Landings and discards on the pulse trawler MFV “Vertrouwen” TX68 in 2009

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Contents

Summary

The catches in terms of landings and discards were monitored onboard MFV "Vertrouwen" TX68, fishing with two pulse trawls using the Verburg-Holland system during four weeks in June-August 2009. The average fishing speed was about 5 knots. The fishing area of the four trips was east of the coast of England and fishing depth was 36 m on average with a minimum depth of 20 m and a maximum depth of 46 m.

For this study the standard sampling procedure for the yearly monitoring of discards of conventional beam trawl fleet was applied (van Helmond and van Overzee, 2008). Sampled numbers of fish per haul were raised to numbers and weight per hour, for both discards and landings.

The four trips led to a total of 103 valid hauls, with a total fishing duration of 186 hours. The number of hauls per trip varied between 17 and 38. A total of 50 landing samples and 66 discard samples were measured.

The average number of plaice landed per hour was 58 or, in weight 19 kg plaice per hour. The average number of plaice discarded per hour was 164 or, in weight 18 kg plaice per hour. This resulted in an average discard percentage for plaice of 74% in numbers and 49% in weight.

The average number of sole landed per hour was 208 or, in weight 53 kg sole per hour. The average number of sole discarded per hour was 54 or, in weight 5 kg sole per hour. This resulted in an average discard percentage for sole of 21% in numbers and 9% in weight.

Comparing the landings with that of conventional beam trawl discard surveys in 2007 leads to the general impression that with the pulse trawl more sole was caught and less plaice than with conventional beam trawls. When compared with conventional beam trawls in previous years it seems that with the pulse trawl more sole in number and weights per unit of time was discarded and less plaice was discarded. However, the average discard percentages of as well plaice as sole for the pulse trawl of this study were within range with the average discard percentages of conventional beam trawls in 2005, 2006 and 2007 (van Keeken, 2006; van Helmond and van Overzee, 2007; van Helmond and van Overzee, 2008) .

Data from 2009 was not yet available and year can have influence on the differences. Another important factor is the fishing area, just east of the coast of England, which probably in this case has influenced the catch composition and the fact that sole was more abundant in as well the landings as the discards. The comparison of pulse beam trawling vs. conventional beam trawling in 2006 showed that the pulse trawl caught less sole in kg per hour, i.e. 12.87 vs. 16.45 (ratio 78.2%), and fewer plaice, i.e. 29.76 vs. 46.13 kg per hour (ratio 64.5%), see van Marlen et al., 2006.

This study gives a general impression of the performance in terms of catches of fishing with a pulse trawl using the Verburg-Holland system. However it is recommended to conduct a comparative study on performance of a beam trawl and a pulse trawl, where the two vessels of similar size fish simultaneously, like was done in 2006 by van Marlen et al. This is to exclude the effects of time and area of fishing.

1 Introduction

1.1 Background

Pulse trawling is perceived as a promising alternative for tickler chain beam trawls to overcome adverse ecosystem effects. In addition the technique allows for substantial reductions in fuel consumption and associated costs (van Marlen et al., 2006).

The development of pulse trawl systems in The Netherlands started in the early 1970 with experimentation by RIVO (now IMARES), and was continued from 1992 by the private Dutch company Verburg-Holland Ltd. of Colijnsplaat. IMARES and Verburg collaborated on the development from 1998, leading to a vessel (MFV "Lub senior" UK153) fitted out with a complete system of two 12m pulse trawls and electrical feeding cable winches. The performance of this boat was compared to conventional beam trawlers in 2006 (van Marlen et al., 2006).

The method has been under review by ICES in 2006 on request of the European Commission, which lead to additional questions that are addressed in further experiments on a range of marine biota under a pulse stimulus (ICES 2006a, b; van Marlen et al., 2006, 2007, 2009; De Haan, et al., 2008, 2009).

