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Discard sampling of Dutch bottom-trawl and seine fisheries in 2011

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Summary

In the European Union, the collection of discard data is enforced through the Data Collection Regulation or Framework (DCF) of the European Commission (EC). To comply with this ruling, approximately ten trips of discard-intensive beam-trawlers are being monitored annually since 1999 (Helmond and Overzee, 2010). In 2009, revisions to the DCF (2008/949/EG), required member states to increase sampling intensity to i) improve the precision of their estimates and ii) the number of sampled métiers. To meet this requirement within an affordable budget, the Institute for Marine Resources and Ecosystem Studies (IMARES, part of Wageningen University and Research) set up a collaborative project between the Dutch fishing industry and the research institute to recruit a 'reference fleet' of vessel owners willing to participate in a self-sampling programme.

In the self-sampling programme, trips were pre-determined from a reference fleet of participating vessels. In total, 155 trips were sampled in 2011, of which 27 trips (17%) were considered invalid due to missing or incomplete information. During the 128 valid self-sampling trips 248 hauls were sampled. While the majority of observations were done on board beam-trawl vessels with mesh sizes ranging between 70 and 99 mm targeting flatfish, data was collected from eight other metiers as well. These included beam trawls with other mesh sizes or target species assemblages, otter trawls and seines. This led, apart from a considerable increase in sampling effort for some métiers, to an increase in the temporal and spatial spread of sampling compared to the previous observer-based sampling. Samples from previously unsampled northern and eastern parts of the North Sea were available now. The spatial distribution of sampling locations matched that of the total effort of the fleet for intensively-sampled métiers.

Large-mesh beam- and otter trawls (100-119 mm) on average landed more than they discarded. In the other métiers, combined fish and benthos discards exceeded the volume of landings. The majority of discards comprised of benthic (invertebrate) species such as common starfish (*Asteria rubens*); sand star (*Astropecten irregularis*); swimming crab (*Liocarcinus holsatus*); and serpent star (*Ophiura ophiura*). Most frequently discarded fish species of no commercial value included: dragonet (*Callionymus lyra*); grey gurnard (*Eutrigla gurnardus*); scaldfish (*Arnoglossus laterna*); solenette (*Buglossidium luteum)*; and lesser weaver (*Echiichthys vipera*). Among commercially-valuable fish, common dab (*Limanda limanda*) and European plaice (*Pleuronectes platessa*) were the most frequently discarded species.

Samenvatting

In het kader van de EU Data Collectie Verordening is iedere lidstaat verplicht gegevens te verzamelen van vangst die niet wordt aangevoerd – zogenaamde "discards" – in de belangrijkste commerciële visserijen. Om aan deze verplichting te voldoen worden sinds 1999 ieder jaar tien reizen van de boomkorvisserij door wetenschappelijk waarnemers gemonitord (Helmond en Overzee, 2010). In 2009 is een herziening van de DCF (2008/949/EG) doorgevoerd, waarna lidstaten werden verzocht hun bemonsteringsprogramma te intensiveren met als doel i) het precisieniveau van discardsschattingen te verbeteren en ii) het aantal bemonsterde vlootsegmenten te laten toenemen. Om binnen het beschikbare budget aan deze eis te kunnen voldoen werkt IMARES (*Institute for Marine Resources and Ecosystem Studies*, onderdeel van Wageningen University and Research) nauw samen met de visserijsector bij het verzamelen van discardsgegevens. Door middel van intensieve samenwerking met een 'referentievloot', bestaande uit een groep Nederlandse commerciële vissers die zich willen inzetten voor het onderzoek, is het huidige zelfbemonsteringsprogramma tot stand gekomen.

In het zelfbemonsteringsprogramma wordt van te voren aangegeven wanneer een schip uit de referentie vloot een monster meeneemt. In totaal zijn in 2011 tijdens 155 reizen monsters door de vissers meegenomen, waarvan de data van 27 reizen (17%) helaas uitgesloten moesten worden van verdere analyse vanwege ontbrekende of foutieve informatie. Tijdens de overige 128 reizen zijn 248 trekken correct bemonsterd.

Hoewel in het zelfbemonsteringsprogramma het merendeel van de bemonstering is uitgevoerd aan boord van boomkorschepen met maaswijdte 70 tot 99 mm, zijn in het programma ook gegevens verzameld van acht andere vlootsegmenten met variërende maaswijdtes tussen de 70 en 99 mm, 100 en 119 mm en >120 mm en met verschillende doelsoortensamenstelling (Noorse kreeft en/of demersale vis). Buiten de enorme toename in bemonsteringsintensiteit voor een aantal van deze vlootsegmenten, heeft het zelfbemonsteringsprogramma ook geleid tot een toename in beschikbare gegevens over de verspreiding van discards in ruimte en tijd. Zo zijn nu meer gegevens beschikbaar in de voorheen schaars bemonsterde gebieden in de noordelijke en oostelijke delen van de Noordzee. De ruimtelijke spreiding van de bemonstering komt het beste overeen met de totale spreiding van de visserijinspanning voor de meest intensief bemonsterde vlootsegmenten.

Alleen voor de twee vlootsegmenten vissend met grote maaswijdtes (boomkor met maaswijdte 100-119 mm en bordenvissers met maaswijdte 100-119 mm) is het zo dat er meer van de vangst wordt aangevoerd dan weer overboord wordt gezet. Voor alle andere bemonsterde vlootsegmenten is over het algemeen het aandeel van de vangst dat uiteindelijk wordt aangevoerd kleiner dan het aandeel dat weer overboord gaat. Het merendeel van discards bestaat uit benthische invertebraten (benthos), zoals zeesterren (*Asteria rubens*), kamsterren (*Astropecten irregularis*), slangsterren (*Ophiura ophiura*) en zwemkrabben (*Liocarcinus holsatus*). Frequent gediscarde vissoorten zonder commerciële waarde, zijn: pitvis (*Callionymus lyra*); grauwe poon (*Eutrigla gurnardus*); schurftvis (*Arnoglossus laterna*); dwergtong (*Buglossidium luteum*); en kleine pieterman (*Echiichthys vipera*). Frequent gediscarde vissoorten met commerciële waarde, zijn schar (*Limanda limanda*) en schol (*Pleuronectes platessa*).

1 Introduction

Discarding unwanted organisms in European fisheries is to a great extent an inevitable consequence of commercial fishing. It is considered to be a waste of valuable natural resources. Potentially unaccounted mortalities may negatively impact on life histories of an individual or entire populations (e.g. review by Broadhurst et al., 2006). Economic and/or regulatory pressures, however, commonly force fishers to discard parts of their catch, but without keeping records of it. Not knowing how much was discarded may, in turn, affect stock assessments. If these are based on landings and do not incorporate the proportion of fish that die as a consequence of being discarded, total fishing mortality is underestimated. With the aim to integrate estimates of discards into single-species stock assessments, at-sea monitoring programmes are required to provide accurate discard estimates by species within acceptable precision limits.

In the European Union (EU), the collection of discard data is enforced through the Data Collection Framework (DCF). To comply with this ruling, approximately ten trips of discard-intensive beam trawlers have been monitored annually since 1999 in the Netherlands by scientifically-trained observers (termed hereafter 'observer-sampling programme'; Helmond and Overzee, 2010). In 2009, revisions to the DCF (2008/949/EG), required member states to increase sampling intensity to i) improve the precision of their estimates and ii) the number of sampled fishing fleets (métiers). In foresight of the expenses involved, an affordable 'self-sampling programme' was conceived at the Institute for Marine Resources and Ecosystem Studies (IMARES, part of Wageningen University and Research) in 2009. In the self-sampling programme, fishers themselves retain discarded fractions of their catches on board their vessels during a number of fishing trips throughout the year. For each sampled haul, information on the composition and volume of the catch, environmental (e.g. wind direction and speed, latitude and longitude position, and water depth) and operational characteristics (e.g. start and end time of setting the net, gear type, and mesh size) was recorded. Discard samples from the self-sampling programme were returned to the laboratory to determine species composition, size and age structure of a subsample, whereas observer samples were processed onboard the commercial vessel. In 2011, self-sampled discard data were integrated in stock assessments.

In Dutch bottom-trawl and seine fisheries in 2011, discard data were collected from nine commercial 'métiers' which were defined based on gear type, target species assemblage, and mesh size characteristics in the DCF (EU Council Regulation 409/2009; Table 1). These métiers were from three fleet segments with three distinct mesh size ranges and two target species assemblages operating in ICES subdivisions IVc and IVb year round, namely beam and otter trawlers and Scottish seiners with 70-99, 100-119 or ≥120 mm codend meshes targeting predominantly European plaice (*Pleuronectes platessa*), common sole (*Solea solea*), and/or crustaceans (i.e. Norway lobster, *Nephrops norwegicus*, hereafter termed *Nephrops)* and squid (Table 1).

The present study provides a summary of the data collected during the self-sampling programme in 2011. Sampling effort and discard data such as landed/discarded numbers and weights were presented as detailed as possible on the trip level (Appendices C-E) and subsequently grouped by relevant strata (metier and quarter). Together with appropriate raising metrics (e.g. the proportion of sampled and total fishing duration per trip), standardized discard rates (i.e. numbers/weights per hour of fishing) were calculated. This research is part of the strategic research program WOT "*Wettelijke onderzoekstaken*" which is funded by the Dutch Ministry of Economic Affairs, Agriculture and Innovation, and was done by IMARES Wageningen University Research centre.

2 Methods

2.1 Discard self-sampling programme

2.1.1 Vessel selection and sampling allocation

A 'reference fleet' of 25 vessels with protocol-instructed fishers collected discard samples according to a predefined schedule during their regular commercial operations throughout the year. Within the Dutch beam-trawl métier (TBB_DEF), a distinct national métier was created which is not reflected within the DCF métier classification. It is based on the engine's horse power and geographical distribution, due to regulations allowing only vessels with engines <300hp (so called "Eurocutters") to fish in a marine protected area ("plaice box") and the Dutch 12-mile Exclusive Economic Zone. To reflect this distributional difference of the fleet which also has implications on their discarding pattern, in the following analysis, summaries of the discard data were presented separately for Eurocutters (termed TBB_DEF_70-99mm_≤300hp) and the remaining part of the beam-trawl fleet (termed TBB_DEF_70-99mm_>300hp; Table 1).

Sampling was carried out on board vessels from nine different métiers: beam trawlers (with 70-99, 100-119, and ≥120 mm meshes); Scottish seiners (100-119, and ≥120 mm); otter trawlers (70-99 targeting either fish or mixed crustaceans and fish; and 100-119 mm targeting fish); and Eurocutters (i.e. beam trawlers with 70-99 mm). Prior to sampling, fishers were provided with all necessary equipment (labels, plastic sampling bags, sealing cable ties, and sampling sheets) and written instructions. Scottish seiners were sampled for the first time in 2011. Their fishing operation differs to other demersal trawls in that long ropes are attached to the net doors deploying them in a semi-circle. The ropes close by pulling the net back towards the vessel.

Since mid-2011, on between 8 and 11 self-sampling trips, an observer will go onboard to measure independently discard quantities. These "matched" or "co-sampled" trips are necessary to evaluate how much variation is introduced by sampling discards via two slightly different methods. As soon as at least 10 matched trips have been carried out, results from such comparisons will be reported elsewhere.

2.1.2 Sampling and data collection procedures

Operational and biological data were collected at the time of each gear deployment ('haul') during a particular fishing trip. With each haul the following information was registered: vessel position (at start and end); haul duration; weather conditions; and the volumes of catches and landings. The total volume of discards of each sampled haul was derived by subtracting the total landings, which was recorded in a logbook, from the total catch volume which was estimated by the skipper/crew. On each of the two sampled trawls per trip, the crew retained a sub-sample of discards which comprised a fixed amount of two boxes of discards (one box equals approx. 40 kg). These boxes were filled by scooping discards randomly at regular intervals from the processing conveyor belt. The sub-samples were collected in large plastic bags which were then sealed off by cable ties, labelled and cool-stored until the vessel returned to port. Discard samples were collected back on land by IMARES research staff and returned to the laboratory for analysis. In the self-sampling programme no samples of the retained part of the catch were collected. All species of discards within each sub-sample were registered and identified, whereby numbers-at-length were recorded for all fish species of discards and also *Nephrops* in the sub-sample (Table 2); and numbers without length measurements were recorded for all non-fish species. Data management software was used to enter and subsequently audit all data before the data were stored in a centralised database.

2.1.3 Raising procedures

Whenever a fraction of discards were sampled, a sub-sampling factor was used to expand measured observations to haul level. This sub-sampling factor was the ratio between the estimated total and sub-sampled volumes of discards. In the next step, existing species-specific length-weight relationships were used to convert numbers-at-length also into weight-at-length. These were then standardized into discards per unit effort ('DPUE) rates by dividing them by the deployment duration (i.e. fishing time). To raise these numbers- and weight-at-length to trip level (i.e. the total number-/weight-at-length per hour per trip of each discarded species), the total numbers at length per haul were summed over all sampled hauls in a trip and multiplied by the ratio of the total fishing duration of a trip by the duration of the sampled hauls.

2.1.4 Fleet effort

Fleet effort data used for Figure 1 was obtained through queries of the IMARES fishing effort database using the statistical software package R (R Development Core Team, 2005). The complete query is listed in Appendix A. To calculate of total fishing effort for TBB_DEF_70-99mm_≤300hp vessels required that explicitly effort of vessels with 300 or less horse power (hp) were included (221kw = 300hp, conversion: 1.36).

3 Results and discussion

3.1 Sampling effort and coverage

A total of 128 trips and 248 hauls were correctly self-sampled in 2011 (Table 3). Sampling effort was proportional to the effort of the fleet for the most-intensely sampled métiers (Figure 1a). All trips were assigned to their respective metiers after their completion, based on gear type, mesh size, and target species assemblage criteria. For example, if *Nephrops* landings from otter-trawl gears (OTB/OTT) exceeded 30%, these were subsequently classified as otter trawls targeting a mixed assemblage of crustaceans and demersal fish (MCD) as opposed to demersal fish (DEF). Notably, among the Scottish seine- and beam-trawl metiers on a single occasion, a mesh size ≥120mm was deployed, which effectively introduced two additional metiers to the list of sampled metiers (Table 1). Due to the low sampling intensity (n=1), comparisons with results of averages from other métiers are meaningless and were therefore omitted from the data summary tables (Tables 5-7). Sampling coverage levels of up to 7% as achieved for one métier (i.e. OTB/OTT_DEF_100-119mm; Table 4). Due to its fleet size and their large number of days spent at sea, the beam trawlers with large engine sizes and 70-99 mm mesh sizes (TBB_DEF_70-99mm_>300hp) continued to receive comparatively little observer coverage of approx. 2% (Table 4).

More samples from more trips and métiers were sampled within the self-sampling programme than ever before in Dutch bottom-trawl fisheries. Self-sampling has greatly improved both the spatial and temporal spread of sampling. However, costs, time and effort to collate, process, and analyse samples increased compared to the smaller-scale observer sampling programme. Although an increase of sampling effort will most likely improve precision levels of discard estimates, it does not necessarily improve their accuracy. Precision levels of species-specific discard estimates as required under DCF targets, were calculated in another project, and will be reported elsewhere.

Implicit to any robust sampling design and raising procedure are assumptions associated with the representativeness of the sampled population (Cotter and Pilling, 2007). However, thus far, it has not been confirmed whether the selection of vessels in the self-sampling programme represents the overall population of active vessels with respect of their overall discarding patterns, landings profile, and temporal distribution of fishing effort. Within the sampled métiers of the self-sampling programme, a variety of conventional and innovative fishing gears were used. The latter group included two >300 hp beam-trawl vessels with sumwing, one with a hydrorig and one with an electric pulse trawl gear. Thus, the population of sampled vessels reflected to some extent the true gear-type composition in the beam-trawl fleet: a majority of vessels with conventional gears and a smaller but increasing number of vessels with modified gears (IMARES, unpubl. data).

3.2 Numbers and weights of discarded and/or landed species

Discards comprised both benthic and fish species in all sampled métiers, whereby on average the numbers discarded per hour of benthic species exceeded that of discarded fish (Tables 5 and 7). In all métiers, some of the most frequently discarded benthic species include: common starfish (*Asterias rubens*); sand star (*Astropecten irregularis*); swimming crab (*Liocarcinus holsatus*); and serpent star (*Ophiura ophiura*; Table 7a,c). Most frequently discarded fish species of no commercial value include: dragonet (*Callionymus lyra*); grey gurnard (*Eutrigla gurnardus*); scaldfish (*Arnoglossus laterna*); and solenette (*Buglossidium luteum*; Table 7b,d).

Among the less-abundant and vulnerable elasmobranch species, the lesser-spotted dogfish (*Scyliorhinus canicula*); thornback ray (*Raja clavata*) and starry ray (*Amblyraja radiata*) were occasionally registered within a discard sample. Among commercially-valuable species, dab (fisheries unions-agreed minimum landing size=23 cm), followed by plaice (legal minimum landing size, MLS=27 cm) were among the most-commonly discarded species both in numbers and weights (Table 5). Other commonly-discarded species included: sole (MLS=24 cm), whiting (MLS=27 cm), and *Nephrops* (in OTB/OTT metiers), whereas less-commonly discarded species included other fish such as brill, turbot, and cod (MLS=35 cm; Tables 5,6). In the length-frequency distributions, few fish above MLS were found within the discard samples for most species, apart from some plaice and cod (Fig. 2b,d). Above-MLS sized cod were discarded in particular in 100mm otter trawls in 2011 (third from the top right panel, Fig. 2d). The majority of discarded *Nephrops* were above MLS (2.5 cm carapax length; Fig. 2f).

Distinct catch patterns were evident for the different métiers. Table 5 shows average discard rates (in numbers and weight per hour) by metier for a selection of commercially-important species. Large-powered beam trawlers (TBB_DEF_70-99mm_>300hp) which target plaice and sole exhibit the highest discard rates of these species compared with other metiers. The lowest rates were observed among the larger-meshed (100-119mm) segments of beam trawlers and Scottish seiners. But, as mentioned above (results, 'vessel selection and sampling allocation'), discard rates expressed as numbers/weights per hour for Scottish seiners may be misleading due to the different nature of their operation. However, their average towing durations are similar to bottom trawls (approx. 120 min).

