Stichting DLO
Centre for Fisheries Research (CVO)

Discard sampling of the Dutch and German pelagic freezer fishery operating in European waters in 2013-2014 – Joint report of the Dutch and German national sampling programmes

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Table of Contents

Summary

Since the introduction of EU Fisheries Data Collection Framework (DCF) catches of the European pelagic freezer trawler fleet are sampled by the Netherlands and Germany through observer programmes. Together the programmes correspond with an annual sampling coverage of around 15% of the total pelagic freezer trawler fleet. This report presents the results of the data analysis of the two monitoring programmes in European waters for 2013 and 2014. This fisheries is confronted with the introduction of the landing obligation in 2015. This has an effect on the sampling protocols and procedures. As sampling shifts towards catch sampling, observers are required to sample more catch fractions, which has implications for the work onboard. Also, data bases need to be adapted to additional catch fractions. Moreover, new raising procedures to fleet level need to be in place presuming that all necessary data for the different fractions are collected by the control agencies (logbooks etc.) and they are reliable.

The pelagic freezer trawler fishery targets small pelagic species. The most important species are: 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 follow seasonal patterns; different species are targeted during different parts of the year. The total landings of the Dutch fleet operating in European waters of these species were about 226,000 tonnes in 2013 and about 203,000 tonnes in 2014. The total landings of the German fleet operating in European waters were 116,000 about tonnes in 2013 and about 114,000 tonnes in 2014. Herring, mackerel and horse mackerel were the most abundant landed species.

On board pelagic freezer trawlers there are two moments in the catch handling process when catch can be discarded: (i) discarding after the catch is sorted and (ii) discarding prior to sorting[1].

Data collected within the Dutch and German sampling programmes has been extrapolated to the total Dutch and German pelagic fleet. The overall discard percentage for the Dutch pelagic fleet in 2013 and 2014, based on 12 sampled trips per year, is estimated at 1% and 2% in weight. This is considerably lower than discard percentages found in previous years. Overall discard percentage for the German pelagic fleet is estimated at 1% for 2013 and <1% for 2014. This is consistent with 2011 and 2012, however, the auxiliary variables used comply with the German mackerel and herring directed fishery separately and, therefore, cannot be considered an annual estimate for this years. In total Germany carried out 6 sampling trips in 2013 and 3 in 2014.

This is the second time that results of the Dutch and German sampling programmes in European waters are presented together in a joint report. A process to harmonize the sampling programmes has been started but sampling procedures of these two programmes still differ. Therefore, results and comparisons between the two programmes need still to be interpreted with caution.

[1] 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 vriestrawlervisserij, die actief zijn in het noordoost Atlantische gebied, een aantal reizen door waarnemers 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 2013 en 2014. Deze visserij is in 2015 geconfronteerd met de introductie van de aanlandplicht. Dit heeft een effect op de bemonsteringsprotocollen en procedures. De bemonstering zal veranderen in een vangstbemonstering, waarbij waarnemers de verschillende vangstfracties zal moeten gaan bemonsteren. Dit heeft consequenties voor het werk van de waarnemer aan boord. Daarbij komt dat er nieuwe opwerking methodes naar vlootniveau ontwikkeld moeten worden. Waarbij er betrouwbare gegevens beschikbaar moeten zijn voor de verschillende fracties vanuit de logboeken.

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 2013 en 2014 werd van deze soorten uit Europese wateren respectievelijk 226,000 ton en 203,000 ton aangeland door de Nederlandse vloot. Door de Duitse vloot werd in 2013 en 2014 respectievelijk 116,000 ton en 114,000 ton aangeland. De aanvoer bestond voor het grootste gedeelte uit haring, makreel 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) discarden voordat het sorteerproces heeft plaatsgenomen direct van de sorteerband uit de koeltanks of uit het net[2].

De gegevens verzameld binnen de Nederlandse en Duitse discards bemonstering zijn opgewerkt naar vloot. De naar vloot opgewerkte discard percentage voor de Nederlandse pelagische vloot in 2013 en 2014, gebaseerd op 12 reizen in beide jaren, is respectievelijk 1% en 2% in gewicht. Dit is aanzienlijk lager dan de discards percentages van de afgelopen jaren. Het opgewerkte discards percentage voor de Duitse pelagische visserij in 2013 en 2014, gebaseerd op respectievelijk 6 en 3 bemonsterde reizen, is 1% en <1% in gewicht. Waar in voorgaande jaren (2011 en 2012) de bemonsterde gegevens apart opgewerkt werden naar de Duitse makreel en haring visserij, zijn in voorliggend rapport de gegevens opgewerkt naar de gehele Duitse vloot.

In dit rapport wordt een tweede 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. Harmonisatie van de bemonsteringsprogramma's is in gang gezet. Echter, bemonsteringsmethodes van de twee landen verschillen nog steeds van elkaar. Eventuele vergelijkingen van de resultaten moeten daarom met voorzichtigheid uitgevoerd worden.

[2] De "niet-bemonsterde discards" zijn alleen genoteerd binnen de Nederlandse discards bemonstering.

Zusammenfassung

Seit der Einführung der europäischen Fischereidatensammlung (EU Fisheries Data Collection Framework - DCF) wird die Flotte der europäischen pelagischen Froster von deutschen und niederländischen wissenschaftlichen Beobachtern beprobt. Zusammen genommen decken die Beprobungsprogramme der beiden Länder dabei etwa 15% dieser Fischerei ab. In diesem Bericht werden die Ergebnisse der beiden Monitoringprogramme für die Jahre 2013 und 2014 präsentiert. Im Jahr 2015 wurde die Anlandeverpflichtung für die pelagische Fischerei eingeführt, was einen nicht unerheblichen Einfluss auf die Beprobungsprotokolle und –prozeduren hat. So muss der Beobachter beispielsweise nun an Bord weitere Fanganteile erfassen, woran auch die Datenbanksysteme in den Instituten angepasst werden müssen. Auch zur Hochrechnung der einzelnen Fangfraktionen von den beobachteten Reisen auf die Gesamtflotte müssen neue Methoden angewandt werden und es muss durch die Kontrollbehörden sichergestellt sein, dass in den Logbüchern alle Fanganteile verlässlich erfasst sind.

Zielarten der pelagischen Fischerei sind kleine im Pelagial lebende Fischarten. Die wichtigsten Arten sind dabei: Hering (*Clupea harengus*), Blauer Wittling (*Micromesistius poutassou*), Stöcker oder Holzmakrele (*Trachurus trachurus*), Nordostatlantische Makrele (*Scomber scombrus*), Goldlachs (*Argentina silus*) und Sardine (*Sardina pilchardus*). Im Jahresverlauf gibt es verschiedene Fischereisaisons, die verschiedenen Fischarten werden jeweils nur in einen bestimmten Zeitraum gefangen. Die Gesamtanlandungen der holländischen pelagischen Fischerei in europäischen Gewässern betrugen dabei etwa 226.000 Tonnen 2013 und etwa 203.000 Tonnen 2014. Die Gesamtanlandungen der deutschen Fischerei in europäischen Gewässern beliefen sich 2013 auf etwa 116.000 Tonnen und auf etwa 114.000 Tonnen 2014. Die meist gefangenen Arten sind Heringe, Makrelen und Stöcker.

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 Auslasse aus den Netzen, bevor sie an Bord gezogen werden.

Die Beprobungsdaten wurden auf die gesamte niederländische bzw. deutsche Flotte hochgerechnet. Der Discardanteil der niederländischen Flotte betrug 2013 zirka 1% und 2014 zirka 2% nach Gewicht. Die Berechnungen beruhen auf jeweils 12 durchgeführten Beprobungsreisen im Jahr. Der Discardanteil ist damit erheblich geringer als in den Vorjahren beobachtet. Der Discardanteil der deutschen Flotte betrug 2013 zirka 1% und 2014 <1% nach Gewicht. Dies sind ähnliche Werte wie in den Jahren zuvor, allerdings wurden zuvor die Discardraten nur für die deutsche Makrelen- und Heringsfischerei einzeln betrachtet und nicht auf die Gesamtflotte bezogen. Insgesamt wurden 6 Fischereireisen 2013 und 3 Reisen 2014 durch deutsche Observer beprobt.

Dies ist das zweite Mal, dass die Ergebnisse der niederländischen und deutschen Monitorprogramme in europäischen Gewässern in einem gemeinsamen Bericht präsentiert werden. Die Verantwortlichen beider Monitoringprogramme arbeiten daran, die Programme in beiden Ländern zu harmonisieren aber aktuell unterscheiden sich noch die Methoden. Daher sind die Ergebnisse der Discardabschätzungen zur Zeit weiterhin nur eingeschränkt vergleichbar.

1 Introduction

From 2002 onwards discard data of pelagic freezer trawlers are monitored under the EC Data Collection Framework 1543/2000, 1639/2001 and 1581/2004 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 the Netherlands and Germany. Both countries conduct their own monitoring programmes and sampling protocols (Stransky et al., 2010; Verver, 2013; Van Beek, 2012). This report presents the results of both monitoring observer programmes in European waters for 2013 and 2014.

> **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 temporally 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).

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.

The fishery is confronted with the introduction of the landing obligation or discard ban which is enforced in 2015 for the pelagic fisheries. Throughout 2013 – 2014, parts of the pelagic fisheries already carried out an organized research project in order to prepare for the introduction of the landing obligation. For this project cameras were installed on some pelagic freezer trawlers to observe and control the fishing operations and crew behavior, modification of fishing gear were tested as well the operation of mincing machines (Pastoors et al 2014).

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 incidentally discard prior to sorting. 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.

2 Methods

Information on landings and fleet effort by the Dutch pelagic freezer fleet in 2013 and 2014 has been derived from the Dutch IMARES VISSTAT database (*Visserij Statistieken*). Information on landings and fleet effort by the German pelagic freezer fleet in 2013 and 2014 has been derived from the German FiStat database (Fischereistatistik) held by the federal office for agriculture and food.

2.1 Sampling procedures Dutch sampling programme

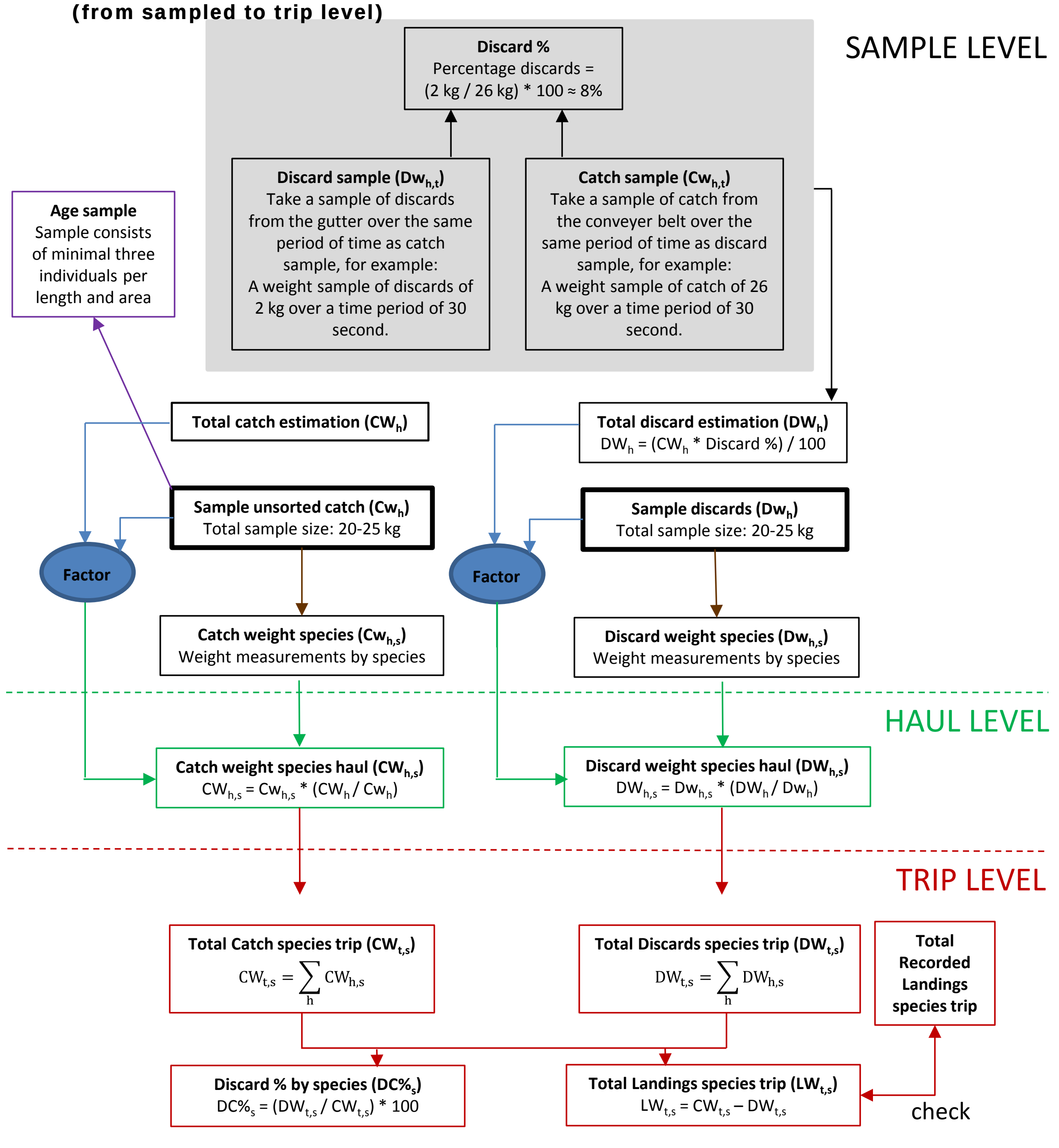
Biological sampling of catch and discards is carried out on board the vessels through an observer programme. Annually 12 trips are planned spread out evenly throughout the year. Vessels are selected in cooperation with the pelagic fishery companies, and is considered ad hoc. Each company was asked to accommodate for 3-4 observer trips in each year. Vessel selection is therefore considered to be non-random. 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 is instructed 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 and are presented as “not sampled” in the results. A schematic overview of the Dutch sampling (and raising) procedure is given in Box 2. The following sampling is conducted on a haul basis (see also sample level in Box 2):

1. Total catch estimate (CW_h)
   The observer estimates the total catch from the bridge in cooperation with the skipper and verifies it with the number of cooling tanks that are 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.
2. Discard percentage (Discard %)
   The observer estimates the discard percentage 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 catch can be estimated. This proportion is used to calculate the total weight of the discards in each haul (DW_h = proportion * CW_h).
3. Catch sample (Cw_h)
   Catch sample is taken prior to the sorting process. The sample is weighted, weight of each species in the sample is recorded ($Cw_{h,s}$) and all fish are measured to the cm below (herring and sprat from 0.5 cm below).
4. Discards sample (Dw_h)
   Discards sample is taken from the gutter. The sample is weighted, weight of each species in the sample is recorded ($Dw_{h,s}$) and all fish are measured to the cm below (herring and sprat from 0.5 cm below).

During each trip, the data is stored into a computer programme on haul-by-haul basis. After quality control the data is transferred into the central database.

