

# Wageningen IMARES

## Institute for Marine Resources & Ecosystem Studies

Location IJmuiden  
P.O. Box 68  
1970 AB IJmuiden  
The Netherlands  
Tel.: +31 255 564646  
Fax: +31 255 564644

Location Yerseke  
P.O. Box 77  
4400 AB Yerseke  
The Netherlands  
Tel.: +31 113 672300  
Fax: +31 113 573477

Location Texel  
P.O. Box 167  
1790 AD Den Burg Texel  
The Netherlands  
Tel.: +31 222 369700  
Fax: +31 222 319235

Internet: [www.wageningenimares.wur.nl](http://www.wageningenimares.wur.nl)  
E-mail: [imares@wur.nl](mailto:imares@wur.nl)

## Report

C061/06

### Discard sampling of the Dutch beam trawl fleet in 2005

Ir. O.A. van Keeken

Commissioned by: Ministerie van Landbouw, Natuur en Voedselkwaliteit  
Postbus 20401  
2500 EK Den Haag

Project number: 4.39.12130.01

|                    |    |
|--------------------|----|
| Number of copies:  | 16 |
| Number of pages:   | 54 |
| Number of tables:  | 28 |
| Number of figures: | 10 |
| Number of annexes: | 2  |

Wageningen UR (Wageningen University and Research Centre) and TNO have combined forces in Wageningen IMARES. We are registered in trade register of the Chamber of Commerce Amsterdam no. 34135929 VAT no. NL 811383696B04.



The management of Wageningen IMARES accepts no responsibility for the follow-up damage as well as detriment originating from the application of operational results, or other data acquired from Wageningen IMARES from third party risks in connection with this application.

This report is drafted at the request of the commissioner indicated above and is his property. Nothing from this report may be reproduced and/or published by print, photoprint microfilm or any other means without the previous written consent from the commissioner of the study.

---

## Table of Contents

|                                       |    |
|---------------------------------------|----|
| Summary.....                          | 3  |
| Samenvatting.....                     | 4  |
| 1. Introduction .....                 | 5  |
| 2. Methods .....                      | 6  |
| 2.1 Sampling procedures .....         | 6  |
| 2.2 Raising procedures .....          | 6  |
| 3. Results .....                      | 8  |
| 3.1 Sampling.....                     | 8  |
| 3.2 Numbers and weight .....          | 8  |
| 3.3 Species.....                      | 8  |
| 4. Discussion .....                   | 10 |
| Acknowledgements .....                | 12 |
| References .....                      | 13 |
| Appendix I: Raising procedures.....   | 15 |
| Appendix II: Tables and Figures ..... | 18 |

## Summary

This report contains results of the discards sampling program on the Dutch beam trawl fishery in the North Sea in 2005. The programme was instigated in 2002 as part of the EC regulations 1543/2000 and 1639/2001 on data collection in European fisheries. Beam trawlers with engine power larger than 300 HP fishing with 80 mm mesh size are the largest part of the Dutch fleet and take most of the plaice and sole landings from the North Sea. Fish under the minimum landing size and benthic animals have to be returned to the sea. This practice is called discarding. In 2005, nine trips with beam trawl vessels were sampled for discards by observers on vessels larger than 300 HP. Eight vessels were fishing with 80 mm mesh size and one with 100 mm mesh size. The spatial distribution of fishing effort of the Dutch beam trawl fleet larger than 300 HP fishing with 80 mm mesh size was similar to the effort distribution in the discard sampling. Samples of the discards and landings were counted and measured, and raised to catches per hour, per trip, per quarter and per year.

The major fish species in the discards were dab (*Limanda limanda*) and plaice (*Pleuronectes platessa*). In 2005, the percentage plaice discards for large beam trawlers fishing with 80 mm mesh size was on average 83% of the total catch in numbers and 52% in weight. For the vessel fishing with 100 mm the percentage plaice discards was 22% in number and 8% in weight. The percentage discards for sole was on average 23% in numbers and 11% in weight for the 80mm fleet (the 100 mm does not target sole).

The percentage discarding of plaice in 2005 appeared to be as high as from 1999-2004 (on average 80% in number, 50% in weight), which is higher compared to the period 1976-1990 (42%-53% in numbers, 18%-31% in weight). In 2004 the trip on a vessel with 100 mm showed lower discards compared to the trip in 2005, but this vessel was operating in the area of the Dogger bank, where the abundance of juvenile plaice is low. There was no apparent trend in discard percentage of sole in number and weight in 2005 compared to previous years.

Length frequency distributions showed that smaller plaice were being caught in recent periods compared to 1976-1990. This is thought to be caused by an observed shift in spatial distribution of small plaice to more offshore areas, whereby they become available to the beam trawl fleet.

## Samenvatting

Dit rapport bevat de resultaten van het discardsbemonsteringsprogramma van de Nederlandse boomkorvisserij in de Noordzee in 2005. Het programma wordt sinds 2002 op deze wijze uitgevoerd als invulling van EC regelingen 1543/2000 en 1639/2001 voor gegevensverzameling in Europese visserijen. Nederlandse boomkorschepen met een motorvermogen groter dan 300 PK met 80 mm maaswijdte zijn verantwoordelijk voor de meeste schol en tong aanlandingen uit de Noordzee. De ondermaatse vis en bodemdieren moeten worden teruggezet in de zee, hetgeen *discarding* genoemd wordt. In 2005 zijn negen reizen met boomkorschepen bemonsterd voor discards. Hiervan werden acht reizen uitgevoerd aan boord van schepen met een motorvermogen groter dan 300 PK vissend met 80 mm maaswijdte, en één aan boord van een schip met 100 mm maaswijdte. De ruimtelijke verdeling van de visserij-inspanning van de boomkorvisserij groter dan 300 PK vissend met 80 mm maaswijdte was vergelijkbaar met de verdeling van de visserij-inspanning in het bemonsteringsprogramma. De discards en de aanlandingen werden geteld en gemeten en vervolgens opgewerkt tot vangsten per visuur, per reis, per kwartaal en per jaar.

De discards in de boomkorvisserij bestaan voornamelijk uit schar (*Limanda limanda*) en schol (*Pleuronectes platessa*). Het percentage discards van schol was in 2005 voor 80 mm gemiddeld 83% in aantallen en 52% in gewicht. Voor het schip vissend met 100 mm maaswijdte was het discardspercentage van schol 22% in aantal en 8% in gewicht. Voor tong was het percentage discards gemiddeld 23% in aantal en 11% in gewicht voor grote kotters met 80 mm maaswijdte.

Het percentage discards van schol in 2005 lijkt even hoog te zijn als in de afgelopen jaren 1999-2004 (ongeveer 80% in aantal, 50% in gewicht), wat hoger is in vergelijking met de periode 1976-1990 (42%-53% in aantal, 18%-31% in gewicht). In 2004 had het schip vissend met 100 mm lagere discards in vergelijking met de reis in 2005, maar dat schip viste toen op de Doggerbank, waar de abundantie van jonge schol laag is. Er was geen duidelijke trend in percentage discards van tong in aantal en gewicht in 2005 in vergelijking met de voorafgaande periode.

De lengteverdelingen van schol laten zien dat in recente periodes gemiddeld kleinere schol werd bijgevangen dan in de periode 1976-1990. Deze verandering hangt waarschijnlijk samen met een verandering in de ruimtelijke verspreiding van ondermaatse schol, waardoor deze nu verder uit de kust voorkomt en daarom beschikbaar is voor de visserij.

# 1. Introduction

Most demersal fisheries are mixed fisheries, targeting a limited number of species and sizes. In general other catches will be thrown overboard, a practice called discarding (Van Beek, 1998). Worldwide the annual fish catch was estimated at 84 million tonnes for 1992-2001 with a discard rate of 8 percent in weight, resulting in an estimated 7.3 million tonnes of discards worldwide (FAO, 2004). This estimate was considerable lower than the previous estimate for 1988-1990 (Alverson et al., 1994), when worldwide discarding was estimated between 17.9 en 39.5 million tonnes annually. This reduction in discarding was due to the use of more selective fishing gears, introduction of bycatch and discard regulations and increased retention of bycatch for human or animal food (FAO, 2004).

Discarding can be highly variable in space and time caused by changing economic, biological, environmental or social factors (ICES, 2004b; Catchpole et al., 2005). There are many types of discards:

- specimens of commercial species below the minimum legal landing size
- over-quota fish which is not allowed to be landed when this result to exceeding legal quota
- bycatch species of no commercial value
- fish with an undesired quality, high-grading

Discarding is an important issue in fisheries management, both from an ecosystem as well as a stock assessment point of view. Discarding leads to lower profits from fish stocks, because generally a large part of the discards will not survive the catching and sorting process (Van Beek et al., 1990; Jennings and Kaiser, 1998). Discards, however, also form an important food item for other organisms like birds (Camphuysen and Garthe, 2000) and benthic invertebrates (Lindeboom and De Groot, 1998) and affect their population dynamics. Discarding, and more important the variation in discarding, may result in bias in fish stock assessments when these assessment are based only on landings numbers at age (Pastoors et al., 2000). To date, in the North Sea fisheries, discards are only incorporated into a few stock assessments (ICES, 2002, 2004c, a) but the intention is to incorporate discards estimates for all stocks where relevant information becomes available.

One of the main fisheries in the southern North Sea is the Dutch beam trawl fishery, targeting mainly sole (*Solea solea*) and plaice (*Pleuronectes platessa*). Trips made with beam trawl vessels between 1976 and 1990 showed great variation in the quantity of plaice discarded (18-31% by weight (Van Beek, 1998)). Recent sampling suggested that the percentage of plaice discarded has increased to around 50% in weight (80% in numbers) (Van Keeken et al., 2003; Van Keeken and Pastoors, 2004). Since the end of the 1990's a change in the distribution of smaller plaice towards deeper water occurred (ICES, 1999; Grift et al., 2004; Van Keeken et al., 2004b) making small plaice more abundant on commercial fishing grounds and more susceptible to fishing (Pastoors et al., 2000; Grift et al., 2004). The discard percentage of plaice also increased due to declining biomass of marketable fish (Pastoors et al., 2000; ICES, 2002).

From 1999 to 2001 discarding practices of the Dutch beam trawl fleet in the North Sea were monitored within an EC funded international research project (Anon., 2002). From 2002 onwards discards data have been collected under the EC Data Collection Regulations 1543/2000 and 1639/2001 (EC., 2000, 2001; Anon., 2002; ICES, 2003). This report gives an overview of the results of the Dutch demersal discard sampling program for 2005, which focuses mainly on vessels larger than 300 HP fishing with 80 mm mesh size.

## 2. Methods

### 2.1 Sampling procedures

Selection of the vessels is quasi-random and based on co-operative sampling (ICES, 2000). This means that co-operation of a skipper with the project is on voluntarily basis. On forehand it is difficult to predict the sampling location, since this depends on the fishing strategy of the skipper. However vessels from different regions are selected during a quarter to obtain widespread coverage. During 2005 a total of nine trips were made on board beam trawl vessels with engine power larger than 300 HP (221 kW), eight of which were fishing with 80 mm mesh size and one with 100 mm.

For a discard sampling trip, two observers went onboard a vessel, sampling at least 60% of the hauls (Van Beek, 2001). For each sampled haul, a sub-sample of the discards was measured. All fish in the sub-sample were counted and measured. Benthic invertebrates were only counted. Total and sampled volume of discards was recorded. Also sub-samples of the landed fish were measured, and total and sampled landings weight were recorded. If possible, otoliths were collected from the major discarded fish species (plaice, sole, dab, cod, whiting) for age readings. All data was entered into a computer program on haul-by-haul basis and later transported into a central database.

### 2.2 Raising procedures

This paragraph gives a short description of the raising procedures used to work up the raw data to annual estimates of discards in the beam trawl fleet. 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, and for some species at age, 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 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.

Average numbers landed and discarded at length per trip were then calculated per period (quarter or year) by summing the numbers at length per hour over the number observer trips in this period and dividing this by total number of trips in this period. Numbers at age were calculated from numbers at length using age-length keys, which calculate the proportion of fish at length ( $l$ ) with age ( $a$ ). Numbers at age landed and discarded by the fleet were calculated by multiplying total numbers at age in the sampled trips with the ratio of hpeffort (effort in days at sea multiplied by the engine power of the vessel in HP) of the fleet to hpeffort of the sampled trips. Discards were also raised by the ratio of numbers of trips in the fleet to number of trips sampled for comparison, because the evaluation of the discards program (Van Keeken et al. 2006), which is still ongoing, showed that raising by number of trips results in less variance then raising by hpeffort.



## 3. Results

### 3.1 Sampling

In 2005 a total of nine trips with beam trawl vessels were sampled for discards. Eight trips were carried out on large vessels with engine power between 1467-1471 KW (1991-1997 HP) using 80 mm mesh and one trip on a vessel with engine power of 1823 KW (2474 HP) using 100 mm mesh (Table 3.1.1).

The total number of hauls in the trips varied between 34 and 46, with an average fishing duration of 79 hours per trip (Table 3.1.2.). 82% of all hauls were sampled for discards and 62% for landings. Otoliths of plaice (260 otoliths) and sole (229 otoliths) were collected from the discards samples.

Per quarter between 0.08% and 0.22% of the effort (in days at sea) of the Dutch beam trawl fleet with engine power larger than 300 HP fishing with 80 mm mesh size was sampled (Table 3.1.3a). Fleet coverage by year was 0.17% in days at sea for this fleet segment (Table 3.1.3a), while for the 100 mm mesh size segment 0.86% was sampled in days at sea (Table 3.1.3b).

The spatial distribution of fishing effort of the Dutch beam trawl fleet larger than 300 HP is shown in Figure 3.1.1a for the segment fishing with 80 mm mesh, and in Figure 3.1.2a for the segment fishing with 100 mm mesh and larger. The 80 mm fleet is mainly distributed offshore from the Dutch coast, while the 100 mm and larger fleet are distributed more northerly.

The distribution of all sampled vessels is presented in Figure 3.1.1. This shows that the spatial distribution of sampling effort covers the major areas for the whole fleet. Because only one vessel larger than 300 HP with 100 mm mesh size was sampled, effort distributions could only be compared for few rectangles.

### 3.2 Numbers and weight

The total landings weight by trip for 80 mm vessels varied between 1075 and 8626 kg for plaice and 1067 and 2526 kg for sole (Table 3.2.1a). For the trip with 100mm mesh the landed weight of plaice was 9102 kg and 37 kg for sole. Sampled landings weight varied for plaice between 47 and 237 kg in all trips and for sole between 47 and 217 kg in trips with 80 mm mesh size (Table 3.2.1b). No sole landings were measured in the trip with 100 mm mesh size.

The average weight of all discards on the observed vessels (both fish and invertebrate discards) in the 80mm fishery was estimated to be 27 tonnes per trip (CV 22%, Table 3.2.2). About 24% of the catch weight consisted of fish landings and 26% of fish discards (Figure 3.2a). Dab and plaice were the most abundant fish species in the discards (Table 3.2.3a, Figure 3.2b). Brittle stars, common starfish, swimming crab and hermit crab were the most abundant benthos species (Table 3.2.3b).

Total weight of the discards on the trip with 100mm mesh was estimated to be 49 tonnes. Dab was the most abundant fish species in the discards. Plaice discards were 835 kg during the trip, which was lower compared to the 80 mm trips. No sole were discarded.

