



Stichting DLO Centre for Fishery Research (CVO)

Discard sampling of the Dutch pelagic freezer fishery in 2010

Drs. H.M.J. van Overzee & Ir. A.T.M. van Helmond

CVO report: 11.010

Commissioned by:

Ministerie van EL&I
Directie AKV
Postbus 20401
2500 EK Den Haag
Drs. C.J.M. Verbogt

Project number:

4301213012

BAS code:

WOT-05-406-130-IMARES-1

Publication date:

20 december 2011

Stichting DLO
Centre for Fisheries Research (CVO)
P.O. Box 68
1970 AB IJmuiden
Phone. +31 (0)317-487418
Fax. +31 (0)317-487326

Visitor address:
Haringkade 1
1976 CP IJmuiden

© 2011 CVO

De Stichting DLO- Centre for Fisheries Research is registered in the Chamber of commerce in Gelderland nr. 09098104, VAT nr. NL 8089.32.184.B01

This report was prepared at the request of the client above and is his property. No part of this report may appear and / or published, photocopied or otherwise used without the written consent of the client.

CVO rapport UK V4.1

Table of Contents

Table of Contents.....	3
Summary	4
Samenvatting.....	5
1 Introduction.....	6
2 Methods	7
2.1 Landings fleet.....	7
2.2 Sampling procedures.....	7
2.3 Raising procedures.....	8
2.3.1 Total weight per species.....	8
2.3.2 Total length per species	9
2.3.3 Unsampling discards.....	10
2.3.4 Not sampled hauls	10
2.3.5 Raising the sampled trips to fleet level.....	10
3 Results.....	11
3.1 Landings fleet.....	11
3.2 Estimated discards from sampled trips.....	11
3.2.1 Sampled trips	11
3.2.2 Discards.....	11
4 Discussion	13
4.1 Long term trends	13
4.2 Annual landings	13
4.3 Discards	13
4.4 Sampling coverage.....	14
Acknowledgements	15
5 References.....	16
Signature.....	17
Appendix 1: Tables and Figures.....	18

Summary

This report contains the results of the discard sampling programme of the Dutch pelagic freezer trawler fleet in European waters in 2010. 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 illustrates its seasonality; different species are targeted during different parts of the year. The total landings of the Dutch fleet were about 201,000 tonnes in 2010. Horse mackerel and herring were the most abundant landed species.

Overall, the discard percentage for the Dutch pelagic fleet in 2010, based on 8 sampled trips, is estimated at 6% in weight. This is consistent with the discard percentages that have been found in previous years. However, in 2010 we did not succeed in sampling the fishery each quarter of the year; no trip was sampled in quarter 3.

On board of the pelagic freezer trawlers two different discarding methods are observed, namely discarding after the catch is sorted and discarding prior to sorting. The latter includes catch that is discarded directly or via the conveyer belt from the cooling tanks, and catch that is slipped from the net. Due to practical limitations and safety issues it is not possible to sample these discards. The results show that the estimated amount of unsampled discards represent 30% of the total estimated discards. Motivations for discarding unsampled catch can vary. Anecdotal information implies most incidents of discarding take place when more fish is caught than can be stored in the cooling tanks. In addition, fish-quality issues, unprofitable mixtures of species, or a lack in quota, could also be reasons for this discarding behaviour. The discard composition and length frequency data shown in this report are only based on routinely sorted discards.

Discard percentages of target species herring, horse mackerel, and blue whiting are relatively low (1%, 1%, and 4% respectively). For mackerel the discard percentage is significantly higher (18%). The present study therefore suggests that, with the exception of mackerel, this fishery is efficient, when it comes to targeting (marketable) fish.

Samenvatting

Jaarlijks worden aan boord van schepen van de Nederlandse pelagische visserij, die actief zijn in het noordoost Atlantische gebied, een aantal reizen door onderzoeksassistenten gemaakt. 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 pelagische visserij in 2010.

De Nederlandse pelagische vriestrawlervloot vist op een aantal pelagische doelsoorten, namelijk haring (*Clupea harengus*), horsmakreel (*Trachurus trachurus*), makreel (*Scomber scombrus*), blauwe wijting (*Micromesistius poutassou*), grote zilversmelt (*Argentina sila*) en pelsers (*Sardina pilchardus*). In 2010 is in totaal 201,000 ton vis 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 gevestigd en wordt tijdens de tweede helft van het jaar op haring gevestigd.

In 2010 was de naar de vloot opgewerkte discard percentage, gebaseerd op 8 reizen, 6% in gewicht. Dit komt overeen met het discard percentage van afgelopen jaren.

Naast de discards die door de bemanning uit de vangst gesorteerd worden, komt het ook incidenteel voor dat een gedeelte of de gehele vangst gediscard wordt direct of via de sorteerband uit de tank, of uit het net. Het is niet mogelijk om zulke discards te bemonsteren. In dit rapport worden deze discards omschreven als "niet-bemonsterde discards". De resultaten laten zien dat een groot deel van de discards uit niet-bemonsterde discards bestaat (30%). Er kunnen verschillende redenen zijn om op deze manier te discarden. Anekdotische informatie doet vermoeden dat de meeste incidenten plaats vinden wanneer er meer vis gevangen wordt dan bewaard kan worden in de koeltanks. Daarnaast zouden minder lucratieve vangsten, een hoog percentage laagwaardige of niet-commerciële vis, of een tekort in quota mogelijke redenen kunnen zijn voor deze manier van discarden. Alle informatie die in dit rapport gegeven wordt over soortensamenstelling en lengte frequentie is gebaseerd op de discardgegevens die verkregen zijn tijdens het normale sorteringsproces.

Discard percentages voor de doelsoorten haring, horsmakreel, en blauwe wijting zijn relatief laag (respectievelijk 1%, 1%, en 4%). Het discard percentage van makreel ligt significant hoger dan bij de andere soorten (18%). Resultaten uit dit rapport laten zien dat, met uitzondering van makreel, de pelagische vriestrawlervisserij een hoge mate van efficiëntie vertoont als het aankomt op het vangen van commerciële doelsoorten.

This research is performed within Wettelijke onderzoekstaken (WOT).

1 Introduction

From 2002 onwards discard data of pelagic freezer trawlers are monitored by IMARES under the EC Data Collection Regulations 1543/2000 and 1639/2001 and Commission Decision 949/2008 (EC, 2000; 2001; Anon., 2002; ICES, 2003) and revisions (2008/949/EG). This report gives an overview of the Dutch pelagic discard sampling programme in European waters for 2010.

The Dutch fleet of 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 Dutch 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 onboard, 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. 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 (depending on the 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 discarded directly or via the conveyer belt from the cooling tanks, and catch that is slipped 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 such discards are therefore 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, using hydraulic pressure. 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 dumped into 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

2.1 Landings fleet

Information on landings and fishing effort by the Dutch pelagic freezer fleet in 2010 was derived from VISSTAT (Visserij Statistieken).

2.2 Sampling procedures

Biological sampling of catch and discards is carried out on board the vessels through an observer programme. Vessels are selected in cooperation with the pelagic fishery companies, and is considered random. 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 (Box 2) (Van Beek, 2001). 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. 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 (Box 3). 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 ($DW_h = \text{proportion} * CW_h$). Furthermore, for each sampled haul a sub-sample of the catch and discards is taken and weighted. The weight of each species in the samples is recorded 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 later transferred into the central database.

Box 2: Sampling protocol for a haul onboard a pelagic trawler

- 1) Estimation and registration of total catch (CW_h).
- 2) Estimation of discard percentage (Box 3).
- 3) Take a sample of the unsorted catch (CW_h):
 - a. Take a sample of the unsorted catch (total sample size: 20-25 kg). This sample includes landings and discards. In order to get a representative sample, sub-samples are taken repeatedly at different moments whilst sorting the haul.
- 4) Take a sample of the discards (DW_h):
 - b. Take a sample of the discards (total sample size: 20-25 kg). In order to get a representative sub-sample, different sub-samples are taken repeatedly at different moments whilst processing the haul.
- 5) Measuring the unsorted catch sample:
 - c. Sort all the fish species and take length ($Cn_{l,h,s}$) and weight ($CW_{h,s}$) measurements for each species. Register the total number by species and length class.
- 6) Measuring the discard sample:
 - d. Sort all the fish species and take length ($Dn_{l,h,s}$) and weight ($DW_{h,s}$) measurements for each species. Register the total number by species and length class.
- 7) Age estimations of the unsorted catch:
 - e. Take a sample of the unsorted catch
 - f. Otoliths from this sample are prepared and analysed.
 - g. The sample of age analysis consists of 'sized' and 'undersized' fish. A sample consists of minimal three individuals per length class per area (ICES quadrant).
- 8) Registration of total landings:
 - h. Information on total landings is collected at the end of the trip.

Box 3: Protocol of estimating the discard percentage

- 1) Take a weight sample of discards from the gutter over a certain length of time.
- 2) Take a weight sample of catch from the conveyer belt over the same length of time as the discard sample.
- 3) Calculate the discard percentage from the proportion between the two samples.

Example:

The sample is taken over a time period of 30 seconds. This results in:

- A weight sample of the discards of 2 kg
- A weight sample of the catch of 26 kg

The percentage discards is calculated by taking the ration between the discard sample and the catch sample:

- Percentage discards = $(2\text{kg} / 26\text{kg}) * 100 \approx 8\%$

2.3 Raising procedures**2.3.1 Total weight per species**

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

$$CW_{h,s} = CW_h * (CW_{h,s} / CW_h)$$

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

$$DW_{h,s} = DW_h * (DW_{h,s} / DW_h)$$

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:

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

2.3.2 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 estimated total catch weight (CW_h) and the ratio of weight of the catch sample (CW_h) to the weight of the species in the catch sample ($CW_{h,s}$):

$$CN_{l,h,s} = Cn_{l,h,s} * CW_h * (CW_{h,s} / CW_h)$$

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:

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

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 discards sample ($Dn_{l,h,s}$) by the estimated total weight of the discards (DW_h) and the ratio of weight of the discards sample (DW_h) to the weight of the species in the discards sample ($DW_{h,s}$):

$$DN_{l,h,s} = Dn_{l,h,s} * DW_h * (DW_{h,s} / DW_h)$$

The 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:

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

The 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 hauls

During the sampled trips it sporadically happened that the observer only estimated 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, 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. 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):

$$(d_{wt})_q = (\sum DW_{t,s} / N_s)_q$$

The average discards (per quarter) has consequently been raised to fleet level (per quarter) by multiplying the sampled average (d_{wt}) with the total number of trips of the entire fleet (N_f) per quarter (q):

$$D_{wfq} = (N_f)_q * (d_{wt})_q$$

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

$$D_{wf} = \sum D_{wfq}$$

3 Results

3.1 Landings fleet

Target species of the Dutch freezer trawler fleet fishing in European waters differ by season and area. The total landings of this fleet were about 201,000 tonnes. Horse mackerel and herring were the most abundant landed species (Table 1, Figure 2). Horse mackerel was caught throughout the year in a number of different areas. The blue whiting and herring fishery are identified as seasonal fisheries: blue whiting was targeted during the first half of 2010, and herring was targeted during the second half of the year (Figures 2,3). Most blue whiting landings originated from areas VIa and VIIc and most herring landings originated from areas IVa, IIa and VIId (Figures 2,3). Horse mackerel and mackerel are caught throughout the year, except for in the summer, in a number of different areas.

3.2 Estimated discards from sampled trips

3.2.1 Sampled trips

In 2010, 8 trips were made on board of pelagic freezer trawlers from which 5 were on board Dutch flagged vessels, 1 trip on board a German flagged vessel and 2 trips on board British flagged vessels. Four different fishing grounds were sampled during the sampled trips, namely the Celtic Sea, North Sea, and the English Channel (Table 3, Figure 4). A total of 265 hauls were sampled, which was 89% of all the hauls during the trips. During 21 hauls (7% of all the hauls) unsampled discarding was observed (Table 2). Haul duration was on average 3.5 hours (Figure 5).

During one or several sampled trips horse mackerel, blue whiting, mackerel, herring and greater argentine was targeted and landed (Tables 3,4). The non-target species hake (*Merluccius merluccius*) was landed during trip P79. The species composition of catch, discards and landings are presented in Figures 6 (catch), 7 (discards) and 8 (landings).

The length frequency distributions of landed and discarded fish are presented in Figures 9-14 per trip and over all trips combined for herring, horse mackerel, mackerel, blue whiting, greater argentine and pilchard. Generally, the length frequency distributions show a regular bell-shaped pattern over the different trips.

3.2.2 Discards

The total catch, landings, discards, and discard percentage per species per trip and corresponding sampling period is reported in Table 4. In this table the total amount of "unsampled discards" observed during each trip and "not sampled hauls" are presented separately. The first variable (unsampled discards) has been taken into account in determining the total discard percentage per trip. Values have been raised to fleet level and are presented in Table 6.

Discards estimates

The raised discard data show a discard percentage of 1% for herring, horse mackerel and greater argentine. For blue whiting the discard percentage is estimated at 4%. Mackerel was by far the most dominant species in the discards during the sampled trips; discard percentage of 18% (Table 6). As pilchard was not targeted during any of the sampled trips, the raised discards estimate of <1% is highly uncertain. The discard "other species" mainly consisted of boarfish (*Capros aper*), hake and deal-fish (*Trachipterus arcticus*) (Table 5). Overall, including the unsampled discards, the discard percentage for the Dutch pelagic fleet in 2010 based on the sampled trips is estimated at 6% (Table 6).

Spatial distribution discards

The spatial and temporal distributions of the discards per species are presented in Figure 16. The distribution of herring discards coincides with the herring fishing grounds. This does not appear to be the case for the other species. No apparent pattern is visible in the spatial and temporal distribution of unsampled discarding (Figure 17).

4 Discussion

4.1 Long term trends

The species composition of the landings has gradually changed over the years (van Helmond & van Overzee, 2007). In the early part of the 1990s, the landings were dominated by horse mackerel whereas in the latter part of the 1990s an increase in blue whiting is observed. Herring has been a relatively constant part of the Dutch pelagic landings since 1990 (van Helmond & van Overzee, 2007).