For the last ten years, no remarkable/clear temporal trends in percentage discard rates of plaice are evident (Table 8). Overall, 54% of the plaice catch was being discarded by weight in 2011 (Table 8). For sole, the proportion of discards in relation to landings was similar to previous years, i.e. 18% by weights (Table 8). In the first and last quarter of the year, discard rates of plaice were the highest for large-powered beam trawlers (70-99mm; Table 6b); a seasonal trend which was not supported in discard nor landings rates by any other metier (Table 6a,b). Discard rates of plaice in the TBB_DEF_100mm segment increased in the second quarter (Table 6b).

For the small-powered beam trawlers (Eurocutters; TBB_DEF_70-99mm_≤300hp), which target plaice and sole, discard rates of plaice were substantially lower compared with previous years and in comparison with their large-powered counterparts (64, 29, and 27 kg/h in 2009, 2010, and 2011, respectively; Table 5 and see also Helmond et al., 2011). The large-meshed beam trawlers (TBB_DEF_100-119mm) target mainly plaice with comparatively lower discard rates for many species compared with some of the other beam-trawl metiers (Table 5). Discard rates of dab were variable and decreased substantially compared to last year (Table 5, Helmond et al., 2011).

The *Nephrops* fishery (OTB/OTT_MCD_70-99mm) targets *Nephrops*, but also lands plaice which occasionally makes up a greater proportion of the landings than *Nephrops*, which will give such a trip a new metier classification. The otter-trawl fishery for demersal fish (*OTB/OTT_DEF_70-99mm*) targets plaice, with more *Nephrops* and whiting discards than the beam-trawl métiers (Table 5). The large-mesh otter-trawl fishery (OTB/OTT_DEF_100-119mm) targets plaice and together with the large-mesh beam-trawl and Scottish seine fleet showed the highest landings rates for plaice, but with a much higher discard rate than these two fleets (Table 5).

For all métiers, the majority of discards were comprised by benthic species, which clearly reflects the nature of bottom-trawl fisheries (Bergmann et al., 2002; Borges et al.,2005). The majority of discards were small in size. Thus, logically discard rates are lower in métiers with larger-meshed gears (>100 mm). However, this difference may also (partly) be attributed to

the use of large-meshed gears in the northern North Sea, where, for example, juvenile plaice is less abundant (Keeken et al., 2007). Overall, there appears to be no major increases or reductions in the numbers and weights of discarded and/or landed species (both commercially-valuable and/or benthic species), although no detailed statistical analyses were carried out to confirm any trends among discard estimates of the available time series. However, the fact that 2011 observations were located within the ranges measured in previous years where métier-specific data were available (Helmond and Overzee, 2010; Helmond et al., 2011) may be testimony to the quality and integrity of self-sampled data in comparison with traditional observer sampling.

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6 Tables

Table 1. List of Dutch bottom-trawl and seine métiers sampled for discards. These were classified according to European Union (EU) definitions (EU Council Regulation 409/2009) requiring information about gear type (i.e. demersal beam – TBB; otter trawl - OTB/OTT; and Scottish seine – SSC; level 4), target species assemblage (i.e. demersal fish - DEF, mixed crustaceans and demersal fish – MCD; level 5), and mesh size ranges (in mm; level 6).

	Level 4	**Level 5**	**Level 6**
	Gear type	**Target assemblage**	**Mesh size**
1	TBB (>300 hp)	DEF	70-99
2	TBB (≤300 hp)*	DEF	70-99
3	TBB	DEF	100-119
4	TBB	DEF	≥120
5	SSC	DEF	100-119
6	SSC	DEF	≥120
7	OTB/OTT**	MCD	70-99
8	OTB/OTT**	DEF	70-99
9	OTB/OTT**	DEF	100-119

* Note that the TBB métier is further subdivided on a national level in the Netherlands based on engine size (horse power, hp): vessels with ≤ 300hp engine power are so called "Eurocutters".

** Otter and pair trawl gear type names were used together in the metier name (OTB/OTT), because in a logbook OTT gears can also be listed as OTB .

Table 2. Self-sampling methodology to sample total catch, discards and landings.

Method		Self sampling
SAMPLING		2 hauls/trip
TOTAL CATCH		
	Estimate: total catch volume	Onboard (all hauls)
DISCARDS		
	Collect: discard subsample	2 boxes onboard
	Sorting: discards by species	Laboratory
	Measuring: fish by species	Laboratory
	Counting: Invertebrates by species	Laboratory
	Sampling: Otoliths from discards	Laboratory
LANDINGS		
	Collect: landings subsample	None
	Measuring: fish by species	None
	Estimate: total landings	Onboard (all hauls)
OPERATIONAL/ENVIRONMENTAL PARAMETERS		
	Position of hauls, duration, weather, etc.	Onboard (all hauls)

Table 3. Summary of the total number of valid self-sampled trips per métier between 2009 and 2011.

Prog	Métier	2009	2010	2011
self	TBB_DEF_70-99mm_>300hp	40	66	67
self	TBB_DEF_70-99mm_≤300hp	2	21	18
self	TBB_DEF_100-119mm	10	12	5
self	TBB_DEF__>=120mm	0	0	1
self	SSC_DEF_100-119mm	0	0	1
self	SSC_DEF_>=120mm	0	0	4
self	OTB/OTT_MCD_70-99mm	4	6	13
self	OTB/OTT_DEF_70-99mm	4	18	9
self	OTB/OTT_DEF_100-119mm	3	9	10
	Total	63	132	128

Table 4. Sampling and fleet effort, and sampling coverage (% days at sea, D.A.S) per self-sampled métier in 2011.

Métier	Sampling effort D.A.S.	Fleet effort D.A.S	Sampling coverage (%) D.A.S
TBB_DEF_70-99mm_>300hp	283	16078	1.8
TBB_DEF_70-99mm_≤300hp	73	4030	1.8
TBB_DEF_100-119mm	18	502	3.6
TBB_DEF_≥120	4	201	2.0
SSC_DEF_100-119	3	372	0.8
SSC_DEF_≥120	11	220	5.0
OTB/OTT_MCD_70-99mm	57	1345	4.2
OTB/OTT_DEF_70-99mm	44	1330	3.3
OTB/OTT_DEF_100-119mm	48	678	7.1

Table 5. Average weights (Wt; in kg) and numbers (Nb) per hour of discarded (Dis) and landed (Lan) commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod, whiting (WHG) and Norway lobster (NEP) by métier in 2011. Nm, not measured (i.e. missing sufficient lengths measurements for discards of *Nephrops*, NEP, to apply length-weight keys). N, number of sampled trips.

	Métier	N	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis COD	Lan COD	Dis WHG	Lan WHG	Dis NEP	Lan NEP
Wt	TBB_DEF_70-99mm_>300hp	67	74	12	83	70	5	23	0	3	0	4	1	3	4	3	1	3
	TBB_DEF_70-99mm_<=300h	18	31	4	27	15	3	6	0	1	1	1	0	1	1	0	2	24
	TBB_DEF_100-119mm	5	10	10	27	396	0	0	0	4	0	3	1	1	0	5	0	8
	SSC_DEF_>=120mm	4	8	237	5	325	0	3	0	0	0	0	1	309	0	0	0	0
	OTB/OTT_MCD_70-99mm	13	29	1	46	19	0	1	0	1	0	2	1	3	14	4	42	26
	OTB/OTT_DEF_70-99mm	9	32	6	35	33	1	5	0	1	0	2	0	2	3	9	9	11
	OTB/OTT_DEF_100-119mm	10	48	13	78	232	0	0	0	0	0	7	1	9	0	1	1	5
Nb	TBB_DEF_70-99mm_>300hp	67	1350	Nm	921	Nm	50	Nm	0	Nm	0	Nm	1	Nm	54	Nm	8	Nm
	TBB_DEF_70-99mm_<=300h	18	408	Nm	259	Nm	41	Nm	2	Nm	3	Nm	2	Nm	14	Nm	64	Nm
	TBB_DEF_100-119mm	5	128	Nm	183	Nm	0	Nm	0	Nm	0	Nm	3	Nm	1	Nm	0	Nm
	SSC_DEF_>=120mm	4	56	Nm	34	Nm	0	Nm	0	Nm	0	Nm	5	Nm	2	Nm	0	Nm
	OTB/OTT_MCD_70-99mm	13	424	Nm	372	Nm	0	Nm	0	Nm	0	Nm	3	Nm	190	Nm	1976	Nm
	OTB/OTT_DEF_70-99mm	9	405	Nm	309	Nm	14	Nm	2	Nm	0	Nm	1	Nm	31	Nm	382	Nm
	OTB/OTT_DEF_100-119mm	10	470	Nm	547	Nm	0	Nm	0	Nm	0	Nm	3	Nm	2	Nm	1	Nm

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Table 6a. Average weights (kg) per hour of discarded (Dis) and landed (Lan) commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod, whiting (WHG) and Norway lobster (NEP) by métier and quarter (Q) in 2011. Nm, not measured (i.e. missing sufficient lengths measurements for discards of *Nephrops*, NEP, to apply length-weight keys).

Métier	Q	N	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis COD	Lan COD	Dis WHG	Lan WHG	Dis NEP	Lan NEP
TBB_DEF_70-99mm_>300hp	1	16	90	21	120	77	4	20	0	3	0	2	0	5	2	3	Nm	4
TBB_DEF_70-99mm_>300hp	2	14	48	8	41	56	4	19	0	3	0	4	0	4	4	2	0	2
TBB_DEF_70-99mm_>300hp	3	17	98	9	79	69	7	26	0	3	0	4	1	2	4	0	Nm	2
TBB_DEF_70-99mm_>300hp	4	20	58	7	87	75	4	26	0	4	0	6	0	2	5	0	Nm	2
TBB_DEF_70-99mm_<=300h	1	3	25	4	28	23	6	5	1	1	0	1	1	1	3	0	0	0
TBB_DEF_70-99mm_<=300h	2	6	50	6	16	12	3	7	0	1	2	1	0	1	0	0	Nm	11
TBB_DEF_70-99mm_<=300h	3	4	35	4	49	12	2	3	0	0	0	2	1	0	1	0	Nm	29
TBB_DEF_70-99mm_<=300h	4	5	8	2	21	16	3	9	0	1	0	1	0	2	1	0	0	0
TBB_DEF_100-119mm	1	1	3	13	9	405	0	0	0	0	0	9	0	0	0	3	0	0
TBB_DEF_100-119mm	2	3	12	9	37	352	0	0	0	4	0	3	2	1	0	7	0	0
TBB_DEF_100-119mm	3	1	13	9	12	519	0	0	0	0	0	0	0	0	0	0	0	8
SSC_DEF_>=120mm	3	3	8	237	5	325	0	3	0	0	0	0	1	309	0	0	0	0
OTB/OTT_MCD_70-99mm	1	2	24	1	6	15	0	1	0	0	0	0	0	2	11	9	Nm	10
OTB/OTT_MCD_70-99mm	2	2	59	0	9	11	0	0	0	0	0	1	1	6	8	0	Nm	23
OTB/OTT_MCD_70-99mm	3	4	39	1	100	17	0	1	0	1	0	2	2	2	22	0	Nm	28
OTB/OTT_MCD_70-99mm	4	5	12	1	34	27	0	1	0	1	0	2	0	3	10	0	Nm	31
OTB/OTT_DEF_70-99mm	1	3	11	1	15	24	0	1	0	0	0	1	0	4	8	18	Nm	8
OTB/OTT_DEF_70-99mm	2	4	53	8	51	25	2	2	0	1	0	2	0	1	1	0	Nm	10

Table 6a. (cont.)

Métier	Q	N	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis COD	Lan COD	Dis WHG	Lan WHG	Dis NEP	Lan NEP
OTB/OTT_DEF_70-99mm	3	1	23	11	28	39	1	1	0	1	0	3	0	0	1	0	Nm	23
OTB/OTT_DEF_70-99mm	4	1	15	6	35	83	2	30	0	4	0	3	0	1	1	0	0	0
OTB/OTT_DEF_100-119mm	1	1	58	18	285	164	0	0	0	0	0	0	5	0	0	0	0	0
OTB/OTT_DEF_100-119mm	2	5	51	14	63	178	0	0	0	0	0	8	1	1	0	1	0	5
OTB/OTT_DEF_100-119mm	3	3	50	10	46	342	0	0	0	0	0	8	1	9	0	0	Nm	0
OTB/OTT_DEF_100-119mm	4	1	17	6	41	235	0	0	0	0	0	2	1	19	0	0	0	0

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Table 6b. Average numbers per hour of discarded (Dis) and landed (Lan) commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod, whiting (WHG) and Norway lobster (NEP) by métier and quarter (Q) in 2011. Nm, not measured (i.e. missing sufficient lengths measurements for discards of *Nephrops*, NEP, to apply length-weight keys).

Métier	Q	N	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis COD	Lan COD	Dis WHG	Lan WHG	Dis NEP	Lan NEP
TBB_DEF_70-99mm_>300hp	1	16	1507	Nm	1244	Nm	45	Nm	2	Nm	0	Nm	0	Nm	27	Nm	0	Nm
TBB_DEF_70-99mm_>300hp	2	14	984	Nm	555	Nm	39	Nm	0	Nm	0	Nm	1	Nm	41	Nm	0	Nm
TBB_DEF_70-99mm_>300hp	3	17	1764	Nm	796	Nm	66	Nm	0	Nm	1	Nm	3	Nm	52	Nm	21	Nm
TBB_DEF_70-99mm_>300hp	4	20	1128	Nm	1026	Nm	46	Nm	0	Nm	0	Nm	1	Nm	86	Nm	10	Nm
TBB_DEF_70-99mm_<=300h	1	3	411	Nm	276	Nm	88	Nm	6	Nm	3	Nm	7	Nm	28	Nm	0	Nm
TBB_DEF_70-99mm_<=300h	2	6	606	Nm	187	Nm	34	Nm	2	Nm	7	Nm	0	Nm	7	Nm	30	Nm
TBB_DEF_70-99mm_<=300h	3	4	417	Nm	429	Nm	19	Nm	1	Nm	2	Nm	4	Nm	14	Nm	244	Nm
TBB_DEF_70-99mm_<=300h	4	5	160	Nm	199	Nm	39	Nm	0	Nm	1	Nm	0	Nm	12	Nm	0	Nm
TBB_DEF_100-119mm	1	1	28	Nm	64	Nm	0	Nm	0	Nm	0	Nm	0	Nm	0	Nm	0	Nm
TBB_DEF_100-119mm	2	3	142	Nm	254	Nm	0	Nm	0	Nm	0	Nm	5	Nm	1	Nm	0	Nm
TBB_DEF_100-119mm	3	1	185	Nm	89	Nm	0	Nm	0	Nm	0	Nm	0	Nm	0	Nm	0	Nm
SSC_DEF_>=120mm	3	3	56	Nm	34	Nm	0	Nm	0	Nm	0	Nm	5	Nm	2	Nm	0	Nm
OTB/OTT_MCD_70-99mm	1	2	335	Nm	38	Nm	0	Nm	0	Nm	0	Nm	0	Nm	92	Nm	145	Nm
OTB/OTT_MCD_70-99mm	2	2	988	Nm	53	Nm	0	Nm	0	Nm	0	Nm	4	Nm	116	Nm	2183	Nm
OTB/OTT_MCD_70-99mm	3	4	514	Nm	840	Nm	0	Nm	1	Nm	0	Nm	5	Nm	291	Nm	3206	Nm
OTB/OTT_MCD_70-99mm	4	5	161	Nm	259	Nm	1	Nm	0	Nm	0	Nm	1	Nm	179	Nm	1642	Nm
OTB/OTT_DEF_70-99mm	1	3	129	Nm	92	Nm	0	Nm	0	Nm	0	Nm	1	Nm	69	Nm	227	Nm
OTB/OTT_DEF_70-99mm	2	4	667	Nm	445	Nm	25	Nm	3	Nm	0	Nm	1	Nm	7	Nm	74	Nm

Table 6b. (cont.)

OTB/OTT_DEF_70-99mm	3	1	351	Nm	254	Nm	3	Nm	0	Nm	0	Nm	0	Nm	34	Nm	2460	Nm
OTB/OTT_DEF_70-99mm	4	1	234	Nm	468	Nm	18	Nm	0	Nm	2	Nm	0	Nm	8	Nm	0	Nm
OTB/OTT_DEF_100-119mm	1	1	541	Nm	2046	Nm	0	Nm	0	Nm	0	Nm	13	Nm	0	Nm	7	Nm
OTB/OTT_DEF_100-119mm	2	5	538	Nm	458	Nm	0	Nm	0	Nm	0	Nm	2	Nm	3	Nm	0	Nm
OTB/OTT_DEF_100-119mm	3	3	407	Nm	285	Nm	0	Nm	0	Nm	0	Nm	2	Nm	1	Nm	2	Nm
OTB/OTT_DEF_100-119mm	4	1	246	Nm	274	Nm	0	Nm	0	Nm	0	Nm	2	Nm	0	Nm	0	Nm

Table 7a. Average numbers per hour of discarded benthic species in Dutch bottom beam-trawl (TBB) and Scottish seine (SSC) fisheries targeting demersal fish (DEF) in 2011.