### 3.3 Species

#### Plaice

On average 3959 kg of plaice was discarded per trip by the beam trawlers fishing with 80 mm mesh (CV 69%, Table 3.2.2), while this was lower on the vessel fishing with 100 mm mesh (835 kg). The average number per hour discarded was 710 compared to 143 individuals landed. This resulted in an average discard percentage of 83% in numbers and 52% in weight. The



average discard percentage per quarter varied between 78% and 91% in numbers and 43% and 67% in weight (Table 3.3.2). Between rectangles, the number discarded per hour varied between 160 and 1225 (Figure 3.3.1a).

The percentage plaice discards on the vessel fishing with 100 mm mesh was 22% in numbers and 8% in weight (Table 3.3.1). The variation in discard catch per unit of effort between rectangles was 63 to 288 individuals per hour (Figure 3.3.1b).

Plaice were caught from 10 cm onwards with 80 mm mesh size, while for 100 mm mesh size plaice were caught from 18 cm onwards (Table 3.3.3). The peak of the discard length distribution was around 18 cm for 80 mm mesh (Table 3.3.3, Figure 3.4.1) and 23 cm for the 100 mm mesh (Table 3.3.3, Figure 3.4.2). Plaice were discarded up to 30 cm whereas the minimum landing size is 27 cm. Most discards were between ages 1 to 4, with the highest number on age 2 (2003 year class). The strong 2001 yearclass, in 2005 at the age of 4, was the most apparent in the landings (Table 3.3.4).

Landings and discards in numbers at age were raised to fleet level for vessels larger than 300 HP and are presented in Table 3.3.5.

### **Sole**

On average 192 kg of sole was discarded per trip by beam trawls vessels fishing with 80 mm mesh (CV 52%, Table 3.2.2). For all trips, landings were higher than discards (Table 3.3.6). The average discard percentage was 23% in number and 11%. The variation by quarter was between 10% and 32% in number and 6% and 15% in weight (Table 3.3.7).

The large vessel with 100 mm mesh had no discards and minor landings.

The peak of the discard length distribution was around 22 cm (Table 3.3.8, Figure 3.4.1). Sole were discarded up to 27 cm. Most sole discards were between ages 1 and 3, with most discards being age 3 (Table 3.3.9). Landings and discards in numbers at age were raised to fleet level for vessels larger than 300 HP (Table 3.3.10).

### **Dab**

On average 3863 kg of dab was discarded per trip by beam trawl vessels fishing with 80 mm mesh (CV 63%, Table 3.2.2). Per hour on average 52 kg was discarded on vessels fishing with 80mm mesh size compared to 6 kg landed, while 137 kg was discarded to 12 landed for the vessel with 100 mm (Table 3.3.11). The average discard percentage was 95% and 96% in numbers and 90% and 92% in weight for the 80 mm and 100 mm mesh fishery respectively. Per quarter the discard percentage varied in weight between 80% and 93% in weight (Table 3.3.12)

### **Cod**

On average 19 kg of cod were discarded per trip by beam trawl vessels fishing with 80 mm mesh (CV 147%, Table 3.2.2). Per hour less than 1 kg cod was discarded (Table 3.3.13). The average discard percentage was 28% in weight. The estimate however is highly uncertain because of the low catches, expressed by the discard percentage in weight per quarter varying between 0% and 45% for large vessels (Table 3.3.14).

### **Whiting**

On average 157 kg of whiting was discarded per trip by beam trawl vessels fishing with 80 mm mesh (CV 76%, Table 3.2.2). Discards were higher than landings with less than 1 kg whiting landed to 2 kg discarded per hour for vessels with 80 mm mesh (Table 3.3.15). The average discard percentage was 85% in number and weight for large vessels. Per quarter the discard percentage in weight was highly variable and varied between 31% and 98% (Table 3.3.16).

## 4. Discussion

The discards sampling programme for the Dutch beam trawl fleet in 2005 was instigated as part of the EC regulations 1543/2000 and 1639/2001 on data collection in European fisheries. In 2005, a total of nine trips on large beam trawlers with engine power larger than 300 HP were sampled. Eight of these were fishing with 80 mm cod-end mesh size, and one was using 100 mm mesh size.

Although the discard sampling program of vessels larger than 300 HP covers the most important fleet fishing for North Sea plaice and sole, it does not entirely cover the fishing grounds of this fleet. This fleet takes most of the plaice and sole landings in the North Sea. Because of the limited coverage of the fleet (coverage of 0.15% in hpeffort), the spatial distribution of fishing effort of this fleet cannot be fully covered. While the total sampling program covers most North Sea areas, not every ICES rectangle can be sampled each quarter or even year. The area north of 54.5° N was underrepresented in the sampling whereas this is still an important area for both plaice and sole fisheries. We think, however, that the areas most important for discarding were covered.

Plaice is the most important target species of the Dutch beam trawl fishery next to sole. The discard percentage of plaice in 2005 was on average 83% in numbers and 52% in weight, which is a similar percentage as in previous years. During 2002-2003 the strong 2001 yearclass dominated the discards fraction. In 2005 this yearclass, at the age of 4, was still present in the discard fraction, but in lower quantities. In 2004 most landings were from this year class. This year (2005) the 2001 year class is still the most abundant year class in the landings.

Although the discard percentage of plaice observed in 2005 is similar to recent years, the percentages are higher than that observed during 1976-1990 (51% in numbers and 27% in weight, Table 4.1). Since the late 1990's a shift in the spatial distribution of juvenile plaice is apparent, through which relatively small plaice move outside the 12-miles zone and plaice box, towards deeper, more offshore water. As a consequence, they earlier recruit on the fishing grounds at a smaller sizes (Pastoors et al., 2000; Grift et al., 2004; Van Keeken et al., 2004a; Van Keeken et al., Submitted). The smallest size of the plaice caught in recent discards trips corresponds to those lengths at which plaice in the 1970s and '80s were only caught inside the 12-mile zone and the plaice box, a coastal nursery area for plaice which is now closed to larger beamers (Rijnsdorp and Van Beek, 1991; ICES, 1999; Van Keeken and Pastoors, 2004). The more offshore distribution could be caused by changes in water temperature, predation risk, or intra- and inter-specific competitive interactions (Van Keeken et al., 2004b; Van Keeken et al., Submitted). Also the decrease in landings contributed to the increase in plaice discard rates (Table 4.1).

The discard percentage of sole in 2005 was within the range of discard percentages observed in earlier years (23% in numbers and 11% in weight, Table 4.3). The amount of sole discarded and landed was around the same as in 2003. Most discards were from the 2002 year class, in 2005 at the age 3. This year class also dominated the discards in 2004 (Van Keeken and Pastoors, 2005).

This year, average discard percentages were estimated in a somewhat different manner but differences in discards percentage between both methods were small. In previous years, the trip duration was taken into account for estimating the average number of landings and discards per hour over all sampled trips (see Table 4.2 for plaice and Table 4.4 for sole). This would imply that a trip with longer duration has more influence on the calculation of numbers at age. This year each trip was taken as a single observation to get rid of this effect. For raising discards to fleet level, different raising procedures can be used. Since engine power and catches are correlated, the ratio of hpeffort by fleet to hpeffort by sampled vessels was chosen

for raising the Dutch discards data. Another procedure is raising by the ratio of number of trips, which does not take the relation between engine power and catch into account. Differences between both raising procedures are eventually 4.5% for plaice and 7.5% for sole (Figure 4.1).

The catches of cod were very low, as was observed in previous years. It is very clear that the absolute numbers caught have decreased substantially compared to the 1970s and 1980s (Van Keeken and Pastoors, 2004). The main reason for the low cod catch is a depleted stock in the southern part of the North Sea where the beam trawlers operate. The discard rates calculated from these low catch numbers cannot be estimated with sufficient precision and are not representative for the fleet. Also the sampled fleet is probably not representative for cod since a large part of the cod landings by beam trawlers is from vessels using chain-mats instead of tickler chain. These vessels were not included in the sample because on board observers could not get access.

Up to 2003 discards have only been included into the stock assessments carried out by ICES of haddock and whiting (ICES, 2002), but from 2004 a discards time series has also been used in the assessment of North Sea plaice. This time series was reconstructed using a modeling approach using historical discard observations for calibration and recent observations from discards trips during 1999-2004 (ICES, 2004c, 2005; Van Keeken et al., 2005). In 2004 recent observations were derived only from the Dutch sampling programme. In 2005 also English observations were used from beam trawls and otter trawls.

In 2004 the Dutch fisheries sector through "Produktschap Vis<sup>1</sup>" instigated a discards self-sampling programme (plaice only), whereby plaice discards were measured weekly onboard of a dozen commercial trawl vessels by fishermen themselves (detailed by week and area). Twice a week the volume of both discards and landings were measured from a single haul. The fisheries industry discards sampling programme covers the spatial and temporal variation, while research sampling yields the required level of detail and ensures the quality of the data. The combination of both sampling programmes can achieve an adequate sampling programme. From 2006 onwards the industry program is extended with measuring the length of plaice and with measuring cod discards and landings. The results were not available yet.

---

<sup>1</sup> The Dutch Fish Product Board

## Acknowledgements

We would like to thank the skippers for their co-operation with the project. We would also like to thank Simon Rijs, Gerrit Rink, Mario Stoker, Kees Groeneveld, Andre Dijkman-Dulkes, Arie Kraayenoord, Dirk den Uijl, Floor Quirijns, Lorna Teal, Betty van Os-Koomen, Marcel de Vries, Eric Visser and Eric Jagtman for their hard work on board of the vessels.

This project is funded under EU funding 2000/439; collection of fisheries data under the Common Fisheries Policy.

## References

- Alverson, D. L., M. H. Freeberg, J. P. Pope and S. A. Murawski. 1994. A global assessment of fisheries bycatch and discards. FAO Fisheries Technical Paper. NO. 339. Rome, FAO: 233 p.
- Anon. 2002. Monitoring discarding and retention on fishing vessels towing demersal gears in the North Sea and Skagerrak, EC Project:98/097: 143 p.
- Camphuysen, C. J. and S. Garthe (2000). Seabirds and commercial fisheries: population trends of piscivorous seabirds explained? Effects of fishing on non-target species and habitats, biological conservation and socio-economic issues. M. J. Kaiser and S. J. De Groot, Blackwell Science: 163-184.
- Catchpole, T. L., C. L. J. Frid and T. S. Gray. 2005. Discards in North Sea fisheries: causes, consequences and solutions. *Marine Policy* 29: 421-430.
- 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. 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 and laying down detailed rules for the application of Council Regulation (EC) No 1543/2000. No. 1639/2001.
- FAO. 2004. The state of world fisheries and aquaculture. Rome, FAO: 153 p.
- Griff, R. E., I. Tulp, L. Clarke, U. Damm, A. McLay, S. Reeves, J. Vigneau and W. Weber. 2004. Assessment of the ecological effects of the Plaice Box. Report of the European Commission Expert Working Group to evaluate the Shetland and Plaice boxes. Brussels: 121 p.
- ICES. 1999. Workshop on the evaluation of the plaice box, IJmuiden, 22-25 June 1999. ICES CM 1999/D:6.
- ICES. 2002. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, Copenhagen, Denmark, 11-20 June 2002. ICES CM 2003/ACFM:02.
- ICES. 2003. Report of the planning group on commercial catch, discards and biological sampling, Rome, Italy, 4-7 March 2003. ICES CM 2003/ACFM:16.
- ICES. 2004a. Report of the ICES Advisory Committee on Fishery Management and Advisory Committee on Ecosystems, 2004, ICES Advice 1 (2): 1520 p.
- ICES. 2004b. Report of the planning group on commercial catch, discards and biological sampling, 2-5 March, Mallorca, Spain. ICES CM 2004/ACFM:13.
- ICES. 2004c. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, Bergen, Norway, 7-16 September 2004. ICES CM 2005/ACFM:07.
- ICES. 2005. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 6-15 September 2005, ICES headquarters Copenhagen. ICES CM 2006/ACFM:09.
- Jennings, S. and M. J. Kaiser. 1998. The effects of fishing on marine ecosystems. *Advances in Marine Biology* 34: 201-352.

- 
- Lindeboom, J. J. and S. J. De Groot. 1998. The effects of different types of fisheries on the North Sea and Irish Sea benthic ecosystems., Z-Rapport 1998-1/RIVO-DLO Report C003/98: 408 p.
- Pastors, M. A., A. D. Rijnsdorp and F. A. Van Beek. 2000. Effects of a partially closed area in the North Sea ("plaice box") on stock development of plaice. ICES Journal of Marine Science 57: 1014-1022.
- Rijnsdorp, A. D. and F. A. Van Beek. 1991. The effects of the "plaice box" on the reduction in discarding and on the level of recruitment of North Sea sole. ICES C.M. 1991/G:47.
- Van Beek, F. A. 1998. Discarding in the Dutch beam trawl fishery. ICES CM 1998/BB:5.
- Van Beek, F. A. 2001. Offerte voor het verzamelen en beheren van gegevens die essentieel zijn voor het gemeenschappelijk visserij beleid. RIVO offerte 01.063. IJmuiden, RIVO: 38 p.
- Van Beek, F. A., P. I. Van Leeuwen and A. D. Rijnsdorp. 1990. On the survival of plaice and sole discards in the otter-trawl and beam-trawl fisheries in the North Sea. Netherlands Journal of Sea research 26(1): 151-160.
- Van Keeken, O. A. and M. A. Pastors. 2004. Discard sampling of the Dutch beam trawl fleet in 2003. IJmuiden, CVO report nr 04.024: 55 p.
- Van Keeken, O. A. and M. A. Pastors. 2005. Discards sampling of the Dutch beam trawl fleet in 2004. IJmuiden, CVO report 05.006: 56 p.
- Van Keeken, O. A., M. A. Pastors and A. D. Rijnsdorp. 2005. Discard reconstruction method used in the assessment of North Sea plaice in 2004. IJmuiden, RIVO report C032/05: 20 p.
- Van Keeken, O. A., J. J. Poos and M. A. Pastors. 2003. Discard sampling of the Dutch beam trawl fleet in 2002. IJmuiden, CVO report 04.010: 46 p.
- Van Keeken, O. A., F. J. Quirijns and M. A. Pastors. 2004a. Analysis of discarding in the Dutch beamtrawl fleet. IJmuiden, RIVO report C034/04: 96 p.
- Van Keeken, O. A., M. Van Hoppe, R. E. Grift and R. A.D. Submitted. The implications of changes in the spatial distribution of juveniles for the management of North Sea plaice (*Pleuronectes platessa*).
- Van Keeken, O. A., M. Van Hoppe, R. E. Grift and A. D. Rijnsdorp. 2004b. The effect of changes in the spatial distribution of juvenile plaice (*Pleuronectes platessa*) in the North Sea on the management of its stocks. ICES C.M. 2004/K:25.

## Appendix I: Raising procedures

**Table I.** 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                                      | o          | hour        |
| 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 ( $\sum u_h$ ).

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

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:

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

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 ( $LN_{l,t,s}$ ). 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 ( $U_t$ ).

