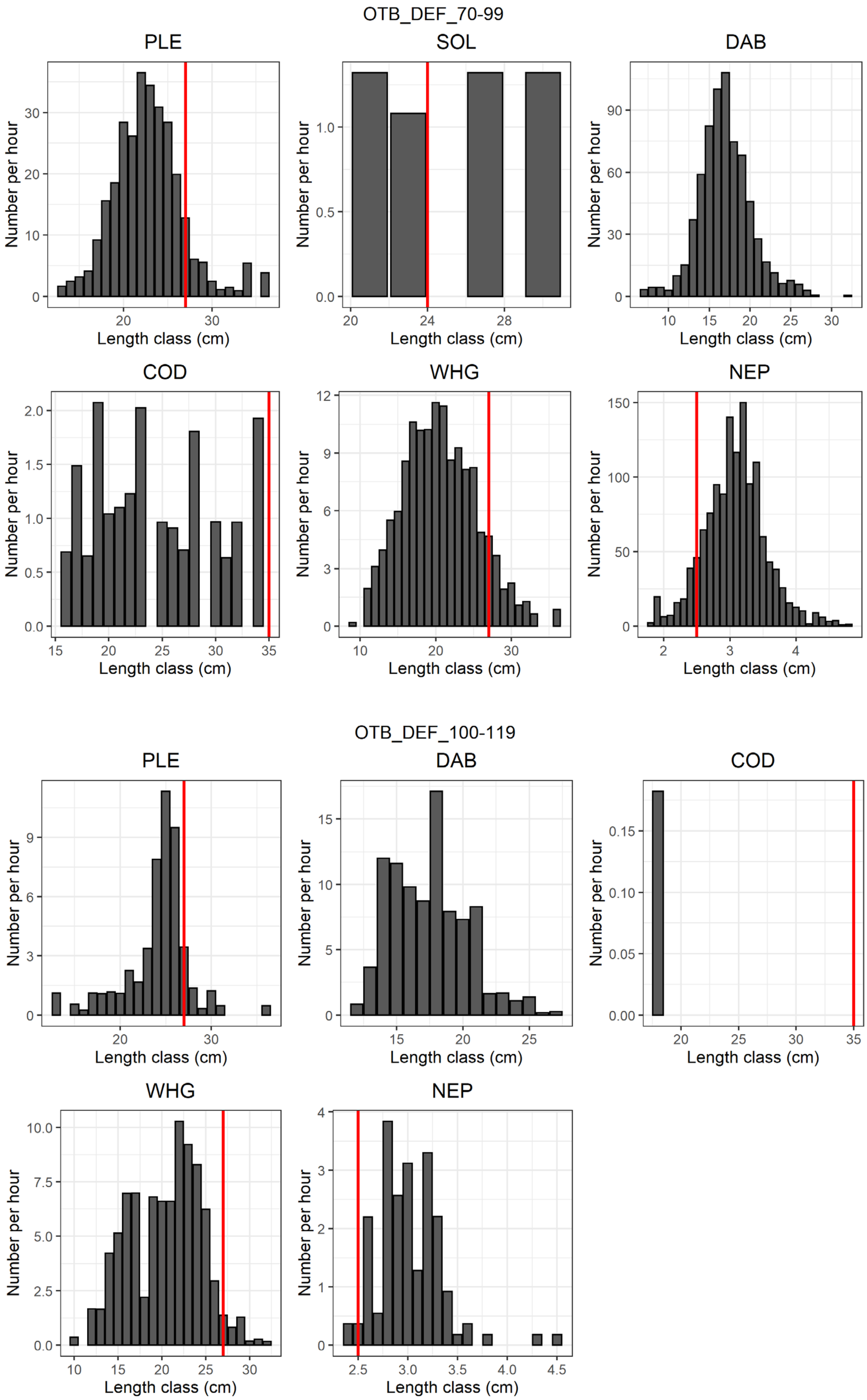


Figure 4a. Number per hour discarded per length class (cm) for several discarded species for the sampled demersal metiers in **2017** (red line = Minimum Landings Size).