Métier Mesh size Species	TBB_DEF 70-99	TBB_DEF* 70-99	TBB_DEF 100-119	SSC_DEF >120
Abietinaria abietina	0	0	0	0
Abra prismatica	0	0	0	0
Acanthocardia echinata	213	<1	4	0
Aequipecten opercularis	5	0	<1	<1
Alcyonidium diaphanum	3	0	<1	0
Alcyonium digitatum	28	3	3	1
Anthozoa	4	1	0	<1
Aphrodita aculeata	84	8	11	<1
Arctica islandica	10	0	3	<1
Ascidiacea	<1	0	0	0
Ascidiella aspersa	0	0	0	0
Ascidiella scabra	0	0	0	0
Asterias rubens	2646	2828	30	2
Astropecten irregularis	9693	69	880	0
Atelecyclus rotundatus	<1	0	0	0
Barnea candida	<1	0	0	0
Buccinum undatum	61	1	20	2
Cancer pagurus	7	4	3	<1
Carcinus maenas	0	8	0	0
Cerastoderma edule	0	0	<1	0
Chamelea gallina	3	1	<1	0
Ciona intestinalis	7	0	0	0
Common mussel	5	2	0	0
Common shrimp	43	6	5	0
Corystes cassivelaunus	231	17	18	1
Crepidula fornicata	<1	0	<1	0
Diphasia sp.	0	0	0	0
Dosinia exoleta	<1	0	0	0
Dosinia lupinus	0	0	<1	0
Dosinia sp.	<1	0	<1	0
Echinidae	7	0	0	0
Echinocardium cordatum	390	7	3	0
Echinocardium sp.	<1	0	0	0
Echinocyamus pusillus	0	0	0	0
Ectopleura larynx	4	<1	0	0
Eledone cirrhosa	<1	0	0	0
Ensis directus	1	0	0	0
Ensis magnus	<1	0	0	0
Ensis sp.	5	1935	0	0

Euspira catena	0	0	0	0
Flustra foliacea	3	0	2	0
Gari fervensis	<1	0	<1	0
Goneplax rhomboides	19	3	0	0
Halichondria panicea	205	1	20	0
Holothuria forskali	0	0	0	0
Hyas araneus	0	0	0	0
Hyas sp.	<1	1	0	0
Hydractinia echinata	<1	0	0	0
Hydrallmania falcata	<1	0	0	0
Laevicardium crassum	1	0	<1	0
Leander serratus	0	<1	0	0
Liocarcinus depurator	133	19	<1	<1
Liocarcinus holsatus	1486	215	47	2
Liocarcinus marmoreus	50	1	0	0
Lithodes maja	0	0	0	0
Loligo forbesi	<1	<1	2	<1
Loligo sp.	0	<1	0	0
Loligo subulata	2	<1	0	<1
Luidia sarsi	0	2	0	0
Lunatia alderi	21	1	<1	0
Lunatia sp.	<1	0	0	0
Macoma balthica	0	0	0	0
Macropodia rostrata	<1	0	0	0
Macropodia tenuirostris	0	0	0	0
Mactra corallina	9	<1	3	0
Maja squinado	0	0	0	0
Marthasterias glacialis	0	0	0	0
Mya truncata	<1	0	0	0
Nassarius reticlatus	0	0	0	0
Necora puber	13	5	0	0
Nemertesia antennina	<1	0	0	0
Nemertesia sp.	<1	0	0	0
Neptunea antiqua	8	0	1	7
Nereis sp.	<1	0	0	0
Ophiothrix fragilis	31	0	28	<1
Ophiura albida	43	106	0	0
Ophiura ophiura	1194	2731	6	0
Ophiura robusta	0	0	0	0
Pagurus bernhardus	361	49	50	2
Pagurus sp.	17	1	0	0
Palaemon sp.	0	0	0	0
Pecten maximus	<1	0	<1	0
Phyllodoce sp.	0	0	0	0

Pisidia longicornis	<1	0	0	0
Psammechinus miliaris	102	6	4	<1
Pseudarchaster parelii	0	0	0	0
Scalibregma inflatum	4	0	<1	0
Scaphander lignarius	0	0	2	0
Securiflustra securifrons	0	0	0	0
Sepia officinalis	<1	0	0	0
Sepia sp.	<1	<1	0	0
Sepietta oweniana	0	0	0	0
Sepiola atlantica	<1	0	0	0
Sepiola sp.	<1	0	0	0
Solen marginatus	<1	2	<1	0
Spatangus purpureus	3	0	0	0
Spisula sp.	15	3	1	0
Thia scutellata	0	0	0	0
Todaropsis eblanae	0	<1	0	0
Turritella communis	<1	0	0	0
Zirfaea crispata	0	0	0	0

*≤300 hp segment

Table 7b. Average numbers per hour of discarded non-target fish species in Dutch bottom beam-trawl (TBB) and Scottish seine (SSC) fisheries targeting demersal fish (DEF) in 2011.

Métier Mesh size Species	TBB_DEF 70-99	TBB_DEF* 70-99	TBB_DEF 100-119	SSC_DEF >120
Ammodytes sp.	15	16	2	0
Anglerfish	0	0	0	0
Ballan wrasse	0	0	0	0
Bib	5	3	<1	0
Blonde ray	3	0	0	0
Bull-rout	14	11	2	0
Cuckoo ray	0	0	0	0
Dragonet	53	8	2	0
Five-bearded rockling	<1	<1	0	0
Flounder	6	20	0	0
Four-bearded rockling	6	<1	0	0
Garfish	0	0	0	0
Greater pipefish	0	<1	0	0
Greater sand-eel	15	3	<1	0
Greater weever	<1	<1	0	0
Grey gurnard	61	27	10	119
Haddock	0	0	0	92
Hake	0	0	0	2
Herring	9	<1	0	55
Hooknose	17	4	<1	0
Horse mackerel	1	<1	0	0
John Dory	0	0	0	0
Lemon sole	40	5	13	3
Lesser sand-eel	0	0	0	0
Lesser spotted dogfish	3	<1	0	0
Lesser weever	33	2	1	0
Ling	0	0	0	0
Long rough dab	1	6	1	6
Lumpsucker	0	0	<1	0
Mackerel	<1	0	0	0
Megrim	0	<1	0	0
Mustelus sp.	<1	<1	<1	0
Nilsson's pipefish	0	<1	0	0
Norwegian topknot	<1	0	0	0
Pomatoschistus sp.	2	0	0	0
Raja sp.	0	0	0	0
Reticulated dragonet	2	<1	0	0
Roker	3	<1	10	15
Sand goby	2	<1	0	0

Sand sole	0	0	0	0
Scaldfish	110	18	2	0
Sea bass	<1	0	0	0
Sea-snail	<1	0	0	0
Solenette	115	23	6	0
Spotted dragonet	0	0	0	0
Spotted ray	4	2	5	0
Sprat	2	<1	0	0
Spurdog	0	0	0	0
Starry ray	0	0	0	0
Striped red mullet	1	0	<1	0
Three-bearded rockling	2	0	0	0
Tope	0	0	0	0
Tub gurnard	19	8	0	0
Witch	0	0	0	0

*≤300 hp segment

Table 7c. Average numbers per hour of discarded benthic species in Dutch bottom otter-trawl (OTB) fisheries targeting mixed crustaceans and fish (MCD) and demersal fish (DEF) in 2011.

Métier Mesh size Species	OTB_MCD 70-99	OTB_DEF 70-99	OTB_DEF 100-119
Abietinaria abietina	0	0	0
Abra prismatica	0	0	0
Acanthocardia echinata	0	0	<1
Aequipecten opercularis	4	<1	1
Alcyonidium diaphanum	0	0	<1
Alcyonium digitatum	3	<1	8
Anthozoa	1	0	<1
Aphrodita aculeata	33	6	6
Arctica islandica	<1	0	1
Ascidiacea	0	0	0
Ascidiella aspersa	0	0	0
Ascidiella scabra	0	0	<1
Asterias rubens	168	310	196
Astropecten irregularis	30	16	26
Atelecyclus rotundatus	0	0	0
Barnea candida	0	0	0
Buccinum undatum	2	<1	5
Cancer pagurus	4	4	6
Carcinus maenas	<1	0	0
Cerastoderma edule	0	0	0
Chamelea gallina	0	0	0
Ciona intestinalis	<1	0	0
Common mussel	0	1	<1
Common shrimp	0	<1	0
Corystes cassivelaunus	2	23	5
Crepidula fornicata	<1	0	0
Diphasia sp.	0	0	0
Dosinia exoleta	0	0	0
Dosinia lupinus	0	0	0
Dosinia sp.	0	0	0
Echinidae	0	0	0
Echinocardium cordatum	8	5	0
Echinocardium sp.	0	3	0
Echinocyamus pusillus	0	0	0
Ectopleura larynx	0	3	0
Eledone cirrhosa	0	0	0
Ensis directus	0	0	0
Ensis magnus	0	0	0
Ensis sp.	0	8	<1

Euspira catena	0	0	0
Flustra foliacea	2	<1	1
Gari fervensis	0	0	0
Goneplax rhomboides	35	2	0
Halichondria panicea	<1	2	66
Holothuria forskali	<1	0	0
Hyas araneus	<1	<1	0
Hyas sp.	<1	0	<1
Hydractinia echinata	0	0	0
Hydrallmania falcata	0	0	0
Laevicardium crassum	0	0	0
Leander serratus	0	0	0
Liocarcinus depurator	182	49	2
Liocarcinus holsatus	57	102	20
Liocarcinus marmoreus	0	15	0
Lithodes maja	<1	0	<1
Loligo forbesi	1	0	<1
Loligo sp.	0	0	<1
Loligo subulata	<1	0	0
Luidia sarsi	0	0	0
Lunatia alderi	0	<1	<1
Lunatia sp.	0	0	0
Macoma balthica	0	0	0
Macropodia rostrata	0	0	0
Macropodia tenuirostris	0	0	0
Mactra corallina	0	0	<1
Maja squinado	0	0	0
Marthasterias glacialis	0	0	0
Mya truncata	<1	0	0
Nassarius reticlatus	0	0	0
Necora puber	0	<1	0
Nemertesia antennina	0	0	0
Nemertesia sp.	0	0	0
Neptunea antiqua	<1	<1	3
Nereis sp.	0	0	0
Ophiothrix fragilis	0	<1	103
Ophiura albida	0	66	0
Ophiura ophiura	5	2688	12
Ophiura robusta	0	0	0
Pagurus bernhardus	82	107	22
Pagurus sp.	0	0	<1
Palaemon sp.	0	0	0

Pecten maximus	0	0	0
Phyllodoce sp.	0	0	0
Pisidia longicornis	0	0	0
Psammechinus miliaris	<1	<1	10
Pseudarchaster parelii	0	0	0
Scalibregma inflatum	<1	<1	0
Scaphander lignarius	0	0	0
Securiflustra securifrons	0	0	0
Sepia officinalis	0	0	0
Sepia sp.	0	<1	0
Sepietta oweniana	0	0	0
Sepiola atlantica	1	<1	0
Sepiola sp.	0	0	0
Solen marginatus	0	0	1
Spatangus purpureus	0	0	0
Spisula sp.	0	<1	0
Thia scutellata	0	8	0
Todaropsis eblanae	0	0	0
Turritella communis	0	0	0
Zirfaea crispata	0	0	<1

Table 7d. Average numbers per hour of discarded non-target fish species in Dutch bottom otter-trawl (OTB) fisheries targeting mixed crustaceans and fish (MCD) and demersal fish (DEF) in 2011.

Métier Mesh size Species	OTB_MCD 70-99	OTB_DEF 70-99	OTB_DEF 100-119
Ammodytes sp.	0	<1	<1
Anglerfish	<1	0	0
Ballan wrasse	0	0	0
Bib	<1	0	0
Blonde ray	1	<1	0
Bull-rout	1	20	17
Cuckoo ray	0	0	0
Dragonet	6	4	2
Five-bearded rockling	0	0	0
Flounder	0	0	0
Four-bearded rockling	5	2	0
Garfish	0	0	0
Greater pipefish	0	0	0
Greater sand-eel	0	<1	0
Greater weever	0	0	0
Grey gurnard	27	55	70
Haddock	<1	0	<1
Hake	<1	0	0
Herring	<1	1	0
Hooknose	<1	4	0
Horse mackerel	0	0	0
John Dory	0	0	0
Lemon sole	9	3	16
Lesser sand-eel	0	0	0
Lesser spotted dogfish	3	0	<1
Lesser weever	0	2	<1
Ling	<1	0	0
Long rough dab	11	9	1
Lumpsucker	0	<1	<1
Mackerel	0	0	0
Megrim	<1	0	0
Mustelus sp.	<1	0	0
Nilsson's pipefish	0	0	0
Norwegian topknot	<1	<1	0
Pomatoschistus sp.	0	0	0
Raja sp.	0	0	0

Reticulated dragonet	0	<1	0
Roker	<1	<1	<1
Sand goby	0	<1	0
Sand sole	0	0	0
Scaldfish	13	7	7
Sea bass	0	0	<1
Sea-snail	0	0	0
Solenette	4	13	2
Spotted dragonet	0	0	0
Spotted ray	7	<1	<1
Sprat	<1	0	0
Spurdog	<1	0	0
Starry ray	<1	0	1
Striped red mullet	<1	<1	0
Three-bearded rockling	0	0	0
Tope	0	0	0
Tub gurnard	3	4	<1
Witch	2	1	<1

Table 8. Average weights (kg) and numbers per hour of landed (L) and discarded (D) plaice (PLE) and sole (SOL, top) and dab (DAB) and whiting (WHG, bottom) in the beam-trawl fisheries (TBB_DEF_70-99mm_>300hp) between 1976 and 2011. Nm, not measured; n/a, not available.

				PLE						SOL			
Year /		Numbers			Weight			Numbers			Weight		
Period	N trips	L	D	%D	L	D	%D	L	D	%D	L	D	%D
1976-1979	21	253	185	42%	108	28	20%	116	8	6%	32	1	4%
1980-1983	24	309	418	57%	99	51	34%	85	24	22%	19	3	15%
1989-1990	6	392	330	46%	104	46	30%	286	83	22%	48	12	20%
1999	3	145	181	55%	42	18	29%	112	16	13%	32	2	5%
2000	12	194	601	76%	50	47	48%	90	25	22%	22	2	10%
2001	4	364	1184	76%	84	89	51%	82	17	17%	17	1	6%
2002	6	263	868	77%	69	71	51%	126	38	23%	18	3	13%
2003	9	196	945	83%	52	70	57%	95	32	25%	20	3	14%
2004	8	158	792	83%	42	57	57%	175	69	28%	31	7	17%
2005	8	143	710	83%	47	51	52%	99	29	23%	20	2	11%
2006	9	166	997	86%	57	67	54%	64	26	29%	16	2	13%
2007	10	214	700	77%	67	57	46%	94	27	23%	22	2	10%
2008	10	169	902	84%	61	69	53%	95	16	16%	23	1	6%
2009	48	189	917	83%	61	76	55%	113	34	23%	25	3	11%
2010	74	201	872	81%	82	68	45%	132	42	24%	22	4	14%
2011	67	Nm	921	n/a	72	85	54%	Nm	50	n/a	23	5	18%

				DAB						WHG			
Year /		Numbers			Weight			Numbers			Weight		
Period	N trips	L	D	%D	L	D	%D	L	D	%D	L	D	%D
1976-1979	21	12	917	99%	4	65	95%	10	34	78%	3	5	62%
1980-1983	24	31	796	96%	7	60	90%	21	89	81%	5	11	69%
1989-1990	6	15	2147	99%	2	123	98%	5	122	96%	1	17	95%
1999	3	112	1411	93%	13	106	89%	Nm	77	n/a	<1	10	93%
2000	12	28	951	97%	6	49	89%	Nm	117	n/a	2	9	85%
2001	4	125	2268	95%	12	97	89%	Nm	69	n/a	1	9	86%
2002	6	92	934	91%	11	57	84%	14	104	88%	1	7	85%
2003	9	60	1166	95%	8	64	89%	2	40	96%	<1	3	86%
2004	8	54	1037	95%	7	51	87%	0	46	100%	<1	2	92%
2005	8	25	492	95%	6	52	90%	3	18	85%	<1	2	85%
2006	9	46	2335	98%	9	79	90%	Nm	36	n/a	<1	3	74%
2007	10	81	1196	94%	12	62	83%	0	10	100%	<1	3	87%
2008	10	51	905	95%	8	49	87%	0	15	100%	<1	3	93%
2009	48	31	1221	98%	33	62	65%	Nm	58	n/a	<1	5	89%
2010	74	48	1178	96%	10	65	87%	Nm	70	n/a	1	5	82%
2011	67	Nm	1350	n/a	12	74	86%	Nm	54	n/a	3	4	57%

Figures

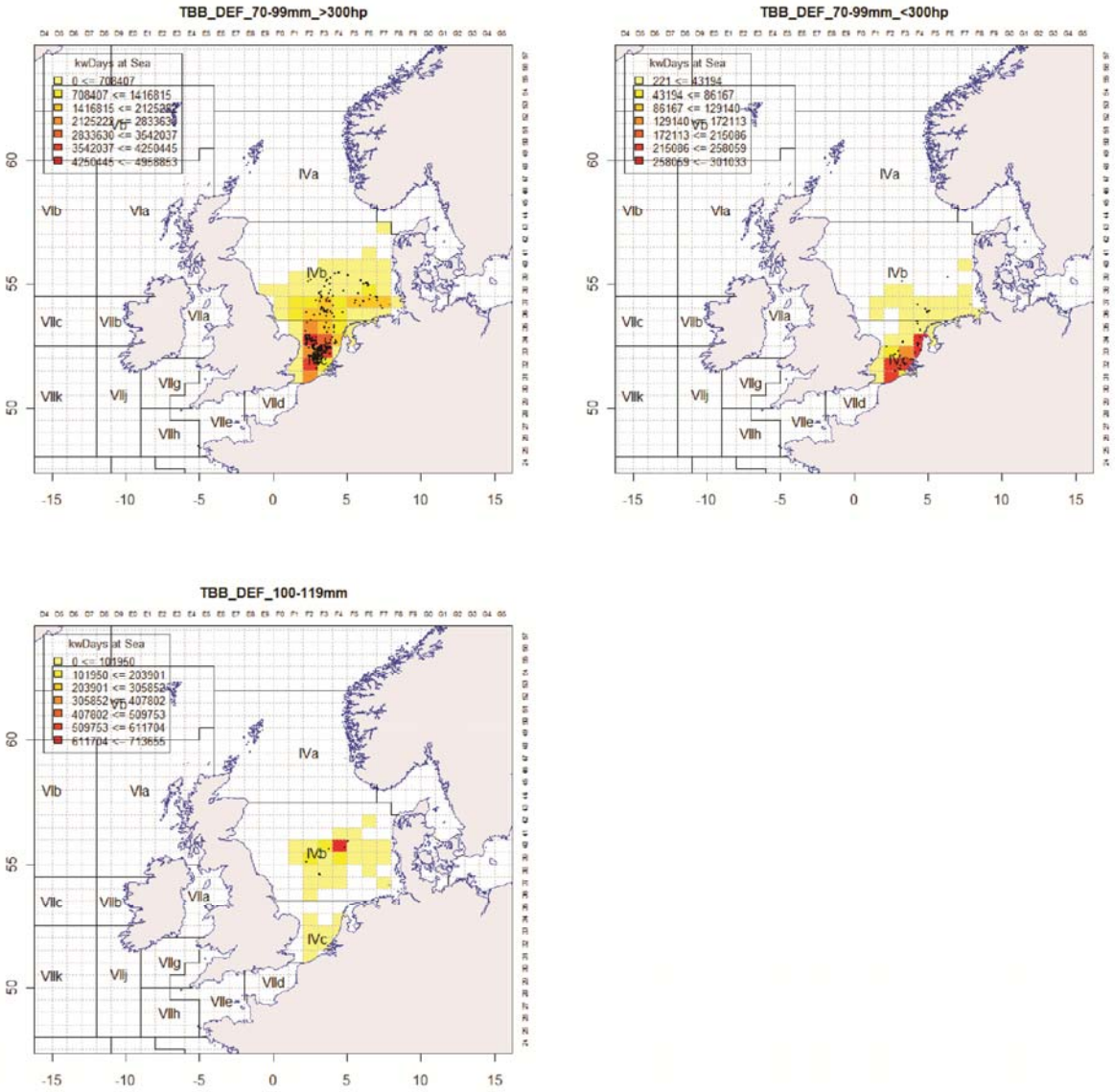

Figure 1a. Distribution of total effort (in kw*days at sea, shaded colours per ICES rectangle) and positions of sampled beam trawls (black dots) in 2011.