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

### Numbers at length, per quarter and year

The number of discards and landings ( $CN_{l,o,p,s}$ ) at length per hour was calculated per quarter/year by summing the number landings or discards at length per hour per trip ( $CN_{l,o,t,s}$ ) over all trips in that period ( $p$ ) and then dividing this by the total number of trips ( $U_t$ ) in this period:

$$CN_{l,o,p,s} = \left( \sum_p CN_{l,o,t,s} \right) / \sum_p U_t$$



Total numbers discards or landings ( $CN_{o,p,s}$ ) were calculated by summing over length. Trips were excluded from calculation numbers per hour per period if landings were not measured during a trip, but auction records existed for this species.

$$CN_{o,p,s} = \sum_{l=i} CN_{l,o,p,s}$$

### Numbers at age, per quarter and year

The age structure of both plaice and sole discard and landings was calculated by distribution of numbers at length over age groups using age-length-keys (ALK). The number landed and discarded ( $CN_{l,a,t,s}$ ) at length and age per trip and species was calculated by distribution of the proportion ( $f_{l,a}$ ) of fish at length (l) with age (a) over the number ( $CN_{l,t,s}$ ) at length per trip and species. Because  $f_{l,a}$  is dependent on the period, ALK were taken from discards and market samples from the quarter where discards were sampled.

$$CN_{l,a,t,s} = f_{l,a} * CN_{l,t,s}$$

The number landed and discarded ( $CN_{a,t,s}$ ) at age per trip and species was calculated by multiplying the number landed and discarded ( $CN_{l,a,t,s}$ ) at length and age per trip and species over length:

$$CN_{a,t,s} = \sum_{l=i} CN_{l,a,t,s}$$

The number of discards and landings ( $CN_{a,o,p,s}$ ) at age per hour was calculated per quarter/year by summing the number of landings or discards at age per hour per trip ( $CN_{a,o,t,s}$ ) over all trips in that period (p) and then dividing this by the total number of trips ( $U_t$ ) in this period:

$$CN_{a,o,p,s} = \left( \sum_p CN_{a,o,t,s} \right) / \sum_p U_t$$

### Numbers at age, per quarter and year per fleet

Total landings or discards ( $CN_{a,p,s,f}$ ) at age per quarter/year were calculated for the entire fleet by multiplying the total numbers of discards and landings ( $CN_{a,p,s}$ ) at age per quarter/year with the ratio effort of the entire fleet ( $E_{p,f}$ ) per quarter/year measured in Hpeffort (proportion fishing duration per day multiplied with engine power) to the effort of the sampled part of the fleet in Hpeffort per quarter ( $e_{p,f}$ ).

$$CN_{a,p,s,f} = \frac{E_{p,f}}{e_{p,f}} CN_{a,p,s}$$

Trips were excluded from calculation numbers per hour per period if landings were not measured during a trip, but auction records existed for this species.

## Appendix II: Tables and Figures

**Table 3.1.1.** Characteristics per trip sampled in 2005. For each vessel the engine power in KW, the mesh size in mm and sampled ICES rectangles are presented.

| Mesh | Vessel | KW   | Quarter | Sampled ICES rectangles                         |
|------|--------|------|---------|---|
| 80   | 61     | 1471 | 1       | 36/F4, 36/F5, 37/F5, 37/F6, 38/F6               |
|      | 62     | 1467 | 1       | 33/F2, 33/F3,                                   |
|      | 63     | 1467 | 2       | 33/F3, 33/F4, 34/F3, 34/F4                      |
|      | 65     | 1471 | 3       | 35/F3, 36/F3,                                   |
|      | 66     | 1469 | 3       | 36/F0, 36/F1, 37/F0, 37/F1                      |
|      | 67     | 1467 | 4       | 34/F3, 34/F4, 35/F2, 35/F3, 35/F4, 36/F2, 36/F3 |
|      | 68     | 1467 | 4       | 33/F4, 34/F3, 34/F4, 35/F3, 35/F4               |
|      | 69     | 1471 | 4       | 35/F3, 35/F4, 36/F3                             |
| 100  | 64     | 1823 | 2       | 38/F2, 38/F3, 39/F2, 39/F3, 40/F3, 40/F4        |

**Table 3.1.2.** Sampling effort per trip sampled in 2005. For each trip the duration and number of hauls sampled for landings and discards and total duration and number of hauls for the total trip are given, and the number of plaice and sole otoliths taken from the discard fraction.

| Mesh size | Vessel        | Number of hauls |            |            | Duration (hour) |            |            | Plaice     | Sole       |
|-----------|---------------|-----------------|------------|------------|-----------------|------------|------------|------------|------------|
|           |               | Land            | Disc       | Tot        | Land            | Disc       | Tot        | Otolith    | Otolith    |
| 80        | R61           | 38              | 41         | 46         | 78              | 84         | 95         | 48         | 37         |
|           | R62           | 34              | 34         | 41         | 69              | 69         | 83         | 45         | 32         |
|           | R63           | 32              | 32         | 41         | 62              | 62         | 80         | 31         | 25         |
|           | R65           | 34              | 34         | 45         | 56              | 56         | 75         | 25         | 25         |
|           | R66           | 27              | 28         | 37         | 47              | 49         | 64         | 24         | 16         |
|           | R67           | 14              | 39         | 42         | 26              | 72         | 78         |            |            |
|           | R68           | 29              | 34         | 43         | 58              | 68         | 86         | 33         | 40         |
|           | R69           | 14              | 27         | 34         | 28              | 54         | 68         | 23         | 24         |
|           | 100           | R64             | 5          | 31         | 38              | 11         | 69         | 83         | 31         |
|           | <b>Total</b>  | <b>227</b>      | <b>300</b> | <b>367</b> | <b>435</b>      | <b>583</b> | <b>712</b> | <b>260</b> | <b>229</b> |
|           | <b>%Total</b> | <b>62%</b>      | <b>82%</b> |            | <b>61%</b>      | <b>82%</b> |            |            |            |

**Table 3.1.3a.** Sampling effort in 2005 in days at sea (D.A.S.) and hp-effort (HPeff, days at sea corrected for engine power) per trip and per quarter for the sampled trips and for the fleet larger than 300 HP using 80 mm, and fleet coverage by the sampled trips. Fleet data from VIRIS. vermeld gegevensbron fleetgegevens

| Quarter    | Vessel       | Sampled effort |               | Fleet effort  |                   | Fleet coverage |              |
|------------|--------------|----------------|---------------|---------------|-------------------|----------------|--------------|
|            |              | D.A.S.         | HPeff         | D.A.S.        | HPeff             | D.A.S.         | HPeff        |
| 1          | R61          | 5              | 10,000        |               |                   |                |              |
|            | R62          | 4              | 7,973         |               |                   |                |              |
|            | Total        | 9              | 17,973        | 4,745         | 10,751,053        | 0.19%          | 0.17%        |
| 2          | R63          | 4              | 7,980         |               |                   |                |              |
|            | Total        | 4              | 7,980         | 5,223         | 11,716,634        | 0.08%          | 0.07%        |
| 3          | R65          | 4              | 7,891         |               |                   |                |              |
|            | R66          | 5              | 9,985         |               |                   |                |              |
|            | Total        | 9              | 17,876        | 5,167         | 11,609,995        | 0.17%          | 0.15%        |
| 4          | R68          | 4              | 7,980         |               |                   |                |              |
|            | R68          | 4              | 7,980         |               |                   |                |              |
|            | R69          | 4              | 8,096         |               |                   |                |              |
|            | Total        | 12             | 24,056        | 5,351         | 12,094,200        | 0.22%          | 0.20%        |
| <b>All</b> | <b>Total</b> | <b>34</b>      | <b>67,885</b> | <b>20,487</b> | <b>46,171,883</b> | <b>0.17%</b>   | <b>0.15%</b> |

**Table 3.1.3b.** Sampling effort in 2005 in days at sea (D.A.S.) and hp-effort (HPeff, days at sea corrected for engine power) per trip and per quarter for the sampled trip and for the fleet larger than 300 HP using 100 mm, and fleet coverage by the sampled trips.

| Quarter    | Vessel       | Sampled effort |              | Fleet effort |                           | Fleet coverage |              |
|------------|--------------|----------------|--------------|--------------|---------------------------|----------------|--------------|
|            |              | D.A.S.         | HPeff        | D.A.S.       | Quarter                   | Vessel         | D.A.S.       |
| 1          | Total        |                |              | 7.05         | 14112.8                   |                |              |
| 2          | R64          | 5              | 12393        |              |                           |                |              |
|            | Total        | 5              | 12393        | 300          | 760938                    | 1.67%          | 1.63%        |
| 3          | Total        |                |              | 169          | 391762                    |                |              |
| 4          | Total        |                |              | 108          | 265920                    |                |              |
| <b>All</b> | <b>Total</b> | <b>5</b>       | <b>12393</b> | <b>584</b>   | <b>143273</b><br><b>2</b> | <b>0.86%</b>   | <b>0.86%</b> |

**Table 3.2.1a.** Total landings weight per trip in 2005 for the plaice, sole, cod, whiting, dab, turbot and brill for beam trawl vessels larger than 300 hp using 80 mm cod-end mesh size and a beam trawl vessel larger than 300 hp using 100 mm cod-end mesh size.

| Mesh | Vessel | Quar       | Plaice       | Sole         | Cod        | Whiting    | Dab         | Turbot      | Brill       |
|------|--------|------------|--------------|--------------|------------|------------|-------------|-------------|-------------|
| 80   | 61     | 1          | 8626         | 1168         | 6          | 2          | 200         | 478         | 149         |
|      | 62     | 1          | 3153         | 1833         | 187        | 25         | 744         | 107         | 232         |
|      | 63     | 2          | 1075         | 2526         | 25         | 13         | 493         | 113         | 78          |
|      | 65     | 3          | 2248         | 1222         | 56         | 0          | 540         | 288         | 43          |
|      | 66     | 3          | 2659         | 1409         | 6          | 134        | 403         | 153         | 233         |
|      | 67     | 4          | 2299         | 1689         | 48         | 0          | 334         | 466         | 124         |
|      | 68     | 4          | 3940         | 1888         | 26         | 10         | 405         | 424         | 128         |
|      | 69     | 4          | 5980         | 1067         | 24         | 3          | 482         | 479         | 95          |
| 100  | 64     | 2          | 9102         | 37           | 31         | 0          | 1030        | 229         | 93          |
|      |        | <b>All</b> | <b>39082</b> | <b>12839</b> | <b>409</b> | <b>187</b> | <b>4631</b> | <b>2737</b> | <b>1175</b> |

**Table 3.2.1b.** Sampled landings weight per trip in 2005 for the plaice, sole, cod, whiting, dab, turbot and brill for beam trawl vessels larger than 300 hp using 80 mm cod-end mesh size and a beam trawl vessel larger than 300 hp using 100 mm cod-end mesh size.

| Mesh | Vessel | Quar       | Plaice      | Sole        | Cod       | Whiting  | Dab        | Turbot     | Brill     |
|------|--------|------------|-------------|-------------|-----------|----------|------------|------------|-----------|
| 80   | 61     | 1          | 139         | 155         | 6         | 0        | 30         | 94         | 35        |
|      | 62     | 1          | 162         | 160         | 0         | 0        | 0          | 0          | 0         |
|      | 63     | 2          | 179         | 178         | 20        | 0        | 0          | 0          | 4         |
|      | 65     | 3          | 237         | 217         | 53        | 0        | 130        | 161        | 17        |
|      | 66     | 3          | 93          | 92          | 0.5       | 8        | 0          | 0          | 0         |
|      | 67     | 4          | 62          | 68          | 7         | 0        | 0          | 9          | 3         |
|      | 68     | 4          | 118         | 158         | 0         | 0        | 0          | 0          | 0         |
|      | 69     | 4          | 97          | 47          | 0         | 0        | 0          | 0          | 0         |
| 100  | 64     | 2          | 47          | 0           | 0         | 0        | 7          | 0          | 0         |
|      |        | <b>All</b> | <b>1134</b> | <b>1075</b> | <b>87</b> | <b>8</b> | <b>167</b> | <b>264</b> | <b>59</b> |

**Table 3.2.2.** Total weight (kg) in 2005 of all discards (fish and benthos) and of plaice, sole, dab, cod and whiting for a beam trawl vessels larger than 300 hp using 80 mm and 100 mm cod-end mesh by trip and summed over trips.

| <b>Mesh</b> | <b>Vessel</b> | <b>All discards</b> | <b>Plaice</b> | <b>Sole</b> | <b>Dab</b>   | <b>Cod</b>  | <b>Whiting</b> |
|-------------|---------------|---------------------|---------------|-------------|--------------|-------------|----------------|
| 80          | 61            | 29873               | 3971          | 156         | 981          | 55          | 49             |
|             | 62            | 31723               | 10311         | 364         | 6234         | 21          | 333            |
|             | 63            | 15567               | 2134          | 230         | 2022         | 0           | 225            |
|             | 65            | 27065               | 2188          | 64          | 2923         | 0           | 6              |
|             | 66            | 29153               | 3732          | 111         | 8514         | 0           | 55             |
|             | 67            | 31709               | 2185          | 127         | 3160         | 1           | 100            |
|             | 68            | 20522               | 2880          | 189         | 3043         | 5           | 222            |
|             | 69            | 28512               | 4269          | 299         | 4029         | 67          | 271            |
|             | <b>Mean</b>   |                     | <b>26765</b>  | <b>3959</b> | <b>192</b>   | <b>3863</b> | <b>19</b>      |
| <b>CV</b>   |               | <b>22%</b>          | <b>69%</b>    | <b>52%</b>  | <b>63%</b>   | <b>147%</b> | <b>76%</b>     |
| 100         | 64            | 49422               | 835           | 0           | 11393        | 3           | 0              |
|             | <b>Mean</b>   | <b>49422</b>        | <b>835</b>    | <b>0</b>    | <b>11393</b> | <b>3</b>    | <b>0</b>       |

**Table 3.2.3a.** Numbers of fish discarded per hour in 2005 for beam trawl vessels larger than 300 hp using 80 mm and a vessel using 100 mm mesh size.

| <b>English name</b>    | <b>Dutch name</b> | <b>80 mm</b> | <b>100 mm</b> |
|------------------------|-------------------|--------------|---------------|
| Allis shad             | Elft              | <0.1         |               |
| Ammodytes sp.          | Ammodytes         | 3.6          | 128.6         |
| Anglerfish             | Zeeduivel         |              | 0.7           |
| Bib                    | Steenbolk         | 1.0          |               |
| Brill                  | Griet             | 0.2          |               |
| Bull-rout              | Zeedonderpad      | 1.1          |               |
| Cod                    | Kabeljauw         | 2.6          | 1.2           |
| Dab                    | Schar             | 1087.4       | 2008.9        |
| Dragonet               | Pitvis            | 50.5         | 37.4          |
| Five-bearded rockling  | Vijfdradige meun  | 0.1          |               |
| Flounder               | Bot               | 3.9          |               |
| Four-bearded rockling  | Vierdradige meun  | 3.9          |               |
| Garfish                | Geep              | <0.1         |               |
| Greater pipefish       | Grote zeenaald    | <0.1         |               |
| Greater sand-eel       | Smelt             | 2.1          |               |
| Grey gurnard           | Grauwe poon       | 72.8         | 169.0         |
| Herring                | Haring            | 1.5          |               |
| Hooknose               | Harnasmannetje    | 5.0          | 4.1           |
| Horse mackerel         | Horsmakreel       | 0.8          |               |
| Lemon sole             | Tongschar         | 9.3          | 41.6          |
| Lesser spotted dogfish | Hondshaai         | 0.3          |               |
| Lesser weever          | Kleine pieterman  | 16.0         | 2.6           |
| Long rough dab         | Lange schar       | 0.5          | 11.5          |
| Lumpsucker             | Snotolf           | <0.1         |               |
| Mackerel               | Makreel           | <0.1         |               |
| Megrim                 | Scharretong       | <0.1         |               |
| Nilsson's pipefish     | Kleine zeenaald   | 0.1          |               |
| Plaice                 | Schol             | 710.1        | 96.2          |
| Pomatoschistus sp.     | Grondel           | 4.9          | 2.3           |
| Poor cod               | Dwergbolk         | 0.5          |               |
| Raja sp.               | Rog indet         | 1.0          |               |
| Red gurnard            | Engelse poon      | 0.2          |               |
| Reticulated dragonet   | Rasterpitvis      | 0.4          |               |
| Roker                  | Stekelrog         | 0.1          | 130.8         |