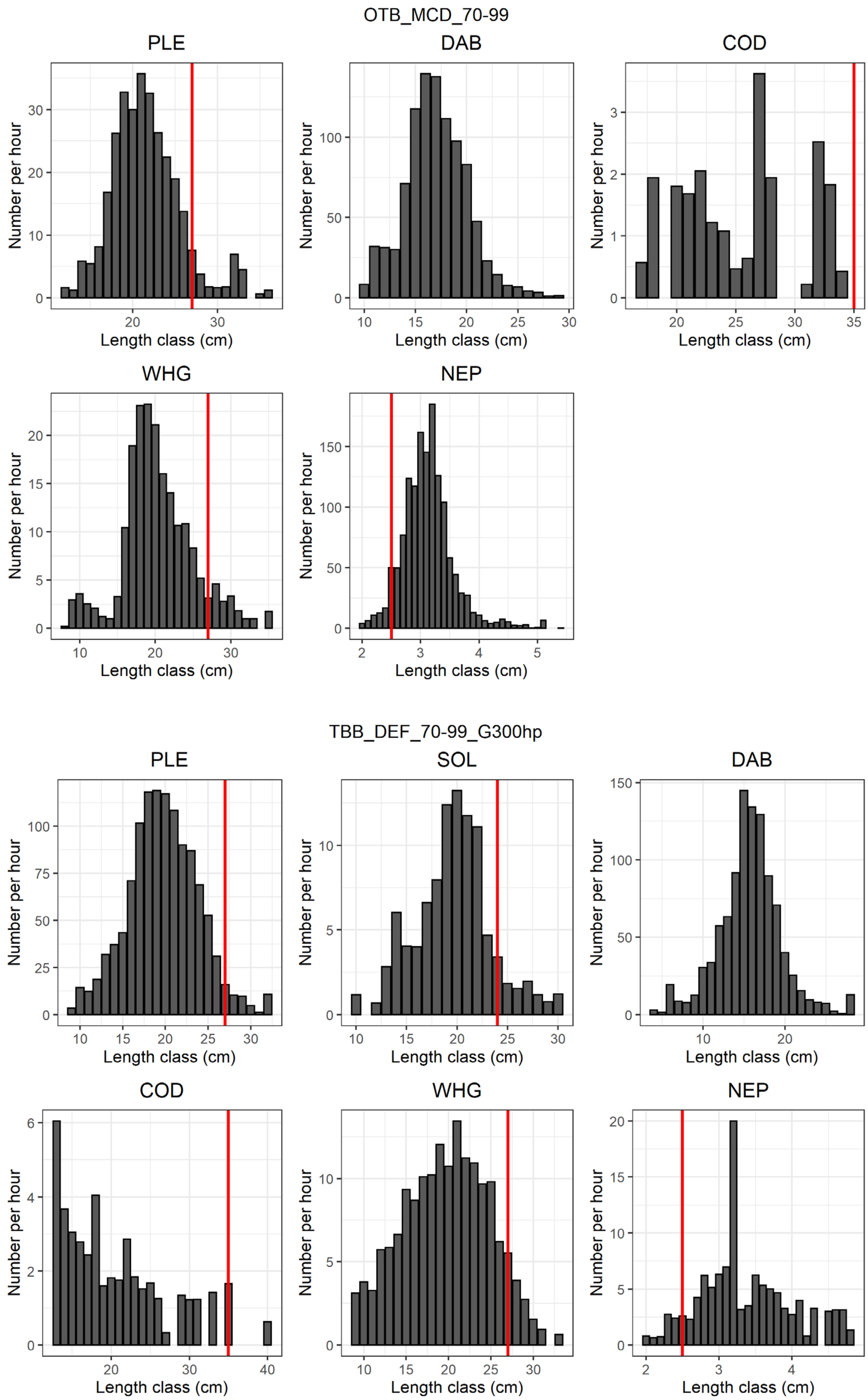


Figure 4a. Continued.