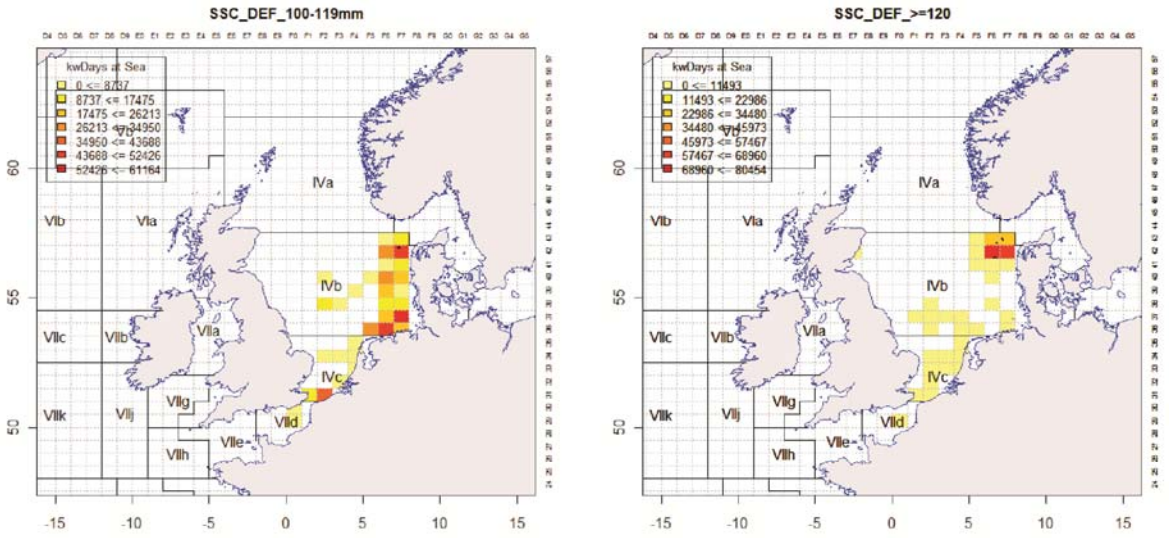

Figure 1b. Distribution of total effort (in kw*days at sea, shaded colours per ICES rectangle) and positions of sampled Scottish seine sets (black dots) in 2011.

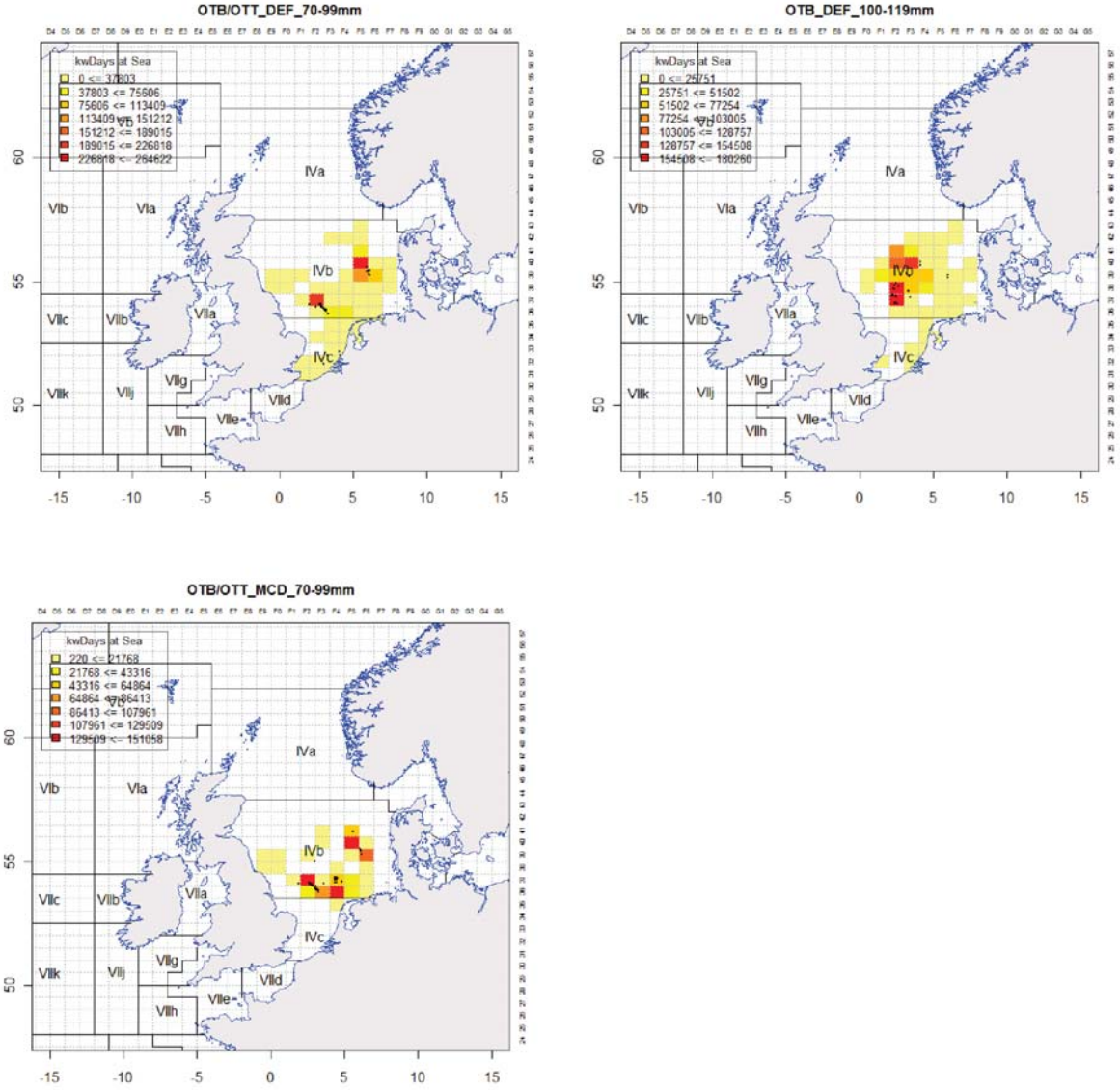

Figure 1c. Distribution of total effort (in kw*days at sea per ICES rectangle) and positions of sampled otter trawls (black dots) in 2011.

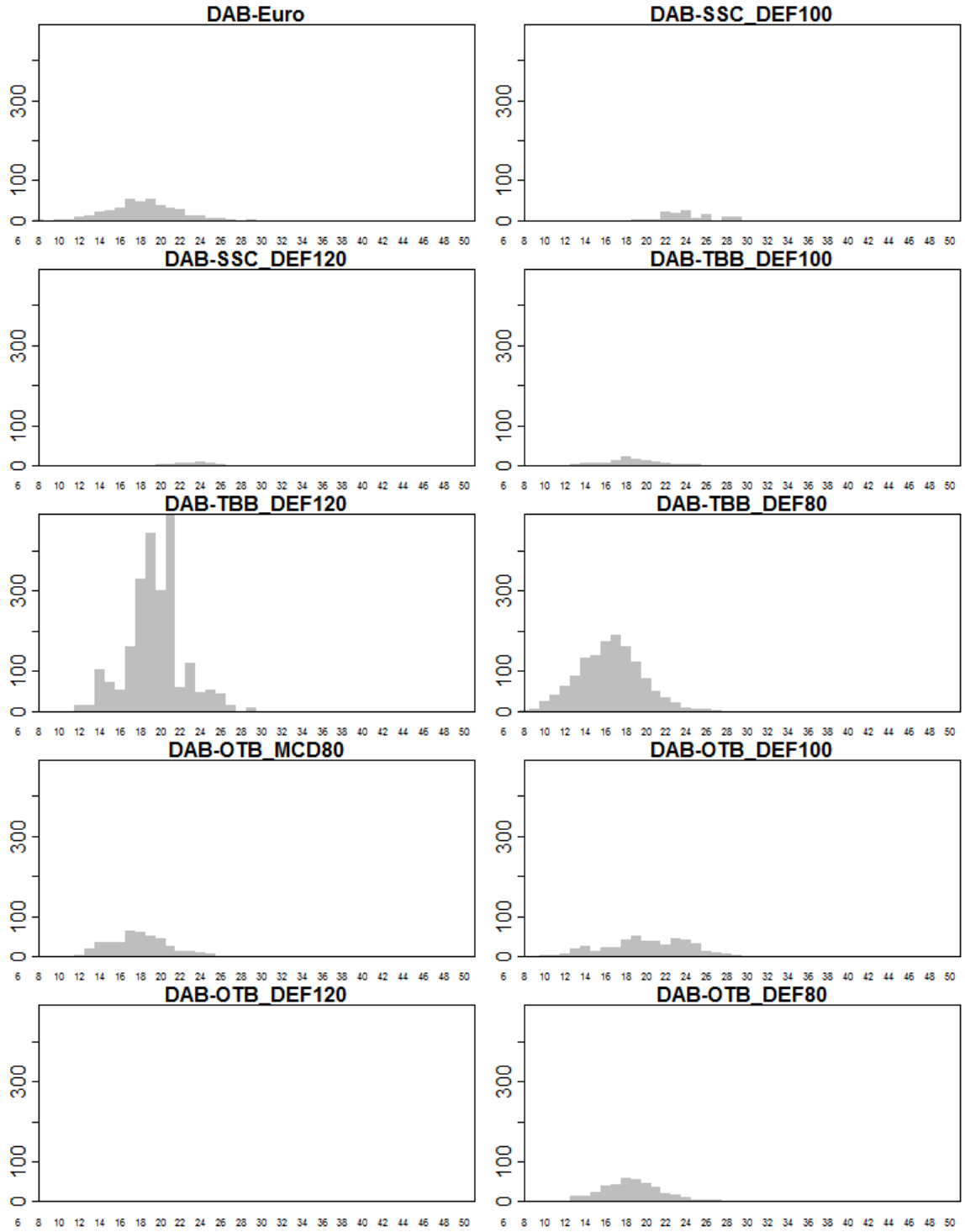

Figure 2a. Length frequency distribution of the average number per hour of discarded dab (minimum landing size=none) for each of the relevant metiers in 2011. Refer to Table 3 for metier names.

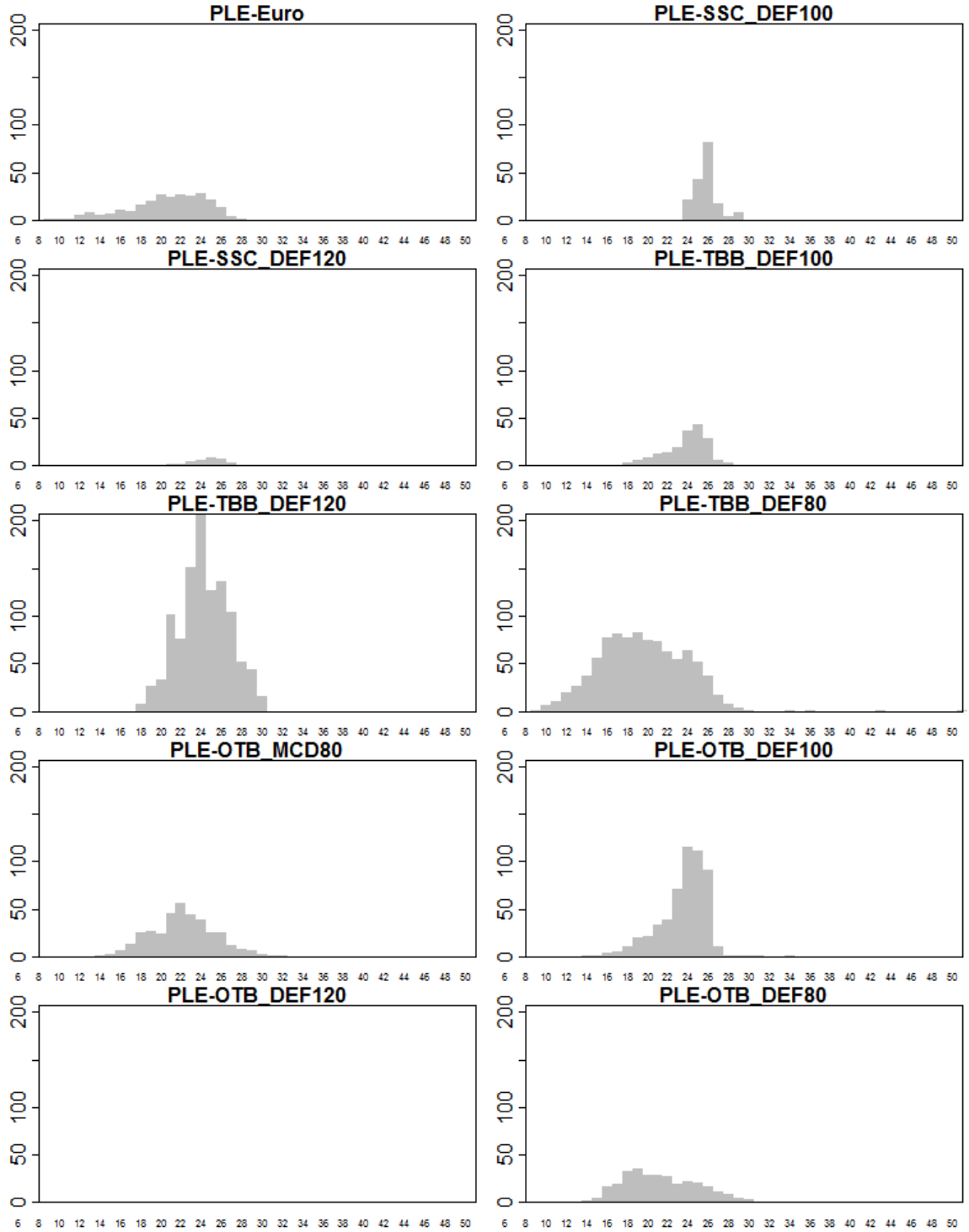

Figure 2b. Length frequency distribution of the average number per hour of discarded plaice (minimum landing size=27cm; ICES code= "PLE") for each of the relevant metiers in 2011. Refer to Table 3 for metier names.