The need was expressed to collect more data on landings and by-catches (discards), but UK153 was sold and stopped using the technique in 2007. Therefore a new vessel had to be sought. It was not until 2009 that the TX68 was fitted out with pulse trawls and commenced fishing. This report describes the results of four monitoring trips undertaken in June, August and September 2009.

1.2 Assignment

The original work plan of Task 4.2 in EU project DEGREE (contract SSP8-CT-2004-022576) comprised of monitoring 10 sea trips onboard commercial vessels fishing with pulse trawls, which was later adjusted in consultation and agreement with the European Commission services into measurements on the electric field *in situ* and tank experiments on cat sharks related to the ICES Advice of 2006 (Marlen et al, 2007), and a smaller number of remaining sea trips (four) to be monitored.

2 Methods

2.1 General information

This monitoring has been carried out on one sample vessel MFV "Vertrouwen" TX68 (2000 hp (1471 kW), Loa = 41.15 m, B = 8.50 m, H = 5.30 m). A total of four trips were made on board of this vessel in the months June, August and September. The vessel fished with 12m pulse beam trawls supplied by Verburg-Holland Ltd. and the average fishing speed was about 5 nautical miles per hour. The fishing area of the four trips was east of the coast of England (figure 2.1) and fishing depth was 36 m on average with a minimum depth of 20 ms and a maximum depth of 46 m.

2.2 Sampling procedures

For this survey the standard sampling procedure for the yearly monitoring of discards of conventional beam trawl fleet was applied (van Helmond and van Overzee, 2008).

For the first two discard sampling trips, two observers went onboard vessel. Due to a lack of available personnel in the last two trips in August and September only one observer went onboard the vessel.

The observers targeted to sampling at least 60% of the hauls. For each sampled haul, a representative sub-sample of the discards was taken from the conveyer belt. All fish in the sub-sample were counted and length of the fish were measured. Benthic invertebrates were only counted. Total and sampled volume of discards was recorded. In addition, sub-samples of the landed fish were measured, and total and sampled landings weight were recorded. All data was entered into a computer program on haul-by-haul basis and later transferred into a central database.

Sampling protocol per haul:

1) Estimation of total catch per haul. Registration of total catch in volume.
2) Method of taking discard sample
    a. The sample consists of one basket (35 kg). To get a representative sample, discards are taken at different moments from the conveyer belt when processing the haul.
3) Method of measuring discard sample:
    a. Sort all fish species, take length measurements and register total number by species and length class.
    b. Sort all benthos and register total number by species.
4) Method of measuring landings sample:
    a. Sample landings from target species (sole and plaice), 10-15 kg. Register total number by species and length class.
    b. Sample landings from non-target species (e.g. dab, turbot, brill, whiting, cod) 10-15 kg. Register total number by species and length class.
5) Data on position, haul duration, wind direction, fishing depth en landed catch is collected in cooperation with the skipper for each haul.
6) Registration of total landings:
    a. Information on total landings is collected at the end of the trip.

2.3 Raising procedures

This paragraph gives a short description of the raising procedures used to work up the raw data, and estimate discards. The raising procedures are the same as applied in previous years. A mathematical description of the raising procedure is given in Appendix I.

Sampled numbers of fish per haul were raised to numbers at length, for both discards and landings. Different raising procedures were used for discards and landings because different sources of information were used for

these catch components. For the landings, the total landed weight per species by trip was available from the auction, while such data was not available for discards.

Discards were raised from sampled numbers in a haul to total numbers in a haul with the ratio of estimated haul volume to sampled haul volume. Total numbers per haul were summed over all sampled hauls in a trip and divided by duration of the sampled hauls to obtain total numbers discarded per hour per trip. Numbers were converted to weight using standard length-weight relationships.

Landings were raised from sampled numbers per haul to total numbers per trip with the ration of total landings weight in the trip to sampled landings weight. Total numbers per hour landed were calculated by dividing total numbers in the trip by the trip duration. Landed weight per hour was calculated by dividing total landings weight by trip duration.