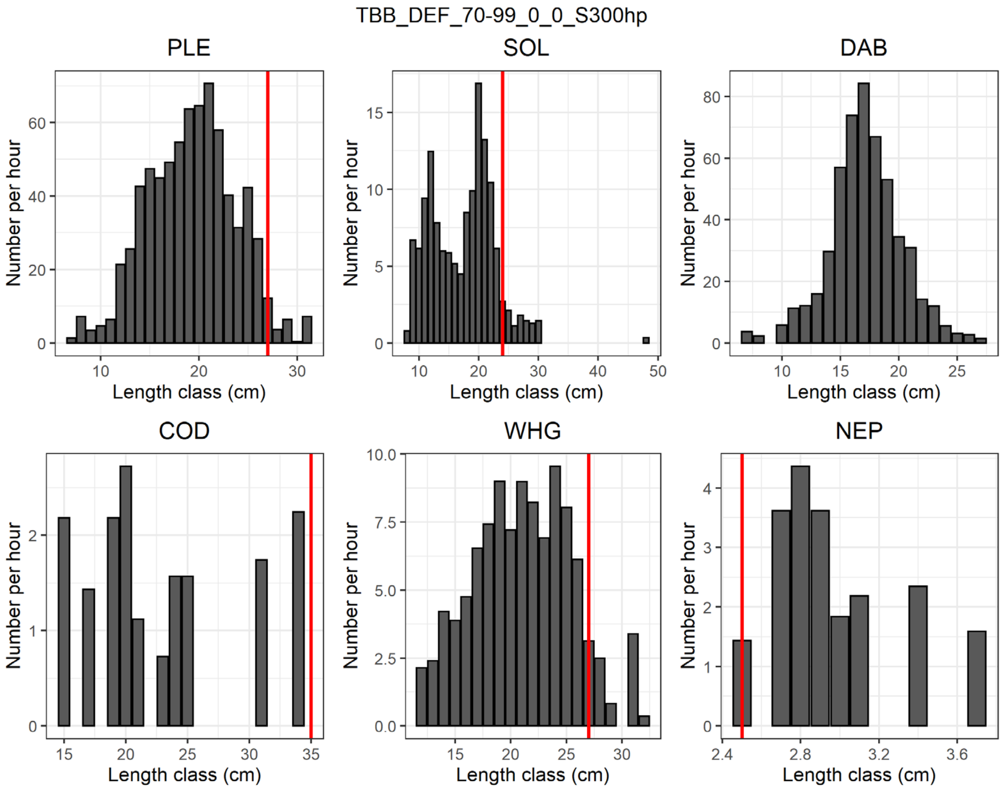


Figure 4a. Continued.