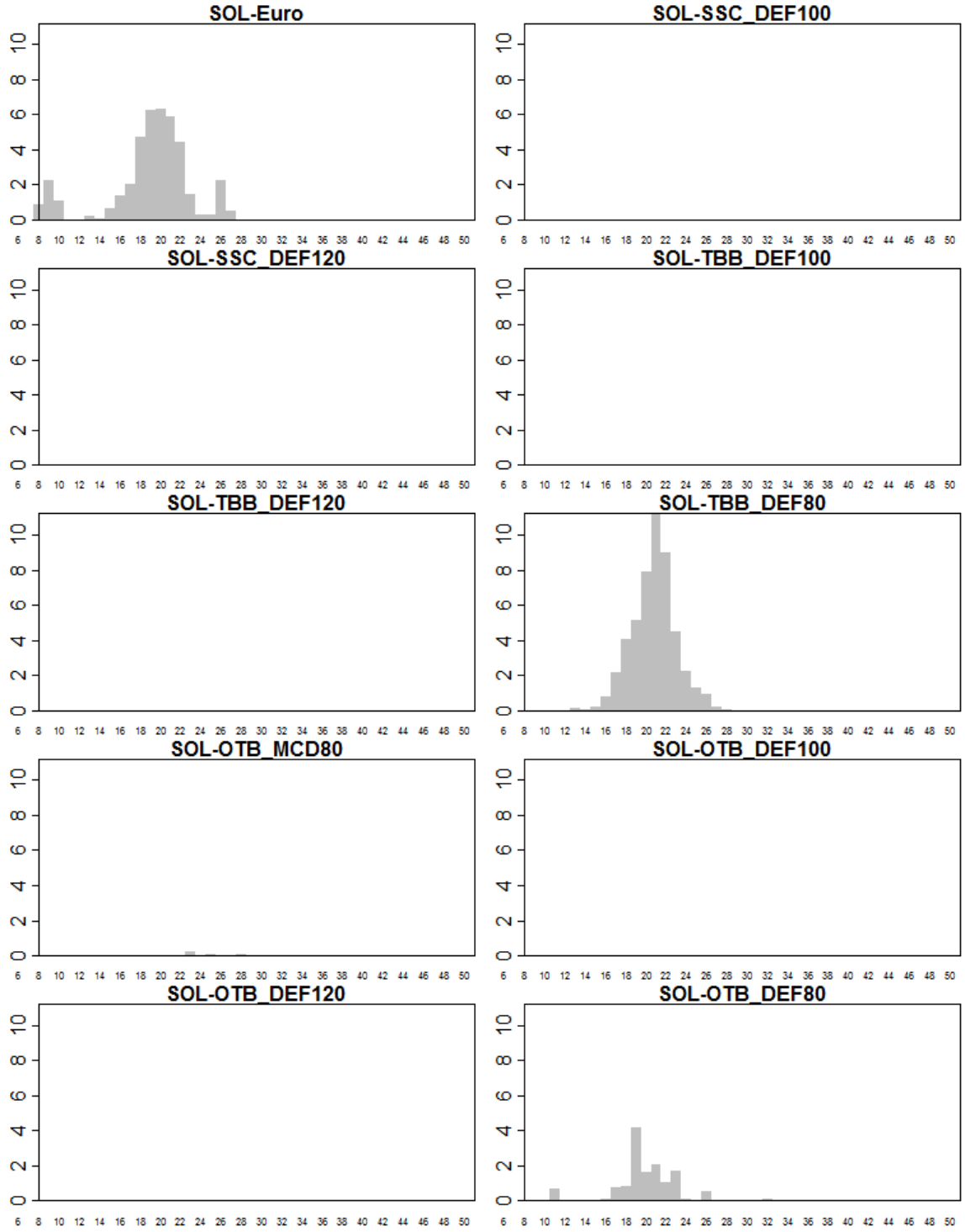

Figure 2c. Length frequency distribution of the average number per hour of discarded sole (minimum landing size= 24cm; ICES code= "SOL") for each of the relevant metiers in 2011. Refer to Table 3 for metier names.

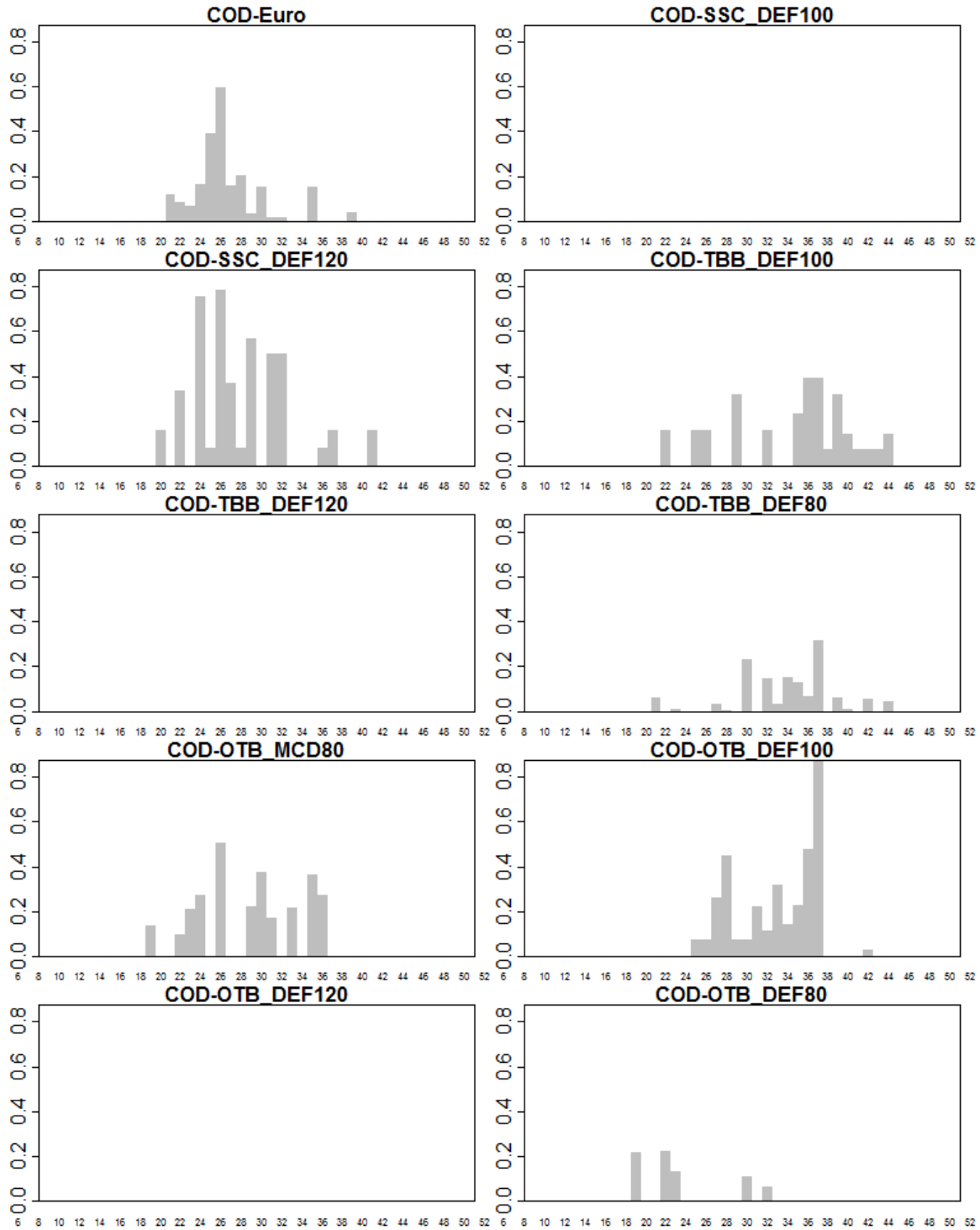

Figure 2d. Length frequency distribution of the average number per hour of discarded cod (minimum landing size=35 cm; ICES code= "COD") for each of the relevant metiers in 2011. Refer to Table 3 for metier names.

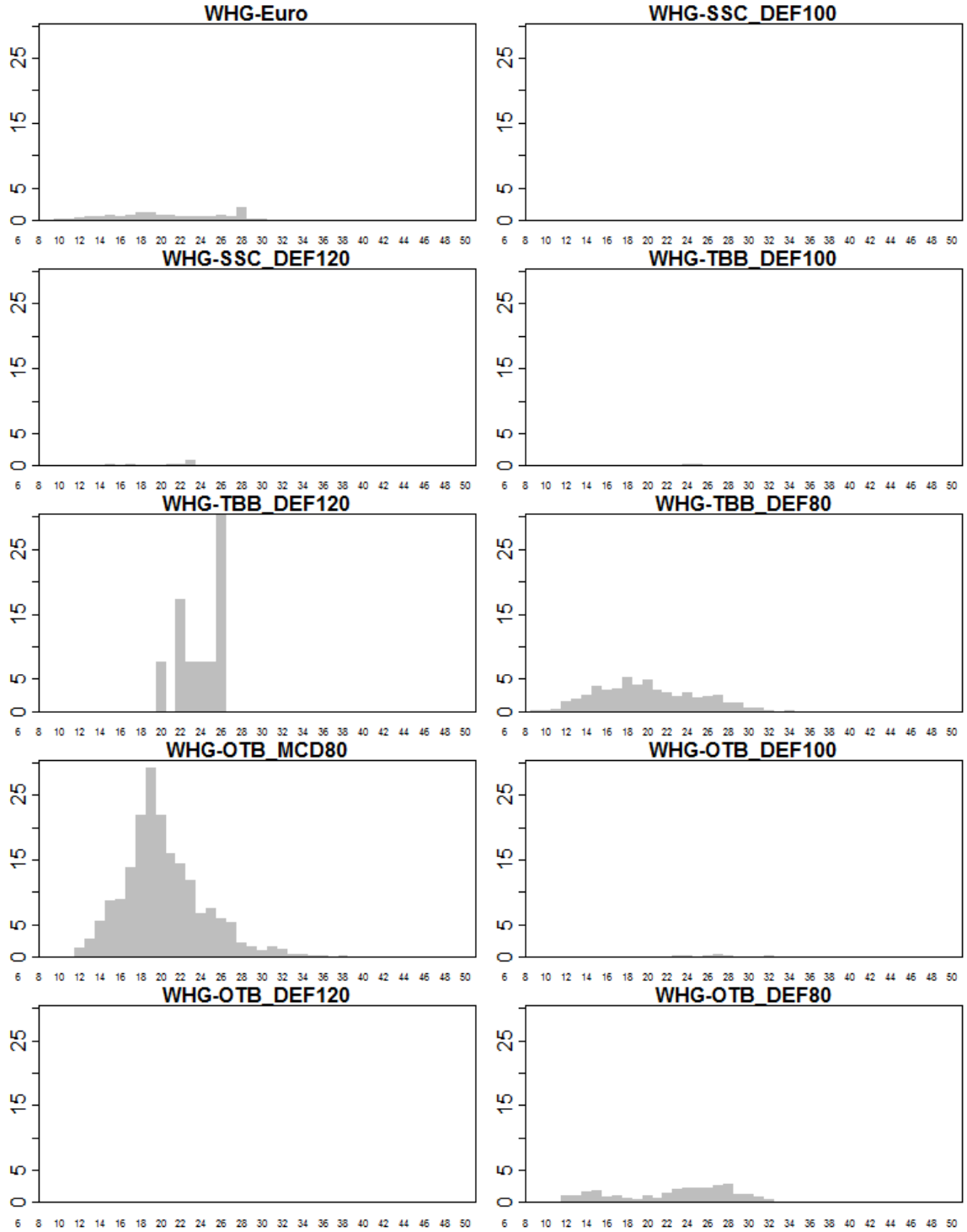

Figure 2e. Length frequency distribution of the average number per hour of discarded whiting (minimum landing size=27 cm; ICES code= "WHG") for each of the relevant metiers in 2011. Refer to Table 3 for metier names.

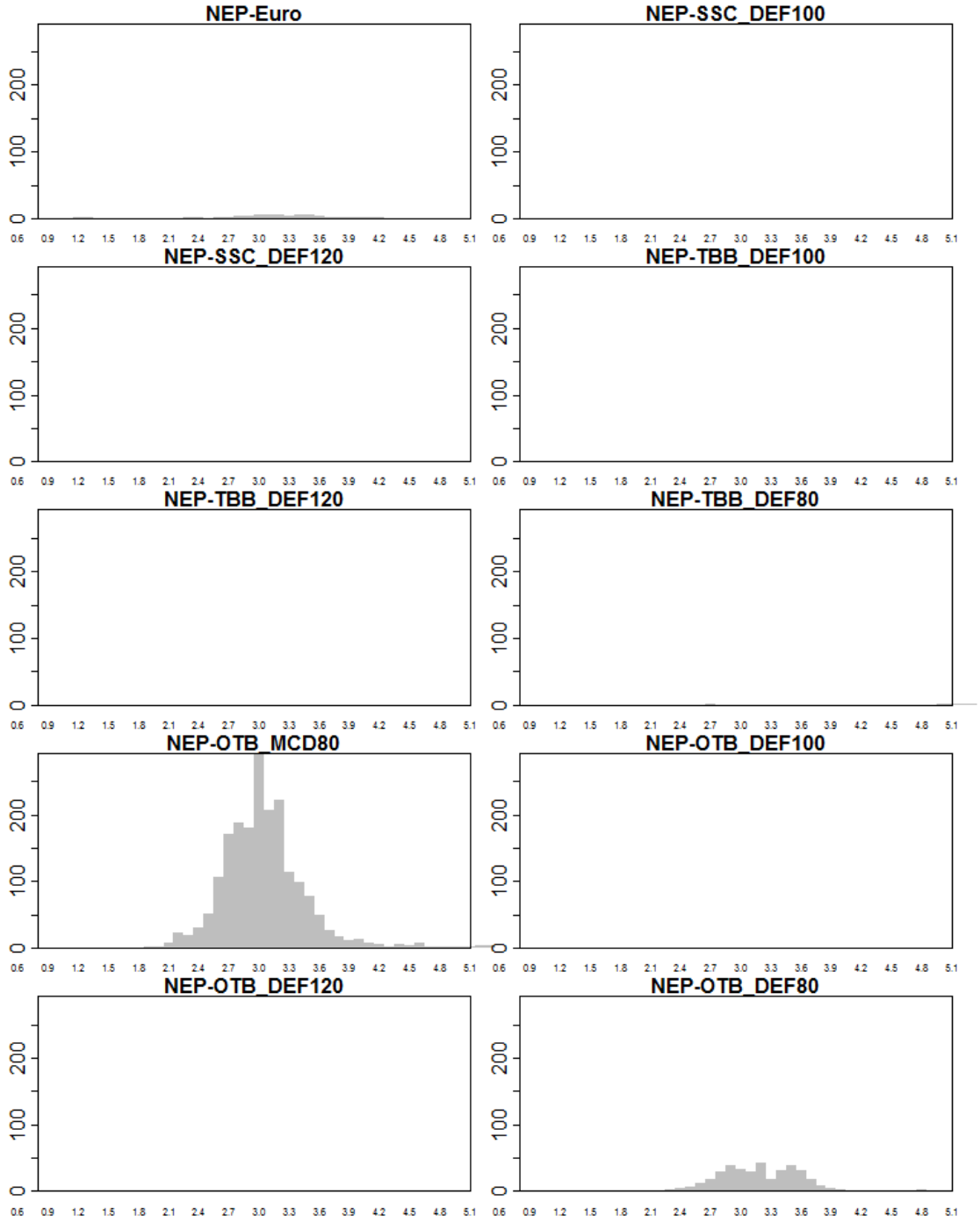

Figure 2f. Carapax length frequency distribution of the average number per hour of discarded Norway lobster (minimum landing size=2.5 cm; ICES code: "NEP") for each of the relevant metiers in 2011. Refer to Table 3 for metier names.

Appendix A:

Query used in the statistical software package R to obtain métier-specific subsets of data:

```
dis_TBB_DEF80 <- eflalo.11[eflalo.11$VE_FLT %in% c('TBB_DEF_70-89_0_0', 'TBB_DEF_70-99_0_0',
'TBB_DEF_90-119_0_0') & eflalo.11$LE_SUBDIV %in% c('IVc', 'IVb'),];

dis_TBB_DEF100 <- eflalo.11[eflalo.11$VE_FLT %in% c('TBB_DEF_100-119_0_0') &
eflalo.11$LE_SUBDIV %in% c('IVc', 'IVb'),]

dis_SSC_DEF120 <- eflalo.11 [eflalo.11$VE_FLT %in% c('SSC_DEF_>=120_0_0') &
eflalo.11$LE_SUBDIV %in% c('VIId', 'VIIe','IVc', 'IVb'),];

dis_SSC_DEF100 <- eflalo.11 [eflalo.11$VE_FLT %in% c('SSC_DEF_100-119_0_0') &
eflalo.11$LE_SUBDIV %in% c('VIId', 'VIIe','IVc', 'IVb'),];

dis_OTB_MCD_80 <- eflalo.11[eflalo.11$VE_FLT %in% c('OTB_MCD_70-99_0_0', 'OTT_MCD_70-
99_0_0') & eflalo.11$LE_SUBDIV %in% c('IVc', 'IVb'),]

dis_OTB_DEF_80 <- eflalo.11[eflalo.11$VE_FLT %in% c('OTB_DEF_70-99_0_0', 'OTT_DEF_70-99_0_0',
'OTB_DEF_90-119_0_0') & eflalo.11$LE_SUBDIV %in% c('IVc', 'IVb'),]

dis_OTB_DEF_100 <- eflalo.11[eflalo.11$VE_FLT %in% c('OTB_DEF_100-119_0_0', 'OTT_DEF_100-
119_0_0') & eflalo.11$LE_SUBDIV %in% c('IVc', 'IVb'),]
```

Appendix B:

Table 9a. Fishing and sampling effort of self-sampled trips (by TBB_DEF and SSC_DEF métier) in 2011. For each trip ID, the quarter of observation (Q), the total number of hauls (Hauls), the total number of fishing hours (Fish_h), the hours of sampling for landings (Lan_h) and discards (Dis_h) is given. Blank cells, no landings were measured.