3 Results

3.1 Samplings

The four trips led to a total of 103 valid hauls, with a total fishing duration of 186 hours. The number of hauls per trip varied between 17 and 38. Trip 2 was ended earlier (after 2 days, 18 hauls) due to problems with the fishing gear. In trip 3 only the first 12 hauls were used for analyses, because after haul 12 the pulse beam trawl on starboard side only functioned well by 50%. From the 103 valid hauls, a total of 50 landing samples were measured and 66 discard samples were measured (overview table 3.1).

3.2 Total landings and discards

Total numbers and weight of landings and discards per trip are discussed for trip 1 and 4 only, as trip 2 an 3 were not complete fishing weeks. The total landings for plaice for trip 1 and trip 4 were respectively 2519 and 1587 kg, the total landings for sole were 2372 and 3838 kg (table 3.2). The total weight of discards ranged from 21.4 tonnes in trip 1 till 46.7 tonnes in trip 4 (table 3.3).

Dab, plaice and sole were the most abundant fish species in the discards (table 3.4). The common starfish and swimming crab were the most abundant benthos species (table 3.5).

3.3 Catches of benthic invertebrates

The main benthos species caught were: common starfish (*Asterias rubens L.*), and swimming crab (*Liocarcinus holsatus L.*) (table 3.5a). Especially during trip 4 high numbers of common starfish and swimming crab were caught (table 3.5b).

3.4 Landings and Discards per hour

Plaice
The average number of plaice landed per hour was 58 or, in weight 19 kg plaice per hour. The average number of plaice discarded per hour was 164 or, in weight 18 kg plaice per hour. This resulted in an discard percentage of 74% in numbers and 49% in weight (table 3.6).

Sole
The average number of sole landed per hour was 208 or, in weight 53 kg sole per hour. The average number of sole discarded per hour was 54 or, in weight 5 kg sole per hour This resulted in an average discard percentage of 21% in numbers and 9% in weight (table 3.7).

4 Discussion

Total weight of discards (fish and benthos) per trip of the pulse trawl (trip 1 and 4) was within range of total weights of discards on conventional beam trawls in 2006 and 2007 (van Helmond and van Overzee, 2007, 2008). Extremely high numbers of common sea star and swimming crab (per hr) were caught during trip 4 when compared to averages of numbers of benthos caught in previous years (van Helmond and van Overzee, 2007, 2008). It is however not possible to draw conclusions out of these findings as there was no real time comparison with a conventional beam trawl. In a previous study of van Marlen et al. in 2006, 51.1% less benthic fauna was discarded with the pulse trawl compared to a conventional trawl.

Comparing the data of the pulse beam trawl with the data from conventional beam trawl discard surveys in 2007 (van Helmond and van Overzee, 2008) leads to the general impression that less plaice and more sole was caught with the pulse trawl; The range of numbers of plaice landed per hour was 101 - 561 on the conventional beam trawls monitored in 2007, whereas during this study between 14 – 106 numbers of plaice were landed per hour with the pulse trawl. The range of number of sole landed per hour was 45 - 149 on the conventional beam trawls that were monitored in 2007, whereas during this study between 142 – 259 numbers of sole were landed per hour with the pulse trawl.

Also discards of plaice were relatively low and discards of sole were relatively high when compared with discards of plaice and sole on conventional beam trawls in 2007 (van Helmond and van Overzee, 2008); Average discards for plaice of conventional beam trawls in 2007 were in numbers/ hr: 700, and in weight: 57 kg/hr. The average discard for plaice on the pulse trawl in number/hour were 164 and in weight 18 kg/hr. Average discards of sole for conventional beam trawls in 2007 were in numbers/ hr: 27, and in weight: 2 kg/hr, whereas for the pulse trawl, the average discards for sole in number/hour were 54 and in weight 5 kg/hr.

However, when comparing discard percentages of plaice and sole for the pulse trawl with discard percentages for conventional beam trawls in years 2005, 2006 and 2007 (van Keeken, 2006; van Helmond and van Overzee, 2007, 2008), it shows that the discard percentages of the pulse trawl for sole and plaice are only slightly lower or within range (table 4.1).