The overall discard percentage for 2010, including unsampled discards, is estimated at 6% in weight. This is consistent with discard percentages found for the period 2004-2009 (6%-8%) (van Helmond & van Overzee 2008; 2010). However, it should be noted that the 2010 estimate is based on a smaller number of sampled trips (8 trips) than in previous years (on average 12 trips).

4.2 Annual landings

The annual landings of the Dutch pelagic fleet illustrate the seasonality in this fishery. Every year the target species change with season and area. This means that within one year a species can be targeted in one season and discarded in the next season. Herring and horse mackerel are the most abundant species in the landings. This corresponds with the relative large quota the Netherlands possess for these species (Table 7).

4.3 Discards

The discard data was raised, similar as in previous studies (van Helmond & van Overzee, 2008; 2010), by total number of trips per quarter. Raising was done quarterly so that the high seasonality of this fishery could be taken into account. Due to lack of space on board and availability of ships we did not succeed to sample the fishery each quarter; no trip was sampled in quarter 3. This quarter was therefore not included within the raising procedure. In other words, the calculated overall discard percentage for 2010 (6%) does not include quarter 3. The annual discard percentage of 2010 does not deviate from previous years (van Helmond & van Overzee, 2009; 2010). We therefore conclude that missing the third quarter did not have an effect on estimating the overall discard percentage. At the beginning of 2011 agreements with the pelagic industry have been made to ensure that in the future trips are monitored in all quarters.

At present the species composition of "unsampled discards" and "not sampled hauls" remains unclear and is therefore presented separately. The results show that the estimated amount of unsampled discards represent 30% of the total estimated discards (<2% of the total catch). The number of incidents of unsampled discarding differ between sampled trips. During trips P77 and P80 unsampled discarding was observed during >10% of the hauls, while during trip P78 it was not observed at all. Anecdotal information implies that most incidents of unsampled discarding take place when more fish is caught than can be stored in the cooling tanks. However, fish-quality issues, unprofitable mixtures of species, or a lack in quota, could also be reasons for this discarding behaviour.

Discard rates of target species, herring, horse mackerel and blue whiting are highly dependent on season, quota limits, market prices and fish size and quality. Fish prices vary per season and, therefore, the incentive to discard a particular species depends on season. When a species is targeted, discard rates appear to be marginal (<1%-7%). Outside a season, when a species is not targeted, discard rates are high (up to 100%). Overall, the total discard rate per species per year are low. However, it should be noted that discard rates do not give insight on the absolute amount of fish that is discarded. Based on these results it can be concluded that the Dutch pelagic freezer fishery can have a high efficiency, when

it comes to targeting (marketable) fish. However, the fishery on mackerel is an exception. For mackerel the discard rates are considerably higher than for the other target species. For 2010 the estimated discard rate for this species is 18%.

4.4 Sampling coverage

The Dutch pelagic discard sampling programme aims at sampling 12 trips per year. This corresponds with a sampling coverage of 10% of the pelagic freezer trawler fleet. In 2010 only 8 trips were sampled. This was caused by a combination of two different reasons. Firstly, a number of vessels were not fishing in European waters during a large part of 2010, resulting in a smaller pool of vessels that could be sampled in comparison to previous years. Secondly, we were denied several trips as there was no sleeping accommodation available at that time for the observer.

The pelagic freezer trawler fleet is dynamic through time and space. For example, herring is targeted during the second half of the year on the specific herring fishing grounds. In order to monitor annual discard percentages it is essential that our sampled trips follow the distribution of the fleet through time and space. In the near future we will investigate the possibilities of using VMS information to visualise whether this is indeed the case. Results of this study will be reported next year.

Acknowledgements

We would like to thank the fleet managers, skippers and crew of the sampled vessels for their co-operation within this project. We would also like to thank Thomas Pasterkamp, Hendrik Jan Westerink, Hanz Wiegerinck and Douwe Timmer for their hard work on board of the vessels.

5 References

Anon, 2000. Monitoring discarding and retention on fishing vessels towing demersal gears in the North Sea and Skagerrak. EC Project: 98/097: 143 p.

Beek, F.A. van, 2001. Offerte voor het verzamelen en beheren van gegevens die essentieel zijn voor het gemeenschappelijk visserij beleid. RIVO offerte 01.063: 38 p.

Couperus, A.S., W. Patberg, O.A. van Keeken, and M.A. Pastoors, 2004. Discard sampling of the Dutch pelagic freezer fishery in 2002. CVO Report. Report number 04.0333: 35 p.

EC, 2000. Council Regulation (EC) No. 1543/2000 of 29 June 2000 establishing a Community framework for the collection and management of the data needed to conduct the common fisheries policy. Council Regulation (EC). No. 1543/2000.

EC, 2001. Council Regulation (EC) No. 1639/2001 of 25 July 2001 establishing the minimum and extended Community programmes for the collection of data in the fisheries sector laying down detailed rules for the application of Council Regulation (EC) No. 1543/2000. Council Regulation (EC). No. 1639/2001.

Helmond, A.T.M., and H.M.J. van Overzee, 2007. Discard sampling of the Dutch pelagic freezer fishery in 2006. CVO Report. Report number 07.010: 40 p.

Helmond, A.T.M., and H.M.J. van Overzee, 2008. Discard sampling of the Dutch pelagic freezer fishery in 2003-2007. CVO Report. Report number 09.001: 60 p.

Helmond, A.T.M., and H.M.J. van Overzee, 2010. Discard sampling of the Dutch pelagic freezer fishery in 2008 and 2009. CVO Report. Report number 10.008: 63 p.

ICES, 2003. Report of the planning group on commercial catch, discards, and biological sampling, Rome, Italy, 4-7 March 2003. ICES Conference Meeting Document. ICES CM 2003/ACFM: 16.

Signature

CVO Report: 11.010

Project number: 4301213012

Approved by: Drs. F.A. van Beek
 Head WOT, Centre for Fisheries Research

Signature:

Date: 20 december 2011

Appendix 1: Tables and Figures

Table 1. Landings (tonnes) per year, species and ICES area by the Dutch freezer trawler fleet in 2010. Data extracted from the VISSTAT database. For areas see Figure 1.

Year	Species	IIa	IIb	IVa	IVb	IVc	Vb	VIa	VIIa	VIIb	VIIc	VIIId	VIIe	VIIg	VIIh	VIIIb	VIIj	VIIk	?	Total
2010	Greater argentine	0	0	0	0	0	0	2901	0	0	0	0	0	0	0	4	0	0	0	2905
	Herring	24474	2221	13593	830	318	0	3600	0	0	0	7863	406	180	145	387	0	0	0	54017
	Horse mackerel	0	0	339	250	494	0	1685	151	5786	21548	15978	8299	0	7477	98	14904	1150	109	78268
	Mackerel	55	35	997	0	0	0	7998	0	4080	906	68	0	0	13	618	7900	43	2190	24903
	Pilchard	0	0	0	0	0	0	0	0	0	0	6162	472	0	10	0	0	0	681	7325
	Blue whiting	16	0	0	0	0	647	15286	0	413	16727	0	0	0	0	0	823	126	0	34038

Table 2. Overview of sampled trips

Year	Trip	Number of hauls	Number of hauls sampled	% of hauls sampled	Number of hauls with unsampled discards	% of hauls with unsampled discards
2010	P75	31	23	74%	1	4%
	P76	40	38	95%	2	5%
	P77	47	45	96%	7	15%
	P78	35	30	86%	0	0%
	P79	43	40	93%	1	2%
	P80	51	43	84%	6	12%
	P81	25	22	88%	2	8%
	P82	27	24	89%	2	7%

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

Year	Trip	Period	Target species*	ICES areas
2010	P75	02/01 – 22/01	Horse mackerel, mackerel, herring	VIa, VIIb, VIId, VIIj
	P76	19/01 – 13/02	Horse mackerel, mackerel, blue whiting	VIa, VIIb, VIIc, VIIh, VIIj, VIIk
	P77	27/01 – 21/02	Blue whiting, horse mackerel	VIa, VIIb, VIIc, VIIk
	P78	15/03 – 07/04	Blue whiting, greater argentine	VIa
	P79	29/03 – 21/04	Blue whiting, horse mackerel	VIa, VIIc, VIIj, VIIk
	P80	21/06 – 09/07	Herring	IVa, IVb
	P81	04/11 – 22/11	Mackerel	IVa, VIa
	P82	30/11 – 22/12	Horse mackerel, herring	VIa, VIIb, VIIc, VIId, VIIe

*) These species are described as target species in the observer journals, based on information prior to the trip. This not necessarily means 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 2010

Trip	Month	Quarter		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others	Unsampled discards	Total	Not sampled hauls	
P75	1	1	Catch	0		220.3	410.7	671.1		3.4	6	1311.5	62	
			Landings	0		220.0	409.7	665.0		0.0			1294.7	
			Discards	0		0.3	1.0	6.1		3.4		6	16.8	
			% Discards			<1%	<1%	1%		100%		100%	1%	
P76	1,2	1	Catch	1046.5	0		881.5	1583.7		13.6	38	3563.3		
			Landings	1035.5	0		872.1	1499.0		0.0			3406.6	
			Discards	11.0	0		9.4	84.7		13.6		38	156.7	
			% Discards	1%			1%	5%		100%		100%	4%	
P77	1,2	1	Catch	3375.0			1085.5	1.5		10.6	139.5	4612.1	46	
			Landings	3271.4			1058.6	0.0		0.0			4330.0	
			Discards	103.6			26.9	1.5		10.6		139.5	282.1	
			% Discards	3%			2%	100%		100%		100%	6%	
P78	3,4	1	Catch	3433.0			7.0	44.4				3484.4	37	
			Landings	3409.2			0.0	27.3					3436.5	
			Discards	23.8			7.0	17.1					47.9	
			% Discards	1%			100%	39%					1%	
P79	3,4	2	Catch	827.2	31.2		820.7	50.5		131.4	2	1863.0		
			Landings	766.3	28.7		807.7	0.0		93.6			1696.3	
			Discards	60.9	2.5		13.0	50.5		37.8		2	166.7	
			% Discards	7%	8%		2%	100%		29%		100%	9%	
P80	6,7	2	Catch			1717.8		81.9		1.0	63.7	1864.4		
			Landings			1696.4		17.2		0.0			1713.6	
			Discards			21.4		64.7		1.0		63.7	150.8	
			% Discards			1%		80%		100%		100%	8%	
P81	11	4	Catch					2984.5			105	3089.5		
			Landings					2984.5					2984.5	
			Discards					0.0				105	105	
			% Discards					0%				100%	3%	
P82	11,12	4	Catch	0.3		1040.1	606.0	242.8	0.2	23.6	30	1943.0		
			Landings	0.0		1004.9	598.6	0.0	0.0	0.0			1603.5	
			Discards	0.3		35.2	7.4	242.8	0.2	23.6		30	339.5	
			% Discards	100%		3%	1%	100%	100%	100%		100%	17%	

Table 5. Average amount of discards (tonnes) over sampled pelagic discard trips in 2010

Name	Scientific name	Discards (tonnes)
Blue whiting	<i>Micromesistius poutassou</i>	25.0
Greater argentine	<i>Argentine silus</i>	0.3
Herring	<i>Clupea harengus</i>	7.1
Horse mackerel	<i>Trachurus trachurus</i>	6.9
Mackerel	<i>Scomber scombrus</i>	58.4
Pilchard	<i>Sardina pilchardus</i>	<0.1
Anglerfish	<i>Lophius piscatorius</i>	0.2
Blackfish	<i>Centrolophus niger</i>	0.1
Blue-mouth	<i>Helicolenus dactylopterus</i>	<0.1
Boarfish	<i>Capros aper</i>	5.8
Deal-fish	<i>Trachipterus arcticus</i>	0.7
Grey gurnard	<i>Eutrigla gurnardus</i>	0.1
Haddock	<i>Melanogrammus aeglefinus</i>	0.1
Hake	<i>Merluccius merluccius</i>	3.5
Loligo	<i>Loligo sp.</i>	0.1
Longtooth anglemouth	<i>Gonostoma elongatum</i>	<0.1
Norway pout	<i>Trisopterus esmarkii</i>	0.1
Ray's bream	<i>Brama brama</i>	0.2
Saithe	<i>Pollachius virens</i>	0.1
Striped red mullet	<i>Mullus surmuletus</i>	<0.1
Tub gurnard	<i>Trigla lucerna</i>	<0.1
Tusk	<i>Brosme brosme</i>	<0.1
White seabream	<i>Diplodus sargus</i>	<0.1
Whiting	<i>Merlangius merlangus</i>	<0.1
Witch	<i>Glyptocephalus cynoglossus</i>	<0.1

Table 6. Total catch, landings, discards (tonnes), discard percentage and unsampled discards raised to pelagic fleet level for 2010

		Blue whiting	Greater argentine	Herring	Horse mackerel	Mackerel	Pilchard	Others	Unsampled discards	Total	Not sampled hauls
2010	Catch	35521	2929	54732	78787	30229	7328	8375	3774	221675	943
(n=8)	Landings	34038	2905	54017	78268	24903	7325	7485		208941	
	Discards	1483	24	715	519	5326	3	890	3774	12734	
	% Discards	4%	1%	1%	1%	18%	<1%	11%	100%	6%	

Table 7. Fishing TACs and quotas for 2010 as agreed by Council Regulations (EC) No 1359/2008 of 28 November 2008, (EC) No 1226/2009 of 20 November 2009, (EC) No 1287/2009 of 27 November 2009, (EU) No 53/2010 of 14 January 2010 and (EU) No 219/2010 of 15 March 2010. Changes may be made during 2010.