TripID	Métier	Q	Hauls	Fish_h	Lan_h	Dis_h
361	TBB_DEF_70-99mm_>300hp	1	29	76		5
362	TBB_DEF_70-99mm_>300hp	1	34	67		4
363	TBB_DEF_70-99mm_>300hp	1	38	76		4
364	TBB_DEF_70-99mm_>300hp	1	38	76		4
367	TBB_DEF_70-99mm_>300hp	1	41	72		4
371	TBB_DEF_70-99mm_>300hp	1	46	91		4
372	TBB_DEF_70-99mm_>300hp	1	47	82		4
383	TBB_DEF_70-99mm_>300hp	1	38	69		2
392	TBB_DEF_70-99mm_>300hp	1	35	79		5
399	TBB_DEF_70-99mm_>300hp	1	42	69		2
400	TBB_DEF_70-99mm_>300hp	1	37	63		4
401	TBB_DEF_70-99mm_>300hp	1	44	73		3
405	TBB_DEF_70-99mm_>300hp	1	33	76		5
406	TBB_DEF_70-99mm_>300hp	1	33	74		3
408	TBB_DEF_70-99mm_>300hp	1	37	82		4
409	TBB_DEF_70-99mm_>300hp	1	45	88		5
414	TBB_DEF_70-99mm_>300hp	2	32	60		4
444	TBB_DEF_70-99mm_>300hp	2	39	78		4
445	TBB_DEF_70-99mm_>300hp	2	37	72		4
446	TBB_DEF_70-99mm_>300hp	2	30	61		4
447	TBB_DEF_70-99mm_>300hp	2	36	72		4
449	TBB_DEF_70-99mm_>300hp	2	45	79		4
450	TBB_DEF_70-99mm_>300hp	2	47	82		4
451	TBB_DEF_70-99mm_>300hp	2	48	86		4
454	TBB_DEF_70-99mm_>300hp	2	39	76		4
455	TBB_DEF_70-99mm_>300hp	2	41	81		4
456	TBB_DEF_70-99mm_>300hp	2	44	86		4
464	TBB_DEF_70-99mm_>300hp	2	47	77		3
481	TBB_DEF_70-99mm_>300hp	2	39	76		4
482	TBB_DEF_70-99mm_>300hp	2	38	75		4
365	TBB_DEF_70-99mm_>300hp	3	37	73		4
366	TBB_DEF_70-99mm_>300hp	3	39	77		4
368	TBB_DEF_70-99mm_>300hp	3	35	64		4
369	TBB_DEF_70-99mm_>300hp	3	40	74		4
370	TBB_DEF_70-99mm_>300hp	3	36	62		2

TripID	Métier	Q	Hauls	Fish_h	Lan_h	Dis_h
373	TBB_DEF_70-99mm_>300hp	3	46	78		3
374	TBB_DEF_70-99mm_>300hp	3	36	62		4
375	TBB_DEF_70-99mm_>300hp	3	47	83		4
384	TBB_DEF_70-99mm_>300hp	3	39	76		5
385	TBB_DEF_70-99mm_>300hp	3	24	52		5
402	TBB_DEF_70-99mm_>300hp	3	49	76		3
403	TBB_DEF_70-99mm_>300hp	3	39	79		4
410	TBB_DEF_70-99mm_>300hp	3	44	85		4
412	TBB_DEF_70-99mm_>300hp	3	40	82		4
475	TBB_DEF_70-99mm_>300hp	3	42	61		3
483	TBB_DEF_70-99mm_>300hp	3	37	72		3
492	TBB_DEF_70-99mm_>300hp	3	33	71		4
427	TBB_DEF_70-99mm_>300hp	4	40	80		4
428	TBB_DEF_70-99mm_>300hp	4	47	79		4
429	TBB_DEF_70-99mm_>300hp	4	41	75		3
430	TBB_DEF_70-99mm_>300hp	4	47	82		4
431	TBB_DEF_70-99mm_>300hp	4	46	78		3
432	TBB_DEF_70-99mm_>300hp	4	48	83		4
434	TBB_DEF_70-99mm_>300hp	4	40	79		4
435	TBB_DEF_70-99mm_>300hp	4	32	66		4
470	TBB_DEF_70-99mm_>300hp	4	36	81		5
472	TBB_DEF_70-99mm_>300hp	4	36	79		5
476	TBB_DEF_70-99mm_>300hp	4	42	70		3
477	TBB_DEF_70-99mm_>300hp	4	44	77		4
478	TBB_DEF_70-99mm_>300hp	4	23	46		2
484	TBB_DEF_70-99mm_>300hp	4	39	87		4
485	TBB_DEF_70-99mm_>300hp	4	44	87		4
486	TBB_DEF_70-99mm_>300hp	4	32	82		5
497	TBB_DEF_70-99mm_>300hp	4	30	73		5
498	TBB_DEF_70-99mm_>300hp	4	40	86		5
500	TBB_DEF_70-99mm_>300hp	4	33	73		5
501	TBB_DEF_70-99mm_>300hp	4	28	65		5
376	TBB_DEF_70-99mm_<=300h	1	40	80		4
387	TBB_DEF_70-99mm_<=300h	1	54	127		3
396	TBB_DEF_70-99mm_<=300h	1	30	62		3
443	TBB_DEF_70-99mm_<=300h	2	27	48		3
448	TBB_DEF_70-99mm_<=300h	2	20	13		1
453	TBB_DEF_70-99mm_<=300h	2	21	114		12
461	TBB_DEF_70-99mm_<=300h	2	42	88		4
462	TBB_DEF_70-99mm_<=300h	2	39	86		5
463	TBB_DEF_70-99mm_<=300h	2	32	62		4
377	TBB_DEF_70-99mm_<=300h	3	13	76		11
378	TBB_DEF_70-99mm_<=300h	3	13	81		13
389	TBB_DEF_70-99mm_<=300h	3	10	50		10
397	TBB_DEF_70-99mm_<=300h	3	19	42		5

TripID	Métier	Q	Hauls	Fish_h	Lan_h	Dis_h
438	TBB_DEF_70-99mm_<=300h	4	8	21		2
473	TBB_DEF_70-99mm_<=300h	4	40	85		4
474	TBB_DEF_70-99mm_<=300h	4	36	80		5
496	TBB_DEF_70-99mm_<=300h	4	26	45		3
499	TBB_DEF_70-99mm_<=300h	4	32	56		4
413	TBB_DEF_100-119mm	1	24	56		5
436	TBB_DEF_100-119mm	2	8	53		12
487	TBB_DEF_100-119mm	2	25	59		5
490	TBB_DEF_100-119mm	2	33	61		4
415	TBB_DEF_100-119mm	3	29	54		4
404	SSC_DEF_>=120mm	3	18	54		4
479	SSC_DEF_>=120mm	3	17	35		
479	SSC_DEF_>=120mm	3	2	4		4
491	SSC_DEF_>=120mm	3	21	59		5

Table 9b Fishing and sampling effort of self-sampled trips (by OTB/OTT métier) in 2011. For each trip ID, the quarter of observation (Q), the total number of hauls (Hauls), the total number of fishing hours (Fish_h), the hours of sampling for landings (Lan_h) and discards (Dis_h) is given. Blank cells, no landings were measured.

TripID	Métier	Q	Hauls	Fish_h	Lan_h	Dis_h
424	OTB/OTT_MCD_70-99mm	1	10	53		12
425	OTB/OTT_MCD_70-99mm	1	5	40		23
420	OTB/OTT_MCD_70-99mm	2	12	131		38
442	OTB/OTT_MCD_70-99mm	2	12	66		11
390	OTB/OTT_MCD_70-99mm	3	26	132		10
391	OTB/OTT_MCD_70-99mm	3	23	127		10
421	OTB/OTT_MCD_70-99mm	3	13	89		11
426	OTB/OTT_MCD_70-99mm	3	14	169		11
493	OTB/OTT_MCD_70-99mm	4	18	96		11
494	OTB/OTT_MCD_70-99mm	4	18	109		11
495	OTB/OTT_MCD_70-99mm	4	14	78		12
502	OTB/OTT_MCD_70-99mm	4	11	65		12
503	OTB/OTT_MCD_70-99mm	4	7	37		10
418	OTB/OTT_DEF_70-99mm	1	12	78		13
419	OTB/OTT_DEF_70-99mm	1	14	171		43
422	OTB/OTT_DEF_70-99mm	1	10	71		13
452	OTB/OTT_DEF_70-99mm	2	38	83		4
468	OTB/OTT_DEF_70-99mm	2	13	75		11
469	OTB/OTT_DEF_70-99mm	2	23	161		14
488	OTB/OTT_DEF_70-99mm	2	11	61		11
433	OTB/OTT_DEF_70-99mm	3	16	102		12
471	OTB/OTT_DEF_70-99mm	4	37	81		4
388	OTB/OTT_DEF_100-119mm	1	35	153		10
386	OTB/OTT_DEF_100-119mm	2	15	74		11
439	OTB/OTT_DEF_100-119mm	2	16	58		8
457	OTB/OTT_DEF_100-119mm	2	36	155		9
458	OTB/OTT_DEF_100-119mm	2	15	59		7
460	OTB/OTT_DEF_100-119mm	2	15	60		8
393	OTB/OTT_DEF_100-119mm	3	16	63		8
394	OTB/OTT_DEF_100-119mm	3	15	59		8
395	OTB/OTT_DEF_100-119mm	3	14	56		8
440	OTB/OTT_DEF_100-119mm	4	11	45		8
424	OTB/OTT_MCD_70-99mm	1	10	53		12
425	OTB/OTT_MCD_70-99mm	1	5	40		23
420	OTB/OTT_MCD_70-99mm	2	12	131		38
442	OTB/OTT_MCD_70-99mm	2	12	66		11
390	OTB/OTT_MCD_70-99mm	3	26	132		10
391	OTB/OTT_MCD_70-99mm	3	23	127		10

TripID	Métier	Q	Hauls	Fish_h	Lan_h	Dis_h
421	OTB/OTT_MCD_70-99mm	3	13	89		11
426	OTB/OTT_MCD_70-99mm	3	14	169		11
493	OTB/OTT_MCD_70-99mm	4	18	96		11
494	OTB/OTT_MCD_70-99mm	4	18	109		11
495	OTB/OTT_MCD_70-99mm	4	14	78		12
502	OTB/OTT_MCD_70-99mm	4	11	65		12
503	OTB/OTT_MCD_70-99mm	4	7	37		10
418	OTB/OTT_DEF_70-99mm	1	12	78		13
419	OTB/OTT_DEF_70-99mm	1	14	171		43
422	OTB/OTT_DEF_70-99mm	1	10	71		13

Table 10a. Weights (kg) per hour of discarded (Dis) and landed (Lan) dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod, whiting (WHG) and Norway lobster (NEP) for each self-sampled trip in the demersal beam-trawl and Scottish seine métiers (TBB_DEF and SCC_DEF) in 2011.

TripID	Métier	Q	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis COD	Lan COD	Dis WHG	Lan WHG	Dis NEP	Lan NEP
361	TBB_DEF_70-99mm_>300hp	1	15	29	4	98	0	4	0	0	0	4	0	0	0	0	0	0
362	TBB_DEF_70-99mm_>300hp	1	152	12	496	184	5	26	3	4	0	1	0	10	13	7	0	0
363	TBB_DEF_70-99mm_>300hp	1	101	11	208	116	3	24	0	4	0	2	0	7	1	4	0	0
364	TBB_DEF_70-99mm_>300hp	1	116	11	111	36	4	31	0	4	0	2	0	1	3	2	0	0
367	TBB_DEF_70-99mm_>300hp	1	43	16	106	138	5	22	0	3	0	2	0	9	3	2	0	0
371	TBB_DEF_70-99mm_>300hp	1	1	1	12	29	11	24	0	4	0	1	0	4	0	1	0	2
372	TBB_DEF_70-99mm_>300hp	1	20	2	19	15	3	16	0	5	0	2	0	4	5	1	0	11
383	TBB_DEF_70-99mm_>300hp	1	63	4	45	72	3	15	0	2	0	5	0	3	1	0	0	0
392	TBB_DEF_70-99mm_>300hp	1	36	23	63	94	3	24	0	3	0	1	0	7	3	4	0	0
399	TBB_DEF_70-99mm_>300hp	1	56	6	88	79	0	25	0	0	0	1	0	1	0	9	0	0
400	TBB_DEF_70-99mm_>300hp	1	101	8	267	85	9	19	0	2	0	2	0	4	1	1	0	0
401	TBB_DEF_70-99mm_>300hp	1	217	21	174	42	10	22	1	1	0	1	0	2	2	0	0	0
405	TBB_DEF_70-99mm_>300hp	1	161	139	35	150	0	21	0	0	0	4	0	3	0	0	0	0
406	TBB_DEF_70-99mm_>300hp	1	190	53	72	84	0	17	0	0	0	4	0	0	0	0	0	0
408	TBB_DEF_70-99mm_>300hp	1	111	0	146	4	6	15	0	0	0	3	0	0	0	0	0	0
409	TBB_DEF_70-99mm_>300hp	1	61	0	75	3	0	18	0	0	0	4	0	0	2	0	0	0
414	TBB_DEF_70-99mm_>300hp	2	31	0	13	391	0	0	0	1	0	0	0	0	0	0	0	0
444	TBB_DEF_70-99mm_>300hp	2	67	4	69	22	8	31	0	6	1	3	0	1	11	4	0	0
445	TBB_DEF_70-99mm_>300hp	2	12	3	52	32	2	20	0	3	0	3	1	7	10	1	0	0
446	TBB_DEF_70-99mm_>300hp	2	53	7	108	28	4	21	0	2	0	4	0	1	0	0	0	0
447	TBB_DEF_70-99mm_>300hp	2	9	5	9	43	1	18	0	3	0	3	0	7	3	2	0	0
449	TBB_DEF_70-99mm_>300hp	2	30	5	21	22	1	17	0	7	0	3	3	2	19	3	0	0

450	TBB_DEF_70-99mm_>300hp	2	22	2	8	20	2	11	0	5	0	4	2	4	7	1	0	0
451	TBB_DEF_70-99mm_>300hp	2	18	9	18	58	1	15	0	2	0	1	0	2	3	1	0	2
454	TBB_DEF_70-99mm_>300hp	2	39	4	47	40	1	16	0	0	0	0	0	0	1	0	0	0
455	TBB_DEF_70-99mm_>300hp	2	18	3	39	28	3	17	0	0	0	3	0	0	3	0	0	0
456	TBB_DEF_70-99mm_>300hp	2	48	5	35	9	5	17	0	1	0	7	0	0	1	0	0	0
464	TBB_DEF_70-99mm_>300hp	2	64	6	52	45	10	22	0	2	0	4	0	0	1	0	0	0
481	TBB_DEF_70-99mm_>300hp	2	71	20	73	28	6	24	0	2	0	3	0	0	1	6	0	0
482	TBB_DEF_70-99mm_>300hp	2	194	36	29	21	7	18	0	0	0	11	0	0	2	0	0	0
365	TBB_DEF_70-99mm_>300hp	3	110	6	90	54	12	33	0	1	0	3	0	0	22	0	0	0
366	TBB_DEF_70-99mm_>300hp	3	71	13	160	74	15	55	0	3	1	5	0	2	3	0	0	0
368	TBB_DEF_70-99mm_>300hp	3	66	16	149	50	9	27	0	1	0	1	3	0	4	0	0	0
369	TBB_DEF_70-99mm_>300hp	3	38	13	90	44	6	37	0	0	0	0	8	2	11	0	0	0
370	TBB_DEF_70-99mm_>300hp	3	94	8	88	70	6	34	0	3	0	2	11	2	12	0	0	0
373	TBB_DEF_70-99mm_>300hp	3	24	11	25	36	2	13	0	4	0	2	1	1	6	0	0	0
374	TBB_DEF_70-99mm_>300hp	3	40	10	50	60	1	11	0	7	0	4	2	1	1	0	0	2
375	TBB_DEF_70-99mm_>300hp	3	11	5	20	35	2	22	0	6	0	3	0	1	6	0	0	3
384	TBB_DEF_70-99mm_>300hp	3	48	3	23	16	1	18	0	2	0	3	0	0	0	0	0	0
385	TBB_DEF_70-99mm_>300hp	3	63	2	44	134	0	21	0	0	0	2	0	0	2	0	0	0
402	TBB_DEF_70-99mm_>300hp	3	188	15	198	23	38	20	0	0	0	4	0	0	0	0	0	0
403	TBB_DEF_70-99mm_>300hp	3	112	4	149	17	19	37	0	0	1	4	0	0	0	0	0	0
410	TBB_DEF_70-99mm_>300hp	3	251	0	118	1	0	19	0	0	0	15	0	0	0	0	32	0
412	TBB_DEF_70-99mm_>300hp	3	166	0	43	5	1	20	0	0	0	6	0	0	1	0	0	0
475	TBB_DEF_70-99mm_>300hp	3	91	0	43	168	0	32	0	1	0	4	0	3	4	0	0	0
483	TBB_DEF_70-99mm_>300hp	3	160	17	25	158	0	10	0	0	0	7	0	1	0	0	0	2
492	TBB_DEF_70-99mm_>300hp	3	125	19	26	222	0	27	0	0	0	4	0	1	0	0	0	0
427	TBB_DEF_70-99mm_>300hp	4	50	5	141	81	12	24	0	4	0	5	0	1	1	0	0	0
428	TBB_DEF_70-99mm_>300hp	4	57	2	204	75	5	34	0	4	0	3	3	1	21	0	0	0

429	TBB_DEF_70-99mm_>300hp	4	15	5	103	92	7	25	0	2	0	4	1	0	9	0	0	0
430	TBB_DEF_70-99mm_>300hp	4	4	1	7	20	1	26	0	3	0	2	1	1	1	0	0	0
431	TBB_DEF_70-99mm_>300hp	4	2	1	6	37	2	28	0	5	0	3	0	5	5	0	0	4
432	TBB_DEF_70-99mm_>300hp	4	2	1	12	68	1	20	0	5	0	3	0	6	3	0	0	0
434	TBB_DEF_70-99mm_>300hp	4	12	0	19	20	1	25	0	3	0	6	0	0	0	0	0	0
435	TBB_DEF_70-99mm_>300hp	4	2	2	17	6	1	33	0	3	0	4	0	3	10	0	0	0
470	TBB_DEF_70-99mm_>300hp	4	15	4	137	90	8	33	0	3	0	2	0	0	1	0	0	0
472	TBB_DEF_70-99mm_>300hp	4	2	3	14	108	6	27	0	5	0	3	0	2	2	0	0	0
476	TBB_DEF_70-99mm_>300hp	4	99	2	292	96	5	25	0	3	0	7	0	2	1	0	0	0
477	TBB_DEF_70-99mm_>300hp	4	141	3	165	111	8	25	0	3	0	10	0	2	10	0	3	0
478	TBB_DEF_70-99mm_>300hp	4	38	0	101	131	6	15	0	6	0	8	0	0	3	0	0	0
484	TBB_DEF_70-99mm_>300hp	4	93	0	89	4	3	20	0	0	0	4	0	0	10	0	1	0
485	TBB_DEF_70-99mm_>300hp	4	101	10	37	33	2	32	0	1	0	14	0	0	1	0	0	0
486	TBB_DEF_70-99mm_>300hp	4	43	0	159	4	3	12	0	0	0	15	0	0	0	0	0	0
497	TBB_DEF_70-99mm_>300hp	4	333	7	28	187	0	18	0	0	0	4	2	1	2	0	0	0
498	TBB_DEF_70-99mm_>300hp	4	38	0	38	126	1	37	0	6	0	7	0	0	3	0	0	0
500	TBB_DEF_70-99mm_>300hp	4	72	53	127	42	4	41	0	0	0	11	0	0	5	0	0	0
501	TBB_DEF_70-99mm_>300hp	4	30	4	51	169	3	25	0	0	0	11	0	0	1	0	0	0
376	TBB_DEF_70-99mm_<=300h	1	53	8	11	4	14	5	2	1	1	0	1	0	6	0	0	0
387	TBB_DEF_70-99mm_<=300h	1	12	1	25	18	2	5	0	3	0	2	2	0	1	0	0	0
396	TBB_DEF_70-99mm_<=300h	1	11	4	49	47	1	4	0	1	0	0	0	3	2	0	0	0
443	TBB_DEF_70-99mm_<=300h	2	37	2	28	10	2	10	0	0	0	0	0	0	0	0	0	0
448	TBB_DEF_70-99mm_<=300h	2	177	12	5	19	6	7	0	2	10	0	0	0	0	0	0	0
453	TBB_DEF_70-99mm_<=300h	2	32	10	28	23	0	1	0	1	0	2	0	1	1	0	3	11
461	TBB_DEF_70-99mm_<=300h	2	22	4	12	4	5	10	0	1	0	1	0	0	1	0	0	0

