



Demersal discard atlas for the South Western Waters

December 2014



Demersal discard atlas for the South Western Waters

Authors :

- Marie-Joëlle Rochet, IFREMER Nantes, France (coordinator)
- Luis Arregi, AZTI Sukarieta, Spain
- Tereza Fonseca, SWW-AC Lisbon, Portugal
- João Pereira, IPMA Lisbon, Portugal
- Nélida Pérez, IEO Vigo, Spain
- Jon Ruiz Gondra, AZTI Sukarieta, Spain
- Julio Valeiras, IEO Vigo, Spain

Contributors :

- Juan José Acosta, IEO Cádiz, Spain
- Hortensia Araujo, IEO Vigo, Spain
- Anne-Sophie Cornou, IFREMER Nantes, France
- Ana Juárez, IEO Cádiz, Spain
- Cristina Rosa, DGRM Lisbon, Portugal
- Itxaso Salinas, IEO Vigo, Spain
- Luis Silva, IEO Cádiz, Spain
- Els Torreele, Ilvo Oostende, Belgium

This document was prepared on the request of the European Union Member States that fish in the South West Waters Region (ICES Areas VIII, IX and X), namely Belgium, France, Portugal, and Spain. The Netherlands used to fish in this area in the past, but have not used these fishing opportunities for several years.

The authors thank the fishers, scientists, and all those who participated in the onboard observer programmes, contributing to provide the data used to establish this document.

Recommended format for purposes of citation:

Rochet M.-J., Arregi, L., Fonseca, T., Pereira, J., Pérez, N., Ruiz, J., and Valeiras J. Demersal discard atlas for the South Western Waters. 121 p.

Executive summary	3
1 Introduction.....	5
2 Stocks	8
2.1 <i>Nephrops</i> stocks.....	8
2.1.1 VIIIa-b	8
2.1.2 VIIIc	8
2.1.3 IXa	9
2.2 Sole stock	9
2.2.1 VIIIa-b	9
2.3 Hake stocks.....	10
2.3.1 Northern stock	10
2.3.2 Southern stock.....	10
2.4 National quota allocation systems.....	12
2.4.1 Portugal.....	12
2.4.2 France.....	12
2.4.3 Belgium	12
2.4.4 The Netherlands.....	13
3 Métiers	14
3.1 Data sources and raising procedures	14
3.1.1 Portuguese data	14
3.1.2 Spanish data	14
3.1.3 French data	14
3.2 Métiers descriptions	15
3.2.1 Portuguese métiers :	pages 16-24
3.2.2 Spanish métiers :	pages 25-715
3.2.3 French métiers :	pages 72-108
3.2.4 Belgian métier :	pages 109-111
4 Recommendations.....	112
4.1 Potential choke species in the South Western Waters	113
4.2 Potential measures to comply with the Landing Obligation.....	115
4.2.1 Portuguese métiers.....	115
4.2.2 Spanish métiers.....	115
4.2.3 French métiers.....	117
4.3 Ongoing projects, knowledge gaps and recommended research.....	118
References.....	120

Executive summary

The new Common Fisheries Policy recently launched by the European Union aims at a gradual elimination of discards, and therefore includes provisions for a landing obligation. The landing obligation will target three demersal species in the South Western Waters region in 2016, namely Norway lobster, hake, and sole. This amounts to six stocks: *Nephrops* in VIIIa-b, VIIIc, and IXa; sole in VIIIa-b; and the Northern and Southern stocks of European hake. Among these stocks three are evaluated by the International Council for the Exploration of the Seas as undergoing overfishing and/or overfished (*Nephrops* in VIIIc and IXa, and Southern hake).

A wide diversity of fleets, mostly from France, Portugal and Spain, are fishing on these stocks. These fleets consist primarily of large numbers (dozens to hundreds) of small-sized vessels (< 18 m, with many < 12 m). Most of these fleets are currently decreasing in number of vessels, especially trawlers, but maintain a fairly steady fishing effort. This atlas presents catch and discard estimates at the most reliable scale, *i.e.*, the métier: combination of gear and target species or species group, and fishing area. The sampled fraction with respect to fishing activity (in days at sea) is generally low, 1% or lower. As a result, most discard estimates have a low precision.

The proportion of total catch discarded annually per métier varies from 1% to 90%. Broadly two categories can be distinguished: trawlers which discard 25% of their total catch or more, and passive gears (gillnetters and longliners), which discard 20% of their total catch or less. The species massively discarded by trawlers are blue whiting, boarfish, mackerel and horse mackerel, either for marketing reasons, or lack of quota, or both. These métiers also discard large amounts of undersized hake and, to a lesser extent, undersized individuals of other target species. Passive gears discard small amounts of their target species, either undersized, or because they are damaged by parasites. Among the species which define the fisheries and therefore will be concerned by the landing obligation as soon as 2016, hake is likely to become a choke species for most métiers in this area. In the Bay of Biscay sole may also be a choke species for some French trawlers. In the next years, boarfish, blue whiting, and mackerel might be the most problematic species for all trawl métiers.

Larger mesh sizes seem to be an obvious solution to address a large part of the discarding issues in many métiers; however, it may be difficult to implement owing to the multi-species nature of these fisheries. Other technical solutions, and changes in fishing areas or seasons, might also contribute to reduce bycatch. Knowledge of fishing selectivity and discard survival is limited, and further research and development is warranted for most métiers. Increasing the legitimacy of the new regulation, and providing appropriate incentives to fishers to comply with it, will be key to successful implementation. Onboard observer programmes will need to evolve and adapt to the new legislative context.

1 Introduction

The new Common Fisheries Policy (CFP) recently launched by the European Union (European Union 2013) aims at a gradual elimination of discards, and therefore includes provisions for a landing obligation. Discard management plans are required to detail the implementation of the landing obligation as per Article 15, § 5 and 6 of this regulation. As per article 14.2, Member States may produce a "discard atlas" showing the level of discards in each of the fisheries which are covered by Article 15(1). This atlas has been prepared to serve as a basis for building up the discard management plan in the South Western Waters (SWW). The atlas includes (i) comprehensive information on discards and landings of the demersal fisheries in the South Western Waters (ii) existing management measures to mitigate discards (iii) elements of understanding on drivers and incentives for discarding and (iv) recommendations for mitigation solutions.

The SWW region is characterized by a relatively small size, as for the number of member states involved in the fisheries, and the number of demersal species that will be concerned by the CFP landing obligation as early as 2016. Therefore, the approach for the SWW discard atlas is to gather knowledge of a reliable quality. In addition to the national onboard observer programmes run under the European Union (EU) Data Collection Framework (DCF), a number of national and regional projects have been devoted to characterizing discards in the area, understanding their major causes, and proposing mitigation strategies. This atlas summarizes the outcomes of these studies.

The landing obligation will target four demersal species in the SWW region in 2016, namely Norway lobster, European hake, sole, and plaice. Actually no fishery targets plaice in this area with known significant discards, so that only three species will be concerned by the landing obligation in 2016. This amounts to six stocks: three stocks of *Nephrops*: VIIa-b, VIIc, and IXa; one stock of sole: VIIa-b; and two stocks of hake: Northern stock and Southern stock.

The details of the implementation of the landing obligation are not known yet. The units for discard management will be a political issue discussed by the member states and representative bodies such as the SWW Advisory Council (AC). Besides, there is a long experience with management units being different from assessment units, *e.g.* for stocks, Total Available Catch and quota management. Therefore, this atlas presents the discard information at the scale where it is most reliable, that is, the strata used in the national programmes for sampling and/or estimating discards. In all four countries which contributed to this atlas, these strata are métiers: combinations of gear and target species or species group, and fishing area. The atlas includes all métiers which target the stocks listed above, plus one métier with a high level of bycatch for at least one of these species (Table 1.1). For each métier, information is reported about catches and discards of the three species that will be concerned by the landing obligation in 2016, and a number of problematic species, especially the species that might become "choke" species as the

landing obligation extends to non-target species. Information for 2011-2013 is made available as far as possible.

The atlas first summarizes the status of the six stocks as assessed by the International Council for the Exploration of the Seas (ICES). Stock information to be considered for managing discards is also included: Total Allowable Catch (TAC) and catches over recent years; minimum landing sizes (MLS) and knowledge to consider when setting minimum conservation reference size (MCRS), including size at maturity; and any relevant stock-level management measures. The National quota allocation systems are also summarized. The data used and discard procedures are briefly introduced. Knowledge available per métier is then presented, including: fleet description (summary of activity, number of vessels, number of trips per year, map of activity) together with sampling coverage; a summary of current management measures; catch and discard estimates for the whole catch (including non-TAC species), and a selection of species that may become problematic species under the landing obligation. Reasons for discarding and foreseeable impact of the landing obligation are also included when available.

Table 1.1. Métiers included in the SWW discard atlas and their target stocks. Stock references indicate the stock “which defines the fisheries” (Hake: N Northern stock, S Southern stock; *Nephrops* and sole: the stock area is indicated). Multiple targets for one métier do not imply that several species are targeted during each fishing operation – it may also mean that several sub-métiers with different targets are grouped into a single unit. [S] means that the species is not targeted, but caught in large amounts, with the consequence that the species may become problematic for this métier under the landing obligation.

Métier	Métier code	Target species		
		Hake	<i>Nephrops</i>	Sole
Portuguese métiers				
Otter bottom trawl targeting crustaceans or demersal species in Portuguese waters	OTB_>70mm	S	IXa	
Polyvalent Portuguese fleet	LLS, GNS_>80mm, GTR_>100mm	S	IXa	
Spanish métiers				
Pair bottom trawl targeting demersal species in the Bay of Biscay	PTB_DEF_VIIIabd	S		
Otter bottom trawl targeting demersal species in the Bay of Biscay	OTB_DEF_VIIIabd	S		
Otter bottom trawl targeting demersal fish and cephalopods in the Bay of Biscay	OTB_DEF_CEP_VIIIabd	[S]		
Otter bottom trawl targeting demersal species in north Spanish Iberian waters ('Baca')	OTB_DEF_>=55_VIIIc_IXa	S		
Pair bottom trawl targeting pelagic and demersal species in north Spanish Iberian waters ('Pareja')	PTB_MPD_>=55_VIIIc_IXa	S		
Otter bottom trawl targeting crustaceans and demersal species in south Spanish Iberian waters	OTB_MCD_>=55_VIIc_IXa	S	VIIIc	
Set gillnet targeting demersal species using a mesh size of 60mm in north Spanish Iberian waters ('Beta')	GNS_DEF_60-79_VIIIc_IXa	S		
Set gillnet targeting hake using a mesh size of 90mm in north Spanish Iberian waters ('Volanta')	GNS_DEF_80-99_VIIIc_IXa	S		
Bottom longline targeting demersal species in Spanish Iberian waters	LLS_DEF_VIIIc_IXa	S		
French métiers				
Bottom trawls targeting demersal fish and cephalopods in the northern Bay of Biscay	OTB_OTT_PTB_DEF_CEP_VIIIab	N		VIIIab
Bottom trawls targeting crustaceans in the northern Bay of Biscay	OTB_OTT_CRU_VIIIab		VIIIab	
Set gillnetters smaller than 15 meters targeting demersal fish and crustaceans in the northern Bay of Biscay	GTR_GNS_DEF_CRU_Inf15m_VIIIab	N		VIIIab
Set gillnetters larger than 15 meters targeting demersal fish and crustaceans in the northern Bay of Biscay	GTR_GNS_DEF_CRU_Sup15m_VIIIab	N		VIIIab
Bottom longline targeting demersal species in the northern Bay of Biscay	LLS_DEF_LHM_LHP_FIF_VIIIab	N		
Belgian métier				
Beam trawls targeting sole in the Bay of Biscay	TBB_DEF_70-99			VIIIab

2 Stocks

2.1 *Nephrops stocks*

2.1.1 *VIIIa-b*

ICES advises on the basis of a data-limited approach, meaning that no analytical stock assessment is conducted – rather, advice is based on a biomass index from a survey, used as an indicator of stock size. The uncertainty associated with the index values is not available. The harvest control rules are expected to stabilize stock size in the short term (3–5 years), but they may not be suitable if the stock size is low and/or overfished. No specific management objectives are set for this stock.

Nephrops in FUs 23–24 are almost exclusively exploited by French trawlers, which have decreased as a consequence of several decommissioning schemes. Landings have declined since 2005. The biomass index from 2006–2013 shows no clear trend; the average of the last two years over the previous three years shows a 14% increase.

2014 advice states that landings should be no more than 3214 tonnes, assuming that discard rates do not change from the average of the last three years (2011–2013), and a fixed proportion (30%) of discards survive. This corresponds to removals of no more than 4224 tonnes. The agreed TAC has been 3.9 ktonnes 2010–2014, while removals (landings + dead discards) estimated by ICES have declined from ~4.3 kt (2009–11) to ~3.3 kt (2012–13).

MLS is 20 mm Cephalothoracic Length but 26 mm are used by the fishers for commercial reasons. Size at maturity (as used by the stock assessment working group) is 26 mm for males and 25 mm for females. The assessment working group also assumes a 30% rate of survival for discarded individuals.

2.1.2 *VIIIc*

The ICES Division VIIIc includes two *Nephrops* Functional Units: FU 25, North Galicia and FU 31, Cantabrian Sea. ICES advises on the basis of a data-limited approach, meaning that no analytical stock assessment is conducted in either FU. According to the ICES data-limited approach, these stocks are considered as category 3.1.4 (ICES, 2012). FU 31 and FU 25 are assessed by the analysis of the LPUE series trend. All information indicates that these stocks are at a very low abundance level. Landings and LPUEs have declined continuously and are currently very low. Landings in 2013 were 10 t in FU25 and 10 t in FU31.

Landings in VIIIc were reported only by Spain. *Nephrops* are caught in the mixed bottom trawl fishery. The fishery takes place throughout the year, with the highest landings in spring and summer. *Nephrops* are taken together with hake, anglerfish, megrim, horse mackerel, mackerel, and blue whiting. Due to the mixed nature of the demersal fisheries in this area, management measures for finfish species influence the exploitation of

Nephrops. Discarding of *Nephrops* in this fishery is negligible, based on observer information.

Nephrops is managed by an annual TAC (applying to the whole of ICES Division VIIIc) and technical measures. European Union regulations establish 20 mm carapace length (CL) as a minimum landing size. Few animals are caught under size.

ICES advises on the basis of precautionary considerations that there should be no directed fishery, and that bycatch should be minimized for FUs 25 and 31. Furthermore, effective technical measures should be implemented to reduce *Nephrops* as bycatch. To protect the stocks in these functional units, ICES advises that the management area should be consistent with the assessment area.

2.1.3 IXa

ICES advises on the basis of precautionary considerations that there should be no directed fishery and bycatch should be minimized. The advice for these *Nephrops* stocks is biennial and valid for 2015 and 2016. To protect the stock in these functional units, ICES advises that management should be implemented at the functional unit level. *Nephrops* are limited to a muddy habitat. This means that the distribution of suitable sediment defines the species distribution and the stocks are therefore assessed as five separate functional units (ICES WGBIE, 2014).

2.2 Sole stock

2.2.1 VIIIa-b

ICES advises on the basis of the MSY approach and an analytical stock assessment. Input data include commercial catches (discards considered negligible), one survey index, and four commercial indices.

The French fleet, which consists mainly of trawlers and fixed-nets, contributes about 90% of the total official international landings over the historical series. The remaining part is landed by the Belgian beam trawler fleet. A large part of the French fishery is a fixed-net fishery directed on sole. Bycatch of non-commercial species is limited in this fishery. The spawning stock increased from a historical low in 2003 but has been decreasing since 2012 and is currently just below MSY $B_{trigger}$. During this period, the fishing mortality has been stable around F_{pa} . The 2012 and 2013 recruitments are the lowest values in the time-series.

2014 advice states that catches in 2015 should be no more than 2407 tonnes, assuming all catches are landed. Total catch (2013): 4.2 kt (inshore trawlers 7%, offshore otter trawlers 18%, offshore beam trawlers 7%, fixed nets 68%). Discards estimates are not used in the assessment and considered to be negligible. Agreed TAC has decreased from 4.8 kt in 2010 to 4.1 kt in 2013, with ICES estimated landings generally slightly exceeding the TAC. Sole is a candidate choke species for several French métiers.

A multiannual plan has been agreed by the EU in 2006 (EC Reg. No. 388/2006, Annex 7.3.21). The aim of the plan was first to bring the spawning-stock biomass above 13 000

tonnes in 2008 and thereafter to ensure the sustainable exploitation of the stock. MLS for Bay of Biscay sole is 24 cm.

2.3 Hake stocks

2.3.1 Northern stock

ICES advises on the basis of the MSY approach and an analytical, length-based stock assessment. Data include official landings and discard estimates for most fleets, and four survey indices. Only around 75% of the known discards are included in the assessment.

Hake is caught in mixed fisheries operating a diversity of gears together with megrim, anglerfish, and *Nephrops*. Discards of juvenile hake can be substantial in some areas and fleets. Overall, hake discards have increased substantially in the last five years for all fleets. Several changes in fishing technology have taken place in recent years, including increased mesh sizes in several gears, introduction of the high vertical opening trawls in the mid-1990s, and introduction of selective gears in the *Nephrops* trawl fishery of the Bay of Biscay (square mesh panel). The spawning biomass (SSB) has been increasing since 1998 and has been very high in recent years. Fishing mortality, while still above F_{MSY} , has decreased significantly over the last decade. Recruitment fluctuations appear to be without substantial trend over the whole series. After low recruitments in 2009, 2010, and 2011, the recruitment in 2012 is estimated to be the highest in the time-series.

2014 advice states that landings should be no more than 78 457 tonnes in 2015. Even though most of the discards are included in the assessment, the total amount of discards cannot be quantified. Therefore, total catches cannot be calculated. Agreed TAC has increased from 55 kt 2010-2012 to 69 kt in 2013, and has been overshoot by 15 to 36%.

A recovery plan was agreed by the EU in 2004 (EC Reg. No. 811/2004, Annex 9.3.10). The aim of the plan is to increase SSB to above 140 000 t with a fishing mortality (F_{MP}) of 0.25, constrained by a year-to-year change in TAC lower than 15% when SSB is above 100 000 t. MLS for the Northern stock of hake is 27 cm.

2.3.2 Southern stock

ICES advises, on the basis of the transition to the MSY approach and a length-age analytical assessment (GADGET). Data include commercial catches (international landings, discards and length frequencies from catch sampling); three survey indices and two commercial indices.

ICES advises that landings in 2014 should be no more than 13,123 t. The agreed TAC for Southern hake in 2013 was 14,144 t and in 2014 is 16,266 t. Landings in 2013 were 11% above the TAC (76,700 t vs 69,400 t) and total catch 33% above (92,500 t).

Catch has decreased from 23 kt in 1981 until a minimum of 7.8 kt in 2004. Afterwards catches increased, peaking in 2009 with 22.2 kt, dropping slightly again, and reaching 16.1 kt in 2013. Recruitment was variable along the time series. However recruitment in recent years has been well over historical means. Fishing mortality has been well over the F_{msy} proxy ($F_{max}=0.24$) in the whole time series. F has decreased in recent years but is

still over Fmsy. The stock is being overexploited. SSB drastically decreased in the 1980s, then gradually increased since the historic minimum (5.9 kt in 1998), reaching 24.7 kt in 2014.