	European TAC 2010 (tonnes)	Dutch TAC 2010 (tonnes)	% Dutch TAC
Herring	1 913 226	45 639	2%
Blue whiting	540 000	12 463	2%
Mackerel	367 014	28 912	8%
Horse mackerel	269 317	61 691	23%

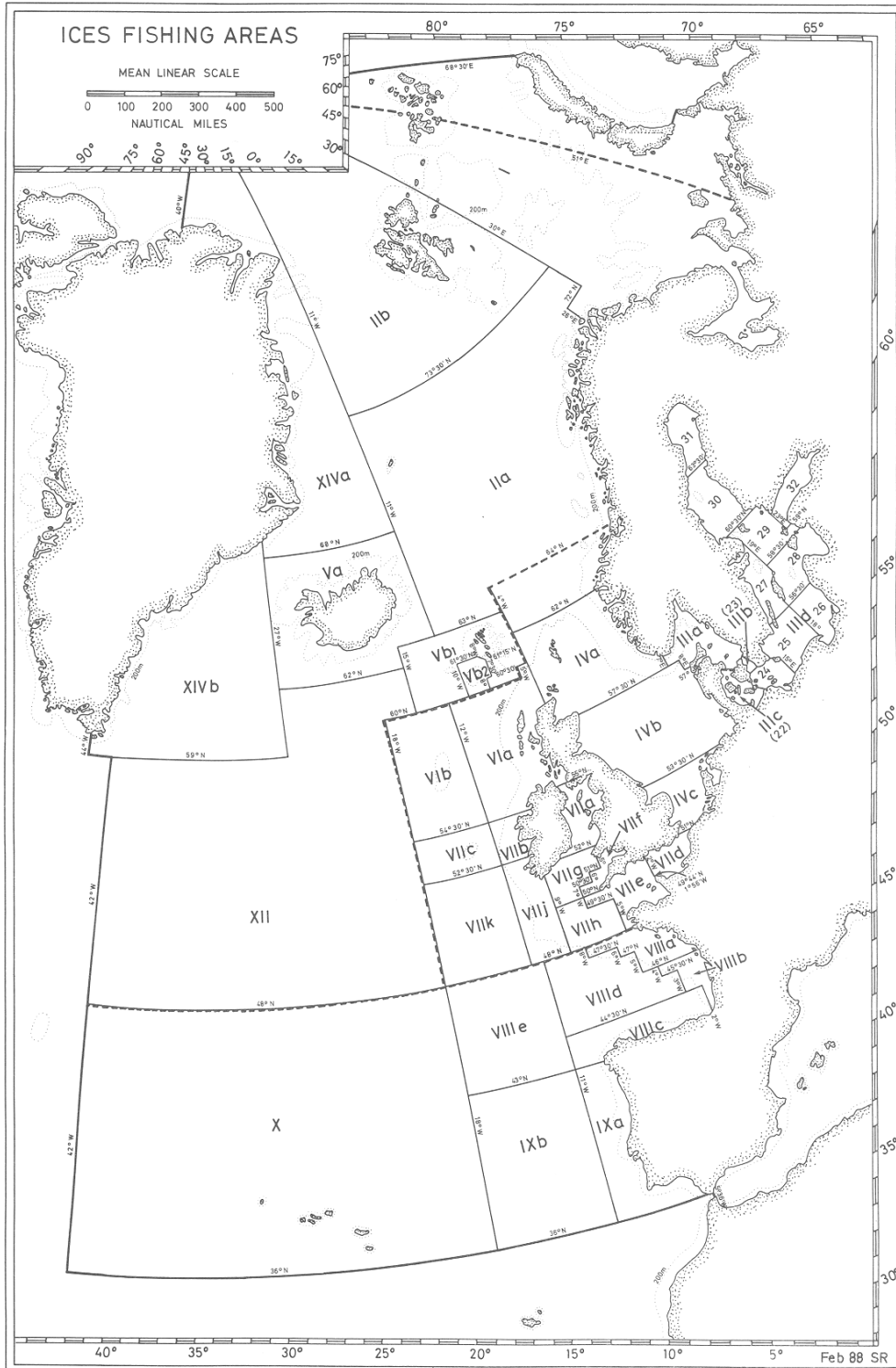


Figure 1. Map of ICES rectangles

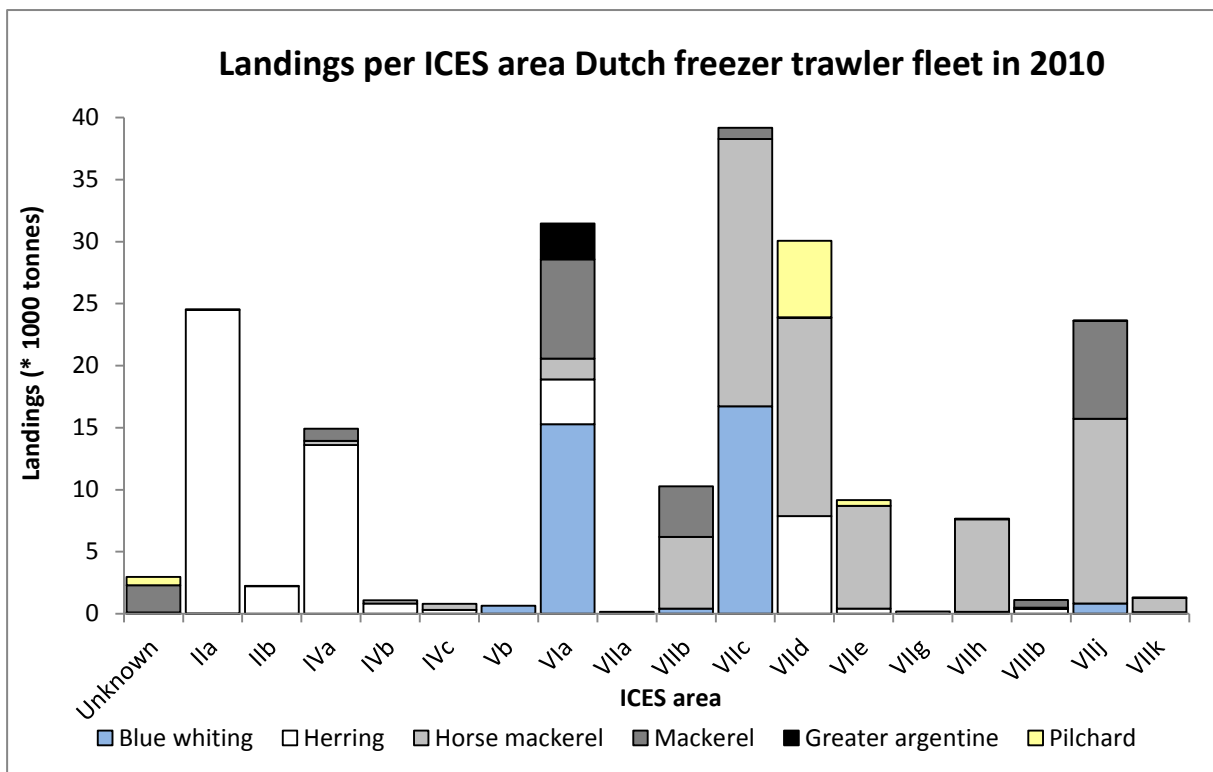
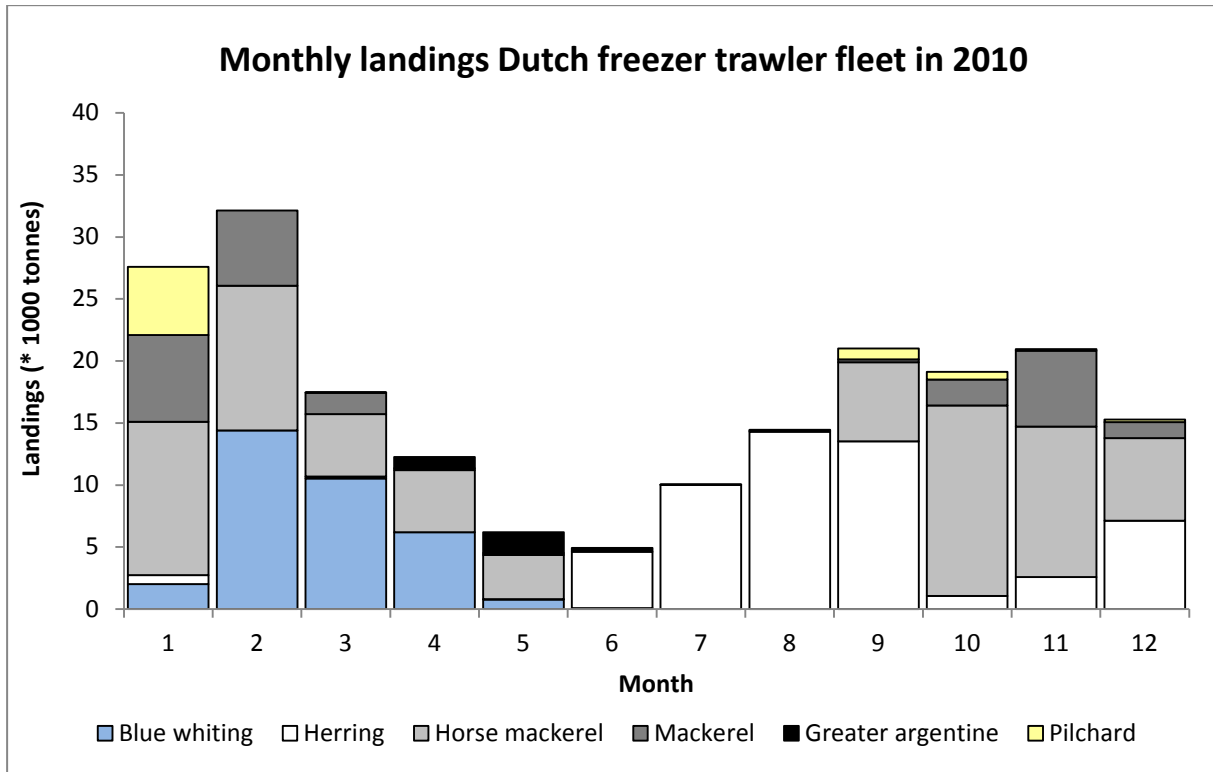


Figure 2. Landings (*1000 tonnes) from the Dutch freezer trawler fleet in 2010. Upper panel shows monthly landings by species, lower panel shows landings per ICES subarea (Figure 1) by species. Data extracted from the VISSTAT database.

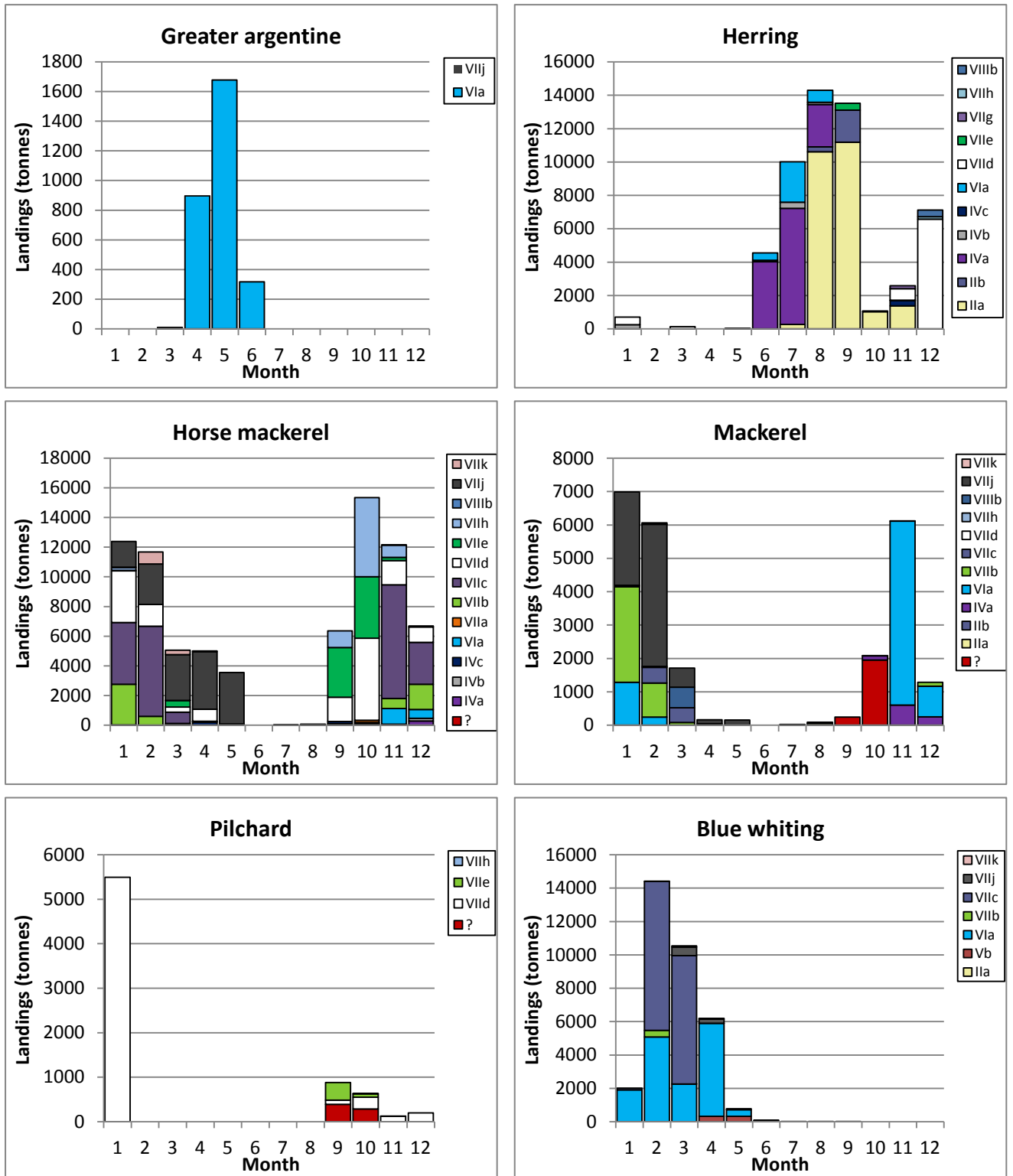


Figure 3. Monthly landings in tonnes per species from the Dutch freezer trawler fleet during 2010 from the most important ICES rectangles (Figure 1). Data extracted from the VISSTAT database.