Box 2: Schematic overview of the Dutch sampling and raising procedures (from sampled to trip level)

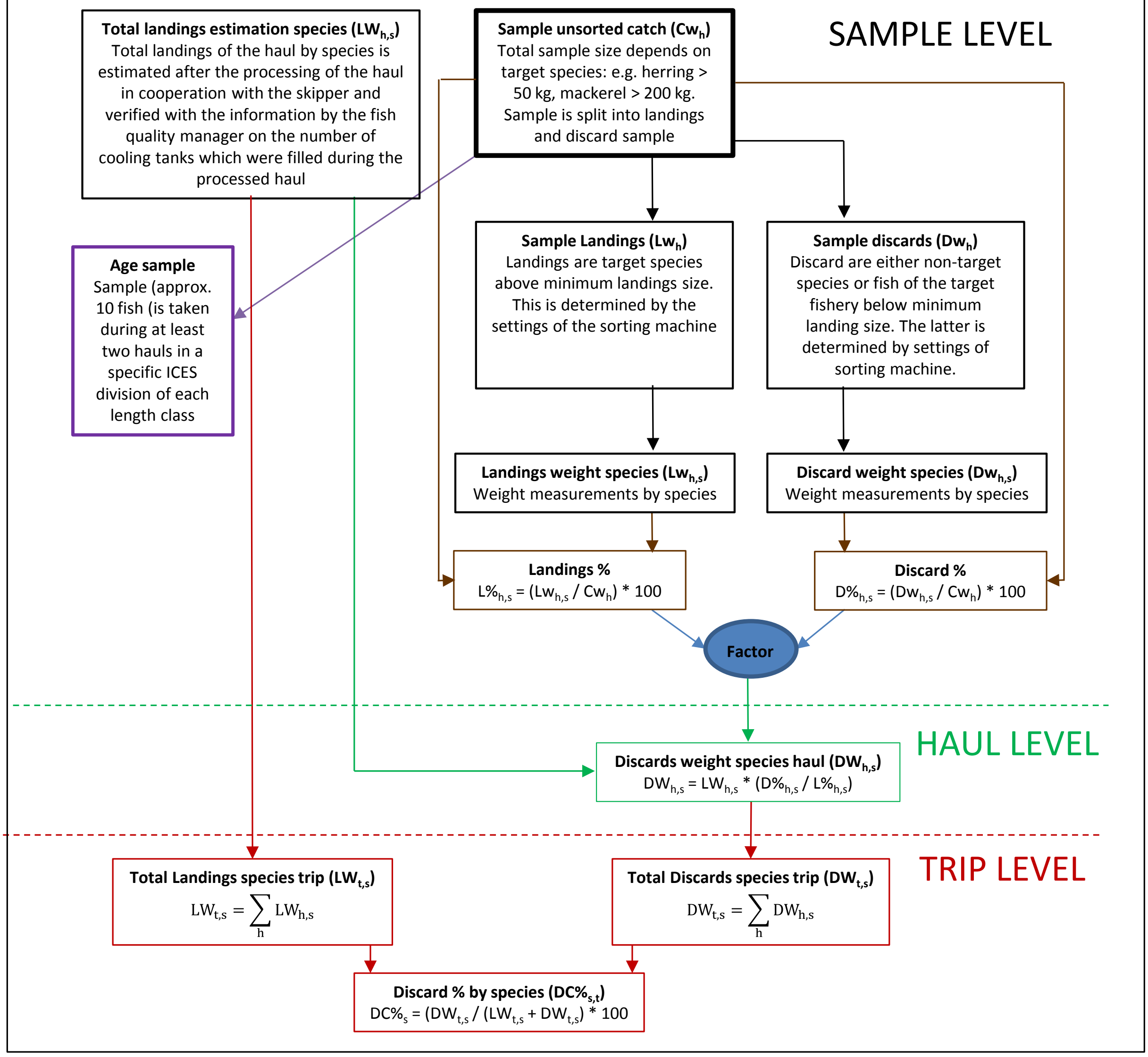


2.2 Sampling procedures German sampling programme

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.

A schematic overview of the German sampling and raising procedures (from sampled to trip level) is presented in Box 3.
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. 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. 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. In addition, the samples are used to estimate the discard percentage by species in the haul (see $D\%_{h,s}$ 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 estimated discard is also agreed with the fish quality manager and skipper. Subsamples are taken for further age analysis in the laboratory. After each trip, data is stored in a central database.

Box 3: Schematic overview of the German sampling and raising procedures (from sampled to trip level)



2.3 Raising procedures Dutch sampling programme

An overview of the Dutch (sampling and) raising procedure is given in Box 2.

2.3.1 Raising the samples to haul level (see also haul level in Box 2)

Total weight per species
Total catch weight per species and haul ($CW_{h,s}$) is estimated by multiplying the weight of the species in the catch sample ($Cw_{h,s}$) with the ratio between the estimated total catch weight (CW_h) and 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 ($DW_{h,s}$) is estimated by multiplying the weight of the species in the discards sample ($Dw_{h,s}$) with the ratio between the estimated total weight of discards (DW_h) and 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 ($CN_{l,h,s}$) is estimated per species and haul by multiplying the numbers at length in the catch sample ($Cn_{l,h,s}$) with the ratio between the estimated total catch weight (CW_h) and 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 ($DN_{l,h,s}$) is estimated per species and haul by multiplying the numbers at length in the discard sample ($Dn_{l,h,s}$) with the ratio between the estimated total discard weight (CW_h) and 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 (see also trip level in Box 2)

Total weight per species
Total catch weight per species and trip ($CW_{t,s}$) is estimated 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 ($DW_{t,s}$) is estimated 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 ($LW_{t,s}$) is estimated by subtracting discard weight from the catch weight per species:

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

Estimated landings by species are cross-checked with the total recorded landings by species.

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

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

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

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

Total numbers landed at length per species and trip ($LN_{l,t,s}$) is estimated by subtracting total discards numbers at length per species from total numbers caught at length per species:

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

2.3.3 Unsampled discards

During the observed trips it occasionally happens that a part of or the whole catch within a haul is discarded before the sorting process; in this report referred to as unsampled discards. In such occasions the weight of the unsampled discarded catch is estimated by the observer. Sampling of the species composition and the length frequency distribution of such incidents is not possible. Consequently, these unsampled discards cannot be raised by the raising procedure that is described above. It is therefore decided to interpret "unsampled discards" as a separate component (DWS_h). When only part of the catch within a haul is discarded without sorting, the raising procedure is used for the sampled part of the catch while the unsampled part is treated as unsampled discards. Total unsampled discards within a trip (DWS_t) is estimated 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 happens that the observer only estimates the weight of the catch and the discard percentage. Because the species composition and length frequency distribution of both the catch and discards for such hauls is unknown, not sampled hauls are presented 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 are estimated (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 ($DW_{t,s}$) divided by the total number of sampled trip per quarter ($N_{s,q}$):

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

The average discards per quarter (DWF_q) is raised to the Dutch fleet level (per quarter) by multiplying the sampled average (DW_q) with the total number of trips of the entire fleet per quarter ($N_{f,q}$):

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

Total discard weight per species per year at fleet level (DWF) is estimated 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 ($DW_{h,s}$) is estimated by multiplying the estimated total landings per haul (LW_h) with the ratio between the proportion discards and proportion landings:

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

Total length per species
The total numbers of landed fish caught at length ($LN_{l,h,s}$) is estimated 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 ($DN_{l,h,s}$) is estimated per species and haul by multiplying the numbers at length in the discards sample ($Dn_{l,h,s}$) by the ratio between the estimated total discards weight by species ($DW_{h,s}$) and 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 ($LW_{t,s}$) is estimated 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 ($DW_{t,s}$) is estimated 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 ($LN_{l,t,s}$) is estimated 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 ($DN_{l,t,s}$) is estimated 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 happens that the observer does 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

In order to raise the total discard weight per species and trip ($DW_{t,s}$) to fleet level, first the sampled average discards needs to be estimated (DW). 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 ($DW_{t,s}$) divided by the total number of sampled trips (N_s):

$$DW \quad = \sum DW_{t,s} / N_s$$

The discards are raised to the German fleet level by multiplying the sampled average (DW) with the total number of trips of the entire fleet (N_f):

$$DWF \quad = N_t \times DW$$

3 Results

3.1 Fleet

3.1.1 Landings

Target species of the freezer trawler fleet in European waters differ by season and area. Main target species are greater argentine, herring, horse mackerel, mackerel, pilchard and blue whiting. The total landings of these species by the Dutch fleet were about 226,000 tonnes in 2013 and 203,000 tonnes in 2014 (in European waters). The total landings of the German fleet were about 116,000 tonnes in 2013 and 114,000 tonnes in 2014 (in European waters).

Herring, horse mackerel, mackerel and blue whiting were the most abundant species landed (Table 1, Figure 2a-d). Herring is mostly caught in the 2^{nd} half of the year (June to December). The herring fishery is normally concentrated on North Sea herring during summer, in autumn targeting Atlanto-Scandian herring in ICES IIa and IIb and in December channel herring in VIId (see Figure 1 for an explanation of the ICES areas). Horse mackerel was caught throughout the year in a number of different areas. Mackerel is mainly caught in the 1^{st} and 4^{th} quarter of the year. Blue whiting was targeted during the first half of the year (February to May). Greater argentine is targeted in April to June, whereas pilchard is only caught occasionally in small amounts.

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 4a,b for 2013 and 2014 in total and in Figures 5a-h by quarter for both years. According 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 due to data protection issues.

3.2 Discards

3.2.1 Sampled trips

Dutch sampled trips
Within the Dutch sampling programme 12 trips were conducted on board pelagic freezer trawlers in 2013, from which 6 trips were on board Dutch flagged vessels, 2 trips on board German flagged vessels and 1 trip on board a French and UK flagged vessel. In 2014, 12 trips were conducted 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).

Four different fishing grounds were sampled during the sampled trips, namely the Celtic Sea, West of Scotland, North Sea and the English Channel (Table 3, Figures 4a,b). A total of 522 hauls in 2013 and 477 hauls in 2014 were sampled, which was 94% and 97% respectively of all the hauls during the sampled trips (Table 2). In 2013 during 10 hauls (i.e. 2% of all the hauls) and in 2014 during 6 hauls (i.e. 1% 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.

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 observed species that were discarded during the sampled trips. As the observer is unable to monitor all rare, incidental bycatches, it must be noted that the presented numbers for these species are likely underestimates.

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 3a,b. For greater argentine, herring and horse mackerel, the length frequency distributions generally show a quite regular bell-shaped pattern which may indicate that only one major age class was caught. For the other species length distributions are not so regular, especially the length frequency for mackerel shows a divergent pattern; an extra peak for small mackerel.

German sampled trips
Within the German sampling programme 7 and 5 trips were made in 2013 and 2014 respectively on board pelagic freezer trawlers. One trip in 2013 and two trips in 2014 were self-sampled by the ship´s crew. These trips are not included in the discards analysis. All trips were on board German flagged vessels. Three different fishing grounds were sampled during the sampled trips, namely the Celtic Sea, West of Scotland and the North Sea (Table 3). A total of 232 hauls in 2013 and 118 hauls in 2014 were sampled, which was 81% and 71% respectively of all the hauls during the sampled trips (Table 2).

The average length frequency distribution of landed and discarded blue whiting, herring, horse mackerel and mackerel by trip is presented in Figures 3c,d. Due to the overall lower number of sampled trips and therefore also the lower number of measured fish in comparison to the Dutch sampling programme, the length distribution curves are not as regular shaped but showing different peaks. Also, it has to be noted that the shown length frequency cannot be seen as representative for the whole fishery. It has therefore been decided to only report the length frequency distributions of the most frequently measured species (i.e. greater argentine, herring, horse mackerel, mackerel and pilchard in 2013 and herring, horse mackerel and mackerel in 2014).

3.2.2 Discards

The total catch, landings, discards, and discard percentages by species by trip and corresponding sampling period is reported in Table 4. In this table the total amount of “unsampled disards” observed during each trip, “not sampled hauls” 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 G15, G16, G17, G19, G20-21, G22, G23 and G26. The trips G21-22 are presented together. During G21 only a few hauls were made before the vessel had to go into harbour for repairs after which the trip continued as G22. Tables 5a,b show the average amount of discards or total number of observed individuals by all caught species within the Dutch and German observed trips in 2013 and 2014. In general higher discard rates are only observed for target species (>1 tonne up to 21.4 tonnes) while the discard rates for most non-target species are mostly negligible with the exception of boarfish and hake. Occasional catches of rare or protected species such as dolphins, sharks and seals are also observed (Tables 5a,b). These catches are also reported to the Working Group on Bycatch of Protected Species (WGBYC) (ICES, 2015).

Raised Dutch discard estimates
Values collected within the Dutch sampling programme have been raised to the Dutch pelagic fleet by quarter (Table 6) and are presented in Table 7a.

For 2013, the raised discard data show a discard percentage of <1% for blue whiting, 2% for greater argentine, 1% for herring, <1% for horse mackerel, 7% for mackerel, 3% for pilchard and 13% for other species (Table 7a). Hake, the most frequently discarded other species (Table 5a), shows a discard percentage of 49%. Mackerel was the most dominant species in the discards (in tonnes) during the sampled trips. Overall, including the unsampled discards, the discard percentage for the Dutch pelagic fleet in 2013 based on sampled trips is estimated at 1% (Table 7a).

For 2014, the raised discard data show a discard percentage of <1% for blue whiting, 4% for greater argentine, 1% for herring, <1% for horse mackerel, 3% for mackerel, 0% for pilchard and 20% for other species (Table 7a). Boarfish and hake, the most frequently discarded other species (Table 5a), show a discard percentage of 100% and 40% respectively. Mackerel was the most dominant species in the discards (in tonnes) during the sampled trips. As pilchard was not targeted during any of the sampled trips (Table 3), the raised discard estimate of this species is considered to be highly uncertain. Overall, including the unsampled discards, the discard percentage for the Dutch pelagic fleet in 2014 based on sampled trips is estimated at 2% (Table 7a).

Raised German discard estimates

In contrast to Van Overzee et al. (2013), data collected within the German sampling programme have in this report been raised to fleet level in a similar way to the Dutch programme. Estimates are now given for the total fleet and not only for parts of the fleet targeting a certain species. The only difference with the Dutch raising method is that data are not raised by quarter to the total fleet but for the whole year due to the more limited number of fishing trips in comparison to the Dutch fishery. The values are presented in table 7b.

For 2013, the raised discard data show a discard percentage of 6% for blue whiting, <1% for greater argentine, <1% for herring, <1% for horse mackerel, <1% for mackerel, 0% for pilchard and 9% for other species combined leading to a total discard percentage of 1% (Table 7b). Boarfish and hake, the most frequently discarded other species (Table 5b), show a discard percentage of 100% and 95% respectively. By species blue whiting was the most dominant species in the discards during the sampled trips. But, as blue whiting was not targeted during any of the sampled trips, this estimate is only calculated from by-catch in non-blue whiting targeting fisheries. Overall discard rates which includes the target fishery might be lower. Therefore, the raised discard estimate for this species is considered to be highly uncertain.

For 2014, the raised discard data show a discard percentage of <1% for blue whiting, <1% for greater argentine, <1% for herring, <1% for horse mackerel, <1% for mackerel, 0% for pilchard and 12% for other species combined leading to a total discard percentage of <1% (Table 7b). Boarfish and hake, the most frequently discarded other species (Table 5b), show a discard percentage of 100% and 96% respectively.

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. An initial attempt for this synthesis was made by van Overzee et al. (2013) who presented a joint report with the results of the Dutch and German sampling programme in 2011 and 2012 in European waters. It was concluded that sampling and raising procedures on board pelagic trawlers differed between Germany and the Netherlands. This report continues the synthesis from van Overzee et al. (2013) and presents the data collected in 2013 and 2014. The results of both programmes are again presented separately because sampling protocols still differ between the two countries (see sections 2.1 and 2.2). However, the raised estimates of the Dutch and German sampling programme are now better comparable as both discard estimates represent the total annual effort (expressed in total number of trips) of the Dutch, resp. German trawlers which was not the case before.

4.2 Sampling coverage

The European pelagic freezer trawler fleet is sampled by both the Netherlands and Germany. The Dutch pelagic sampling programme aims at sampling 12 trips per year. This aim was reached in both sampling years. The German sampling programme aims at sampling at least 4 trips per year, one trip in each quarter. In 2013 6 trips were sampled but in 2014 only 3 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 may visit several fishing grounds during one fishing 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 6 trips in 2013 and 3 trips in 2014. The overall number of German fishing trips in this metier was 36 in 2013 and 39 in 2014. Therefore, the sampled trips were not able to cover all fisheries over all seasons. For example, the fishery targeting blue whiting was not sampled. Since most discarding occurs when species are not targeted, e.g. herring and mackerel is discarded in the fishery targeting horse mackerel or blue whiting (Tables 4a,b), it is possible that raised German discard data result in non-accurate total annual discard estimations. Additionally, 3 German trips were sampled by self-sampling of the ship´s crew for the collection of age/length samples of the landings fraction but these samplings cannot be used for the estimation of discards.

The Netherlands sampled 24 trips in total in 2013 and 2014; 12 trips in each year. VMS information has been used to visualise the distribution of the Dutch pelagic freezer trawler fleet and sampled trips per quarter (Figures 5-9). 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. Similar to the 2011 and 2012 (Overzee et al., 2013) 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 5a,b). However on a quarterly basis (Figures 6-9), sampling did not entirely follow the distribution of the fleet. Such a mismatch may be caused by the fact that some quarters are not sampled as intensively as the others (Table 3). However, this might be a matter of how the data is presented; the quarterly presentation does not follow the fishing season. Another reason might be that the observed fishing trips are not always matching the typical fishing pattern. Unfortunately, due to data protection VMS data were not made available to make a similar comparison for the German sampling programme.

4.3 Combining results of two sampling programmes

The sampling protocols from the Netherlands and Germany differ (see Boxes 2,3). 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 (Stransky et al., 2010). 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. This results in a different calculation of the factors used to raise the discards to haul and to trip level. Both methods introduce different sources of bias.

The overall estimated discard rate (annually) of the Dutch programme for 2013 and 2014 is 1% and 2% respectively. This is a decrease in comparison with 2011 and 2012 (discard rates 9% and 6% respectively, Overzee et al., 2013). This decrease may possibly be due to changes in fishing operations in anticipation of the landing obligation (see also 4.4). The overall estimated discard rate of the German programme is approximately 1% for both years. The German overall discards rates are therefore similar to the observed rates in 2011 and 2012 – although it has to be mentioned that the German discard rates in 2011 and 2012 were estimated for the herring and mackerel directed fishery separately (van Overzee et al., 2013).