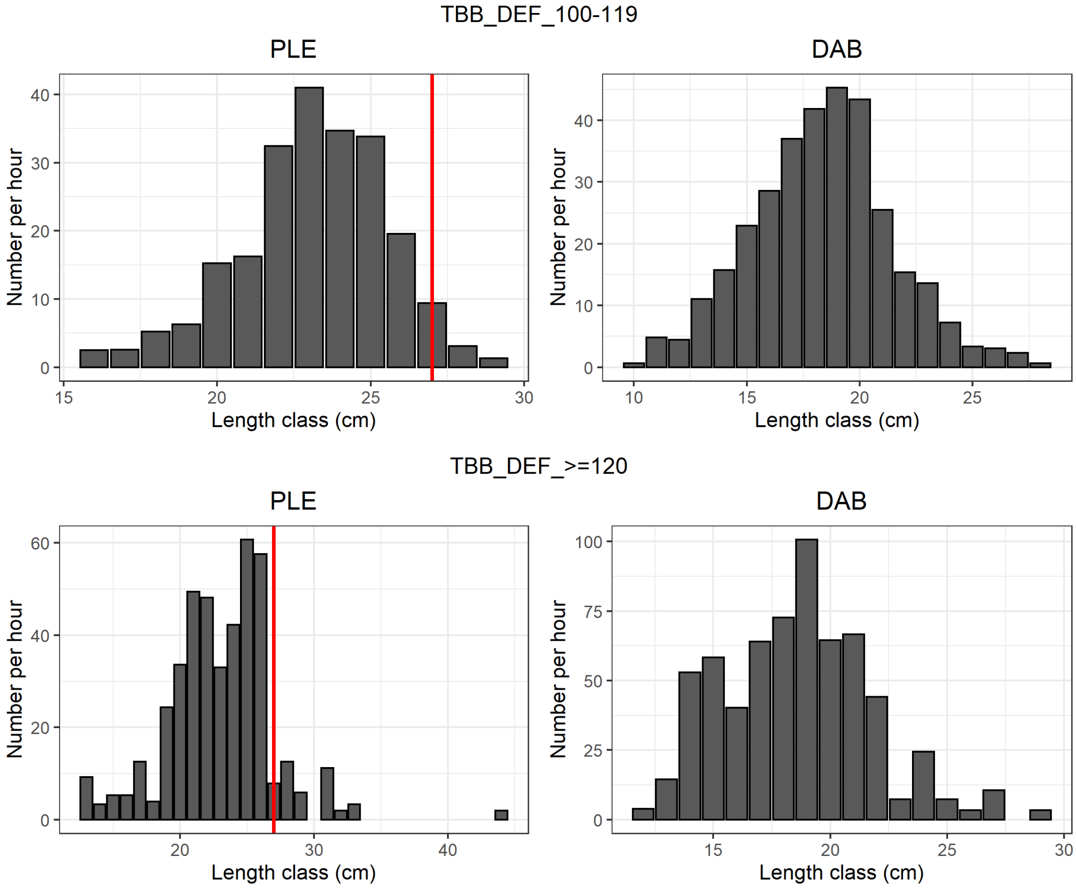


Figure 4a. Continued.

