

# Stichting DLO Centre for Fisheries Research (CVO)

## **Discard sampling of the Dutch and German pelagic freezer fishery operating in European waters in 2011 and 2012**

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## Summary

Catches of the European pelagic freezer trawler fleet are regularly sampled by both the Netherlands and Germany through observer programmes. Both programmes together correspond with an annual sampling coverage of around 15% of the total pelagic freezer trawler fleet. This report presents the results of the data collected within both monitoring programmes on board pelagic freezer trawlers in European waters for 2011 and 2012.

The pelagic freezer trawler fishery targets pelagic species, namely herring (*Clupea harengus*), blue whiting (*Micromesistius poutassou*), horse mackerel (*Trachurus trachurus*), mackerel (*Scomber scombrus*), greater argentine (*Argentina silus*) and pilchard (*Sardina pilchardus*). The annual landings of this fishery illustrate seasonal patterns; different species are targeted during different parts of the year. The total landings of the Dutch fleet operating in European waters were 158,000 about tonnes in 2011 and about 221,000 tonnes in 2012. The total landings of the German fleet operating in European waters were 113,000 about tonnes in 2011 and about 98,000 tonnes in 2012. Horse mackerel and herring were the most abundant landed species.

On board pelagic freezer trawlers two different discard practises are observed, namely (i) discarding after the catch is sorted and (ii) discarding prior to sorting<sup>1</sup>. The latter includes catch that is discarded from the cooling tanks via the conveyer belt and discarded directly from the net and is estimated at 3% of total catch in 2011 and ~1% of total catch in 2012.

Data collected within the Dutch sampling programme has been extrapolated to the total Dutch pelagic fleet. Raised data shows that, overall, the discard percentage for the Dutch pelagic fleet in 2011 and 2012, based on 15 and 12 sampled trips respectively, is estimated at 9% and 6% in weight. This is consistent with discard percentages found in previous years. Data collected within the German sampling programme has been raised for the German mackerel and herring directed fishery separately. Raised data for the German mackerel directed fishery in 2011 and 2012, based on 2 sampled trips in both years, shows that overall the discard percentage is estimated at 1% and 0% in weight. Raised data for the German herring directed fishery in 2011 and 2012, based on 2 and 1 sampled trips respectively, shows that the overall discard percentage is estimated at 3% and 0% in weight.

In this report, data collected within the Dutch and German sampling programmes on board pelagic freezer trawlers in European waters is presented for the first time together. It shows that sampling and raising procedures (i.e. yearly vs. seasonal) of these two programmes differ. This will affect the estimates derived from the programmes.

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<sup>1</sup> Discarding prior to sorting has only been monitored in the Dutch sampling programme.

## Samenvatting

Jaarlijks worden aan boord van schepen van de Nederlandse en Duitse pelagische vriestrawlvisserij, die actief zijn in het noordoost Atlantische gebied, een aantal reizen door onderzoeksassistenten gemaakt. Beide programma's dekken samen ongeveer 15% van de gehele pelagische vloot. Gedurende deze reizen worden biologische monsters van zowel de vangsten als van de discards genomen. Deze gegevens worden naderhand opgewerkt wat resulteert in een jaarlijkse schatting van discardpercentages voor de verschillende doelsoorten binnen deze visserij. Dit rapport presenteert de resultaten van het discardsbemonsteringsprogramma van de Nederlandse en Duitse pelagische visserij in 2011 en 2012.

De pelagische vriestrawlervloot vist op een aantal pelagische doelsoorten, namelijk haring (*Clupea harengus*), blauwe wijting (*Micromesistius poutassou*), horsmakreel (*Trachurus trachurus*), mackerel (*Scomber scombrus*), grote zilversmelt (*Argentina silus*) en pelser (*Sardina pilchardus*). In 2011 en 2012 werd respectievelijk 158,000 ton en 221,000 ton aangeland door de Nederlandse vloot. Door de Duitse vloot werd in 2011 en 2012 respectievelijk 113,000 ton en 98,000 ton aangeland. De aanvoer bestond voor het grootste gedeelte uit haring en horsmakreel. De aanvoergegevens laten tevens zien dat de visserij gedurende het jaar varieert in de gerichtheid op doelsoorten. Zo wordt in het begin van het jaar op blauwe wijting gevist en wordt tijdens de tweede helft van het jaar op haring gevist.

Aan boord van de pelagische schepen zijn twee verschillende vormen van discards waargenomen, namelijk (i) discards die door de bemanning uit de vangst gesorteerd worden en (ii) discards voordat het sorteerproces heeft plaatsgenomen direct van de sorteerband uit de koeltanks of uit het net<sup>2</sup>. De resultaten laten zien dat in 2011 en 2012 respectievelijk 3% en ~1% van de totale vangst uit "niet-bemonsterde discards" bestond.

De gegevens verzameld binnen de Nederlandse discards bemonstering zijn opgewerkt naar vloot. De naar vloot opgewerkte discard percentage voor 2011 en 2012, gebaseerd op respectievelijk 15 en 12 reizen, is 9% en 6% in gewicht. Dit komt overeen met het discard percentage van de afgelopen jaren. De gegevens verzameld binnen de Duitse discards bemonstering zijn apart opgewerkt naar de Duitse makreel en haring gerichte visserij met de pelagische vloot. De opgewerkte gegevens voor de Duitse pelagische visserij gericht op makreel laat een discard percentage voor 2011 en 2012 zien van respectievelijk 1% en 0% in gewicht. Deze opwerking is gebaseerd op 2 bemonsterde reizen in beiden jaren. De opgewerkte gegevens voor de Duitse pelagische visserij gericht op haring laat een discard percentage voor 2011 en 2012 zien van respectievelijk 3% en 0% in gewicht. Deze opwerking is gebaseerd op 2 bemonsterde reizen in 2011 en 1 bemonsterde reis in 2012.

In dit rapport wordt een eerste poging gedaan om de gegevens die verzameld zijn binnen de Nederlandse en Duitse bemonsteringsprogramma's aan boord van pelagische schepen die actief zijn in het noordoost Atlantische gebied te presenteren. De bemonsterings- en opwerkingsmethodes (jaarbasis vs. seizoen basis) van de twee landen blijken te verschillen van elkaar. Dit heeft consequenties op schattingen die gemaakt worden op basis van de verzamelde gegevens.

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<sup>2</sup> De "niet-bemonsterde discards" zijn alleen genoteerd binnen de Nederlandse discards bemonstering.

## Zusammenfassung

Die europäische Flotte der pelagischen Hochseefischerei, die mit Schwimmschleppnetzen im Nordostatlantik Schwarmfische fischt, wird regelmäßig von den Niederlanden und Deutschland mit einer jährlichen Abdeckung von etwa 15% der Fischereireisen beprobt. Dabei nehmen Mitarbeiter der beteiligten Institute an Bord der Fischereischiffe den Fang nach Anlandungen und Discards (Rückwürfe) auf. Der vorliegende Bericht stellt die Ergebnisse der Beprobungsprogramme beider Länder für 2011 und 2012 vor.

Zielarten der pelagischen Hochseefischerei sind Hering (*Clupea harengus*), Blauer Wittling (*Micromesistius poutassou*), Stöcker oder Holzmakrele (*Trachurus trachurus*), Atlantische Makrele (*Scomber scombrus*), Goldlachs (*Argentina silus*) und Sardine (*Sardina pilchardus*). Die verschiedenen Zielarten werden dabei saisonal unterschiedlich befishet. Die niederländischen Anlandungen aller Arten zusammengefasst betragen 2011 158.000 Tonnen und 2012 221.000 Tonnen, die deutschen Anlandungen beliefen sich 2011 auf 113.000 Tonnen und 2012 auf 98.000 Tonnen. Hering und Stöcker hatten den höchsten Anteil an den Anlandungen.

An Bord der pelagischen Hochseefischereifahrzeuge wurden zwei unterschiedliche Rückwurfpraktiken beobachtet. Fisch wird vor der Fangsortierung (nur während der holländischen Beprobungen erfasst) sowie nach der Fangsortierung an Bord discardet. Discards vor der Fangsortierung sind zum einen Teile des Fanges, die direkt von den Kühltanks über Fließbänder zurückgeworfen werden, zum anderen direkte Auslässe aus den Netzen, bevor sie an Bord gezogen werden. Der Anteil dieses Discards betrug 2011 geschätzt 3% und 2012 1% des Totalfanges.

Hochgerechnet auf die gesamte niederländische Flotte betrug der Discardanteil nach Gewicht zirka 9% 2011 und 6% 2012. Die Abschätzung basiert dabei auf 15 durchgeführte Fischereireisen im Jahr 2011 bzw. 12 Reisen im Jahr 2012. Dies stimmt mit den Ergebnissen aus den Vorjahren überein. Die aus dem deutschen Beprobungsprogramm erhobenen Daten wurden getrennt jeweils für die Makrelen- wie für die Heringsfischerei hochgerechnet. Dabei ergaben die hochgerechneten Daten für die deutsche Makrelenfischerei einen Discardanteil nach Gewicht von 1% des Gesamtfanges im Jahr 2011 sowie 0% im Jahr 2012. In beiden Jahren wurden jeweils zwei Reisen in dieser Fischerei beprobt. Die Discardanteile in der Heringsfischerei, basierend auf 2 Beobachtungsreisen im Jahr 2011 und einer Reise 2012, betragen etwa 3% bzw. 0%.

In diesem Bericht werden zum ersten Mal die von den deutschen und niederländischen Beobachtungsprogrammen erhobenen Daten in der pelagischen Hochseefischerei kombiniert. Allerdings unterscheiden sich die Methoden der Beprobung durch die Beobachter und die Hochrechnungsprozeduren (beispielsweise jährlich entgegen saisonalen Werten) in beiden Ländern. Daher sind die Ergebnisse der Discardsabschätzungen nur eingeschränkt vergleichbar.

## 1 Introduction

From 2002 onwards discard data of pelagic freezer trawlers are monitored under the EC Data Collection Framework 1543/2000 and 1639/2001 and Commission Decision 949/2008 (EC, 2000; 2001; Anon., 2002; ICES, 2003) and revisions (2008/949/EG). The pelagic freezer trawler fishery is an international fishery which is monitored at sea by both the Netherlands and Germany. Both countries conduct their own monitoring programmes and sampling protocols (Stransky et al., 2010; Ulleweit et al., 2010). This report presents the results of the data collected within both monitoring programmes in European waters for 2011 and 2012.

Freezer trawlers use a mid-water pelagic trawl to target pelagic species (Box 1). Their most important fishing grounds in European waters are situated on the continental slope west of the British Isles, in the English Channel, along the British eastern coast, the northern North Sea and the Norwegian Sea.

Depending on the season freezer trawlers target herring (*Clupea harengus*), blue whiting (*Micromesistius poutassou*), horse mackerel (*Trachurus trachurus*), mackerel (*Scomber scombrus*), greater argentine (*Argentina silus*) and pilchard (*Sardina pilchardus*). Differences in catch composition are caused by seasonal changes, fishing ground, or changes in the market situation; i.e. market prices fluctuate by season per species. Since the fishing companies concentrate on different markets and have different quota shares, the fleet is usually spread over a number of different areas throughout the year.

During the standard procedure of processing catch on board, unwanted fish is removed from the conveyer belt and discarded. As fish will normally not survive the catch and sorting procedure, the fish that go back over board are dead or dying. To give a complete estimation of the total fishing mortality it is therefore necessary to include an estimation of the discarded part of the catch.

The main reasons for discarding are considered to be:

1. Species have no commercial interest (dependent on market);
2. Fish is below minimum landings size (regulation);
3. Fish has low quality or is damaged (market driven);
4. Limits on quota (regulation).

In addition, pelagic trawlers occasionally discard relatively large amounts of the catch. This includes catch that is (i) discarded from the cooling tanks via the conveyer belt and (ii) discarded directly from the net. Due to practical reasons and safety issues it is not possible to sample these discards. Therefore, the species composition and length frequency of these discards are unknown. Consequently, accurate numbers per species for these discards cannot be calculated. In this report only volume estimates of the discarded part of the catch are given for these events; in this report referred to as unsampled discards.

### Box 1: Pelagic freezer fishery

Pelagic freezer trawlers target schooling fish. Echo-sounding equipment on board of the trawlers provides information on the size and position of a shoal of fish, which makes this fishery very efficient. As a full net is too large to get on board, a hauled net remains in the water, while the catch is pumped on board. Catch is temporarily stored in cooling tanks until it can be processed in the factory below deck. During the sorting process unwanted catch (discards) is returned into the sea and the landings are frozen in blocks of 20-25 kg. The duration of each fishing trip depends mainly on the catch of target species and the storing capacity of the ship. The vessels usually return when all freezing stores are full. Smaller vessels make trips of 2-4 weeks, larger vessels of 5-6 weeks. A more detailed description of the fishery is given by Couperus *et al* (2004).



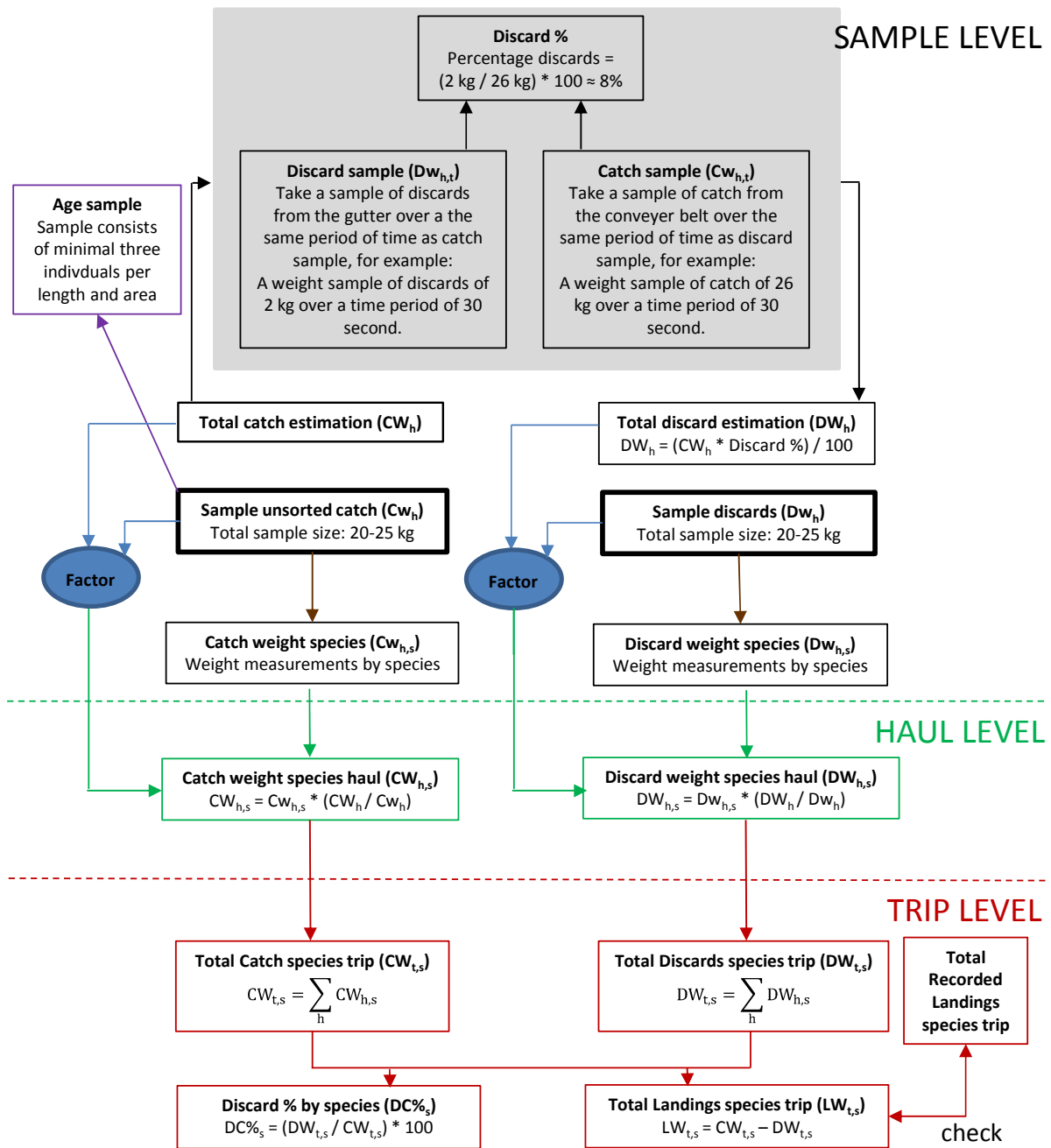
## 2 Methods

Information on landings and fleet effort by the Dutch pelagic freezer fleet in 2011 and 2012 has been derived from the Dutch IMARES VISSTAT database (*Visserij Statistieken*). Information on landings and fleet effort by the German pelagic freezer fleet in 2011 and 2012 has been derived from the German FiStat database held by the federal office for agriculture and food.

### 2.1 Sampling procedures Dutch sampling programme

Biological sampling of catch and discards is carried out on board the vessels through an observer programme. Annually 12 trips are planned spread out evenly throughout the year. Vessels are selected in cooperation with the pelagic fishery companies, and is considered ad hoc. At the beginning of 2011 and 2012 the Dutch pelagic freezer association (PFA) provided IMARES a sampling scheme giving guidance on when which freezer-trawler company should provide a vessel for sampling. Each company was asked to accommodate for 3-4 observer trips in each year. The fishing area is not a consideration in the stratification of sampling trips. The choice of fishing area and target species is usually a last minute decision, and may even change during the trip. It is not uncommon that during one trip several fishing and management areas are visited.

Sampling is conducted by one observer who takes samples of at least 80% of the hauls (Van Beek, 2001). As illustrated in the *schematic overview of the Dutch sampling and raising procedures*: from each sampled haul the total catch of the haul ( $CW_h$ ) is estimated from the bridge in cooperation with the skipper and verified with the number of cooling tanks filled (with help of the fish quality manager). The observer validates his estimates of the total catch, several times during the trip, by comparing his estimates with the actual number of boxes of retained catch (landings) on board the vessel and discard estimates. For each sampled haul the discard percentage is estimated by the ratio of catch and discards, preferably, by sampling unsorted catch from the conveyer belt (straight from the cooling tanks) and discards from the discard-gutter, during a fixed period of time. Consequently, the proportion of the discards relative to the landings can be estimated. This proportion is used to calculate the total weight of the discards in each haul ( $DW_h = ((\text{Discards}\% * CW_h) / 100)$ ). Furthermore, for each sampled haul a sample of the catch ( $CW_h$ ) and discards ( $DW_h$ ) is taken and weighted. The weight of each species in the samples is recorded ( $CW_{h,s}$  and  $DW_{h,s}$ ) and all fish are measured to the cm below (herring and sprat from 0.5 cm below). Otoliths are collected from the major species for age readings. After each trip, the data is stored into a computer programme on haul-by-haul basis and thereafter transferred into the central database.

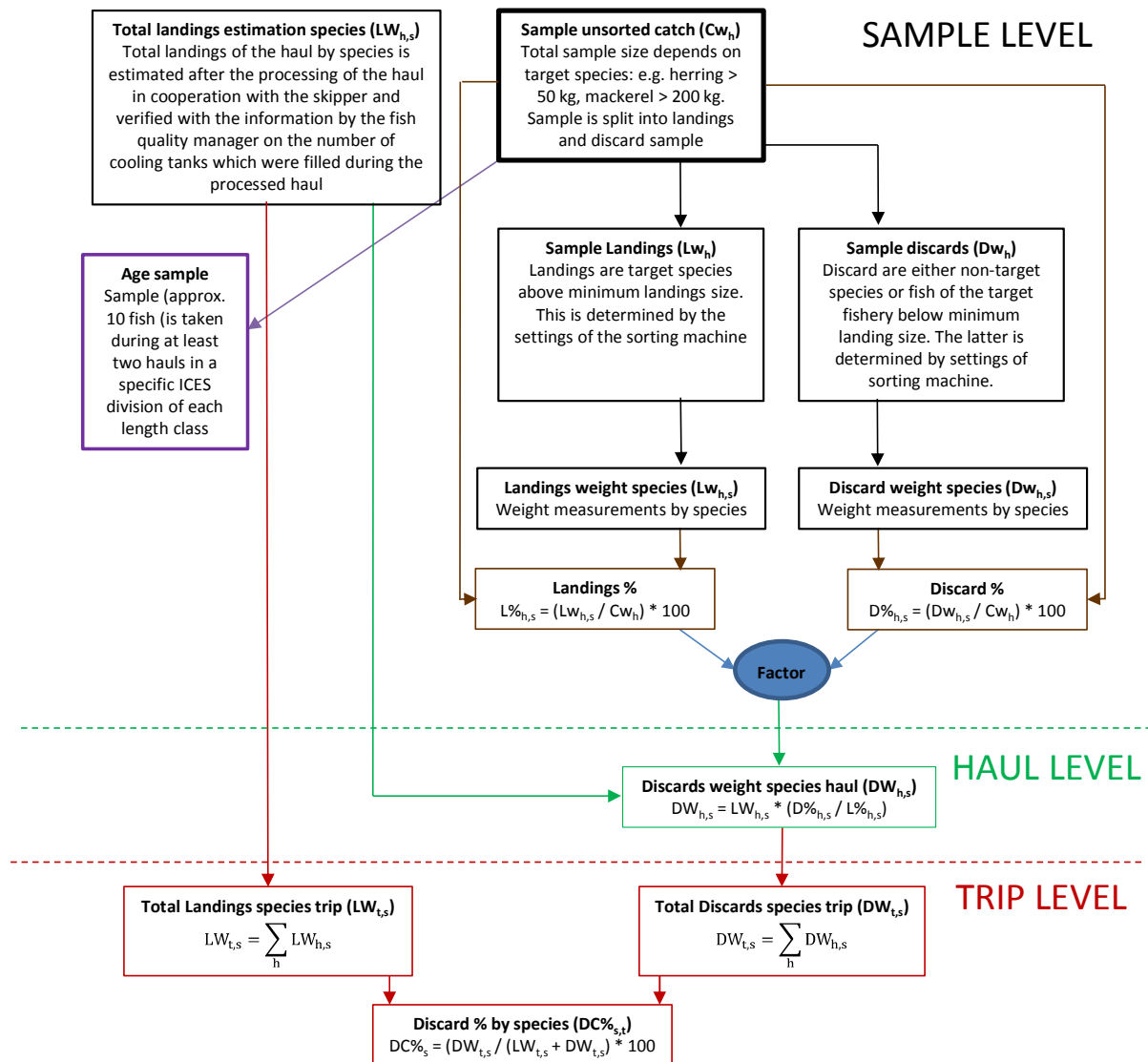


Schematic overview of the **Dutch** sampling and raising procedures (from sampled to trip level)

## 2.2 Sampling procedures German sampling programme

Germany has to sample the catches of the pelagic freezer trawler fleet in order to fulfil the obligations of the data collection framework. Similar to the Dutch programme, biological sampling of landings and discards is carried out on board the fishing vessels through an observer programme. Only one fishing company is involved in the pelagic freezer trawler fleet in Germany. The general sampling scheme is discussed with this company once or twice in the year, after which vessels are selected on an ad hoc basis.