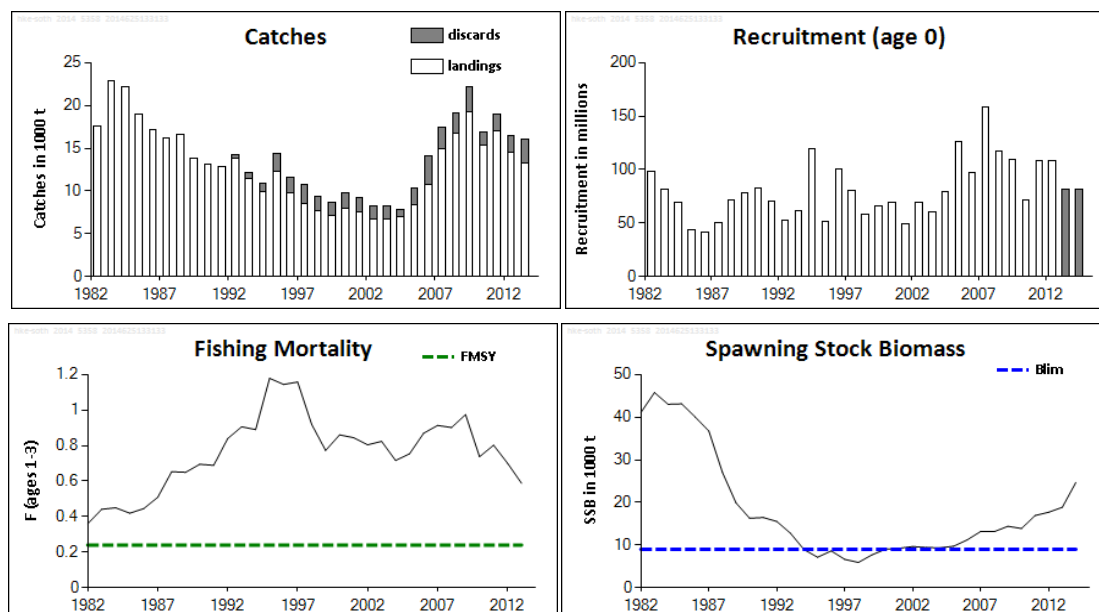


Figure 2.1. Estimated catches, recruitment, fishing mortality and Spawning Stock Biomass for the Southern stock of European hake (ICES WGBIE, 2014).

Table 2.1. TAC/catch over recent years for the Southern stock of European hake (ICES WGBIE, 2014).

Year	TAC	Landings	Discards	Catches	%disc
2005	5.968	8.3	2	10.3	19%
2006	6.661	10.8	3.2	14	23%
2007	6.128	14.9	3	17.9	17%
2008	7.047	16.8	2.4	19.2	13%
2009	8.104	19.2	3.2	22.4	14%
2010	9.3	15.73	1.6	17.3	9%
2011	10.695	17.1	1.95	19	10%
2012	12.299	14.6	2.06	16.6	12%
2013	14.144	13.54	2.87	16.41	17%

MLS and biological knowledge

MLS is 27 cm. Mean size of maturity (L50) for the period 1981 to 2013 is 31.6 cm for males and 44.4 cm for females. However males showed a decreasing trend along the series.

Management measures

Hake is managed by TAC, effort control and technical measures. A recovery plan was agreed by the EU in 2005 (EC Reg. No. 2166/2005, Appendix 7.3.7.1). The aim of the plan is to rebuild the stock to safe biological limits, set as SSB above 35 000 tonnes by 2016, and to reduce fishing mortality to 0.27. The main elements of the plan are a 10% annual reduction in F and a 15% constraint on TAC change between years. This regulation includes effort management in addition to TAC measures, set in Reg. EU Council 39/2013.

Since 2006, a 10% annual reduction of fishing days at sea was applied to all vessels, although with some exclusions. The effort from fishing trips which retain <3% hake are excluded from the regulation.

According to the Spanish Regulations in 2012 and 2013 the fishing options have been shared by quarters and individual trawlers (ARM/3158/2011 and Res. 28-12-2012 SGMAR). A Portuguese national regulation also established a closure for trawling off the southwest coast of Portugal between December and February.

Technical measures applied to this stock include: (i) minimum landing size of 27 cm, (ii) protected areas, and (iii) minimum mesh size. These measures are set depending on areas and gears by several national regulations.

2.4 National quota allocation systems

2.4.1 Portugal

In Portugal the establishment of quota per vessels for hake was implemented after the approval of the recovery plan for hake and *Nephrops*.

Vessels that have restrictions in their activity have a quota based on hake landings in the three previous years. These quota may be transferred by the vessel owner to another vessel with quota. The quota allocated to these vessels represent 71,5% of the national quota, and the remaining part of the quota (28,5%), is divided into 3 sub-quotas, according to the home port of the vessel, with a maximum of 10 tons of hake per vessel (but this part cannot be transferred to other vessels).

2.4.2 France

The French quota management system works by reference to Fixed Quota Allocations (FQA) units. FQA units represent a share of quota allocated to vessels, based on a track record of fishing activity in a historic period. These shares do not reflect a fixed permanent entitlement to quota (such as with an ITQ). Annual quota allocations between the Producer Organizations (POs) and the vessels not member of any PO are based on the FQA. It is then to each PO to decide how best to allocate quota to its members. Swaps are facilitated between POs in addition to international swaps between Member States.

2.4.3 Belgium

Belgium uses a collective quota allocation system. The regional authorities define with a ministerial decree the quota allocations. The Quota Commission (from the PO) gives advice to the authorities in this respect. For the most important stocks (i.e. sole and plaice) an allocation is made for the great fleet segment GFS (engine power above 221 Kw) and for the small fleet segment SFS (engine power under 221 Kw) in function of the engine power of the vessel, as X kg per Kw installed engine power. The allocation is valid for a certain period of time (6 months, 4 months, 2 months for the GFS and 10 months, 2 months for the SFS). After each period the quota left are reallocated. For bycatch species, day limits are defined as X kg per equivalent day presence in an area. Again the allocation is different for GFS and SFS. For the smaller vessels part of the coastal fleet segment,

another quota allocation scheme is in force. With the exception of the species under management plan or recovery plan, small vessels do not have quota limitations. For the species under management plans the day limits in force for the SFS, are doubled.

2.4.4 The Netherlands

In general two systems in place. Individual transferable quota are used for 8 species: cod, whiting, plaice, sole, mackerel, horse mackerel, herring and greater silver smelt, in western waters and North Sea (ITQ for mackerel and silver smelt stock outside North Sea). It is not possible for a vessel to have only an ITQ for plaice without sole. The same applies to the ITQ's for cod and whiting (unavoidable by-catches). The sale of ITQ's can only take place with the approval of the ministry. Not all of the entire quotas are converted into ITQ's. From each quota's so-called "national reserve" is held back as a buffer for possible small quota overruns and for swaps to compensate the overruns. In addition to the ITQ system there are two kinds of by-catch regulations in place for vessels without ITQ's for certain species. Members of an Producer Organisation are obliged to transfer their ITQ's and their monthly by-catch quantities to the PO and to commit themselves to the joint fishing plan and other rules. In principle the members maintain the right to use their own ITQ's and by-catch quantities, but are also allowed to lease quota to or from other members. The lease of ITQ's (whole or partial) between the members of the same PO are only recorded by the PO and not by the ministry. This is in contrast to the exchange of quantities between the PO's. A PO can only transfer an amount of fish of a particular species to another PO, if the quota of the receiving PO of that species has not been exceeded. When the quota of a PO of particular species is fully fished, fishing for that species is prohibited for the members of that PO. The second system is for non-ITQ stocks. In principle these quota are available for every vessel with a fishing licence, but there are special rules for hake and haddock.

3 Métiers

3.1 Data sources and raising procedures

3.1.1 Portuguese data

Data are collected by IPMA through the Portuguese onboard observer sampling programme according to the DCF rules agreed with the EU (PNAB/DCF). In general this includes a selection of fishing vessels and trips to be sampled. For the OTB_CRU vessels $\geq 18\text{m}$ length overall (LOA) are sampled, whereas for OTB_DEF vessels $\text{LOA} \geq 24\text{m}$ are sampled. Raising procedures from port-sampling to total stock size are stock-specific and also depend on the stratification (usually vessel to port to region to national). More details can be found in specific stock annexes of ICES WGBIE (ICES WGBIE, 2014) and other documents (Jardim and Fernandes 2013; Prista et al, 2014).

3.1.2 Spanish data

All the data used for the description of the Spanish métiers were collected by AZTI and IEO under the Spanish Discard Sampling Program, which is funded under the Data Collection Framework (EC) No 199/2008.

The sampling design is stratified by fleet, area, and quarter. Trips are the primary sampling unit, and sample selection is non probability based; trips are selected based on availability and suitability of the vessel.

Total volume, catch composition and length distribution of the discarded and retained catches are estimated from the sampling design. Raising procedure is based on the total number of trips per stratum.

3.1.3 French data

Since 2003, France has implemented a programme of data collection onboard fishing vessels, as part of the DCF. Sampling is stratified by métier (DCF level 5): combination of gear and target species or species-group, quarter, and ICES area. For each trip, samples (one or more baskets) are taken from the discards, sorted and weighed by species, and length-measured. Either the sampling fraction, or the total amount of discards, is estimated by weight, volume, or visually, depending on working conditions onboard. Landings are weighed by species and individually measured. Total catch per trip is estimated as the sum of landings and discards. The sampling protocol is available online (Ifremer, 2012).

Catch and discards were raised to the trip level by the proportion of fishing operations sampled, and to the métier level either by landings, or by days-at-sea. The latter consists in converting catch and discards per trip to per day-at-sea by dividing by the average number of days-at-sea of the observed trips, and raising to the métier level by the number of days-at-sea. The landings and total number of days at sea of each métier are available from cross-validation of the log-book records, market sales, and records from the Vessel

Monitoring System. Details on the raising variables and estimation procedure can be found in Cornou et al. (2013). Confidence intervals were estimated by boot-straping methods.

3.2 Métiers descriptions

3.2.1 Portuguese métiers : pages 16-24

3.2.2 Spanish métiers : pages 25-71

3.2.3 French métiers : pages 72-108

3.2.4 Belgian métier : pages 109-111

3.2.1 Portuguese métiers

Tereza Fonseca (SWWAC), Joao Pereira (IPMA), and Cristina Rosa (DGRM)

3.2.1.1 Bottom-trawlers targeting hake and *Nephrops* with mesh sizes ≥ 70 mm in the Portuguese Iberian waters

i) Fleet

The vessels which operate this métier use a bottom otter-trawl (OTB) to target hake and crustaceans, namely *Nephrops* and rose shrimp. In 2013 this fleet comprised 8 vessels which exclusively operated under this métier and a variable number of others which conducted operations in this métier alternating with others. Average length overall (LOA) and gross tonnage (GT) was 24.4 m (range 13.9-32.0m) and 174.3 tonnes in 2013 (total 1395 tonnes).

Vessels are active in the Portuguese South and southwest coast (ICES areas IXa, functional area 28 and 29), landing mainly in the fishing ports of Portimão (south coast) and Sines (south west coast). This fleet operates all year round, mainly on the continental shelf (Figure 3.2.1.1). Vessels land in main fishing ports, including Aveiro, Figueira da Foz, Matosinhos, Peniche and Portimão. They are engaged in fishing operations from February to December.

Vessels which were not exclusively in this métier were also licensed for the 55-59 mm mesh size category, and could have used both mesh size categories in the same fishing trip (in compliance with EU and national legislation).

Table 3.2.1.1 Portuguese crustacean trawlers (OTB_CRU, with length overall LOA ≥ 12 m) and demersal fish trawlers (OTB_DEF, length overall LOA ≥ 24 m): number of vessels, landings, trips, days-at-sea (DAS) and sampled fraction (%). 2011 -2013. Note: non official estimates based on logbooks and first sale records.

	vessels			trips			DAS		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
OTB_CRU LOA≥ 12m									
Total	23	21	24	2026	1908	1642	4561	4435	5010
Observed	4	5	3	13	13	6	27	33	14
Fraction (%)	17.39	23.81	12.50	0.64	0.68	0.37	0.59	0.74	0.28
OTB_DEF LOA≥ 24m									
Total	38	33	39	4651	4965	4741	6660	7301	7115
Observed	8	6	6	30	31	25	47	35	30
Fraction (%)	21.05	18.18	15.38	0.65	0.62	0.53	0.71	0.48	0.42

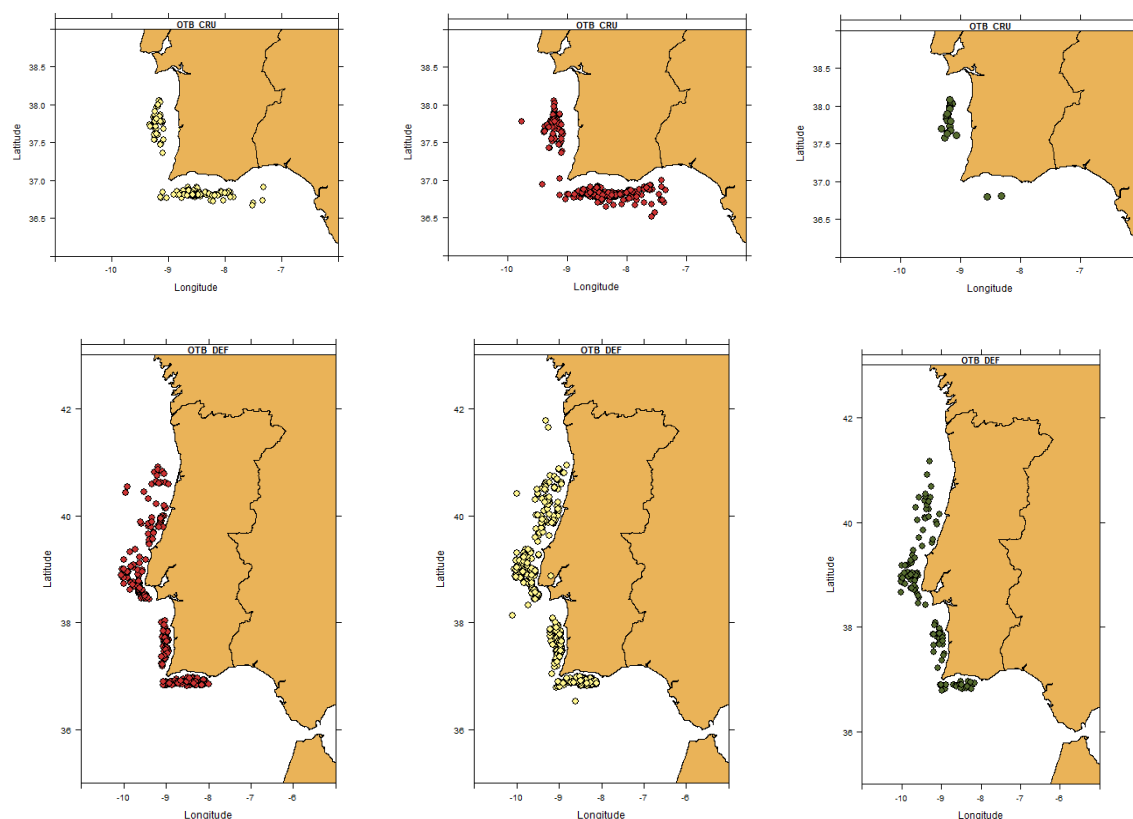


Figure 3.2.1.1 Fleet activity of discard sampling (data corresponding to 2009), upper panel: OTB_CRU and lower panel OTB_DEF. High (>50%), medium (10-50%) and low (<10%) discard rates (FAROS project, 2011).

ii) Current management measures

This is a limited entry fishery with no new license in the Portuguese trawl fleet. Catch composition rules (minimum percentage of target species) vary according to the mesh being used (Portaria no. 1102-E/2000). The minimum permitted codend mesh size for crustacean trawl is 55-59 mm and the demersal fisheries is 65-69 mm. Only vessels licensed to operate with mesh sizes >70 mm may target Norway lobster or hake.

Other species also subject to minimum landing sizes (MLS) and some to quotas established at EU level are also caught. Quota species include *Nephrops norvegicus* Norway lobster (NEP), *Merluccius merluccius* hake (HKE), *Lophius* spp. anglerfish (ANF), *Micromesistius poutassou* blue whiting (WHB), *Trachurus picturatus* Jack mackerel (JAA) and *Scomber scombrus* mackerel (MAS), *Lepidorhombus* spp. megrim (LEZ) and *Solea* spp. sole (SOO).

Devices which may obstruct or reduce the codend mesh size are not allowed as established by (EC) Regulation n° 850/98.

As for spatial activity, vessels are restricted to operate beyond the six miles distance from the coastline or the base line in some areas. All vessels in this fishery are obliged by Portuguese legislation to carry an operational tracking device (vessel monitoring system) and all have

electronic logbooks. During the month of January there is a temporary fishing prohibition (Portaria nº 43/2006, for crustaceans fisheries with vessels licensed to mesh size 55-59 mm). There is presently a recovery plan for hake and Norway lobster (Regulation (EC) nº 2166/2005), which implies restricted activity for about 45 of the vessels with license for the 70mm mesh size category.

iii) Catch and discard estimates

Approximately 1,400 and 13,000 tonnes/year are discarded by the Portuguese crustacean and demersal trawl fleets (average 2011-2013, Table 3.2.1.2 and Figure 3.2.1.2). *Nephrops* discards in this fishery are negligible, and thus have been omitted in the tables and figures below.

Table 3.2.1.2 Total catch and discards estimates by Portuguese crustacean (métier PT OTB_CRU) and demersal fish (OTB_DEF) trawlers in Portuguese waters ICES IXa (area/stratum) in 2011-2013. Number of observed fishing operations (FO). The average discard coefficient of variation is 30.8%.

Fleet	Quarter	Catch (mt)	Landing (mt)	Discard (mt)	Discards (%)	FO
OTB_CRU	2011	3153.9	1405.9	1748	55.4	56
	2012	3006	1684	1322	44.0	68
	2013	2713.4	1626.4	1087	40.0	28
OTB_DEF	2011	18954.9	12026.9	6928.0	36.5	83
	2012	15069.8	12470.8	2609.0	17.3	60
	2013	20086.6	15185.6	4901.0	24.4	50

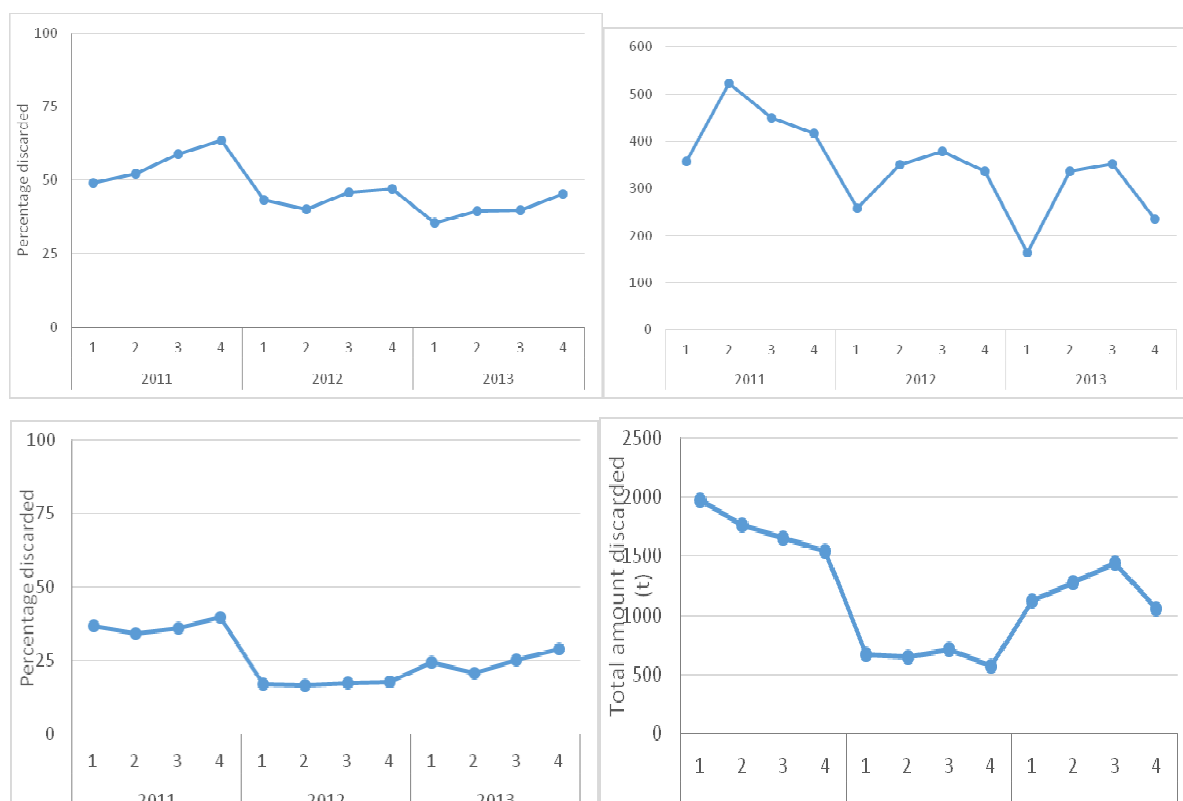


Figure 3.2.1.2. Total proportion (left panels) and amount (right panels) discarded (ton) per quarter and year (2011 - 2013) by Portuguese crustacean (top panels) and demersal fish (bottom panels) trawlers in Portuguese waters (ICES IXa)

Table 3.2.1.3. Estimated percentages discarded per species in weight (%), by Portuguese crustacean (OTB_CRU) and demersal fish (OTB_DEF) trawlers in Portuguese waters (ICES IXa). Percent undersized in the species discards (%). (a) Species with no European minimum landing size (MLS).