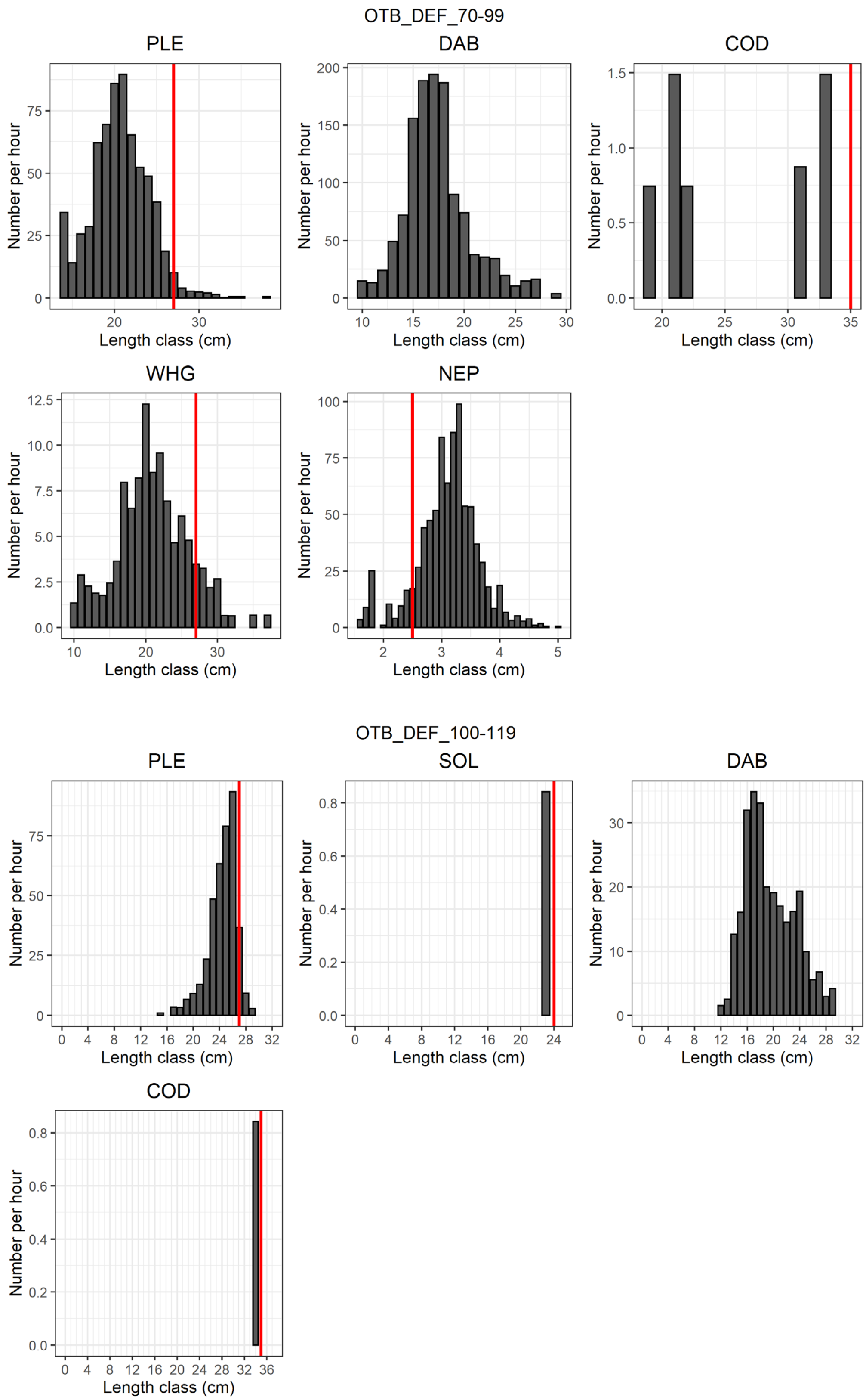


Figure 4b. Number per hour discarded per length class (cm) for several discarded species for the sampled demersal metiers in **2018** (red line = minimum landing)