Sampling on board is conducted by one observer. The observer is advised to take samples from all hauls. However, if this is not possible due to working hours or technical issues, non-sampled hauls are not taken into account. On average, the number of non-sampled hauls varies between 2 and 4 within a trip consisting of 25 hauls. As illustrated in the *schematic overview of the German sampling and raising procedures*: from each sampled haul, an unsorted catch sample ( $Cw_h$ ) is taken and is split by the observer into a landings sample ( $Lw_h$ ) and discards sample ( $Dw_h$ ) according to the crew's behaviour. If possible the sample should be taken from different cooling tanks. The weight of each species in the samples is recorded ( $Lw_{h,s}$  and  $Dw_{h,s}$ ) and all fish are measured. In addition, these samples are used to estimate the discard percentage by species in the haul (see  $D\%_{0h,s}$  in *schematic overview*). This percentage is used to calculate the total discard weight per species and haul ( $DW_{h,s}$  - see also section: raising procedure German sampling programme). The calculated discard is also agreed with the fish quality manager and skipper. Total landings of the haul by species ( $LW_{h,s}$ ) is estimated after the processing of the haul in cooperation with the skipper and verified with the information by the fish quality manager on the number of cooling tanks which were filled during the processed haul. Subsamples are taken for further age analysis in the laboratory. After each trip, data is stored in a central database.



Schematic overview of the **German** sampling and raising procedures (from sampled to trip level)

## 2.3 Raising procedures Dutch sampling programme

### 2.3.1 Raising the samples to haul level

#### Total weight per species

Total catch weight per species and haul ( $CW_{h,s}$ ) has been calculated by multiplying the weight of the species in the catch sample ( $Cw_{h,s}$ ) by the ratio of the estimated total catch weight ( $CW_h$ ) to the weight of the catch sample ( $Cw_h$ ):

$$CW_{h,s} = Cw_{h,s} \times (CW_h/Cw_h)$$

Total discards weight per species and haul ( $DW_{h,s}$ ) has been calculated by multiplying the weight of the species in the discards sample ( $Dw_{h,s}$ ) by the ratio of the estimated total weight of discards ( $DW_h$ ) to the weight of the discards sample ( $Dw_h$ ):

$$DW_{h,s} = Dw_{h,s} \times (DW_h/Dw_h)$$

#### Total length per species

The total numbers caught at length ( $CN_{l,h,s}$ ) have been calculated per species and haul by multiplying the numbers at length in the catch sample ( $Cn_{l,h,s}$ ) by the ratio of the estimated total catch weight ( $CW_h$ ) to the weight of the catch sample ( $Cw_h$ ):

$$CN_{l,h,s} = Cn_{l,h,s} \times (CW_h/Cw_h)$$

The total numbers discarded at length ( $DN_{l,h,s}$ ) have been calculated per species and haul by multiplying the numbers at length in the discard sample ( $Dn_{l,h,s}$ ) by the ratio of the estimated total discard weight ( $DW_h$ ) to the weight of the discard sample ( $Dw_h$ ):

$$DN_{l,h,s} = Dn_{l,h,s} \times (DW_h/Dw_h)$$

### 2.3.2 Raising sampled hauls to trip level

#### Total weight per species

Total catch weight per species and trip ( $CW_{t,s}$ ) has been calculated by summing the catch weight per species over all hauls:

$$CW_{t,s} = \sum_h CW_{h,s}$$

Total discard weight per species and trip ( $DW_{t,s}$ ) has been calculated by summing the discard weight per species over all hauls:

$$DW_{t,s} = \sum_h DW_{h,s}$$

Total landings weight per species and trip ( $LW_{t,s}$ ) has been calculated by subtracting discard weight from the catch weight per species:

$$LW_{t,s} = CW_{t,s} - DW_{t,s}$$

### *Total length per species*

Total numbers caught at length per species and trip ( $CN_{l,t,s}$ ) have been calculated by summing the numbers at length per species over all hauls:

$$CN_{l,t,s} = \sum_h CN_{l,h,s}$$

Total numbers discarded at length per species and trip ( $DN_{l,t,s}$ ) have been calculated by summing the numbers at length per species over all hauls:

$$DN_{l,t,s} = \sum_h DN_{l,h,s}$$

Total numbers landed at length per species and trip ( $LN_{l,t,s}$ ) have been calculated by subtracting discards numbers at length from numbers caught at length per haul:

$$LN_{l,t,s} = CN_{l,t,s} - DN_{l,t,s}$$

### *2.3.3 Unsampling discards*

During the observed trips it occasionally happened that a part of or the whole catch within a haul was discarded before the sorting process; in this report referred to as unsampled discards. In such occasions the weight of the unsampled discarded catch was estimated by the observer. Sampling of the species composition and the length frequency distribution of such incidents was not possible. Consequently, these unsampled discards could not be raised by the raising procedure that is described above. It was therefore decided to interpret "unsampled discards" as a separate component ( $DWS_h$ ). When only part of the catch within a haul was discarded without sorting, the raising procedure was used for the sampled part of the catch while the unsampled part was treated as unsampled discards. Total unsampled discards within a trip ( $DWS_t$ ) was calculated by summing the unsampled discard catch over all hauls:

$$DWS_t = \sum_h DWS_h$$

### *2.3.4 Not sampled*

During the sampled trips it sporadically happened that the observer only estimated the weight of the catch and in some occasions also the discard percentage. Because the species composition and length frequency distribution of both the catch and discards for such hauls is unknown, it was decided to interpret not sampled hauls as a separate component in this report.

### *2.3.5 Raising the sampled trips to fleet level*

In order to raise the total discard weight per species and trip ( $DW_{t,s}$ ) to fleet level, first the sampled average discards (per quarter) needed to be calculated ( $DW_q$ ). Note that when target species are not caught during a sampled trip they are marked zero. The sampled average is the total weight of discards per trip per species per quarter ( $DW_{t,s,q}$ ) divided by the total number of sampled trips ( $N_{s,q}$ ):

$$DW_q = \sum DW_{t,s,q} / N_{s,q}$$

The average discards per quarter has consequently been raised to fleet level (per quarter) by multiplying the sampled average ( $DW_q$ ) with the total number of trips of the entire fleet per quarter ( $N_{t,q}$ ):

$$DWF_q = N_{t,q} \times DW_q$$

Total discard weight per species per year at fleet level (DWF) has been calculated by summing the total discard weights per species per quarter for each year:

$$DWF = \sum_q DWF_q$$

## 2.4 Raising procedure German sampling programme

### 2.4.1 Raising the samples to haul level

#### Total weight per species

Total landings weight per haul and species ( $LW_{h,s}$ ) is estimated in cooperation with the skipper after the sampling and processing of the sampled haul.

Total discards weight per species and haul ( $DW_{h,s}$ ) has been calculated by multiplying the estimated total landings per species and haul ( $LW_{h,s}$ ) with the ratio of the proportion discards and proportion landings:

$$DW_{h,s} = LW_{h,s} \times (D\%_{h,s}/L\%_{h,s})$$

#### Total length per species

The total numbers of landed fish caught at length ( $LN_{l,h,s}$ ) have been calculated per species and haul by multiplying the numbers at length in the landings sample ( $Ln_{l,h,s}$ ) by the ratio of the estimated total landing weight by species ( $LW_{h,s}$ ) to the weight of the landings sample by species ( $LW_{h,s}$ ):

$$LN_{l,h,s} = Ln_{l,h,s} \times (LW_{h,s}/Lw_{h,s})$$

The total numbers of discarded fish caught at length ( $DN_{l,h,s}$ ) have been calculated per species and haul by multiplying the numbers at length in the discards sample ( $Dn_{l,h,s}$ ) by the ratio of the estimated total discards weight by species ( $DW_{h,s}$ ) to the weight of the discards sample by species ( $Dw_{h,s}$ ):

$$DN_{l,h,s} = Dn_{l,h,s} \times (DW_{h,s}/Dw_{h,s})$$

### 2.4.2 Raising sampled hauls to trip level

#### Total weight per species

Total landings weight per species trip ( $LW_{t,s}$ ) has been calculated by summing the landings weight per species over all sampled hauls:

$$LW_{t,s} = \sum_h LW_{h,s}$$

Total discard weight per species trip ( $DW_{t,s}$ ) has been calculated by summing the discard weight per species over all hauls:

$$DW_{t,s} = \sum_h DW_{h,s}$$

#### Total length per species

Total landings numbers caught at length per species and trip ( $LN_{l,t,s}$ ) have been calculated by summing the numbers at length per species over all sampled hauls:

$$LN_{l,t,s} = \sum_h LN_{l,h,s}$$

Total discards numbers caught at length per species and trip ( $DN_{l,t,s}$ ) have been calculated by summing the numbers at length per species over all sampled hauls:

$$DN_{l,t,s} = \sum_h DN_{l,h,s}$$

#### 2.4.3 *Not sampled*

During the sampled trips it sporadically happened that the observer did not sample a haul. Non sampled hauls are mostly hauls with a small catch. Not sampled hauls are excluded from calculations.

#### 2.4.4 *Raising the sampled trips to fleet level*

Target species directed trips are extracted from the FiStat database by filtering the database according to quarter, area and most caught species. The extracted data are sorted by trip numbers. The identified trips are then counted for the total number of trips by sampled metier and the landings by species and identified trips are added up for the total landings by species and sampled metier.

Discard weights from the samples are raised by the number of total trips in the sampled metier. For example, 2 sampled trips, total discards sampled trips is 0.13 tonnes, 7 trips in total, therefore total discards:  $(0.13/2)*7$ . The total catch is calculated by summing the raised discard weight and the total landings by species and sampled metier.



## **3 Results**

### **3.1 Fleet**

#### *3.1.1 Landings*

Target species of the freezer trawler fleet in European waters differ by season and area. The total landings of the Dutch fleet were about 158,000 tonnes in 2011 and 221,000 tonnes in 2012 (in European waters). The total landings of the German fleet were about 113,000 tonnes in 2011 and 98,000 tonnes in 2012 (in European waters).

Horse mackerel and herring were the most abundant species landed (Table 1, Figure 2). Horse mackerel was caught throughout the year in a number of different areas. The blue whiting and herring fisheries, are identified as seasonal fisheries: blue whiting was targeted during the first half of the year (February to May), and herring was targeted during the second half of the year (June to December) (Figures 2,3). Mackerel was caught throughout the year, except for in the summer, in a number of different areas (Figure 3).

#### *3.1.2 Fleet effort*

The fishing grounds are situated in the Celtic Sea, North Sea, English Channel and Norwegian Sea. The spatial and temporal distribution based on VMS information of the Dutch freezer trawler fleet is presented in Figures 6-10. According to the VMS information the Celtic Sea and the English Channel are the most intensely fished areas. VMS information for the German fleet was not made available.

### **3.2 Discards**

#### *3.2.1 Sampled trips*

##### *Dutch sampled trips*

Within the Dutch sampling programme 15 trips were made on board pelagic freezer trawlers in 2011, from which 14 trips were on board Dutch flagged vessels and 1 trip on board a French flagged vessel. In 2012, 12 trips were made on board pelagic freezer trawlers, from which 8 trips were on board Dutch flagged vessels, 2 trips on board French flagged vessels and 2 trips on board German flagged vessels (Table 2).

Five different fishing grounds were sampled during the sampled trips, namely the Celtic Sea, West of Scotland, North Sea, the English Channel and the Norwegian Sea (Table 3, Figures 6a,b). A total of 394 hauls in 2011 and 502 hauls in 2012 were sampled, which was 89% and 93% respectively of all the hauls during the sampled trips (Table 2). In 2011 during 45 hauls (i.e. 10% of all the hauls) and in 2012 during 13 hauls (i.e. 2% of all the hauls) observers were unable to sample the complete catch, because the catch was (partly) discarded directly without being sorted first. However, observers were able to estimate the weight of discarded catch. These estimates are described as 'unsampled discarding' in Table 2. Haul duration was on average 3 hours in 2011 and 4 hours in 2012, ranging from 0.5-14 hours (Figure 4a).

During the sampled trips one or several species were targeted (Tables 3,4). In addition a number of non-target species were landed. Table 5a provides an overview of all species that were discarded during the sampled trips.

The average length frequency distribution of landed and discarded blue whiting, greater argentine, herring, horse mackerel, mackerel and pilchard by trip is presented in Figures 5a,c. For all species, except for mackerel and horse mackerel, the length frequency distributions generally show a regular bell-

shaped pattern. For blue whiting the length frequency differs between years; in 2011 blue whiting was discarded over nearly all lengths, while the length distribution for 2012 shows a regular bell shaped pattern (Figures 5a,c). This is most likely the result of blue whiting not being a target species during the sampled trips in 2011. In 2011 the blue whiting quorum was considerably lower than in 2012 (Tables 8,9).

#### *German sampled trips*

Within the German sampling programme 4 and 3 trips were made in 2011 and 2012 respectively on board pelagic freezer trawlers. All trips were on board German flagged vessels (Table 2). Three different fishing grounds were sampled during the sampled trips, namely the Celtic Sea, West of Scotland and the Norwegian Sea (Table 3). A total of 114 hauls in 2011 and 57 hauls in 2012 were sampled, which was 87% and 86% respectively of all the hauls during the sampled trips (Table 2). Haul duration was on average 4 hours in 2011 and 6 hours in 2012, ranging from 0.5-34.5 hours (Figure 4b). Haul duration appears to depend on the species that is targeted during the trip. Longer haul durations were hauls targeting redfish in 2011 and 2012.

The average length frequency distribution of landed and discarded blue whiting, herring, horse mackerel and mackerel by trip is presented in Figures 5b,d. All species generally show a regular bell shaped pattern.

#### 3.2.2 *Discards*

The total catch, landings, discards, and discard percentages by species and trip and corresponding sampling period is reported in Table 4. In this table the total amount of "unsampled discards" observed during each trip, "not sampled" and catch lost due to a "damaged net" are presented separately. The first variable (i.e. unsampled discards) has been taken into account in determining the total discard percentage per trip. Unsampled discarding was not measured during trips G1, G4, G6, G7, G12, G13, G14.

#### *Raised Dutch discard estimates*

Values collected within the Dutch sampling programme have been raised to the Dutch pelagic fleet and are presented in Table 6.

For 2011, the raised discard data show a discard percentage of 0% for greater argentine, 1% for horse mackerel and 3% for herring (Table 6). Mackerel was by far the most dominant species in the discards during the sampled trips; discard percentage of 19% (Table 6). As pilchard and blue whiting were not targeted during any of the sampled trips (Table 3), the raised discard estimates for these species are highly uncertain. The discarded "other species" mainly consisted of hake and boarfish. Overall, including the unsampled discards, the discard percentage for the Dutch pelagic fleet in 2011 based on the sampled trips is estimated at 9% (Table 6).

For 2012, the raised discard data show a discard percentage of 1% for greater argentine and horse mackerel, 2% for herring and 4% for blue whiting (Table 6). Mackerel was again the most dominant species in the discards during the sampled trips; discard percentage of 21% (Table 6). Though pilchard was planned to be targeted during one trip (i.e. P108; Table 3), eventually this species was not targeted (Table 4). Therefore, the raised discard estimate for this species is highly uncertain. The discarded "other species" mainly consisted of hake. Overall, including the unsampled discards, the discard percentage for the Dutch pelagic fleet in 2012 based on the sampled trips is estimated at 6% (Table 6).

### *Raised German discard estimates*

Unlike the Dutch programme, where data is raised by quarter to the total fleet level regardless of the target of the fishery, data collected within the German sampling programme have been raised for the mackerel and herring directed fishery separately (Table 7). This difference between the both programmes needs to take into consideration when interpreting the raised estimates.

The raised data for the mackerel directed fishery show a discard percentage of 0% for target species mackerel in 2011 and 2012 (Table 7a). Horse mackerel was the second most dominant species in the landings. The discard percentage for this species was also 0% in 2011 and 2012. As herring, pilchard and "other species" were not targeted during the sampled trips (Table 3), the raised discard estimates for these species are highly uncertain, i.e. raised discard estimates for pilchard, herring and "other species" are only representative for the discards in the observed fisheries (i.e. the mackerel directed fishery) and not for all pilchard and blue whiting catches. The discarded "other species" mainly consisted of boarfish. Overall, the discard percentage for the German pelagic fleet targeting mackerel in 2011 and 2012 based on the sampled trips is estimated at 1% and 0% respectively (Table 7a). However, it must be noted that these raised numbers are only based on 2 trips in 2011 and 2 trips in 2012.

The raised data for the herring directed fishery show a discard percentage of 0% for target species herring in 2011 and 2012 (Table 7b). Redfish was the second most dominant species in the landings. This species has been categorized under "other species". As mackerel and blue whiting were not targeted during the sampled trips (Table 3), the raised discard estimates for these species are highly uncertain, i.e. raised discard estimates for mackerel and blue whiting are only representative for the discards in the observed fisheries (i.e. the herring directed fishery) and not for all pilchard and blue whiting catches. Overall, the discard percentage for the German pelagic fleet targeting herring in 2011 and 2012 based on the sampled trips is estimated at 3% and 0% respectively (Table 7b). However, it must be noted that these raised numbers are only based on 2 trips in 2011 and 1 trip in 2012.

## 4 Discussion

### 4.1 Two sampling programmes

The European Data Collection Framework foresees regionally harmonised sampling of commercial fisheries as a comprehensive pan-European synthesis of discard data across species, fishing regions and fleets. In anticipation, this report is a first attempt in presenting the data collected within the Dutch and German sampling programme in 2011 and 2012 on board pelagic freezer trawlers in European waters. As sampling protocols on board pelagic trawlers differ between Germany and The Netherlands (see sections 2.1 and 2.2) and different protocols result in different outcomes of the monitoring programmes (Stransky et al., 2010; Uhlmann et al., 2013), the results of both programmes are presented separately.

### 4.2 Sampling coverage

The European pelagic freezer trawler fleet is regularly sampled by both the Netherlands and Germany. The Dutch pelagic sampling programme aims at sampling 12 trips per year. As this aim was not reached in 2010 (i.e. only 8 trips were sampled), an extra 3 trips were conducted in 2011 which resulted in a total of 15 sampled trips in this year. The German sampling programme aims at sampling 4 trips per year, one trip in each quarter. However, in 2012 only three trips were sampled. Both programmes together correspond with an annual sampling coverage of around 15% of the total pelagic freezer trawler fleet effort in European waters, with the Dutch sampling programme having a higher sampling coverage than the German sampling programme.

The pelagic freezer trawler fleet is dynamic through time and space and visits several fishing grounds during one physical trip. In order to monitor annual catch and discards rates, it is essential that the sampled trips match the distribution of the fleet. Germany sampled 7 trips in total in 2011 and 2012; 4 trips were sampled during the mackerel fishery and 3 trips were sampled during the northern herring fishery in Norwegian waters (ICES area IIa), traditionally a fishery with very low discard rates (van Overzee & van Helmond, 2011). These sampled trips did not cover all fisheries over all seasons. Therefore, since most discarding of species occurs when they are not targeted, e.g. herring is discarded in the fishery targeting mackerel and horse mackerel (Table 4a; Trip P92), it is possible that raised German discard data result in lower total annual discard estimations. While this issue is partly solved by raising data by fishery, this rules out the possibility to (correctly) estimate total annual discard weights by species and year. This issue is in particular a problem for annual estimates for discarded mackerel, since this species is a regular (by)catch in fisheries targeting other species (Tables 4a,b).

The Netherlands sampled 27 trips in total in 2011 and 2012; 15 trips in 2011 and 12 trips in 2012. VMS information has been used to visualise the distribution of the Dutch pelagic freezer trawler fleet and sampled trips per quarter (Figures 7-10). In order to monitor the 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 catch and discard estimates. When plotting the distribution of the fleet and sampled trips on a yearly basis, it appears that sampling followed the distribution of the fleet (Figures 6a,b). However, when the data is plotted on a quarterly basis (Figures 7-10), sampling in quarter 2 in 2011 did not entirely follow the distribution of the fleet; the fleet was active in three different areas, while sampling occurred in only one area (Figure 8a). Such a mismatch may be caused by the fact that this period was not sampled as intensively as the other periods (Table 3). However, it is questionable whether splitting the data by quarter is the best method in determining whether sampling is following the distribution of the fleet. In the near future we will also investigate whether splitting the data by fishing season and/or fishing area or even on a more detailed level will result in a different fit. Unfortunately, data were not made available to make a similar comparison for the German sampling programme.

### 4.3 Combining results of two sampling programmes

This report shows that the sampling protocols from the Netherlands and Germany differ (see sections 2.1 and 2.2 for *schematic overviews of sampling programmes*). Differences in sampling protocol could cause a difference in estimating discard rates, especially when estimates are raised to fleet level and minor differences are extrapolated and emphasized. An important difference between the protocols is the recording of “unsampled discards” in the Dutch programme; Germany does not record such incidents. In addition, within the Dutch sampling programme discard samples are taken directly from the discard-gutter while within the German sampling programme discard samples are taken from unsorted catch samples (see sections 2.1 and 2.2 for *schematic overviews of sampling programmes*). This results in a different calculation of the raising factors that are needed to raise the discards to haul and consequently trip level. Both methods introduce different sources of bias.

The exclusion of non-sampled hauls in the discard estimates by trip by Germany – although this may be the case for a few hauls only – may lead to a slight underestimation of total discards in the fleet. Furthermore, differences in spatial and temporal sampling coverage and annual versus seasonal monitoring may cause for differences in discards estimates between the two sampling programmes. The raised estimates of the Dutch and German sampling programme are not directly comparable; the raised discard estimates for the Dutch sampling programme (Table 6) represent the total annual effort of the Dutch trawlers, while the German discard estimates (Table 7) are representative for the target fishery only. The overall estimated discard rate (annually) of the Dutch programme for 2011 and 2012 is 9% and 6% respectively and the overall estimated (seasonally) discard rate of the German programme for 2011 and 2012 is 1% and 0% respectively. Differences in the annual by the Netherlands and the seasonal monitoring by Germany are also illustrated in the length frequencies (Figure 5); the length frequencies of mackerel are different between the two monitoring programmes, and to lesser extend for herring, hors mackerel and blue whiting. Since mackerel is a regular (by)catch in fisheries targeting other species, these discards are not included in the German length frequencies.