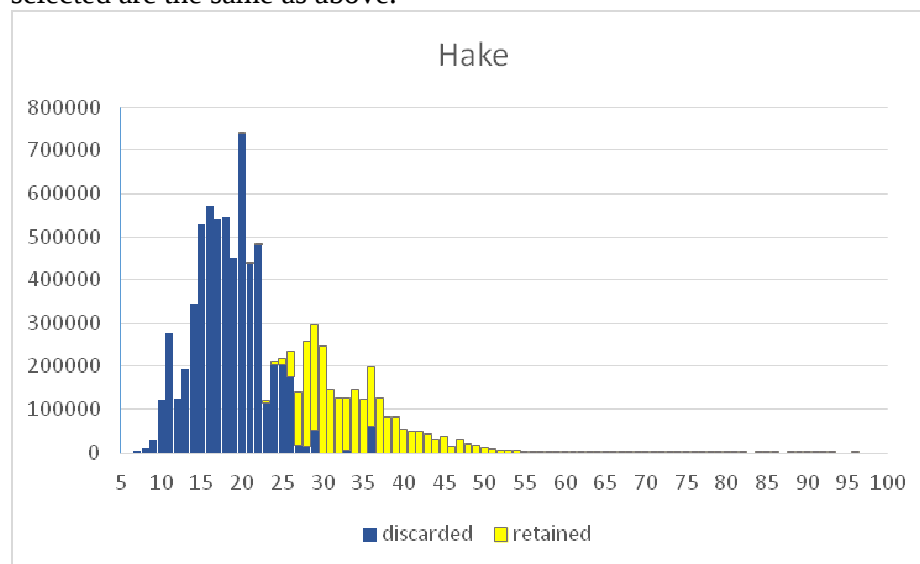
Fleet	Species	MLS	Percent discarded			Percent undersized
			2011	2012	2013	2013
OTB_CRU	Hake	27	60.1	42.5	44.5	97.7
	Boarfish	(a)	100.0	100.0	100.0	(a)
	Blue whiting	(a)	88.6	37.9	59.6	(a)
	Horse mackerel	15	68.6	4.4	9.4	5.2
	Jack mackerel	15	97.8	36.1	19.4	0
	Mackerel	20	100.0	94.8	71.1	4.2
OTB_DEF	Hake	27	NA	NA	NA	97.7
	Boarfish	(a)	100.0	100.0	100.0	(a)
	Blue whiting	(a)	21.0	11.4	2.5	(a)
	Horse mackerel	15	0.0	0.0	0.3	5.2
	Jack mackerel	15	18.9	3.9	18.5	0
	Mackerel	20	25.8	75.6	75.2	4.2

Table 3.2.1.4. Caught and discarded weight (mt) of the main quota species caught by Portuguese crustacean (OTB_CRU) and demersal fish (OTB_DEF) trawlers in Portuguese waters (ICES IXa). Coefficient of variation (%) in brackets. *Hake discards are from both trawling fleets (OTB_CRU + OTB_DEF)

Fleet	Species	Catch			Discards		
		2011	2012	2013	2011	2012	2013
OTB_CRU+ OTB_DEF	Hake*	1230	1410	1460	740	600	650
OTB_CRU	Boarfish	9	32	3	9 (36)	32 (85)	3 (66)
	Blue whiting	572	733	1062	507 (39)	278 (60)	633 (43)
	Horse mackerel	169	203	405	116 (59)	9 (105)	38 (78)
	Jack mackerel	116	39	46	113 (66)	14 (67)	9 (89)
	Mackerel	29	18	28	29 (77)	17 (70)	20 (91)
OTB_DEF	Boarfish	61	48	42	61 (56)	48 (28)	42 (37)
	Blue whiting	770	1680	1571	162 (54)	191 (56)	39 (42)
	Horse mackerel	4456	4784	7767	1 (67)	1 (63)	24 (39)
	Jack mackerel	1984	1657	1648	375 (42)	64 (48)	305 (30)
	Mackerel	795	637	821	205 (75)	482 (65)	617 (60)

iv) Length structure 2013

The following length structure figures (Figure 3.2.1.3) correspond to the Portuguese trawl fleet (OTB_CRU + OTB_DEF) for 2013, it is not available per segment (i.e.>70mm). Species selected are the same as above.



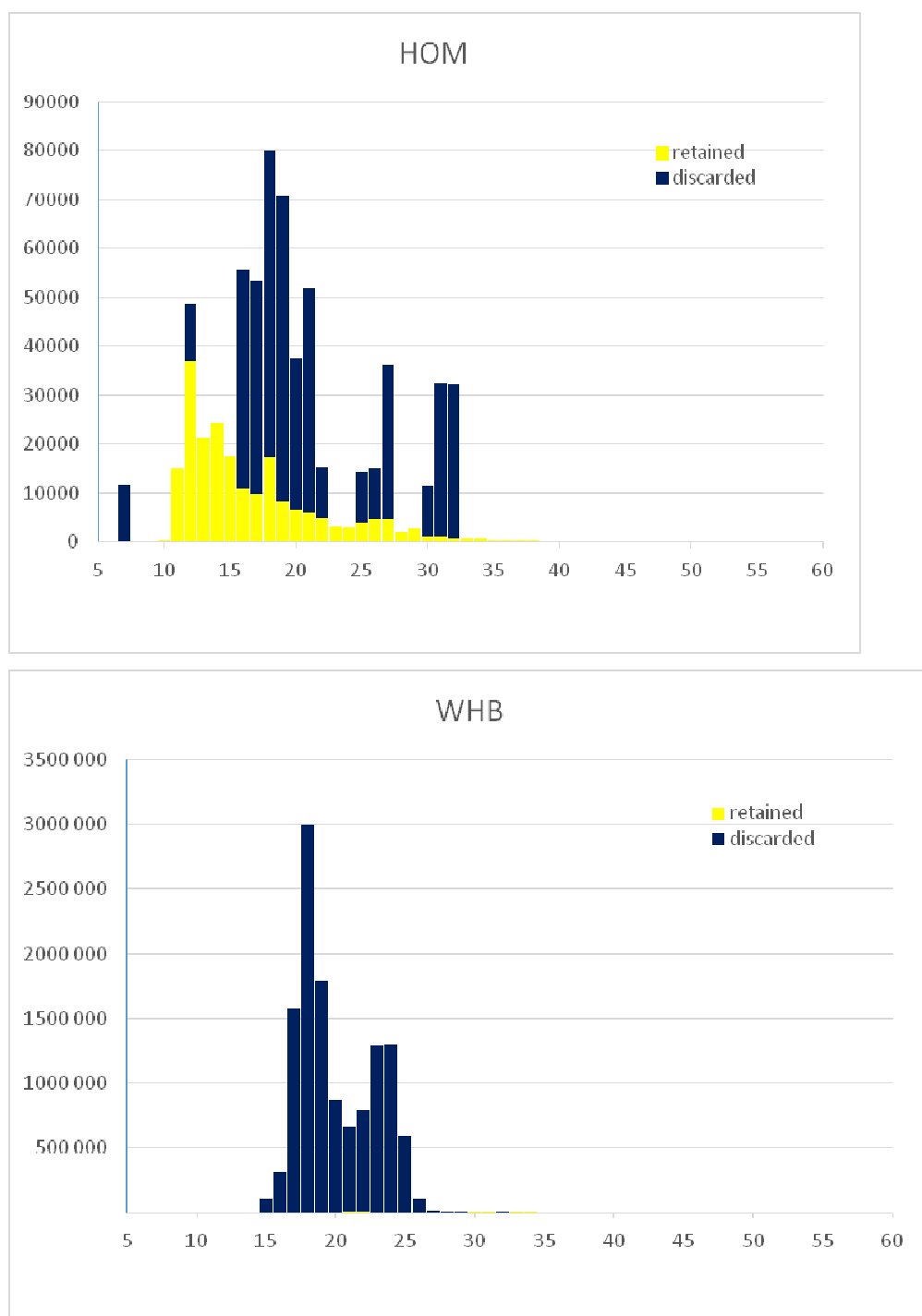


Figure 3.2.1.3. Length structure of the total (red) and discarded (blue) catch, for various species (hake, horse mackerel HOM and blue whiting WHB) caught by Portuguese trawlers in ICES IXa. Note this is raised data.

v) Reasons for discarding

Small-sized fish are caught by this fleet, and much of the bycatch is undersized and discarded. Species discarded due to no or low economic value include *Capros aper*, *Gadiculus argenteus*, *Micromesistius poutassou*, *Boops boops*, *Lepidopus caudatus* and *Plesionika* spp. Undersized individuals which are captured include hake ($L < 27\text{cm}$), *Trisopterus luscus* (national MLS=18cm), and *Scomber* spp. European MLS=20cm). Unwanted catch is discarded also due to quota restrictions and more restrictive national catch composition rules. *Nephrops* discards are considered negligible according to ICES advice.

vi) Other relevant information

Trials with selective grid devices were conducted by IPMA (former IPIMAR) onboard Portuguese research and fishing vessels (Campos, 2003, Fonseca et al., 2006) to demonstrate that the grid allowed juvenile benthic fish and *Nephrops* to escape. Selective experiments with square mesh panels have also been carried out. However these selective devices are not well accepted by the fishing sector as they imply considerable losses of the main target species (rose shrimp). Few species are believed to survive deep water trawling for crustacean, examples include *Conger conger* (COE) and of particular interest *Nephrops* (Castro et al., 2003). According to ICES WGEF (2014), there are indications that many elasmobranch species show high survivability to trawling.

According to the latest available information, female hake caught in Portugal mature at an L50 of 42cm.

3.2.1.2 Portuguese polyvalent (PT LLS, GNS>80>R>100)

i) Fleet

The polyvalent fleet employ a variety of static gear depending on licenses carried and operational interest. In total it is composed of approximately 6250 vessels, only about half of which are licensed for set longlines (LLS), gillnets >80mm and trammel nets >100. Most are small-sized: ~95% are <12m in LOA. For approximately 92% of these vessels (those < 10m LOA) there is no record of gear-catch correspondence, since there is no obligation to fill a logbook. The vessels in this category are on average only 5.7m LOA.

ii) Current management measures

Fishing with these gears is regulated at the national level, mainly by: i) Portaria nº 1102-C/2000 regulating LLS and ii) Portaria nº 1102-H/2000 that establishes rules for nets (GNS and GTR). There are minimum distances of operation from the coast. A maximum gear height (10 m for gillnets and 5 m for trammel nets) and gear length (from 2km to 20 km) according to the type of gear and size of the vessels.

iii) Catch and discard estimates

The fact that this is such a numerous fleet with small vessels making daily or sub-daily trips makes it difficult to sample discards, and although it is generally believed (from a small sample)

that discards are not a major problem for this segment, catches of the target species are nonetheless important and the possibility of discards should therefore be considered.

An analysis of the landings of these vessels suggests that catches of hake (HKE), sole (SOL) and plaice (PLE) are performed mainly by a sub-set of the fleet that employ the following métiers: bottom-set longlines (LLS) which target hake, bottom-set gillnets with a mesh size of 80mm or more (GNS_>80mm), which also target hake, and bottom-set trammel nets with a mesh size of 100mm or more (GTR_>100mm), which target sole and plaice (the latter in estuaries).

In 2013 significant monthly landings of either hake, *Nephrops* (NEP), sole or plaice could be identified from a number of these vessels. Generally there is a marked seasonality in the importance of the landings of these species (as a percentage of the total monthly landings of all species for each vessel). Annually, these landings are mostly diluted among those of other species such that directed operations for these species cannot generally be identified.

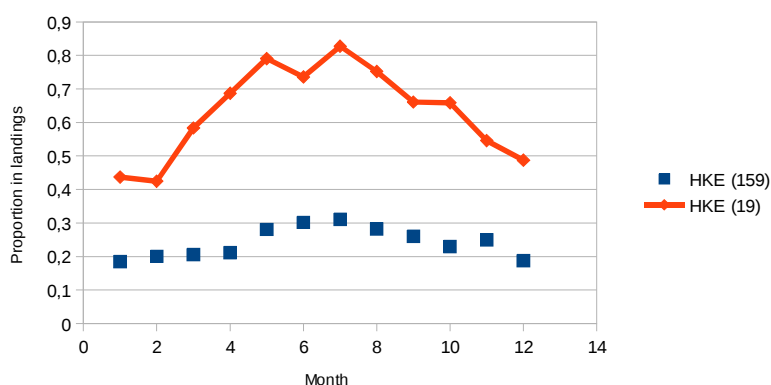
In weight for the vessels in these fleet segments:

a) hake (HKE) represented more than 50% of the landings in at least one month between March and November for 159 vessels, of which only 19 present annual averages greater than 50%;

b) *Nephrops* (NEP) represented more than 50% of at least one monthly landing for only five vessels (on one occasion each for four and twice for one); no fleet segment is therefore identified that targets *Nephrops*.

c) sole (SOL) represented more than 50% of at least one monthly landing between April and September for 147 vessels, of which only one presented an annual average landing of the species of more than 50%;

d) plaice (PLE) represented over 50% of at least one monthly landing between May and December for 14 vessels, of which three presented an annual average above 50%.



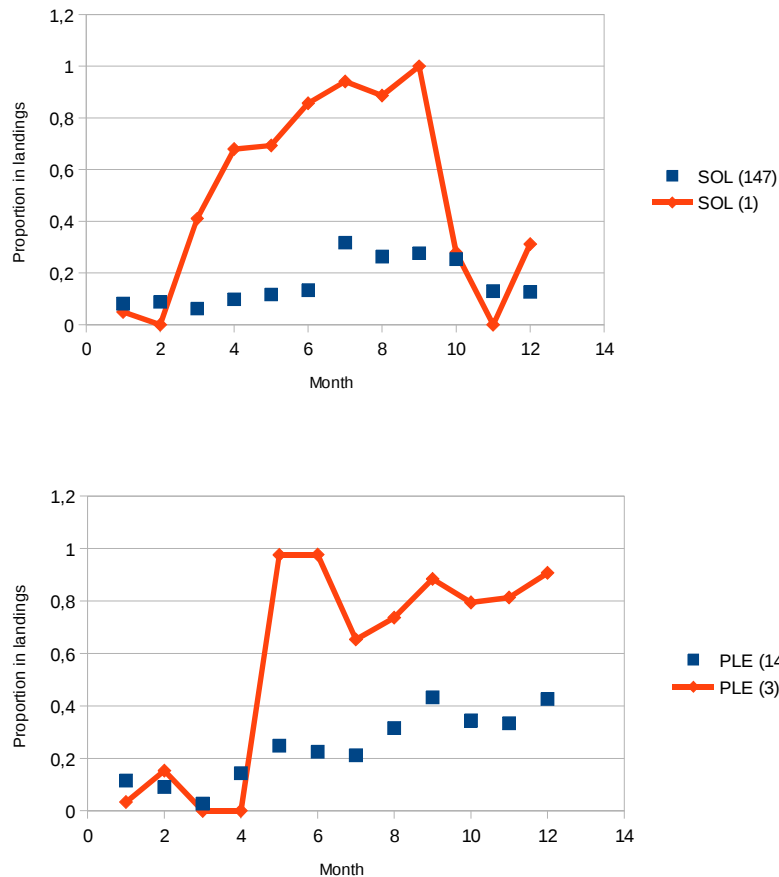


Figure 3.2.1. Average proportion that each species represents of the monthly landings of sub-sets of vessels of the Portuguese polyvalent fleet in Portuguese waters (ICES IXa) in 2013. Red line corresponds to vessels which on average target the species throughout the year, whereas the blue dots correspond to the global average of the monthly landings of all of the vessels which targeted the same species on a seasonal basis and for a variable period of time (therefore displaying only global seasonal trends for each sub-set). Species: hake (HKE), sole (SOL) and plaice (PLE). No discard data are available for any of these sub-sets.

iii) Other relevant information

As the polyvalent fleet are allowed to carry a number of different gears in a single trip, there is a problem in determining catches and discards per gear. Therefore, they have to be treated together.

SWW DEMERSAL FISHERIES DISCARD ATLAS

Valeiras, J.¹, Pérez N.¹, Salinas, I.¹, Araujo, H.¹, Silva, L.², Juárez, A.², Acosta, J.J.².

¹IEO-Centro Oceanográfico de Vigo

²IEO-Centro Oceanográfico de Cádiz

1. Otter bottom trawl targeting demersal species (OTB_DEF_>=55) in north Spanish Iberian waters ('Baca')
2. Pair bottom trawl targeting pelagic and demersal species (PTB_MPD_>=55)) in north Spanish Iberian waters('Pareja')
3. Otter bottom trawl targeting crustaceans and demersal species (OTB_MCD_>=55) in south Spanish Iberian waters
4. Set gillnet targeting demersal species using a mesh size of 60mm (GNS_DEF_60-79)) in north Spanish Iberian waters ('Beta')
5. Set gillnet targeting hake using a mesh size of 90mm (GNS_DEF_80-99)) in north Spanish Iberian waters ('Volanta')
6. Bottom longline targeting demersal species (LLS_DEF)

1. Otter bottom trawl targeting demersal species (OTB_DEF_>=55) in north Spanish Iberian waters ('Baca')

Valeiras, J., Salinas, I., Araujo, H. and Pérez, N.
IEO-Centro Oceanográfico de Vigo

1.1. Fleet

The Spanish bottom trawl operating in the Northern and Western coastal waters (ICES Divisions VIIIc and IXa) is prosecuted by vessels with 28 m of average length. This fleet is composed of otter trawlers and pair trawlers.

"Baca" gear (OTB_DEF_>=55_0_0) target demersal species, standing out hake (*Merluccius merluccius*), megrims (*Lepidorhombus boscii* and *L. whiffiagonis*) and anglerfish (*Lophius piscatorius* and *L. budegassa*). Vessels from Galicia (A Coruña, Burela, Celeiro, Corme, Marin, Muros, Muxia, Ribeira, Vigo), Asturias (Avilés, Gijón) and Cantabria trawl for demersal species all year round on the continental shelf and upper slope from southern Bay of Biscay to northwest Spanish Iberian waters.