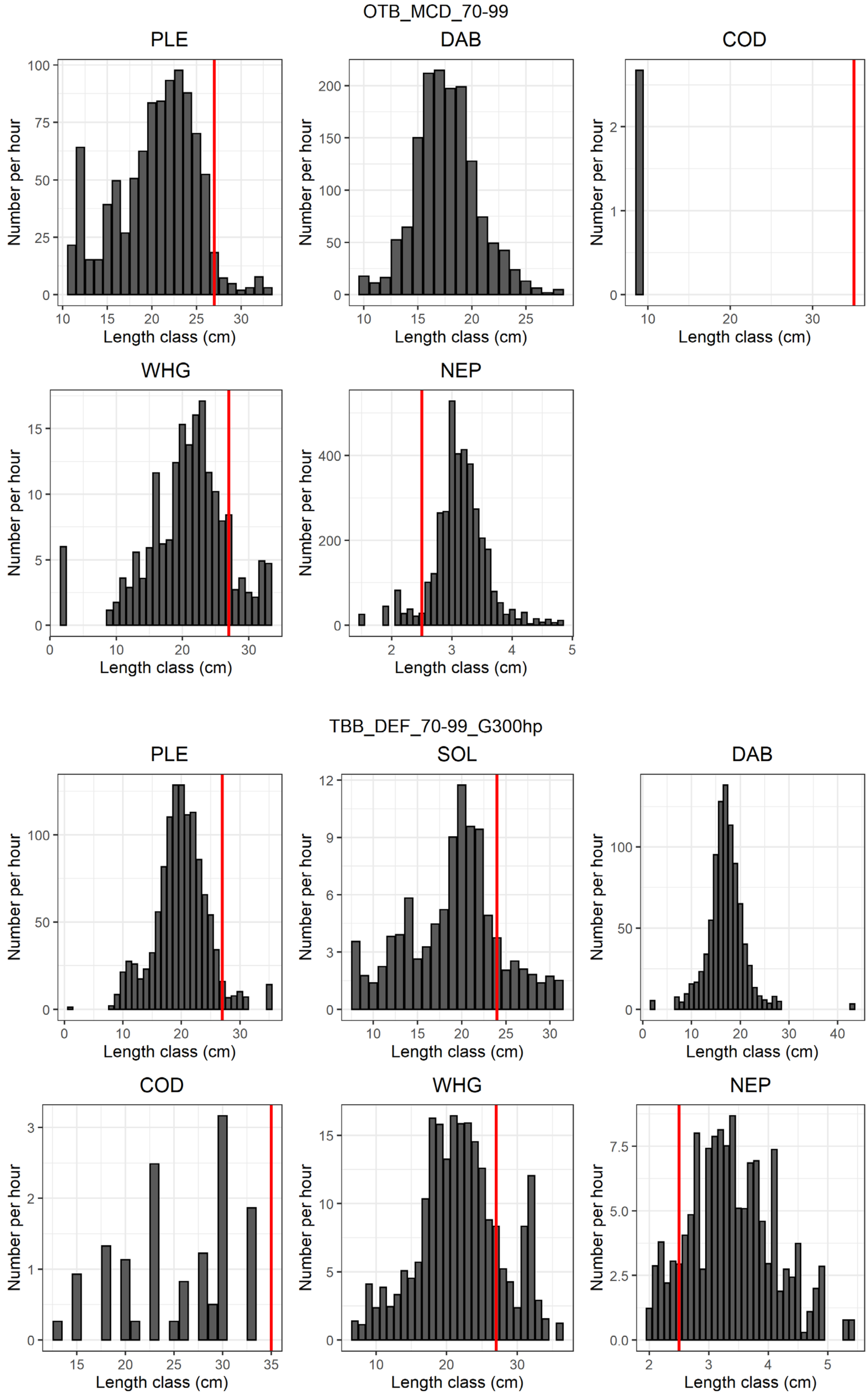


Figure 4b. Continued.