Annual differences between the Dutch and German monitoring are illustrated in the length frequencies (figures 3a,b and 4a,b). For most species differences are apparent. These differences between the countries can be explained mostly by the different sampling intensity of the two programmes. Due to the smaller German fleet not all fisheries are sampled with the same extent and the length distribution of some species are only showing parts of the whole length spectrum. However, another reason could be that sampling methods are not congruent between the countries.

In January 2010, a German flagged but Dutch owned pelagic freezer trawler was accidently 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 sampling intensities 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 combining the results within one joint report an important first step between the two member states is made to a more harmonized combined sampling programme for the pelagic freezer trawler fleet. 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 still to be interpreted with caution.

However, a discussion has started and it is clear that not only the fisheries have to adapt to the new EU regulation of the landing ban but also the data collection and the sampling procedures. Therefore, the implementation of a new fishing regime has also to be seen as a chance to harmonize the observer schemes and sampling methods. Bilateral meetings with Dutch and German participants are now held on a regular basis to ensure the process.

4.4 Reform of the Common Fishery Policy

An important element in the 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, is going to be replaced by a catch quota regime. From 2015 onwards, fisheries are in principle obliged to keep catches of quota regulated species on board. Undersized fish which is under a specific minimum conservation reference size must be landed but cannot be marketed for human consumption purposes. Details of the implementation are defined in multiannual plans or in specific discard plans when no multiannual plan is in place. These details include for a specific region and/or fishery the species covered, provisions on catch documentation, minimum conservation reference sizes, and exemptions (for fish that may survive after returning them to the sea, and a specific *de minimis* discard allowance under certain conditions). Quota management will also become more flexible in its application to facilitate the landing obligation (http://ec.europa.eu/fisheries/cfp/fishing_rules/discards/index_en.htm).

Although the landing obligation has been enforced from the beginning of 2015, 2015 is currently perceived as a transition year for the pelagic fisheries. Fisheries and control agencies are trying to implement the new regulation in terms of managing but not actually enforcing it.

It is clear that the obligation to land all catches, or at least the species subjected to the discard ban (i.e. quota species), will affect the sampling programme on board pelagic freezer trawlers. Sampling methods and raising procedures need to be adapted in order to quantify all different catch fractions. In any case, it is also clear that scientific monitoring programmes on board must proceed under the new regime to collect biological data (e.g. length, age, maturity) 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).

A potential problem with comparable monitoring schemes (one for compliance (official catch data) and one for scientific programmes) is conflicting information. Two sources of information may result in two different outcomes: discarding of some species will become an illegal activity and scientific observers will be in a position where they are be able to observer these illegal practices, this may have an effect on fishing behaviour and, eventually, will cause bias in observer data. Both data sources have its potential deficiencies, e.g. illegal discarding is not recorded in official catch data, and, the scientific programmes will have to deal with potential biases.

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Appendix: Tables and Figures

Table 1a. Landings (tonnes) per year, species and ICES area by the **Dutch** freezer trawler fleet in 2013 and 2014. Data extracted from VISSTAT database, landings in non-ICES areas not included. For areas see Figure 1. Arg = Greater argentine, Her = Herring, Hom = Horse mackerel, Mac = Mackerel, Pil = Pilchard, Whb = Blue whiting.

Year	Species	IIa	IIb	IIIa	IVa	IVb	IVc	Vb	VIa	VIb	VIIb	VIIc	VIId	VIIe	VIIg	VIIh	VIIIb	VIIj	VIIk	Total*
2013	Arg	0	0	0	0	0	0	0	1337	0	0	0	0	0	0	0	0	0	0	1337
	Her	2339	3287	29	28473	33284	407	0	1814	0	0	0	18299	0	0	442	0	0	0	88373
	Hom	0	0	0	0	0	143	0	11078	98	11458	3074	7938	11891	0	5073	1057	9945	48	61803
	Mac	0	1	0	4222	5	0	0	6254	129	3309	225	229	12	0	1	1330	4594	0	20310
	Pil	0	0	0	0	0	0	0	0	0	0	0	591	870	0	274	445	0	0	2180
	Whb	18	13	0	0	0	0	0	21406	5204	83	24262	0	0	0	0	619	30	0	51635
2014	Arg	0	0	0	345	0	0	0	2332	0	0	0	0	0	0	0	0	0	0	2677
	Her	5711	3464	0	37380	22628	423	0	1645	0	0	0	14216	3	821	0	0	0	0	86291
	Hom	107	0	0	310	8	241	0	8580	0	6465	149	4113	3210	0	1239	526	4457	0	29405
	Mac	5815	0	0	23884	50	0	73	8486	0	3792	50	269	2	0	45	398	3087	0	45949
	Pil	0	0	0	0	0	0	0	0	0	0	0	51	141	0	0	0	0	0	192
	Whb	93	92	0	3664	0	0	3150	27487	0	198	2732	0	0	0	0	0	659	448	38524

* Due to rounding this value may differ slightly from when one would sum the values by species and area from this table.

Table 1b. Landings (tonnes) per year, species and ICES area by the **German** freezer trawler fleet in 2013 and 2014. Data extracted from German FiStat database, landings in non-ICES areas not included. For areas see Figure. Arg = Greater argentine, Her = Herring, Hom = Horse mackerel, Mac = Mackerel, Pil = Pilchard, Whb = Blue whiting.

Year	Species	IIa	IIb	IVa	IVb	IVc	Vb	VIa	VIb	VIIb	VIIc	VIId	VIIe	VIIh	VIIi-j	VIIIa	VIIIb	Total
2013	Arg	0	0	0	0	0		417	0	0	0	0	0	0	0	0	0	417
	Her	1922	2322	19339	17700	56		4024	0	0	0	9827	0	450	0	0	0	55640
	Hom	0	0	20	231	0		8616	0	2908	794	2710	1882	2792	7405	417	0	27776
	Mac	74	0	5753	1	0		9196	0	1359	51	72	0	0	3673	358	392	20930
	Pil	0	0	0	0	0		0	0	0	0	105	58	50	0	0	0	214
	Whb	38	40	0	0	0		3624	5120	0	2341	0	0	0	256	0	0	11418
2014	Arg	0	0	204	0	0	110	908		0	0	0	0	0	0	0	0	1223
	Her	668	1	23244	4424	0	0	3354		0	0	9098	0	578	0	0	0	41367
	Hom	0	0	2	0	0	0	4194		7335	1796	1617	83	1140	2593	14	6	18780
	Mac	0	0	4976	2	0	0	11721		2523	95	10	0	30	5143	1592	2363	28455
	Pil	0	0	0	0	0	0	0		0	0	17	1	0	0	0	0	18
	Whb	26	1	2627	0	0	6966	7359		62	7447	0	0	0	0	0	0	24487

Table 2. Overview of sampled trips in 2013 and 2014 (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 ***
2013	P110	NLD	GBR	23	21	91%	0
	P111	NLD	NLD	59	59	100%	0
	P112	NLD	NLD	44	39	89%	0
	P113	NLD	NLD	35	34	97%	0
	P114	NLD	DEU	88	87	99%	0
	P115	NLD	FR	28	27	96%	4
	P116	NLD	GBR	49	49	100%	0
	P117	NLD	NLD	41	41	100%	1
	P118	NLD	NLD	80	64	80%	1
	P119	NLD	DEU	30	25	83%	2
	P120	NLD	NLD	31	30	97%	2
	P121	NLD	DEU	50	46	92%	0
	G15	DEU	DEU	26	25	96%	n.m.
	G16	DEU	DEU	21	20	95%	n.m.
	G17	DEU	DEU	79	62	78%	n.m.
	G18****	DEU	DEU	4	4	100%	n.m.
	G19	DEU	DEU	86	65	76%	n.m.
	G20	DEU	DEU	8	7	88%	n.m.
	G21	DEU	DEU	63	49	78%	n.m.
2014	P122	NLD	NLD	27	26	96%	0
	P123	NLD	NLD	56	54	96%	2
	P124	NLD	NLD	36	31	86%	0
	P125	NLD	GER	42	42	100%	0
	P126	NLD	GER	78	78	100%	0
	P127	NLD	FR	27	27	100%	3
	P128	NLD	NLD	32	32	100%	0
	P129	NLD	NLD	33	31	94%	0
	P130	NLD	FR	36	34	94%	0
	P131	NLD	NLD	61	60	98%	1
	P132	NLD	NLD	36	35	97%	0
	P133	NLD	NLD	27	27	100%	0
	G22	DEU	DEU	54	33	61%	n.m.
	G23	DEU	DEU	44	41	93%	n.m.
	G24****	DEU	DEU	27	5	19%	n.m.
	G25****	DEU	DEU	6	6	100%	n.m.
	G26	DEU	DEU	36	33	92%	n.m.

** 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

**** Self-sampling by industry

Table 3. Period, target species and ICES areas of the trips conducted during the observer programme in 2013 and 2014

Year	Trip	Period*	Target species**	ICES areas
2013	P110	Jan	Horse mackerel, mackerel	VIa, VIIb
	P111	Feb, Mar	Horse mackerel, blue whiting	VIII, VIIc, VIIe, VIIh
	P112	Feb, Mar	Horse mackerel, blue whiting	VIa, VIIb, VIIc
	P113	Mar, Apr	Blue whiting	VIa
	P114	Jun, Jul	Blue whiting, greater argentine, herring	IVa, VIa
	P115	Jun	Herring	IVa
	P116	Jul	Herring	IVa
	P117	Aug	Herring	IVa
	P118	Oct, Nov	Horse mackerel, pilchard, mackerel	VIId, VIIe, VIIh
	P119	Nov, Dec	Horse mackerel	VIII, VIId, VIIe, VIIh
	P120	Dec	Herring, horse mackerel	IVc, VIId
	P121	Dec	Herring	VIId
	G15	Jan, Feb	Mackerel	VIa, VIIb, VIIc
	G16	Jan	Mackerel	VIa
	G17	April, May	Horse mackerel	VIIj
	G19	Nov, Dec	Herring, horse mackerel	VIa, VIIb, VIIc, VIId; VIIe, VIIh
	G20	Aug	Herring	IVa
	G21	Aug, Sep	Herring	IVa, IVb, VIa
2014	P122	Jan	Horse mackerel, mackerel	VIa, VIIb, VIIe
	P123	Feb, Mar	Horse mackerel, mackerel, blue whiting	VIII, VIa, VIIb-c, VIIe, VIIh, VIIj-k
	P124	Feb, Mar	Horse mackerel, mackerel, blue whiting	VIII, VIa, VIIb, VIIe, VIIh, VIIj
	P125	Apr	Blue whiting	Vb, VIa
	P126	May, Jun	Greater argentine, blue whiting	IVa, Vb, VIa
	P127	Jun	Herring	IVa
	P128	Jul	Herring	IVa
	P129	Aug	Herring	IVa
	P130	Okt	Mackerel, horse mackerel	IVa
	P131	Okt, Nov	Mackerel, horse mackerel	IVa, VIa, VIIb-c
	P132	Nov, Dec	Horse mackerel, herring	VIId-e
	P133	Dec	Herring	VIIe
	G22	Jan	Mackerel, horse mackerel	VIa, VIIb, VIIc, VIId
	G23	July	Herring	IVa
	G26	Nov, Dec	Horse mackerel	VIa, VIIb

* During fishing (not steaming).

** 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 4. Total catch, landings, discards (tonnes), discard percentage and unsampled discards per sampled pelagic discard trip in 2013 and 2014 (Q= quarter)

2013	Month	Q		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others*	Unsampled discards[&]	Total	Not sampled[+]	Damaged net
P110	1	1	Catch			2.4	428.9	2283.8		6.9		2722.0	23	
			Landings			0	428.9	2253.4		0		2682.3		
			Discards			2.4	0	30.4		6.9		39.7		
			%Discards			100%	0%	1.3%		100%		1.5%		
P111	2,3	1	Catch	2403.3		0.1	1393.6	419.0	15.5	6.9		4238.4		
			Landings	2391.9		0	1392.0	390.7	11.8	1.3		4187.7		
			Discards	11.4		0.1	1.6	28.3	3.7	5.6		50.7		
			%Discards	0.5%		100%	0.1%	6.8%	23.9%	81.2%		1.2%		
P112	2,3	1	Catch	6309.5	<0.1		127.9	429.3		3.9		6870.6		
			Landings	6307.7	0		127.7	394.0		0		6829.4		
			Discards	1.8	<0.1		0.2	35.3		3.9		41.2		
			%Discards	<0.1%	100%		0.2%	8.2%		100%		0.6%		
P113	3,4	1	Catch	1914.5	7.4					125.9		2047.8	70	
			Landings	1914.5	7.4					123.2		2045.1		
			Discards	<0.1	0					2.7		2.7		
			%Discards	<0.1%	0%					2.1%		0.1%		
P114	6,7	2	Catch	512.2	706.1	3588.4	<0.1	205.0		7.0		5017.7	5	
			Landings	505.7	703.2	3569.4	0	195.8		0		4974.1		
			Discards	6.5	2.9	19.0	<0.1	9.2		7.0		44.6		
			%Discards	1.3%	0.4%	0.5%	100%	4.5%		100%		0.9%		
P115	6	2	Catch			1658.7		3.0		<0.1	36	1697.7	0.3	
			Landings			1646.9		0		0	0	1646.9		
			Discards			11.8		3.0		<0.1	36	50.8		
			%Discards			0.7%		100%		100%	100%	3.0%		
P116	7	3	Catch			3167.3		10.7				3178.0		
			Landings			3158.2		0				3158.2		
			Discards			9.1		10.7				19.8		
			%Discards			0.3%		100%				0.6%		

Table 4. Continued

2013	Month	Q		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others*	Unsampled discards[&]	Total	Not sampled[+]	Damaged net
P117	8	3	Catch			3890.0	0.4	23.8		12.6	25	3951.8		
			Landings			3857.9	0	0		0	0	3857.9		
			Discards			32.1	0.4	23.8		12.6	25	93.9		
			%Discards			0.8%	100%	100%		100%	100%	2.4%		
P118	10,11	4	Catch			2.5	1222.3	213.8	294.9	7.4	1	1741.9	85.5	
			Landings			0	1222.3	100.8	288.1	4.2	0	1615.4		
			Discards			2.5	0.0	113.0	6.8	3.2	1	126.5		
			%Discards			100%	0%	52.9%	2.3%	43.2%	100%	7.3%		
P119	11,12	4	Catch			0.3	803.2	1.6	3.2	0.9	9	818.2	3	
			Landings			0	803.2	0	3.2	0	0	806.4		
			Discards			0.3	0	1.6	0	0.9	9	11.8		
			%Discards			100%	0%	100%	0%	100%	100%	1.4%		
P120	12	4	Catch			1723.8	29.0	1.4	<0.1	0.8	35	1790.0	10	
			Landings			1709.1	29.0	0	0	0	0	1738.1		
			Discards			14.7	<0.1	1.4	<0.1	0.8	35	51.9		
			%Discards			0.9%	0.1%	100%	100%	100%	100%	2.9%		
P121	12	4	Catch			1167.4		10.1				1177.5	24.6	
			Landings			1160.4		10.0				1170.4		
			Discards			7.0		0.1				7.1		
			%Discards			0.6%		1.0%				0.6%		
G15	1,2	1	Catch	<0.1			270.7	1004.4		1.3		1277.9		
			Landings	0			270.7	1004.1		0.9		1275.8		
			Discards	<0.1			0	0.3		0.3		2.2		
			%Discards	100%			0%	0.03%		27%		0		
G16	1	1	Catch			3	138.2	1084.3		4		1229.8		
			Landings			3	138.2	1084.3		0		1225.4		
			Discards			0	0	0		4		4.4		
			%Discards			0%	0%	0%		100%		0.4%		

Table 4. Continued

2013	Month	Q		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others*	Unsampled discards[&]	Total	Not sampled[+]	Damaged net
G17	4,5	2	Catch	316.3	<0.1	1.2	3524.6	208.3		11.4		4083		
			Landings	203.3	0	0	3524.3	206.5		0		3938.5		
			Discards	113	<0.1	1.2	0.3	1.8		11.4		144.5		
			%Discards	36%	100%	100	0	1%		100%		4%		
G19	11,12	4	Catch			2788.9	432.1	12.4	46.8	0.8		3284.5		
			Landings			2758.9	431.9	11.2	46.8	0		3248.7		
			Discards			30	0.2	1.2	0	0.8		35.8		
			%Discards			15%	0%	10%	0%	100%		1%		
G20-G21	8,9	3	Catch			5705.6	94.5	1.4		<0.1		5801.5		
			Landings			5705.6	94.5	1.2		0		5801.3		
			Discards			0	0	0.2		<0.1		0.2		
			%Discards			0%	0%	14%		100%		0%		