In January 2010, a German flagged but Dutch owned pelagic freezer trawler was accidentally double manned with a Dutch and German observer. Stransky et al. (2010) compared the results derived from the data collected during this sampled trip within the Dutch and German sampling programme. Differences were found within this study in catch estimates by weight and numbers and length distributions for the sampled trip between the two sampling programmes. While these differences were minor to moderate, they could play a greater role when raising data to the whole fleet or fisheries.

Differences in methods and implementation show the necessity to develop a rightly bilateral harmonized sampling programme. Protocols, sampling frames, implementation and selection procedures need to be synchronized; from sampling hauls on board to statistically sound raising procedures to fleet level. Nonetheless, with this report an important first step is made by the two member states to a more harmonized combined sampling programme for the pelagic freezer trawler fleet. However, there is still a long way to go and lots of work needs to be done, and therefore, at this stage, results and comparisons between the two programmes need to be interpreted with caution.

### 4.4 Reform of the Common Fishery Policy

An important element in the proposed reform of the Common Fishery Policy (CFP) is the obligation to land all catches, i.e. a discard ban. The current system, where quotas are based on landings, will be replaced by a catch quota regime. Raised estimates of landings and discards are good indicators for future bottle necks. In 2013, the PFA started a pilot study, in cooperation with IMARES and the NVWA (Dutch Control Agency), to investigate the possibilities when operating under a discard ban. Within this project different scenarios are tested to reduce discards through technical measures. In addition,

methods are developed to process products from formerly discarded fish and a system with closed circuit television (CCTV) is tested to fully document the fishery as possible tool for compliance.

An obligation to land all catches, or at least the species subjected to the discard ban, will have an effect on the current sampling programme on pelagic freezer trawlers. The ICES Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS) states: "*although it is currently not clear how quantities of catches will be quantified and recorded, in principle there is the possibility for exhaustive coverage (at least in large-scale fisheries) leading to substantial increase in precision of catch estimates for the species covered by the ban*" (ICES, 2013b). In any case, there still will be a need for scientific monitoring programmes on board to collect biological data (e.g. length, age, maturity) on a haul basis in order to cover spatial and temporal variations and develop weighting factors for combining samples over sampled hauls and trips to give total length and age compositions for the fleet, which is essential information for stock assessments (ICES, 2013b).

Two different catch monitoring schemes, namely one for compliance (official catch data) and one for scientific programmes, may potentially result in data series with conflicting information. Discarding will become an illegal activity that will not be recorded in the official catch data. However, scientific observers will be in a position where they are able to observe these illegal practices. This could affect fishing behaviour and, eventually, cause bias in observer data.

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## Signature

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Approved by:

Drs. F.A. van Beek

Deputy head WOT, Centre for Fisheries Research

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A handwritten signature in black ink, appearing to read 'F.A. van Beek', with a long horizontal flourish underneath.

Date:

12<sup>th</sup> December 2013

**Appendix: Tables and Figures**

**Table 1a.** Landings (tonnes) per year, species and ICES area by the **Dutch** freezer trawler fleet in 2011 and 2012. Data extracted from VISSTAT database. For areas see Figure 1.

Year	Species	IIa	IIb	IVa	IVb	IVc	VIa	VIb	VIIb	VIIc	VIIId	VIIe	VIIh	VIIIb	VIIj	VIIk	?	Total
2011	Greater argentine	0	0	0	0	0	1483	0	0	0	0	0	0	0	0	0	0	1483
	Herring	7955	0	15126	7314	802	1684	0	0	0	9791	6	568	29	7	0	470	43752
	Horse mackerel	1	0	81	346	2140	6353	0	12462	8005	13300	3155	4296	49	21114	137	0	71439
	Mackerel	178	0	9565	35	1	8765	0	2047	457	22	47	394	0	6536	7	0	28054
	Pilchard	0	0	0	0	0	0	0	0	0	436	33	44	5	0	0	0	518
	Blue whiting	47	0	1	0	0	3429	0	17	1079	0	0	0	5	16	0	0	4594
2012	Greater argentine	0	0	14	0	0	1742	0	0	0	0	0	0	0	0	0	0	1757
	Herring	1266	4826	46654	9202	1042	3523	0	0	0	12580	0	936	0	2719	0	145	82893
	Horse mackerel	0	0	92	1	187	12653	0	17908	6104	11188	5780	3504	5	20057	194	0	77675
	Mackerel	5	0	5573	44	0	6432	0	4645	477	40	68	297	2	7719	0	0	25303
	Pilchard	0	0	0	0	20	0	0	0	0	566	439	630	0	0	0	0	1655
	Blue whiting	0	82	150	0	0	11781	976	3065	9792	0	0	0	0	291	0	0	26136

**Table 1b.** Landings (tonnes) per year, species and ICES area by the **German** freezer trawler fleet in 2011 and 2012. Data extracted from German FiStat database, landings in non-ICES areas not included. For areas see Figure.

Year	Species	IIa	IIb	IVa	IVb	IVc	VIa	VIIb	VIIc	VIIId	VIIe	VIIh	VIII-j	VIIk	VIIIa	VIIIId	Total
2011	Greater argentine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Herring	11787	1509	2533	279	0	3388	0	0	4984	0	0	0	0	0	0	24478
	Horse mackerel	0	0	0	0	96	6508	4409	4988	3366	105	534	4463	50	61	0	24576
	Mackerel	0	0	5281	0	0	11772	2366	461	0	64	111	2679	0	1341	0	24073
	Pilchard	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	5
	Blue whiting	22	10	0	0	0	0	0	220	0	0	0	16	0	0	0	267
2012	Greater argentine	0	0	0	0	0	538	0	0	0	0	0	0	0	0	0	538
	Herring	3361	8584	12806	84	0	1829	0	0	7268	0	230	0	0	0	0	34162
	Horse mackerel	0	0	0	0	576	671	6273	2494	4779	705	65	6620	234	0	0	22418
	Mackerel	101	5	4536	0	0	10545	1272	149	0	0	0	922	0	0	1390	18920
	Pilchard	0	0	0	0	0	0	0	0	46	220	321	0	0	0	0	587
	Blue whiting	2	10	0	0	0	3963	0	2238	0	0	0	25	0	0	0	6238

**Table 2.** Overview of sampled trips in 2011 and 2012 (n.m. = not measured)

Year	Trip	Sampling programme*	Flag vessel *	Nr of hauls	Nr of hauls sampled **	% of hauls sampled	Nr of hauls with unsampled discards ***
2011	P83	NLD	NLD	50	44	88%	1
	P84	NLD	NLD	28	27	96%	3
	P85	NLD	NLD	32	29	91%	0
	P86	NLD	NLD	43	41	95%	1
	P87	NLD	NLD	40	37	93%	3
	P88	NLD	FR	26	24	92%	14
	P89	NLD	NLD	37	33	89%	0
	P90	NLD	NLD	35	35	100%	2
	P91	NLD	NLD	17	11	65%	2
	P92	NLD	NLD	30	29	97%	1
	P93	NLD	NLD	26	26	100%	9
	P94	NLD	NLD	13	9	69%	3
	P95	NLD	NLD	24	15	63%	0
	P96	NLD	NLD	11	7	64%	4
	P97	NLD	NLD	32	27	84%	2
	G1	DEU	DEU	24	21	88%	n.m.
	G4	DEU	DEU	22	19	86%	n.m.
	G6	DEU	DEU	42	37	88%	n.m.
G7	DEU	DEU	43	37	86%	n.m.	
2012	P98	NLD	NLD	15	8	53%	0
	P99	NLD	FR	37	36	97%	2
	P100	NLD	NLD	34	34	100%	0
	P101	NLD	NLD	73	70	96%	0
	P102	NLD	DEU	94	87	93%	0
	P103	NLD	FR	23	23	100%	4
	P104	NLD	NLD	26	25	96%	0
	P105	NLD	NLD	52	47	90%	0
	P106	NLD	NLD	70	64	91%	1
	P107	NLD	NLD	38	38	100%	1
	P108	NLD	DEU	29	24	83%	0
	P109	NLD	NLD	48	46	96%	4 ****
	G12	DEU	DEU	23	19	83%	n.m.
	G13	DEU	DEU	21	21	100%	n.m.
	G14	DEU	DEU	22	17	77%	n.m.

\* NLD = Netherlands, DEU = Germany, FR = France

\*\* Including hauls with zero catch

\*\*\* Discarding events during which part of or the whole catch within a haul was discarded prior to the sorting process

\*\*\*\* The observer was able to sample one haul

**Table 3.** Period, target species and ICES areas of the trips conducted during the observer programme in 2011 and 2012

Year	Trip	Period	Target species *	ICES areas
2011	P83	Jan	Horse mackerel, mackerel	VIa, VIIb, VIIc, VIId
	P84	Feb, March	Horse mackerel, mackerel	VIId, VIIh, VIIj
	P85	March, Apr	Horse mackerel, mackerel	VIIb, VIIc, VIIj, VIIk
	P86	June	Herring	IVa, IVb
	P87	July, Aug	Herring, argentine, horse mackerel	IVa, IVb, VIa
	P88	July	Herring	IVa, IVb
	P89	Aug, Sep	Horse mackerel	VIId, VIIe
	P90	Aug, Sep	Herring	IVb, IIa
	P91	Oct	Horse mackerel, pilchard	VIId, VIIe, VIIh
	P92	Nov	Mackerel, horse mackerel	IVa, VIa
	P93	Nov	Herring	IIa
	P94	Nov, Dec	Horse mackerel, herring	VIId, VIIe
	P95	Nov, Dec	Mackerel	IVa, VIa
	P96	Dec	Herring, horse mackerel, sprat, mackerel	IVc, VIa, VIId, VIIe
	P97	Dec	Herring, sprat	IVc, VIId
	G1	Jan	Mackerel	VIa
	G4	Feb, Mar	Mackerel	VIIj
G6	Aug, Sep	Herring	IIa	
G7	Oct, Nov	Herring	IIa	
2012	P98	Feb	Horse mackerel, mackerel	VIId, VIIh, VIIj
	P99	Jan	Horse mackerel, mackerel	VIIb, VIIc, VIIj
	P100	Feb, Mar	Blue whiting	VIa, VIIb, VIIc
	P101	Apr, May	Argentine, blue whiting, horse mackerel, mackerel	Vb, VIa, VIIb, VIIc, VIIj, VIIk
	P102	Apr, May, June	Blue whiting, argentine, horse mackerel	VIa
	P103	June, July	Herring	IVa
	P104	July	Herring	IVa
	P105	July	Herring	IVa
	P106	Aug	Sprat	IVb, IVc
	P107	Oct	Herring	IIa
	P108	Nov	Horse mackerel, pilchard, black seabream	VIIe, VIIh
	P109	Nov, Dec	Horse mackerel, herring	VIId, VIIe, VIIh
	G12	Jan	Mackerel	VIa
	G13	Jan, Feb	Mackerel	VIa, VIIb, VIIj
G14	Aug, Sep	Herring, redfish	IIa, IIb	

\* These species are described as target species in the observer journals, based on information prior to the trip. This does not necessarily mean that the species are caught during the trip; if they fail to find the species the catch is zero.

**Table 4a.** Total catch, landings, discards (tonnes), discard percentage and unsampled discards per sampled pelagic discard trip in 2011

2011	Month	Quarter		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others*	Unsampled discards <sup>&amp;</sup>	Total	Not sampled <sup>+</sup>	Damaged net	
P83	1	1	Catch	3.5			2363.7	1025.3		5.1	30	3427.6	69		
			Landings	0.0			2360.6	780.0		2.0			3142.6		
			Discards	3.5			3.1	245.3		3.1		30	285.0		
			% Discards	100%			<1%	24%		61%		100%	8%		
P84	1,2	1	Catch	4.7			416.3	593.3	0.6	19.6	20	1054.5	3		
			Landings	0.0			411.5	465.1	0.0	0.0			876.6		
			Discards	4.7			4.8	128.2	0.6	19.6		20	177.9		
			% Discards	100%			1%	22%	100%	100%		100%	17%		
P85	3,4	1,2	Catch	113.0	0.1		806.5	461.9		50.0		1431.5	115		
			Landings	0.0	0.0		796.0	374.7		0.0			1170.7		
			Discards	113.0	0.1		10.5	87.2		50.0			260.8		
			% Discards	100%	100%		1%	19%		100%			18%		
P86	6	2	Catch			2049.9		42.1		3.7	6	2101.7	20		
			Landings			2008.9		27.8		0.0			2036.7		
			Discards			41.0		14.3		3.7		6	65.0		
			% Discards			2%		34%		100%		100%	3%		
P87	7,8	3	Catch	73.1	96.5	1387.4	186.4	66.8		7.1	13.5	1830.8			
			Landings	65.2	95.5	1356.4	180.1	44.0		0.0			1741.2		
			Discards	7.9	1.0	31.0	6.3	22.8		7.1		13.5	89.6		
			% Discards	11%	1%	2%	3%	34%		100%		100%	5%		
P88	7	3	Catch			1646.2	0.3	8.5		3.0	336.7	1994.7	104		
			Landings			1629.2	0.0	0.0		0.0			1629.2		
			Discards			17.0	0.3	8.5		3.0		336.7	365.5		
			% Discards			1%	100%	100%		100%		100%	18%		
P89	8,9	3	Catch	0.1			1654.0	222.8	26.0	0.3		1903.2	98		
			Landings	0.0			1616.9	69.9	0.0	0.0			1686.8		
			Discards	0.1			37.1	152.9	26.0	0.3			216.4		
			% Discards	100%			2%	69%	100%	100%			11%		

**Table 4a.** Continued

2011	Month	Quarter		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others*	Unsampled discards <sup>&amp;</sup>	Total	Not sampled <sup>+</sup>	Damaged net	
P90	8,9	3	Catch	6.6		3870.3		20.2		0.2	25	3922.3			
			Landings	6.6		3840.3		0.0		0.0			3846.9		
			Discards	0.0		30.0		20.2		0.2		25	75.4		
			% Discards	0%		1%		100%		100%		100%	2%		
P91	10	4	Catch				430.4	17.6	30.5	12.4	65	555.9	25		
			Landings				426.6	6.8	20.7	11.3			465.4		
			Discards				3.8	10.8	9.8	1.1		65	90.5		
			% Discards				1%	61%	32%	9%		100%	16%		
P92	11	4	Catch	0.0		11.2	530.2	2043.1	0.8	7.2	3	2595.5			
			Landings	0.0		0.0	512.3	1645.3	0.0	0.0			2157.6		
			Discards	0.0		11.2	17.9	397.8	0.8	7.2		3	437.9		
			% Discards			100%	3%	19%	100%	100%		100%	17%		
P93	11	4	Catch	0.9		1834.2				0.9	190	2026.0			
			Landings	0.0		1810.3			0.0				1810.3		
			Discards	0.9		23.9			0.9			190	215.7		
			% Discards	100%		1%			100%		100%	100%	11%		
P94	11,12	4	Catch			112.7	369.2	14.9	1.1	5.6	195.5	699.0			
			Landings			110.3	349.6	3.0	0.0	5.4			468.3		
			Discards			2.4	19.6	11.9	1.1	0.2		195.5	230.7		
			% Discards			2%	5%	80%	100%	4%		100%	33%		
P95	11,12	4	Catch			0.1		2156.5				2156.6	1470 <sup>#</sup>		
			Landings			0.0		2094.0				2094.0			
			Discards			0.1		62.5					62.6		
			% Discards			100%		3%					3%		
P96	12	4	Catch			78.7		371.3		55.0	82	587.0			
			Landings			72.4		297.5		55.0			424.9		
			Discards			6.3		73.8		0.0		82	162.1		
			% Discards			8%		20%		0%		100%	28%		



**Table 4a.** Continued

2011	Month	Quarter		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others*	Unsampled discards <sup>&amp;</sup>	Total	Not sampled <sup>+</sup>	Damaged net		
P97	12	4	Catch			820.9		0.0		137.1	50	1008.0	10	20		
			Landings			810.2		0.0		137.0 <sup>§</sup>			947.2			
			Discards					10.7		0.0		0.1	50	60.8		20
			% Discards					1%				<1%	100%	6%		100%
G1	1	1	Catch					1270.0				1270.0				
			Landings					1270.0					1270.0			
			Discards						0				0			
			% Discards						0%				0%			
G4	2,3	1	Catch				168.5	1033.5		48.9		1250.9				
			Landings				168.5	1033.5		0			1202.0			
			Discards					0	0		48.9			48.9		
			% Discards					0%	0%		100%			4%		
G6	8,9	3	Catch	11.6		1035.6				187.4		1234.6				
			Landings	0		1024.3				185.2			1209.5			
			Discards	11.6		11.3				2.2			25.1			
			% Discards	100%		1%				1%			2%			
G7	10,11	4	Catch	35.9		3706.4		0.6		12.6		3755.5				
			Landings	35.9		3706.4		0		0			3742.3			
			Discards	0		0		0.6		12.6			13.2			
			% Discards	0%		0%		100%		100%			<1%			

\* Other species landed include: black seabream (*Spondyliosoma cantharus*), bonito (*Sarda sarda*), gilt head (*Sparus aurata*), hake (*Merluccius merluccius*), redfish (*Sebastes mentella*), sprat (*Sprattus sprattus*) and sea bass (*Dicentrarchus labrax*). For other species discarded see Table 5.

<sup>&</sup> Discarding events during which part of or the whole catch within a haul is discarded. Such incidents have only been monitored within the Dutch sampling programme.

<sup>+</sup> During the sampled trips it sporadically happened that a haul was not sampled. Within the Dutch sampling programme the observer did during such occasions estimate total weight. These values are presented in this column.

<sup>#</sup> Due to medical circumstances the observer had to depart the vessel earlier resulting in this relatively high tonnage of not sampled hauls.

<sup>§</sup> As the target species in this trip was sprat, the value for "others" is higher in comparison with other trips.

**Table 4b.** Total catch, landings, discards (tonnes), discard percentage and unsampled discards per sampled pelagic discard trip in 2012

2012	Month	Quarter		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others*	Unsampled discards <sup>&amp;</sup>	Total	Not sampled <sup>+</sup>	Damaged net	
P98	2	1	Catch	2.9			100.9	286.0		5.3		395.1			
			Landings	0.0			100.2	253.1		4.1		357.4			
			Discards	2.9			0.7	32.9		1.2		37.7			
			% Discards	100%			1%	12%		23%		10%			
P99	1	1	Catch				936.7	771.6		5.7	25	1739.0	51	8	
			Landings				929.6	467.5		0.0		1397.1			
			Discards				7.1	304.1		5.7	25	341.9		8	
			% Discards				1%	39%		100%	100%	20%		100%	
P100	2,3	1	Catch	2050.9			29.1					2080.0			
			Landings	2050.0			29.1					2079.1			
			Discards	0.9			0.0					0.9			
			% Discards	<1%			0%					<1%			
P101	4,5	2	Catch	1164.3	296.1	0.6	2041.5	753.9		149.2		4405.6	123		
			Landings	1049.7	292.1	0.0	1982.6	257.7		8.6		3722.7			
			Discards	114.6	4.0	0.6	58.9	496.2		140.6		682.9			
			% Discards	10%	1%	100%	3%	66%		94%		16%			
P102	4,5,6	2	Catch	999.9	1634.5		12.9					2647.3		79	
			Landings	936.3	1634.5		12.9					2583.7			
			Discards	63.6	0.0		0.0					63.6		79	
			% Discards	6%	0%		0%					2%		100%	
P103	6,7	3	Catch			1617.9		0.9			65	1683.8			
			Landings			1595.4		0.0				1595.4			
			Discards			22.5		0.9				65	88.4		
			% Discards			1%		100%				100%	5%		
P104	7	3	Catch			2214.8		14.6				2229.4	5		
			Landings			2208.6		0.0				2208.6			
			Discards			6.2		14.6				20.8			
			% Discards			<1%		100%				1%			

**Table 4b.** Continued

2012	Month	Quarter		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others*	Unsampled discards <sup>&amp;</sup>	Total	Not sampled <sup>+</sup>	Damaged net	
P105	7	3	Catch			4260.2		31.7		3.8		4295.7	113		
			Landings			4231.9		0.0		0.0			4231.9		
			Discards			28.3		31.7		3.8			63.8		
			% Discards			1%		100%		100%			1%		
P106	8	3	Catch			0.2	0.1	91.8		2049.2	32	2173.3	152		
			Landings			0.0	0.0	29.5		2030.2 <sup>#</sup>			2059.7		
			Discards			0.2	0.1	62.3		19.0	32		113.6		
			% Discards			100%	100%	68%		1%	100%		5%		
P107	10	4	Catch	90.1		3102.1		0.2		2.1	10	3204.6			
			Landings	88.3		3096.1		0.2		2.0			3186.6		
			Discards	1.8		6.1		0.0		0.1	10		18.0		
			% Discards	2%		<1%		0%		5%	100%		1%		
P108	11	4	Catch				526.9	2.3	3.1	3.0		535.3	9		
			Landings				526.9	0.0	0.0	0.5			527.4		
			Discards				0.0	2.3	3.1	2.5			7.9		
			% Discards				0%	100%	100%	83%			1%		
P109	11,12	4	Catch			3090.5	806.1	8.2	32.1	1.9	70	4008.8	15		
			Landings			2953.8	797.5	0.0	0.0	0.0			3751.3		
			Discards			136.7	8.6	8.2	32.1	1.9	70		257.5		
			% Discards			4%	1%	100%	100%	100%	100%		6%		
G12	1	1	Catch				1.9	1233.1		0.2		1235.2			
			Landings				1.9	1233.0		0		1234.9			
			Discards				0	0.1		0.2			0.3		
			% Discards				0%	<1%		100%			<1%		
G13	1,2	1	Catch				53.1	1260.1				1313.2			
			Landings				53.1	1260.1				1313.2			
			Discards				0	0					0		
			% Discards				0%	0%					0%		

**Table 4b.** Continued

2012	Month	Quarter		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others*	Unsampled discards <sup>&amp;</sup>	Total	Not sampled <sup>+</sup>	Damaged net
G14	8,9	3	Catch	0.9		448.3		0.0		114.4		563.6		
			Landings	0.9		448.3		0.0		114.4 <sup>§</sup>		563.6		
			Discards	0		0		0		0		0		
			% Discards	0%		0%		0%		0%		0%		

\* Other species landed include: black seabream (*Spondyliosoma cantharus*), golden redfish (*Sebastes norvegicus*), hake (*Merluccius merluccius*), redfish (*Sebastes mentella*) and sprat (*Sprattus sprattus*). For other species discarded see Table 5.