Data from 2009 was not yet available and year can have influence on the differences. Another important factor is the fishing area, just east of the coast of England, which probably in this case has influenced the catch composition and the fact that sole was more abundant then plaice in as well the landings as the discards. The Dutch beam trawl fleet is normally more active in the eastern parts of the North Sea, were the bottom is less rocky and more sandy. In these areas abundance of plaice in the catches is higher (Aarts and van Helmond, 2009).

A comparative study performed in 2006 by van Marlen et al. 2006 showed that with the pulse trawl less sole in kg per hour, i.e. 12.87 vs. 16.45 (ratio 78.2%), and fewer plaice, i.e. 29.76 vs. 46.13 kg per hour (ratio 64.5%), was landed with the pulse trawl. At the same time the average discards in number/hour for sole were 14.6 (pulse) vs. 19.4 (conventional beam trawl), and the average weight in kg/hour were 1.4 (pulse) vs. 1.8 (conventional). For plaice these were in numbers/hour: 997 (pulse) vs. 948 (conventional), and in weight: 68.1 (pulse) vs. 66.9 (conventional) kg/hour. The differences in discards were statistically significant for sole, but not for plaice (van Marlen et al., 2006).

5 Conclusions

This study gives a general impression of the performance of fishing with a pulse trawl using the Verburg-Holland system. However, it is recommended to conduct a comparative study on performance of a beam trawl and a pulse trawl, where the two vessels of similar size fish simultaneously. This is to exclude the effects of time and area of fishing.

Total weight of discards (fish and benthos) per trip of the pulse trawl was within range of total weights of discards on conventional beam trawls. The fishing area is most probably the reason of the relatively high abundances of sole and relative low abundances of plaice in the catches.

Comparing the outcome of this study with studies of previous years leads to the general impression that:

- The numbers and weights of landed and discarded sole per unit of time were higher when compared with conventional beam trawls in previous years.
- The numbers and weights of landed and discarded plaice per unit of time were lower when compared with conventional beam trawls in previous years.
- The discard percentages of the pulse trawl for sole and plaice were only slightly lower or within range when compared with the discard percentages of beam trawls in previous years

6 Quality Assurance

IMARES utilises an ISO 9001:2000 certified quality management system (certificate number: 08602-2004-AQ-ROT-RvA). This certificate is valid until 15 December 2009. The organisation has been certified since 27 February 2001. The certification was issued by DNV Certification B.V. Furthermore, the chemical laboratory of the Environmental Division has NEN-AND-ISO/IEC 17025:2005 accreditation for test laboratories with number L097. This accreditation is valid until 27 March 2013 and was first issued on 27 March 1997. Accreditation was granted by the Council for Accreditation. In addition the report was reviewed by A.T.M. van Helmond of IMARES.

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Justification

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Project Number: 4391500101 (KP6 DEGREE R&D)

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

Approved: Ir. A.T.M. van Helmond
Researcher

Signature:

Date: 17 December 2009

Approved: Dr. ir. T.P. Bult
Head of department Fisheries

Signature:

Date: 17 December 2009

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Appendix I: Raising procedures

From van Helmond and van Overzee, 2008:

Table 2.1. Explanation of the abbreviations used in the formulas in appendix I.

	explanation	sub-script	explanation
n	sampled number	l	length
N	total number	h	haul
w	sampled weight		hour
		o	
W	total weight	t	trip
v	sampled discards volume	p	period
V	total discards volume	y	year
u	sampled duration	s	species
U	total duration	f	fleet
wt	sampled landings weight		
WT	total landings weight		
e	sampled fleet effort in number of trips		
E	total fleet effort in number of trips		
T	Number of trips		
DN	total discard number		
LN	total landings number		
CN	total catch number (landings and discards combined)		

Raising discards per trip

The sampled number per length and haul were raised per species to total number per length and haul

$$DN_{l,h,s} = \frac{V_h}{v_h} Dn_{l,h,s}$$

where $DN_{l,h,s}$ is the total number discarded at length (l) in haul (h) for species (s), V_h is total volume of haul (h), v_h is sampled volume of haul (h) and $Dn_{l,h,s}$ sampled number discarded at length (l) in haul (h) for species (s).