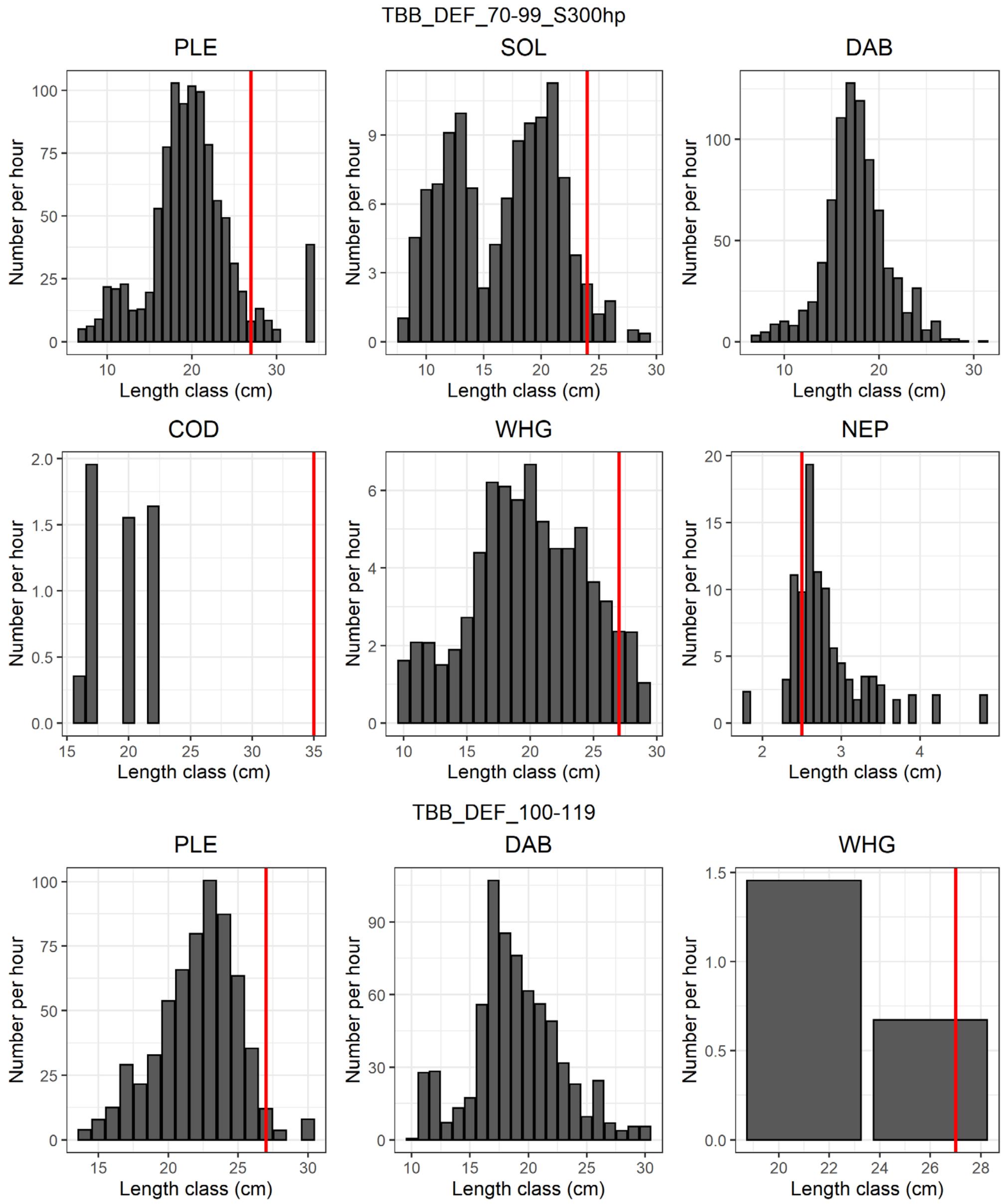


Figure 4b. Continued.

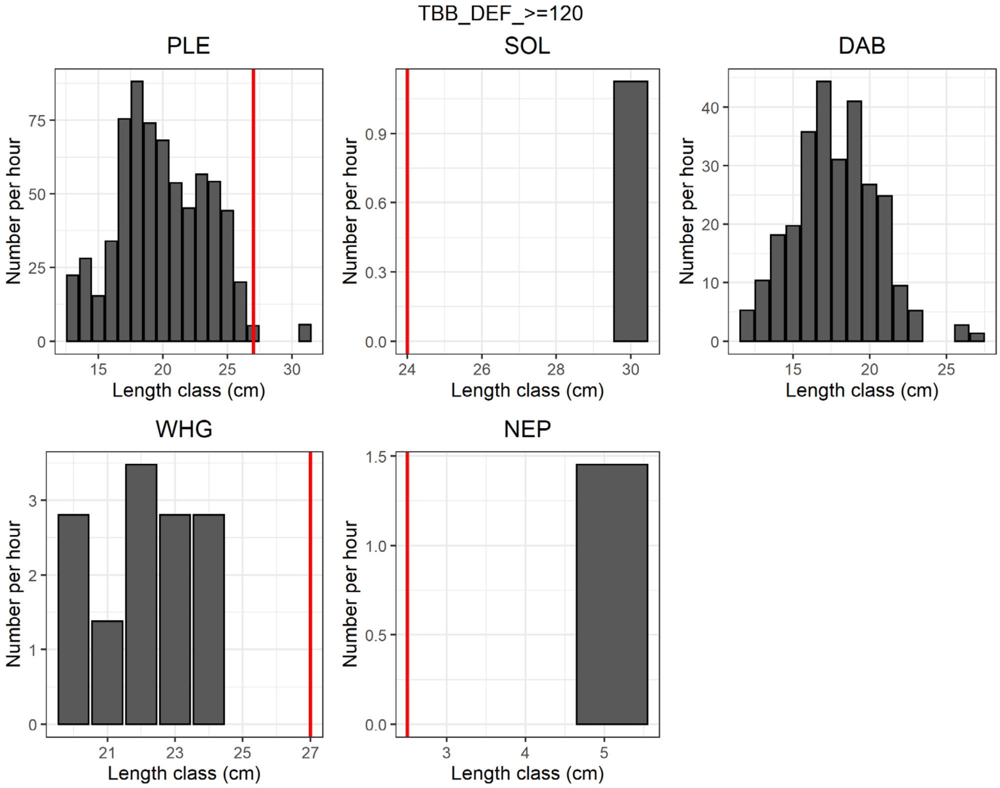


Figure 4b. Continued

Justification

CVO Report: 19.024
Project number: 4311213033
BAS code: WOT-05-001-004

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

Approved by: Ing. A.T.M. van Helmond
Researcher

Signature:

Date: 23rd of December 2019

Approved by: Ing. S.W. Verver
Head Centre for Fisheries Research

Signature:

Date: 23rd of December 2019