Table 4. Continued

2014	Month	Q		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others*	Unsampled discards[&]	Total	Not sampled[+]	Damaged net
P122	1,2	1	Catch	<0.1		4.1	1152.6	498.9		4.5		1660.1	5	
			Landings	0		4.1	1152.6	496.6		0		1653.3		
			Discards	<0.1		0	0	2.3		4.5		6.8		
			%Discards	100%		0%	0%	0.5%		100%		0.4%		
P123	2,3	1	Catch	2227.8	0.6	2.3	814.8	681.0	1.7	67.6	45	3840.8	1	
			Landings	2191.4	0	2.1	805.1	643.7	1.6	0		3643.9		
			Discards	36.4	0.6	0.2	9.7	37.3	0.1	67.6	45	196.9		
			%Discards	1.6%	100%	8.7%	1.2%	5.5%	5.9%	100%	100%	5.1%		
P124	2,3	1	Catch	1315.8	4.2		154.0	331.0		6.0		1811.0	30	
			Landings	1315.8	4.2		154.0	329.0		0		1803.0		
			Discards	0	0		0	2.0		6.0		8.0		
			%Discards	0%	0%		0%	0.6%		100%		0.4%		
P125	4	2	Catch	4758.5	176.8			60.3		2.4		4998.0		
			Landings	4758.4	159.9			59.3		0		4977.6		
			Discards	0.1	16.9			1.0		2.4		20.4		
			%Discards	<0.1%	9.6%			1.7%		100%		0.4%		
P126	5,6	2	Catch	3863.3	1215.6		1.0	0.2		24.0		5104.1		
			Landings	3863.3	1205.3		0.9	0.1		0		5069.6		
			Discards	0	10.3		0.1	0.1		24.0		34.5		
			%Discards	0%	0.8%		10%	50%		100%		0.7%		
P127	6	2	Catch			1530.4		0.1			24	1554.5		
			Landings			1505.4		0				1505.4		
			Discards			25.0		0.1			24	49.1		
			%Discards			1.6%		100%			100%	3.2%		
P128	7	3	Catch			3340.1		45.0				3385.1		
			Landings			3340.1		0				3340.1		
			Discards			0		45.0				45.0		
			%Discards			0%		100%				1.3%		

Table 4. Continued

2014	Month	Q		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others*	Unsampled discards[&]	Total	Not sampled[+]	Damaged net
P129	8	3	Catch			1811.5		33.2		5.1		1849.8	20	
			Landings			1783.4		26.2		0		1809.6		
			Discards			28.1		7.0		5.1		40.2		
			%Discards			1.6%		21.1%		100%		2.2%		
P130	10	4	Catch			25.1	10.4	1434.0		0.1		1469.6	12	
			Landings			0	10.4	1426.6		0		1462.1		
			Discards			25.1	0	7.4		0.1		7.5		
			%Discards			100%	0%	0.5%		100%		0.5%		
P131	10,11	4	Catch	0.1		49.6	1588.5	2068.5		55.1	10	3771.8	1	
			Landings	0		40.9	1575.6	1946.7		0		3563.2		
			Discards	0.1		8.7	12.9	121.8		55.1	10	208.6		
			%Discards	100%		17.5%	0.8%	5.9%		100%	100%	5.5%		
P132[#]	11,12	4	Catch			2689.7	165.0	0.2	<0.1	0.1		2855.0	10	
			Landings			2688.8	165.0	0	<0.1	0.1		2853.9		
			Discards			0.9	0	0.2	0	0		1.1		
			%Discards			<0.1%	0%	100%	0%	0%		<0.1%		
P133[#]	12	4	Catch			1610.0	30.0	0.6		1.4		1642.0		
			Landings			1602.0	28.3	0		0		1630.3		
			Discards			8.0	1.7	0.6		1.4		11.7		
			%Discards			0.5%	5.7%	100%		100%		0.7%		
G22	1	1	Catch	0.8		0.1	1522.7	2683.2		3.1		4213.8		
			Landings	0		0	1522.7	2674.6		0		4197.2		
			Discards	0.8		0.1	0	8.6		3.1		16.6		
			%Discards	100%		100%	0%	0%		100%		0%		
G23	7	3	Catch	<0.1		4413.8		28.3		1.8		4450.3		
			Landings	<0.1		4405.7		28.3		1.8		4442		
			Discards	0		8.1		<0.1		0		8.2		
			%Discards	0%		0%		0%		0%		0%		

Table 4. Continued

2014	Month	Q		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others*	Unsampled discards&	Total	Not sampled+	Damaged net
G26	11,12	4	Catch				1789.4	37.6		2.9		1840.6		
			Landings				1789.4	37.5		0		1826.9		
			Discards				0	0.1		2.9		13.7		
			%Discards				0%	0%		100%		1%		

* Other species landed include: black seabream (*Spondyliosoma cantharus*), hake (*Merluccius merluccius*), whiting (*Merlangius merlangus*) and black seabream (*Spondyliosoma cantharus*). For other species discarded see Table 5.

& 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.

+ 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.

Observer did not sample entire trip (covered, based on number of days, 86% of trip P132 and 56% of trip P133).

Table 5a. Average amount of discards (tonnes) or total number observed over sampled pelagic **Dutch** discard trips in 2013 and 2014

		2013	2014
Species	Scientific name	Average weight (tonnes)	Average weight (tonnes)
Blue whiting	*Micromesistius poutassou*	1.6	3.0
Greater argentine	*Argentina silus*	0.2	2.3
Herring	*Clupea harengus*	8.2	8.0
Horse mackerel	*Trachurus trachurus*	0.2	2.0
Mackerel	*Scomber scombrus*	21.4	18.7
Pilchard	*Sardina pilchardus*	0.9	<0.1
Bib	*Trisopterus luscus*	<0.1	
Black seabream	*Spondyliosoma cantharus*	<0.1	<0.1
Blackfish	*Centrolophus niger*	0.1	<0.1
Blue-mouth	*Helicolenus dactylopterus*	<0.1	<0.1
Boarfish	*Capros aper*	0.2	8.7
Garfish	*Belone belone*	0.1	
Grey gurnard	*Eutrigla gurnardus*	0.1	0.1
Haddock	*Melanogrammus aeglefinus*	0.1	0.3
Hake	*Merluccius merluccius*	1.0	3.3
John Dory	*Zeus faber*		<0.1
Loligo	*Loligo* sp.	0.7	0.3
Lumpsucker	*Cyclopterus lumpus*		0.1
Norway pout	*Trisopterus esmarkii*	<0.1	0.1
Oar-fish	*Regalecus glesne*	<0.1	
Pollack	*Pollachius pollachius*		0.3
Poor cod	*Trisopterus minutus*	<0.1	<0.1
Saithe	*Pollachius virens*	0.9	<0.1
Silvery pout	*Gadiculus argenteus*		<0.1
Small redfish	*Sebastes viviparus*		<0.1
Sprat	*Sprattus sprattus*	<0.1	
Whiting	*Merlangius merlangus*	0.4	0.4
Basking shark	*Cetorhinus maximus*	no observations	3 individuals
Bluefin tuna	*Thunnus thynnus*	no observations	2 individuals

Species	Scientific name	2013 Average weight (tonnes)	2014 Average weight (tonnes)
Grey seal	*Halichoerus grypus*	1 individual	4 individuals
Lesser spotted dogfish	*Scyliorhinus canicula*	no observations	<0.1
Porbeagle	*Lamna nasus*	4 individuals	no observations
Saddle-backed dolphin	*Delphinus delphis*	no observations	1 individual
Smoothhound	*Mustelus mustelus*	0.1	no observations
Starry smoothhound	*Mustelus asterias*	no observations	<0.1

Table 5b. Average amount of discards (tonnes) or total number observed over sampled pelagic **German** discard trips in 2013 and 2014

		2013	2014
Species	Scientific name	Average weight (tonnes)	Average weight (tonnes)
Greater argentine	*Greater argentine*	0	<0.1
Argentine	*Argentina sphyraena*	<0.1	0
Red gurnard	*Aspitrigla cuculus*	0	<0.1
Boarfish	*Capros aper*	3.8	3.0
Herring	*Clupea harengus*	5.2	<0.1
Lumpsucker	*Cyclopterus lumpus*	<0.1	0
Grey gurnard	*Eutrigla gurnardus*	<0.1	0.8
Cod	*Gadus morhua*	<0.1	<0.1
Loligo	*Loligo forbesi*	0	<0.1
Monkfish	*Lophius piscatorius*	0	<0.1
Haddock	*Melanogrammus aeglefinus*	0.4	<0.1
Whiting	*Merlangius merlangus*	0.3	<0.1
Hake	*Merluccius merluccius*	2.1	1.1
Blue whiting	*Micromesistius poutassou*	18.9	0.3
Lemon sole	*Microstomus kitt*	0	<0.1
Lamprey	*Petromyzonidae*	0	<0.1
Saithe	*Pollachius virens*	0	<0.1
Blue skate	*Dipturus batis*	0	<0.1
Mackerel	*Scomber scombrus*	0.8	3.0
Horse mackerel	*Trachurus trachurus*	0.1	0
Tub gurnard	*Trigla lucerna*	0	<0.1
John Dory	*Zeus faber*	<0.1	0
Porbeagle	*Lamna nasus*	no observations	1 individual
Spurdog	*Squalus acanthias*	no observations	<0.1
Grey Seal	*Halychoerus grypus*	no observations	13 individuals
Saddle-backed dolpin	*Delphinus delphis*	no observations	1 individual

Table 6. Overview of number of trips by the Dutch and German pelagic fleet and sampled trips for 2013 and 2014. Data extracted from VISSTAT database (NLD) and FiStat (DEU).

Year	Country	Quarter	Nr trips pelagic fleet	Nr trips sampled*
2013	NLD	1	21	4
		2	14	2
		3	16	2
		4	21	4
2013	DEU	all	36	6
2014	NLD	1	11	3
		2	12	3
		3	18	2
		4	22	4
2014	DEU	all	39	3

* German self-samplings by the industry not included

Table 7a. Total catch, landings, discards (tonnes) and discard percentages from the **Dutch sampling programme** raised to **Dutch pelagic fleet** for 2013 and 2014

		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others	Unsampled discards	Total	Not sampled
2013	Catch	51750	1357	89060	61816	21775	2236	2196	688	230878	1172
(n=12)	Landings*	51635	1337	88373	61803	20310	2180	1920		227558	
	Discards[&]	115	20	687	13	1465	56	276	688	3320	
	% Discards	<1%	2%	1%	<1%	7%	3%	13%	100%	1%	
2014[#]	Catch	38658	2788	86915	29528	47292	192	3703	316	209392	439
(n=12)	Landings*	38524	2677	86291	29405	45949	192	2948		205986	
	Discards[&]	134	111	624	123	1343	<0.1	755	316	3406	
	% Discards	<1%	4%	1%	<1%	3%	0%	20%	100%	2%	

* Based on the Dutch landings statistics
[&] Raised discard estimates based on sampled information
[#] As observer departed trips P132 and P133 early, a correction was applied for these trips prior to data raising

Table 7b. Total catch, landings, discards (tonnes) and discard percentages from the **German sampling programme** raised to **German pelagic freezer trawler fleet** for 2013 and 2014

		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others	Total
2013	Catch	12096	417	51084	27778	20956	214	2699	115247
(n=6)	Landings*	11418	417	50898	27775	20929	214	2467	114118
	Discards[&]	678	<0.1	186	3	27	0	232	1129
	% Discards	6%	<1%	<1%	<1%	<1%	0	9%	1%
2014	Catch	24497	1222	37054	18778	28567	17	1680	111814
(n=3)	Landings*	24487	1222	37052	18778	28453	17	1480	111489
	Discards[&]	10	<0.1	2	0	114	0	200	325
	% Discards	<1%	<1%	<1%	0	<1%	0	12%	<1%

* Based on the German landings statistics
[&] Raised discard estimates based on sampled information

Table 8. Fishing TACs and quotas for 2013 as fixed by Council Regulations (EU) No 694/2012 of 27 July 2012, No 1261/2012 of 20 December 2012, No 39/2013 of 21 January 2013, No 40 of 21 January 2013 and No 297/2013 of 27 March 2013. Changes may have been made during 2013.

Species	*TAC 2013 (tonnes)*	Dutch TAC 2013 (tonnes)	German TAC 2013 (tonnes)	% Dutch TAC	% German TAC
Herring	*1 387 538*	92 553	72298	7%	5%
Mackerel	*338 392*	26 663	17785	8%	5%
Horse mackerel	*250 950*	59 010	13696	24%	5%
Blue whiting	*643 000*	21 601	6888	3%	1%

Table 9. Fishing TACs and quotas for 2014 as fixed by Council Regulations (EA) No 1262/2012 of 20 December 2012, No 713/2013 of 23 July 2013, No 1180/2013 of 19 November 2013, No 24/2014 of 10 January 2014, No 43/2014 of 20 January 2014, No 315/2014 of 24 March 2014 and No 432/2014 of 22 April 2014. Changes may have been made during 2014.

Species	*TAC 2014 (tonnes)*	Dutch TAC 2014 (tonnes)	German TAC 2014 (tonnes)	% Dutch TAC	% German TAC
Herring	*1 203 576*	90 385	67395	8%	6%
Mackerel	*613 317*	48 356	32290	8%	5%
Horse mackerel	*202 140*	43 855	10103	22%	5%
Blue whiting	*1 200 000*	34 623	11073	3%	1%

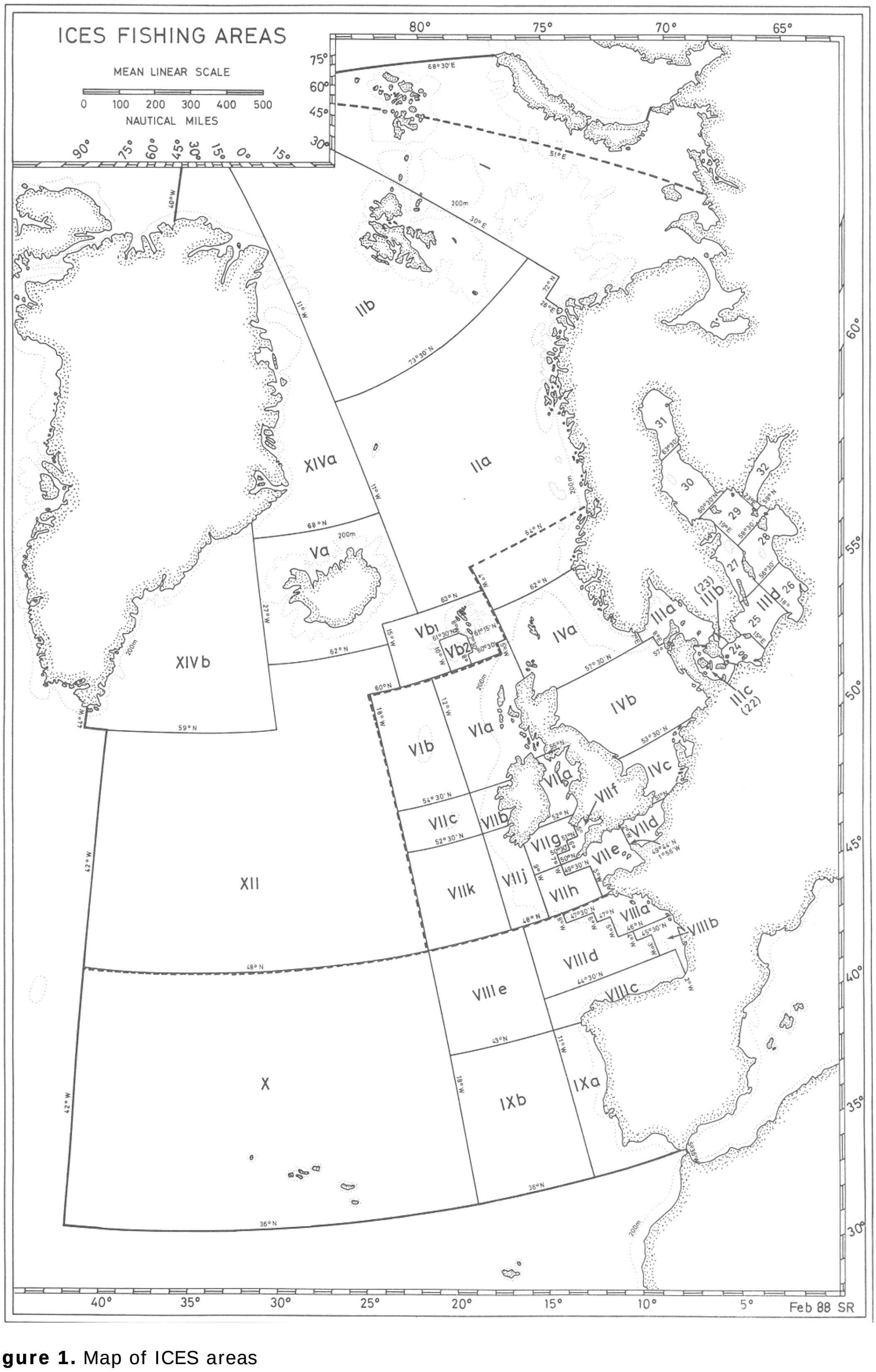
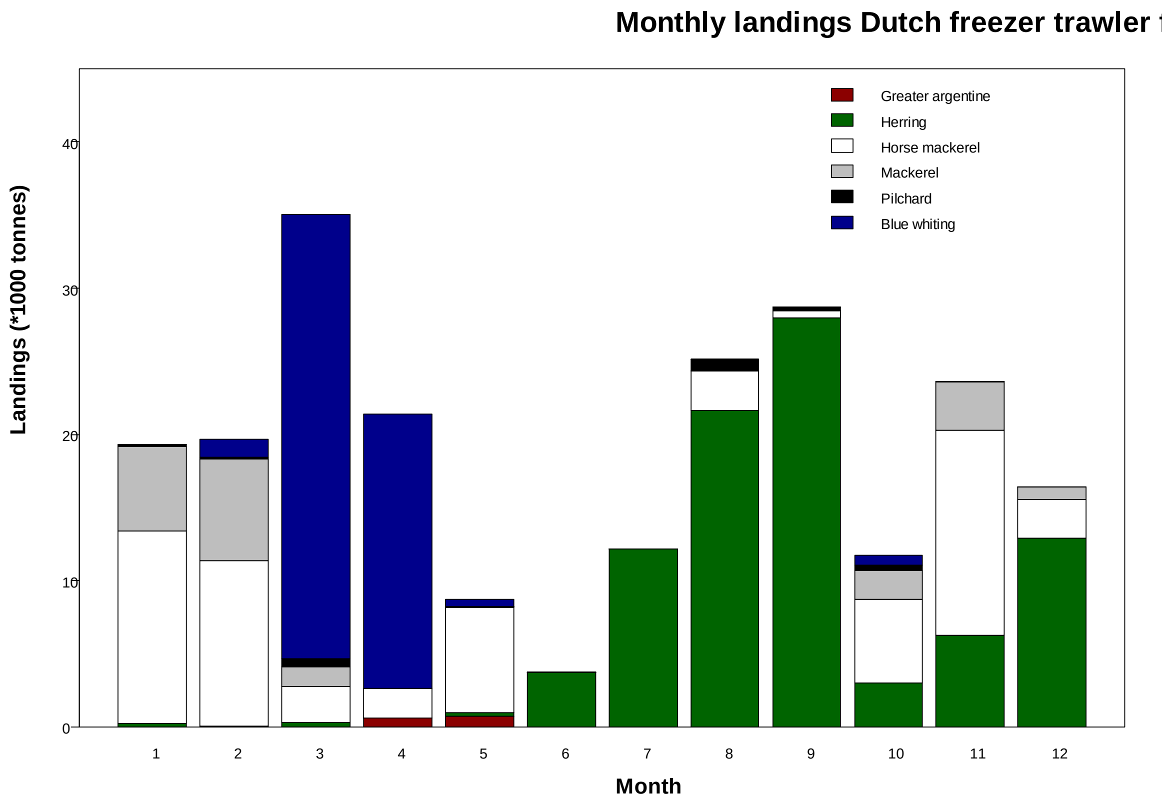