Table 1 – Spanish otter bottom-trawlers in north Spanish Iberian waters OTB_DEF_>=55 ('Baca'): vessels, landings, trips, and sampled fraction 2011 – 2013

Harbour	OTB_DEF_>=55_0_0
No trips landed in the harbour 2013	6231
No observed trips	67
Vessel length range (m) (average)	23.3
2013 Total landings (mt)	15945.9
2013 Hake landings (mt)	695.1
2013 Nephrops landings (mt)	21.4

	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	77	66	63	4698	5731	6393	7592	9160	9967
Observed	18	13	14	57	55	49	91	92	75
Sample fraction (%)	23.4	19.7	22.2	1.213	0.96	0.766	1.199	1.004	0.752

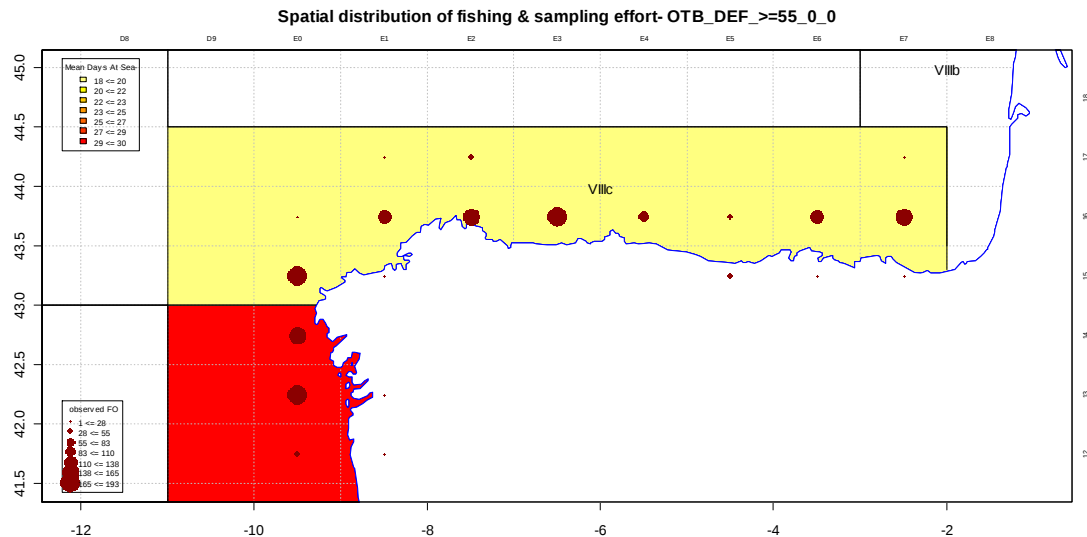


Figure 1 – Fleet activity of Spanish otter bottom-trawlers in north Spanish Iberian waters OTB_DEF_>=55 ('Baca') (rectangle colours, days-at-sea) versus sampling effort (circles, number of observed fishing operations) (2003-2013)

1.2. Current management measures

"Baca" gear (OTB_DEF_>=55_0_0), characterized by a vertical opening of 1.2-1.5 m and a wingspread of 22-25 m, is allowed to use a cod end mesh size of 70 mm. The minimum depth for activity is fixed in 100 meters, the maximum activity period is 18 hours per day and they must stop fishing for a 48-hour continuous period per week.

Hake (minimum landing size (MLS) 27cm), and Megrim (MLS 20cm), Horse mackerel (MLS 15cm) and Norway lobster (MLS 20mm cephalotoracic length) are managed by an annual TAC and minimum landing size (MLS). Anglerfish by an annual TAC and minimum legal weight (500gr) and Blue whiting only annual TAC (MLS only for Galician region).

1.3. Catch and discard estimates

This mixed bottom trawl fishery takes place throughout the year, with the highest landings in spring and summer. Nephrops and hake are taken together with anglerfish, megrim, horse mackerel, mackerel, and blue whiting.

Table 2 – Total catch and discards estimates by Spanish otter bottom-trawlers in north Spanish Iberian waters OTB_DEF_>=55 ('Baca') per stratum in 2013, FO fishing operations.

Quarter	Area	Métier	Catch (mt)	CI	Landing (mt)	Discard (mt)	Percent discarded (%)	Nº observed hauls
1	8C	OTB_DEF_>=55_0_0	21382		2870	18511	86.6	45
2	8C	OTB_DEF_>=55_0_0	13791		3229	10562	76.6	61
3	8C	OTB_DEF_>=55_0_0	32892		4408	28484	86.6	28
4	8C	OTB_DEF_>=55_0_0	40482		1877	38605	95.4	26
1	9AN	OTB_DEF_>=55_0_0	8593		992	7601	88.5	5
2	9AN	OTB_DEF_>=55_0_0	4695		956	3740	79.6	11
3	9AN	OTB_DEF_>=55_0_0	9257		911	8346	90.2	9
4	9AN	OTB_DEF_>=55_0_0	22762		702	22060	96.9	8
All	8c9aN	OTB_DEF_>=55_0_0	153855	0	15946	137909	89.6	193

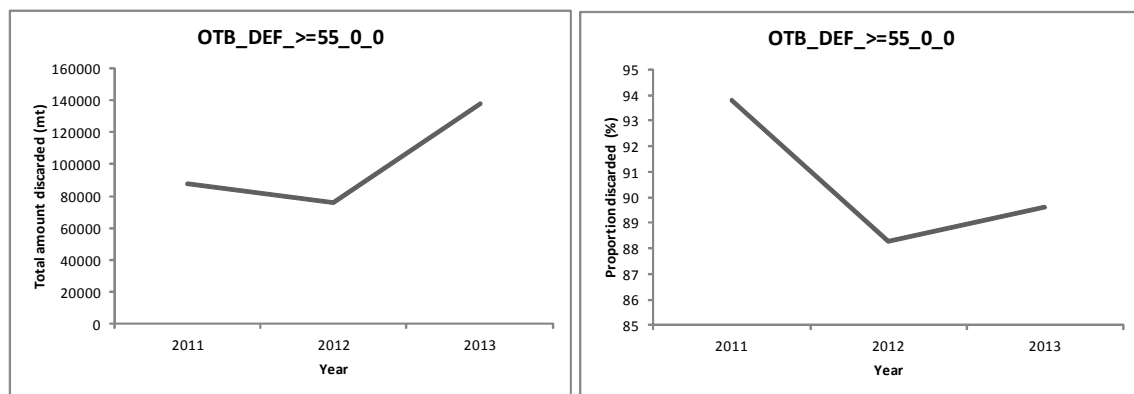


Figure 2 – Total amount and proportion discarded per year (2011 - 2013) by Spanish otter bottom-trawlers in north Spanish Iberian waters OTB_DEF_>=55 ('Baca')

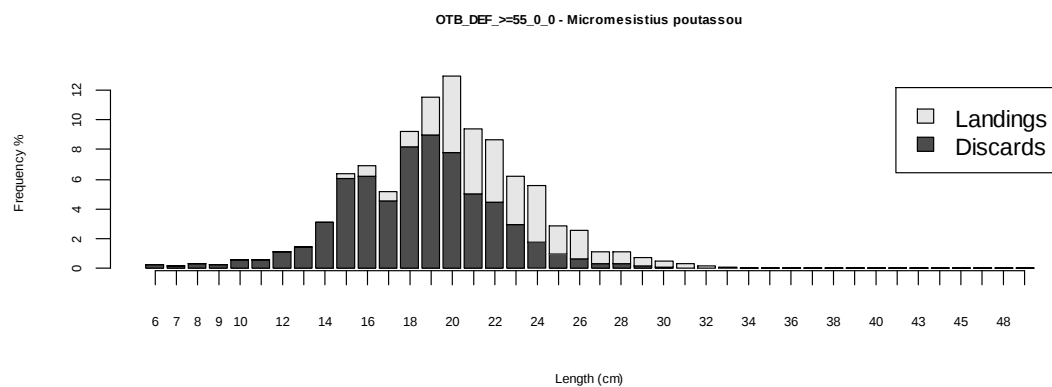
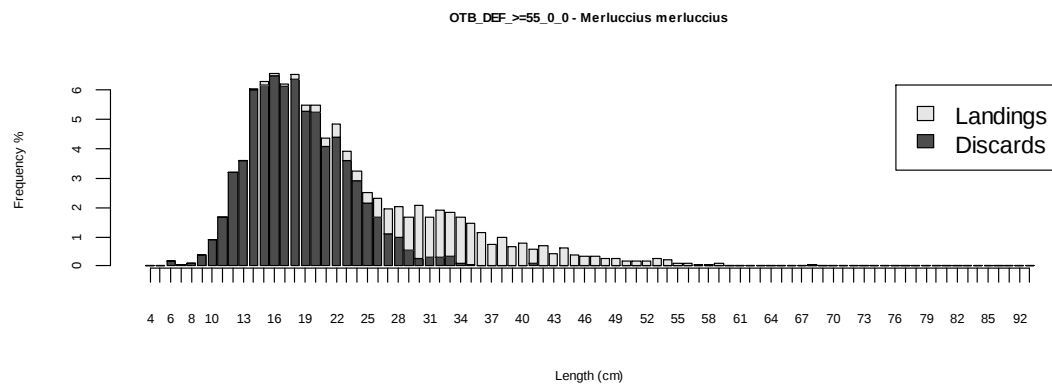
Table 3 – Estimated proportions discarded per species in weight, by Spanish otter bottom-trawlers in north Spanish Iberian waters OTB_DEF_>=55 ('Baca'), with their confidence interval (95%)

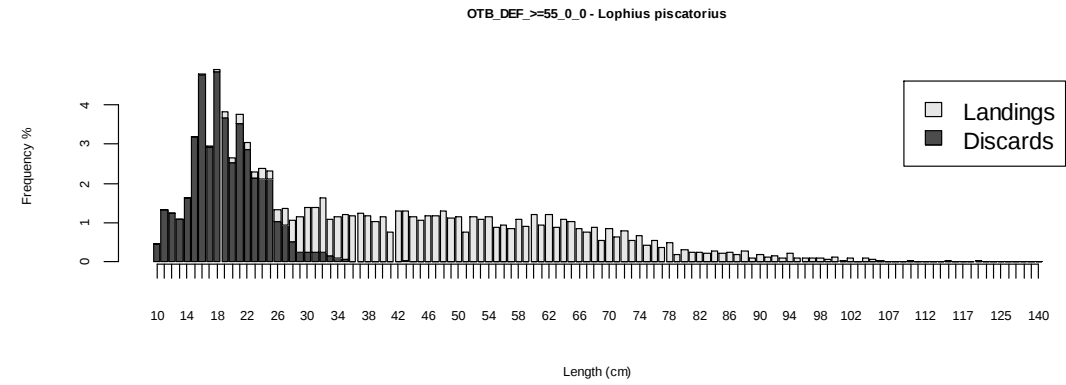
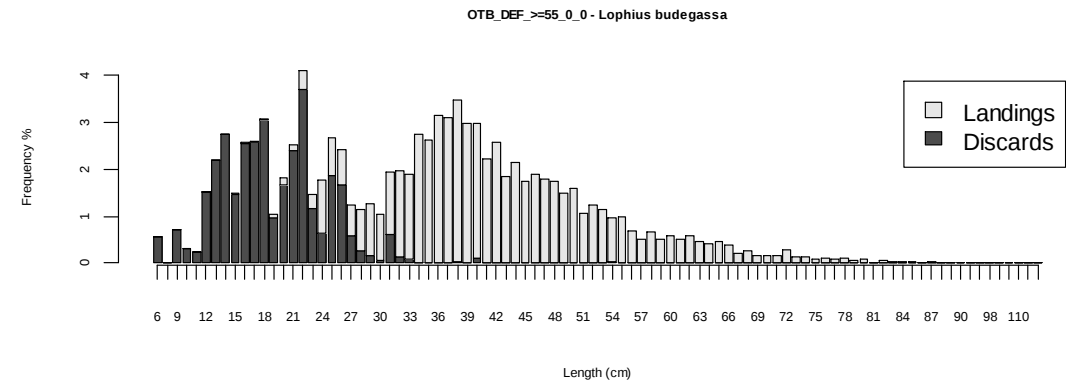
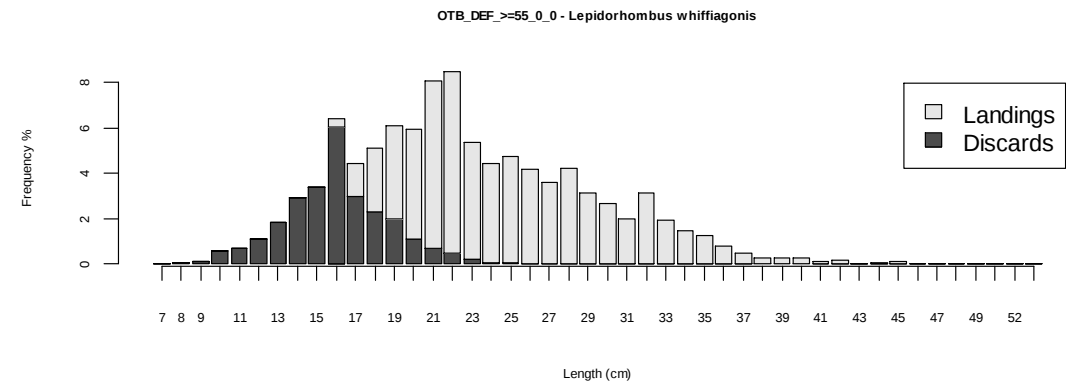
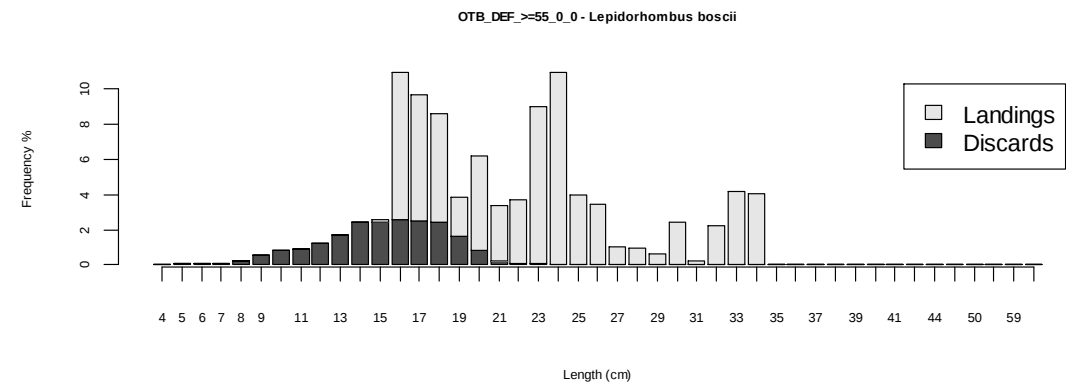
Species	Percent discarded (%)			Percent undersize in the species discards (%)		
	2011	2012	2013	2011	2012	2013
OTB_DEF_>=55_0_0						
Lophius spp.	5.3 (0 - 100)	7.6 (0 - 81.8)	3.8 (0 - 66)	99.4	91.9	100.0
Merluccius merluccius	49.6 (0 - 100)	25.6 (0 - 100)	37.6 (0 - 89.2)	91.7	95.2	97.8
Trachurus trachurus	51.4 (0 - 100)	16.3 (0 - 100)	16.1 (0 - 100)	1.6	24.7	4.7
Lepidorhombus spp.	20.5 (0 - 61.9)	23.9 (0 - 68.2)	21.9 (0 - 54.5)	97.0	96.9	90.1
Scomber scombrus	88.2 (0 - 100)	68.1 (0 - 100)	25.2 (0 - 100)	52.3	28.1	16.6
Nephrops norvegicus	0.1 (0 - 2.3)	0.4 (0 - 2.5)	0 (0 - 0)	0.0	55.6	
Micromesistius poutassou	73.9 (4.8 - 100)	70.4 (1.5 - 100)	70.6 (0 - 100)			
Galeus melastomus	100 (100-100)	100 (100-100)	100 (100-100)			
Capros aper	100 (100-100)	100 (100-100)	100 (100-100)			

Table 4 – Caught and discarded weight of the main quota species caught by Spanish otter bottom-trawlers in north Spanish Iberian waters OTB_DEF_>=55 ('Baca')

OTB_DEF_>=55_0_0	Catch (mt)			Discards (mt)		
Species	2011	2012	2013	2011	2012	2013
Lophius spp.	497 (475 - 519)	567 (533 - 602)	621 (603 - 639)	26	66	88
Merluccius merluccius	1344 (1029 - 1659)	1167 (1014 - 1320)	1653 (1470 - 1836)	662	225	714
Trachurus trachurus	903 (723 - 1084)	551 (509 - 592)	1441 (1401 - 1481)	401	71	160
Lepidorhombus spp.	897 (834 - 960)	891 (827 - 955)	1006 (900 - 1112)	336	396	417
Scomber scombrus	387 (387 - 387)	295 (147 - 443)	360 (268 - 452)	334	149	239
Micromesistius poutassou	1130 (891 - 1369)	2243 (1998 - 2488)	2949 (2653 - 3245)	919	978	1110
Galeus melastomus	718 (359 - 1077)	1421 (1116 - 1725)	745 (507 - 983)	718	1421	745
Capros aper	283 (189 - 378)	325 (246 - 404)	248 (177 - 319)	283	325	248

Length structure 2013.





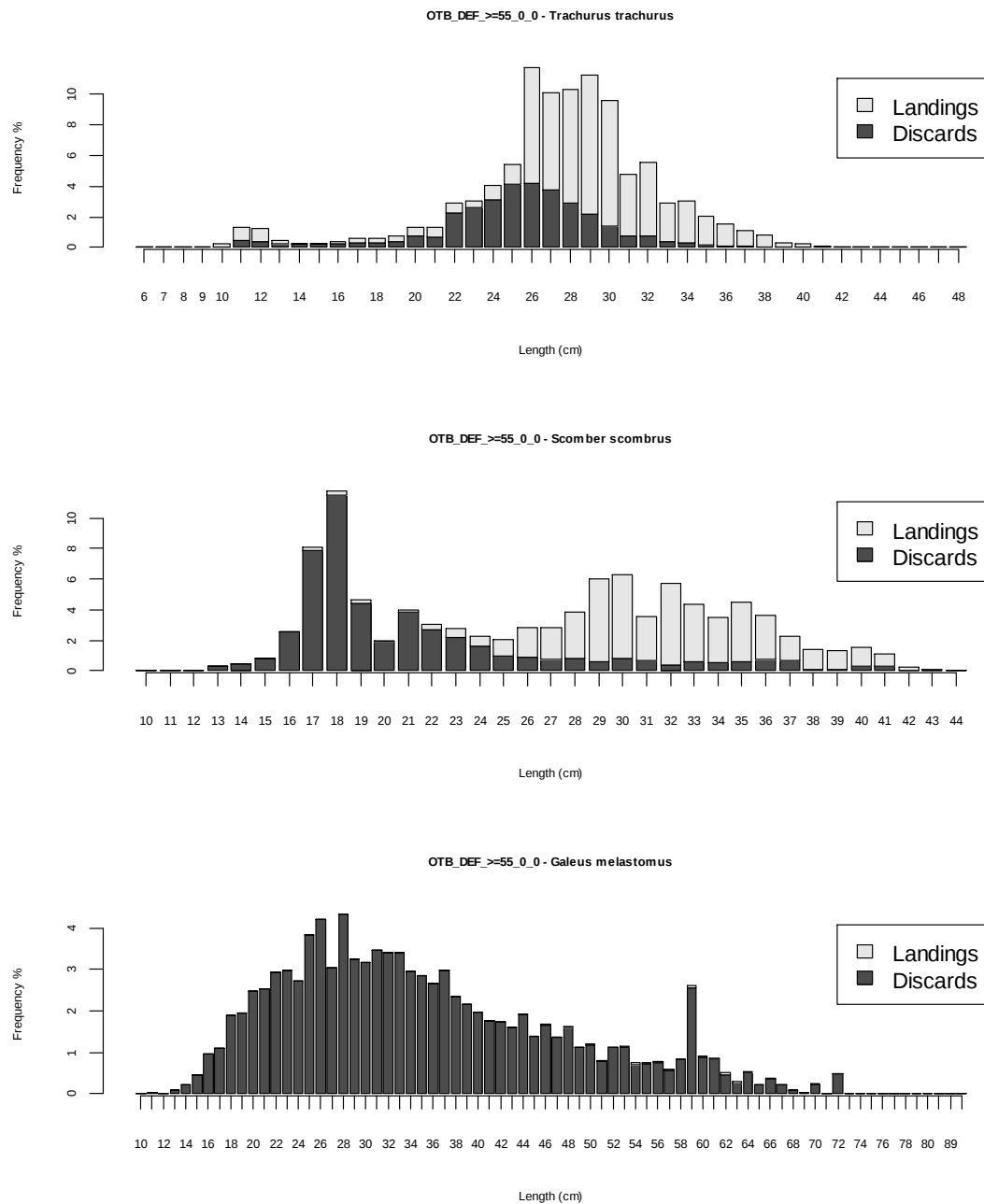


Figure 3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by Spanish otter bottom-trawlers in north Spanish Iberian waters OTB_DEF_>=55 ('Baca')

1.4. Reasons for discarding

The main causes of discarding are two: fish discarded below the legal minimum landing size and discards that can be attributed to fishers' responses to quota restrictions (including highgrading). The remainder of discards included species with low or no market value, which

were not worth landing given the high value of the target species. To develop successful discard mitigation measures, it is necessary to better identify the reasons for discarding.