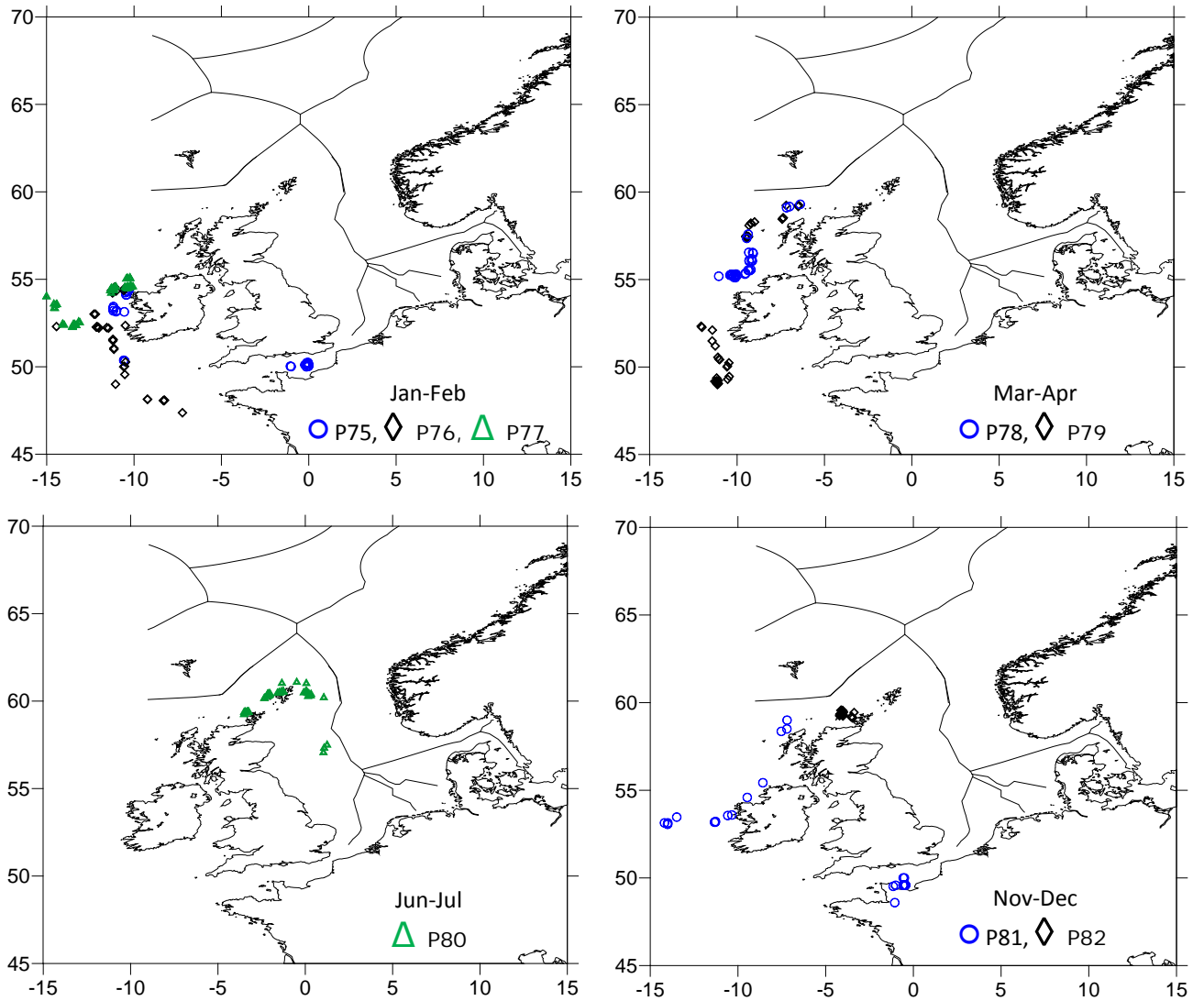


Figure 4. Trawl positions per haul for each sampled trip in 2010.

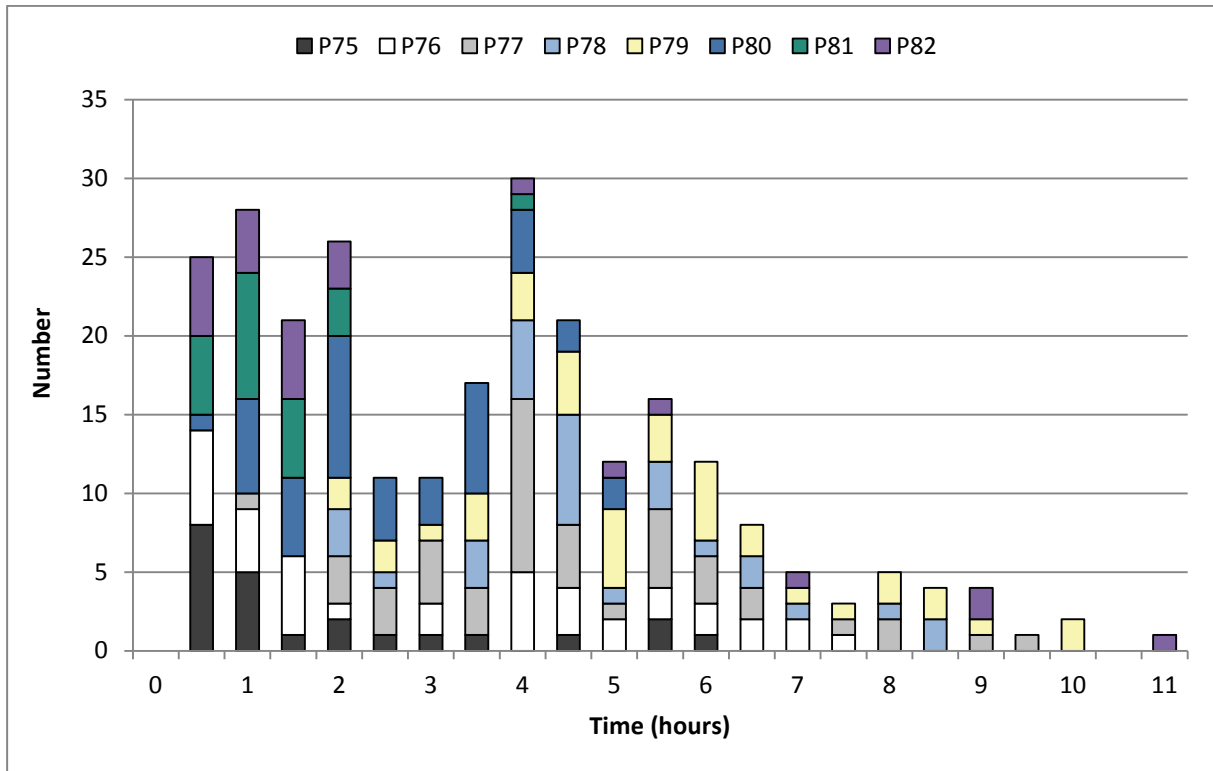


Figure 5. Frequency of haul durations for the sampled trips in 2010.