Figure 1. Map of ICES areas



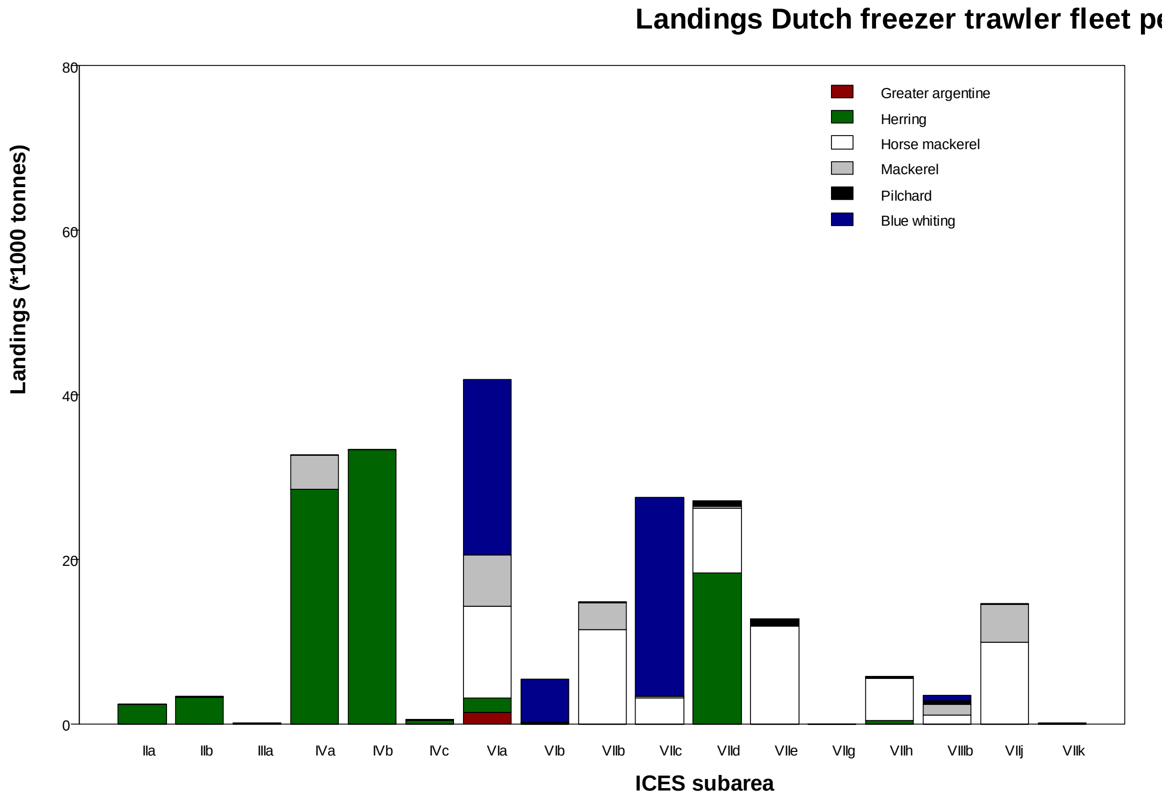


Figure 2a. Landings (*1000 tonnes) from the **Dutch** freezer trawler fleet in **2013**. Upper panel shows monthly landings by species, lower panel shows landings per ICES subarea (Figure 1) by species. Data extracted from VISSTAT database.

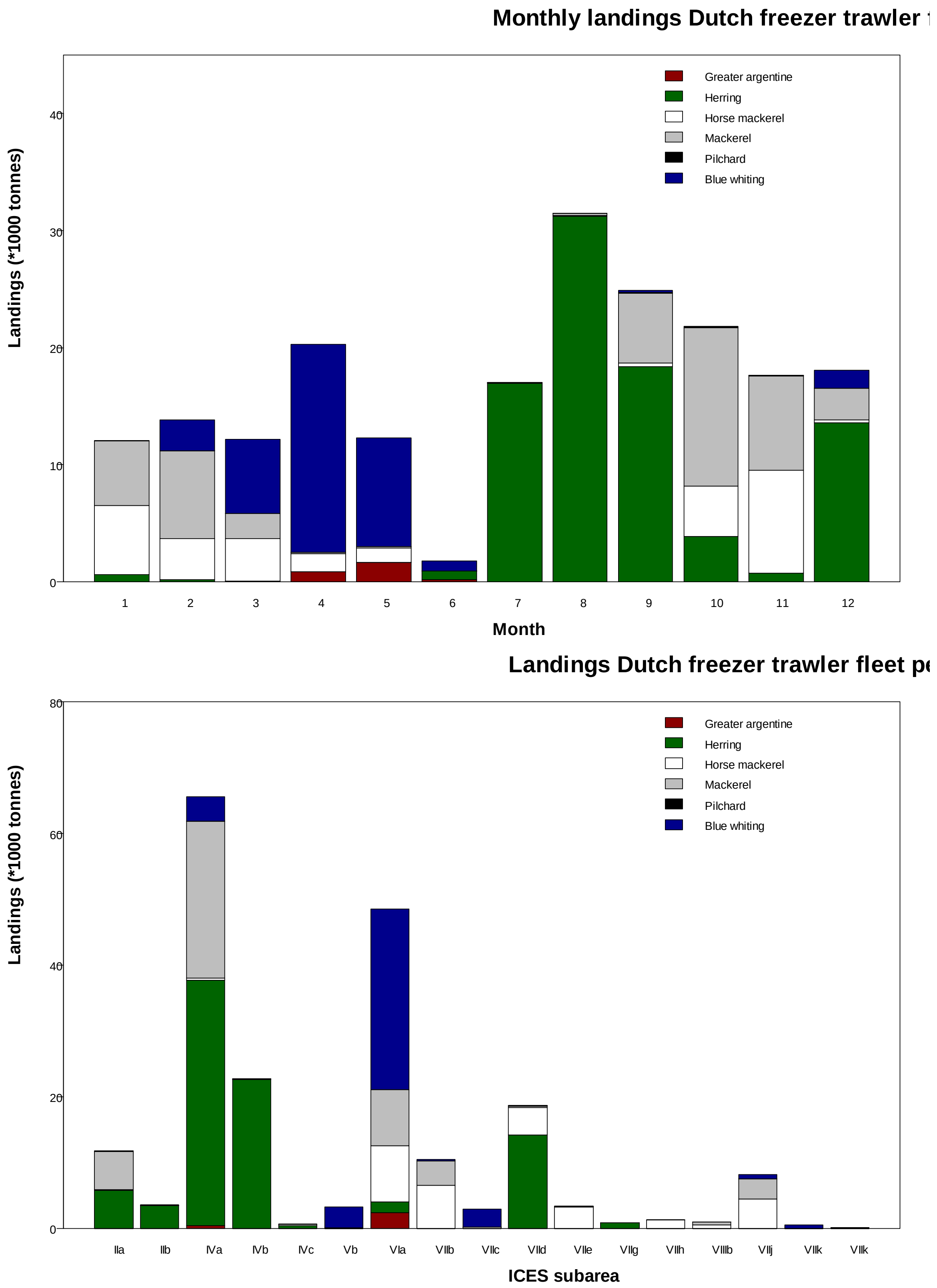
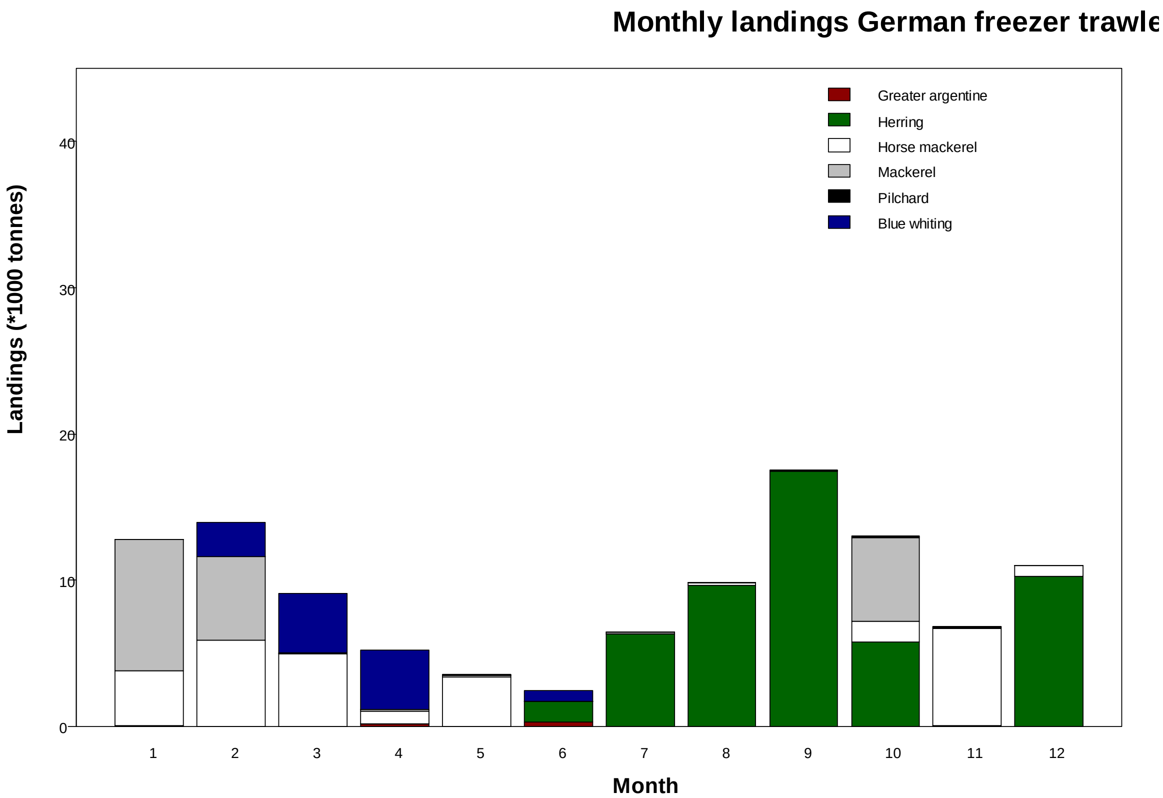


Figure 2b. Landings (*1000 tonnes) from the **Dutch** freezer trawler fleet in **2014**. Upper panel shows monthly landings by species, lower panel shows landings per ICES subarea (Figure 1) by species. Data extracted from VISSTAT database.



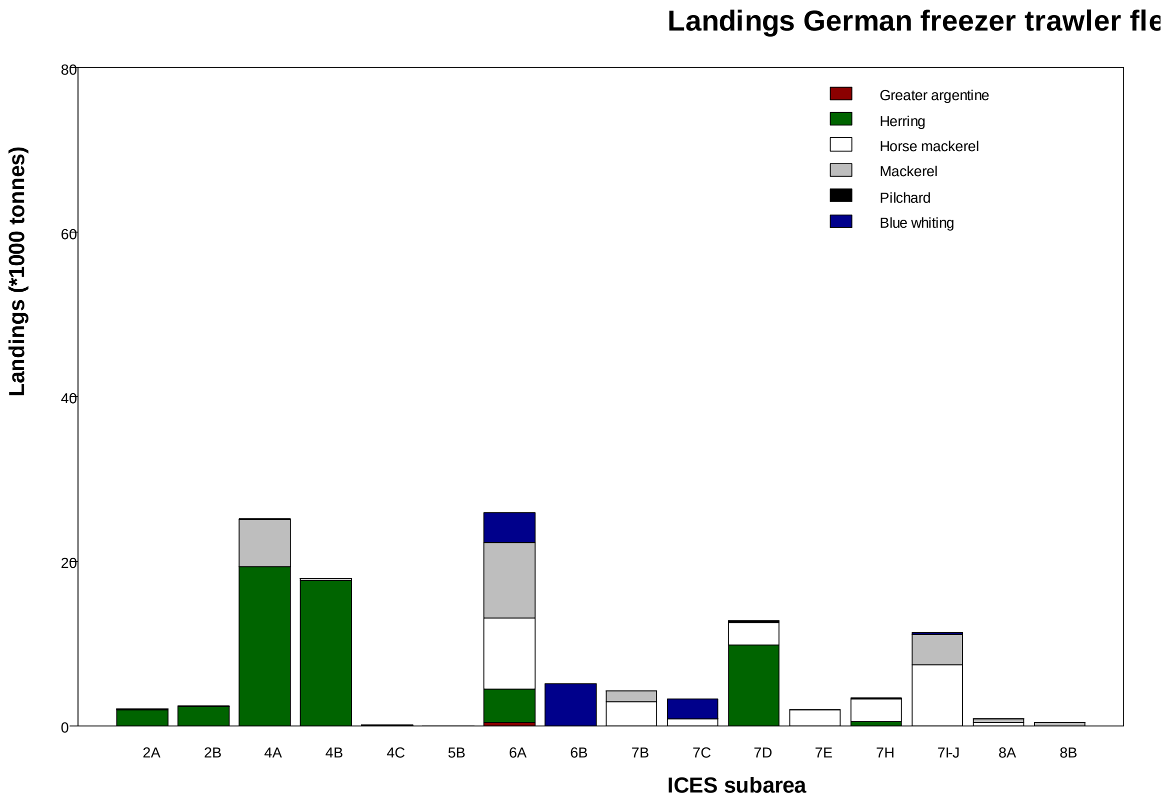


Figure 2c. Landings (*1000 tonnes) from the **German** freezer trawler fleet in **2013**. Upper panel monthly landings by species, lower panel shows landings per ICES subarea (Figure 1) by species. Data extracted from FISTAT database.