1.5. Choke species and impact of the landing obligation

Blue whiting is the most important choke species. Boarfish and Blackmouth catshark *Galeus melastomus* are the most discard valueless species

1.6. Other relevant information

Several selective projects have been carried out in this fishery to reduce the capture of juvenile hake and avoid blue whiting catches. Discard survival has not been studied in this métier.

2. Pair bottom trawl targeting pelagic and demersal species (PTB_MPD_ $\geq$ 55) in north Spanish Iberian waters ('Pareja')

Valeiras, J., Salinas, I., Araujo, H. and Pérez, N.
IEO- Centro Oceanográfico de Vigo

2.1. Fleet

The Spanish bottom trawl operating in the Northern and Western coastal waters (ICES Divisions VIIIc and IXaN) is prosecuted by vessels with 28 m of average length. This fleet is composed of otter trawlers and pair trawlers. The fisheries effort is mainly exerted in ICES VIIIc.

The pair bottom trawl fleet (PTB_MPD_ $\geq$ 55_0_0) target blue whiting (*Micromesistius poutassou*), hake and mackerel (seasonally). The fleet from 3 ports in Galicia (Ribeira, Celeiro y Burela) and Aviles (Asturias) operates on the continental shelf and upper slope of NW Spanish waters and Cantabrian Sea.

Table 1 – Spanish pair bottom trawl fleet (PTB_MPD_ $\geq$ 55_0_0): vessels, landings, trips, and sampled fraction 2011 – 2013

Harbour	PTB_MPD_ $\geq$ 55_0_0
No trips landed in the harbour 2013	6549
No observed trips	25
Vessel length range (m) (average)	24.7
2013 Total landings (mt)	26645.3
2013 Hake landings (mt)	1863.1
2013 Nephrops landings (mt)	0.1

	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	52	44	44	4988	5543	6549	6701	6994	7197
Observed	7	5	5	26	30	25	30	36	29
Sample fraction (%)	13.5	11.4	11.4	0.521	0.541	0.382	0.448	0.515	0.403

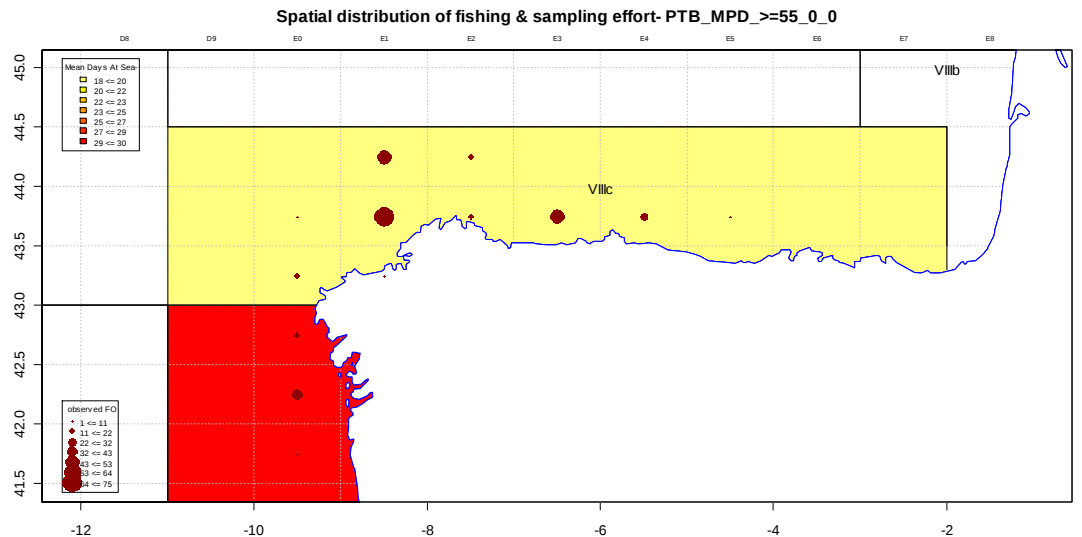


Figure 1 – Fleet activity of Spanish pair bottom-trawlers in north Spanish Iberian waters PTB_MPD_>=55 ('Pareja') (rectangle colours, days-at-sea) versus sampling effort (circles, number of observed fishing operations) (2003-2013)

2.2. Current management measures

The vessels in this métier use a gear that can reach a vertical opening of 25m and a wingspread of 65m. This fleet is allowed to use a minimum mesh size of 55 mm when it is directed to blue whiting (*Micromesistius poutassou*), the main species in landings, but needs to be extended to 70 mm when the hake proportion exceeds 15% in landings (Castro et al., 2010). However, both cod ends are included into the same DCF mesh range due to the difficulty of split both kind of trips for sampling purposes. The minimum depth for activity is fixed in 100 meters.

Hake, blue whiting and mackerel are managed by an annual TAC and minimum landing size (only in Galician waters for blue whiting). MLS for hake is 27 cm total length. MLS for blue whiting is 18cm total length.

2.3. Catch and discard estimates

This pair bottom trawl fishery takes place throughout the year. A number of vessels can change fishing gears to operate as otter bottom trawlers.

Table 2 – Total catch and discards estimates by Spanish pair bottom-trawlers in north Spanish Iberian waters PTB_MPD_>=55 ('Pareja') per stratum in 2013, FO fishing operations.

Quarter	Area	Métier	Catch (mt)	CI	Landing (mt)	Discard (mt)	Percent discarded (%)	Nº observed hauls
1	8C	PTB_MPD_>=55_0_0	9802		6124	3678	37.5	4
2	8C	PTB_MPD_>=55_0_0	8024		5043	2981	37.1	7
3	8C	PTB_MPD_>=55_0_0	10404		5387	5017	48.2	11
4	8C	PTB_MPD_>=55_0_0	5854		5044	810	13.8	5
1	9AN	PTB_MPD_>=55_0_0	1430		675	755	52.8	
2	9AN	PTB_MPD_>=55_0_0	3452		2190	1262	36.6	
3	9AN	PTB_MPD_>=55_0_0	3414		1505	1909	55.9	
4	9AN	PTB_MPD_>=55_0_0	877		678	200	22.8	
All	8c9aN	OTB_DEF_>=55_0_0	43257	0	26645	16612	38.4	27

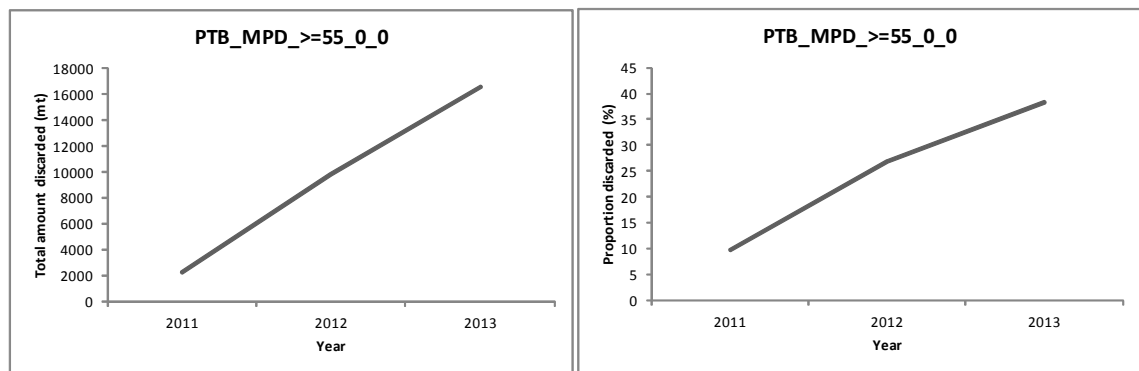


Figure 2 – Total amount and proportion discarded per year (2011 - 2013) by Spanish pair bottom-trawlers in north Spanish Iberian waters PTB_MPD_>=55 ('Pareja').

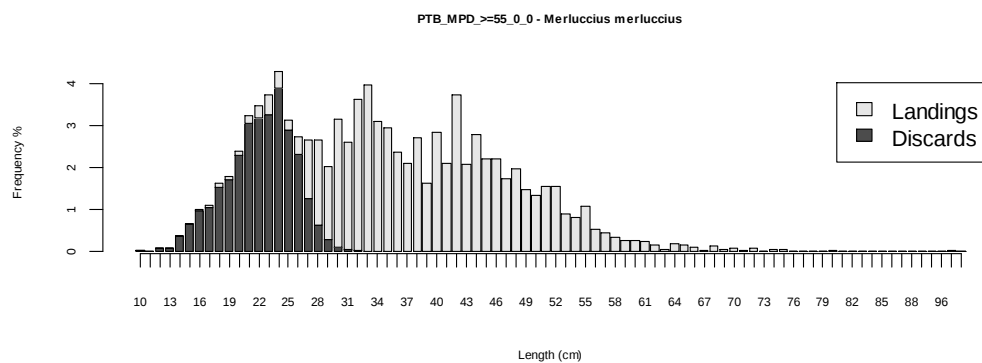
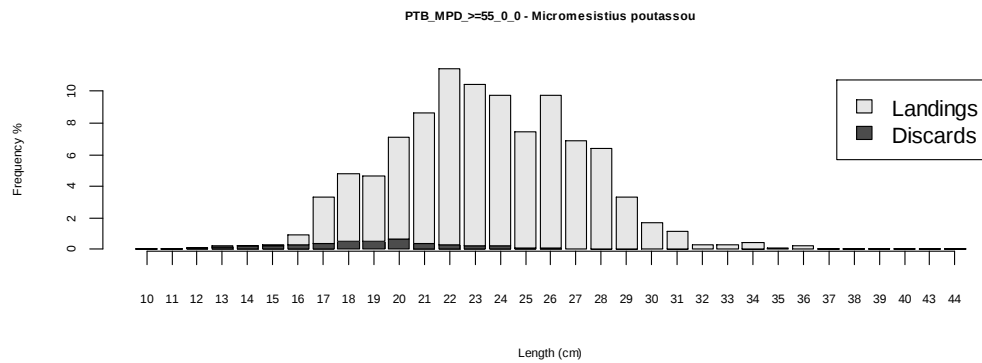
Table 3 – Estimated proportions discarded per species in weight, by Spanish pair bottom-trawlers in north Spanish Iberian waters PTB_MPD_>=55 ('Pareja'), with their confidence interval (95%)

Species	Percent discarded (%)			Percent undersize in the species discards (%)		
	2011	2012	2013	2011	2012	2013
PTB_MPD_>=55_0_0						
Lophius spp.	4.3 (0 - 13)	0 (0 - 0)	0 (0 - 0)	0.0	0.0	0.0
Merluccius merluccius	6.1 (0 - 37)	13.1 (0 - 72.3)	23.5 (0 - 76.5)	97.6	98.9	97.8
Trachurus trachurus	3.5 (0 - 100)	2.6 (0 - 100)	19.1 (0 - 95.2)	0.0	0.0	0.0
Lepidorhombus spp.	7.8 (0 - 14.8)	54.1 (0 - 100)	4.6 (0 - 100)	0.0	44.0	100.0
Scomber scombrus	0.5 (0.3 - 100)	3 (0.1 - 100)	99.3 (0 - 100)	56.9	20.8	4.5
Nephrops norvegicus						
Micromesistius poutassou	10 (0.1 - 100)	2.1 (0 - 100)	7.3 (0 - 100)			
Galeus melastomus	100 (100-100)	100 (100-100)	100 (100-100)			
Capros aper	100 (100-100)	100 (100-100)	100 (100-100)			

Table 4 – Caught and discarded weight of the main quota species caught by Spanish pair bottom-trawlers in north Spanish Iberian waters PTB_MPD_>=55 ('Pareja')

PTB_MPD_>=55_0_0	Catch (mt)			Discards (mt)		
Species	2011	2012	2013	2011	2012	2013
Lophius spp.	67 (64 - 70)	0	0	3	0	0
Merluccius merluccius	1851 (1676 - 2025)	2215 (0 - 4720)	4285 (3470 - 5101)	384	837	2422
Trachurus trachurus	2239 (2237 - 2241)	680 (666 - 694)	524 (488 - 560)	3	30	25
Lepidorhombus spp.	14 (14 - 14)	39 (39 - 39)	9 (9 - 10)	0	2	0
Scomber scombrus	1434 (1430 - 1438)	1551 (1287 - 1815)	2020 (1809 - 2232)	33	321	401
Micromesistius poutassou	2292 (2065 - 2518)	5727 (5468 - 5987)	13023 (11888 - 14158)	622	679	873
Galeus melastomus	11 (0 - 25)	12 (12 - 13)	1 (0 - 1)	11	12	0.5
Capros aper	8 (2 - 14)	805 (775 - 835)	30 (0 - 130)	8	805	30

Length structure 2013.



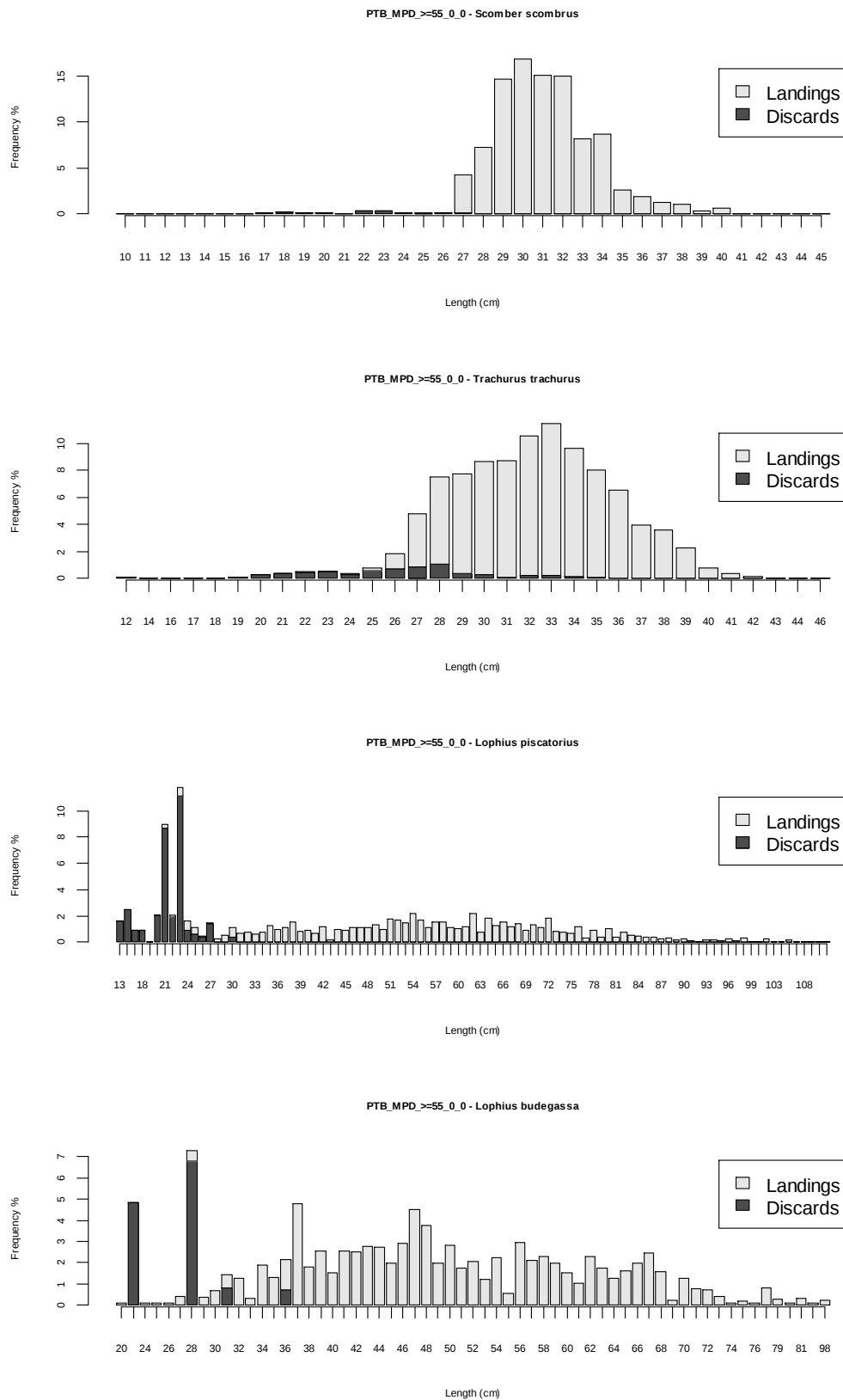


Figure 3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by Spanish pair bottom-trawlers in north Spanish Iberian waters PTB_MPD_>=55 ('Pareja')

2.4. Reasons for discarding

The main causes of discarding are two: fish discarded below the legal minimum landing size and minimum commercial size (case of blue whiting) discards that can be attributed to fishers' responses to quota restrictions (including highgrading). The remainder of discards included species with low or no market value, which were not worth landing given the high value of the target species. To develop successful discard mitigation measures, it is necessary to better identify the reasons for discarding.

2.5. Choke species and impact of the landing obligation

Boarfish is the most important choke species, especially when métier is targeting mackerel.

2.6. Other relevant information

A selective project was carried out in this fishery to reduce the capture of juvenile hake and blue whiting (1998). Discard survival has not been studied in this métier.

3. Otter bottom trawl targeting crustaceans and demersal species (OTB_MCD_>=55) in south Spanish Iberian waters

Juárez, A., Silva, L. and Acosta, J.J.

IEO-Centro Oceanográfico de Cádiz

3.1. Fleet

The Spanish bottom trawl operating in IXa South Iberian waters (Gulf of Cádiz) is directed to crustaceans and demersal species as hake (*Merluccius merluccius*), rose shrimp (*Parapenaeus longirostris*) and cuttlefish (*Sepia officinalis*). The trawl fleet is mainly composed of around 150 vessels. Their average characteristics are about 17.9 m length, 31 HP and 212 GRT. The traditional trawl gear used is the “baca” trawl gear with some modifications (Anom., 2001).

The bottom trawl fleet operating in the Division IXa South (Gulf of Cádiz) was classified by Silva et al. (2007) in a unique métier. For proper management of this fishery, should be taken into account that there are coastal trips targeting caramote prawn, wedge sole and cephalopods, but also there are deeper trips targeting blue whiting, hake and deep rose shrimp.

Table 1 – Spanish otter bottom trawl targeting crustaceans and demersal species (OTB_MCD_>=55): vessels, landings, trips, and sampled fraction 2011 – 2013

Harbour	OTB_MCD_>=55_0_0
No trips landed in the harbour 2013	21403
No observed trips	26
Vessel length range (m) (average)	18.98
2013 Total landings (mt)	7348
2013 Hake landings (mt)	582
2013 Nephrops landings (mt)	26

	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	161	145	143	21212	21802	21403	22526	22682	23175
Observed	24	32	21	29	36	26	29	36	26
Sample fraction (%)	14.9	22.1	14.7	0.137	0.165	0.121	0.129	0.159	0.112

3.2. Current management measures

The vessels in this métier are allowed to use a minimum mesh size of 55 mm (from 2009). The minimum trawl depth is established for a minimum distance to the coast of 6 nautic miles. Trawl fleet must stop fishing during a temporary closure of 45 days between late September and early November. The maximum activity period is 18 hours per day and they must stop fishing for a 48-hour continuous period per week.