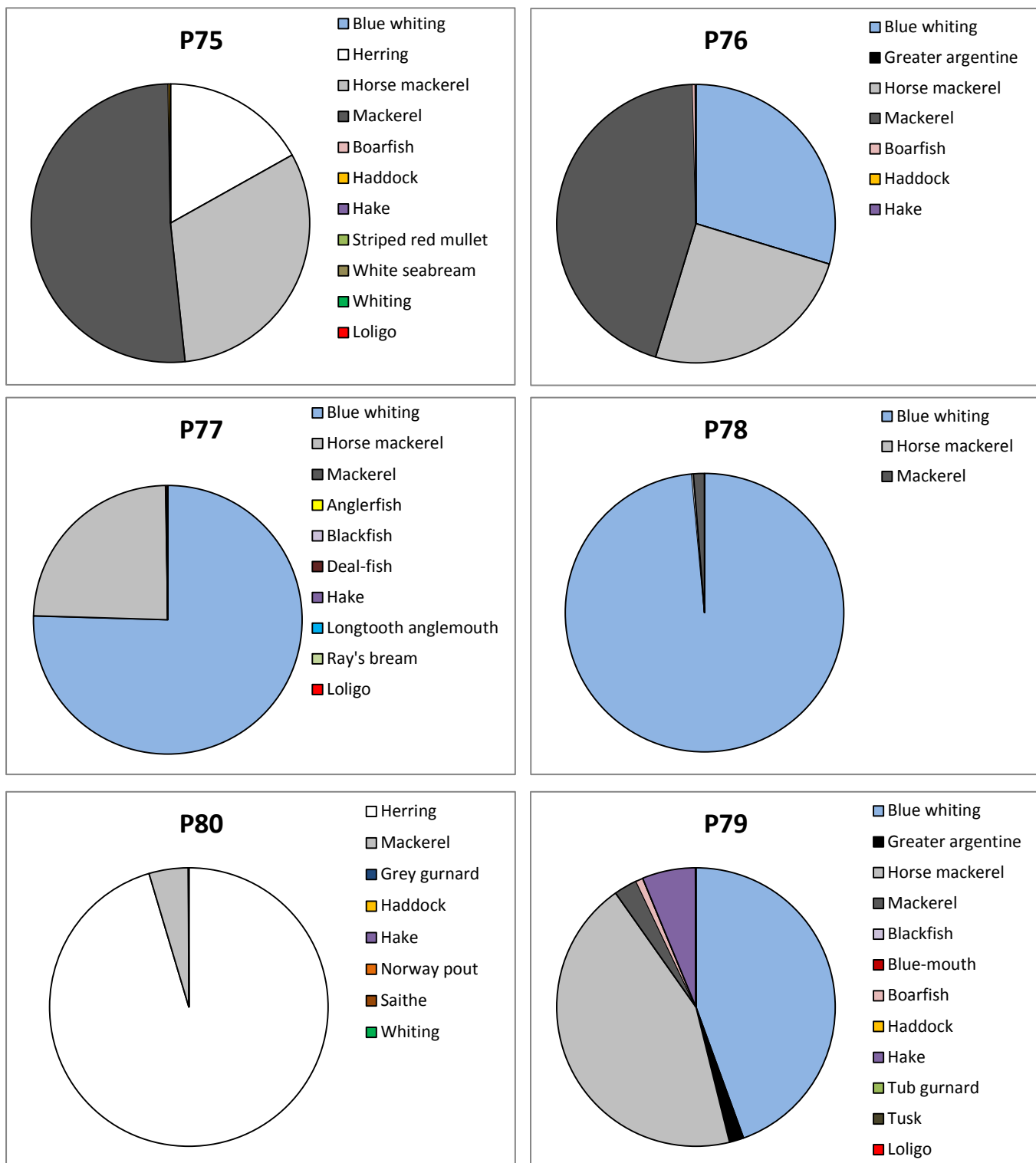


Figure 6. Composition of the total catches per trip

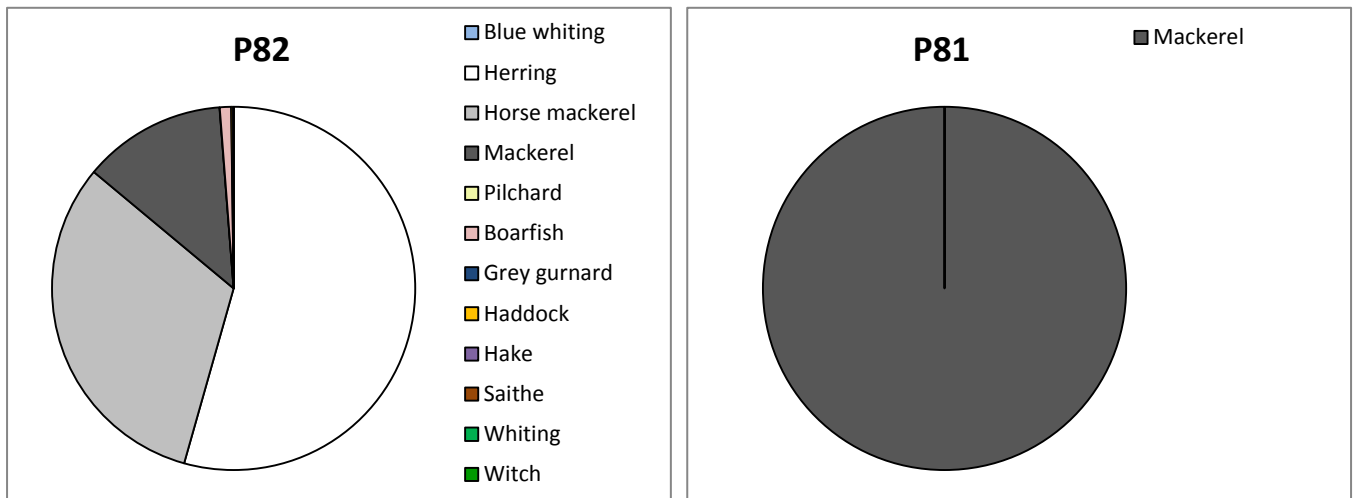


Figure 6. Continued

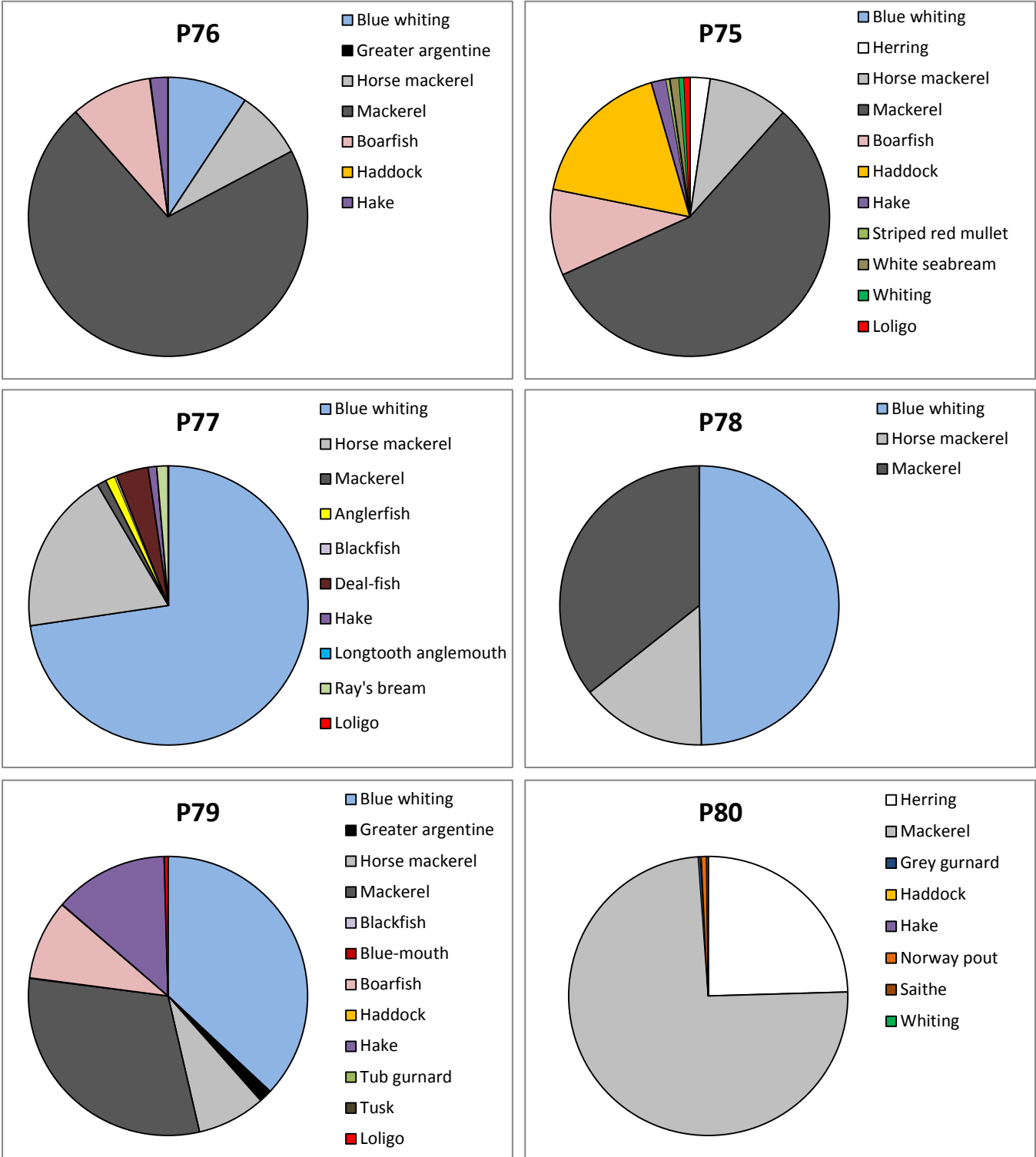


Figure 7. Composition of the total discards per trip

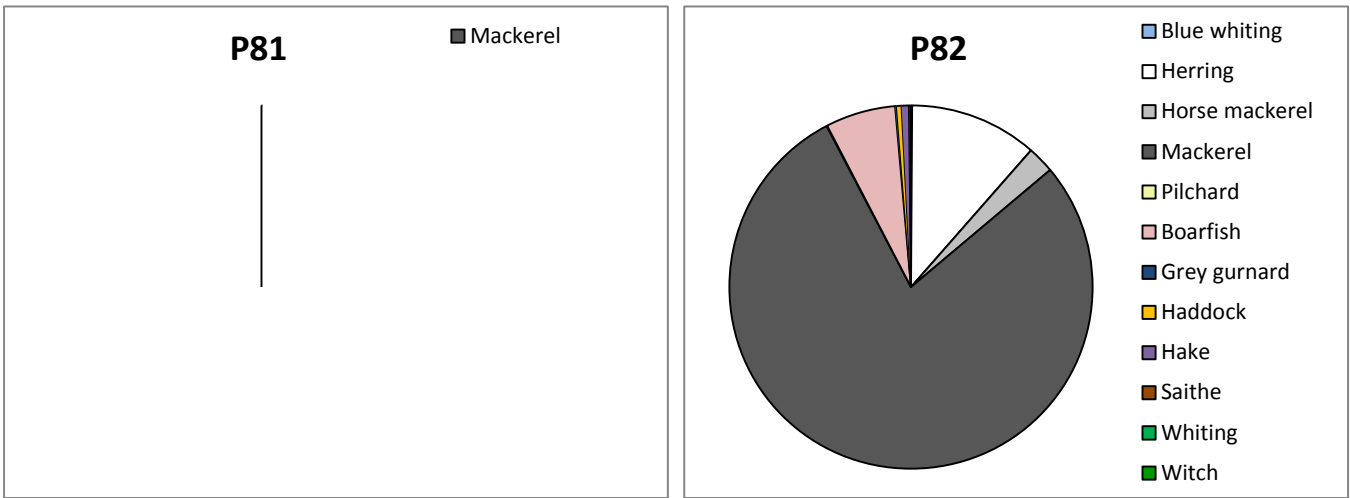


Figure 7. Continued

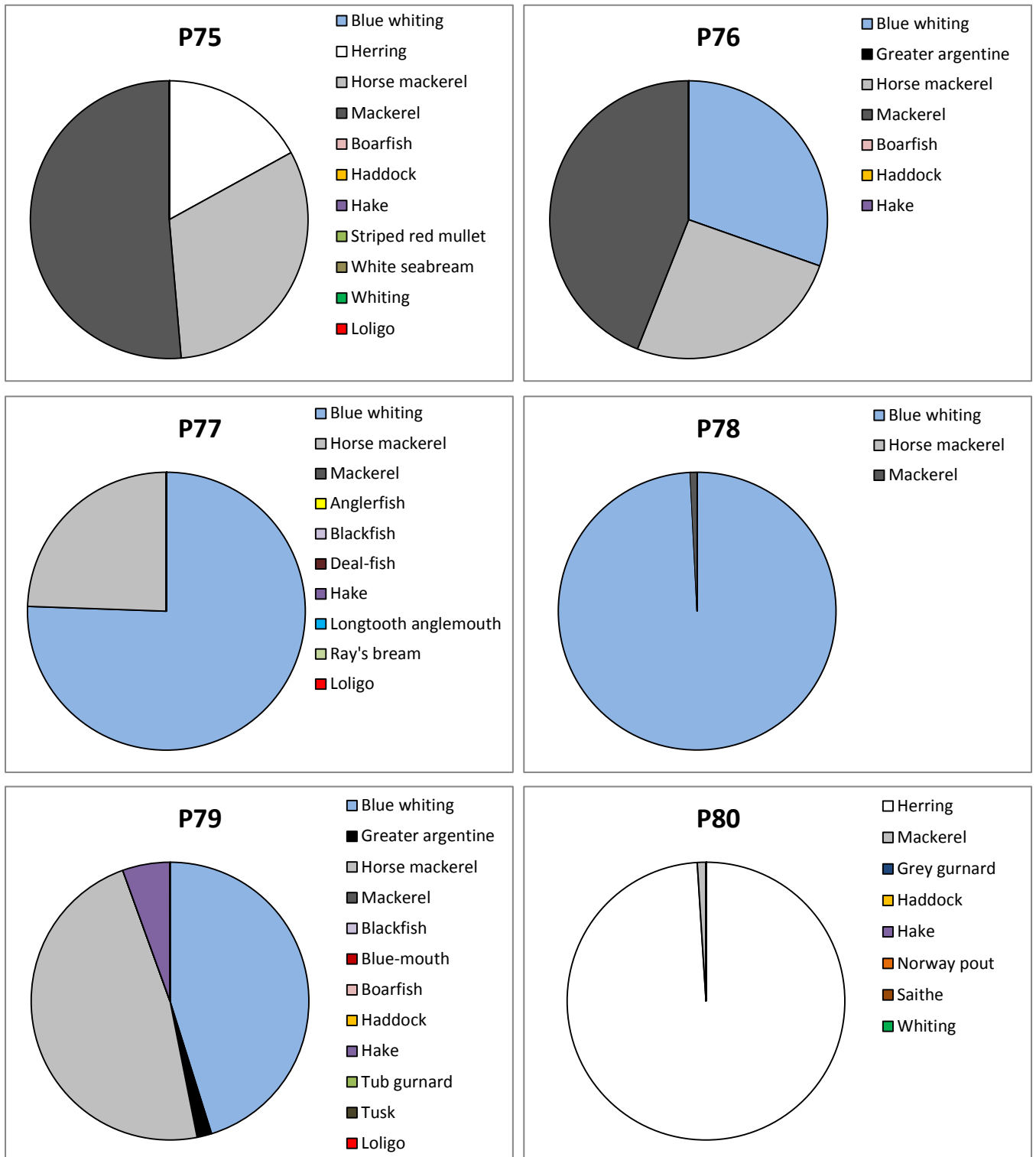


Figure 8. Composition of the total landings per trip

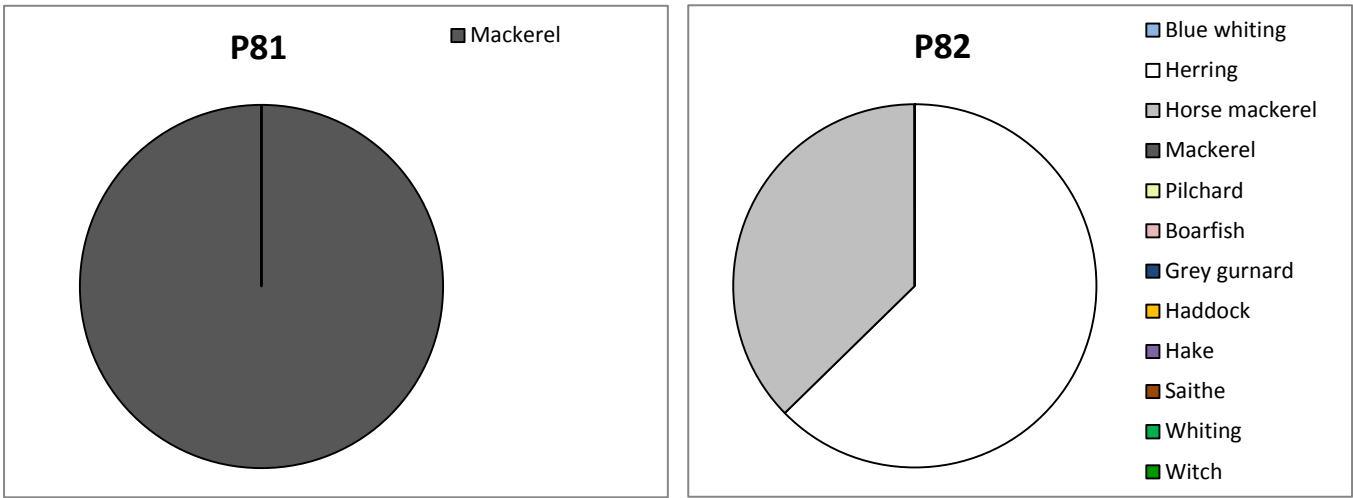


Figure 8. Continued

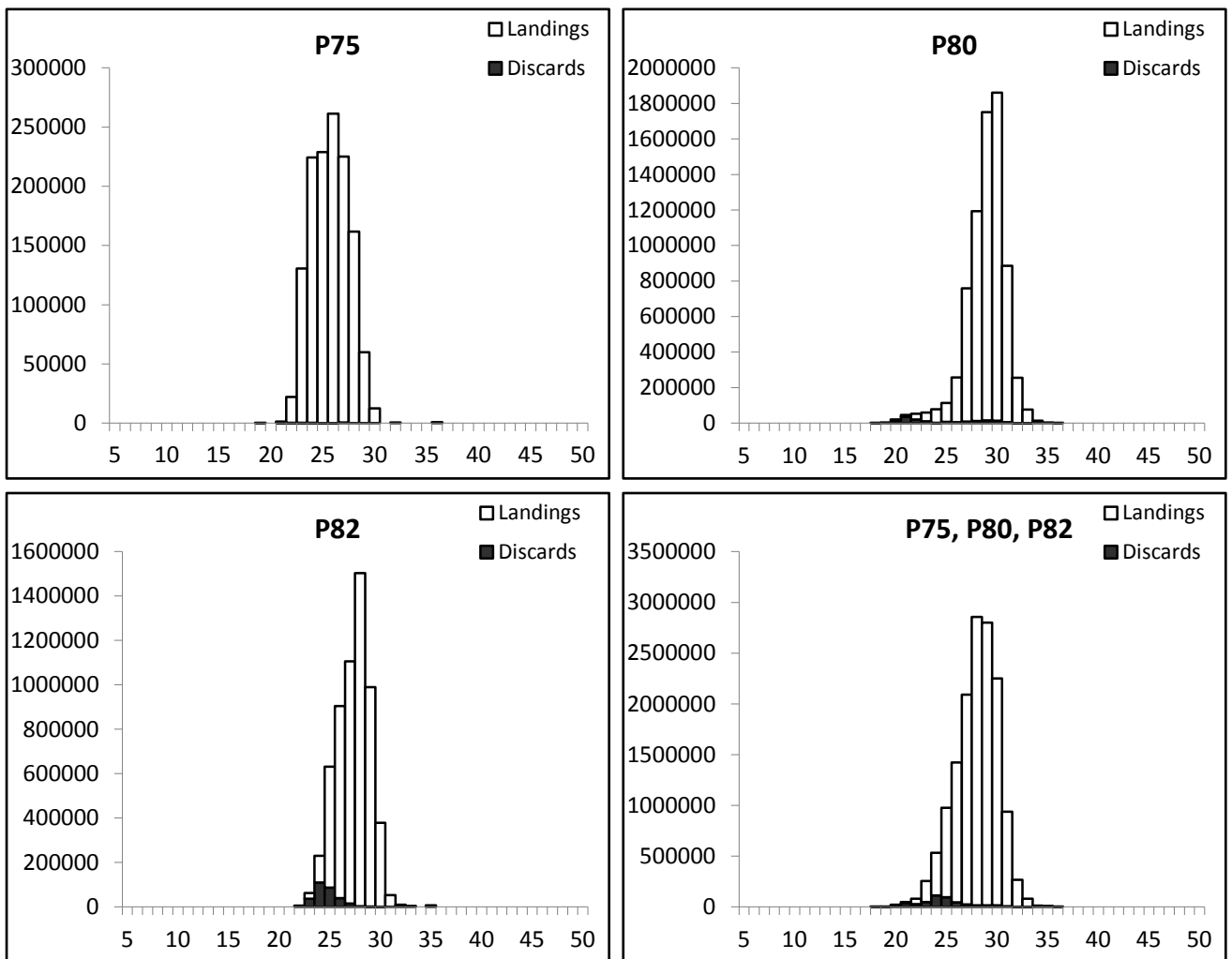


Figure 9. Numbers of herring landed and discarded against length (cm) for 2010 per trip and for these trips combined.