<sup>&</sup> Discarding events during which part of or the whole catch within a haul is discarded. Such incidents have only been monitored within the Dutch sampling programme.

<sup>+</sup> During the sampled trips it sporadically happened that a haul was not sampled. Within the Dutch sampling programme the observer did during such occasions estimate total weight. These values are presented in this column.

<sup>#</sup> As the target species in this trip was sprat, the value for "others" is higher in comparison with other trips.

<sup>§</sup> As the target species in this trip were herring and redfish, the value for "others" is higher in comparison with other trips.

**Table 5a.** Average amount of discards (tonnes) or total number observed over sampled pelagic **Dutch** discard trips in 2011 and 2012

Species	Scientific name	2011 Average weight (tonnes)	2012 Average weight (tonnes)
Blue whiting	<i>Micromesistius poutassou</i>	8.7	15.3
Greater argentine	<i>Argentina silus</i>	0.1	0.3
Herring	<i>Clupea harengus</i>	11.6	16.7
Horse mackerel	<i>Trachurus trachurus</i>	6.9	6.3
Mackerel	<i>Scomber scombrus</i>	82.4	79.4
Pilchard	<i>Sardina pilchardus</i>	2.6	2.9
Anchovy	<i>Engraulis encrasicolus</i>	0.1	<0.1
Beaked redfish	<i>Sebastes mentella</i>		
Bib	<i>Trisopterus luscus</i>	<0.1	
Black scabbardfish	<i>Aphanopus carbo</i>		<0.1
Black seabream	<i>Spondyliosoma cantharus</i>	<0.1	<0.1
Boarfish	<i>Capros aper</i>	2.0	1.0
Garfish	<i>Belone belone</i>	<0.1	
Gilt head	<i>Sparus aurata</i>	<0.1	
Golden redfish	<i>Sebastes norvegicus</i>		<0.1
Greater weever	<i>Trachinus draco</i>		<0.1
Grey gurnard	<i>Eutrigla gurnardus</i>	0.1	<0.1
Haddock	<i>Melanogrammus aeglefinus</i>	0.5	<0.1
Hake	<i>Merluccius merluccius</i>	3.4	11.3
John Dory	<i>Zeus faber</i>		<0.1
Loligo	<i>Loligo sp.</i>	<0.1	<0.1
Lumpsucker	<i>Cyclopterus lumpus</i>	<0.1	0.1
Norway pout	<i>Trisopterus esmarkii</i>	<0.1	<0.1
Poor cod	<i>Trisopterus minutus</i>	<0.1	
Saithe	<i>Pollachius virens</i>	<0.1	<0.1
Sea bass	<i>Dicentrarchus labrax</i>	<0.1	
Silvery pout	<i>Gadiculus argenteus</i>		<0.1
Sprat	<i>Sprattus sprattus</i>	<0.1	1.6
Tub gurnard	<i>Trigla lucerna</i>	<0.1	<0.1
Whiting	<i>Merlangius merlangus</i>	0.3	0.5
Basking shark	<i>Cetorhinus maximus</i>	1 individual	
Blue shark	<i>Prionace glauca</i>	1 individual	
Grey seal	<i>Halichoerus grypus</i>	4 individuals	
Lesser spotted dogfish	<i>Scyliorhinus canicula</i>	<0.1	<0.1
Long-finned pilot whale	<i>Globicephala melas</i>		1 individual
Porbeagle	<i>Lamna nasus</i>		<0.1
Smoothhound	<i>Mustelus sp.</i>	<0.1	<0.1
Spurdog	<i>Squalus acanthias</i>	0.1	
Starry smoothhound	<i>Mustelus asterias</i>		<0.1
Thresher shark	<i>Alopias vulpinus</i>	<0.1	<0.1
Tope	<i>Galeorhinus galeus</i>		<0.1

**Table 5b.** Average amount of discards (tonnes) or total number observed over all sampled pelagic German discard trips in 2011 and 2012.

Species	Scientific name	2011 Average weight (tonnes)	2012 Average weight (tonnes)
Blue whiting	<i>Micromesistius poutassou</i>	2.9	
Greater argentine	<i>Argentina silus</i>		
Herring	<i>Clupea harengus</i>	2.8	
Horse mackerel	<i>Trachurus trachurus</i>		
Mackerel	<i>Scomber scombrus</i>	0.2	<0.1
Pilchard	<i>Sardina pilchardus</i>		
Anchovy	<i>Engraulis encrasicolus</i>		
Beaked redfish	<i>Sebastes mentella</i>	3.1	
Bib	<i>Trisopterus luscus</i>		
Black scabbardfish	<i>Aphanopus carbo</i>		
Black seabream	<i>Spondylisoma cantharus</i>		
Boarfish	<i>Capros aper</i>	12.2	
Garfish	<i>Belone belone</i>		
Gilt head	<i>Sparus aurata</i>		
Golden redfish	<i>Sebastes norvegicus</i>		
Greater weever	<i>Trachinus draco</i>		
Grey gurnard	<i>Eutrigla gurnardus</i>		0.1
Haddock	<i>Melanogrammus aeglefinus</i>	<0.1	
Hake	<i>Merluccius merluccius</i>		
John Dory	<i>Zeus faber</i>		
Loligo	<i>Loligo sp.</i>		
Lumpsucker	<i>Cyclopterus lumpus</i>		
Norway pout	<i>Trisopterus esmarkii</i>		
Poor cod	<i>Trisopterus minutus</i>		
Saithe	<i>Pollachius virens</i>		
Sea bass	<i>Dicentrarchus labrax</i>		
Silvery pout	<i>Gadiculus argenteus</i>		
Sprat	<i>Sprattus sprattus</i>		
Tub gurnard	<i>Trigla lucerna</i>		
Whiting	<i>Merlangius merlangus</i>	0.6	
Basking shark	<i>Cetorhinus maximus</i>		
Blue shark	<i>Prionace glauca</i>		
Grey seal	<i>Halichoerus grypus</i>		
Lesser spotted dogfish	<i>Scyliorhinus canicula</i>		
Long-finned pilot whale	<i>Globicephala melas</i>	5 individuals	
Porbeagle	<i>Lamna nasus</i>		
Smoothhound	<i>Mustelus sp.</i>		
Spurdog	<i>Squalus acanthias</i>		
Starry smoothhound	<i>Mustelus asterias</i>		
Thresher shark	<i>Alopias vulpinus</i>		
Tope	<i>Galeorhinus galeus</i>		

**Table 6.** Total catch, landings, discards (tonnes) and discard percentages from the **Dutch sampling programme** raised to **Dutch pelagic fleet** for 2003-2012. Raised data for the period 2003-2007 taken from Van Helmond & van Overzee (2009), raised data for the period 2008-2009 taken from Van Helmond & van Overzee (2010), raised data for 2010 taken from Van Overzee & van Helmond (2011).

		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others	Unsampled discards	Total	Not sampled	Damaged net
2003 (n=5)	Catch	58522	3857	96954	72405	36830	10847	6181	20174	305770	482	
	Landings	57262	2610	90062	68614	28861	8147	0		255556		
	Discards	1260	1247	6892	3791	7969	2700	6181	20174	50214		
	% Discards	2%	32%	7%	5%	22%	25%	100%	100%	17%		
2004 (n=6)	Catch	78316	10890	132399	68117	32095	3430	2419	4854	332520	443	
	Landings	77185	10662	128705	67105	27114	2684	461		313916		
	Discards	1131	228	3694	1012	4981	746	1958	4854	18604		
	% Discards	1%	2%	3%	1%	16%	22%	81%	100%	6%		
2005 (n=11)	Catch	131280	3984	128763	69057	38970	2424	2175	4900	381553	37	
	Landings	128367	3984	124627	68431	24740	2230	67		352446		
	Discards	2913	0	4136	626	14230	194	2108	4900	29107		
	% Discards	2%	0%	3%	1%	37%	8%	97%	100%	8%		
2006 (n=12)	Catch	97085	1211	93157	64795	33583	2975	1148	6883	300837	71	
	Landings	96139	1062	90688	64183	24054	2291	117		278534		
	Discards	946	149	2469	612	9529	684	1031	6883	22303		
	% Discards	1%	12%	3%	1%	28%	23%	90%	100%	7%		
2007 (n=12)	Catch	81832	3911	101993	61528	33293	1212	911	6562	291242	1064	
	Landings	80730	3866	100454	61118	24037	1202	193		271600		
	Discards	1102	45	1539	410	9256	10	718	6562	19642		
	% Discards	1%	1%	2%	1%	28%	1%	79%	100%	7%		
2008 (n=12)	Catch	80541	3084	57659	63069	29196	2476	1634	4308	241967	3694	
	Landings	78447	3026	56709	62631	19819	2398	142		223172		
	Discards	2094	58	950	438	9377	78	1492	4308	18795		
	% Discards	3%	2%	2%	1%	32%	3%	91%	100%	8%		
2009 (n=11)	Catch	36164	1871	54555	58207	29132	2892	2547	3395	188763	1057	
	Landings	35796	1797	52523	57574	23067	2851	834		174442		
	Discards	368	74	2032	633	6065	41	1713	3395	14321		
	% Discards	1%	4%	4%	1%	21%	1%	67%	100%	8%		

**Table 6.** Continued

		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others	Unsampled discards	Total	Not sampled	Damaged net
2010*	Catch	35521	2929	57008	79194	30348	7328	9310	3842	225120	943	
(n=8)	Landings	34038	2905	56275	78672	24901	7325	8408		212524		
	Discards	1483	24	733	522	5447	3	902	3842	12596		
	% Discards	4%	1%	1%	1%	18%	<1%	10%	100%	6%		
2011*	Catch	5449	1489	45105	71973	34800	713	9249	4925	173703	8933	83
(n=15)	Landings	4594	1483	43752	71439	28054	518	8604		158444		
	Discards	855	6	1353	534	6746	195	645	4925	15259		
	% Discards	16%	0%	3%	1%	19%	27%	7%	100%	9%		
2012	Catch	27343	1783	84453	78204	32064	1972	7001	1400	234220	2740	583
(n=12)	Landings	26136	1757	82893	77675	25303	1655	5878		221297		
	Discards	1207	26	1560	529	6761	317	1123	1400	12923		583
	% Discards	4%	1%	2%	1%	21%	16%	16%	100%	6%		100%

\* As the number of trips of the fleet have been adjusted according to the most recent information, the values presented in this table may differ from earlier presented information.



**Table 7a.** Total catch, landings, discards (tonnes) and discard percentages from the **German sampling programme** raised to the **German mackerel directed fishery** for 2011 and 2012.

		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others	Unsampled discards	Total	Not sampled hauls	Damaged net
2011	Catch			13	3324	18602	5	220		22164		
(n=2)	Landings			13	3324	18602	5	0		21944		
	Discards			0	0	0	0	220		220		
	% Discards			0%	0%	0%	0%	100%		1%		
2012	Catch				8205	14243	551	0		23001		
(n=2)	Landings				8205	14242	551	0		22998		
	Discards				0	0	0	2		2		
	% Discards				0%	0%	0%	100%		0%		

**Table 7b.** Total catch, landings, discards (tonnes) and discard percentages from the **German sampling programme** raised to the **German herring directed fishery** for 2011 and 2012.

		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others	Unsampled discards	Total	Not sampled hauls	Damaged net
2011	Catch	55		13318		1		531		13905		
(n=2)	Landings	32		13296		0		214		13542		
	Discards	23		23		1		326		373		
	% Discards	42%		0%		100%		61%		3%		
2012	Catch	12201		11945		107		200		24453		
(n=1)	Landings	12201		11945		107		200		24453		
	Discards	0		0		0		0		0		
	% Discards	0%		0%		0%		0%		0%		



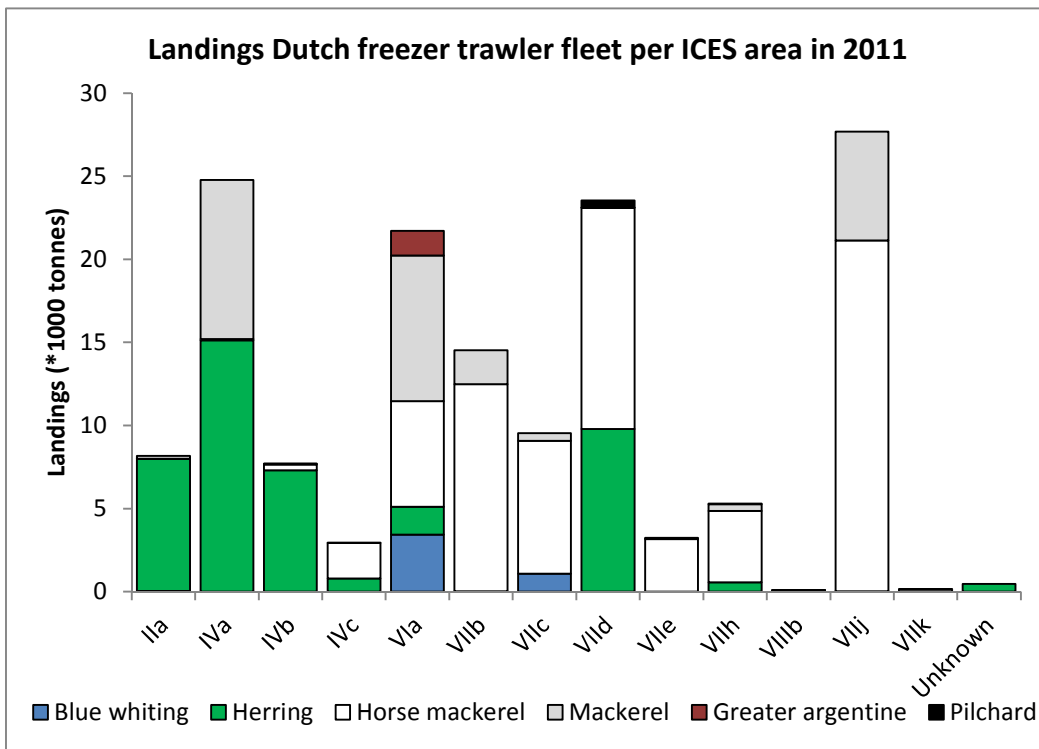
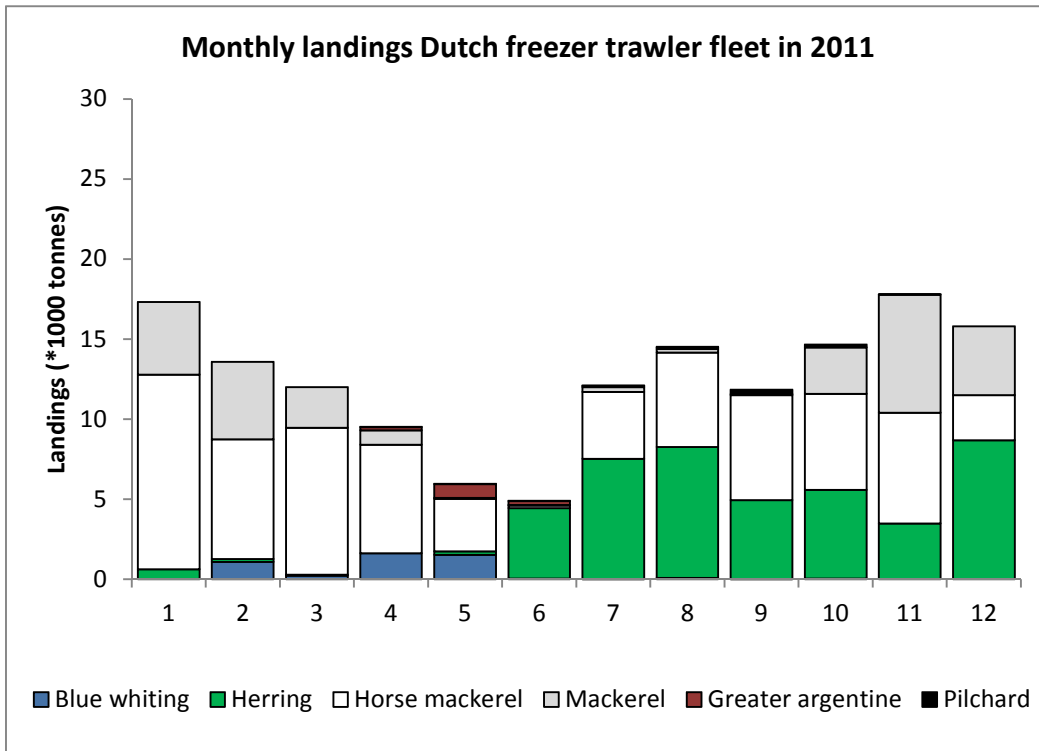
**Table 8.** Fishing TACs and quotas for 2011 as fixed by Council Regulations (EC) No 685/2010 of 26 July 2010, No 1124/2010 of 29 November 2010, No 1225/2010 of 13 December 2010, No 1256/2010 of 17 December 2010, and No 57/2011 of 18 January 2011. Changes may have been made during 2011.

Species	European TAC 2011 (tonnes)	Dutch TAC 2011 (tonnes)	German TAC 2011 (tonnes)	% Dutch TAC	% German TAC
Herring	1 470 799	48 292	33 830	3%	2%
Mackerel	319 498	25 350	16 902	8%	5%
Horse mackerel	260 014	61 029	13 947	23%	5%
Blue whiting	40 100	1 869	596	5%	1.5%

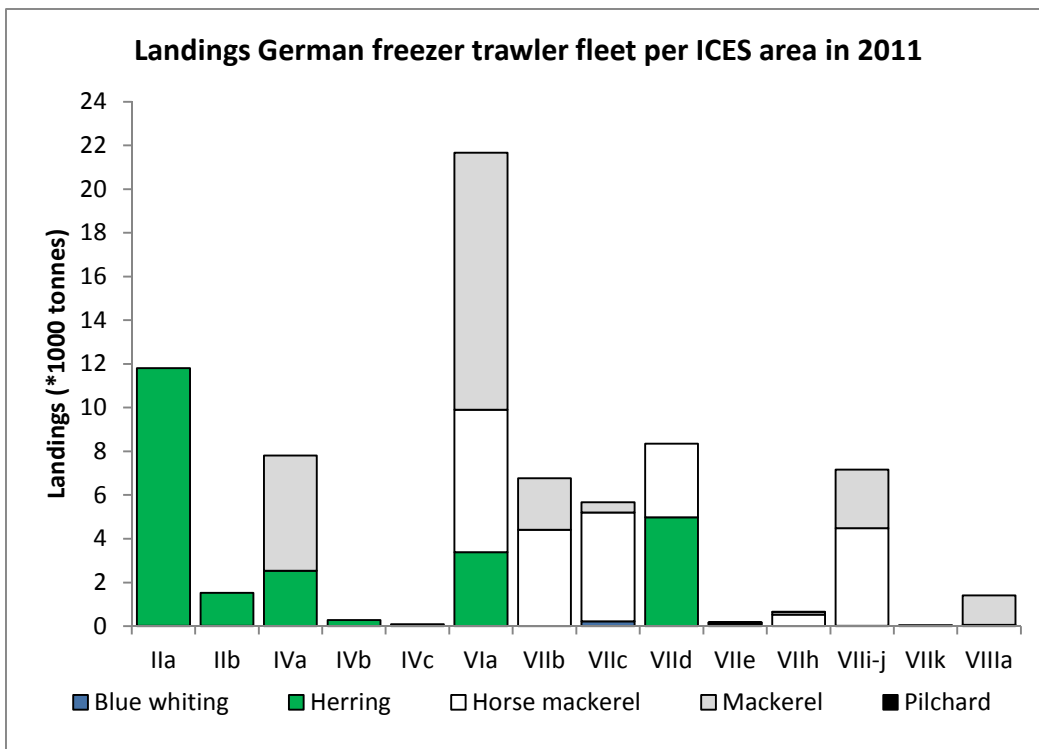
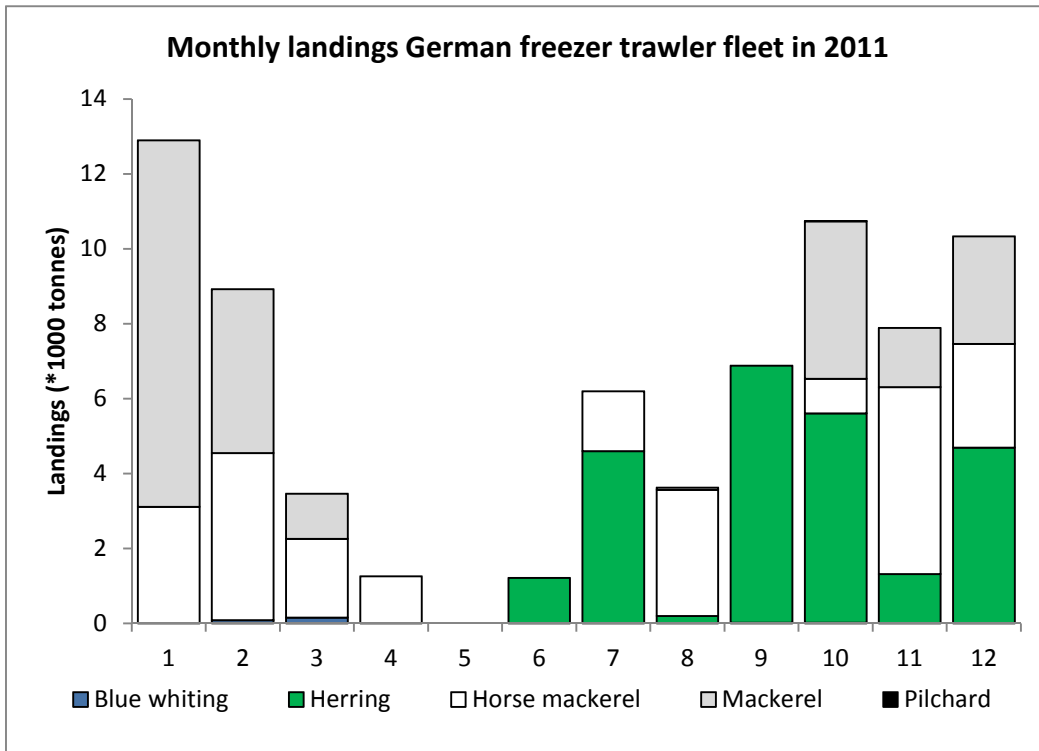
**Table 9.** Fishing TACs and quotas for 2012 as fixed by Council Regulations (EC) No 1225/2010 of 13 December 2010, No 716/2011 of 19 July 2011, No 1256/2011 of 30 November 2011, No 5/2012 of 19 December 2011, No 43/2012 of 17 January 2012. Changes may have been made during 2012.