462	TBB_DEF_70-99mm_<=300h	2	9	3	12	8	3	9	0	1	0	2	0	0	1	0	0	0
463	TBB_DEF_70-99mm_<=300h	2	26	4	9	7	5	7	1	1	0	1	0	0	0	0	0	0
377	TBB_DEF_70-99mm_<=300h	3	11	6	7	8	0	1	0	0	0	2	0	0	0	0	4	28
378	TBB_DEF_70-99mm_<=300h	3	5	3	9	17	0	1	0	0	0	3	0	0	1	0	17	23
389	TBB_DEF_70-99mm_<=300h	3	106	4	147	15	0	0	0	0	0	2	4	0	2	0	5	34
397	TBB_DEF_70-99mm_<=300h	3	19	2	31	7	6	8	1	1	1	0	0	0	0	0	0	0
438	TBB_DEF_70-99mm_<=300h	4	3	0	35	19	2	6	0	2	0	1	0	5	3	0	0	0
473	TBB_DEF_70-99mm_<=300h	4	13	3	13	19	7	6	0	2	0	1	0	0	2	0	0	0
474	TBB_DEF_70-99mm_<=300h	4	5	2	45	22	4	6	0	1	0	1	1	0	0	0	0	0
496	TBB_DEF_70-99mm_<=300h	4	8	3	8	11	1	15	0	0	0	2	0	0	0	0	0	0
499	TBB_DEF_70-99mm_<=300h	4	12	2	4	7	0	11	0	1	0	1	0	0	0	0	0	0
413	TBB_DEF_100-119mm	1	3	13	9	405	0	0	0	0	0	9	0	0	0	3	0	0
436	TBB_DEF_100-119mm	2	15	0	84	77	0	0	0	0	0	3	7	1	0	0	0	0
487	TBB_DEF_100-119mm	2	7	13	13	505	0	0	0	4	0	4	0	0	0	9	0	0
490	TBB_DEF_100-119mm	2	13	13	15	475	0	0	0	0	0	1	0	0	0	4	0	0
415	TBB_DEF_100-119mm	3	13	9	12	519	0	0	0	0	0	0	0	0	0	0	0	8
404	SSC_DEF_>=120mm	3	2	6	0	60	0	3	0	0	0	0	0	129	0	0	0	0
479	SSC_DEF_>=120mm	3	6	616	0	736	0	0	0	0	0	0	1	778	0	0	0	0
491	SSC_DEF_>=120mm	3	15	88	16	178	0	0	0	0	0	0	2	21	0	0	0	0

Table 10b. Weights (kg) per hour of discarded (Dis) and landed (Lan) dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod, whiting (WHG) and Norway lobster (NEP) for each self-sampled trip in the demersal otter-trawl métiers (OTB/OTT) in 2011.

TripID	Métier	Q	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis COD	Lan COD	Dis WHG	Lan WHG	Dis NEP	Lan NEP
424	OTB/OTT_MCD_70-99mm	1	16	1	8	22	0	1	0	0	0	0	0	3	3	0	2	12
425	OTB/OTT_MCD_70-99mm	1	32	1	4	7	0	1	0	0	0	0	0	2	19	9	2	8
420	OTB/OTT_MCD_70-99mm	2	8	0	9	10	0	0	0	0	0	1	1	4	5	0	29	17
442	OTB/OTT_MCD_70-99mm	2	109	0	10	11	0	0	0	0	0	1	1	7	12	0	61	29
390	OTB/OTT_MCD_70-99mm	3	38	1	76	20	0	0	0	1	0	1	2	0	23	0	37	50
391	OTB/OTT_MCD_70-99mm	3	97	1	174	19	0	1	1	1	0	2	4	0	3	0	43	27
421	OTB/OTT_MCD_70-99mm	3	12	0	88	17	0	1	0	1	0	4	0	1	11	0	46	21
426	OTB/OTT_MCD_70-99mm	3	11	0	64	11	0	1	0	1	0	1	0	2	50	0	175	15
493	OTB/OTT_MCD_70-99mm	4	3	0	10	21	0	1	0	1	0	2	0	4	15	0	43	28
494	OTB/OTT_MCD_70-99mm	4	15	0	47	20	0	1	0	1	0	4	0	1	11	0	28	28
495	OTB/OTT_MCD_70-99mm	4	23	2	40	27	0	0	0	1	0	1	0	1	0	0	5	35
502	OTB/OTT_MCD_70-99mm	4	9	0	41	33	0	1	0	0	0	1	0	5	11	0	59	32
503	OTB/OTT_MCD_70-99mm	4	8	1	31	34	0	1	0	1	0	2	1	2	13	0	22	33
418	OTB/OTT_DEF_70-99mm	1	10	1	37	52	0	1	0	1	0	1	0	6	6	1	4	9
419	OTB/OTT_DEF_70-99mm	1	6	1	2	6	0	1	0	0	0	0	0	2	11	17	1	5
422	OTB/OTT_DEF_70-99mm	1	18	3	5	15	0	1	0	0	0	1	0	5	7	36	7	10
452	OTB/OTT_DEF_70-99mm	2	73	18	15	8	8	8	1	1	0	1	0	0	0	0	0	0
468	OTB/OTT_DEF_70-99mm	2	59	3	75	32	0	0	0	1	0	2	0	1	1	0	0	10

469	OTB/OTT_DEF_70-99mm	2	32	7	49	28	0	0	0	0	0	2	0	1	0	0	6	10
488	OTB/OTT_DEF_70-99mm	2	47	5	66	30	0	0	0	1	0	3	0	1	1	0	0	11
433	OTB/OTT_DEF_70-99mm	3	23	11	28	39	1	1	0	1	0	3	0	0	1	0	61	23
471	OTB/OTT_DEF_70-99mm	4	15	6	35	83	2	30	0	4	0	3	0	1	1	0	0	0
388	OTB/OTT_DEF_100-119mm	1	58	18	285	164	0	0	0	0	0	0	5	0	0	0	0	0
386	OTB/OTT_DEF_100-119mm	2	16	13	44	82	0	0	0	0	0	6	4	0	0	0	0	0
439	OTB/OTT_DEF_100-119mm	2	32	12	35	264	0	0	0	0	0	10	0	0	0	1	0	0
457	OTB/OTT_DEF_100-119mm	2	39	10	108	106	0	0	0	0	0	6	0	0	0	0	0	5
458	OTB/OTT_DEF_100-119mm	2	80	31	87	194	0	0	0	0	0	5	0	0	2	0	0	0
460	OTB/OTT_DEF_100-119mm	2	86	6	40	243	0	0	0	0	0	12	0	1	0	0	0	0
393	OTB/OTT_DEF_100-119mm	3	89	12	66	258	0	0	0	0	0	8	2	6	0	0	0	0
394	OTB/OTT_DEF_100-119mm	3	26	14	47	420	0	0	0	0	0	6	1	3	0	0	0	0
395	OTB/OTT_DEF_100-119mm	3	34	5	26	350	0	0	0	0	0	9	0	17	0	0	0	0
440	OTB/OTT_DEF_100-119mm	4	17	6	41	235	0	0	0	0	0	2	1	19	0	0	0	0

Table 11a. Numbers per hour of discarded (Dis) and landed (Lan) dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod, whiting (WHG) and Norway lobster (NEP) for each self-sampled trip in the demersal beam-trawl and Scottish seine métiers (TBB_DEF and SCC_DEF) in 2011. Blank cells, no landings were measured.

TripID	Métier	Q	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis WHG	Lan WHG	Dis COD	Lan COD	Dis NEP	Lan NEP
361	TBB_DEF_70-99mm_>300hp	1	281		44		1		0		0		3		0		1	
362	TBB_DEF_70-99mm_>300hp	1	1817		3174		44		15		0		101		0		0	
363	TBB_DEF_70-99mm_>300hp	1	1289		1892		27		0		0		5		0		0	
364	TBB_DEF_70-99mm_>300hp	1	1738		1195		46		0		0		25		0		0	
367	TBB_DEF_70-99mm_>300hp	1	574		1122		51		0		0		40		0		0	
371	TBB_DEF_70-99mm_>300hp	1	10		127		117		0		0		9		0		0	
372	TBB_DEF_70-99mm_>300hp	1	308		213		34		0		0		49		0		0	
383	TBB_DEF_70-99mm_>300hp	1	1349		743		46		0		0		51		0		0	
392	TBB_DEF_70-99mm_>300hp	1	697		748		31		4		0		25		0		0	
399	TBB_DEF_70-99mm_>300hp	1	881		939		3		0		0		6		0		0	
400	TBB_DEF_70-99mm_>300hp	1	1423		3269		97		0		0		9		0		0	
401	TBB_DEF_70-99mm_>300hp	1	4208		2423		126		7		0		51		0		0	
405	TBB_DEF_70-99mm_>300hp	1	2337		469		6		0		0		1		0		0	
406	TBB_DEF_70-99mm_>300hp	1	3438		1065		4		0		0		0		0		0	
408	TBB_DEF_70-99mm_>300hp	1	2295		1580		81		0		0		27		0		0	
409	TBB_DEF_70-99mm_>300hp	1	1467		902		1		0		0		23		0		0	
414	TBB_DEF_70-99mm_>300hp	2	422		84		0		0		0		0		0		0	
444	TBB_DEF_70-99mm_>300hp	2	1125		736		77		0		7		89		0		0	
445	TBB_DEF_70-99mm_>300hp	2	209		559		13		0		0		73		4		0	

446	TBB_DEF_70-99mm_>300hp	2	751		1322		43		0		0		0		0		0	
447	TBB_DEF_70-99mm_>300hp	2	160		90		5		0		0		23		1		0	
449	TBB_DEF_70-99mm_>300hp	2	493		318		13		0		0		147		3		0	
450	TBB_DEF_70-99mm_>300hp	2	440		97		23		0		0		56		5		0	
451	TBB_DEF_70-99mm_>300hp	2	329		178		12		0		0		36		0		0	
454	TBB_DEF_70-99mm_>300hp	2	688		532		13		0		0		19		0		0	
455	TBB_DEF_70-99mm_>300hp	2	339		621		34		0		0		46		0		0	
456	TBB_DEF_70-99mm_>300hp	2	869		432		55		0		0		10		0		0	
464	TBB_DEF_70-99mm_>300hp	2	1246		630		110		0		0		14		0		0	
481	TBB_DEF_70-99mm_>300hp	2	1317		1665		71		4		0		21		0		0	
482	TBB_DEF_70-99mm_>300hp	2	5387		512		82		0		0		37		0		0	
365	TBB_DEF_70-99mm_>300hp	3	1668		778		112		0		0		242		0		0	
366	TBB_DEF_70-99mm_>300hp	3	1065		1448		139		0		5		28		0		0	
368	TBB_DEF_70-99mm_>300hp	3	814		1452		86		0		0		41		6		0	
369	TBB_DEF_70-99mm_>300hp	3	495		629		56		0		0		99		17		0	
370	TBB_DEF_70-99mm_>300hp	3	1841		878		63		0		0		180		21		0	
373	TBB_DEF_70-99mm_>300hp	3	418		223		22		0		0		67		2		0	
374	TBB_DEF_70-99mm_>300hp	3	717		491		12		0		0		20		7		0	
375	TBB_DEF_70-99mm_>300hp	3	155		192		16		0		0		65		0		0	
384	TBB_DEF_70-99mm_>300hp	3	841		320		5		2		0		2		0		0	
385	TBB_DEF_70-99mm_>300hp	3	1143		334		0		0		0		38		0		0	
402	TBB_DEF_70-99mm_>300hp	3	3727		2258		421		0		0		7		0		0	
403	TBB_DEF_70-99mm_>300hp	3	2733		1949		184		0		5		0		0		0	
410	TBB_DEF_70-99mm_>300hp	3	5304		1558		4		0		0		4		0		355	
412	TBB_DEF_70-99mm_>300hp	3	3338		314		10		0		0		21		0		0	
475	TBB_DEF_70-99mm_>300hp	3	1653		263		0		0		0		63		0		0	
483	TBB_DEF_70-99mm_>300hp	3	2209		231		0		0		0		9		0		0	

492	TBB_DEF_70-99mm_>300hp	3	1870		208		0		0		0		0		0		0	
427	TBB_DEF_70-99mm_>300hp	4	856		1583		128		0		0		24		0		0	
428	TBB_DEF_70-99mm_>300hp	4	752		1896		50		0		0		196		7		0	
429	TBB_DEF_70-99mm_>300hp	4	196		848		83		0		0		125		4		0	
430	TBB_DEF_70-99mm_>300hp	4	51		59		11		0		0		18		2		0	
431	TBB_DEF_70-99mm_>300hp	4	31		53		31		0		0		90		0		0	
432	TBB_DEF_70-99mm_>300hp	4	21		111		10		0		0		45		0		0	
434	TBB_DEF_70-99mm_>300hp	4	245		236		17		0		0		10		0		1	
435	TBB_DEF_70-99mm_>300hp	4	28		145		20		0		0		203		0		0	
470	TBB_DEF_70-99mm_>300hp	4	195		1275		86		0		0		11		0		0	
472	TBB_DEF_70-99mm_>300hp	4	37		121		68		0		0		51		0		0	
476	TBB_DEF_70-99mm_>300hp	4	1782		2959		55		0		0		15		0		0	
477	TBB_DEF_70-99mm_>300hp	4	3079		2038		97		0		0		244		0		116	
478	TBB_DEF_70-99mm_>300hp	4	853		1422		74		0		0		126		0		0	
484	TBB_DEF_70-99mm_>300hp	4	2502		685		41		0		0		235		0		58	
485	TBB_DEF_70-99mm_>300hp	4	2068		620		22		0		0		26		0		0	
486	TBB_DEF_70-99mm_>300hp	4	900		2047		46		0		0		7		0		16	
497	TBB_DEF_70-99mm_>300hp	4	5357		201		0		0		0		46		8		0	
498	TBB_DEF_70-99mm_>300hp	4	1110		455		11		0		0		84		0		2	
500	TBB_DEF_70-99mm_>300hp	4	1664		2840		40		0		0		131		4		0	
501	TBB_DEF_70-99mm_>300hp	4	833		929		41		0		0		33		0		0	
376	TBB_DEF_70-99mm_<=300h	1	917		192		225		17		8		44		8		0	
387	TBB_DEF_70-99mm_<=300h	1	205		243		21		0		0		24		13		0	
396	TBB_DEF_70-99mm_<=300h	1	111		393		17		0		0		17		0		0	
443	TBB_DEF_70-99mm_<=300h	2	755		447		17		0		0		9		0		0	

448	TBB_DEF_70-99mm_<=300h	2	1716		78		39		0		39		0		0		0	
453	TBB_DEF_70-99mm_<=300h	2	445		266		0		0		0		18		0		182	
461	TBB_DEF_70-99mm_<=300h	2	255		109		58		2		1		12		0		0	
462	TBB_DEF_70-99mm_<=300h	2	89		111		30		1		0		5		0		0	
463	TBB_DEF_70-99mm_<=300h	2	377		109		59		9		0		0		0		0	
377	TBB_DEF_70-99mm_<=300h	3	137		68		0		0		0		9		0		67	
378	TBB_DEF_70-99mm_<=300h	3	79		81		0		0		0		27		0		758	
389	TBB_DEF_70-99mm_<=300h	3	1204		1208		0		0		0		19		16		153	
397	TBB_DEF_70-99mm_<=300h	3	249		360		75		4		8		0		0		0	
438	TBB_DEF_70-99mm_<=300h	4	38		289		29		0		0		31		1		0	
473	TBB_DEF_70-99mm_<=300h	4	240		106		107		0		0		20		0		0	
474	TBB_DEF_70-99mm_<=300h	4	71		383		45		0		1		4		1		0	
496	TBB_DEF_70-99mm_<=300h	4	201		127		11		0		1		4		0		0	
499	TBB_DEF_70-99mm_<=300h	4	250		88		2		1		1		0		0		0	
413	TBB_DEF_100-119mm	1	28		64		0		0		0		0		0		0	
436	TBB_DEF_100-119mm	2	186		553		0		0		0		2		14		0	
487	TBB_DEF_100-119mm	2	73		79		0		0		0		0		0		0	
490	TBB_DEF_100-119mm	2	167		128		0		0		0		0		0		0	
415	TBB_DEF_100-119mm	3	185		89		0		0		0		0		0		0	
466	TBB_DEF_>=120mm	2	2340		1079		0		0		0		78		0		0	
480	SSC_DEF_100-119mm	4	109		176		0		0		0		0		0		0	
404	SSC_DEF_>=120mm	3	21		0		0		0		0		2		2		0	
479	SSC_DEF_>=120mm	3	46		0		0		0		0		2		7		0	
491	SSC_DEF_>=120mm	3	101		102		0		0		0		1		5		0	

Table 11b. Numbers per hour of discarded (Dis) and landed (Lan) dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod, whiting (WHG) and Norway lobster (NEP) for each self-sampled trip in the demersal otter-trawl métiers (OTB/OTT) in 2011. Blank cells, no landings were measured.