**Table 3.2.3a.** Continued.

| <b>English name</b> | <b>Dutch name</b> | <b>80 mm</b> | <b>100 mm</b> |
|---------------------|-------------------|--------------|---------------|
| Sand sole           | Franse tong       | 0.0          |               |
| Scaldfish           | Schurftvis        | 169.5        | 70.8          |
| Smoothhound         | Gladde haai       | 0.1          |               |
| Snake pipefish      | Adderzeenaald     | 0.1          |               |
| Sole                | Tong              | 29.3         |               |
| Solenette           | Dwergtong         | 112.5        | 139.1         |
| Sprat               | Sprot             | 7.6          |               |
| Striped red mullet  | Mul               | 0.7          |               |
| Tub gurnard         | Rode poon         | 17.9         |               |
| Twaite shad         | Fint              | 0.4          |               |
| Whiting             | Wijting           | 41.5         |               |



**Table 3.2.3b.** Numbers of benthic species discarded per hour in 2005 for beam trawl vessels larger than 300 HP fishing using 80 mm and a vessel using 100 mm mesh size.

| <b>Latin name</b>              | <b>Dutch name</b>    | <b>80 mm</b> | <b>100 mm</b> |
|--------------------------------|----------------------|--------------|---------------|
| <i>Acanthocardia echinata</i>  | Gedoornde Hartschelp | 20.6         | 179.1         |
| <i>Aequipecten opercularis</i> | Wijde mantel         | 1.3          |               |
| <i>Alcyonidium diaphanum</i>   | Hanenkam             | 3.4          |               |
| <i>Alcyonium digitatum</i>     | Dodemansduim         | 7.2          |               |
| <i>Alloteuthis subulata</i>    | Dwergpijlinktvis     | 0.1          |               |
| Anthozoa                       | Zeeanemonen          | 3.7          |               |
| <i>Aphrodita aculeata</i>      | Fluwelen zeemuis     | 322.4        | 501.9         |
| <i>Arctica islandica</i>       | Noordkromp           | 2.5          | 195.6         |
| Asciacea                       | Zakpijp              | 2.0          |               |
| <i>Asterias rubens</i>         | Zeester              | 847.3        | 857.3         |
| <i>Astropecten irregularis</i> | Kamster              | 3253.2       | 4742.4        |
| <i>Buccinum undatum</i>        | Wulk                 | 18.4         | 423.7         |
| <i>Cancer pagurus</i>          | Noordzeekrab         | 5.6          |               |
| <i>Carcinus maenas</i>         | Strandkrab           | 0.1          |               |
| Cephalopoda                    | Cephalopoda          |              | 1.7           |
| <i>Corystes cassivelaunus</i>  | Helmkrab             | 172.8        | 2508.7        |
| <i>Crangon</i> sp.             | Garnaal              | 3.8          |               |
| Echinidae                      | Zeeegels             | 212.2        | 904.7         |
| <i>Echinocardium cordatum</i>  | <i>E. cordatum</i>   | 2.6          | 465.1         |
| <i>Echinocardium</i> sp.       | Hartegels            | 182.7        |               |
| <i>Eledone cirrhosa</i>        | Eledone              | 0.1          |               |
| <i>Ensis siliqua</i>           | Tafelmesheft         |              | 4.7           |
| <i>Ensis</i> sp.               | Ensis                | 5.0          |               |
| Gele spons                     | Gele spons           | 4.8          |               |
| <i>Goneplax rhomboides</i>     | <i>G. rhomboides</i> | <0.1         |               |
| <i>Hyas</i> sp.                | Spinkrab             |              | 8.1           |
| <i>Lanice conchilega</i>       | Zandkokerworm        | <0.1         |               |
| <i>Liocarcinus holsatus</i>    | Gewone zwemkrab      | 2035.8       | 914.8         |
| <i>Liocarcinus marmoreus</i>   | Gemarmerde zwemkrab  | 0.7          |               |
| <i>Loligo</i> sp.              | Loligo               | 0.6          |               |
| <i>Luidia ciliaris</i>         | <i>L. ciliaris</i>   | 0.2          |               |
| <i>Luidia</i> sp.              | <i>Luidia</i>        | 7.3          |               |
| <i>Lunatia alderi</i>          | Glanzende tepelhoorn | 11.1         | 13.4          |
| <i>Macropipus</i> sp.          | Zwemkrabben          | 116.9        |               |

**Table 3.2.2b.** Continued

| <b>Latin name</b>            | <b>Dutch name</b> | <b>80 mm</b> | <b>100 mm</b> |
|------------------------------|-------------------|--------------|---------------|
| <i>Mytilus edulis</i>        | Mossel            | 0.6          |               |
| <i>Necora puber</i>          | Fluwelen zwemkrab | 4.8          |               |
| <i>Nephrops norvegicus</i>   | Noorse kreeft     | 8.6          |               |
| <i>Ophiothrix fragilis</i>   | Brokkelster       |              | 4.4           |
| <i>Ophiura ophiura</i>       | Slangster         | 498.8        | 216.0         |
| <i>Ophiura</i> sp.           | Slangsterren      | 3.5          |               |
| <i>Pagurus bernhardus</i>    | P. bernhardus     | 27.7         | 732.6         |
| <i>Pagurus</i> sp.           | Heremietkreeft    | 170.2        |               |
| <i>Pecten maximus</i>        | St. Jacobsschelp  | 0.1          | 84.3          |
| <i>Psammechinus miliaris</i> | Zeeappel          | 8.5          |               |
| <i>Scaphander lignarius</i>  | Bootschelp        |              | 23.3          |
| <i>Sepiola atlantica</i>     | Dwerginktvis      | 0.3          |               |
| <i>Spisula</i> sp.           | Spisula           | 0.2          |               |

**Table 3.3.1.** Plaice. Landings (L), discards (D) and percentage discards (%D) per hour in numbers (left) and weight (right) for beam trawl vessels larger than 300 HP with 80 mm or 100 mm mesh size in 2005.

| Mesh | Vessel | Quart      | Numbers    |            |            | Weight     |           |            |
|------|--------|------------|------------|------------|------------|------------|-----------|------------|
|      |        |            | L          | D          | %D         | L          | D         | %D         |
| 80   | R61    | 1          | 245        | 729        | 75%        | 91         | 42        | 32%        |
|      | R62    | 1          | 153        | 1770       | 92%        | 38         | 125       | 77%        |
|      | R63    | 2          | 45         | 459        | 91%        | 14         | 27        | 67%        |
|      | R65    | 3          | 86         | 376        | 81%        | 30         | 29        | 49%        |
|      | R66    | 3          | 159        | 707        | 82%        | 42         | 58        | 58%        |
|      | R67    | 4          | 103        | 338        | 77%        | 29         | 28        | 49%        |
|      | R68    | 4          | 135        | 384        | 74%        | 46         | 33        | 42%        |
|      | R69    | 4          | 215        | 918        | 81%        | 87         | 62        | 42%        |
|      |        | <b>All</b> | <b>143</b> | <b>710</b> | <b>83%</b> | <b>47</b>  | <b>51</b> | <b>52%</b> |
| 100  | R64    | 2          | 348        | 96         | 22%        | 110        | 10        | 8%         |
|      |        | <b>All</b> | <b>348</b> | <b>96</b>  | <b>22%</b> | <b>110</b> | <b>10</b> | <b>8%</b>  |

**Table 3.3.2.** Plaice. Landings (L), discards (D) and percentage discards (%D) per hour and per quarter in numbers (left) and weight (right) for beam trawl vessels larger than 300 HP with 80 mm mesh size in 2005.

| Quarter | Numbers |      |     | Weight |    |     |
|---------|---------|------|-----|--------|----|-----|
|         | L       | D    | %D  | L      | D  | %D  |
| 1       | 199     | 1249 | 86% | 65     | 83 | 56% |
| 2       | 45      | 459  | 91% | 14     | 27 | 67% |
| 3       | 123     | 542  | 82% | 36     | 44 | 55% |
| 4       | 151     | 547  | 78% | 54     | 41 | 43% |

**Table 3.3.3. Plaice.** Number landed and discarded per hour per length class for beam trawl vessels larger than 300 HP with 80 mm mesh and for a beam trawl vessel larger than 300 HP with 100 mm mesh in 2005.

| Length<br>(cm) | >300 HP, 80 mm |          | >300 HP, 100 mm |          |
|----------------|----------------|----------|-----------------|----------|
|                | Discards       | Landings | Discards        | Landings |
| 10             | 0.3            |          |                 |          |
| 11             | 1.4            |          |                 |          |
| 12             | 6.6            |          |                 |          |
| 13             | 11.9           |          |                 |          |
| 14             | 20.1           |          |                 |          |
| 15             | 30.9           |          |                 |          |
| 16             | 48.5           |          |                 |          |
| 17             | 70.4           |          | 2.0             |          |
| 18             | 96.3           |          | 7.6             |          |
| 19             | 93.7           |          | 6.8             |          |
| 20             | 74.6           |          | 8.3             |          |
| 21             | 66.0           |          | 6.0             |          |
| 22             | 49.5           | <0.1     | 16.1            |          |
| 23             | 42.7           | 0.1      | 17.2            |          |
| 24             | 40.3           | 0.1      | 10.6            |          |
| 25             | 35.2           | 1.6      | 9.9             |          |
| 26             | 17.4           | 6.6      | 5.7             | 9.3      |
| 27             | 2.9            | 21.0     | 5.1             | 25.7     |
| 28             | 0.8            | 21.2     |                 | 44.4     |
| 29             | 0.5            | 17.2     |                 | 37.4     |
| 30             | 0.1            | 15.4     | 1.0             | 39.7     |
| 31             |                | 13.0     |                 | 25.7     |
| 32             |                | 12.3     |                 | 60.7     |
| 33             |                | 8.2      |                 | 32.7     |
| 34             |                | 6.7      |                 | 23.4     |
| 35             |                | 5.5      |                 | 9.3      |
| 36             |                | 3.8      |                 | 11.7     |
| 37             |                | 3.1      |                 | 14.0     |
| 38             |                | 2.4      |                 | 7.0      |
| 39             |                | 1.2      |                 |          |
| 40             |                | 1.2      |                 | 2.3      |

**Table 3.3.3.** Continued.

| <b>Length<br/>(cm)</b> | <b>&gt;300 HP, 80 mm</b> |             | <b>&gt;300 HP, 100 mm</b> |             |
|------------------------|--------------------------|-------------|---------------------------|-------------|
|                        | <b>Disc</b>              | <b>Land</b> | <b>Disc</b>               | <b>Land</b> |
| 41                     |                          | 0.6         |                           | 2.3         |
| 42                     |                          | 0.7         |                           |             |
| 43                     |                          | 0.1         |                           | 2.3         |
| 44                     |                          | 0.4         |                           |             |
| 45                     |                          |             |                           |             |
| 46                     |                          | 0.1         |                           |             |
| 47                     |                          | <0.1        |                           |             |
| 48                     |                          | 0.1         |                           |             |
| 49                     |                          |             |                           |             |
| 50                     |                          |             |                           |             |

**Table 3.3.4.** Plaice. Numbers landed (L) and discarded (D) at age per hour per quarter and year for beam trawl vessels larger than 300 HP with 80 mm mesh size in 2005.

| Age | Quarter 1 |    | Quarter 2 |      | Quarter 3 |     | Quarter 4 |     | Year |     |
|-----|-----------|----|-----------|------|-----------|-----|-----------|-----|------|-----|
|     | D         | L  | D         | L    | D         | L   | D         | L   | D    | L   |
| 0   | 1.4       |    | 1         |      | 1         |     | 21        |     | 10   |     |
| 1   | 82        |    | 69        |      | 93        | 12  | 322       | 27  | 173  | 23  |
| 2   | 960       | 4  | 376       | 8    | 375       | 36  | 162       | 35  | 441  | 24  |
| 3   | 130       | 23 | 10        | 17   | 39        | 23  | 19        | 25  | 51   | 23  |
| 4   | 40        | 91 | 1         | 18   | 32        | 30  | 21        | 35  | 26   | 46  |
| 5   | 19        | 22 | 0.8       | 0.4  | 4         | 9   | 0.4       | 12  | 7    | 12  |
| 6   | 16        | 22 | 0.1       | 2    | 0.2       | 8   |           | 7   | 8    | 10  |
| 7   | <0.1      | 15 |           |      | 0.2       | 5   | 0.1       | 5   | 0.1  | 8   |
| 8   |           | 11 |           |      |           | 1   |           | 3   |      | 5   |
| 9   |           | 8  |           | <0.1 | 0.2       | 4   | 0.1       | 4   | 0.2  | 5   |
| 10  |           | 1  |           |      |           | 0.3 |           | 0.4 |      | 0.6 |

**Table 3.3.5.** Plaice. Landings (L) and discards D) raised estimates of total fleet numbers (\*1000) and mean length at age (cm), total weight (\*1000) tonnes and mean weight at age (kg) per quarter for beam trawl vessels larger than 300 HP with 80 mm mesh size in 2005.

| Quarter | Age        | Numbers (*1000) |              | Mean length |             | Weight (*1000) |             | Mean weight |             |
|---------|------------|-----------------|--------------|-------------|-------------|----------------|-------------|-------------|-------------|
|         |            | D               | L            | D           | L           | D              | L           | D           | L           |
| 1       | 0          | 160             |              | 9.2         |             | 1              |             | 0.01        |             |
|         | 1          | 8755            |              | 13.3        |             | 185            |             | 0.02        |             |
|         | 2          | 98967           | 477          | 18.5        | 26.6        | 5808           | 81          | 0.06        | 0.17        |
|         | 3          | 13237           | 2463         | 23.3        | 29.2        | 1500           | 564         | 0.11        | 0.23        |
|         | 4          | 4081            | 9775         | 24.6        | 30.2        | 546            | 2474        | 0.13        | 0.25        |
|         | 5          | 1961            | 2412         | 24.0        | 31.4        | 242            | 699         | 0.12        | 0.29        |
|         | 6          | 1669            | 2430         | 26.0        | 31.2        | 262            | 691         | 0.16        | 0.28        |
|         | 7          | 2               | 1638         | 29.0        | 32.0        | 0              | 502         | 0.22        | 0.31        |
|         | 8          |                 | 1255         |             | 33.1        |                | 420         |             | 0.33        |
|         | 9          |                 | 883          |             | 34.2        |                | 329         |             | 0.37        |
|         | 10         |                 | 120          |             | 38.9        |                | 65          |             | 0.54        |
|         | <b>All</b> | <b>128832</b>   | <b>21453</b> | <b>19.0</b> | <b>30.8</b> | <b>8544</b>    | <b>5823</b> | <b>0.07</b> | <b>0.27</b> |
| 2       | 0          | 139             |              | 9.3         |             | 1              |             | 0.01        |             |
|         | 1          | 8110            |              | 13.5        |             | 180            |             | 0.02        |             |
|         | 2          | 43985           | 920          | 18.9        | 27.7        | 2755           | 176         | 0.06        | 0.19        |
|         | 3          | 1216            | 2012         | 24.4        | 29.5        | 159            | 469         | 0.13        | 0.23        |
|         | 4          | 121             | 2167         | 26.5        | 31.7        | 20             | 637         | 0.17        | 0.29        |
|         | 5          | 94              | 45           | 26.0        | 39.4        | 15             | 25          | 0.16        | 0.55        |
|         | 6          | 17              | 181          | 29.0        | 31.2        | 4              | 52          | 0.22        | 0.28        |
|         | 7          |                 |              |             |             |                |             |             |             |
|         | 8          |                 |              |             |             |                |             |             |             |
|         | 9          |                 | 3            |             | 43.0        |                | 2           |             | 0.72        |
|         | 10         |                 |              |             |             |                |             |             |             |
|         | <b>All</b> | <b>53683</b>    | <b>5329</b>  | <b>18.2</b> | <b>30.2</b> | <b>3133</b>    | <b>1361</b> | <b>0.06</b> | <b>0.26</b> |
| 3       | 0          | 47              |              | 12.0        |             | 1              |             | 0.02        |             |
|         | 1          | 8741            | 492          | 17.9        | 27.1        | 467            | 88          | 0.05        | 0.18        |
|         | 2          | 32562           | 3270         | 20.3        | 28.4        | 2559           | 681         | 0.08        | 0.21        |
|         | 3          | 3387            | 2058         | 23.3        | 29.7        | 388            | 494         | 0.11        | 0.24        |
|         | 4          | 2847            | 2712         | 25.1        | 31.2        | 402            | 768         | 0.14        | 0.28        |
|         | 5          | 153             | 745          | 26.1        | 31.9        | 24             | 229         | 0.16        | 0.31        |
|         | 6          | 7               | 640          | 29.0        | 31.4        | 2              | 187         | 0.22        | 0.29        |
|         | 7          | 7               | 458          | 29.0        | 31.9        | 2              | 141         | 0.22        | 0.31        |
|         | 8          |                 | 106          |             | 37.2        |                | 50          |             | 0.48        |