Species	European TAC 2011 (tonnes)	Dutch TAC 2011 (tonnes)	German TAC 2012 (tonnes)	% Dutch TAC	% German TAC
Herring	1 519 014	83 710	60 831	6%	4%
Mackerel	318 811	25 378	16 926	8%	5%
Horse mackerel	257 980	60 174	13 804	23%	5%
Blue whiting	391 000	11 807	3 765	3%	1%

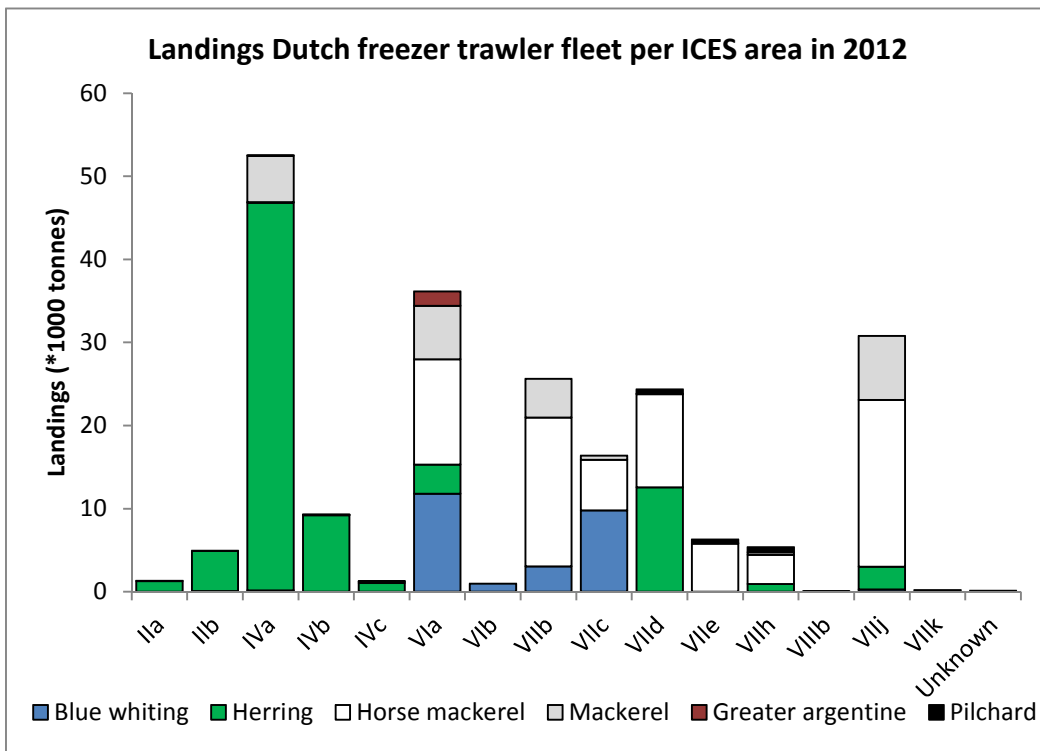
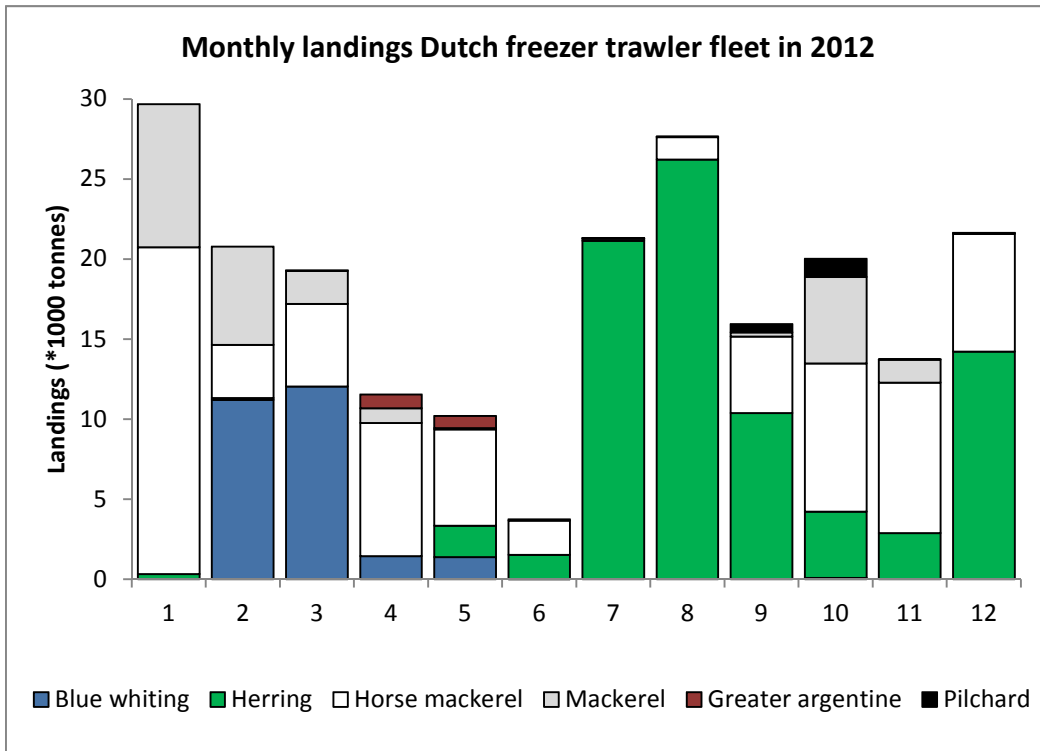




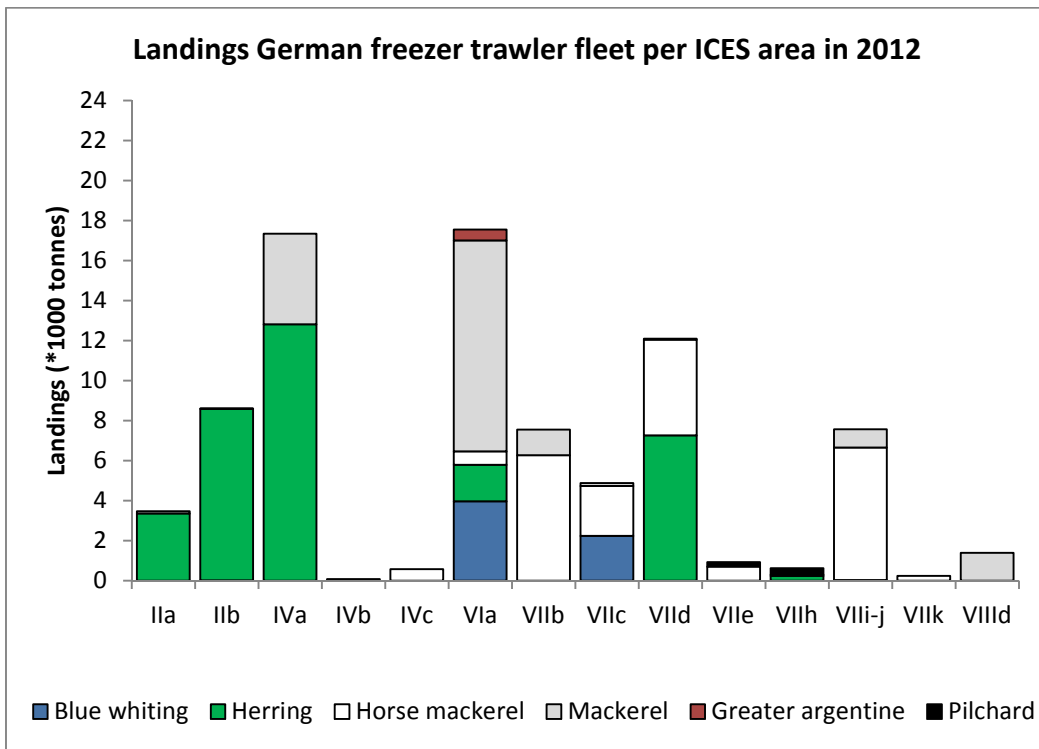
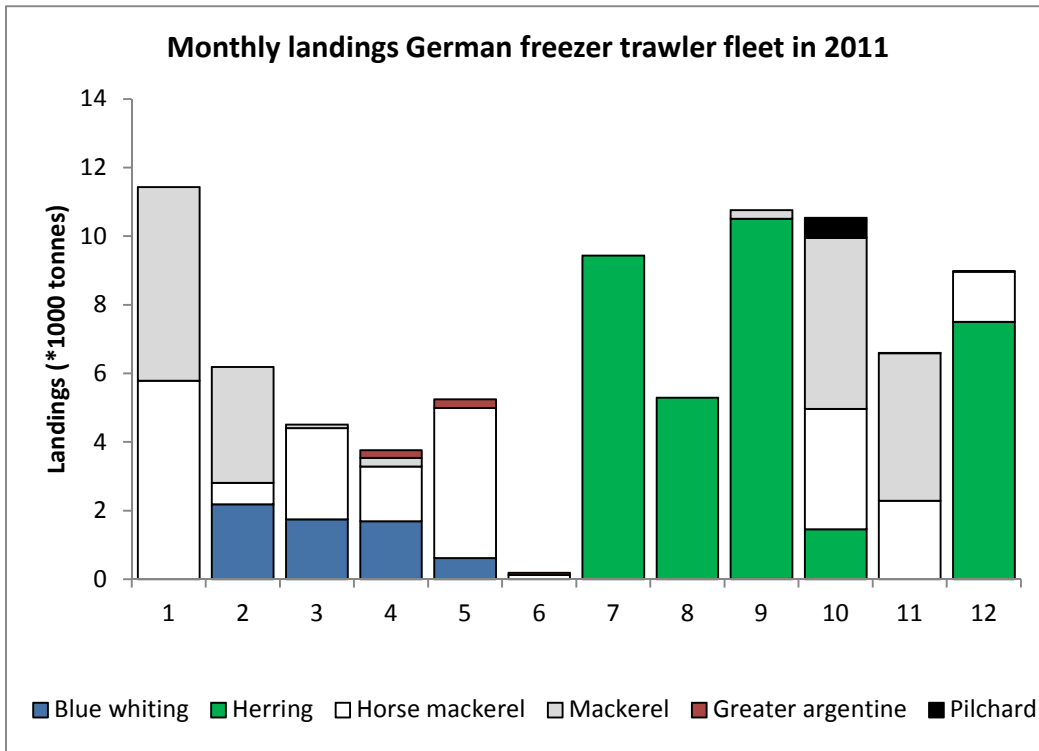
**Figure 2a.** Landings (\* 1000 tonnes) from the **Dutch** freezer trawler fleet in **2011**. Upper panel shows monthly landings by species, lower panel shows landings per ICES subarea (Figure 1) by species. Data extracted from the VISSTAT database.



**Figure 2b.** Landings (\* 1000 tonnes) from the **German** freezer trawler fleet in **2011**. Upper panel shows monthly landings by species, lower panel shows landings per ICES subarea (Figure 1) by species. Data extracted from German FiStat database.

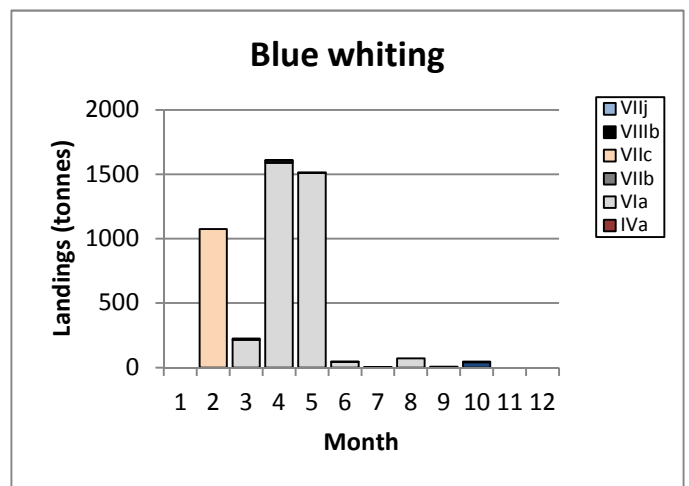
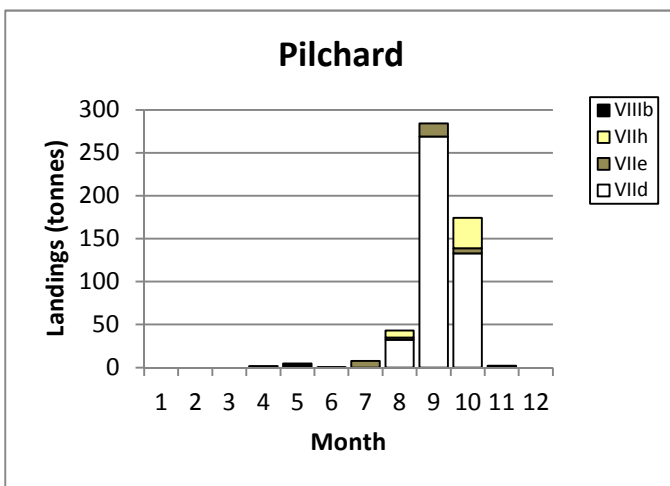
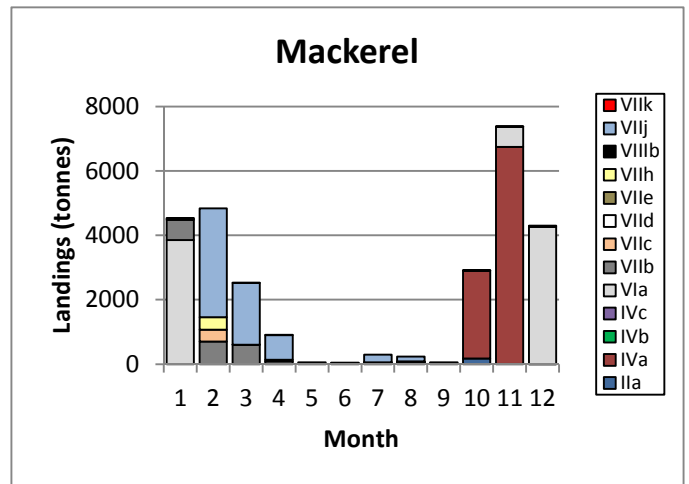
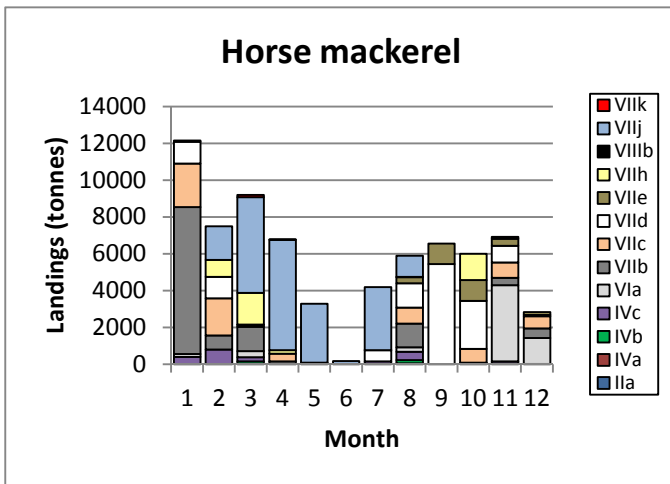
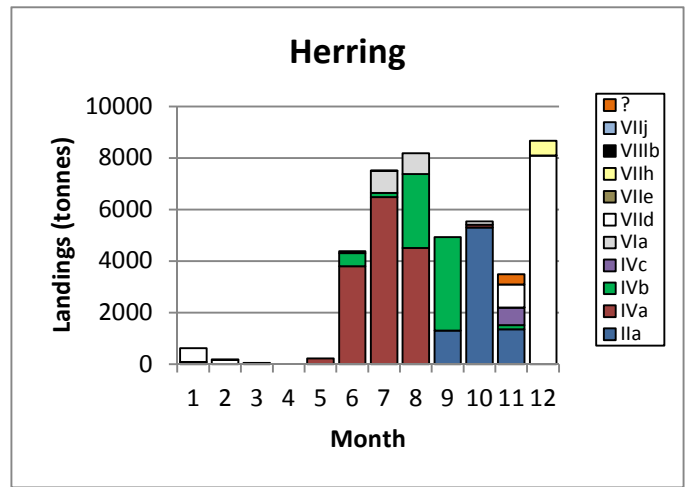
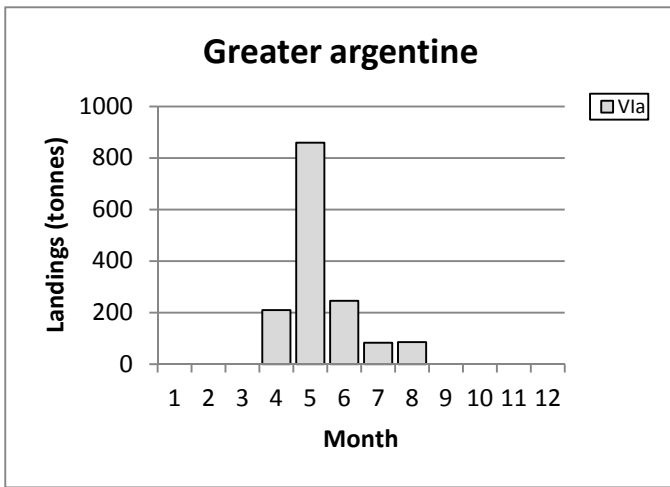


**Figure 2c.** Landings (\* 1000 tonnes) from the **Dutch** freezer trawler fleet in **2012**. Upper panel shows monthly landings by species, lower panel shows landings per ICES subarea (Figure 1) by species. Data extracted from the VISSTAT database.

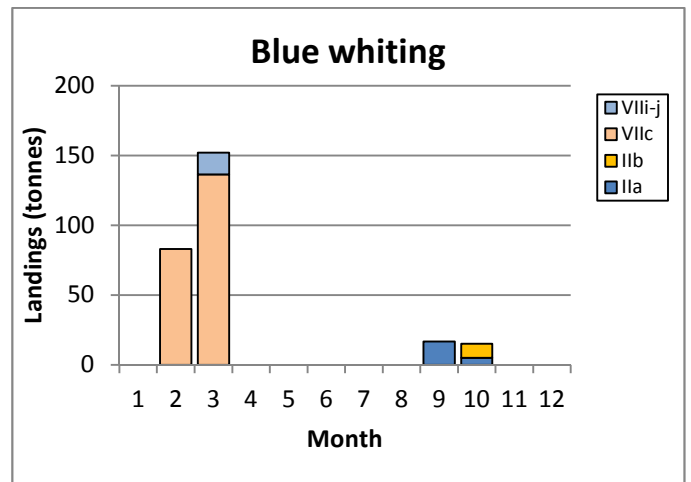
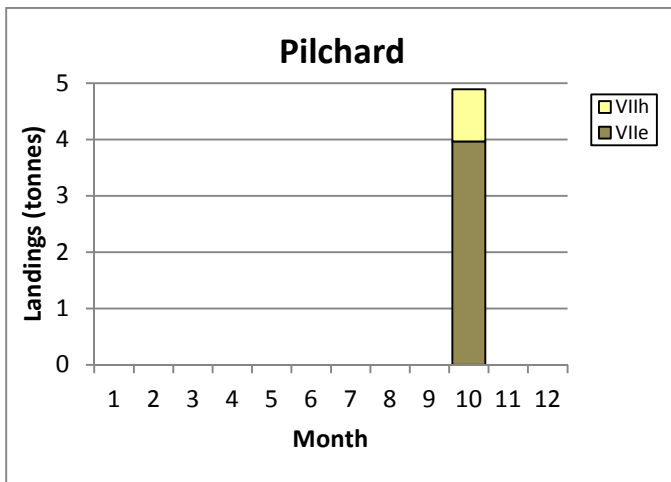
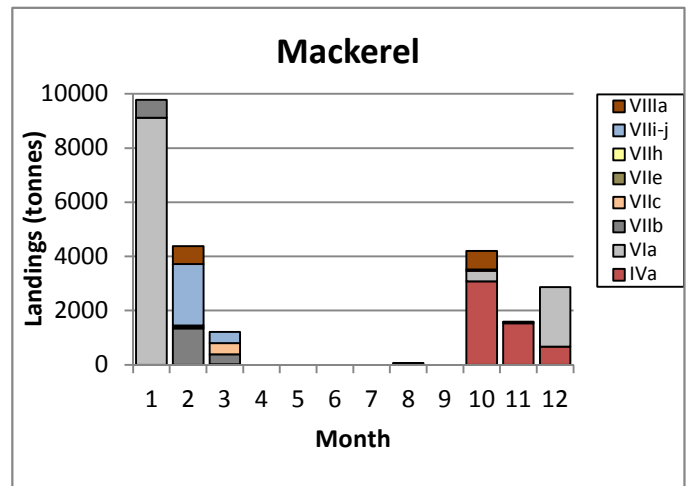
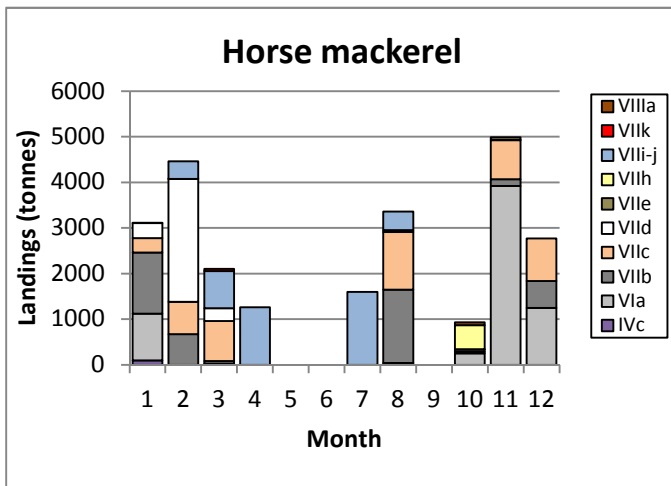
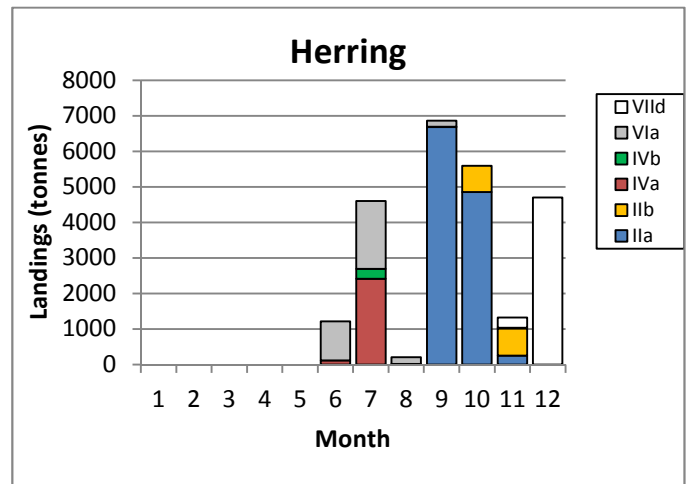


**Figure 2d.** Landings (\* 1000 tonnes) from the **German** freezer trawler fleet in **2012**. Upper panel shows monthly landings by species, lower panel shows landings per ICES subarea (Figure 1) by species. Data extracted from German FiStat database.