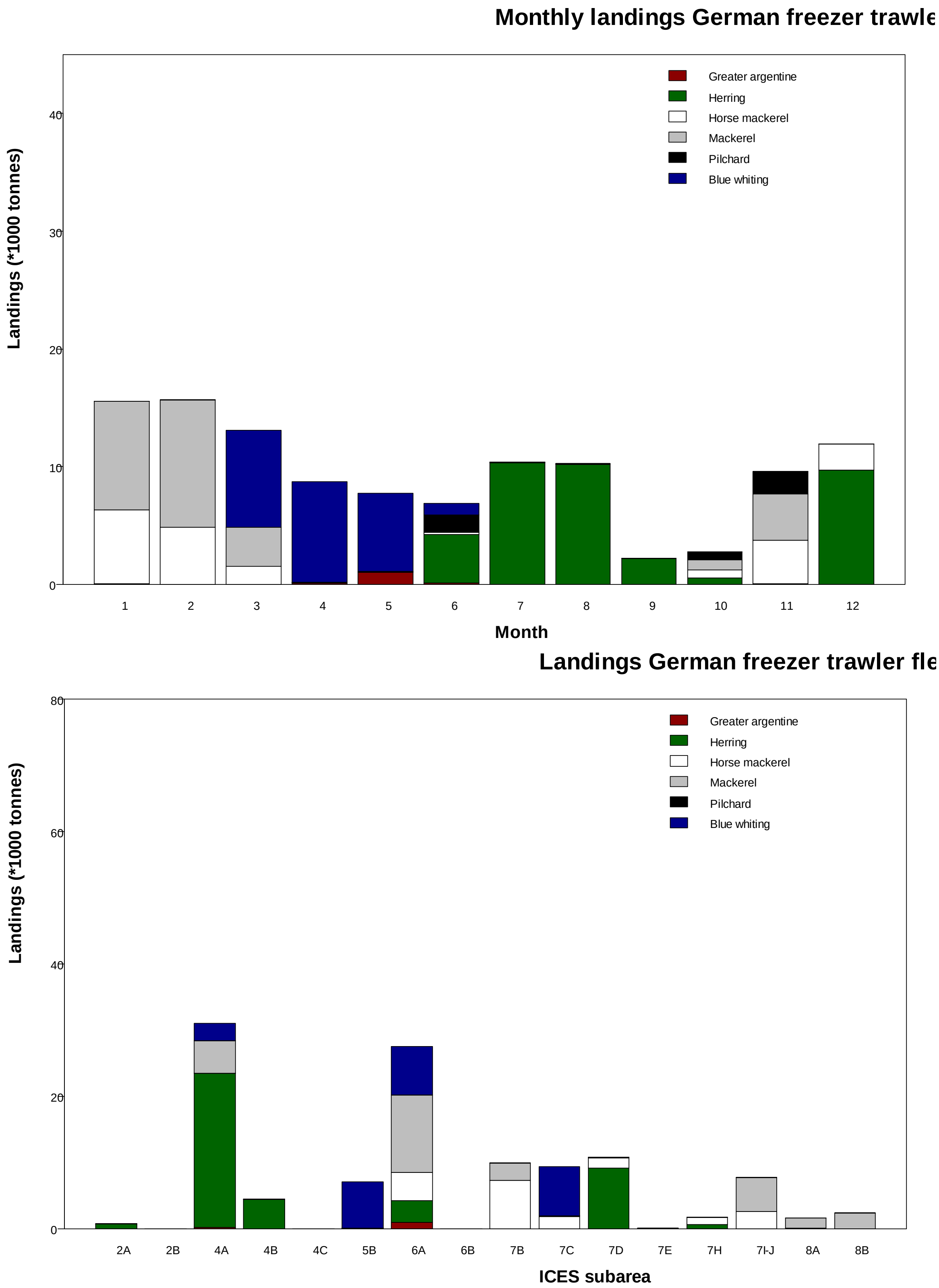


Figure 2d. Landings (*1000 tonnes) from the **German** freezer trawler fleet in **2014**. Upper panel monthly landings by species, lower panel shows landings per ICES subarea (Figure 1) by species. Data extracted from FISTAT database.

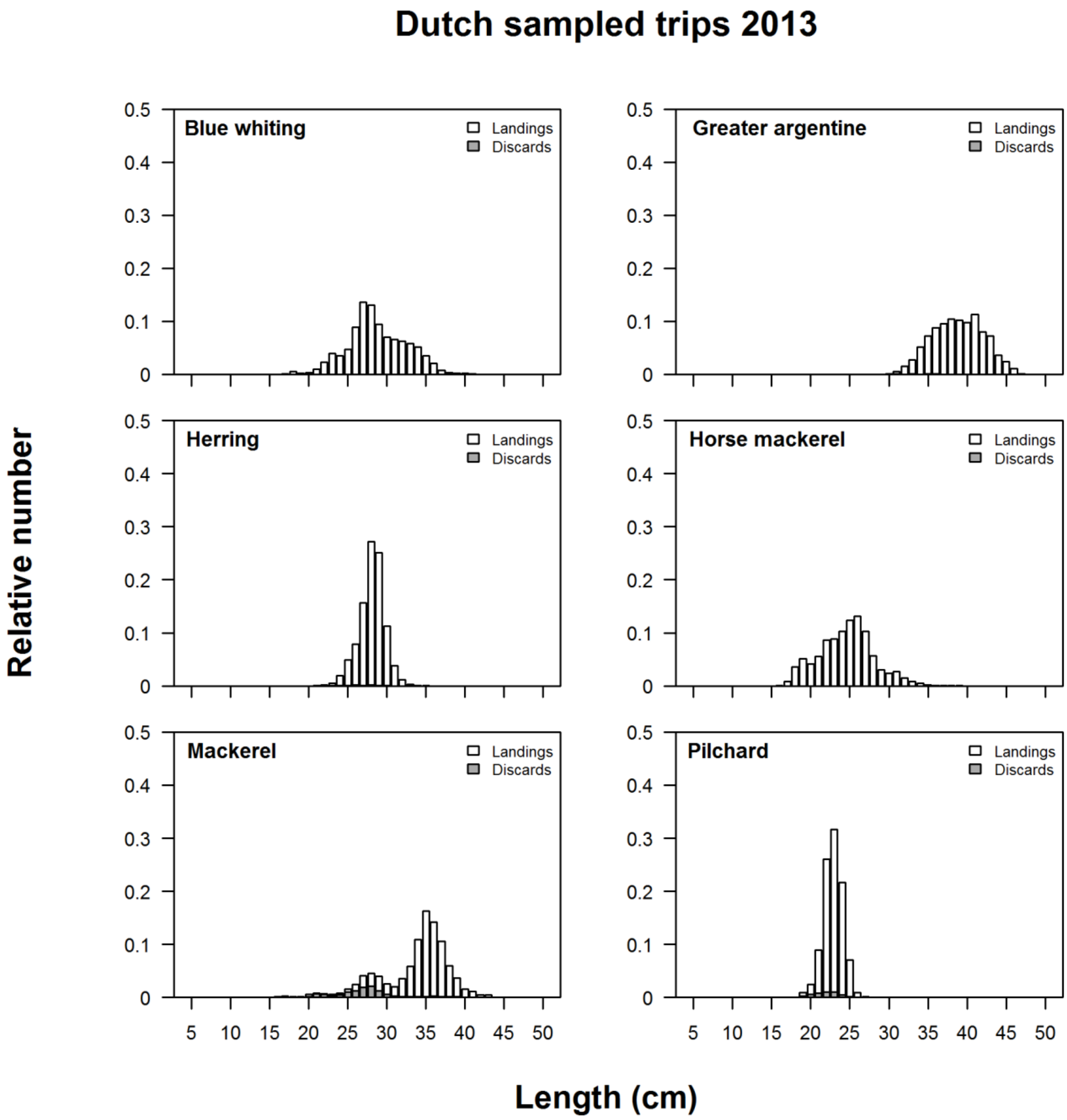


Figure 3a. Relative number of blue whiting (top left), greater argentine (top right), herring (middle left), horse mackerel (middle right), mackerel (bottom left) and pilchard (bottom right) landed and discarded against length (cm) during **Dutch** sampled trips in 2013.

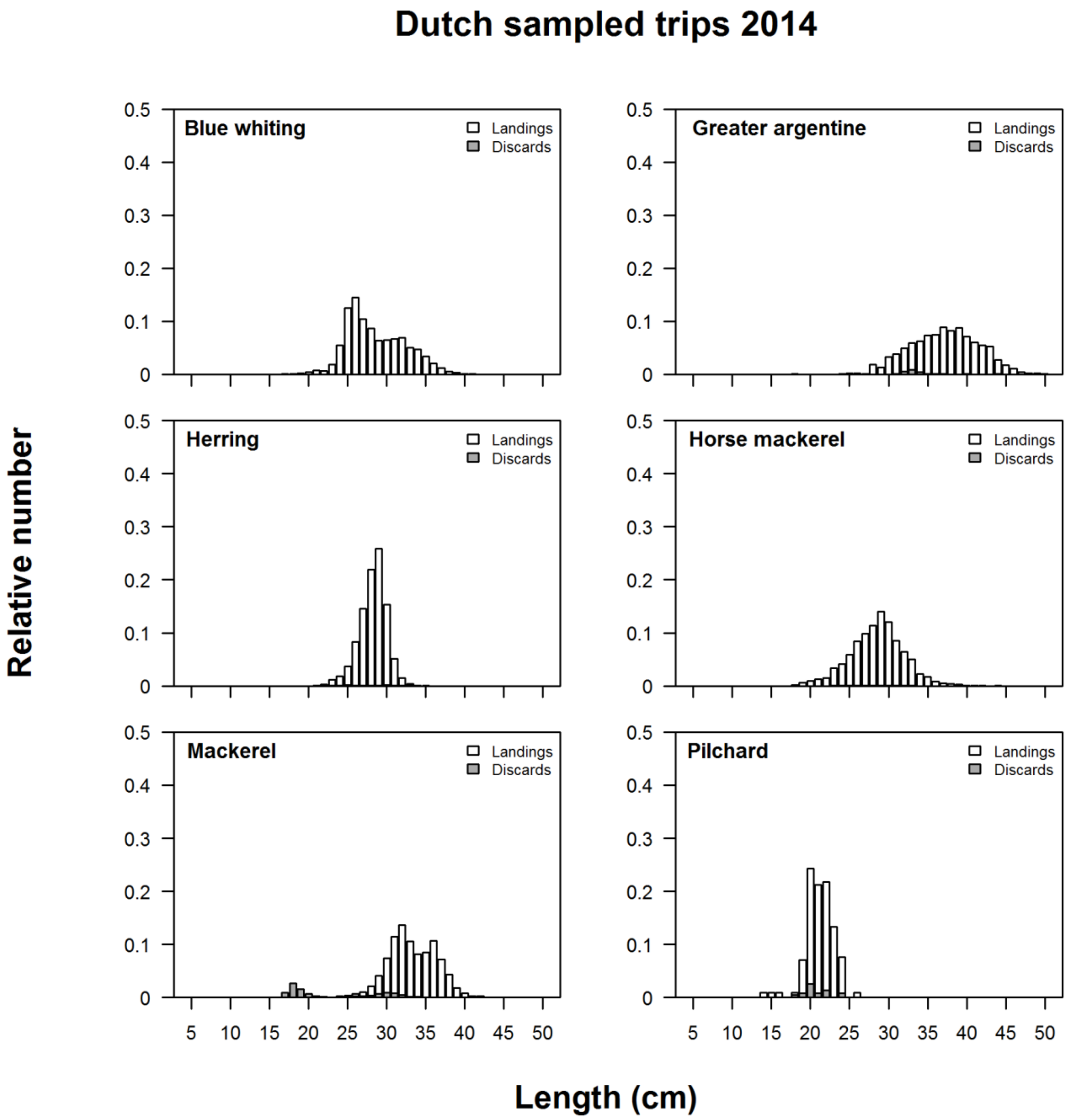


Figure 3b. Average number of blue whiting (top left), greater argentine (top right), herring (middle left), horse mackerel (middle right), mackerel (bottom left) and pilchard (bottom right) landed and discarded against length (cm) during **Dutch** sampled trips in 2014.

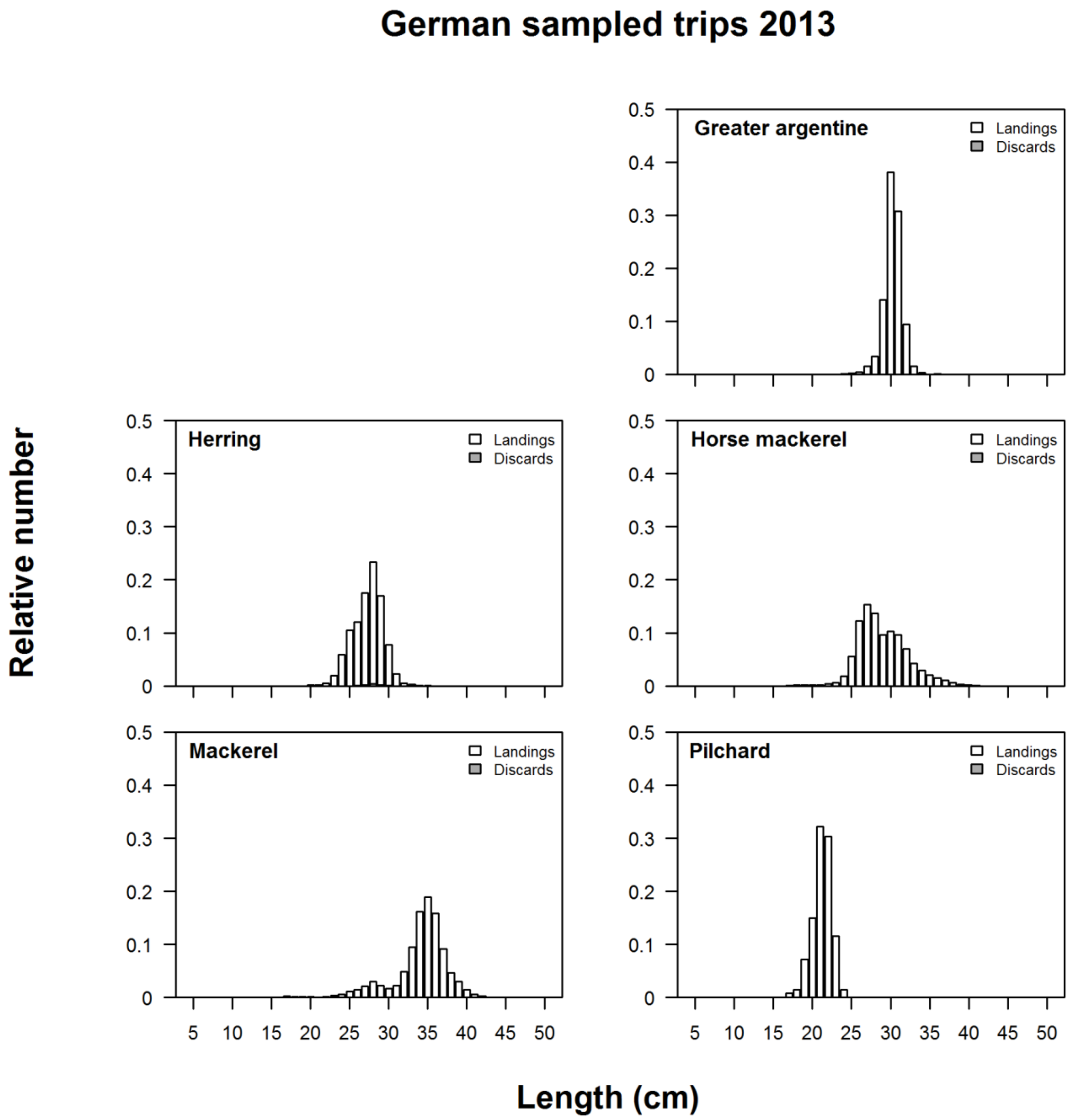


Figure 4a. Relative number of greater argentine (top right), mackerel (middle left), horse mackerel (middle right), herring (bottom left) and pilchard (bottom right) landed and discarded against length (cm) during **German** sampled trips in 2013.