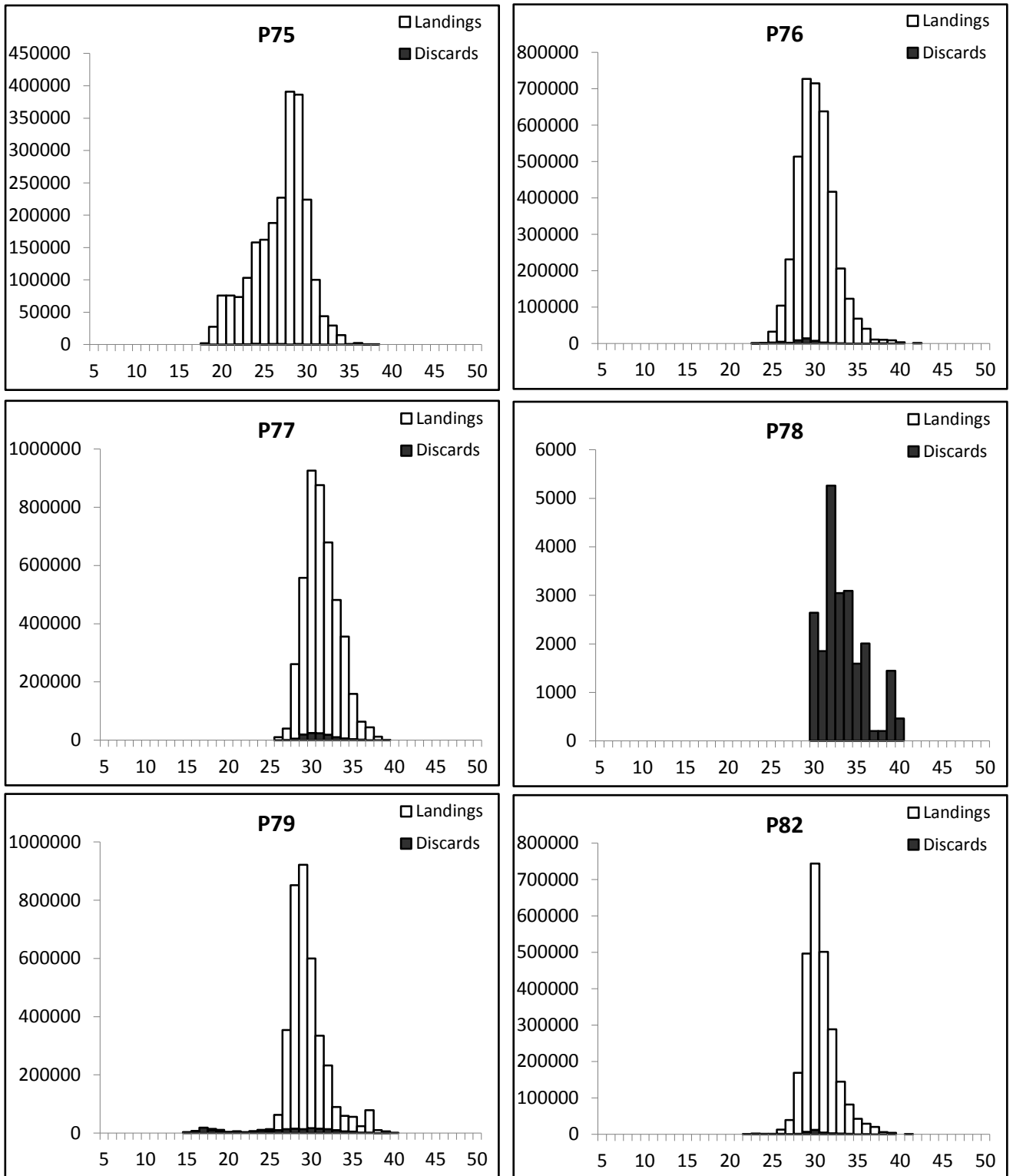


Figure 10. Numbers of horse mackerel landed and discarded against length (cm) for 2010 per trip and for these trips combined.

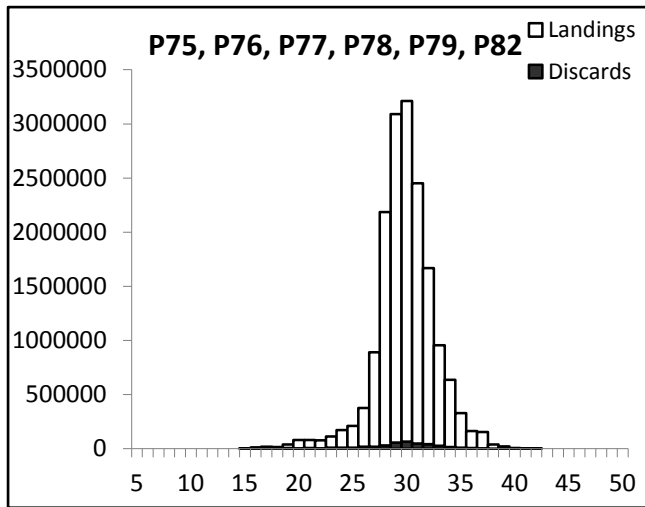


Figure 10. Continued

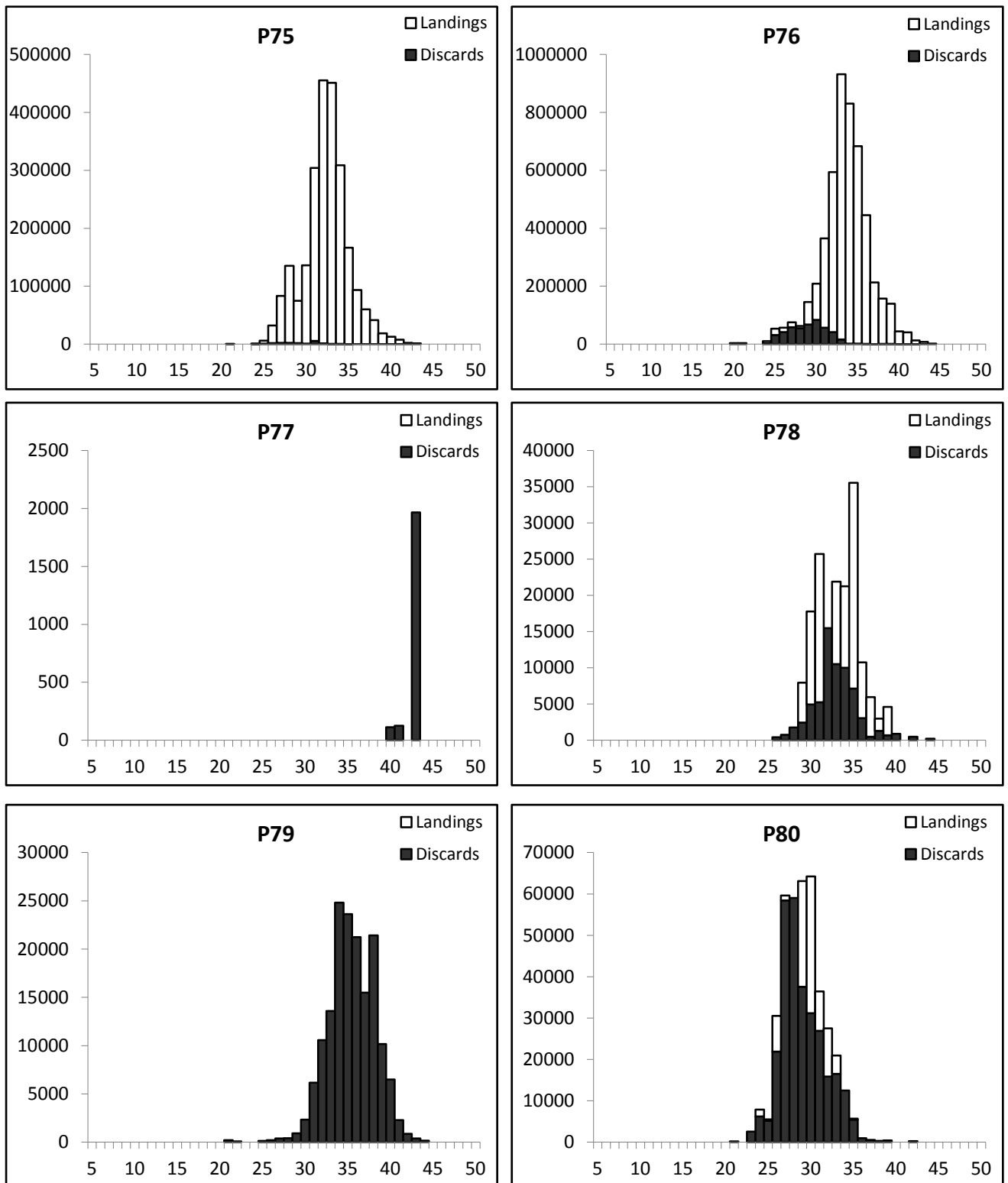


Figure 11. Numbers of mackerel landed and discarded against length (cm) for 2010 per trip and for these trips combined.

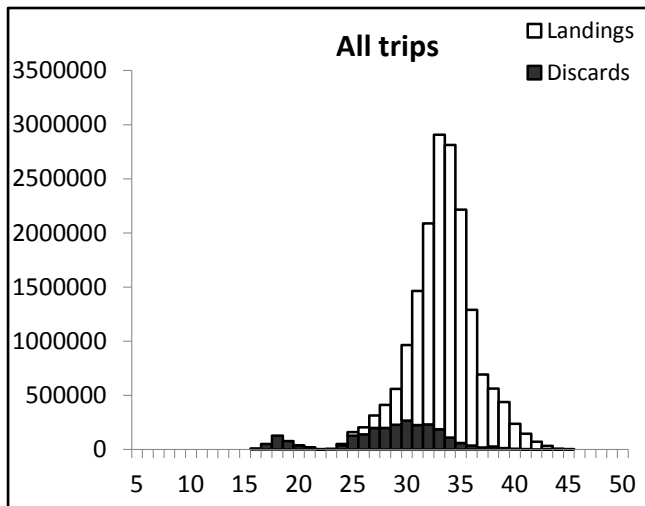
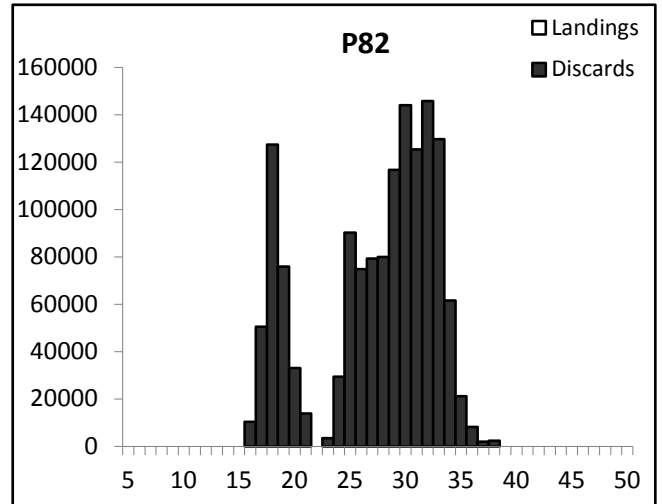
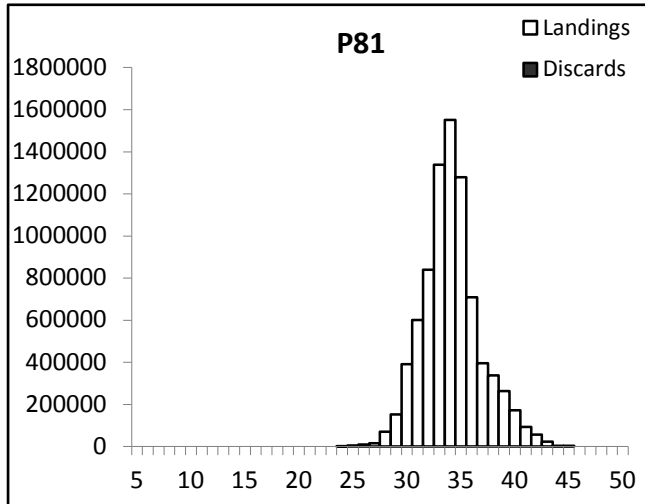


Figure 11. Continued.