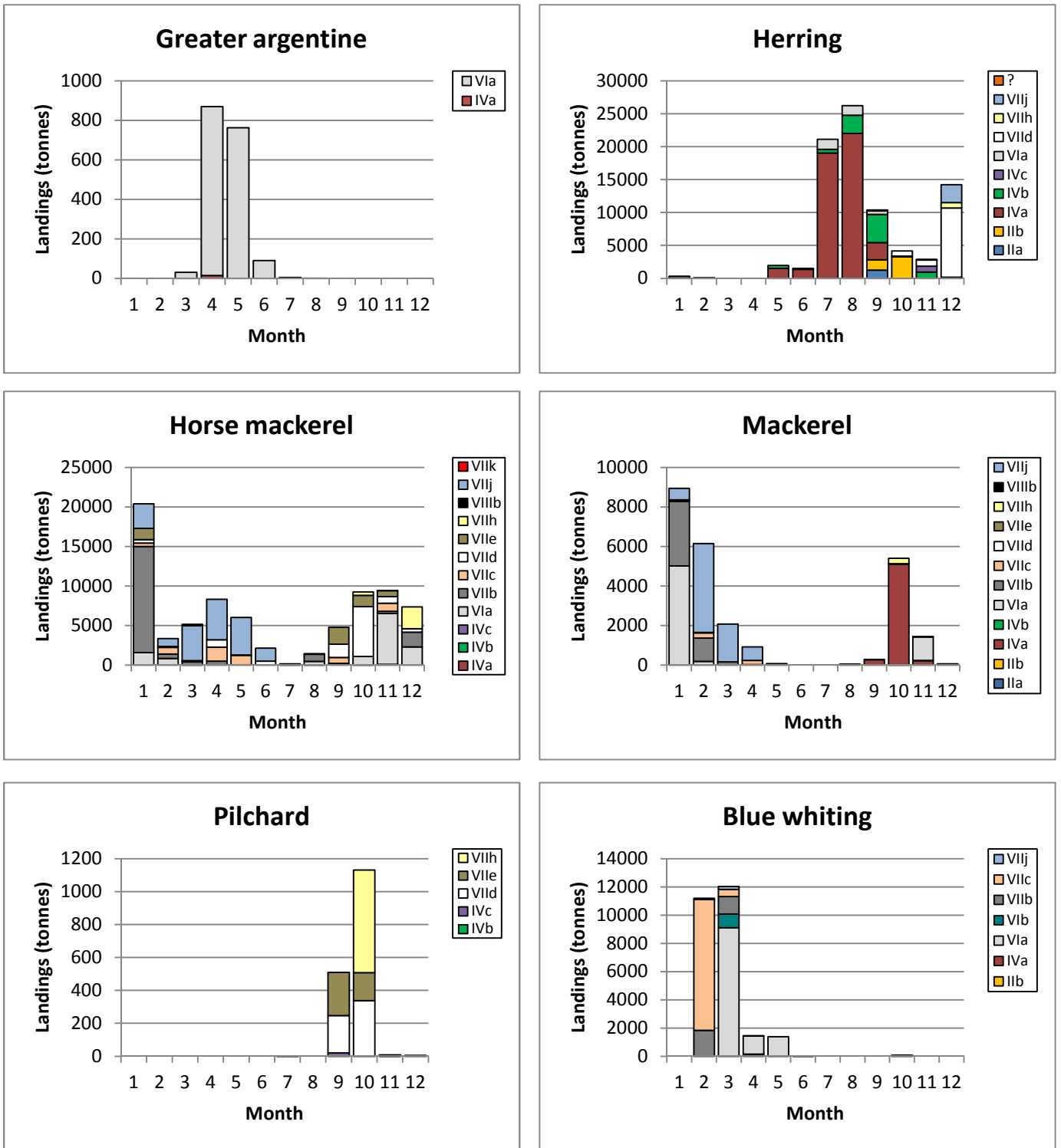




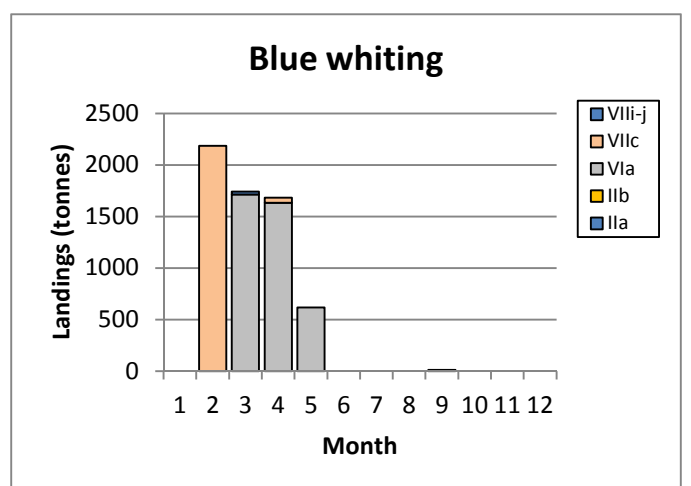
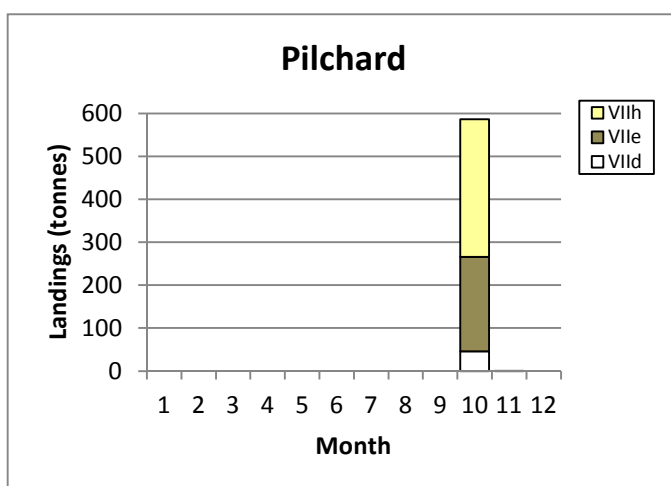
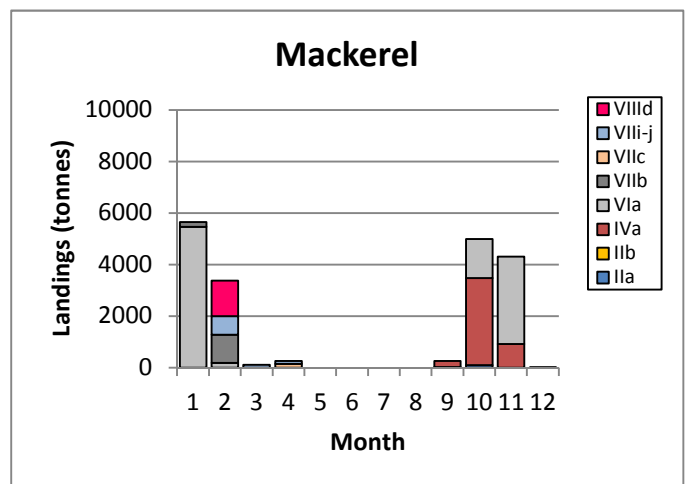
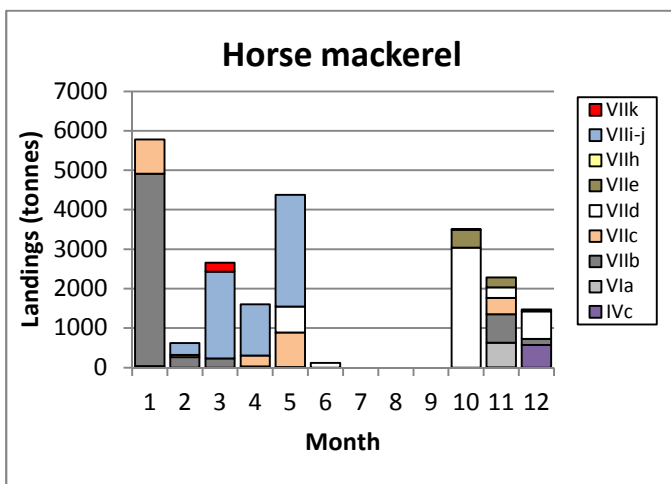
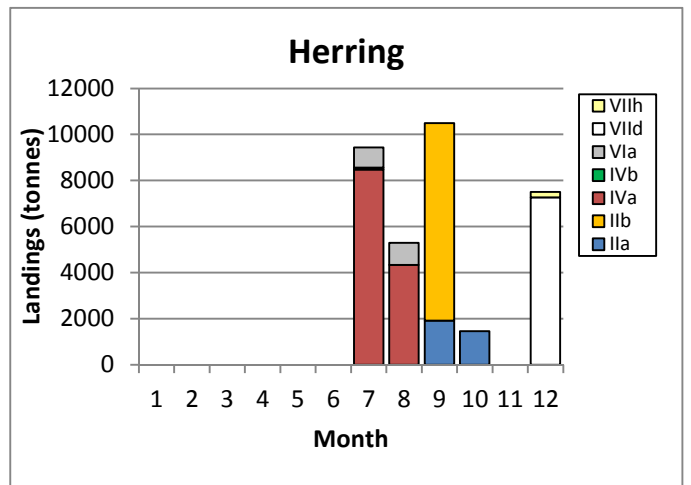
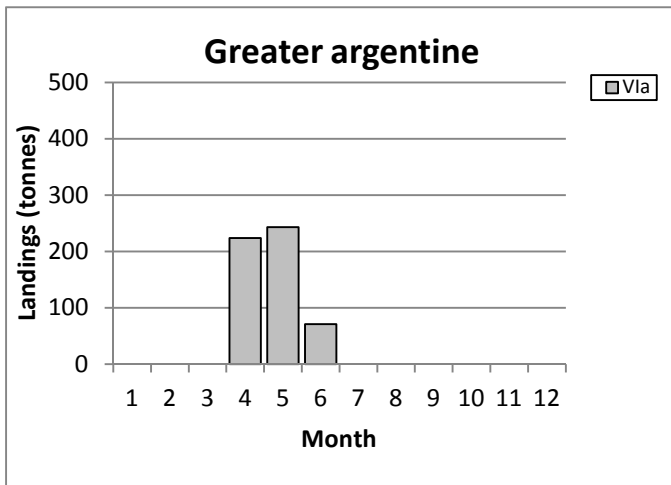
**Figure 3a.** Monthly landings (tonnes) per species from the **Dutch** freezer trawler fleet in **2011** per ICES subarea (Figure 1). Data extracted from the VISSTAT database.



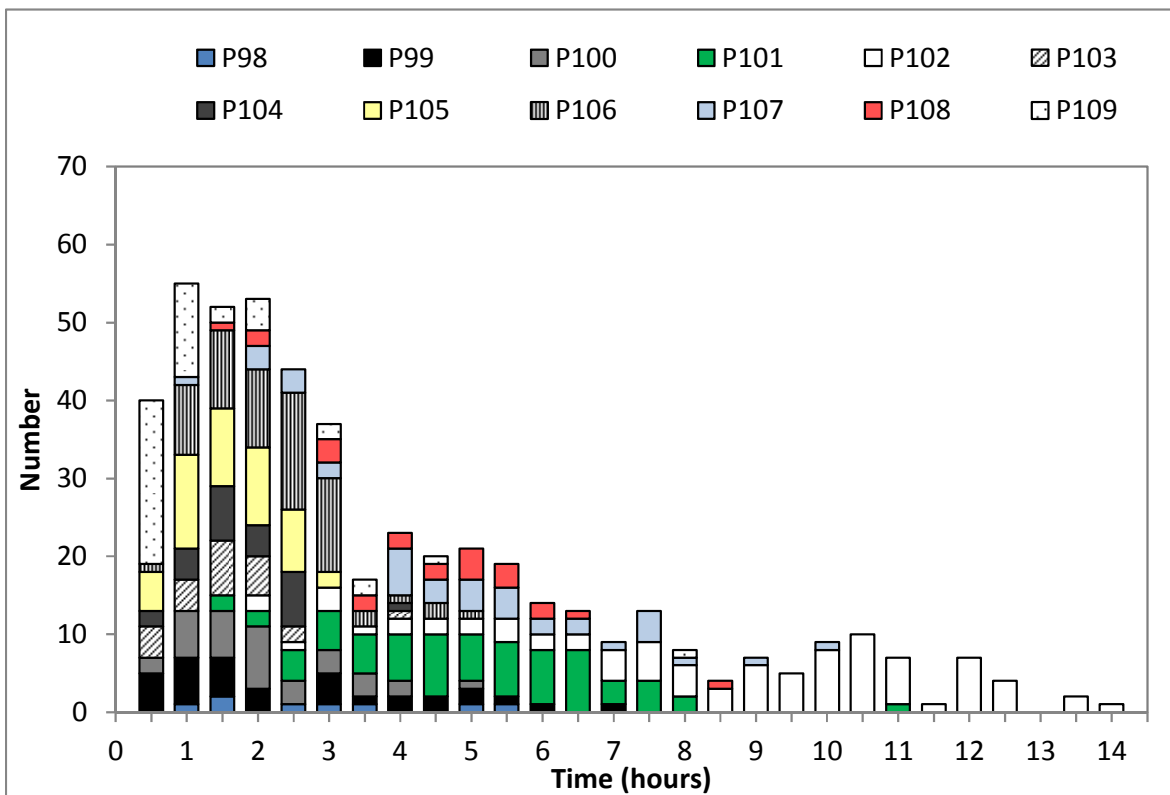
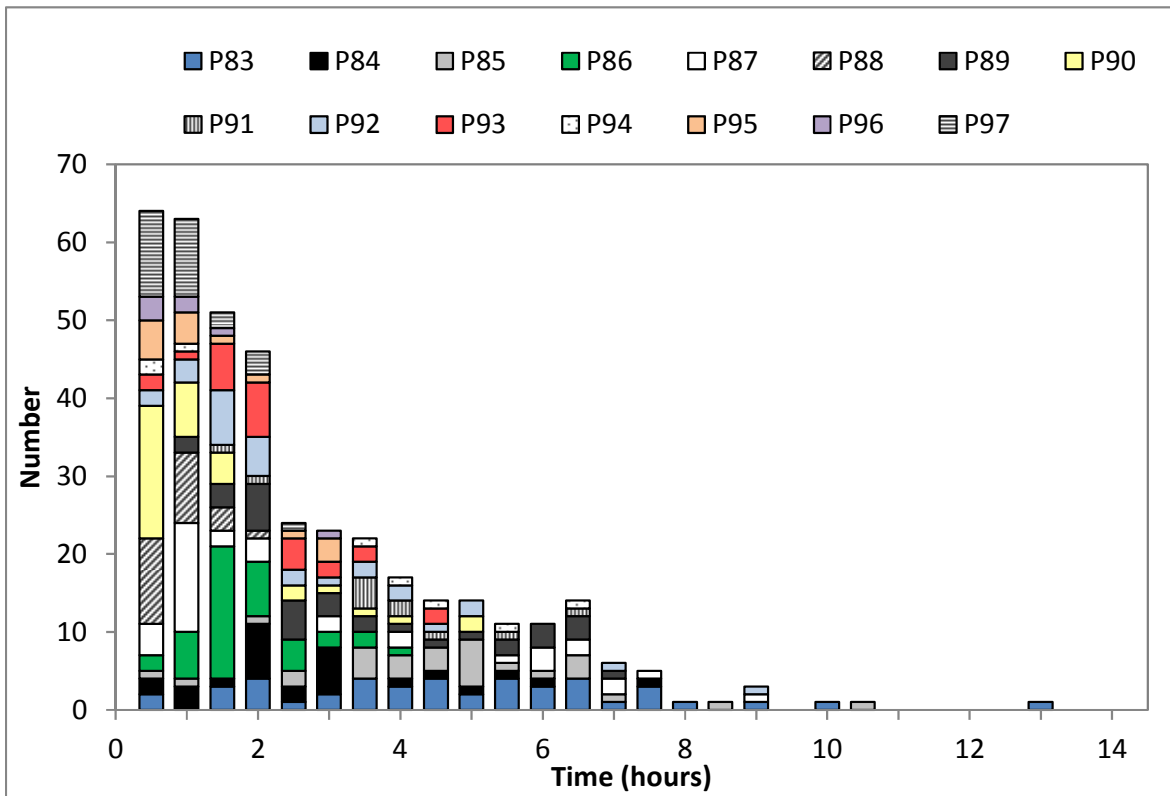
**Figure 3b.** Monthly landings (tonnes) per species from the **German** freezer trawler fleet in **2011** per ICES subarea (Figure 1). Data extracted on German FiStat database.



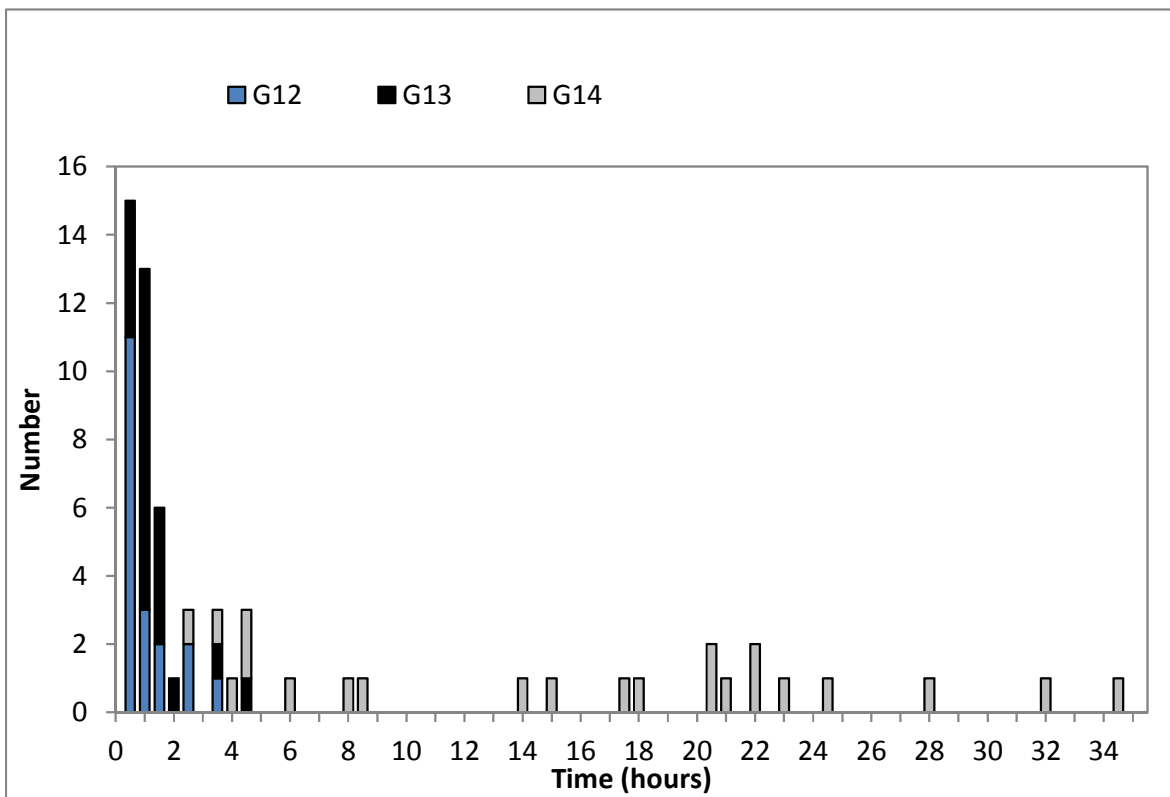
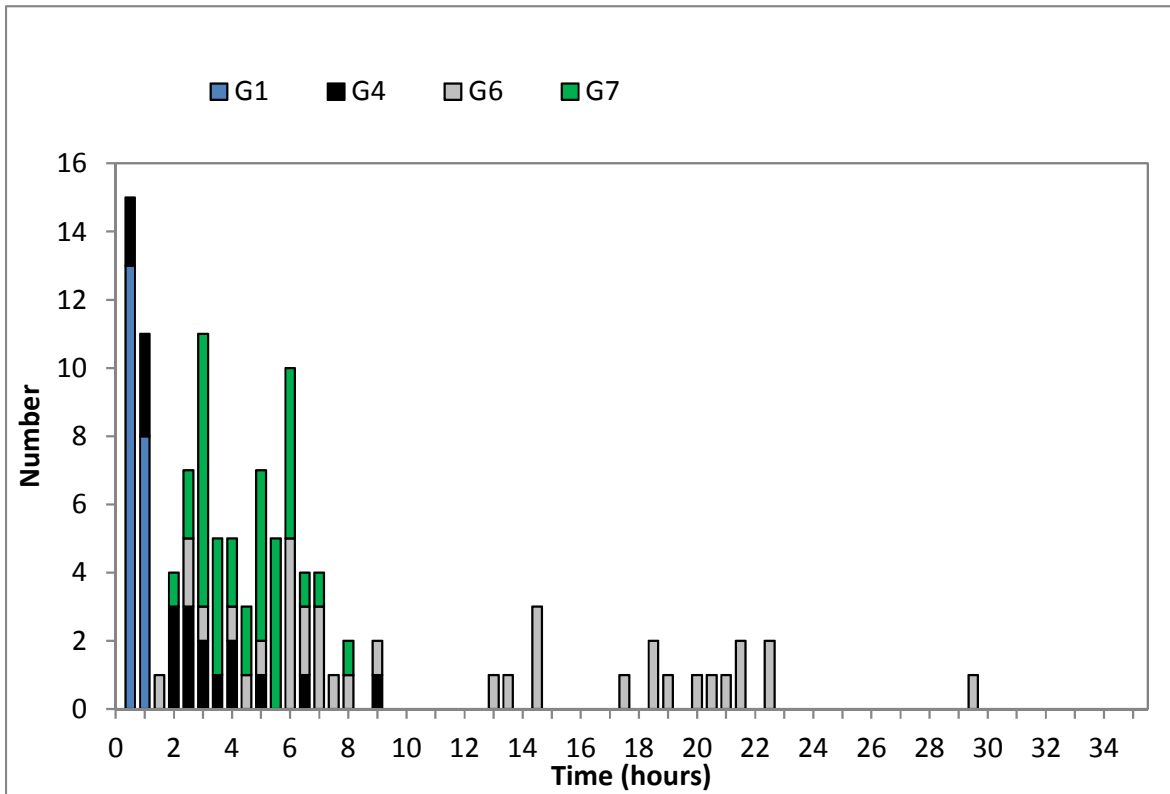
**Figure 3c.** Monthly landings (tonnes) per species from the **Dutch** freezer trawler fleet in **2012** per ICES subarea (Figure 1). Data extracted from the VISSTAT database.