The minimum landing size (MLS) of hake is 27 cm and the MLS of Nephrops is 20 mm carapace length (CL). Nephrops fishing may only be made in fishing periods expressly authorized by ministerial order, after hearing the affected fisheries.

3.3. Catch and discard estimates

This mixed bottom trawl fishery takes catch a large list of species, including commercial fish, cephalopods and crustaceans.

Table 2 – Total catch and discards estimates by Spanish otter bottom trawl targeting crustaceans and demersal species (OTB_MCD_>=55) per stratum in 2013, FO fishing operations.

Quarter	Area	Métier	Catch (mt)	CI	Landing (mt)	Discard (mt)	Percent discarded (%)	Nº observed hauls
1	9aS	OTB_MCD_>=55	3525		2281	1244	35.29	12
2	9aS	OTB_MCD_>=55	4968		2115	2853	57.43	30
3	9aS	OTB_MCD_>=55	4337		1775	2562	59.07	19
4	9aS	OTB_MCD_>=55	2043		1177	866	42.39	13
All	8c9aN	OTB_DEF_>=55_0_0	59007	0	34671	24336	41.2	101

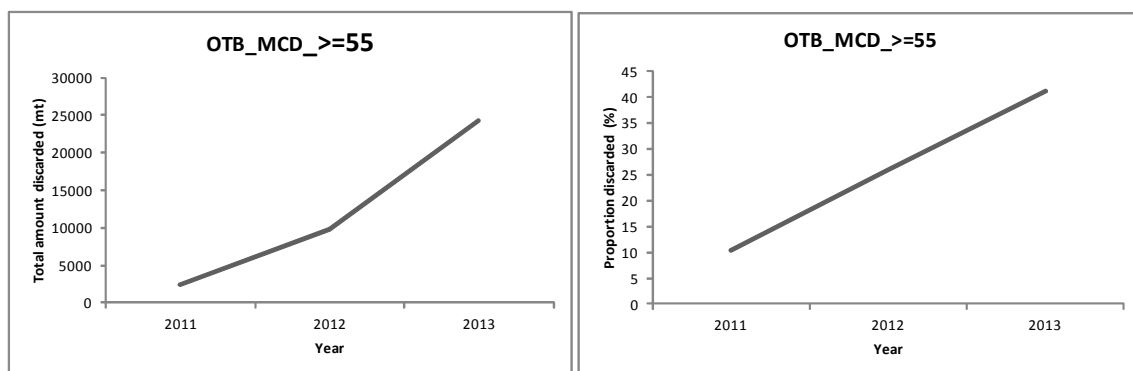


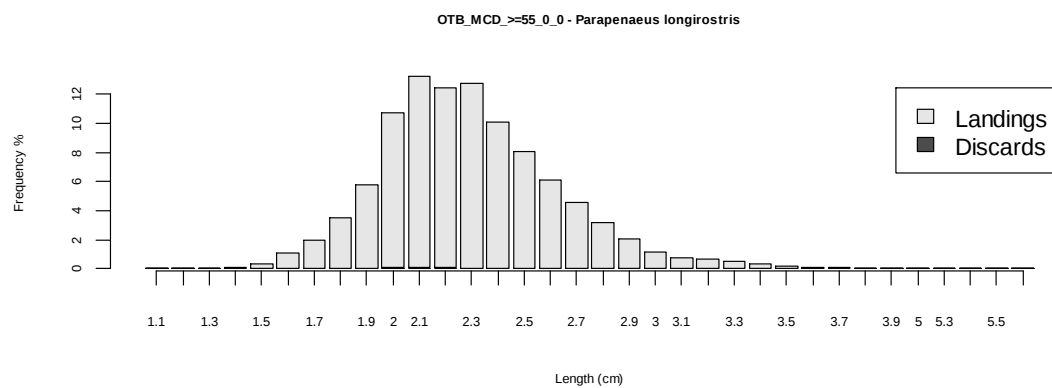
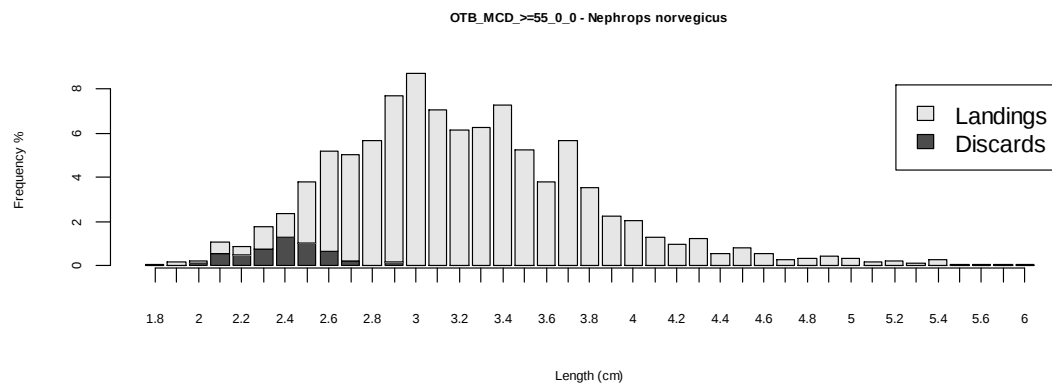
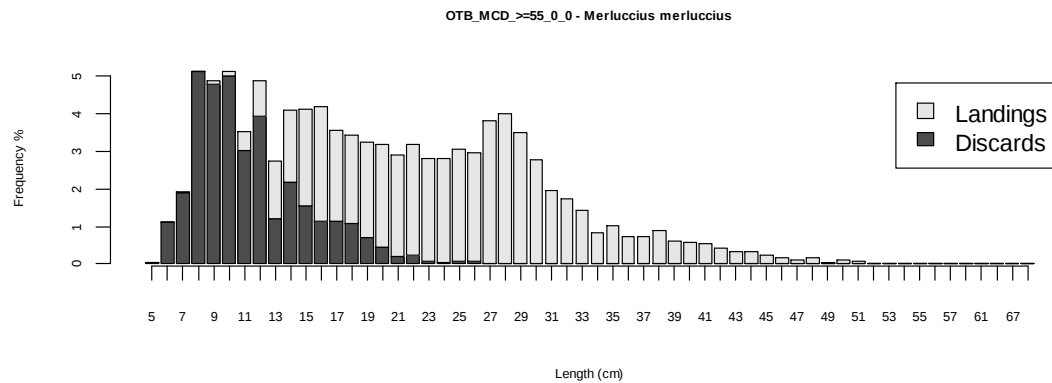
Figure 2 – Total amount and proportion discarded per year (2011 - 2013) by Spanish otter bottom trawl targeting crustaceans and demersal species (OTB_MCD_>=55).

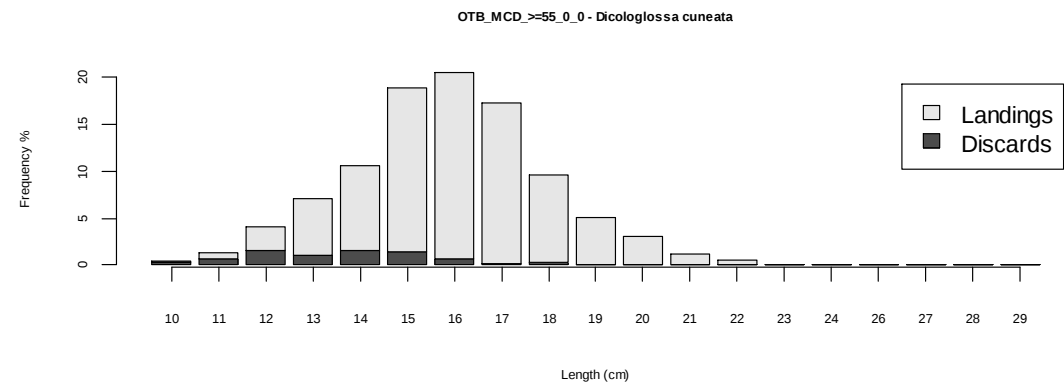
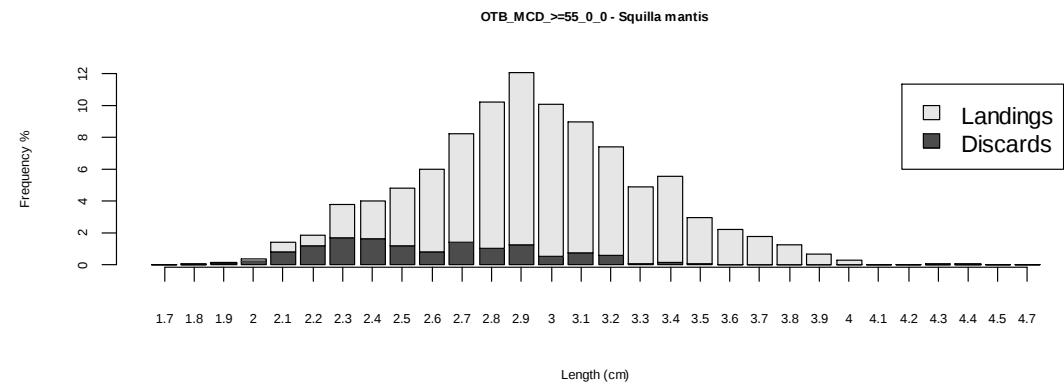
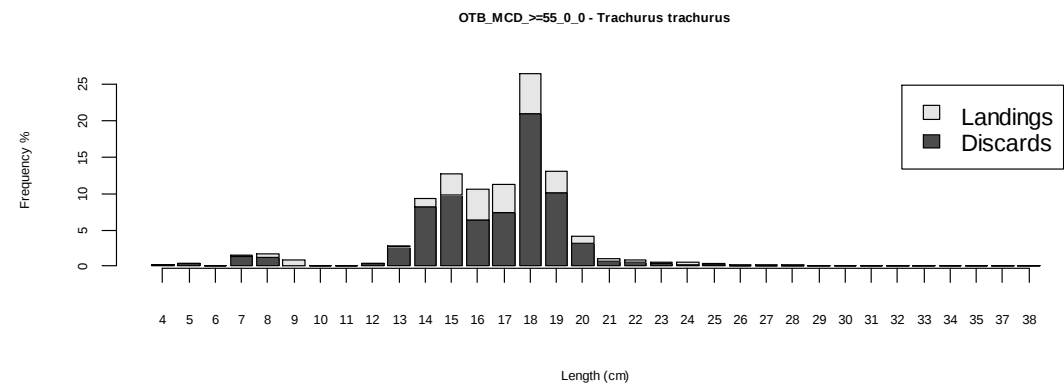
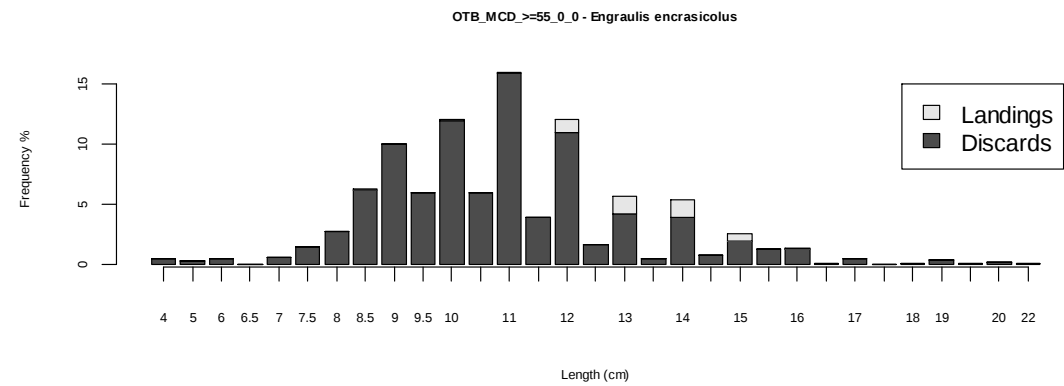
Table 3 – Estimated proportions discarded per species in weight, by Spanish otter bottom trawl targeting crustaceans and demersal species (OTB_MCD_>=55).

Species	Percent discarded (%)			Percent undersize in the species discards (%)		
	2011	2012	2013	2011	2012	2013
OTB_MCD_>=55_0_0						
Lophius spp.	0.2	0.1	0.0			100.0
Merluccius merluccius	21.5	13.0	3.5			100.0
Trachurus trachurus	100.0	100.0	90.4			32.6
Lepidorhombus spp.						
Scomber scombrus	99.9	99.9	100.0			8.9
Nephrops norvegicus	0.1	0.0	36.8			<1
Micromesistius poutassou	27.5	1.9	20.2	22.6	83.8	

Table 4 – Caught and discarded weight of the main quota species caught by Spanish otter bottom trawl targeting crustaceans and demersal species (OTB_MCD_>=55)

OTB_MCD_>=55_0_0	Catch (mt)			Discards (mt)		
	2011	2012	2013	2011	2012	2013
Species						
Lophius spp.	48	66	57	6	27	6
Merluccius merluccius	384	459	603	83	60	21
Trachurus trachurus	75	98	1615	75	98	1615
Scomber scombrus	10	0	293	10	0	190
Nephrops norvegicus	60	85	41	0	0	15
Micromesistius poutassou	215	137	786	59	3	159





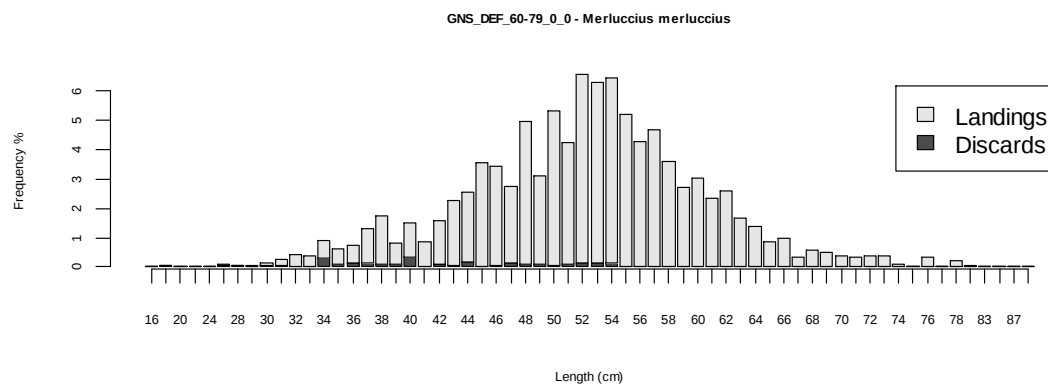


Figure 3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by Spanish otter bottom trawl targeting crustaceans and demersal species (OTB_MCD_ $\geq$ 55)

3.4. Reasons for discarding

The main causes of discarding are two: fish discarded below the legal minimum landing size and discards that can be attributed to fishers' responses to quota restrictions (including highgrading). The remainder of discards included species with low or no market value, which were not worth landing given the high value of the target species. To develop successful discard mitigation measures, it is necessary to better identify the reasons for discarding.

3.5. Choke species and impact of the landing obligation

Anchovy and horse mackerel are choke species in this métier.

3.6. Other relevant information

Discard survival has not been studied in this métier.

4. Set gillnet targeting demersal species using a mesh size of 60mm (GNS_DEF_60-79) in north Spanish Iberian waters ('Beta')

Valeiras, J., Salinas, I., Araujo, H. and Pérez, N.
IEO-Centro Oceanográfico de Vigo

4.1. Fleet

The Spanish set gillnet GNS_DEF_60-79 "Beta" targeting demersal species in the Northern and Western coastal waters (ICES Divisions VIIIc and IXa) is prosecuted by small vessels with 8 m of average length.

"Beta" gear (GNS_DEF_60-79) targeting demersal species, catch mainly hake (*Merluccius merluccius*). Vessels mainly from Galicia (Cariño, Cedeira, Corme, Corcubion, Muxia), Asturias (Bustio, Lastres, Puerto de Vega, Avilés) and Cantabria (Suances) fish for hake all year round on the continental shelf from southern Bay of Biscay to northwest Spanish Iberian waters. This fleet can change fishing gears for other gillnets or longlines depending on month and available species in the fishing grounds.

Table 1 – Spanish set gillnet GNS_DEF_60-79 "Beta" in north Spanish Iberian waters: vessels, landings, trips, and sampled fraction 2011 – 2013

Harbour	GNS_DEF_60-79_0_0
No trips landed in the harbour 2013	18307
No observed trips	3
Vessel length range (m) (average)	7.9
2013 Total landings (mt)	1855.6
2013 Hake landings (mt)	384.1
2013 Nephrops landings (mt)	

	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	287	402	304	20184	20635	18307	25517	21024	18402
Observed	1	0	1	2	0	3	2	0	3
Sample fraction (%)	0.35	0	0.33	0.01	0	0.016	0.008	0	0.016

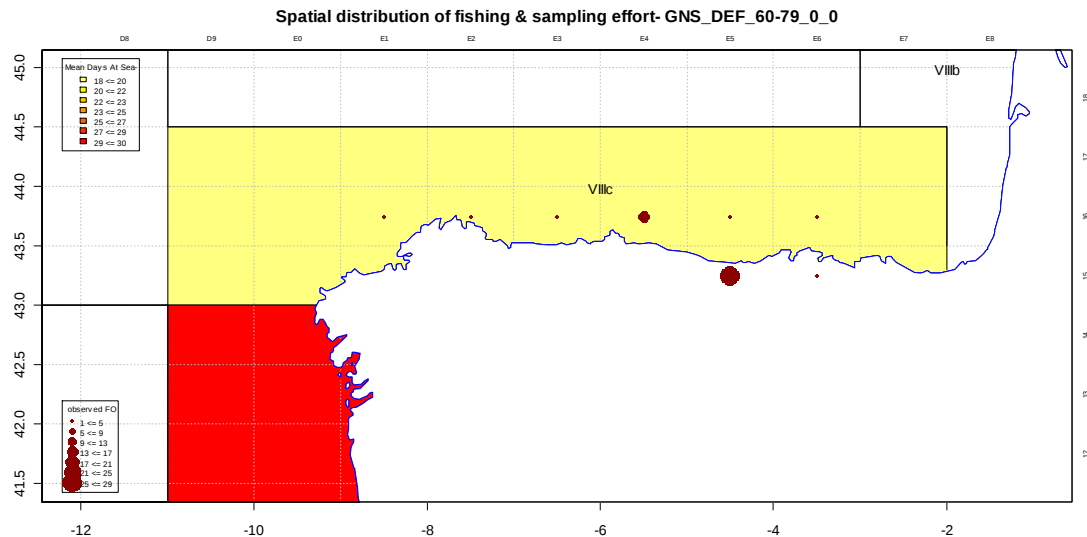


Figure 1 – Fleet activity of Spanish set gillnet GNS_DEF_60-79 “Beta” in north Spanish Iberian waters (rectangle colours, days-at-sea) versus sampling effort (circles, number of observed fishing operations) (2003-2013)

4.2. Current management measures

Hake is managed by an annual TAC and minimum landing size. MLS for hake is 27 cm total length.

4.3. Catch and discard estimates

“Beta” gear (GNS_DEF_60-79) takes place throughout the year, with differences of fishing effort depending on seasons, ports and fish abundance. Hake is taken together with other species and represented around 80% of the catches in the study period.

Table 2 – Total catch and discards estimates by Spanish set gillnet GNS_DEF_60-79 “Beta” in north Spanish Iberian waters per stratum in 2013, FO fishing operations.