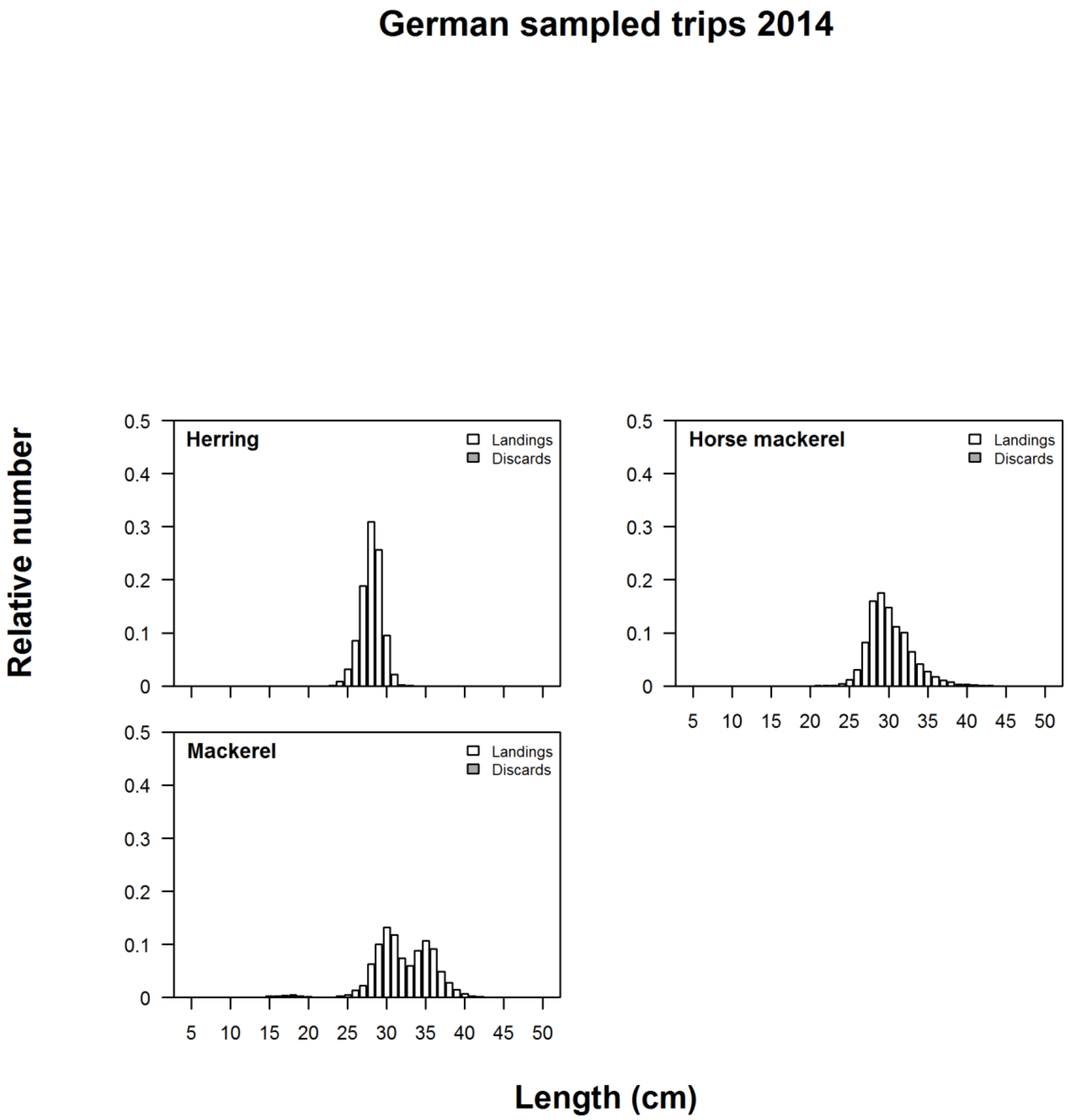


Figure 4b. Average number of herring (middle left), horse mackerel (middle right) and mackerel (bottom left) landed and discarded against length (cm) during **German** sampled trips in 2014.

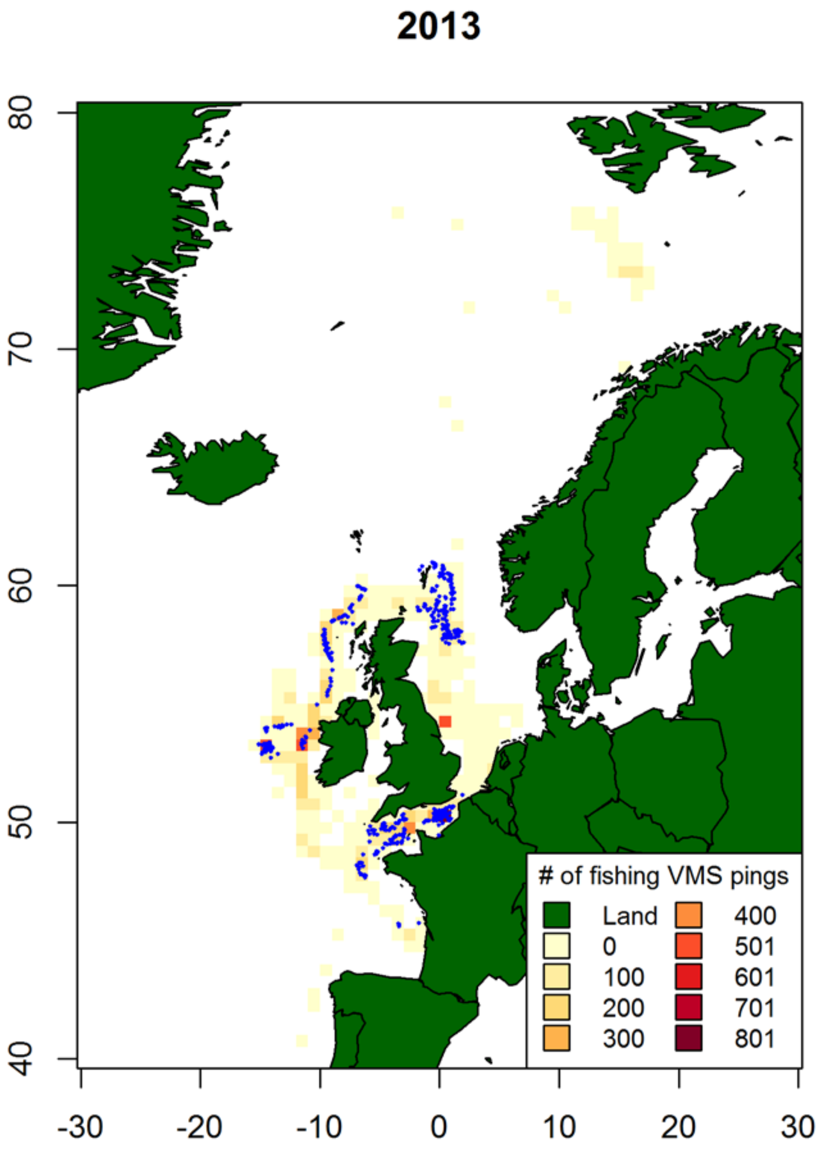


Figure 5a. Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trip per haul in **2013** (blue points).

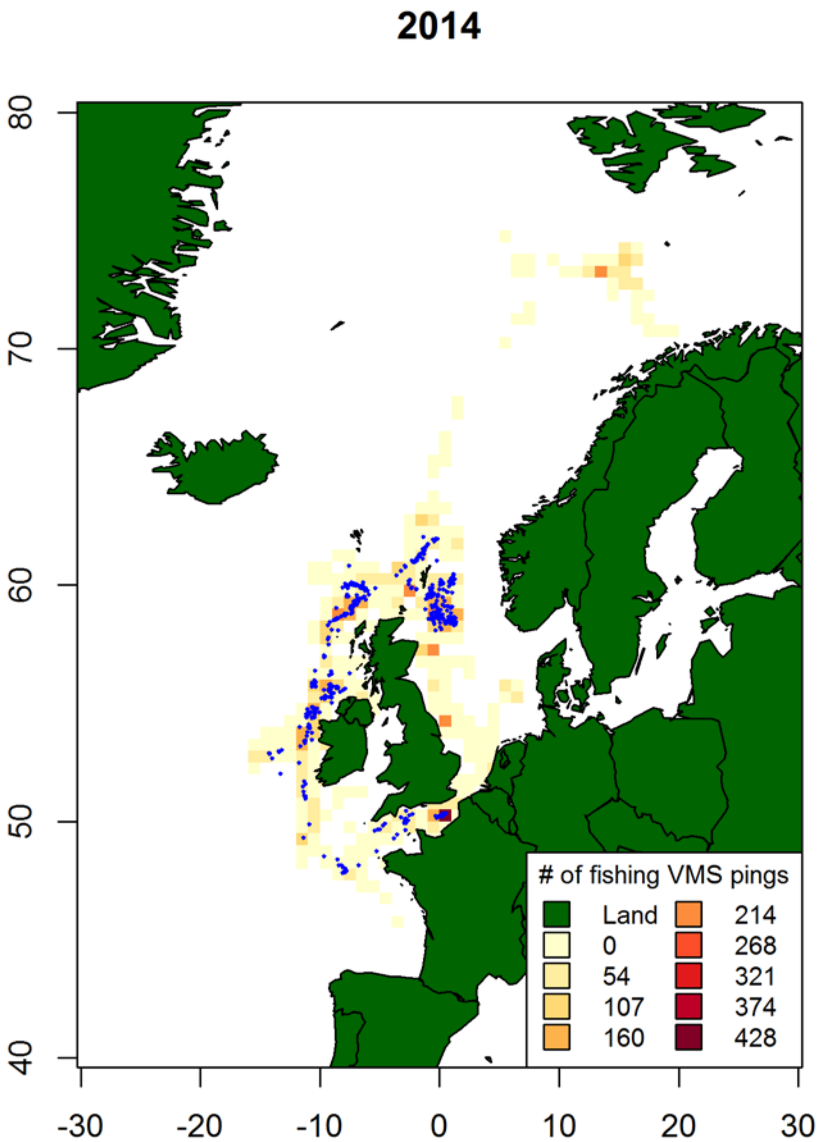


Figure 5b. Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trip per haul in **2014** (blue points).

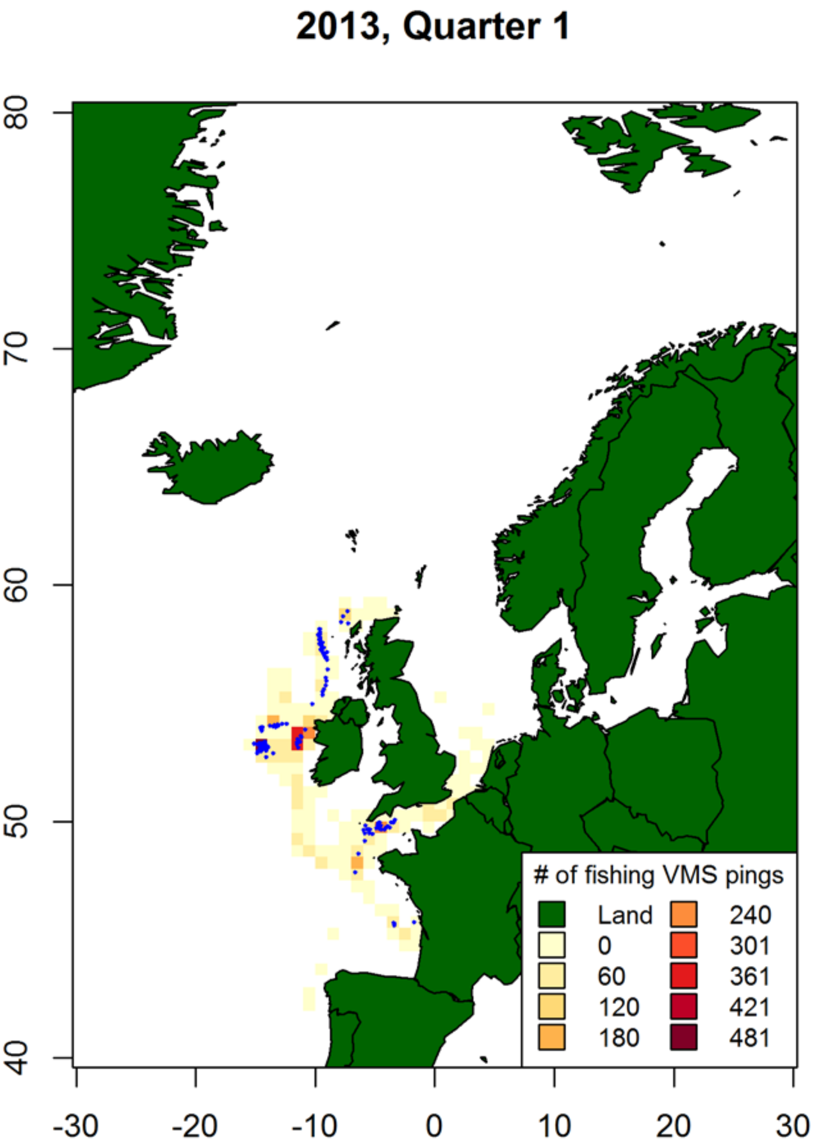


Figure 6a. Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trip per haul in **quarter 1, 2013** (blue points).

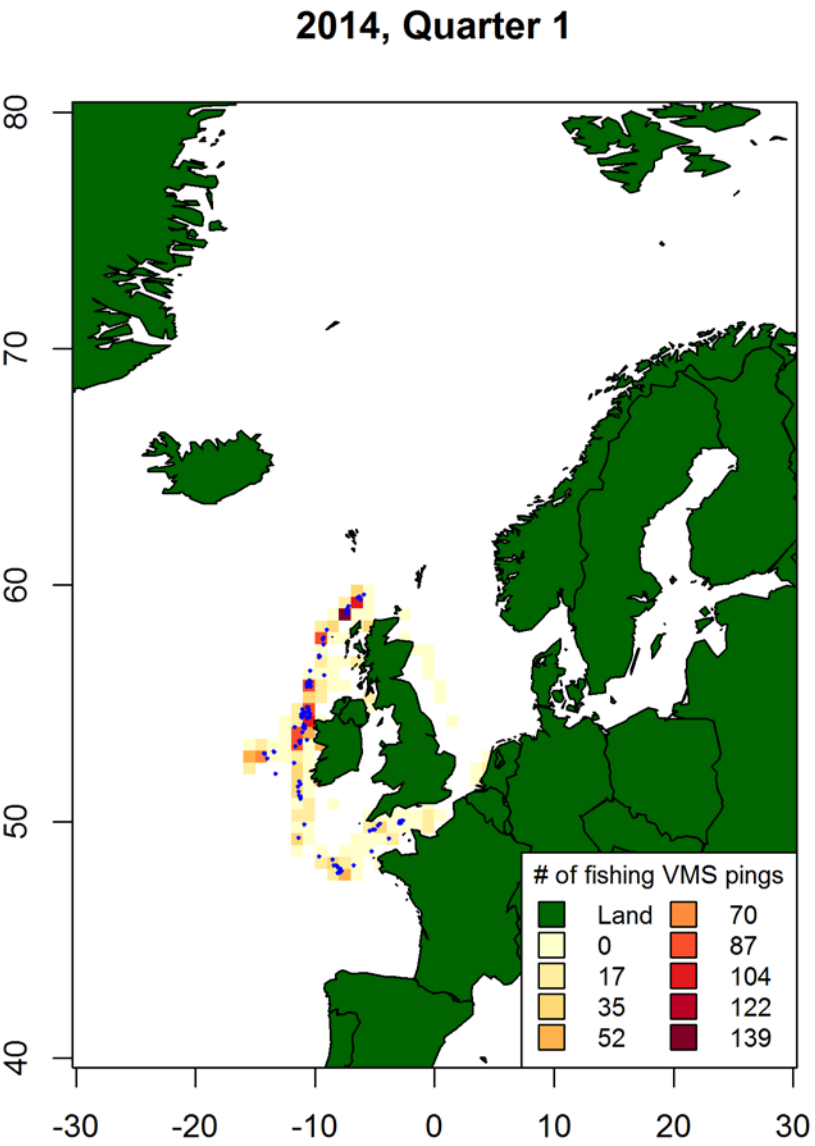


Figure 6b. Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trip per haul in **quarter 1, 2014** (blue points).

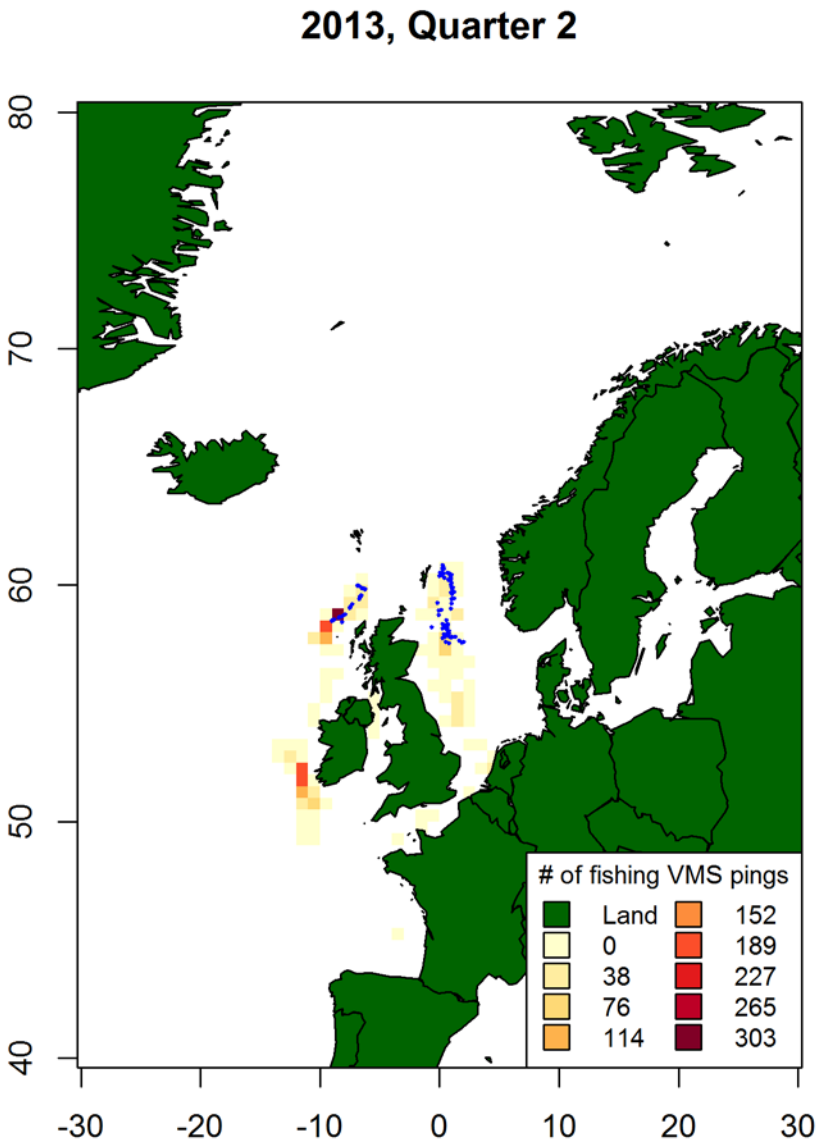


Figure 7a. Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trip per haul in **quarter 2, 2013** (blue points).