**Figure 3d.** Monthly landings (tonnes) per species from the **German** freezer trawler fleet in **2012** per ICES subarea (Figure 1). Data extracted from German FiStat database.

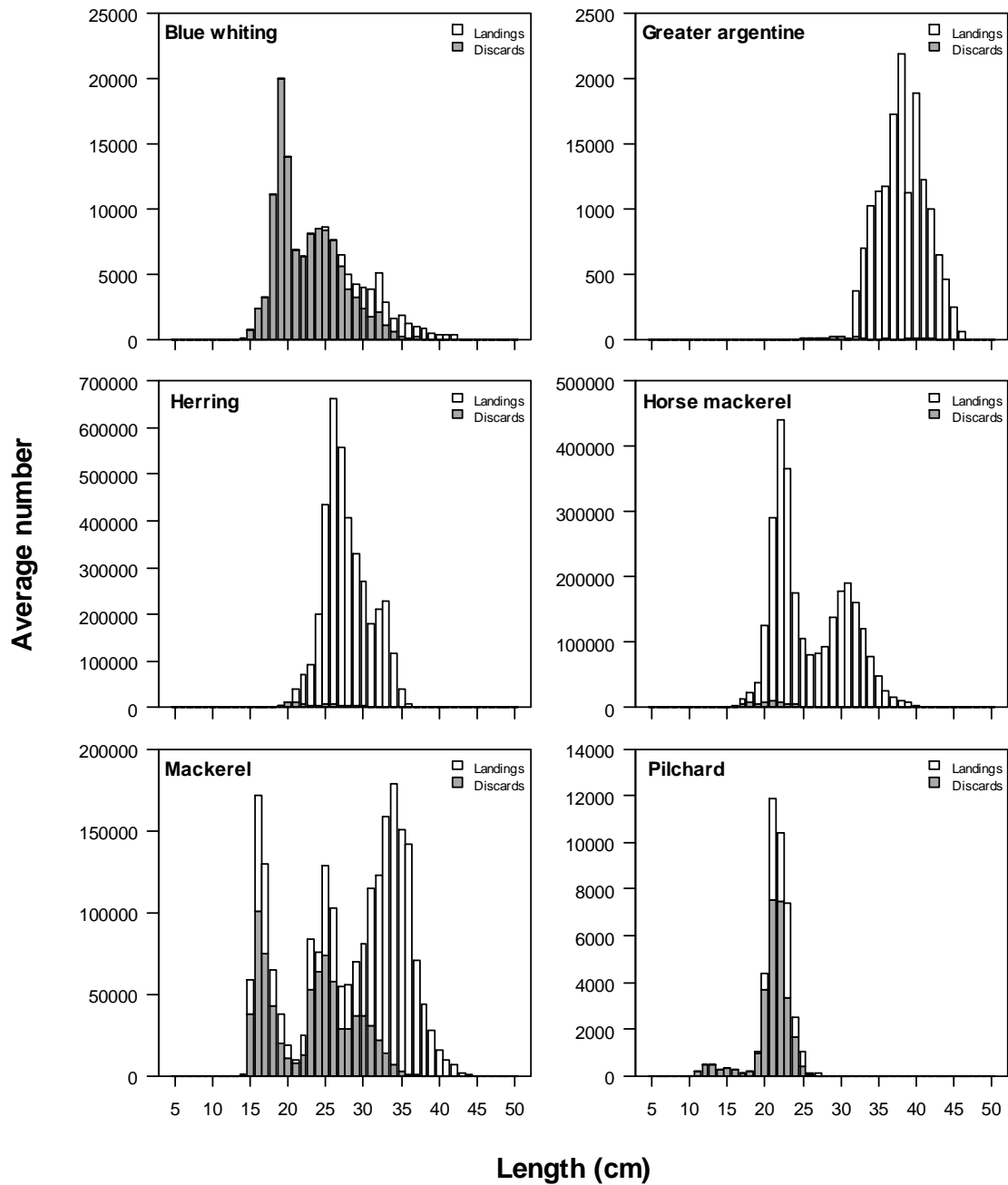


**Figure 4a.** Frequency of haul durations for the sampled **Dutch** trips in **2011** (upper) and **2012** (lower).



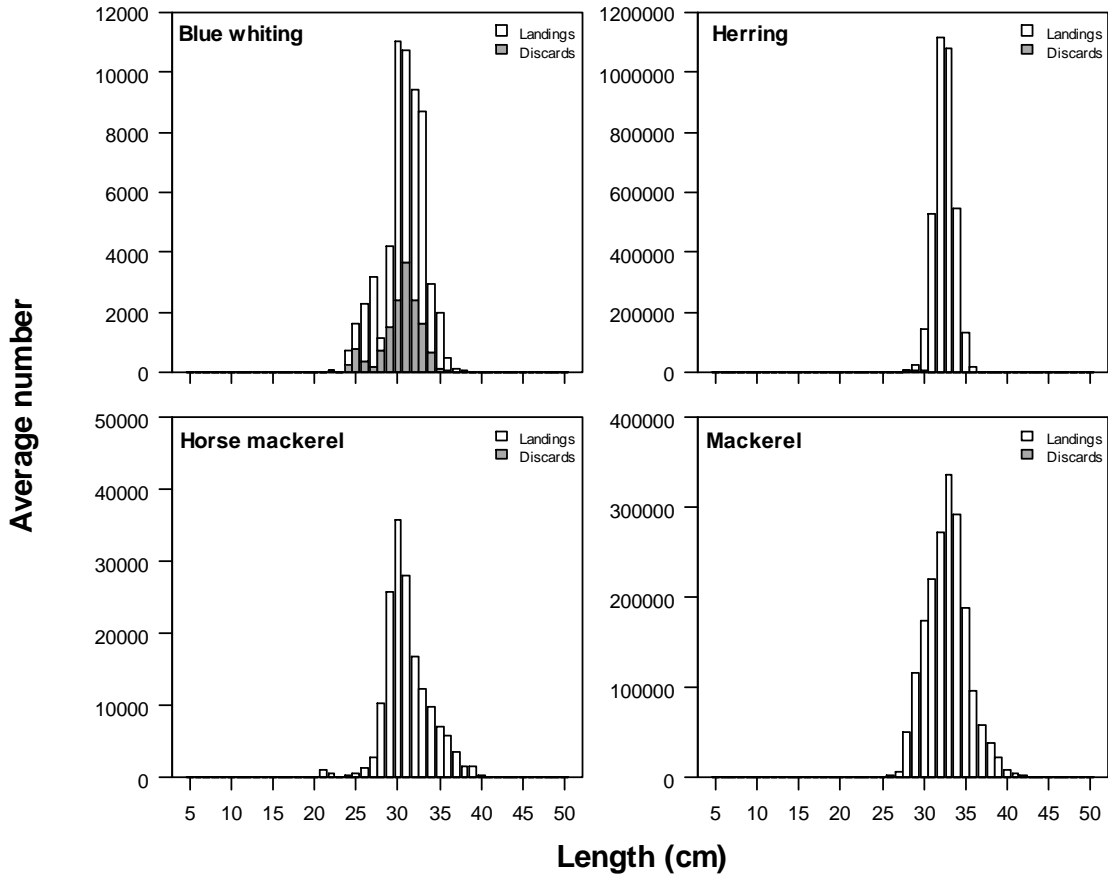
**Figure 4b.** Frequency of haul durations for the sampled **German** trips in **2011** (upper) and **2012** (lower).

## Dutch sampled trips 2011



**Figure 5a.** Average number of blue whiting (top left), greater argentine (top right), herring (middle left), horse mackerel (middle right), mackerel (bottom left) and pilchard (bottom right) landed and discarded during **Dutch** sampled trips against length (cm) for **2011**.

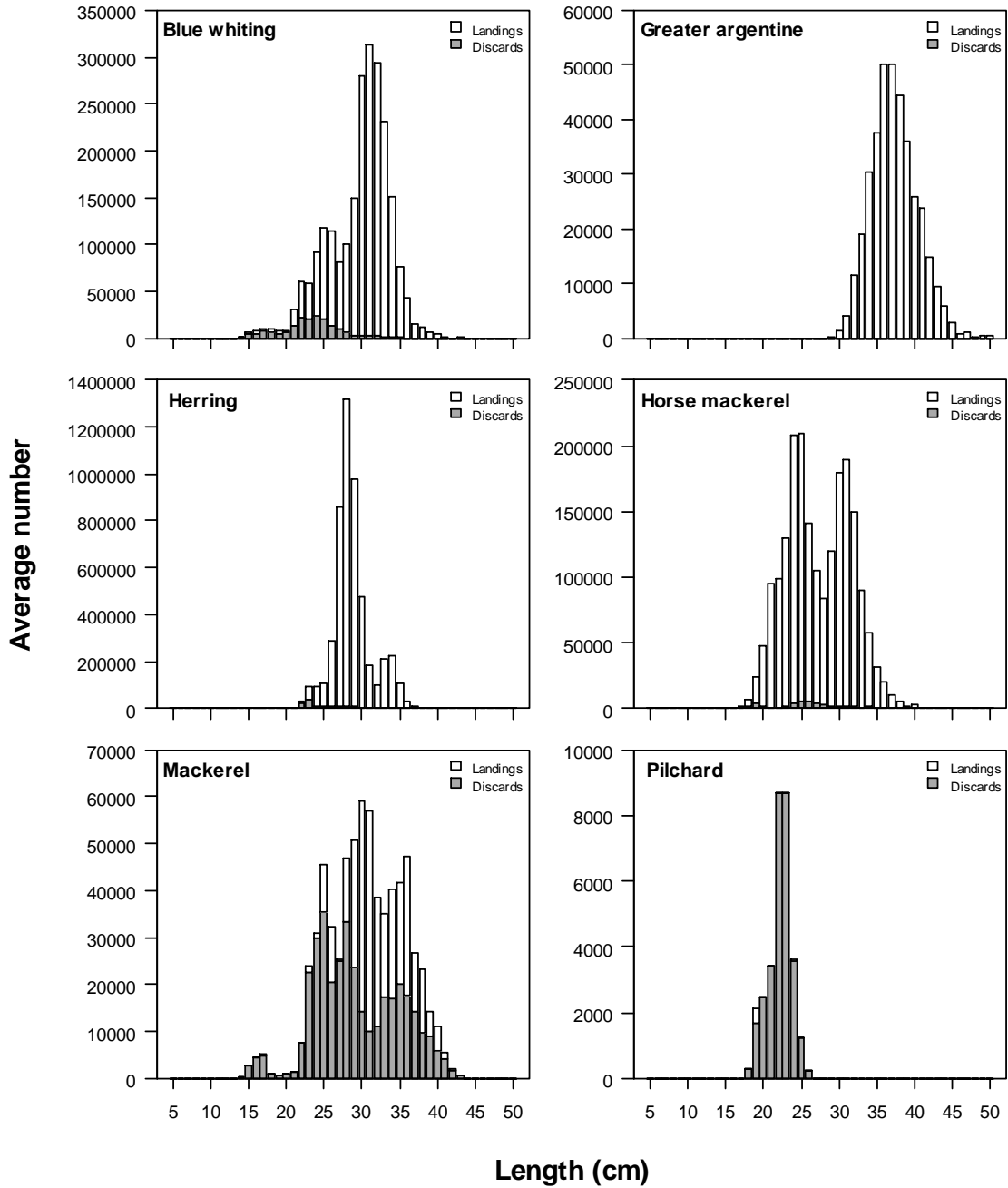
## German sampled trips 2011



**Figure 5b.** Average number of blue whiting (top left), greater argentine (top right), herring (middle left), horse mackerel (middle right), mackerel (bottom left) and pilchard (bottom right) landed and discarded during **German** sampled trips against length (cm) for **2011**.

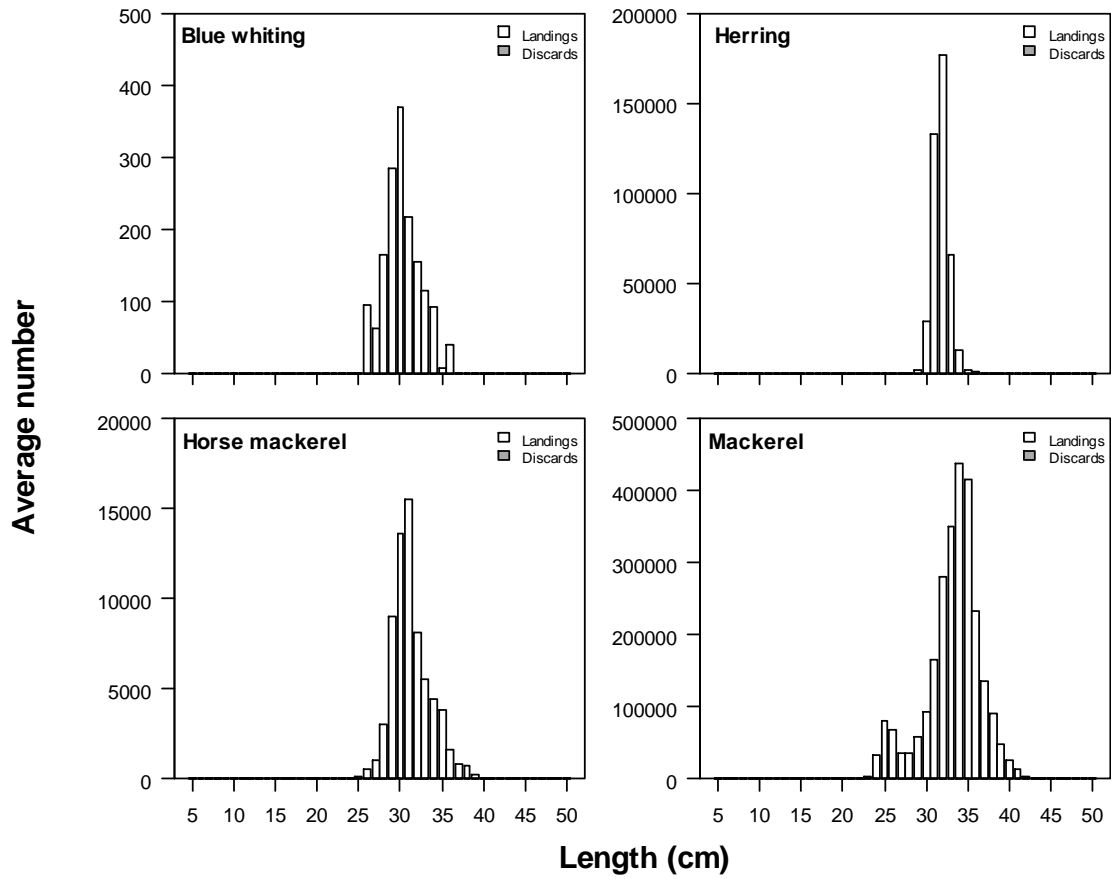


## Dutch sampled trips 2012



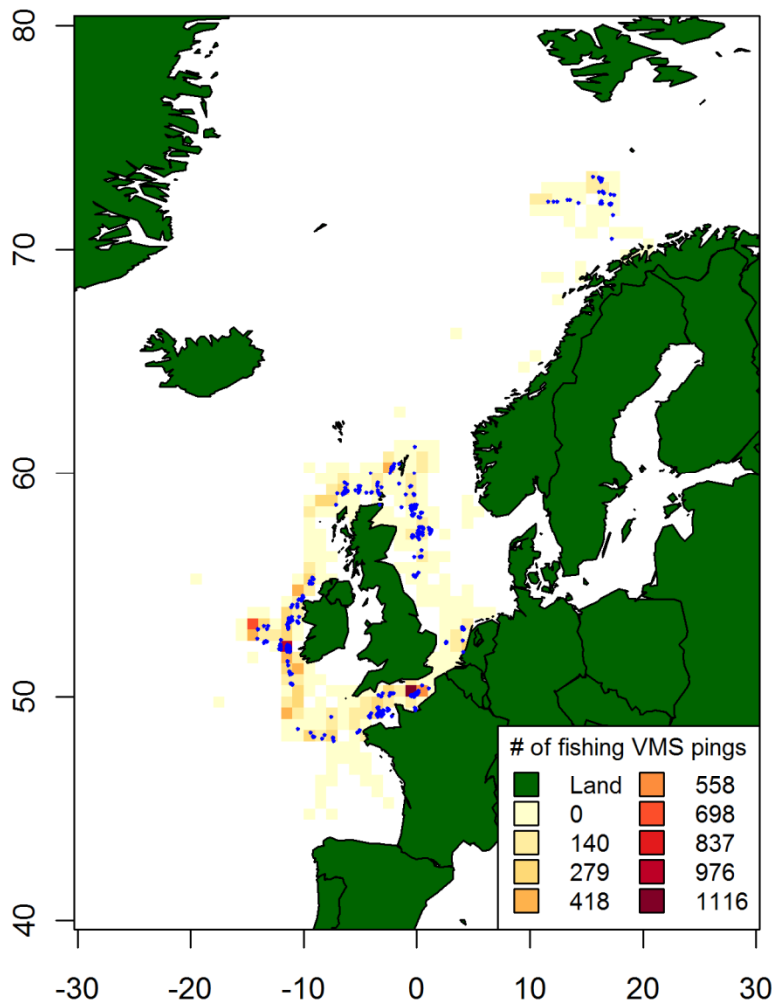
**Figure 5c.** Average number of blue whiting (top left), greater argentine (top right), herring (middle left), horse mackerel (middle right), mackerel (bottom left) and pilchard (bottom right) landed and discarded during **Dutch** sampled trips against length (cm) for **2012**.

## German sampled trips 2012



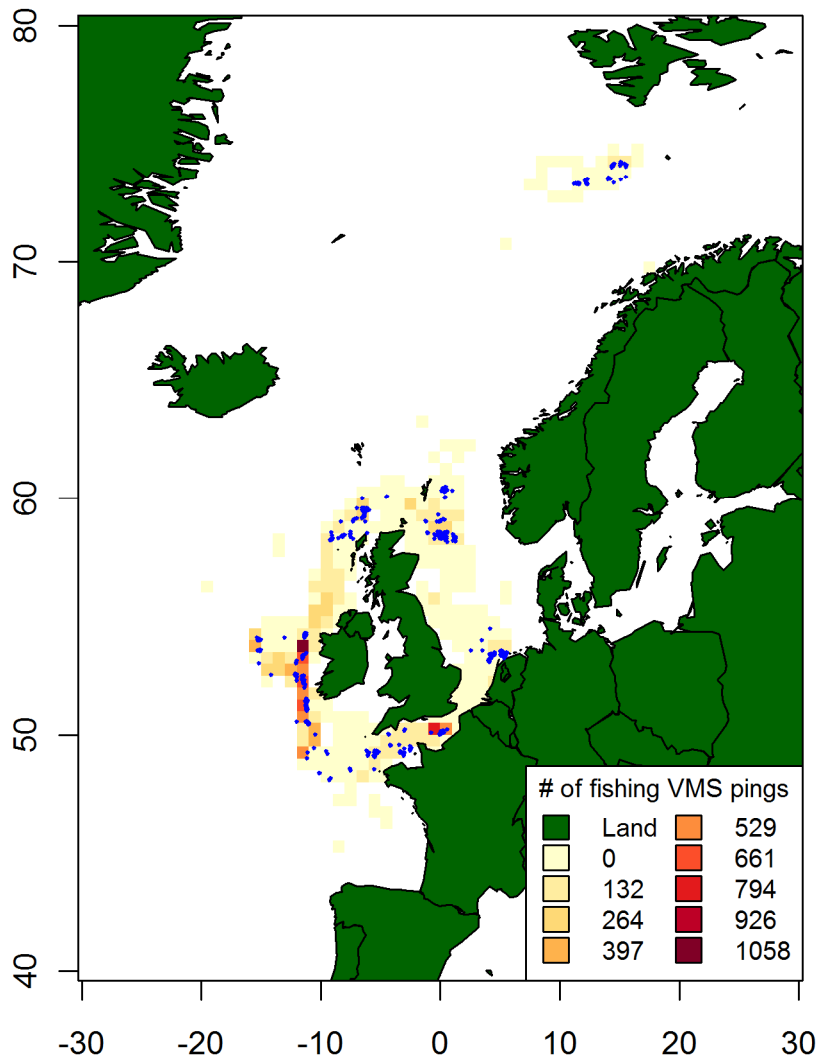
**Figure 5d.** Average number of blue whiting (top left), greater argentine (top right), herring (middle left), horse mackerel (middle right), mackerel (bottom left) and pilchard (bottom right) landed and discarded during **German** sampled trips against length (cm) for **2012**.