Quarter	Area	Métier	Catch (mt)	CI	Landing (mt)	Discard (mt)	Percent discarded (%)	Nº observed hauls
1	8C	GNS_DEF_60-79_0_0			157	NA		
2	8C	GNS_DEF_60-79_0_0			175	NA		
3	8C	GNS_DEF_60-79_0_0			274	NA		
4	8C	GNS_DEF_60-79_0_0	252		220	32	12.6	4
1	9AN	GNS_DEF_60-79_0_0			173	NA		
2	9AN	GNS_DEF_60-79_0_0			207	NA		
3	9AN	GNS_DEF_60-79_0_0			385	NA		
4	9AN	GNS_DEF_60-79_0_0			265	NA		
All	8c9aN	OTB_DEF_>=55_0_0	252	0	1698	32	1.8	4

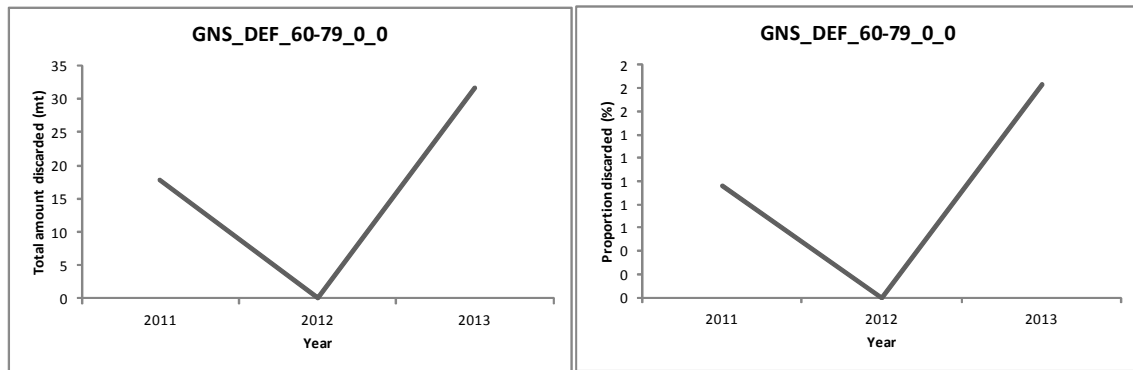


Figure 2 – Total amount and proportion discarded per year (2011 - 2013) by Spanish set gillnet GNS_DEF_60-79 “Beta” in north Spanish Iberian waters in north Spanish Iberian waters

Table 3 – Estimated proportions discarded per species in weight, by Spanish set gillnet GNS_DEF_60-79 “Beta” in north Spanish Iberian waters with their confidence interval (95%)

Species	Percent discarded (%)			Percent undersize in the species discards (%)		
	2011	2012	2013	2011	2012	2013
GNS_DEF_60-79_0_0						
Lophius spp.	0 (0 - 0)	NA			NA	
Merluccius merluccius	2.7 (0 - 5.7)	NA	0 (0 - 0)	0.0	NA	
Trachurus trachurus	100 (100 - 100)	NA	2.6 (0.5 - 6.7)	0.0	NA	0.0
Lepidorhombus spp.	0 (0 - 0)	NA	26.8 (26.8 - 26.8)		NA	0.0
Scomber scombrus	100 (100 - 100)	NA	24.9 (0 - 100)	0.0	NA	0.0
Nephrops norvegicus		NA			NA	
Micromesistius poutassou		NA			NA	

Table 4 – Caught and discarded weight of the main quota species caught by Spanish set gillnet GNS_DEF_60-79 “Beta” in north Spanish Iberian waters

GNS_DEF_60-79_0_0 Species	Catch (mt)			Discards (mt)		
	2011	2012	2013	2011	2012	2013
Lophius spp.	11 (11 - 11)	NA		8	NA	0
Merluccius merluccius	298 (243 - 354)	NA		6	NA	0
Trachurus trachurus	215 (154 - 276)	NA		2	NA	0
Lepidorhombus spp.		NA	1 (0 - 3)	0	NA	1
Scomber scombrus	46 (29 - 63)	NA	65 (62 - 68)	1	NA	1

Length structure 2013.

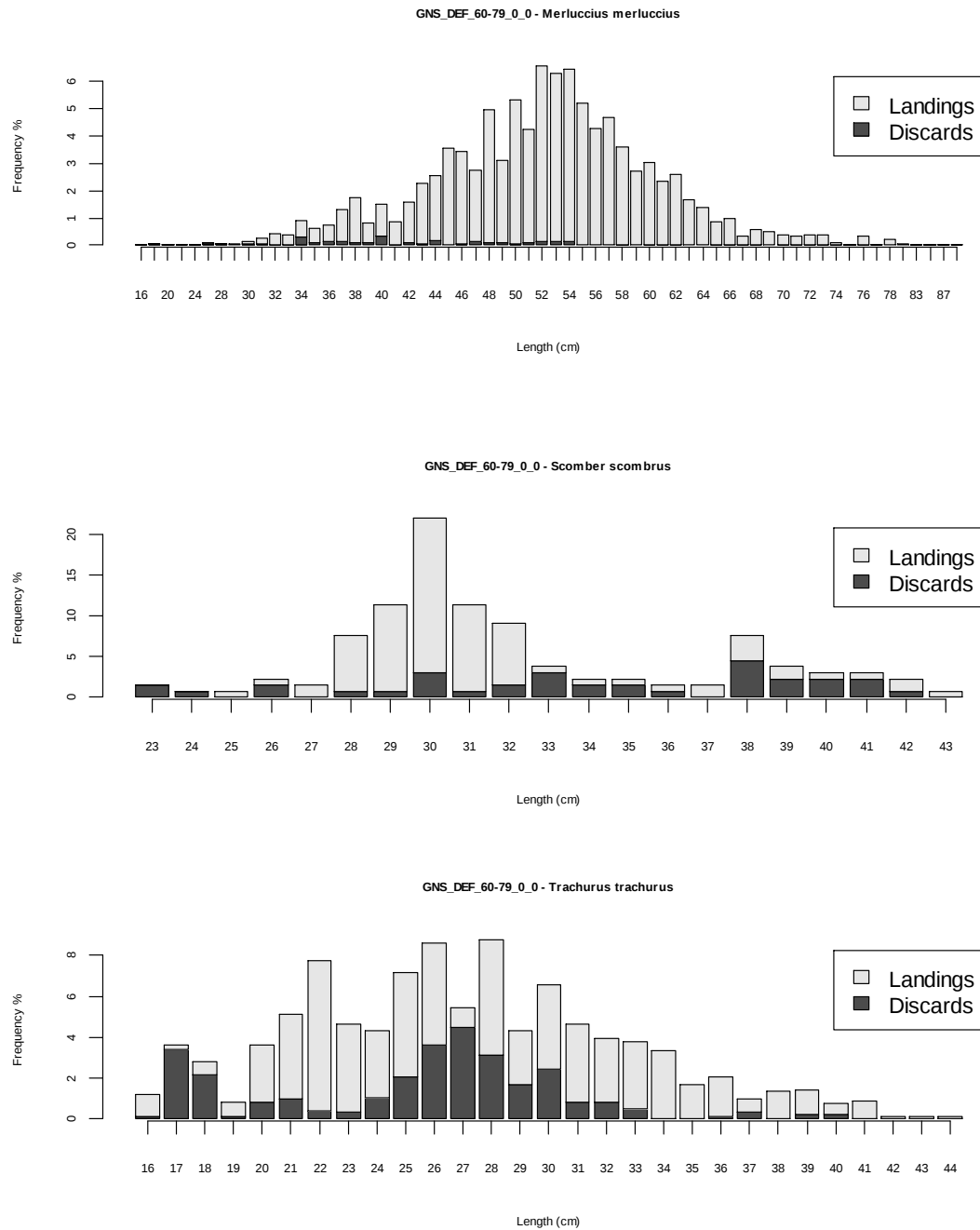


Figure 3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by Spanish set gillnet GNS_DEF_60-79 “Beta” in north Spanish Iberian waters

4.4. Reasons for discarding

The main causes of discarding are catching of species with low or no market value, which were not worth landing given the high value of the target species. Also damaged hakes are

discarded (sea lice and predators). To develop successful discard mitigation measures, it is necessary to better identify the reasons for discarding.

4.5. Choke species and impact of the landing obligation

The choke species are mainly mackerel and also horse mackerel.

4.6. Other relevant information

No selectivity projects have been carried out in this fishery. Discard survival has not been studied in this métier.

5. Set gillnet targeting hake using a mesh size of 90mm (GNS_DEF_80-99)) in north Spanish Iberian waters ('Volanta')

Valeiras, J., Salinas, I., Araujo, H. and Pérez, N.
IEO-Centro Oceanográfico de Vigo

5.1. Fleet

The Spanish set gillnet GNS_DEF_80-99 "Volanta" targeting demersal species in the Northern and Western coastal waters (ICES Divisions VIIIc and IXa) is prosecuted by vessels with 14 m of average length.

"Volanta" gear (GNS_DEF_80-99) target demersal species, mainly hake (*Merluccius merluccius*). Vessels mainly from Galicia (Cariño, Cedeira, Corme, Corcubion, Muxia), Asturias (Bustio, Lastres, Puerto de Vega, Avilés) and Cantabria (Suances) fish for hake all year round on the continental shelf from southern Bay of Biscay to northwest Spanish Iberian waters. This fleet can change fishing gears for other gillnets or longlines depending on month and available species in the fishing grounds.

Table 1 – Spanish set gillnet GNS_DEF_80-99 "Volanta" in north Spanish Iberian waters: vessels, landings, trips, and sampled fraction 2011 – 2013

Harbour	GNS_DEF_80-99_0_0
No trips landed in the harbour 2013	5677
No observed trips	4
Vessel length range (m) (average)	14.5
2013 Total landings (mt)	4116
2013 Hake landings (mt)	1750.6
2013 Nephrops landings (mt)	

	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	59	57	51	7294	6822	5677	8111	7611	6653
Observed	2	0	1	9	0	4	9	0	4
Sample fraction (%)	3.39	0	1.96	0.123	0	0.07	0.111	0	0.06

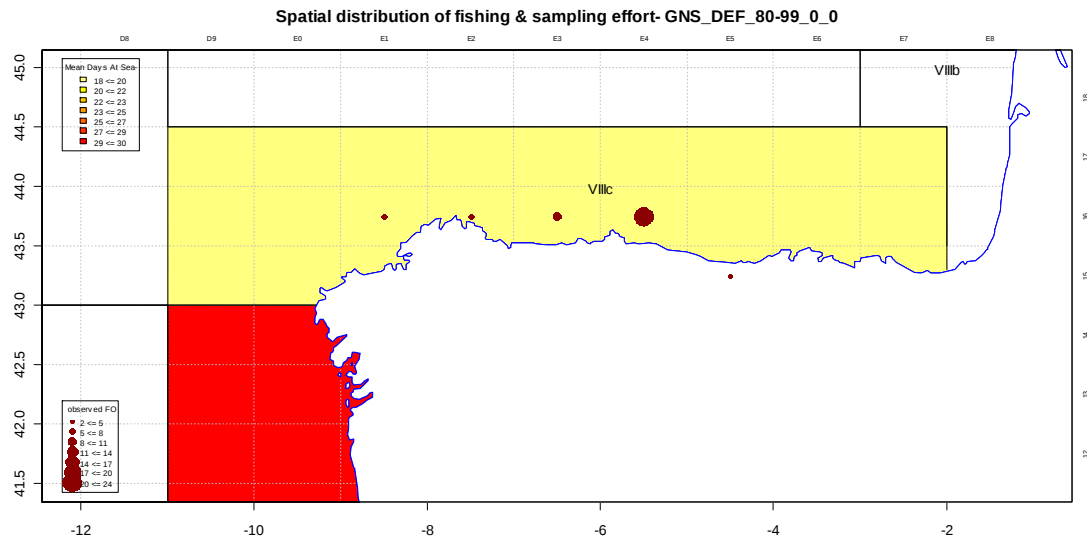


Figure 1 – Fleet activity of set gillnet GNS_DEF_80-99 “Volanta” in north Spanish Iberian waters (rectangle colours, days-at-sea) versus sampling effort (circles, number of observed fishing operations) (2003-2013)

5.2. Current management measures

Hake is managed by an annual TAC and minimum landing size. MLS for hake is 27 cm total length.

5.3. Catch and discard estimates

“Volanta” gear (GNS_DEF_80-99) takes place throughout the year, with differences of fishing effort depending on seasons, ports and fish abundance.

Table 2 – Total catch and discards estimates by set gillnet GNS_DEF_80-99 “Volanta” in north Spanish Iberian waters per stratum in 2013, FO fishing operations.

Quarter	Area	Métier	Catch (mt)	CI	Landing (mt)	Discard (mt)	Percent discarded (%)	Nº observed hauls
1	8C	GNS_DEF_80-99_0_0			1493	NA		
2	8C	GNS_DEF_80-99_0_0	692		598	94	13.6	4
3	8C	GNS_DEF_80-99_0_0			1147	NA		
4	8C	GNS_DEF_80-99_0_0			619	NA		
1	9AN	GNS_DEF_80-99_0_0			74	NA		
2	9AN	GNS_DEF_80-99_0_0			59	NA		
3	9AN	GNS_DEF_80-99_0_0			77	NA		
4	9AN	GNS_DEF_80-99_0_0			50	NA		
All	8c9aN	OTB_DEF_>=55_0_0	692	0	2623	94	3.5	4

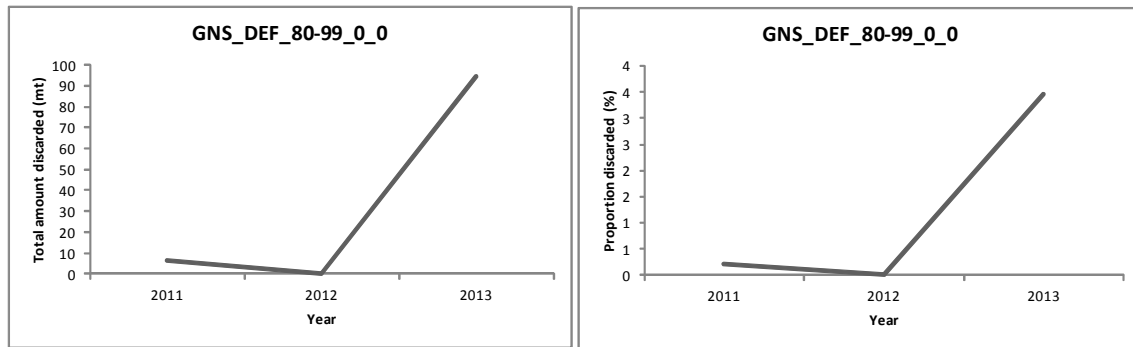


Figure 2 – Total amount and proportion discarded per year (2011 - 2013) by set gillnet GNS_DEF_80-99 “Volanta” in north Spanish Iberian waters

Table 3 – Estimated proportions discarded per species in weight, by Spanish set gillnet GNS_DEF_80-99 “Volanta” in north Spanish Iberian waters with their confidence interval (95%)

Species	Percent discarded (%)			Percent undersize in the species discards (%)		
	2011	2012	2013	2011	2012	2013
GNS_DEF_80-99_0_0						
Lophius spp.		NA			NA	
Merluccius merluccius	1.1 (0 - 9.2)	NA	0.02 (0 - 0)	NA	NA	0.0
Trachurus trachurus	15.2 (7.4 - 64.9)	NA	49.2 (3.7 - 100)	0.0	NA	0.0
Lepidorhombus spp.	0 (0 - 0)	NA	0 (0 - 0)		NA	
Scomber scombrus	21.2 (0 - 100)	NA	100 (100 - 100)	0.0	NA	0.0
Nephrops norvegicus		NA			NA	
Micromesistius poutassou	28.7 (0 - 100)	NA	100 (100 - 100)		NA	

Table 4 – Caught and discarded weight of the main quota species caught by Spanish set gillnet GNS_DEF_80-99 “Volanta” in north Spanish Iberian waters

Species	Catch (mt)			Discards (mt)		
	2011	2012	2013	2011	2012	2013
Merluccius merluccius	601 (597 - 605)	NA	1751 (1751 - 1751)	6	NA	0
Trachurus trachurus	430 (427 - 433)	NA	579 (565 - 593)	1	NA	24
Scomber scombrus	32 (31 - 33)	NA	44 (39 - 49)	1	NA	4

Length structure 2013.

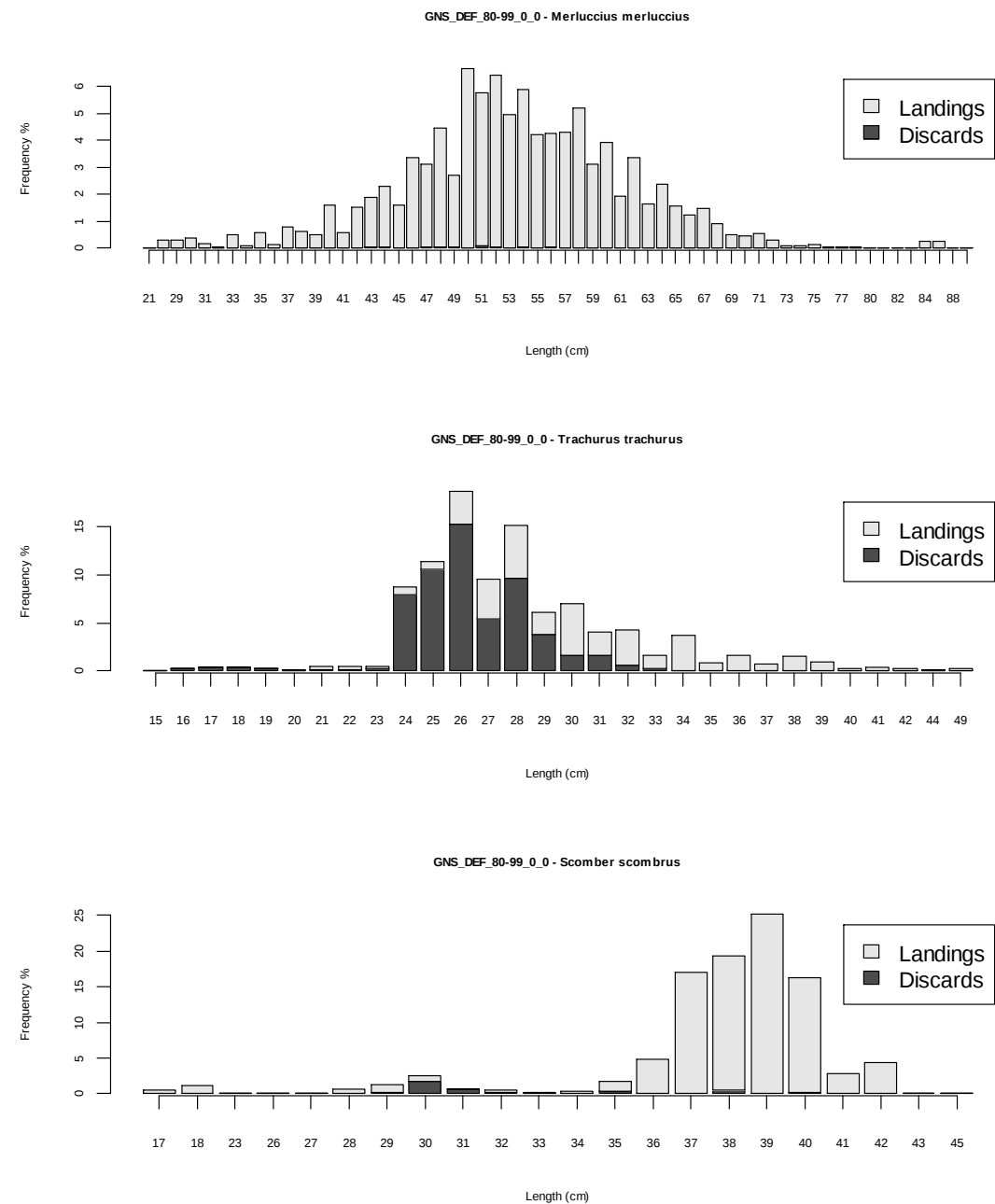


Figure 3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by Spanish set gillnet GNS_DEF_60-79 “Beta” in north Spanish Iberian waters

5.4. Reasons for discarding

The main causes of discarding are catching of species with low or no market value, which were not worth landing given the high value of the target species. Also damaged hakes are discarded (sea lice and predators). To develop successful discard mitigation measures, it is necessary to better identify the reasons for discarding.