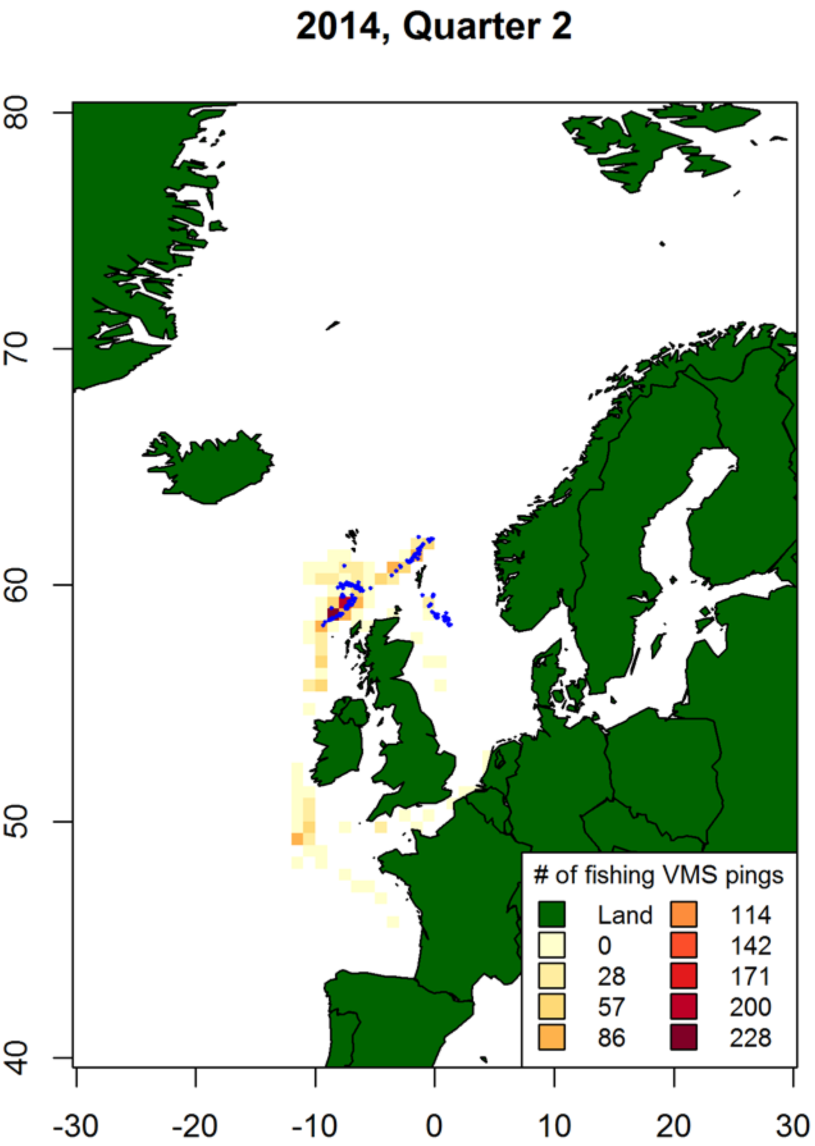


Figure 7b. Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trip per haul in **quarter 2, 2014** (blue points).

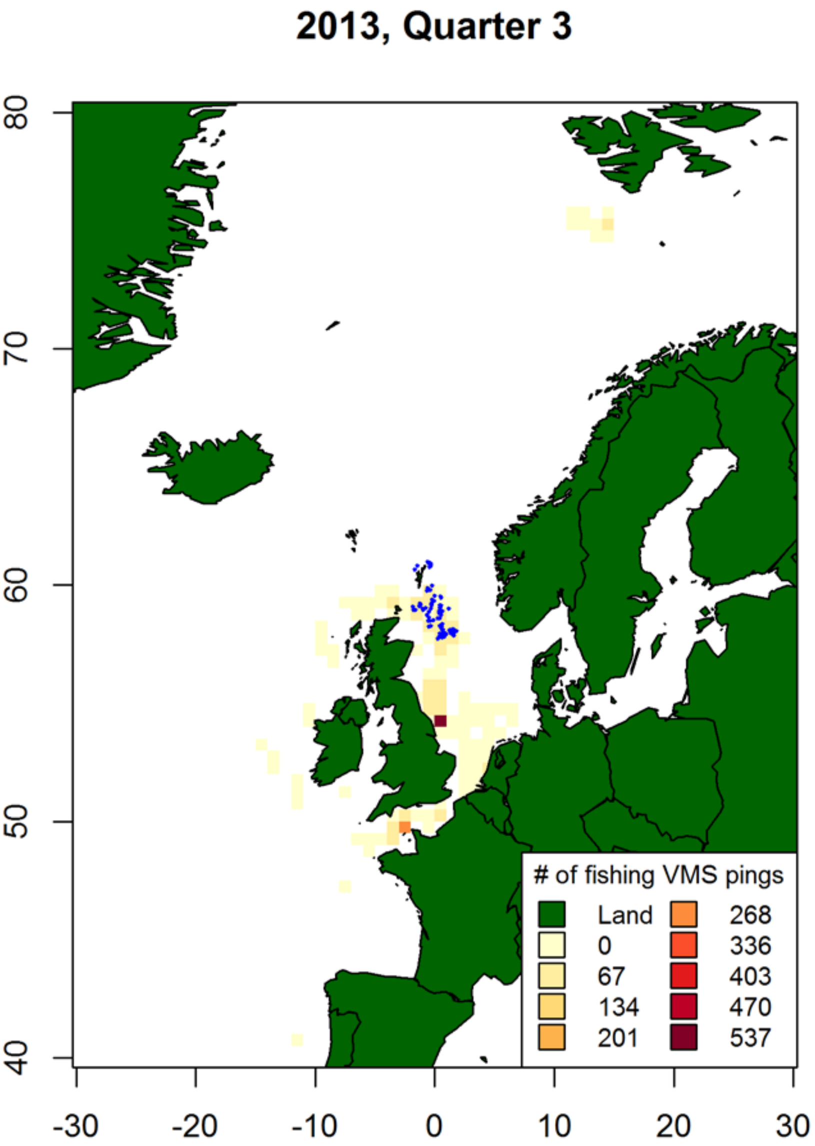


Figure 8a. Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trip per haul in **quarter 3, 2013** (blue points).

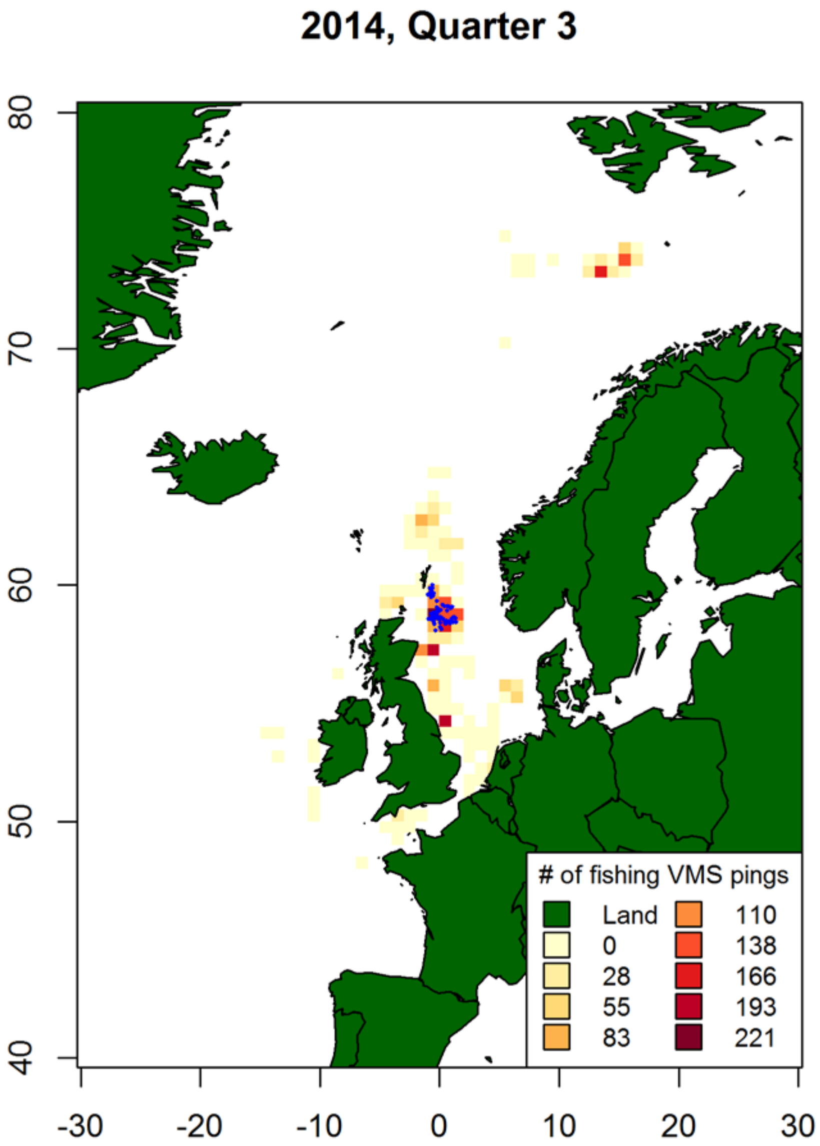


Figure 8b. Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trip per haul in **quarter 3, 2014** (blue points).

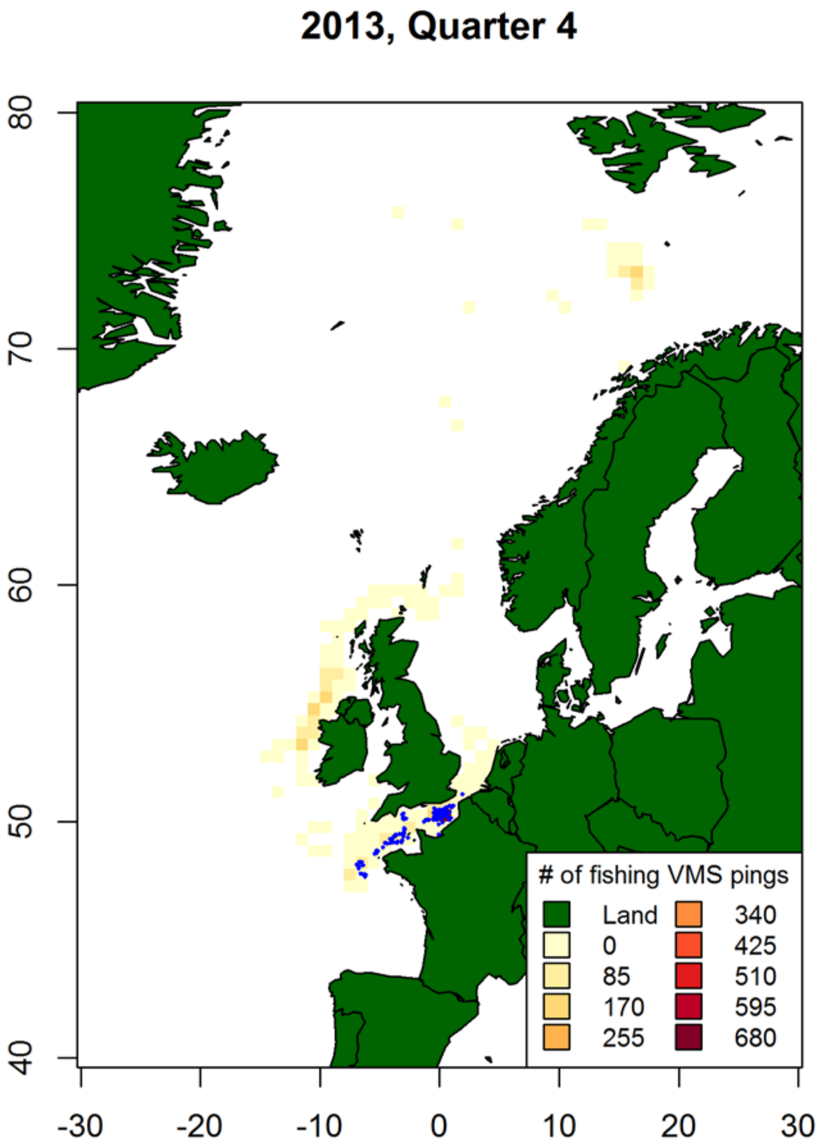


Figure 9a. Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trip per haul in **quarter 4, 2013** (blue points).

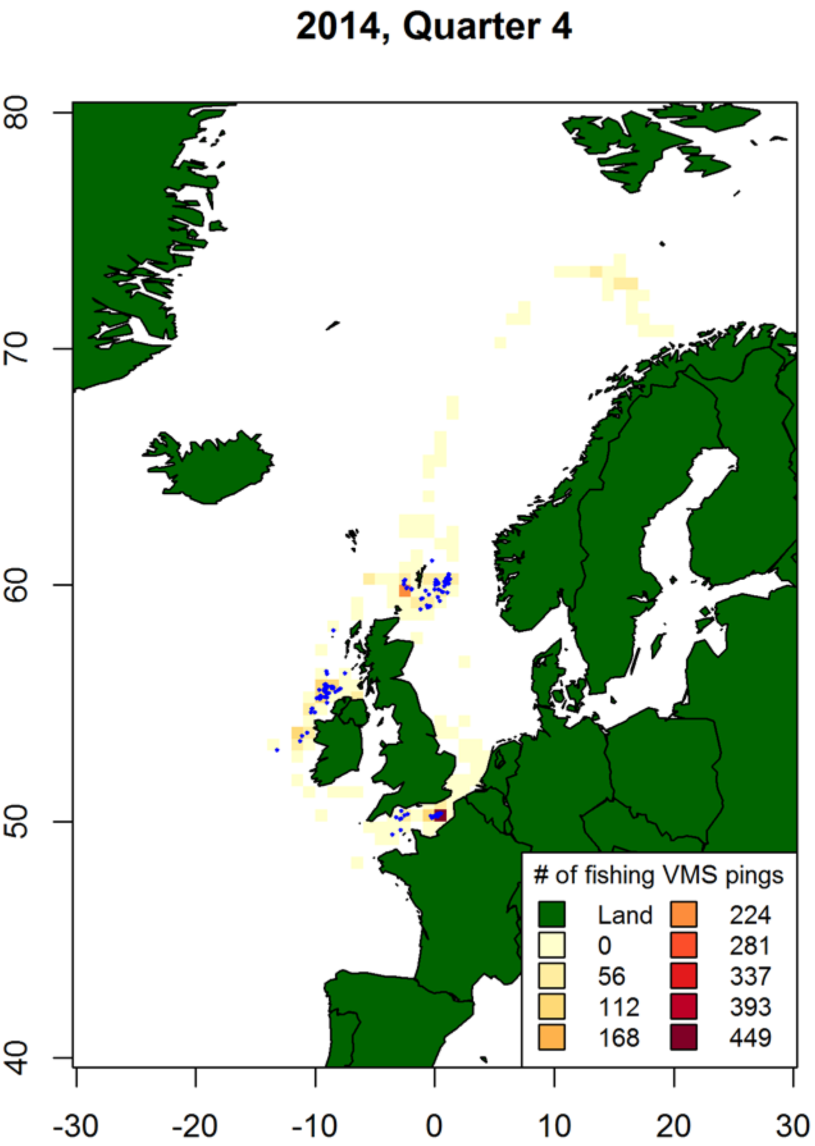


Figure 9b. Distribution of the **Dutch** pelagic fleet (based on VMS data) and positions of the sampled pelagic discard trip per haul in **quarter 4, 2014** (blue points).