2011



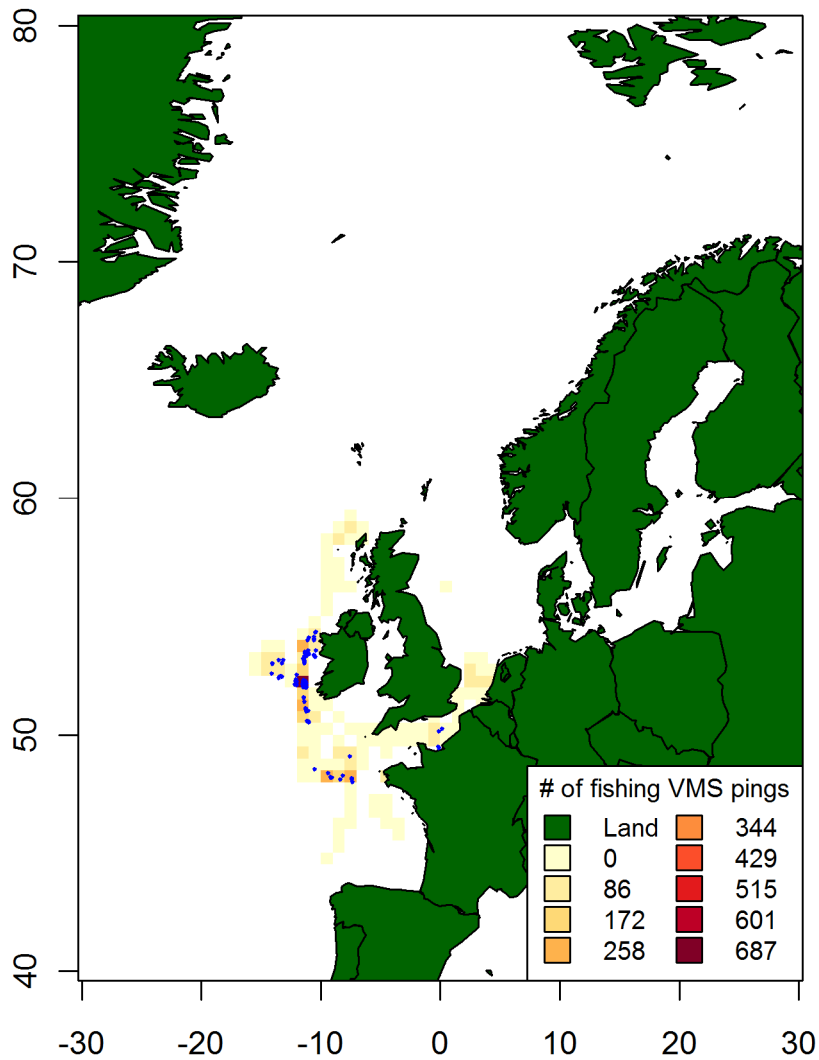
**Figure 6a.** Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trips per haul in **2011** (blue points). Discards that were observed in Norwegian waters were not thrown overboard but frozen as waste product.

2012



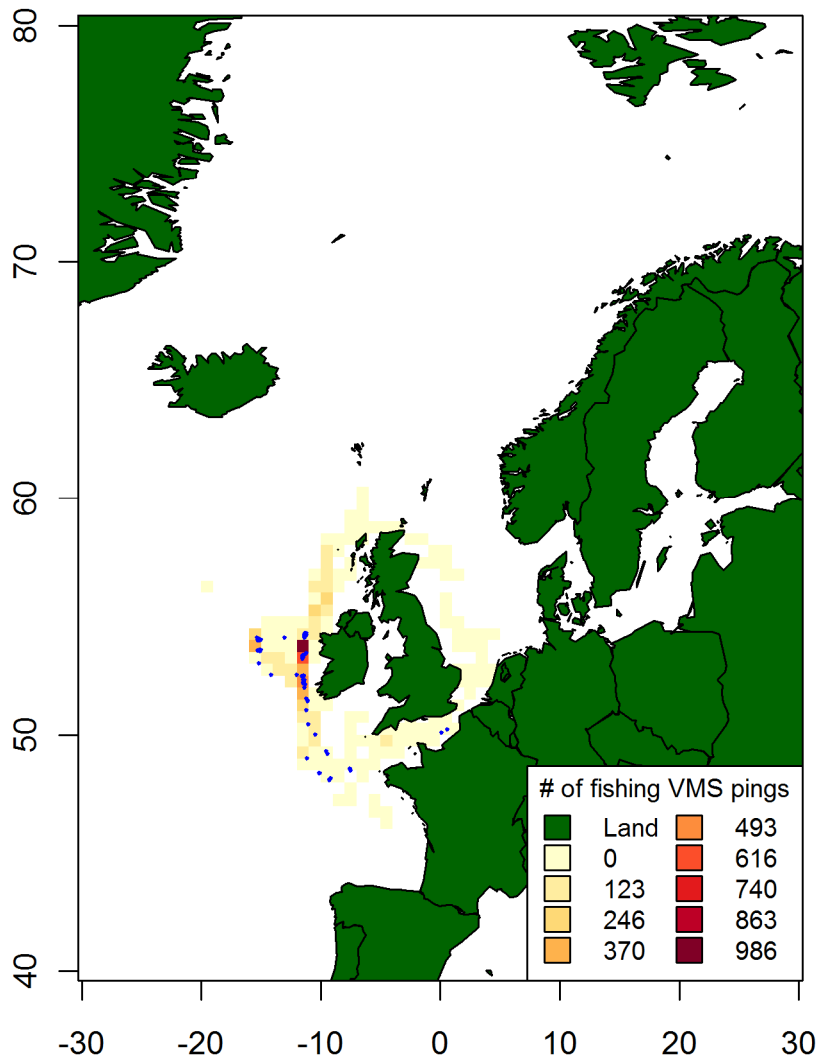
**Figure 6b.** Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trips per haul in **2012** (blue points). Discards that were observed in Norwegian waters were not thrown overboard but frozen as waste product.

## 2011, Quarter 1



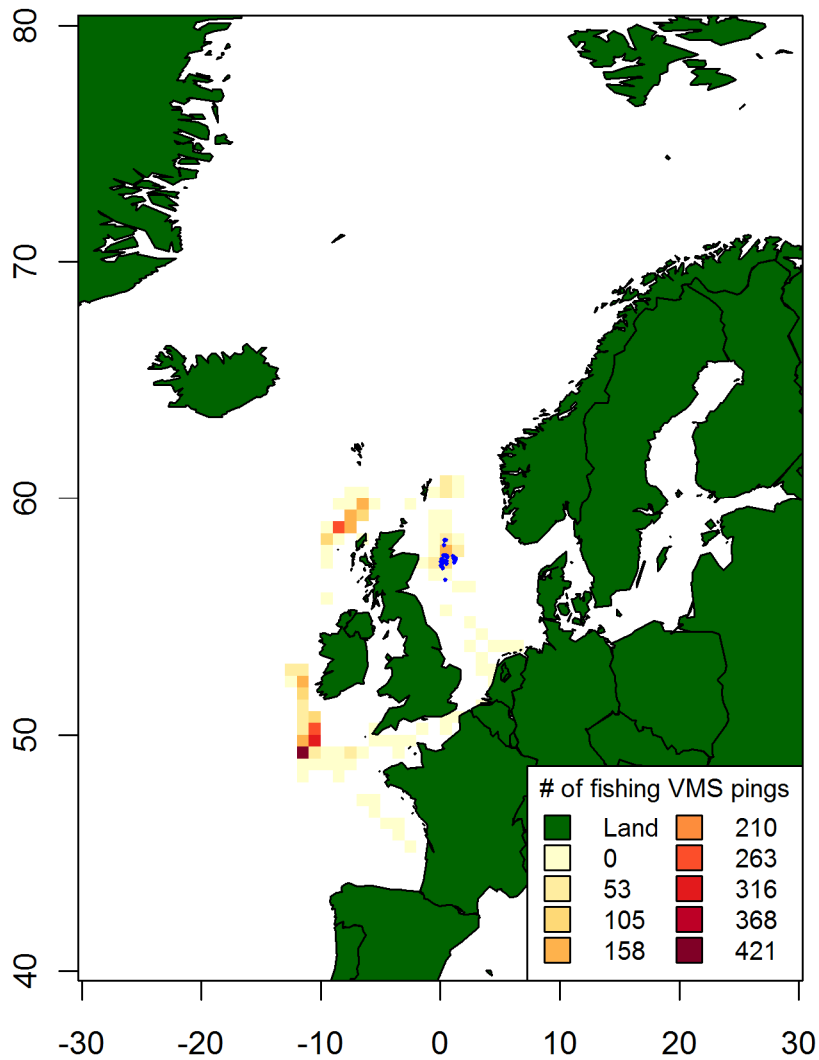
**Figure 7a.** Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trips per haul in **quarter 1, 2011** (blue points). Discards that were observed in Norwegian waters were not thrown overboard but frozen as waste product.

## 2012, Quarter 1



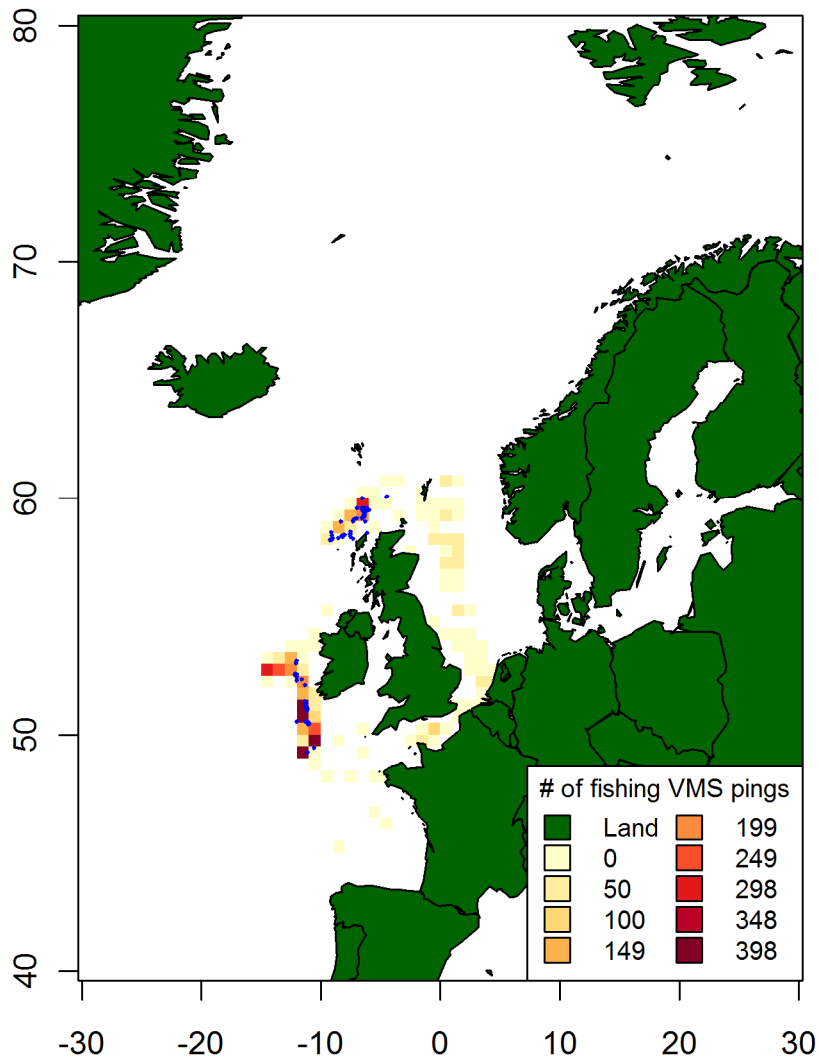
**Figure 7b.** Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trips per haul in **quarter 1, 2012** (blue points). Discards that were observed in Norwegian waters were not thrown overboard but frozen as waste product.

## 2011, Quarter 2



**Figure 8a.** Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trips per haul in **quarter 2, 2011** (blue points). Discards that were observed in Norwegian waters were not thrown overboard but frozen as waste product.

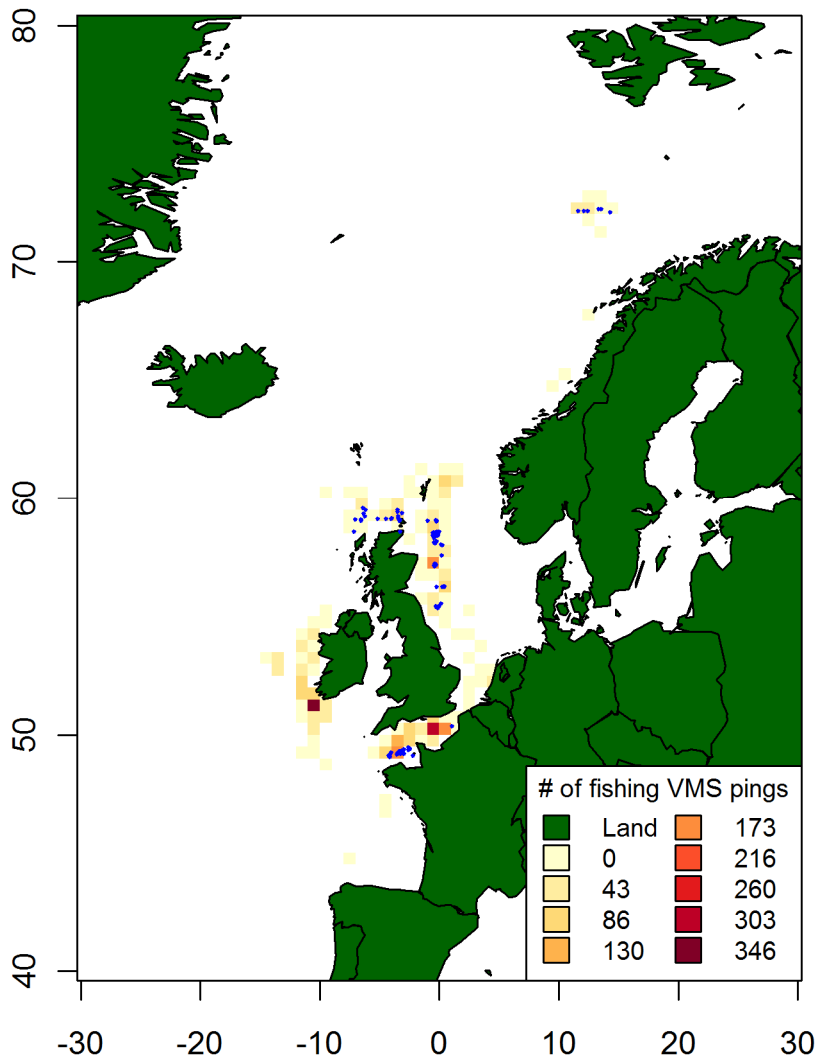
## 2012, Quarter 2



**Figure 8b.** Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trips per haul in **quarter 2, 2012** (blue points). Discards that were observed in Norwegian waters were not thrown overboard but frozen as waste product.

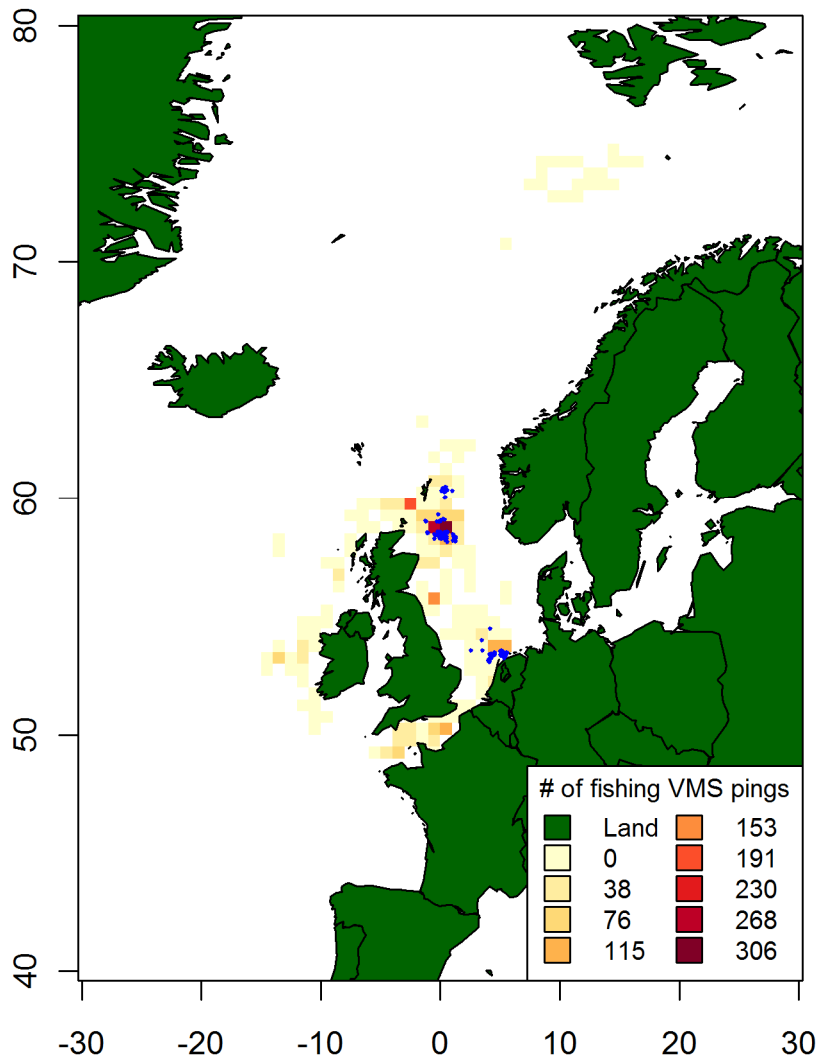


### 2011, Quarter 3



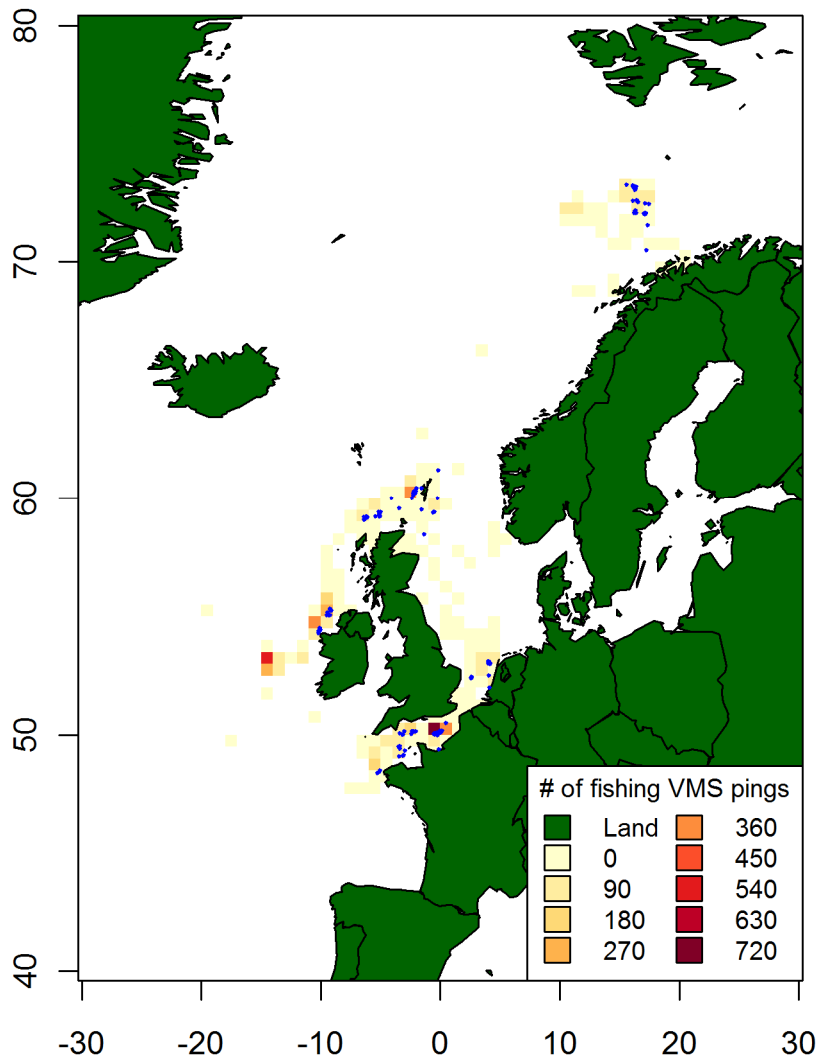
**Figure 9a.** Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trips per haul in **quarter 3, 2011** (blue points). Discards that were observed in Norwegian waters were not thrown overboard but frozen as waste product.

### 2012, Quarter 3



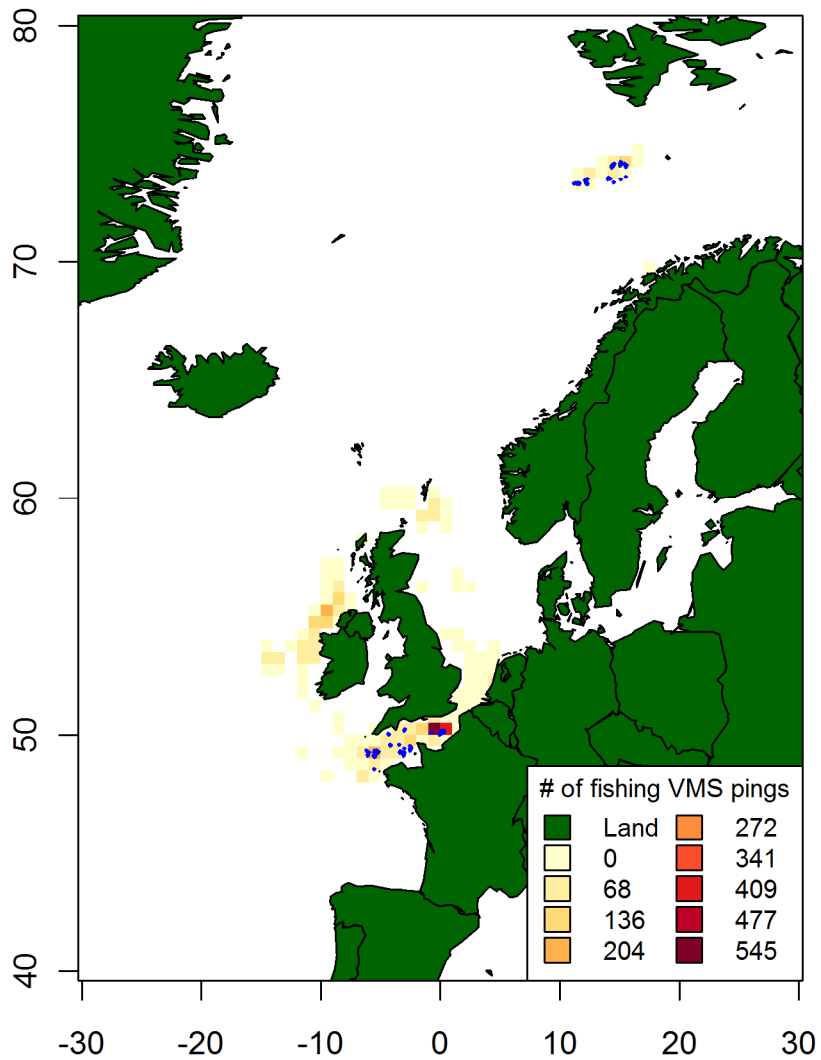
**Figure 9b.** Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trips per haul in **quarter 3, 2012** (blue points). Discards that were observed in Norwegian waters were not thrown overboard but frozen as waste product.

## 2011, Quarter 4



**Figure 10a.** Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trips per haul in **quarter 4, 2011** (blue points). Discards that were observed in Norwegian waters were not thrown overboard but frozen as waste product.

## 2012, Quarter 4



**Figure 10b.** Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trips per haul in **quarter 4, 2012** (blue points). Discards that were observed in Norwegian waters were not thrown overboard but frozen as waste product.