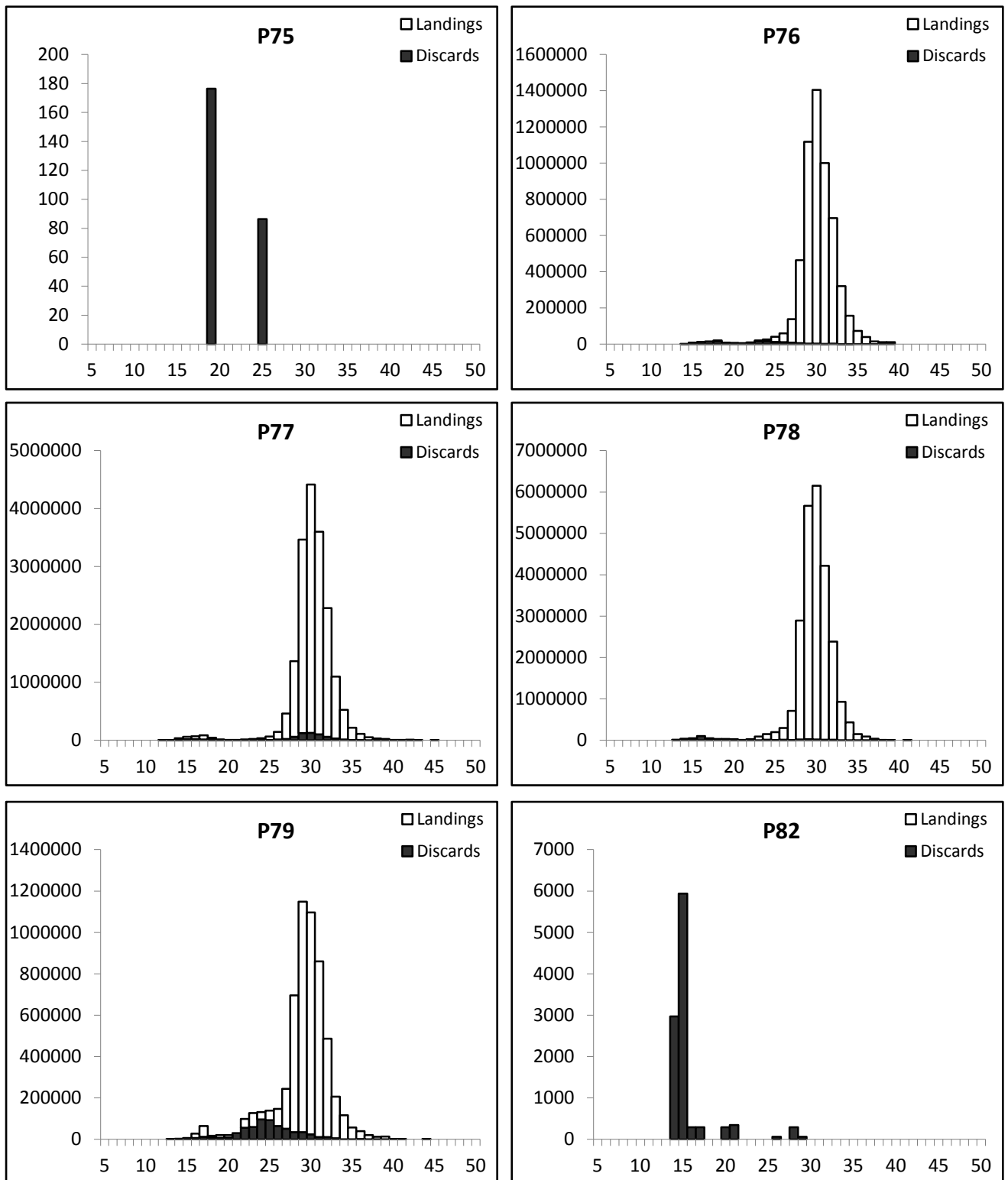


Figure 12. Numbers of blue whiting landed and discarded against length (cm) for 2010 per trip and for these trips combined

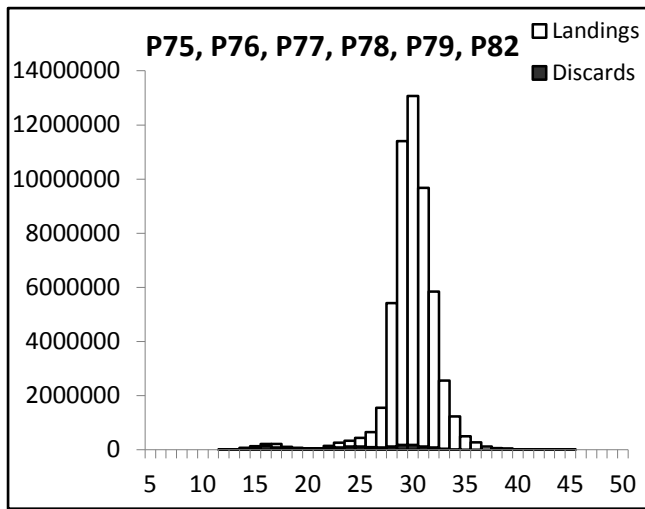


Figure 12. Continued.

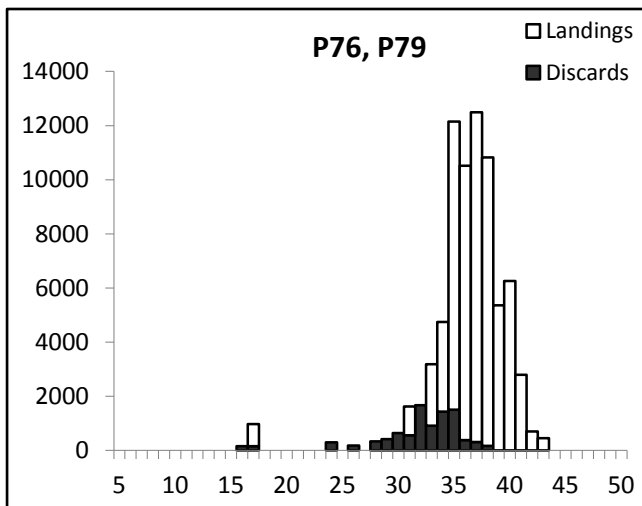
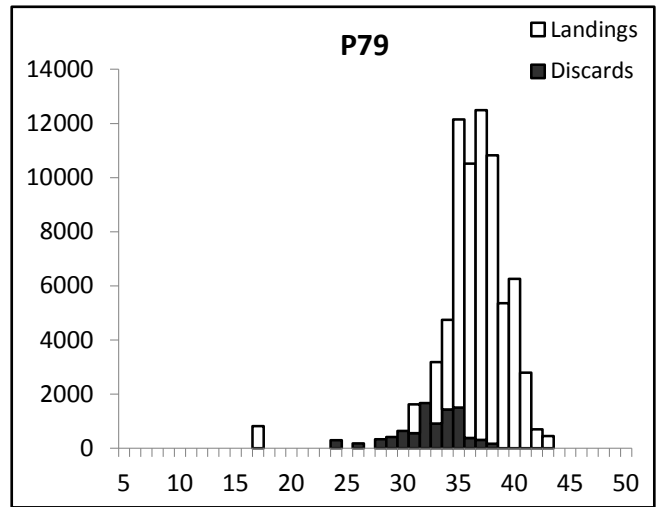
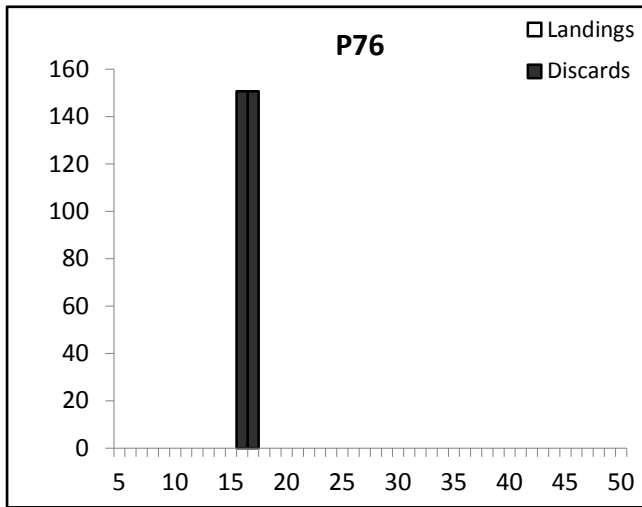


Figure 13. Numbers of greater argentine landed and discarded against length (cm) for 2010 per trip and for these trips combined.

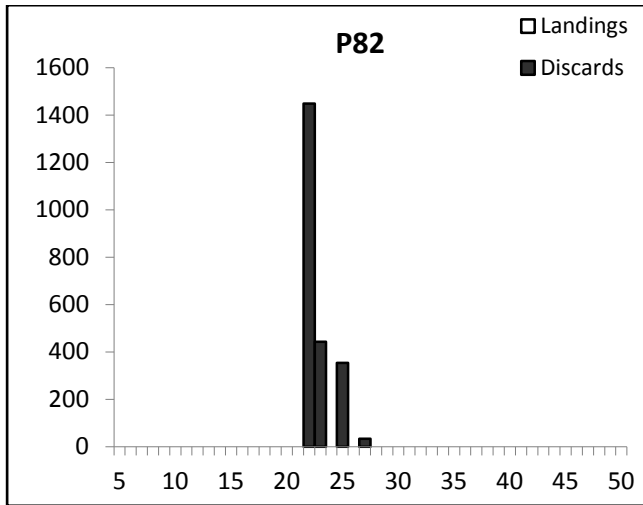


Figure 14. Numbers of pilchard landed and discarded against length (cm) for 2010 per trip.

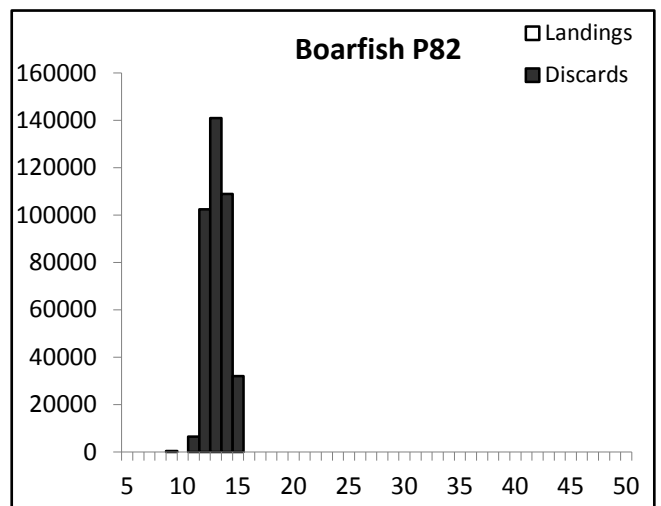
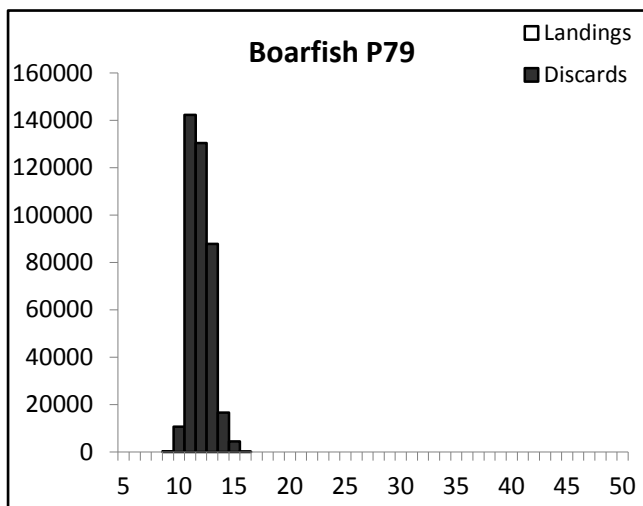
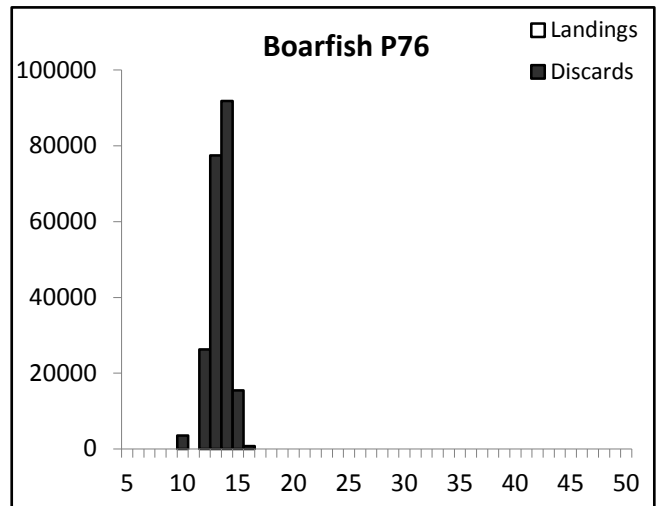
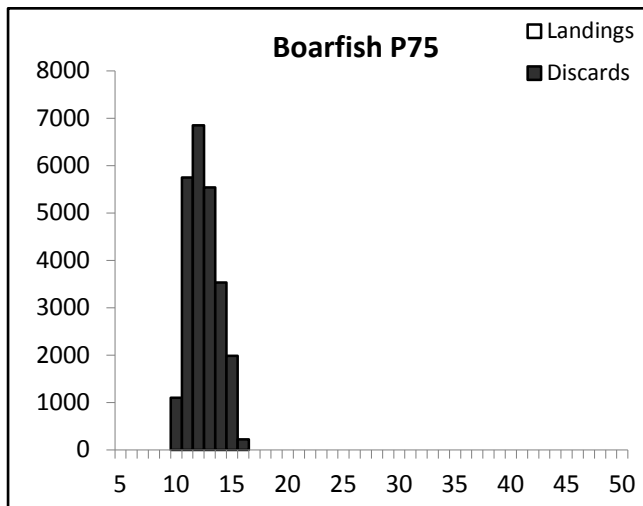


Figure 15. Numbers of most abundant non-target species (see Table 5) landed and discarded against length (cm) per trip for 2010.