**Table 3.3.5.** Plaiice. Continued.

|            |            |               |              |             |             |              |              |             |             |
|------------|------------|---------------|--------------|-------------|-------------|--------------|--------------|-------------|-------------|
| 3          | 9          | 7             | 334          | 29.0        | 31.8        | 2            | 102          | 0.22        | 0.30        |
|            | 10         |               | 24           |             | 36.8        |              | 12           |             | 0.49        |
|            | <b>All</b> | <b>47758</b>  | <b>10839</b> | <b>20.4</b> | <b>30.0</b> | <b>3845</b>  | <b>2750</b>  | <b>0.08</b> | <b>0.25</b> |
| 4          | 0          | 2239          |              | 15.5        |             | 74           |              | 0.03        |             |
|            | 1          | 35224         | 3193         | 19.0        | 28.0        | 2310         | 635          | 0.07        | 0.20        |
|            | 2          | 18905         | 4046         | 21.2        | 29.1        | 1651         | 921          | 0.09        | 0.23        |
|            | 3          | 2391          | 2829         | 24.0        | 30.5        | 295          | 752          | 0.12        | 0.27        |
|            | 4          | 2697          | 4013         | 24.5        | 31.8        | 355          | 1201         | 0.13        | 0.30        |
|            | 5          | 33            | 1339         | 27.5        | 32.2        | 6            | 422          | 0.19        | 0.32        |
|            | 6          |               | 727          |             | 34.0        |              | 268          |             | 0.37        |
|            | 7          | 6             | 580          | 28.0        | 32.6        | 1            | 192          | 0.20        | 0.33        |
|            | 8          |               | 212          |             | 35.3        |              | 87           |             | 0.41        |
|            | 9          | 6             | 333          | 28.0        | 32.9        | 1            | 115          | 0.20        | 0.34        |
|            | 10         |               | 34           |             | 47.9        |              | 36           |             | 1.07        |
|            | <b>All</b> | <b>61499</b>  | <b>17306</b> | <b>20.0</b> | <b>30.5</b> | <b>4692</b>  | <b>4631</b>  | <b>0.08</b> | <b>0.27</b> |
| <b>All</b> | 0          | 2585          |              | 15.0        |             | 76           |              | 0.03        |             |
|            | 1          | 60830         | 3684         | 17.8        | 27.9        | 3141         | 723          | 0.06        | 0.20        |
|            | 2          | 194419        | 8712         | 19.2        | 28.7        | 12772        | 1859         | 0.07        | 0.22        |
|            | 3          | 20230         | 9361         | 23.4        | 29.9        | 2342         | 2279         | 0.12        | 0.25        |
|            | 4          | 9746          | 18668        | 24.7        | 30.8        | 1323         | 5080         | 0.14        | 0.27        |
|            | 5          | 2241          | 4542         | 24.2        | 31.8        | 287          | 1375         | 0.13        | 0.30        |
|            | 6          | 1694          | 3979         | 26.0        | 31.8        | 267          | 1197         | 0.16        | 0.30        |
|            | 7          | 15            | 2676         | 28.5        | 32.1        | 3            | 834          | 0.21        | 0.31        |
|            | 8          |               | 1573         |             | 33.7        |              | 557          |             | 0.36        |
|            | 9          | 13            | 1553         | 28.5        | 33.4        | 3            | 548          | 0.21        | 0.35        |
|            | 10         |               | 178          |             | 40.6        |              | 113          |             | 0.65        |
|            | <b>All</b> | <b>291772</b> | <b>54927</b> | <b>19.4</b> | <b>30.5</b> | <b>20214</b> | <b>14566</b> | <b>0.07</b> | <b>0.27</b> |



**Table 3.3.6.** Sole. Landings (L), discards (D) and percentage discards (%D) per hour in numbers (left) and weight (right) for beam trawl vessels larger than 300 HP with 80 mm and 100 mm mesh size in 2005. nm=Not measured.

| Mesh | Vessel | Quart      | Numbers   |           |            | Weight       |          |            |
|------|--------|------------|-----------|-----------|------------|--------------|----------|------------|
|      |        |            | L         | D         | %D         | L            | D        | %D         |
| 80   | R61    | 1          | 51        | 18        | 26%        | 12           | 2        | 12%        |
|      | R62    | 1          | 88        | 46        | 34%        | 22           | 4        | 17%        |
|      | R63    | 2          | 116       | 30        | 21%        | 32           | 3        | 8%         |
|      | R65    | 3          | 72        | 10        | 12%        | 16           | <1       | 5%         |
|      | R66    | 3          | 136       | 14        | 9%         | 22           | 2        | 7%         |
|      | R67    | 4          | 166       | 15        | 8%         | 22           | 2        | 7%         |
|      | R68    | 4          | 90        | 20        | 18%        | 22           | 2        | 9%         |
|      | R69    | 4          | 70        | 82        | 54%        | 16           | 4        | 22%        |
|      |        | <b>All</b> | <b>99</b> | <b>29</b> | <b>23%</b> | <b>20</b>    | <b>2</b> | <b>11%</b> |
| 100  | R64    | 2          | <i>nm</i> | 0         |            | <1           | 0        | 0%         |
|      |        | <b>All</b> |           |           |            | <b>&lt;1</b> | <b>0</b> | <b>0%</b>  |

**Table 3.3.7.** Sole. Landings (L), discards (D) and percentage discards (%D) per hour and per quarter in numbers (left) and weight (right) for beam trawl vessels larger than 300 HP with 80 mm mesh size in 2005.

| Quarter | Numbers |    |     | Weight |   |     |
|---------|---------|----|-----|--------|---|-----|
|         | L       | D  | %D  | L      | D | %D  |
| 1       | 70      | 32 | 32% | 17     | 3 | 15% |
| 2       | 116     | 30 | 21% | 32     | 3 | 8%  |
| 3       | 104     | 12 | 10% | 19     | 1 | 6%  |
| 4       | 109     | 39 | 26% | 20     | 3 | 12% |

**Table 3.3.8.** Sole. Number landed and discarded per hour per length class for beam trawl vessels larger than 300 HP with 80 mm mesh in 2005.

| Length<br>(cm) | >300 HP, 80 mm |      |
|----------------|----------------|------|
|                | Disc           | Land |
| 10             |                |      |
| 11             |                |      |
| 12             |                |      |
| 13             | 0.1            |      |
| 14             | 2.5            |      |
| 15             | 0.9            |      |
| 16             | 1.6            |      |
| 17             | 0.9            |      |
| 18             | 0.7            |      |
| 19             | 2.7            |      |
| 20             | 3.4            |      |
| 21             | 4.1            | 0.2  |
| 22             | 5.5            | 0.7  |
| 23             | 3.6            | 4.7  |
| 24             | 1.6            | 10.8 |
| 25             | 0.9            | 12.8 |
| 26             | 0.5            | 11.6 |
| 27             | 0.3            | 11.2 |
| 28             |                | 9.9  |
| 29             |                | 8.4  |
| 30             |                | 6.4  |
| 31             |                | 6.1  |
| 32             |                | 4.4  |
| 33             |                | 3.3  |
| 34             |                | 3.1  |
| 35             |                | 1.3  |
| 36             |                | 1.3  |
| 37             |                | 0.7  |
| 38             |                | 0.7  |
| 39             |                | 0.3  |
| 40             |                | 0.2  |

**Table 3.3.8.** Sole. Continued.

| <b>Length<br/>(cm)</b> | <b>&gt;300 HP, 80 mm</b> |             |
|------------------------|--------------------------|-------------|
|                        | <b>Disc</b>              | <b>Land</b> |
| 41                     |                          | 0.2         |
| 42                     |                          | 0.1         |
| 43                     |                          |             |
| 44                     |                          | 0.1         |
| 45                     |                          |             |
| 46                     |                          | <0.1        |
| 47                     |                          | <0.1        |
| 48                     |                          |             |
| 49                     |                          |             |
| 50                     |                          |             |

**Table 3.3.9.** Sole. Numbers landed (L) and discarded (D) at age per hour per quarter and year for beam trawl vessels larger than 300 HP with 80 mm mesh size in 2005.

| Age | Quarter 1 |     | Quarter 2 |     | Quarter 3 |    | Quarter 4 |     | Year |     |
|-----|-----------|-----|-----------|-----|-----------|----|-----------|-----|------|-----|
|     | D         | L   | D         | L   | D         | L  | D         | L   | D    | L   |
| 0   |           |     |           |     | 0.3       |    |           |     | 0.3  |     |
| 1   | 1         |     | 0.3       |     | 2         |    | 16        | 22  | 7    | 22  |
| 2   | 8         | 1   | 13        | 0.1 | 1         | 2  | 13        | 24  | 9    | 10  |
| 3   | 21        | 19  | 6         | 25  | 7         | 36 | 7         | 21  | 10   | 25  |
| 4   | 0.8       | 23  | 10        | 54  | 0.9       | 38 | 3         | 23  | 3    | 31  |
| 5   | 0.4       | 9   | 0.4       | 19  | 1         | 7  | 0.3       | 6   | 0.5  | 9   |
| 6   | 0.1       | 6   | 0.3       | 14  | 0.3       | 5  | 0.5       | 8   | 0.4  | 8   |
| 7   | 0.4       | 6   |           | 1   | 0.3       | 2  |           | 0.8 | 0.3  | 2   |
| 8   | 0.3       | 2   |           | 2   | 0.3       | 4  | 0.1       | 3   | 0.2  | 3   |
| 9   | 0.1       | 2   |           | 0.9 | 0.8       | 9  |           | 2   | 0.4  | 4   |
| 10  |           | 0.5 |           | 0.3 |           | 2  |           | 0.5 |      | 0.6 |

**Table 3.3.10.** Sole. Landings (L) and discards D) raised estimates of total fleet numbers (\*1000) and mean length (left), total weight (\*1000) and mean weight (right) at age per quarter for beam trawl vessels larger than 300 HP with 80 mm mesh size in 2005.

| Quarter | Age        | Numbers (*1000) |              | Mean length |             | Weight (*1000) |             | Mean_weight |             |
|---------|------------|-----------------|--------------|-------------|-------------|----------------|-------------|-------------|-------------|
|         |            | D               | L            | D           | L           | D              | L           | D           | L           |
| 1       | 0          |                 |              |             |             |                |             |             |             |
|         | 1          | 75              |              | 17.0        |             | 3              |             | 0.04        |             |
|         | 2          | 825             | 143          | 20.4        | 24.5        | 66             | 21          | 0.08        | 0.14        |
|         | 3          | 2224            | 1943         | 21.5        | 27.8        | 213            | 438         | 0.10        | 0.23        |
|         | 4          | 85              | 2411         | 24.2        | 29.4        | 12             | 663         | 0.14        | 0.28        |
|         | 5          | 40              | 991          | 24.3        | 29.4        | 6              | 277         | 0.14        | 0.28        |
|         | 6          | 6               | 649          | 25.2        | 29.6        | 1              | 187         | 0.16        | 0.29        |
|         | 7          | 36              | 637          | 24.2        | 28.4        | 5              | 159         | 0.14        | 0.25        |
|         | 8          | 35              | 186          | 24.1        | 27.6        | 5              | 46          | 0.14        | 0.25        |
|         | 9          | 3               | 237          | 26.0        | 30.2        | 1              | 76          | 0.18        | 0.32        |
|         | 10         |                 | 54           |             | 34.7        |                | 25          |             | 0.47        |
|         | <b>All</b> | <b>3329</b>     | <b>7250</b>  | <b>21.3</b> | <b>28.8</b> | <b>311</b>     | <b>1893</b> | <b>0.09</b> | <b>0.26</b> |
| 2       | 0          |                 |              |             |             |                |             |             |             |
|         | 1          | 38              |              | 14.0        |             | 1              |             | 0.02        |             |
|         | 2          | 1525            | 7            | 20.6        | 21.0        | 125            | 1           | 0.08        | 0.09        |
|         | 3          | 740             | 2959         | 21.6        | 27.6        | 72             | 661         | 0.10        | 0.22        |
|         | 4          | 1117            | 6271         | 22.7        | 29.8        | 126            | 1808        | 0.11        | 0.29        |
|         | 5          | 50              | 2166         | 24.5        | 30.6        | 7              | 689         | 0.14        | 0.32        |
|         | 6          | 35              | 1602         | 25.5        | 28.9        | 6              | 428         | 0.16        | 0.27        |
|         | 7          |                 | 140          |             | 39.9        |                | 105         |             | 0.75        |
|         | 8          |                 | 273          |             | 31.6        |                | 103         |             | 0.38        |
|         | 9          |                 | 100          |             | 40.8        |                | 79          |             | 0.79        |
|         | 10         |                 | 31           |             | 42.0        |                | 27          |             | 0.86        |
|         | <b>All</b> | <b>3505</b>     | <b>13549</b> | <b>21.5</b> | <b>29.6</b> | <b>337</b>     | <b>3900</b> | <b>0.10</b> | <b>0.29</b> |
| 3       | 0          | 17              |              | 8.0         |             | 0              |             | 0.00        |             |
|         | 1          | 140             |              | 18.2        |             | 8              |             | 0.05        |             |
|         | 2          | 93              | 169          | 19.7        | 24.2        | 7              | 24          | 0.07        | 0.14        |
|         | 3          | 600             | 3224         | 22.3        | 26.5        | 64             | 622         | 0.11        | 0.19        |
|         | 4          | 82              | 3377         | 25.7        | 27.0        | 14             | 724         | 0.17        | 0.21        |
|         | 5          | 45              | 650          | 26.7        | 28.2        | 9              | 157         | 0.19        | 0.24        |
|         | 6          | 12              | 446          | 26.0        | 29.1        | 2              | 121         | 0.18        | 0.27        |
|         | 7          | 12              | 131          | 26.0        | 26.3        | 2              | 24          | 0.18        | 0.19        |
|         | 8          | 12              | 367          | 26.0        | 28.7        | 2              | 91          | 0.18        | 0.25        |