The total number discarded at length per haul and species was summed over the sampled hauls to obtain the total sampled number discarded at length (l) for species (s) over all sampled hauls (h). The total number discarded ($DN_{l,t,s}$) at length (l) per trip (t) and species (s) was calculated by multiplying the total number discarded ($DN_{l,h,s}$) over all sampled hauls with the ratio of total trip duration (U_t) and duration of all sampled hauls (Σu_h).

$$DN_{l,t,s} = \frac{U_t}{\sum u_h} \sum_{h=i}^{h} DN_{l,h,s}$$

The number discarded at length per hour and species ($DN_{l,o,t,s}$) was calculated by dividing the total number at length per trip ($DN_{l,t,s}$) by total trip duration (U_t).

$$DN_{l,o,t,s} = \frac{DN_{l,t,s}}{U_t}$$

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U	total duration	f	fleet
wt	sampled landings weight		
WT	total landings weight		
e	sampled fleet effort in number of trips		
E	total fleet effort in number of trips		
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Raising discards per trip

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The total number discarded at length per haul and species was summed over the sampled hauls to obtain the total sampled number discarded at length (l) for species (s) over all sampled hauls (h). The total number discarded ($DN_{l,t,s}$) at length (l) per trip (t) and species (s) was calculated by multiplying the total number discarded ($DN_{l,h,s}$) over all sampled hauls with the ratio of total trip duration (U_t) and duration of all sampled hauls (Σu_h):

$$DN_{l,t,s} = \frac{U_t}{\sum u_h} \sum_{h=i}^{h} DN_{l,h,s}$$

The number discarded at length per hour and species ($DN_{l,o,t,s}$) was calculated by dividing the total number at length per trip ($DN_{l,t,s}$) by total trip duration (U_t).

$$DN_{l,o,t,s} = \frac{DN_{l,t,s}}{U_t}$$

The obtained number discarded at length per hour ($DN_{l,o,t,s}$) was summed over length to obtain the number discarded per hour ($DN_{o,t,s}$):

$$DN_{o,t,s} = \sum_{l=i} DN_{l,o,t,s}$$

Discarded weight per hour per species at length was calculated using length-weight relationships:

$$DW_{l,o,t,s} = \sum_{l} \left(\frac{DN_{l,o,t,s} * A_s * l^{Bs}}{U_t} \right)$$

where $DW_{l,o,t,s}$ is the weight per length, per hour and per species, $DN_{l,o,t,s}$ is the number discarded at length, per hour and per species and A_s and B_s species specific constants.

Raising landings per trip

The sampled number landed at length per haul and species ($Ln_{l,h,s}$) were summed over all sampled hauls (h) to calculate the sampled number at length for the trip ($n_{l,t,s}$). The total number landed at length for the entire trip ($LN_{l,t,s}$) was calculated by multiplying the sampled number at length for the trip ($Ln_{l,t,s}$) with the ratio of total trip weight obtained from auction or VIRIS data ($WT_{t,s}$) to sampled landings weight of the trip ($wt_{t,s}$):

$$LN_{l,t,s} = \frac{WT_{t,s}}{wt_{t,s}} \left(\sum_{h=i}^{h} Ln_{l,h,s} \right)$$

Number landed at length per hour per species ($LN_{l,o,t,s}$) was calculated by dividing total number landed at length per trip ($LN_{l,t,s}$) by the trip duration (U_t).

$$LN_{l,o,t,s} = \frac{LN_{l,t,s}}{U_t}$$

The obtained total number at length per hour ($LN_{l,o,t,s}$) was summed to calculate number per hour per species ($LN_{o,t,s}$):

$$LN_{o,t,s} = \sum_{l=i} LN_{l,o,t,s}$$

Total landings weight per hour ($LW_{o,t,s}$) was calculated per species by dividing total landings weight ($WT_{t,s}$) per species by total trip duration (U_t).

$$LW_{o,t,s} = \frac{WT_{t,s}}{U_t}$$

Appendix II: Tables and Figures

Table 3.1 Sampling effort per trip sampled. For each trip the number of hauls sampled for landings (L) and discards (D) and total number and total duration are given.