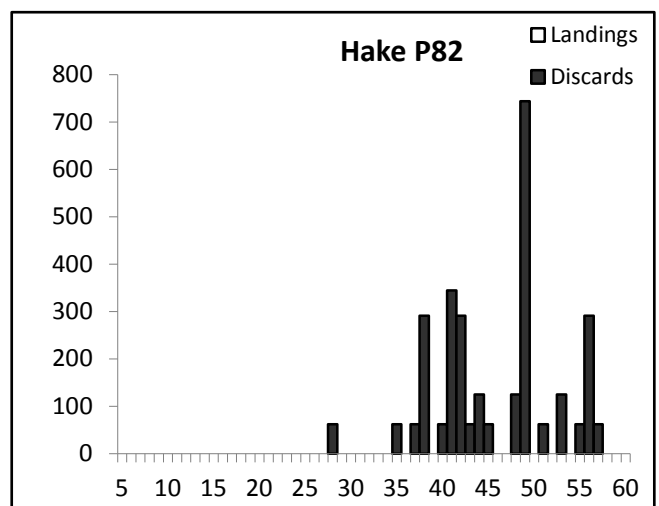
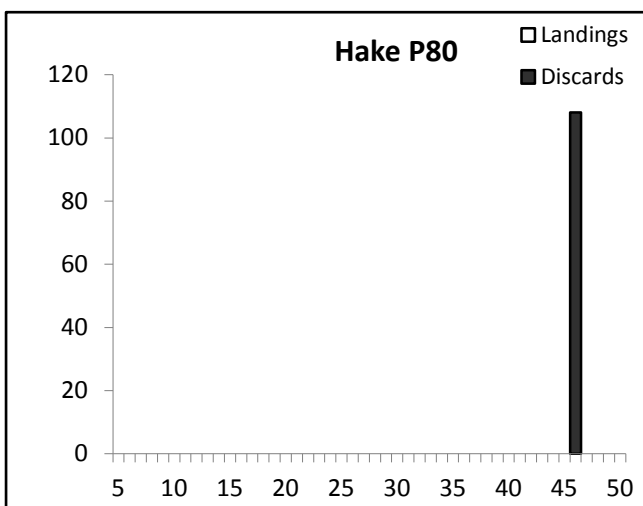
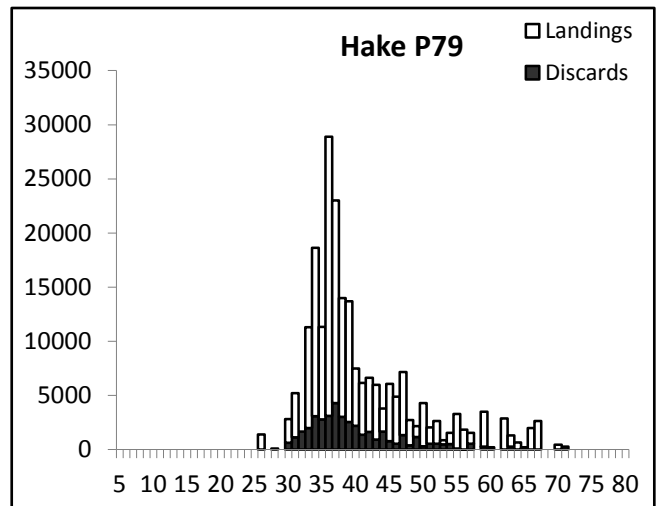
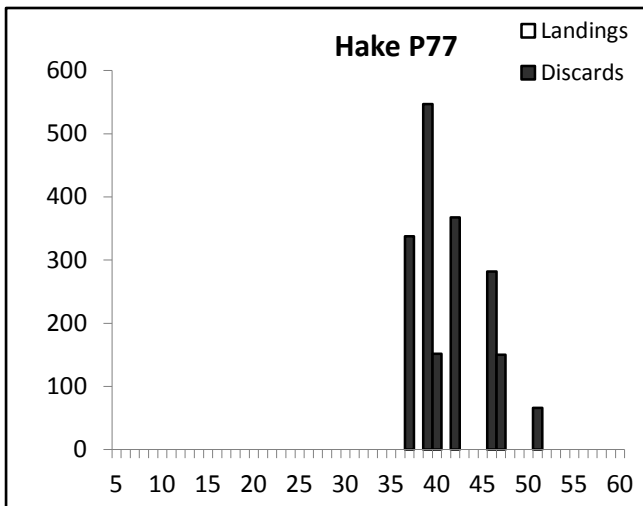
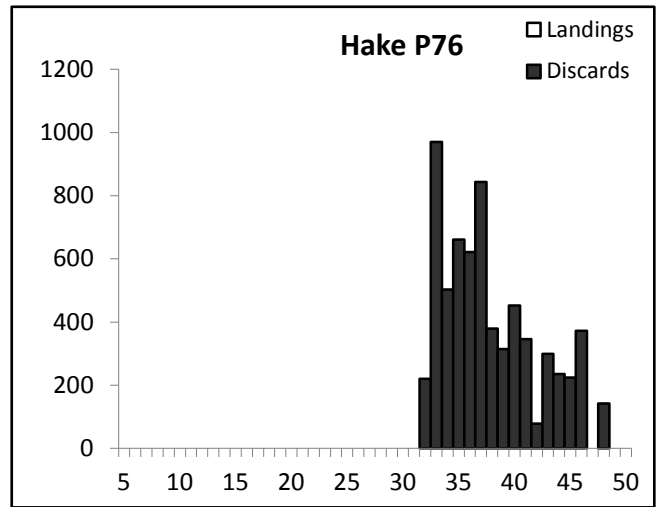
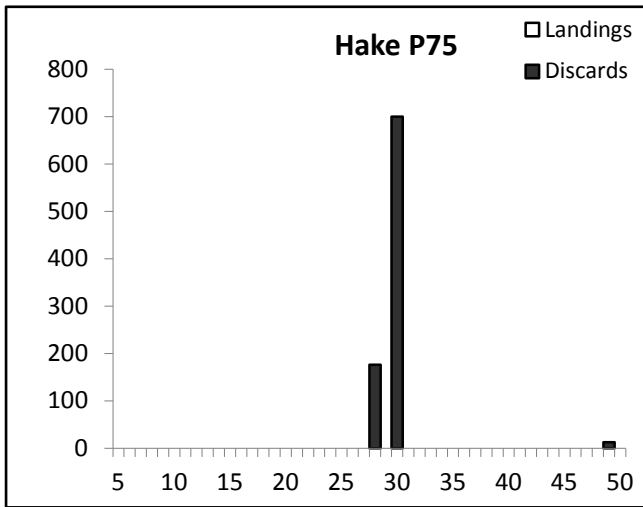


Figure 15. Continued.

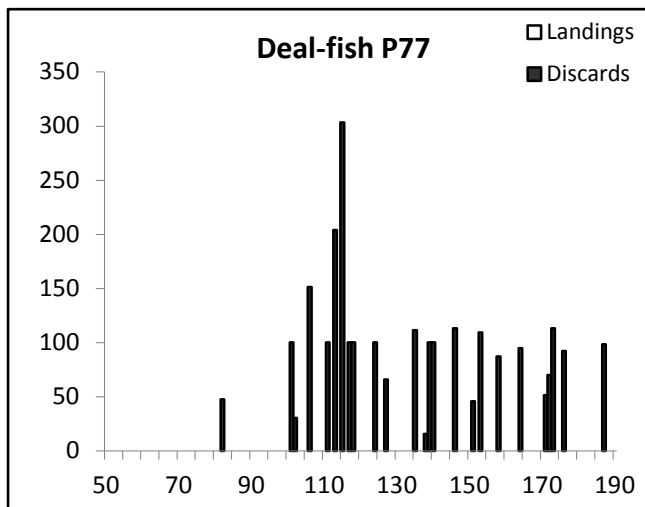


Figure 15. Continued.

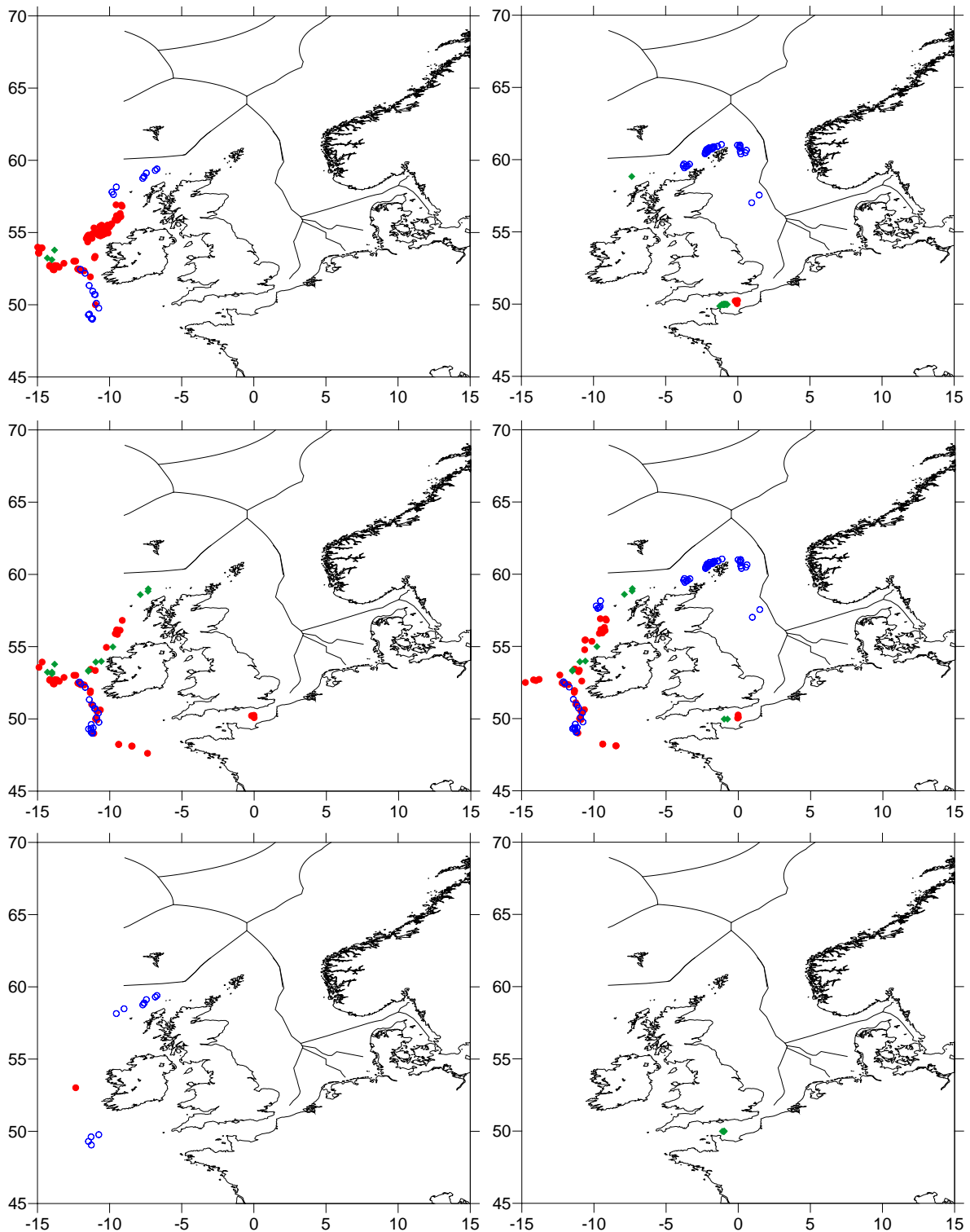


Figure 16. Positions of discards per quarter (red closed circle=quarter 1, blue open circle=quarter 2, open purple diamond=quarter 3, closed green diamond=quarter 4) for blue whiting (upper left), herring (upper right), horse mackerel (middle left), mackerel (middle right), greater argentine (lower left) and pilchard (lower right) for sampled trips in 2010.

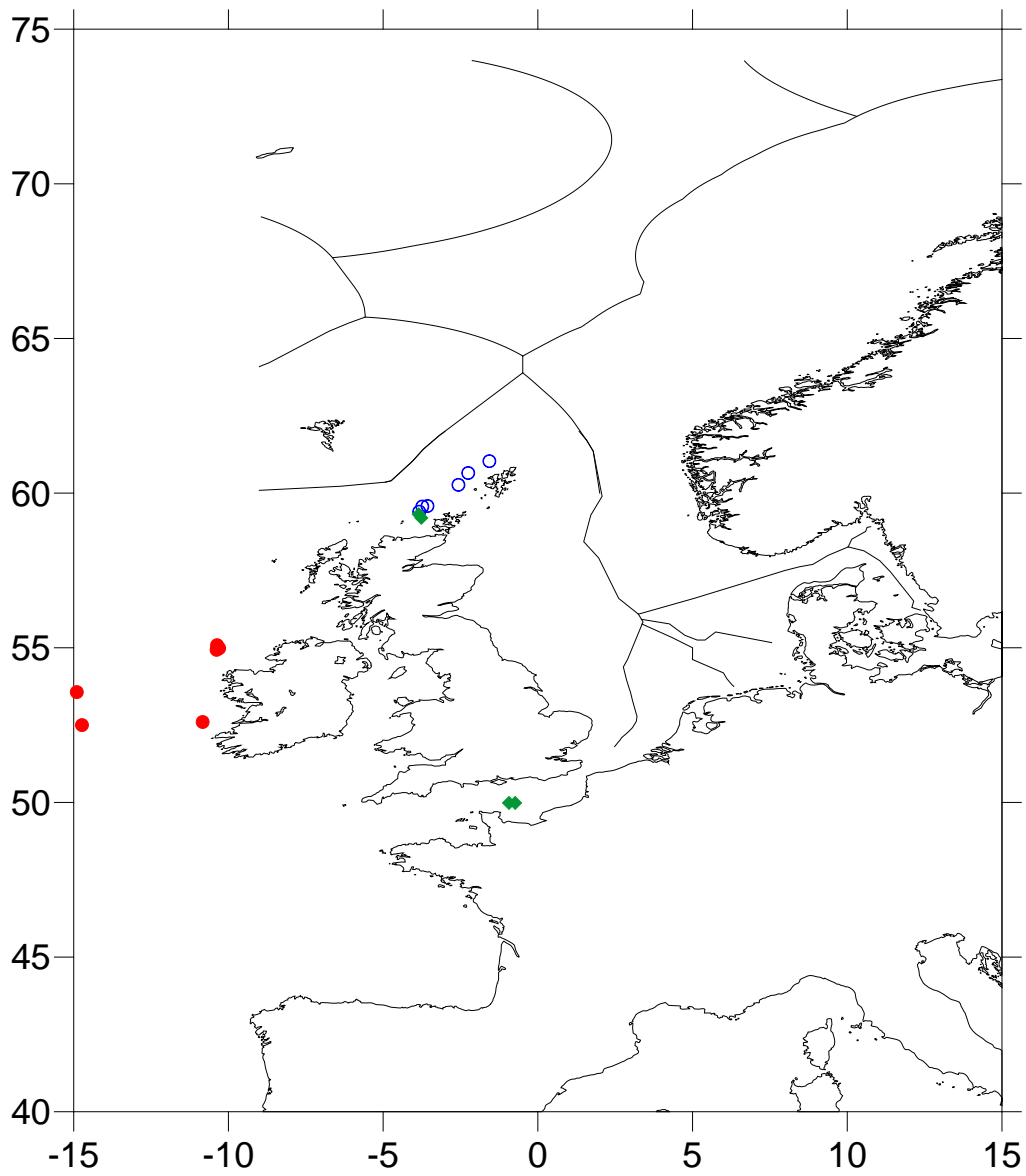


Figure 17. Positions of unsampled discards per quarter (red closed circle=quarter 1, blue open circle=quarter 2, open purple diamond=quarter 3, closed green diamond=quarter 4) for sampled trips in 2010.