TripID	Métier	Q	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis WHG	Lan WHG	Dis COD	Lan COD	Dis NEP
424	OTB/OTT_MCD_70-99mm	1	163		49		1		0		0		25		1		147
425	OTB/OTT_MCD_70-99mm	1	507		27		0		0		0		160		0		143
420	OTB/OTT_MCD_70-99mm	2	123		62		0		0		0		88		2		1483
442	OTB/OTT_MCD_70-99mm	2	1854		45		0		0		0		144		6		2882
390	OTB/OTT_MCD_70-99mm	3	526		609		0		0		0		372		5		321
391	OTB/OTT_MCD_70-99mm	3	1213		1637		0		3		0		36		12		878
421	OTB/OTT_MCD_70-99mm	3	159		584		0		0		0		151		3		2300
426	OTB/OTT_MCD_70-99mm	3	158		529		0		0		0		606		0		9322
493	OTB/OTT_MCD_70-99mm	4	54		80		0		0		0		251		0		2551
494	OTB/OTT_MCD_70-99mm	4	232		398		1		0		0		183		1		1626
495	OTB/OTT_MCD_70-99mm	4	281		279		0		0		0		2		0		200
502	OTB/OTT_MCD_70-99mm	4	107		297		0		0		0		254		2		2805
503	OTB/OTT_MCD_70-99mm	4	129		244		3		0		0		204		4		1030
418	OTB/OTT_DEF_70-99mm	1	105		227		1		0		0		51		2		199
419	OTB/OTT_DEF_70-99mm	1	57		11		0		0		0		74		0		28
422	OTB/OTT_DEF_70-99mm	1	227		38		0		0		0		82		0		455
452	OTB/OTT_DEF_70-99mm	2	962		146		100		12		0		0		0		0
468	OTB/OTT_DEF_70-99mm	2	686		600		1		0		0		14		2		9
469	OTB/OTT_DEF_70-99mm	2	433		438		0		0		0		5		0		272
488	OTB/OTT_DEF_70-99mm	2	586		597		0		2		0		9		3		14

433	OTB/OTT_DEF_70-99mm	3	351		254		3		0		0		34		0		2460
471	OTB/OTT_DEF_70-99mm	4	234		468		18		0		2		8		0		0
388	OTB/OTT_DEF_100-119mm	1	541		2046		0		0		0		0		13		7
386	OTB/OTT_DEF_100-119mm	2	136		349		0		0		0		0		11		0
439	OTB/OTT_DEF_100-119mm	2	285		231		0		0		0		1		0		0
457	OTB/OTT_DEF_100-119mm	2	357		851		0		0		0		0		0		0
458	OTB/OTT_DEF_100-119mm	2	554		586		0		0		0		13		0		0
460	OTB/OTT_DEF_100-119mm	2	1358		276		0		0		0		0		0		0
393	OTB/OTT_DEF_100-119mm	3	687		420		0		0		0		0		5		0
394	OTB/OTT_DEF_100-119mm	3	190		277		0		0		0		0		2		0
395	OTB/OTT_DEF_100-119mm	3	345		158		0		0		0		2		0		6
440	OTB/OTT_DEF_100-119mm	4	246		274		0		0		0		0		2		0

Appendix C:

Table 12a. Standard deviations of the weights (kg) per hour of discarded (Dis) and landed (Lan) commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod, whiting (WHG) and Norway lobster (NEP) by métier in 2011. n/a, not applicable.

Metier	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis COD	Lan COD	Dis WHG	Lan WHG	Dis NEP	Lan NEP
TBB_DEF_70-99mm_>300hp	67.1	20.1	83.4	66.4	5.8	8.4	0.4	1.8	0.2	3.3	1.8	2.5	5.0	2.5	4.0	3.3
TBB_DEF_70-99mm_<=300h	43.8	3.1	32.9	10.2	3.6	3.9	0.5	0.7	2.3	0.6	1.0	1.6	1.4	0.0	4.1	9.8
TBB_DEF_100-119mm	4.8	5.6	32.2	184.0	0.0	n/a	0.0	n/a	0.0	3.5	3.0		0.1	3.4	0.0	n/a
TBB_DEF_>=120mm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SSC_DEF_100-119mm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SSC_DEF_>=120mm	6.7	331.3	9.1	360.9	0.0	n/a	0.0	n/a	0.0	n/a	0.6	409.5	0.1	n/a	0.0	n/a
OTB/OTT_MCD_70-99mm	34.4	0.6	47.2	8.3	0.1	0.4	0.2	0.4	0.0	1.2	1.2	1.9	12.7	6.1	44.4	11.3
OTB/OTT_DEF_70-99mm	23.4	5.5	25.6	24.0	2.6	9.8	0.4	1.2	0.1	1.1	0.2	2.1	4.0	14.4	19.7	5.7
OTB/OTT_DEF_100-119mm	28.4	7.5	77.0	103.1	0.0	n/a	0.0	0.1	0.0	3.0	1.9	7.9	0.6	n/a	n/a	n/a

Table 12b. Standard deviations of the numbers per hour of discarded (Dis) and landed (Lan) commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod, whiting (WHG) and Norway lobster (NEP) by métier in 2011. Nm, no landings were measured. n/a, not applicable.

Metier	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis COD	Lan COD	Dis WHG	Lan WHG	Dis NEP	Lan NEP
TBB_DEF_70-99mm_>300hp	1305.3	Nm	831.3	Nm	61.9	Nm	2.1	Nm	1.2	Nm	3.7	Nm	62.7	Nm	45.8	Nm
TBB_DEF_70-99mm_<=300h	455.9	Nm	268.1	Nm	54.8	Nm	4.3	Nm	9.3	Nm	4.9	Nm	12.5	Nm	181.6	Nm
TBB_DEF_100-119mm	72.4	Nm	208.6	Nm	0.0	Nm	0.0	Nm	0.0	Nm	6.5	Nm	1.0	Nm	0.0	Nm
TBB_DEF_>=120mm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm
SSC_DEF_100-119mm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm
SSC_DEF_>=120mm	41.0	Nm	58.8	Nm	0.0	Nm	0.0	Nm	0.0	Nm	2.6	Nm	0.4	Nm	0.0	Nm
OTB/OTT_MCD_70-99mm	529.7	Nm	434.8	Nm	0.8	Nm	0.7	Nm	0.0	Nm	3.6	Nm	162.1	Nm	2432.0	Nm
OTB/OTT_DEF_70-99mm	295.4	Nm	225.8	Nm	32.8	Nm	4.0	Nm	0.5	Nm	1.2	Nm	31.2	Nm	795.3	Nm
OTB/OTT_DEF_100-119mm	357.7	Nm	564.5	Nm	0.1	Nm	0.0	Nm	0.0	Nm	5.0	Nm	4.0	Nm	2.0	Nm

Table 13a. Standard deviations of the weights (kg) per hour of discarded (Dis) and landed (Lan) commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod, whiting (WHG) and Norway lobster (NEP) by métier and quarter (Q) in 2011. n/a, not applicable.

Metier	Q	N	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis COD	Lan COD	Dis WHG	Lan WHG	Dis NEP	Lan NEP
TBB_DEF_70-99mm_>300hp	1	16	64.7	34.2	124.2	53.5	3.6	6.2	0.7	1.4	0.0	1.3	0.0	2.9	3.3	3.0	n/a	6.1
TBB_DEF_70-99mm_>300hp	2	14	46.8	9.5	28.6	97.2	3.2	4.7	0.1	2.0	0.4	2.6	0.9	2.7	5.5	1.9	0.0	n/a
TBB_DEF_70-99mm_>300hp	3	17	64.5	6.0	57.1	64.0	10.1	11.5	0.1	2.1	0.3	3.3	3.2	0.8	5.9	n/a	n/a	1.0
TBB_DEF_70-99mm_>300hp	4	20	76.4	12.9	78.7	54.2	3.2	7.2	0.0	1.4	0.0	3.9	0.8	1.7	5.2	n/a	n/a	2.5
TBB_DEF_70-99mm_<=300h	1	3	23.8	3.3	19.1	21.8	7.1	0.6	0.9	1.1	0.6	0.8	1.0	1.6	2.4	0.1	0.0	n/a
TBB_DEF_70-99mm_<=300h	2	6	62.7	3.9	9.8	7.6	2.4	3.4	0.5	0.7	4.0	0.5	0.0	0.7	0.4	n/a	n/a	n/a
TBB_DEF_70-99mm_<=300h	3	4	47.8	1.9	66.3	4.8	3.1	3.7	0.4	0.2	0.6	0.9	1.9	0.2	0.8	n/a	n/a	5.5
TBB_DEF_70-99mm_<=300h	4	5	4.3	1.1	17.6	6.3	2.9	3.9	0.1	0.4	0.1	0.3	0.2	2.9	1.3	n/a	0.0	n/a
TBB_DEF_100-119mm	1	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TBB_DEF_100-119mm	2	3	4.3	7.4	40.3	239.1	0.0	n/a	0.0	n/a	0.0	1.5	3.9	n/a	0.2	3.6	0.0	n/a
TBB_DEF_100-119mm	3	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TBB_DEF_>=120mm	2	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SSC_DEF_100-119mm	4	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SSC_DEF_>=120mm	3	3	6.7	331.3	9.1	360.9	0.0	n/a	0.0	n/a	0.0	n/a	0.6	409.5	0.1	n/a	0.0	n/a
OTB/OTT_MCD_70-99mm	1	2	11.3	0.1	2.7	10.6	0.1	0.3	0.0	0.2	0.0	0.0	0.1	0.8	10.6	n/a	n/a	2.3
OTB/OTT_MCD_70-99mm	2	2	71.4	n/a	0.4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.8	5.1	n/a	n/a	8.5
OTB/OTT_MCD_70-99mm	3	4	40.7	0.6	50.0	4.0	0.0	0.3	0.3	0.4	0.0	1.4	2.0	0.5	20.5	n/a	n/a	15.6
OTB/OTT_MCD_70-99mm	4	5	7.9	0.8	14.2	6.4	0.1	0.4	0.0	0.2	0.0	1.3	0.4	1.9	5.8	n/a	n/a	3.2
OTB/OTT_DEF_70-99mm	1	3	5.9	1.2	19.2	24.7	0.1	0.3	0.0	0.2	0.0	0.3	0.3	2.0	2.9	17.1	n/a	2.6
OTB/OTT_DEF_70-99mm	2	4	17.4	6.4	26.7	11.1	3.9	4.1	0.6	0.4	0.0	1.1	0.1	0.5	0.4	0.1	n/a	0.8
OTB/OTT_DEF_70-99mm	3	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 13a. (cont.)

Metier	Q	N	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis COD	Lan COD	Dis WHG	Lan WHG	Dis NEP	Lan NEP
OTB/OTT_DEF_70-99mm	4	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
OTB/OTT_DEF_100-119mm	1	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
OTB/OTT_DEF_100-119mm	2	5	30.5	9.5	32.8	81.3	0.0	n/a	0.0	0.2	0.0	3.0	1.6	n/a	0.9	n/a	0.0	n/a
OTB/OTT_DEF_100-119mm	3	3	34.6	5.0	20.2	81.4	0.0	n/a	0.0	n/a	0.0	1.8	1.2	7.1	0.1	n/a	n/a	n/a
OTB/OTT_DEF_100-119mm	4	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 13b. Standard deviations of the numbers per hour of discarded (Dis) and landed (Lan) commercially-important target species: dab (DAB), plaice (PLE), sole, (SOL), brill (BLL), turbot (TUR), cod, whiting (WHG) and Norway lobster (NEP) by métier and quarter (Q) in 2011. Nm, no landings were measured. Nm, not measured; n/a, not applicable.

Metier	Q	N	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis COD	Lan COD	Dis WHG	Lan WHG	Dis NEP	Lan NEP
TBB_DEF_70-99mm_>300hp	1	16	1145.0	Nm	995.2	Nm	41.1	Nm	3.9	Nm	0.0	Nm	0.0	Nm	27.0	Nm	0.3	Nm
TBB_DEF_70-99mm_>300hp	2	14	1322.0	Nm	457.9	Nm	34.4	Nm	1.0	Nm	1.8	Nm	1.6	Nm	40.4	Nm	0.0	Nm
TBB_DEF_70-99mm_>300hp	3	17	1364.3	Nm	677.6	Nm	107.0	Nm	0.5	Nm	1.8	Nm	6.4	Nm	67.2	Nm	86.0	Nm
TBB_DEF_70-99mm_>300hp	4	20	1340.0	Nm	936.1	Nm	34.0	Nm	0.0	Nm	0.0	Nm	2.4	Nm	79.4	Nm	28.3	Nm
TBB_DEF_70-99mm_<=300h	1	3	440.7	Nm	104.1	Nm	118.9	Nm	9.7	Nm	4.8	Nm	6.4	Nm	13.9	Nm	0.0	Nm
TBB_DEF_70-99mm_<=300h	2	6	587.0	Nm	143.9	Nm	23.3	Nm	3.6	Nm	15.8	Nm	0.0	Nm	7.1	Nm	74.4	Nm
TBB_DEF_70-99mm_<=300h	3	4	528.9	Nm	536.1	Nm	37.3	Nm	1.8	Nm	4.2	Nm	8.2	Nm	11.9	Nm	347.9	Nm
TBB_DEF_70-99mm_<=300h	4	5	98.5	Nm	130.6	Nm	41.7	Nm	0.4	Nm	0.4	Nm	0.6	Nm	13.0	Nm	0.0	Nm
TBB_DEF_100-119mm	1	1	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm
TBB_DEF_100-119mm	2	3	60.3	Nm	260.7	Nm	0.0	Nm	0.0	Nm	0.0	Nm	8.3	Nm	1.3	Nm	0.0	Nm
TBB_DEF_100-119mm	3	1	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm
TBB_DEF_>=120mm	2	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SSC_DEF_100-119mm	4	1	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm
SSC_DEF_>=120mm	3	3	41.0	Nm	58.8	Nm	0.0	Nm	0.0	Nm	0.0	Nm	2.6	Nm	0.4	Nm	0.0	Nm
OTB/OTT_MCD_70-99mm	1	2	243.1	Nm	15.7	Nm	0.6	Nm	0.0	Nm	0.0	Nm	0.4	Nm	95.6	Nm	2.4	Nm
OTB/OTT_MCD_70-99mm	2	2	1224.2	Nm	12.0	Nm	0.0	Nm	0.0	Nm	0.0	Nm	2.8	Nm	39.5	Nm	989.2	Nm
OTB/OTT_MCD_70-99mm	3	4	497.2	Nm	532.7	Nm	0.0	Nm	1.3	Nm	0.0	Nm	5.3	Nm	251.7	Nm	4162.2	Nm
OTB/OTT_MCD_70-99mm	4	5	93.4	Nm	115.6	Nm	1.2	Nm	0.0	Nm	0.0	Nm	1.8	Nm	103.2	Nm	1076.4	Nm
OTB/OTT_DEF_70-99mm	1	3	87.5	Nm	117.6	Nm	0.5	Nm	0.0	Nm	0.0	Nm	0.9	Nm	16.0	Nm	214.9	Nm
OTB/OTT_DEF_70-99mm	2	4	222.5	Nm	213.3	Nm	49.7	Nm	5.8	Nm	0.0	Nm	1.6	Nm	6.1	Nm	132.3	Nm
OTB/OTT_DEF_70-99mm	3	1	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm

Table 13b. (cont.)

Metier	Q	N	Dis DAB	Lan DAB	Dis PLE	Lan PLE	Dis SOL	Lan SOL	Dis BLL	Lan BLL	Dis TUR	Lan TUR	Dis COD	Lan COD	Dis WHG	Lan WHG	Dis NEP	Lan NEP
OTB/OTT_DEF_70-99mm	4	1	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm
OTB/OTT_DEF_100-119mm	1	1	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm
OTB/OTT_DEF_100-119mm	2	5	482.5	Nm	258.3	Nm	0.1	Nm	0.0	Nm	0.0	Nm	5.1	Nm	5.7	Nm	0.0	Nm
OTB/OTT_DEF_100-119mm	3	3	254.6	Nm	131.2	Nm	0.0	Nm	0.0	Nm	0.0	Nm	2.7	Nm	1.0	Nm	3.6	Nm
OTB/OTT_DEF_100-119mm	4	1	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm	n/a	Nm

Appendix D:

Uhlmann, S. S., Helmond, A. T. M. v., Bol, R. A., Nijman, R. R. 2012. Double Dutch: implications of using both observer- and self-sampling techniques to quantify discards in The Netherlands. Oral presentation at the ICES Annual Science Conference 2012.

Double Dutch: implications of using both observer- and self-sampling techniques to quantify discards in The Netherlands

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The technique of commercial catch sampling by fishers ('self-sampling') has been propagated as an alternative to traditional observer-based sampling of discards in meeting the needs of data-hungry stock assessments, seafood certification schemes and management regulations. But, the planning and implementation of reliable procedures to control data collection and quality can be a challenge. This study reviews the lessons learned from setting up a self-sampling programme within the requirements of the European Data Collection Framework (DCF) in The Netherlands. Since 2009, a pre-selected and initially growing number of commercial, bottom-trawl fishers were asked to retain a fraction of their discards to complement an existing observer-based programme under the DCF. This resulted in a >10-fold increase of the number of sampled trips, ultimately, improving the spatio-temporal spread of sampling. However, despite this success and the improved collaboration between scientists and fishers, promoting the independent use of two different sampling techniques, generated haul-, trip-, and fleet-level estimates of species-specific discard rates which precluded their evaluation by direct comparison. To better allow for this, in mid-2011, so called 'matched trips' were introduced where an observer sampled the same hauls than the crew member(s) on board of a vessel participating in the Dutch DCF-self-sampling programme. Detailed comparisons revealed i) patterns among mean lengths of discarded fish at the sample, trip and vessel level of self-samples, and ii) differences among length-frequency distributions of several minimum-landing-size regulated fish discarded during matched trips. Nevertheless, the judgement call whether self-sampling is an appropriate technique within the context of sampling discards is yet to be made.

Keywords: participatory research; collaboration; sustainable resource management; North Sea; demersal fisheries

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