Trip	L	D	Tot	Hrs Tot	% D measured
1	13	25	36	72	70
2	12	13	18	32	72
3	9	9	12	23	75
4	16	19	37	59	50
Total	**50**	**66**	**103**	**186**	

Table 3.2. Total landings (weight) per trip for plaice, sole, cod, whiting, dab, turbot and brill. Based on auctions for trip 1, 2, and 4. Based on observations total landings of first 12 hauls for trip 3.

Trip	Plaice	Sole	Dab	Turbot	Brill	Cod	Whiting
1	2519	2372	339	113	70	37	31
2	135	1522	203	5	8	12	9
3*	246	1517	115	19	20	0	0
4	1587	3838	232	55	113	204	24

Table 3.3. Total weight (kg) of all discards per trip (fish and benthos) and of plaice, sole, dab, cod and whiting.

Trip	All discards	Plaice	Sole	Dab	Cod	Whiting
1	21377	2490	106	2379	0	158
2	4897	36	71	524	0	240
3	1640	23	21	151	0	298
4	46733	2118	845	2214	0	1320

Table 3.4 Numbers of fish discarded per hour.

English name	Dutch name	n
bib	Steenbolk	4.5
Brill	Griet	0.3
Bull-rout	Zeedonderpad	2.0
Dab	Schar	315.8
Dragonet	Pitvis	10.5
Flounder	Bot	0.2
Four-bearded rockling	Vierdradige meun	3.6
Greater sand-eel	Smelt	3.9
Grey gurnard	Grauwe poon	16.0
Hooknose	Harnasmannetje	8.8
John Dory	Zonnevis	0.3
Lemon sole	Tongschar	4.5
Lesser spotted dogfish	Hondshaai	16.6
Lesser weever	Kleine pieterman	19.8
Plaice	Schol	163.7
Poor cod	Dwergbolk	4.3
Red gurnard	Engelse poon	0.8
Roker	Stekelrog	2.7
Scaldfish	Schurftvis	5.7
Smelt	Ammodytes	2.8
Smoothhound	Gladde haai	2.0
Sole	Tong	54.3
Solenette	Dwergtong	8.7
Spotted ray	Gevlekte rog	5.2
Starry ray	Sterrog	7.4
Thickback sole	Dikrugtong	2.1
Tub gurnard	Rode poon	7.9
Whiting	Wijting	131.9

Table 3.5a. Numbers of benthic species discarded per hour.

Scientific Name	Dutch Name	n
Alcyonidium diaphanum	Hanenkam	48.6
Alcyonium digitatum	Dodemansduim	119.0
Anthozoa	Zeeanemonen	138.3
Aphrodita aculeata	Fluwelen zeemuis	20.0
Ascidiacea	Zakpijp	486.4
Asterias rubens	Zeester	11,778
Astropecten irregularis	Kamster	16.3
Buccinum undatum	Wulk	4.9
Cancer pagurus	Noordzeekrab	5.4
Corystes cassivelaunus	Helmkrab	26.6
Crangon crangon	Gewone garnaal	3.0
Echinocardium sp.	Hartegels	2.2
Hyas sp.	Spinkrab	77.5
Liocarcinus depurator	Blauwpootzwemkrab	0.1
Liocarcinus holsatus	Gewone zwemkrab	3,141
Mustelus sp.	Mustelus	0.3
Necora puber	Fluwelen zwemkrab	97.9
Ophiura ophiura	Slangster	201.5
Pagurus bernhardus	P. bernhardus	805.1
Pagurus sp.	Pagurus sp.	56.1
Raja sp.	Rog indet	0.6

Table 3.5 b. Numbers of *Asterias rubens* and *Liocarcinus holsatus* discarded per hour per trip.

trip	Asterias rubens (n/hr)	Liocarcinus holsatus (n/hr)
1	213.753	183.0242
2	173.6311	161.7476
3	30.83408	113.0314
4	46695.52	12109.9

Table 4.1: Comparison of discard percentages of plaice and sole with those of conventional beam trawls in the years 2005, 2006, and 2007 (van Keeken, 2006; van Helmond and van Overzee, 2007, 2008).