**Table 3.3.10.** Sole. Continued.

|            |            |              |              |             |             |             |              |             |             |
|------------|------------|--------------|--------------|-------------|-------------|-------------|--------------|-------------|-------------|
|            | 9          | 35           | 750          | 25.4        | 27.0        | 6           | 163          | 0.17        | 0.22        |
|            | 10         |              | 65           |             | 31.7        |             | 23           |             | 0.35        |
|            | <b>All</b> | <b>1046</b>  | <b>9177</b>  | <b>22.0</b> | <b>27.1</b> | <b>113</b>  | <b>1948</b>  | <b>0.11</b> | <b>0.21</b> |
| 4          | 0          |              |              |             |             |             |              |             |             |
|            | 1          | 1674         | 2624         | 17.0        | 25.3        | 86          | 425          | 0.05        | 0.16        |
|            | 2          | 1446         | 2842         | 19.5        | 27.5        | 106         | 621          | 0.07        | 0.22        |
|            | 3          | 732          | 2478         | 21.4        | 28.0        | 69          | 591          | 0.09        | 0.24        |
|            | 4          | 304          | 2747         | 22.8        | 28.9        | 35          | 731          | 0.11        | 0.27        |
|            | 5          | 24           | 459          | 24.7        | 28.4        | 4           | 119          | 0.15        | 0.26        |
|            | 6          | 57           | 1042         | 24.5        | 26.6        | 8           | 215          | 0.15        | 0.21        |
|            | 7          |              | 99           |             | 35.5        |             | 51           |             | 0.51        |
|            | 8          | 9            | 281          | 25.2        | 28.2        | 1           | 70           | 0.16        | 0.25        |
|            | 9          |              | 218          |             | 30.7        |             | 69           |             | 0.32        |
|            | 10         |              | 60           |             | 34.9        |             | 29           |             | 0.49        |
|            | <b>All</b> | <b>4246</b>  | <b>12849</b> | <b>19.2</b> | <b>27.6</b> | <b>309</b>  | <b>2920</b>  | <b>0.07</b> | <b>0.23</b> |
| <b>All</b> | 0          | 17           |              | 8.0         |             | 0           |              | 0.00        |             |
|            | 1          | 1926         | 2624         | 17.1        | 25.3        | 98          | 425          | 0.05        | 0.16        |
|            | 2          | 3890         | 3161         | 20.0        | 27.2        | 304         | 666          | 0.08        | 0.21        |
|            | 3          | 4295         | 10604        | 21.6        | 27.4        | 418         | 2311         | 0.10        | 0.22        |
|            | 4          | 1587         | 14806        | 23.1        | 28.7        | 187         | 3926         | 0.12        | 0.26        |
|            | 5          | 159          | 4266         | 25.2        | 29.3        | 25          | 1242         | 0.16        | 0.28        |
|            | 6          | 111          | 3739         | 24.9        | 28.1        | 17          | 951          | 0.15        | 0.25        |
|            | 7          | 48           | 1006         | 24.6        | 29.7        | 7           | 339          | 0.15        | 0.31        |
|            | 8          | 55           | 1106         | 24.7        | 28.6        | 8           | 310          | 0.15        | 0.26        |
|            | 9          | 38           | 1304         | 25.5        | 28.8        | 6           | 387          | 0.17        | 0.28        |
|            | 10         |              | 210          |             | 34.3        |             | 104          |             | 0.46        |
|            | <b>All</b> | <b>12127</b> | <b>42825</b> | <b>20.4</b> | <b>28.0</b> | <b>1070</b> | <b>10661</b> | <b>0.09</b> | <b>0.24</b> |

**Table 3.3.11.** Dab. Landings (L), discards (D) and percentage discards (%D) per hour in numbers (left) and weight (right) for beam trawl vessels larger than 300 HP with 80 mm and 100 mm mesh size in 2005. nm=Not measured.

| Mesh | Vessel     | Quart      | Numbers   |             |            | Weight     |            |            |
|------|------------|------------|-----------|-------------|------------|------------|------------|------------|
|      |            |            | L         | D           | %D         | L          | D          | %D         |
| 80   | R61        | 1          | 10        | 190         | 95%        | 2          | 10         | 83%        |
|      | R62        | 1          | <i>nm</i> | 1285        |            | 9          | 76         | 89%        |
|      | R63        | 2          | <i>nm</i> | 597         |            | 6          | 25         | 80%        |
|      | R65        | 3          | 40        | 793         | 95%        | 7          | 39         | 84%        |
|      | R66        | 3          | <i>nm</i> | 2752        |            | 6          | 133        | 95%        |
|      | R67        | 4          | <i>nm</i> | 965         |            | 4          | 40         | 90%        |
|      | R68        | 4          | <i>nm</i> | 854         |            | 5          | 35         | 88%        |
|      | R69        | 4          | <i>nm</i> | 1263        |            | 7          | 59         | 89%        |
|      |            | <b>All</b> |           | <b>25</b>   | <b>492</b> | <b>95%</b> | <b>6</b>   | <b>52</b>  |
| 100  | R64        | 2          | 87        | 2009        | 96%        | 12         | 137        | 92%        |
|      | <b>All</b> |            | <b>87</b> | <b>2009</b> | <b>96%</b> | <b>12</b>  | <b>137</b> | <b>92%</b> |

**Table 3.3.12.** Dab. Landings (L), discards (D) and percentage discards (%D) per hour and per quarter in numbers (left) and weight (right) for beam trawl vessels larger than 300 HP with 80 mm mesh size in 2005.

| Quarter | Numbers |      |     | Weight |    |     |
|---------|---------|------|-----|--------|----|-----|
|         | L       | D    | %D  | L      | D  | %D  |
| 1       | 10      | 737  | 99% | 6      | 43 | 89% |
| 2       |         | 597  |     | 6      | 25 | 80% |
| 3       | 40      | 1773 | 98% | 7      | 86 | 93% |
| 4       |         | 1027 |     | 5      | 45 | 89% |

**Table 3.3.13.** Cod. Landings (L), discards (D) and percentage discards (%D) per hour in numbers (left) and weight (right) for beam trawl vessels larger than 300 HP with 80 mm and 100 mm mesh size in 2005. nm=Not measured.

| Mesh | Vessel | Quart      | Numbers   |              |              | Weight       |              |              |
|------|--------|------------|-----------|--------------|--------------|--------------|--------------|--------------|
|      |        |            | L         | D            | %D           | L            | D            | %D           |
| 80   | R61    | 1          | <1        | 5            | 98%          | <1           | <1           | 90%          |
|      | R62    | 1          | <i>nm</i> | 2            |              | 2            | <1           | 10%          |
|      | R63    | 2          | <1        | 0            | 0%           | <1           | 0            | 0%           |
|      | R65    | 3          | <1        | 0            | 0%           | <1           | 0            | 0%           |
|      | R66    | 3          | <1        | 0            | 0%           | <1           | 0            | 0%           |
|      | R67    | 4          | <1        | <1           | 38%          | <1           | <1           | 2%           |
|      | R68    | 4          | <i>nm</i> | <1           |              | <1           | <1           | 16%          |
|      | R69    | 4          | <i>nm</i> | 14           |              | <1           | <1           | 74%          |
|      |        | <b>All</b> |           | <b>&lt;1</b> | <b>&lt;1</b> | <b>82%</b>   | <b>&lt;1</b> | <b>&lt;1</b> |
| 100  | R64    | 2          | <i>nm</i> | 1            |              | <1           | <1           | 10%          |
|      |        | <b>All</b> |           |              |              | <b>&lt;1</b> | <b>&lt;1</b> | <b>10%</b>   |

**Table 3.3.14.** Cod. Landings (L), discards (D) and percentage discards (%D) per hour and per quarter in numbers (left) and weight (right) for beam trawl vessels larger than 300 HP with 80 mm mesh size in 2005.

| Quarter | Numbers |   |     | Weight |    |     |
|---------|---------|---|-----|--------|----|-----|
|         | L       | D | %D  | L      | D  | %D  |
| 1       | <1      | 3 | 98% | 1      | <1 | 26% |
| 2       | <1      | 0 | 0%  | <1     | 0  | 0%  |
| 3       | <1      | 0 | 0%  | <1     | 0  | 0%  |
| 4       | <1      | 5 | 93% | <1     | <1 | 45% |



**Table 3.3.15.** Whiting. Landings (L), discards (D) and percentage discards (%D) per hour in numbers (left) and weight (right) for beam trawl vessels larger than 300 HP with 80 mm and 100 mm mesh size in 2005. nm=Not measured.

| Mesh | Vessel     | Quart      | Numbers   |          |           | Weight     |              |           |
|------|------------|------------|-----------|----------|-----------|------------|--------------|-----------|
|      |            |            | L         | D        | %D        | L          | D            | %D        |
| 80   | R61        | 1          | <i>nm</i> | 10       |           | <1         | <1           | 96%       |
|      | R62        | 1          | <i>nm</i> | 51       |           | <1         | 4            | 93%       |
|      | R63        | 2          | <i>nm</i> | 45       |           | <1         | 3            | 95%       |
|      | R65        | 3          | 0         | 1        | 100%      | 0          | <1           | 100%      |
|      | R66        | 3          | 9         | 6        | 41%       | 2          | <1           | 29%       |
|      | R67        | 4          | 0         | 46       | 100%      | 0          | 1            | 100%      |
|      | R68        | 4          | <i>nm</i> | 78       |           | <1         | 3            | 96%       |
|      | R69        | 4          | <i>nm</i> | 95       |           | <1         | 4            | 99%       |
|      |            | <b>All</b> |           | <b>3</b> | <b>18</b> | <b>85%</b> | <b>&lt;1</b> | <b>2</b>  |
| 100  | R64        | 2          | 0         | 0        | 0%        | 0          | 0            | 0%        |
|      | <b>All</b> |            | <b>0</b>  | <b>0</b> | <b>0%</b> | <b>0</b>   | <b>0</b>     | <b>0%</b> |

**Table 3.3.16.** Whiting. Landings (L), discards (D) and percentage discards (%D) per hour and per quarter in numbers (left) and weight (right) for beam trawl vessels larger than 300 HP with 80 mm mesh size in 2005.

| Quarter | Numbers |    |      | Weight |    |     |
|---------|---------|----|------|--------|----|-----|
|         | L       | D  | %D   | L      | D  | %D  |
| 1       |         | 30 |      | <1     | 2  | 93% |
| 2       |         | 45 |      | <1     | 3  | 95% |
| 3       | 5       | 4  | 45%  | 1      | <1 | 31% |
| 4       | 0       | 73 | 100% | <1     | 3  | 98% |

**Table 4.1.** Plaice. Landings (L), discards (D) and percentage discards (%D) per hour and year/period in numbers (left) and weight (right). Data raised by taking each trip as single observation. Results over 1976-1983 and 1989-1990 from Van Beek (1998), 1999-2001 from Netherlands Institute for Fisheries Research unpublished data.

| Year/<br>Period | N trips | Numbers |      |     | Weight |    |     |
|-----------------|---------|---------|------|-----|--------|----|-----|
|                 |         | L       | D    | %D  | L      | D  | %D  |
| 1976-1979       | 21      | 253     | 185  | 42% | 104    | 24 | 18% |
| 1980-1983       | 22      | 336     | 380  | 53% | 107    | 49 | 31% |
| 1989-1990       | 6       | 392     | 330  | 46% | 136    | 40 | 23% |
| 1999            | 3       | 145     | 181  | 55% | 42     | 18 | 29% |
| 2000            | 12      | 194     | 601  | 76% | 50     | 47 | 48% |
| 2001            | 3       | 364     | 1184 | 76% | 84     | 89 | 51% |
| 2002            | 6       | 263     | 868  | 77% | 69     | 71 | 51% |
| 2003            | 9       | 196     | 945  | 83% | 52     | 70 | 57% |
| 2004            | 8       | 158     | 792  | 83% | 42     | 57 | 57% |
| 2005            | 8       | 143     | 710  | 83% | 47     | 51 | 52% |

**Table 4.2.** Plaice. Landings (L), discards (D) and percentage discards (%D) per hour and year in numbers (left) and weight (right), as presented in the 2004 report. For the calculation of average number of discards and landings per hour per year, trips were adjusted for trip duration.

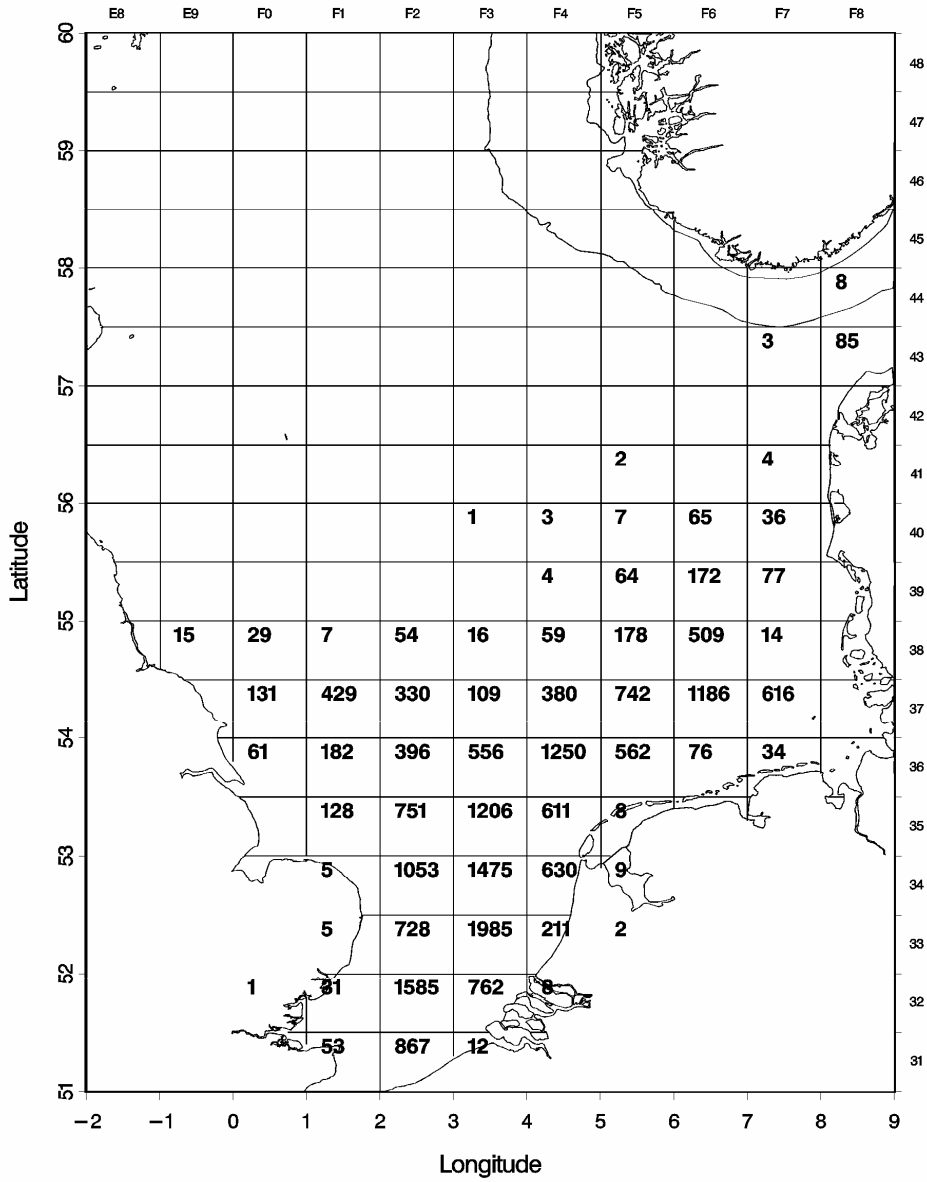
| Period    | Numbers |     | Numbers | Weight |    | Numbers | Weight |
|-----------|---------|-----|---------|--------|----|---------|--------|
|           | L       | D   |         | D      | L  |         |        |
| 1999-2001 | 214     | 575 | 73%     | 56     | 47 | 46%     |        |
| 2002      | 241     | 816 | 77%     | 63     | 66 | 51%     |        |
| 2003      | 189     | 936 | 83%     | 50     | 70 | 58%     |        |
| 2004      | 162     | 692 | 81%     | 51     | 50 | 50%     |        |

**Table 4.3.** Sole. Landings (L), discards (D) and percentage discards (%D) per hour and per period in numbers (left) and weight (right). Data raised by taking each trip as single observation. Results over 1976-1983 and 1989-1990 from Van Beek (1998), 1999-2001 from Netherlands Institute for Fisheries Research unpublished data.

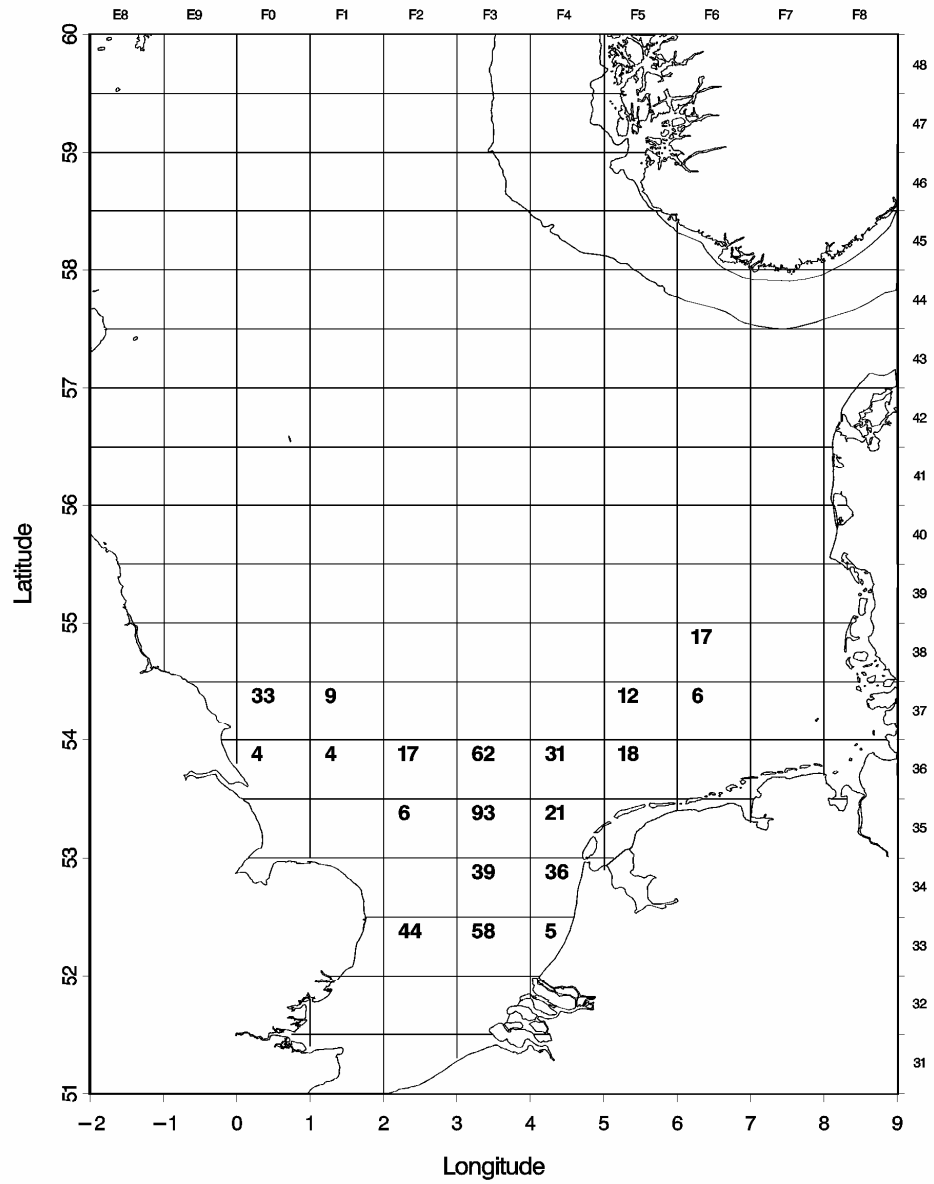
| Period    | N trips | Numbers |    |     | Weight |    |     |
|-----------|---------|---------|----|-----|--------|----|-----|
|           |         | L       | D  | %D  | L      | D  | %D  |
| 1976-1979 | 21      | 116     | 8  | 6%  | 38     | 1  | 3%  |
| 1980-1983 | 22      | 84      | 23 | 21% | 27     | 3  | 9%  |
| 1989-1990 | 6       | 286     | 83 | 22% | 72     | 11 | 13% |
| 1999      | 3       | 112     | 16 | 13% | 32     | 2  | 5%  |
| 2000      | 12      | 90      | 25 | 22% | 22     | 2  | 10% |
| 2001      | 3       | 82      | 17 | 17% | 17     | 1  | 6%  |
| 2002      | 6       | 126     | 38 | 23% | 18     | 3  | 13% |
| 2003      | 9       | 95      | 32 | 25% | 20     | 3  | 14% |
| 2004      | 8       | 175     | 69 | 28% | 31     | 7  | 17% |
| 2005      | 8       | 99      | 29 | 23% | 20     | 2  | 11% |

**Table 4.4.** Sole. Landings (L), discards (D) and percentage discards (%D) per hour and year in numbers (left) and weight (right), as presented in the 2004 report. For the calculation of average number of discards and landings per hour per year, trips were adjusted for trip duration.

| Period    | Numbers |    | Weight |    | Numbers |     | Weight |   |
|-----------|---------|----|--------|----|---------|-----|--------|---|
|           | L       | D  | L      | D  | L       | D   | L      | D |
| 1999-2001 | 92      | 21 | 19%    | 22 | 2       | 8%  |        |   |
| 2002      | 124     | 37 | 24%    | 18 | 3       | 13% |        |   |
| 2003      | 95      | 32 | 25%    | 20 | 3       | 14% |        |   |
| 2004      | 174     | 58 | 25%    | 28 | 5       | 17% |        |   |

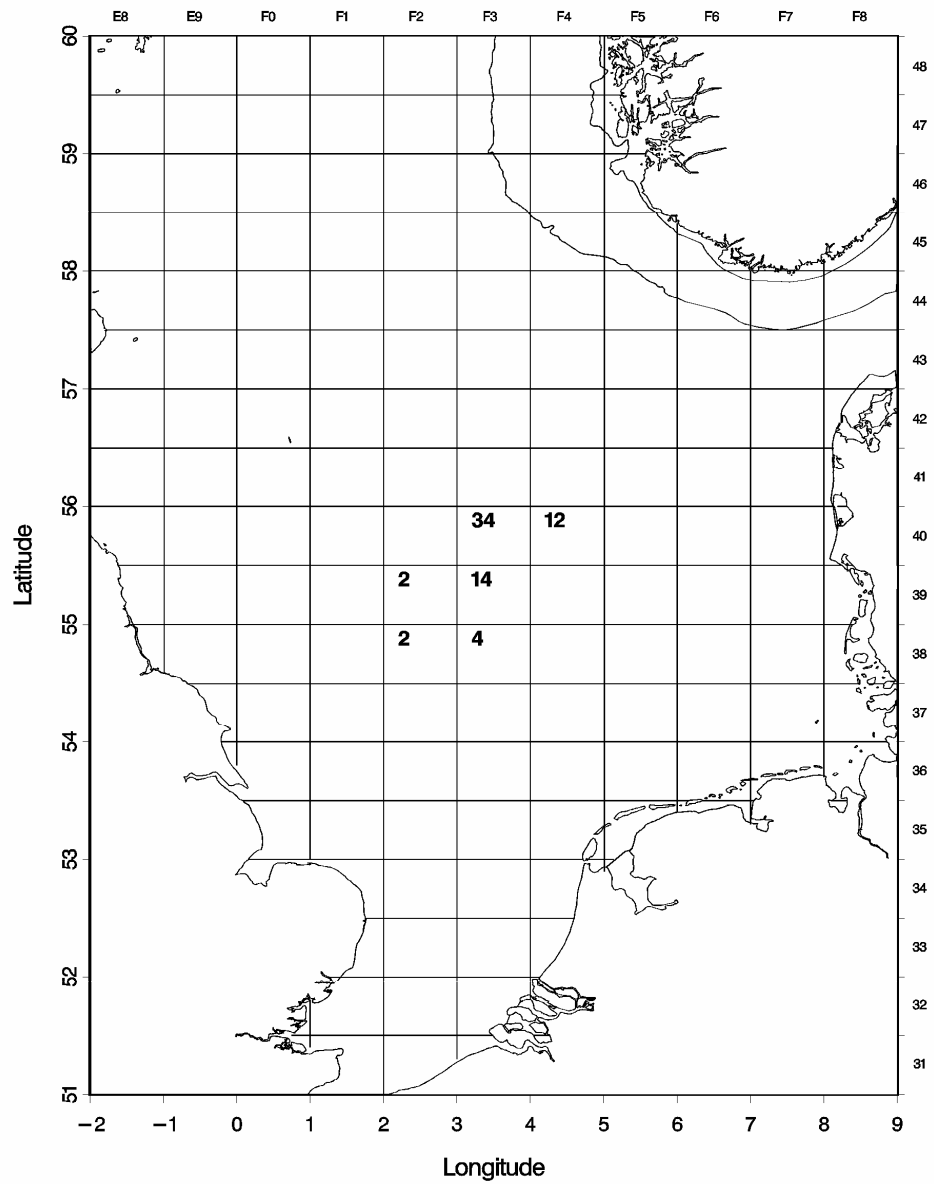


**Figure 3.1.1a.** Distribution of effort in days at sea by the Dutch beam trawl fleet in 2005, for vessels larger than 300 HP with 80 mm mesh size. Data from VIRIS database.

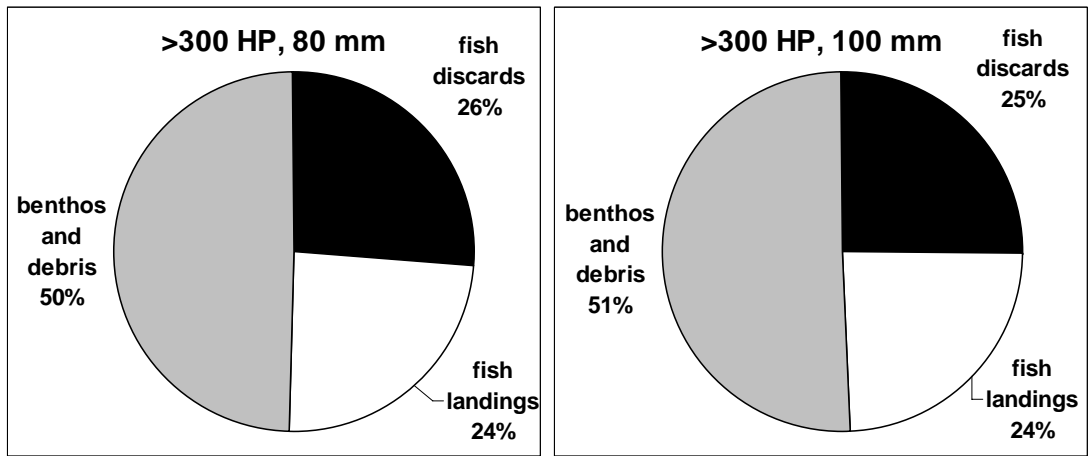


**Figure 3.1.1b.** Distribution of hours sampled for the sampled Dutch beam trawl fleet in 2005 for vessels larger than 300 HP with 80 mm mesh size.

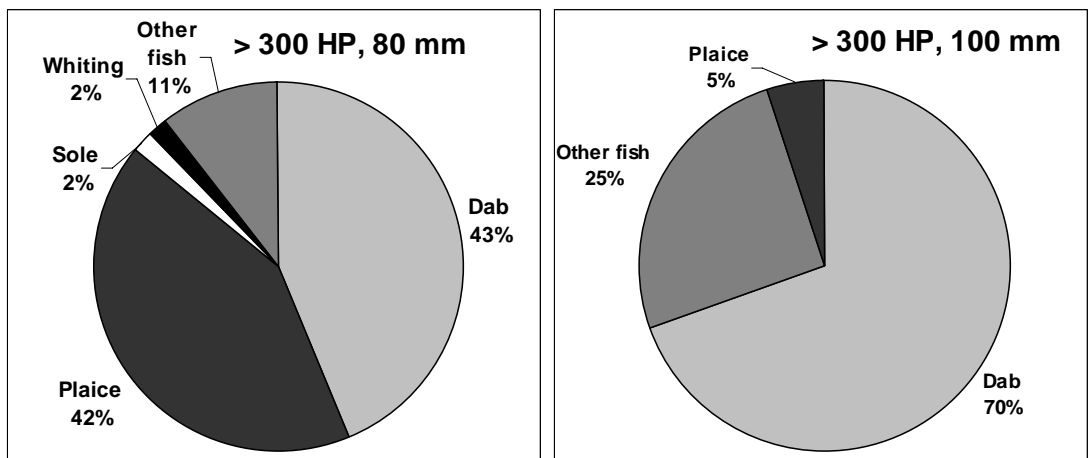




**Figure 3.1.2b.** Distribution of hours sampled for the sampled Dutch beam trawl fleet in 2005 for vessels larger than 300 HP with 100 mm mesh size and larger.