	% D Plaice		% D Sole	
	n	w	n	w
BT 2005	83	52	23	11
BT 2006	86	54	29	13
BT 2007	77	46	23	10
TX68	74	49	21	9

Table 3.6. Plaice. Landings (L), discards (D), and percentage discards (%D) per hour in numbers (left) and weight (right).

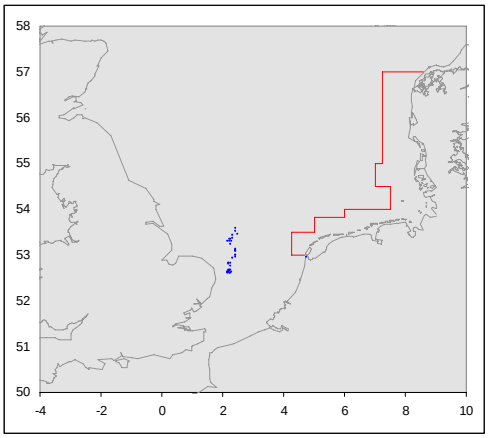
	Numbers			Weight		
Trip	**L**	**D**	**%D**	**L**	**D**	**%D**
1	106	333	76	35	34	50
2	14	13	47	4	1	21
3	43	9	18	11	1	9
4	70	300	81	27	36	57
Mean	**58**	**164**	**74**	**19**	**18**	**49**

Table 3.7. Sole. Landings (L), discards (D), and percentage discards (%D) per hour in numbers (left) and weight (right).

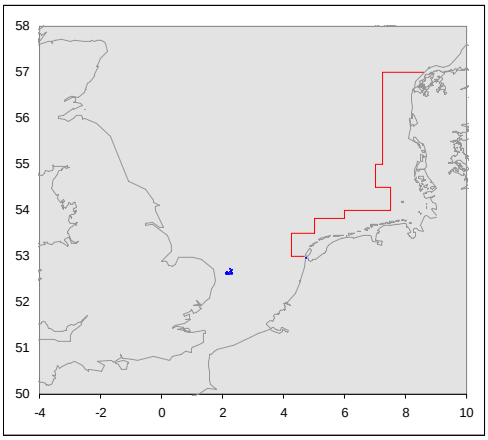
	Numbers			Weight		
Trip	**L**	**D**	**%D**	**L**	**D**	**%D**
1	142	19	12	33	1	4
2	211	25	11	47	2	4
3	220	14	6	66	1	1
4	259	160	38	65	14	18
Mean	**208**	**54**	**21**	**53**	**5**	**9**

Figure 2.1. Location of fishing trips

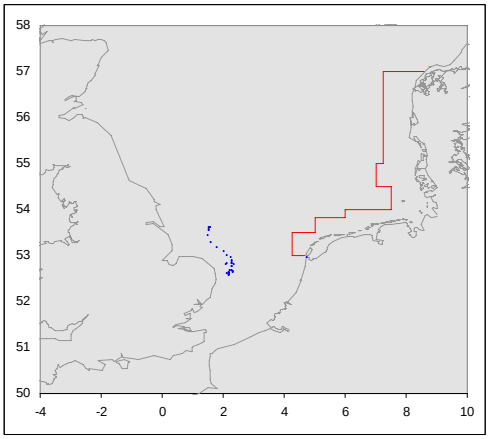
Trip 1: week 26



Trip 2: week 27



Trip 3: week 35



Trip 4: week 36