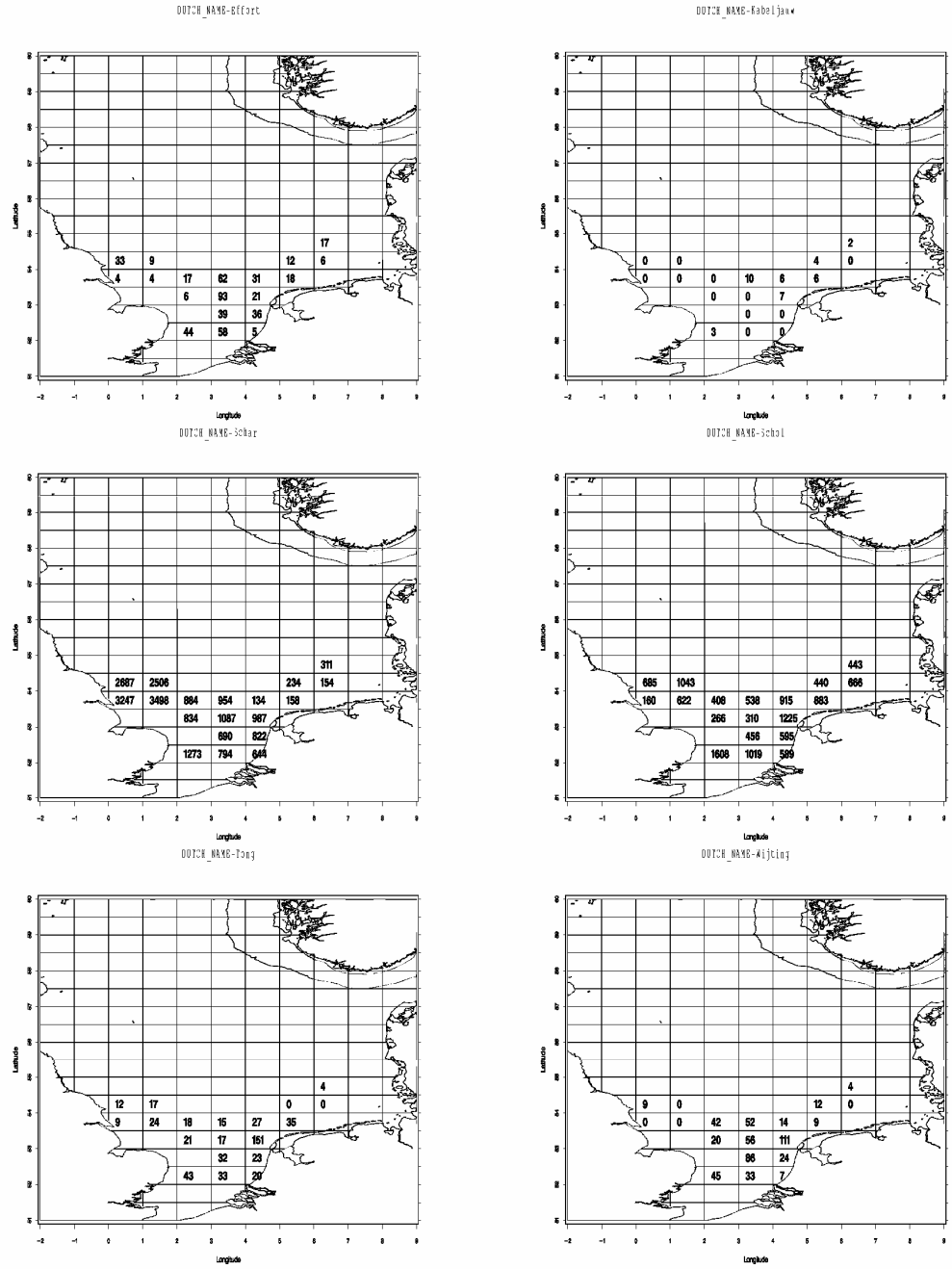


**Figure 3.2a.** Composition of the catch in weight for vessels larger than 300 HP with 80 mm (left panel) and 100 mm mesh (right panel).

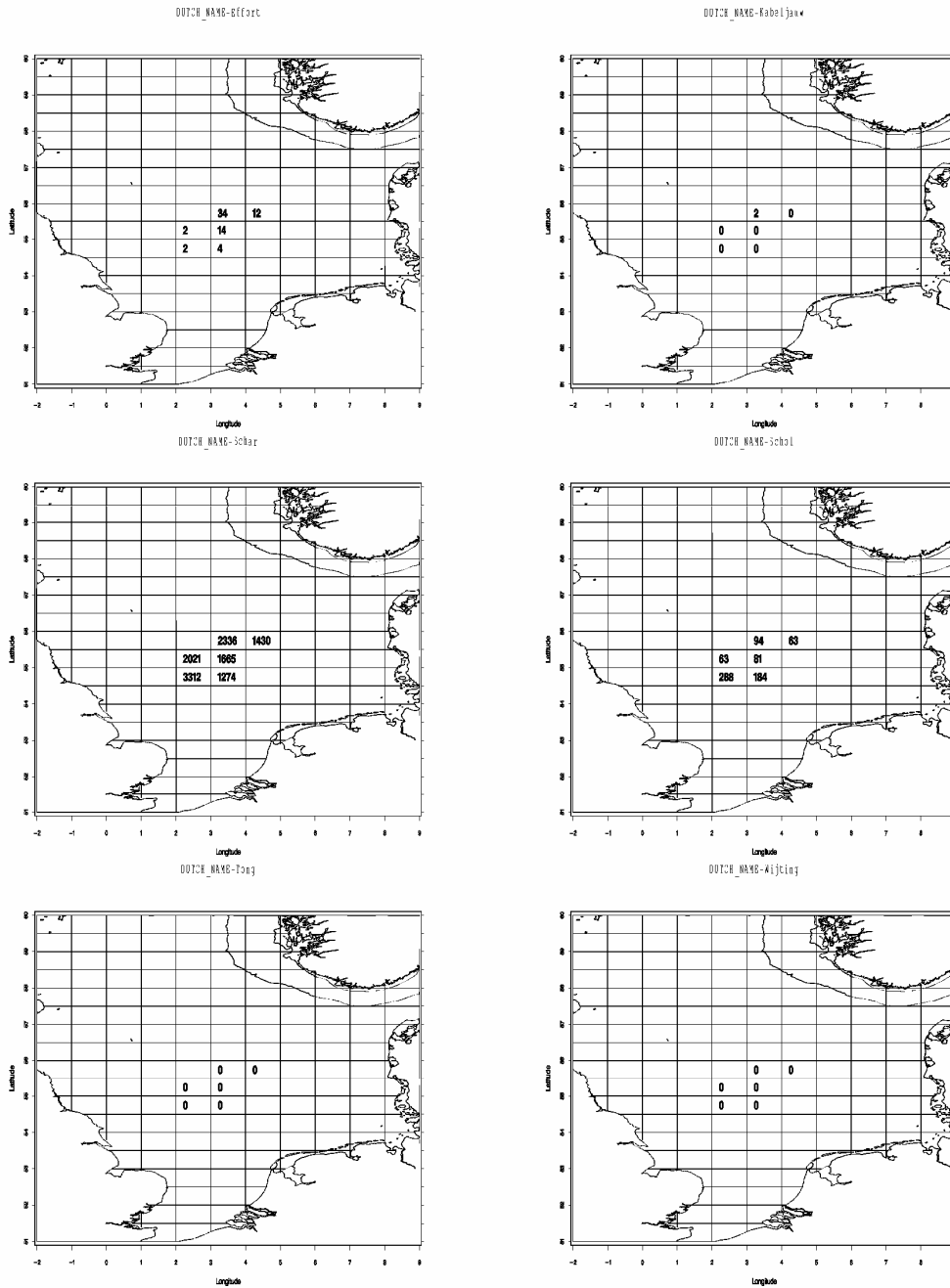


**Figure 3.2b.** Composition of the fish discards in weight for vessels larger than 300 HP with 80 mm (left panel) and 100 mm mesh (right panel).

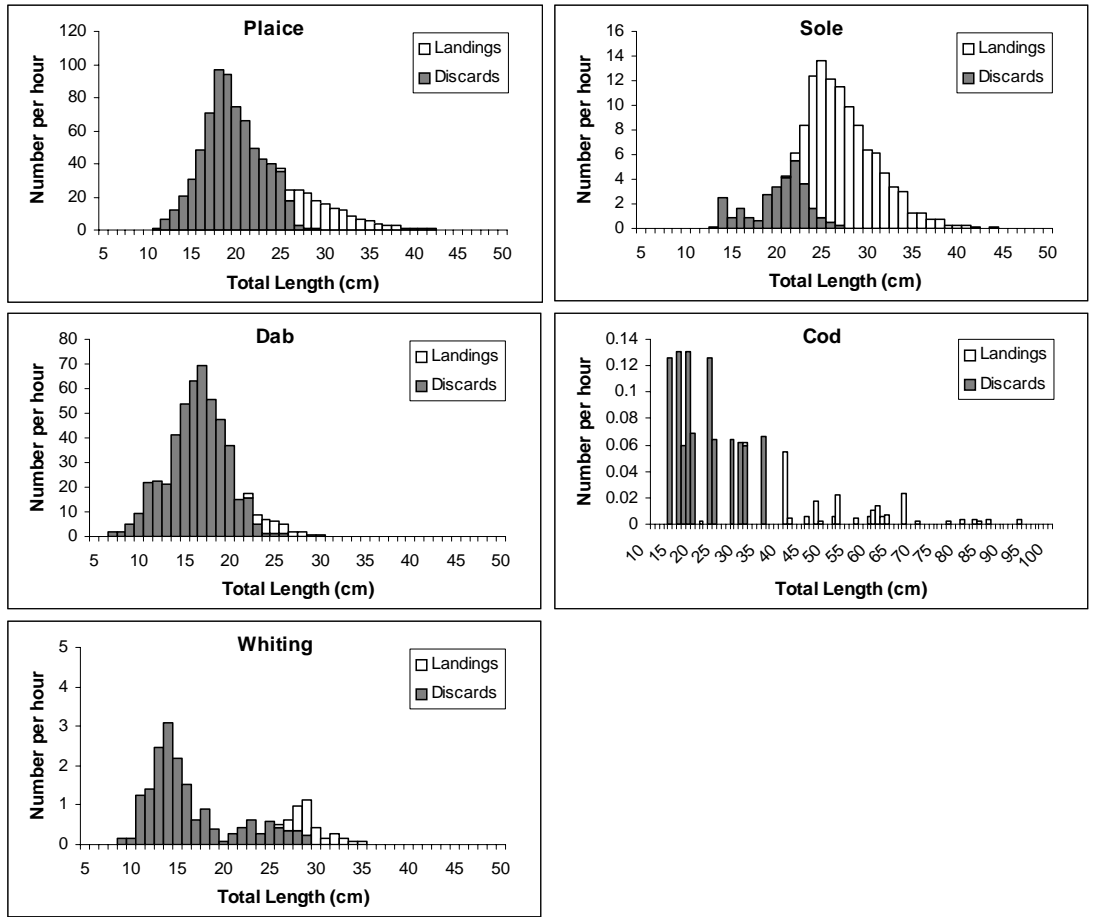




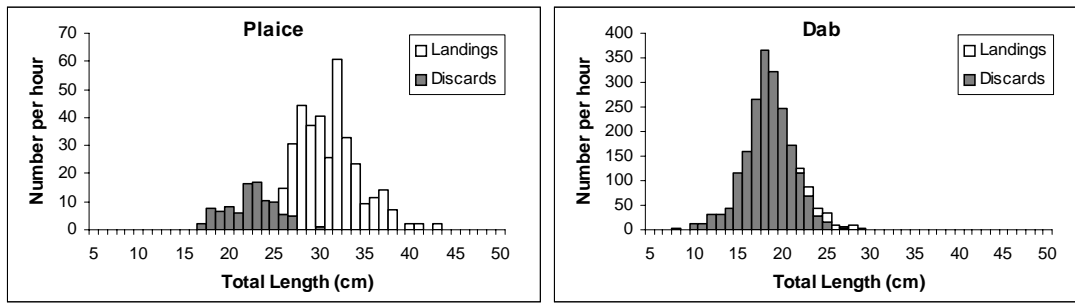
**Figure 3.3.1a.** Effort as sampled hours for discards (upper left) and number of discards per hour per ICES area in 2005 for cod (upper right), dab (middle left), plaice (middle right left), sole (lower left) and whiting (lower right) for beam trawl vessels larger than 300 HP with 80 mm mesh.



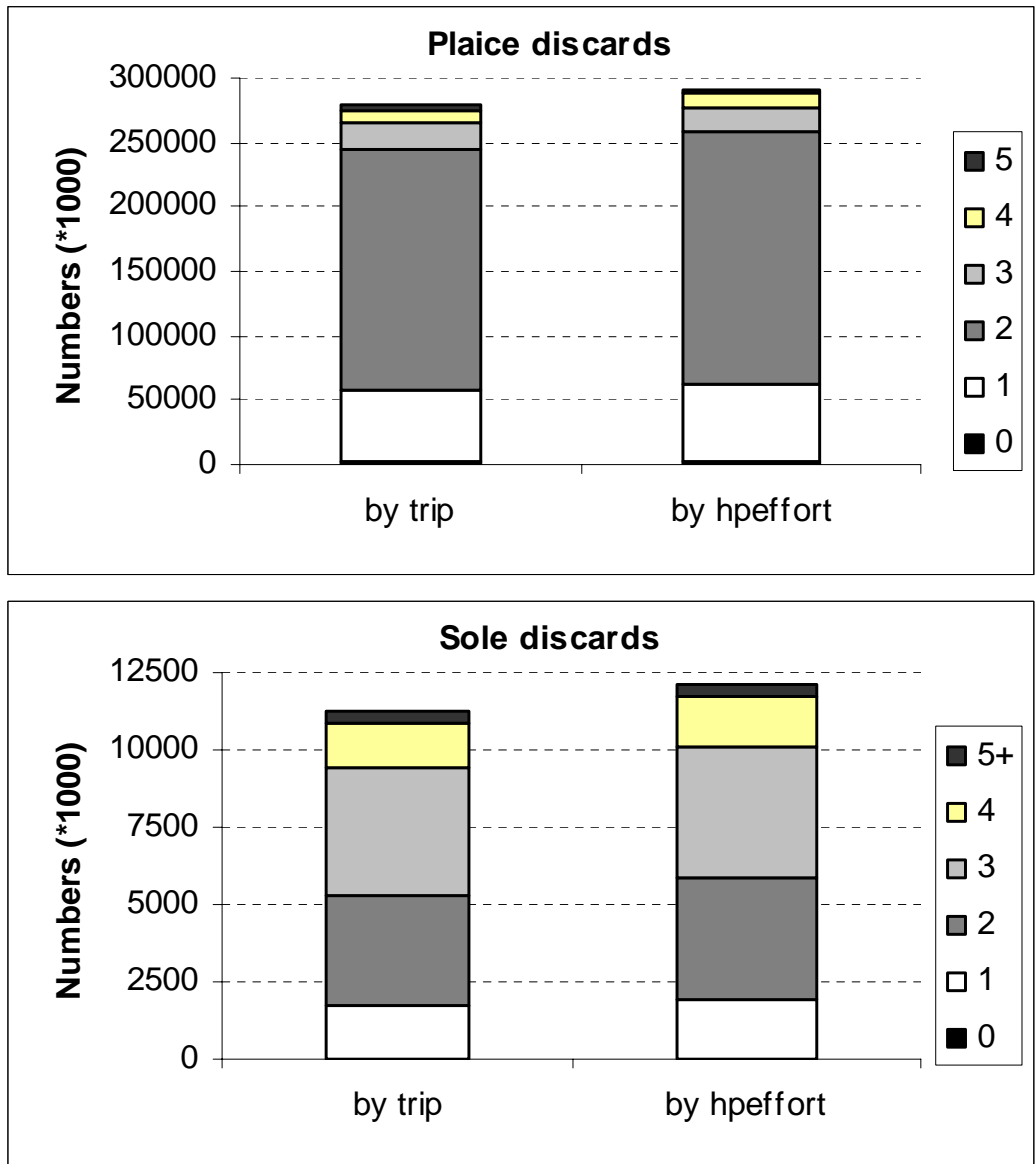
**Figure 3.3.1b.** Effort as sampled hours for discards (upper left) and number of discards per hour per ICES area in 2005 for cod (upper right), dab (middle left), plaice (middle right left), sole (lower left) and whiting (lower right) for a beam trawl vessel larger than 300 HP with 100 mm mesh.



**Figure 3.4.1.** Length frequency distribution of plaice, sole, dab, cod and whiting in 2005, caught with beam trawl vessels larger than 300 HP with 80 mm mesh. Black bars show discards, white landings.



**Figure 3.4.2.** Length frequency distribution of plaice and dab in 2005, caught with a beam trawl vessel larger than 300 HP with 100 mm mesh. Black bars show discards, white landings.



**Figure 4.1.** Number of plaiice and sole discards at age for 2005, raised by either the ratio of number of trips of the fleet to number of trips sampled, or the ratio of hpeffort of the fleet to hpeffort of sampled segment for vessels larger than 300 HP using 80 mm mesh size.

Signature: \_\_\_\_\_

Date: October 2006