5.5. Choke species and impact of the landing obligation

The likely choke species are mainly mackerel and also horse mackerel.

5.6. Other relevant information

No selectivity projects have been carried out in this fishery. Discard survival has not been studied in this métier.

6. Bottom longline targeting demersal species (LLS_DEF)

Valeiras, J., Salinas, I., Araujo, H. and Pérez, N.
IEO-Centro Oceanográfico de Vigo

6.1. Fleet

The Spanish bottom longline targeting demersal species (LLS_DEF_0_0_0) targeting demersal species in the Northern and Western coastal waters (ICES Divisions VIIIc and IXa) is prosecuted by small vessels with 8 m of average length.

“Palangre” gear (LLS_DEF_0_0_0) target demersal species, mainly hake (*Merluccius merluccius*). Vessels from several ports of Galicia (Burela, Camariñas, Camelle, Cariño, Aguiño, Cedeira, Celeiro, Corcubion, Fisterra, Malpica de Bergantiños, Muxia, Ribeira, San Cibrao), Asturias and Cantabria fish for hake all year round on the continental shelf from southern Bay of Biscay to northwest Spanish Iberian waters. This fleet can change fishing gears for gillnets depending on month and available species in the fishing grounds.

Table 1 – Spanish bottom longline targeting demersal species (LLS_DEF_0_0_0) in north Spanish Iberian waters: vessels, landings, trips, and sampled fraction 2011 – 2013

Harbour	LLS_DEF_0_0_0
No trips landed in the harbour 2013	
No observed trips	NA
Vessel length range (m) (average)	
2013 Total landings (mt)	5756.9
2013 Hake landings (mt)	1110.3
2013 Nephrops landings (mt)	

	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	250	548	278	30568	26930	31472	34787	33758	33816
Observed	0	0	0	0	0	0	0	0	0
Sample fraction (%)									

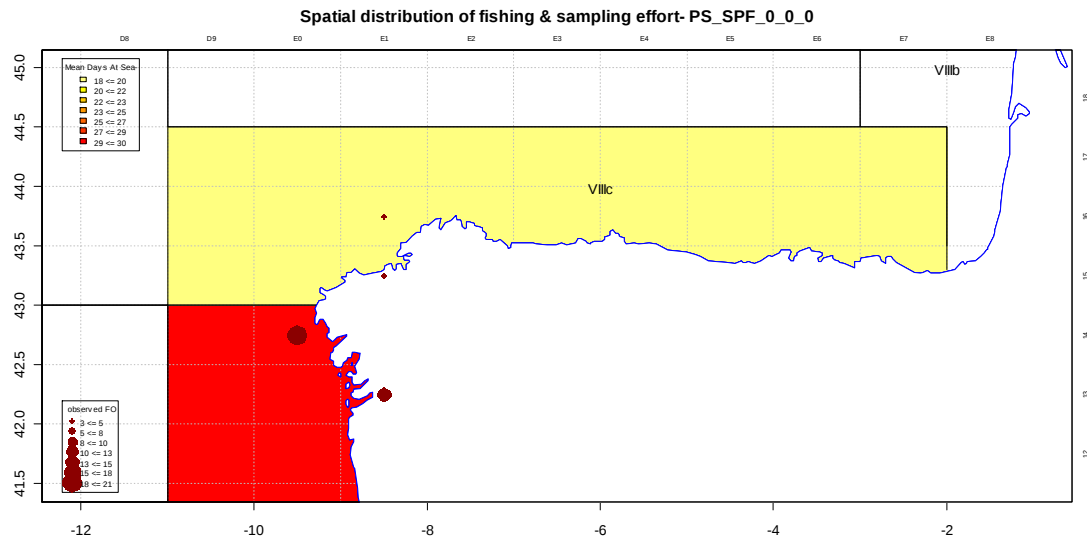


Figure 1 – Fleet activity of bottom longline targeting demersal species (LLS_DEF_0_0_0) in north Spanish Iberian waters (rectangle colours, days-at-sea) versus sampling effort (circles, number of observed fishing operations) (before 2011-2013)

6.2. Current management measures

Hake is managed by an annual TAC and minimum landing size. MLS for hake is 27 cm total length.

6.3. Catch and discard estimates

Bottom longline targeting demersal species (LLS_DEF_0_0_0) takes place throughout the year, with differences of fishing effort depending on seasons, ports and fish abundance. Hake is taken together with other species. During 2011 to 2013 there was not observer effort .

Table 2 – Total landings by bottom longline targeting demersal species (LLS_DEF_0_0_0) in north Spanish Iberian waters per stratum in 2013. During 2011 to 2013 there was not observer effort.

Quarter	Area	Métier	Catch (mt)	CI	Landing (mt)	Discard (mt)	Percent discarded (%)	Nº observed hauls
1	8C	LLS_DEF_0_0_0			1097	NA		
2	8C	LLS_DEF_0_0_0			1437	NA		
3	8C	LLS_DEF_0_0_0			777	NA		
4	8C	LLS_DEF_0_0_0			756	NA		
1	9AN	LLS_DEF_0_0_0			309	NA		
2	9AN	LLS_DEF_0_0_0			359	NA		
3	9AN	LLS_DEF_0_0_0			541	NA		
4	9AN	LLS_DEF_0_0_0			482	NA		
All	8c9aN	OTB_DEF_>=55_0_0	0	0	4660	0	0.0	0

6.4. Reasons for discarding

The main causes of discarding are species with low or no market value, and damaged (sea lice and predators).

6.5. Other relevant information

No selectivity projects have been carried out in this fishery. Discard survival has not been studied in this métier.

Spanish métiers [AZTI]

1. Pair bottom trawl (PTB_DEF_ $\geq$ 70) targeting hake in the Bay of Biscay

1.1.Fleet

Pair trawlers involved in this métier use a very high vertical opening bottom trawl to target hake in ICES Divisions VIIIabd. All the fishing units are based in the Ondarroa port (Basque Country, Spain). The activity is constant along the year, with a slight effort reduction during summer period. Average duration of the trips is about 5 days. Vessel length range is 37-39 meters. Total landings reach 2293 tons in 2013, and hake landings 1682 tones.

Table 1. Spanish pair bottom trawl in the Bay of Biscay: fishing units*, landings, trips, and sampling coverage.

	No vessels*			No trips		
	2011	2012	2013	2011	2012	2013
Total	5	5	3	295	166	174
Sampled	2	3	3	8	8	10
Sampling coverage (%)	40.0	60.0	100	2.7	4.8	5.7

* fishing unit understood as two vessels (pair) operating at the same time. If one of the vessels has been replaced, a new unit has been considered.

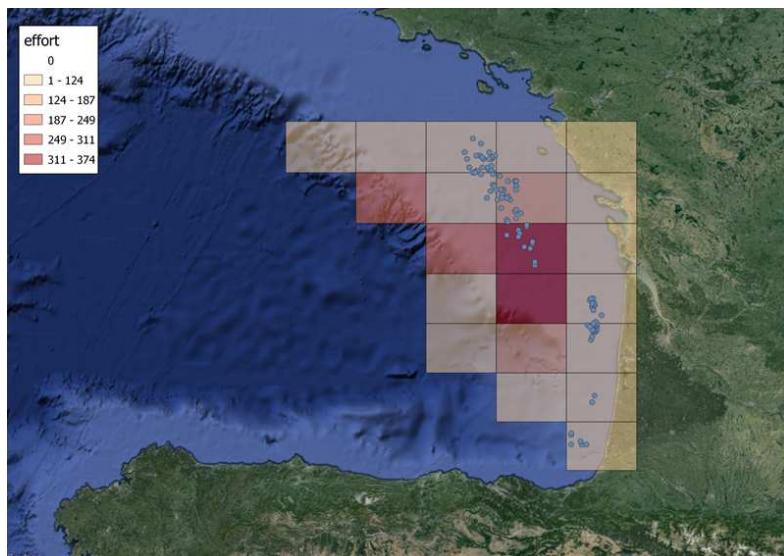


Figure1. Spanish pair bottom trawl effort during 2012. Total number of fishing operation by statistical rectangles, and sampled fishing operations (blue dots).

1.2. Current management measures

Hake is the main target specie in this métier, which is subject to a TAC. Its MLS is fixed at 27 cm. The codend mesh size in this métier is 100 mm. The number of meshes around the codend should be 100 at the maximum and the twine of the meshes should be 6 mm when single twine is used and 4 when double twine is used.

Moreover, these vessels are not allowed to fish within 12 miles from the French coast.

1.3. Catch and discard estimates

Table2. Estimated total catch (tons) and discarded percentage by quarter for PTB_DEF_>=70 operating in the Bay of Biscay during 2013. (CI: confidence interval)

Quarter	Area	Metier	Catch	Landing	Discard	CI discard	Percent discarded	Observed trips	total trips
1	VIIIabd	PTB_DEF_>= 70	884	811	73	(12 - 136)	8%	3	49
2	VIIIabd	PTB_DEF_>= 70	515	460	55	(21 - 89)	11%	3	35
3	VIIIabd	PTB_DEF_>= 70	664	499	165	(28-333)	25%	2	49
4	VIIIabd	PTB_DEF_>= 70	597	523	74	(32-123)	12%	2	41
total	VIIIabd	PTB_DEF_>= 70	2661	2293	368	(93-681)	14%	10	174

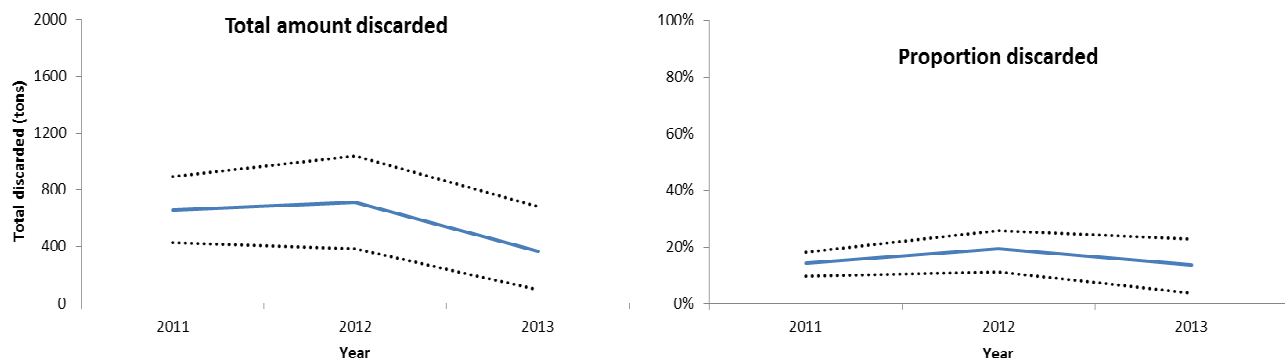


Figure 2. Estimated total amount and proportion discarded for the period 2011-2013

Table 3. Estimated proportion discarded in weight, of the main quota species caught by Spanish pair bottom trawlers in the Bay of Biscay with 95% confidence interval. Percentage of undersize individuals within the discarded fraction is also presented in the last column for the year 2013.

	Percent discarded (%)									% undersize
	2011			2012			2013			2013
	%	CI -	CI +	%	CI -	CI +	%	CI -	CI +	
Horse mackerel	53	45	59	82	67	88	85	79	89	9
Blue whiting	8	3	12	88	80	91	39	28	46	99
Whiting	0	0	0	0	0	0	0	0	0	
Hake	1	1	2	5	4	6	6	5	7	
Rape blanco	0	0	0	0	0	0	0	0	0	
Rape negro	1	0	2	0	0	0	0	0	0	
Mackerel	55	45	62	51	35	61	15	11	20	24

Table 4. Catch and estimated discards in weight of the main quota species caught by the Spanish pair bottom trawlers in the Bay of Biscay.

Species	Discards (T)			Catch (T)		
	2011	2012	2013	2011	2012	2013
Horse mackerel	119	215	117	224	262	137
Blue whiting	11	323	35	143	367	90
Whiting	0	0	0	56	72	48
Hake	37	92	107	2639	1963	1787
Anglerfish	0	0	0	23	30	30
Black-bellied angler	0.3	0	0	31	46	35
Mackerel	384	41	7	697	80	43
Boarfish	5	0	1	5	0	1

Hake is the main landed species, but other demersal species are also landed to a lower degree (anglerfish, whiting, squids, etc.). Total discards are around 15 % of the total catch. Hake individuals under MLS and pelagic species (horse mackerel, blue whiting and mackerel) are main component of the discarded catch fraction. Other species not regulated by TAC complete the rest of the bycatch (landed and discarded).

1.4.Length structure 2013

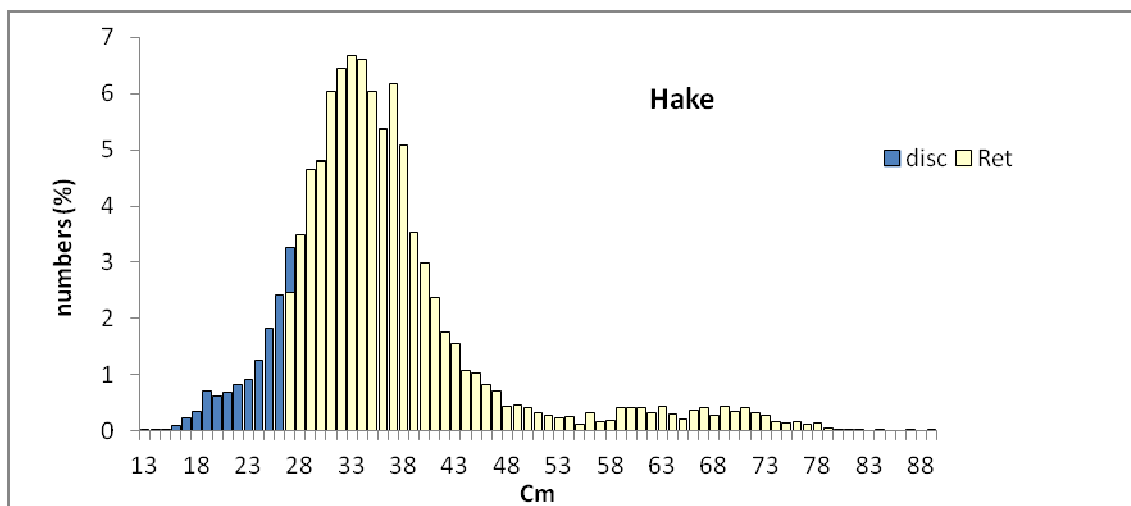


Figure 3. Retained and discarded hake length distribution. 99 % of hakes discarded are below the MLS (27 cm)

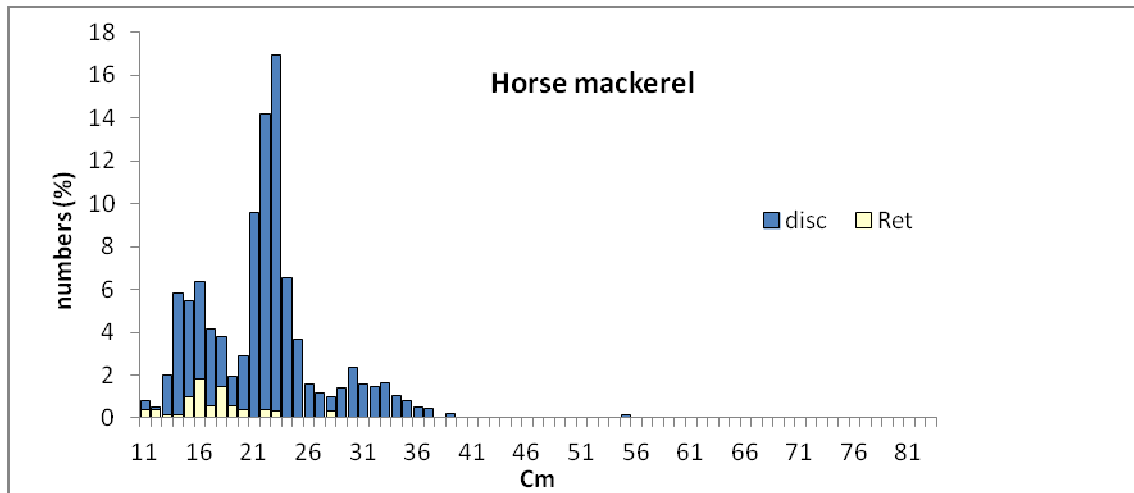


Figure 4. Retained and discarded horse mackerel length distribution. 9 % of horse mackerel discarded is below the MLS (15 cm)

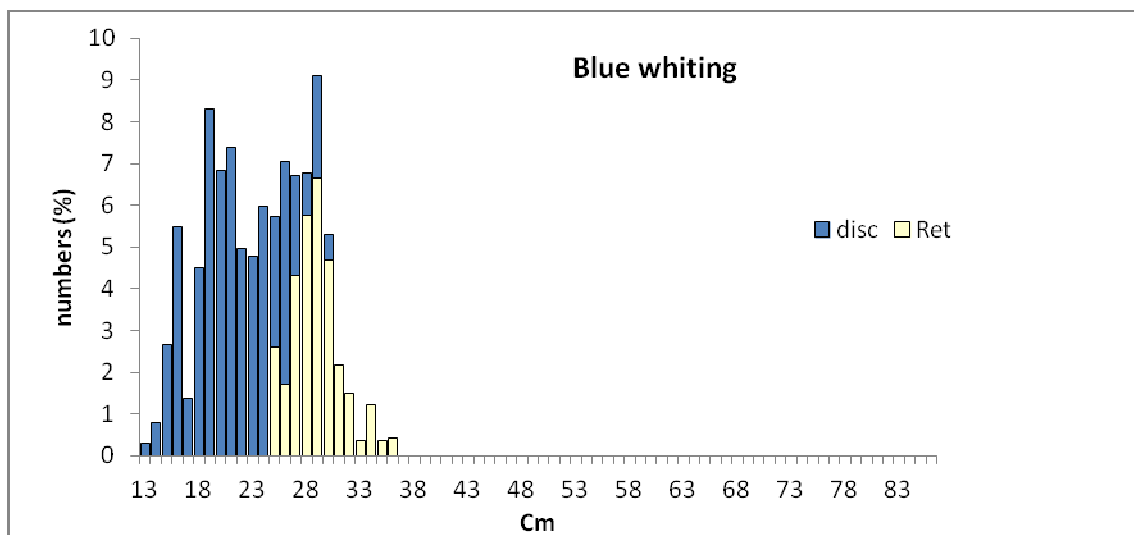


Figure 5. Retained and discarded blue whiting length distribution.

1.5.Reasons for discarding

There are both market and regulation reasons for discarding within this métier. Hake and mackerel are discarded due to legal reasons; MLS is main reason for the first one and quota exhaustion for the second. On the other hand, commercial reasons lie behind blue whiting and horse mackerel discards; both species have a relatively low market price in comparison with main target species, thus blue whiting and horse mackerel are discarded frequently. Moreover, in both cases the price volatility is highly influenced by freshness, thus catch from last sets is mainly retained.

1.6.Likely choke species, and impact of the landing obligation

With the implementation of the new regulation, the main choke species for this métier are likely to be hake in 2016, and mackerel, horse mackerel and blue whiting in some moment within the period 2017-2019. Nevertheless, it should be said that any other species subject to TAC could

be included in this list depending on available quotas and catches. Available quota for the mentioned choke species is scarce, whereas in the particular case of the boarfish is 0.

Currently, with the former regulation, hake individuals under the MLS are discarded without being registered. Under the landing obligation (2016), these undersized individuals should be landed and registered against quota, so a portion of the already short quota will be consumed.

The lack of enough mackerel quota will also be a difficulty for this métier under the landing obligation. Currently, this quota is exhausted early in the year, and from that moment onwards this species is discarded by this métiers.

Most of the horse mackerel and blue whiting are discarded due to market reasons. Both species are retained punctually only when there is a real demand in the market. In the new regulatory situation, with the landing obligation, the quota is likely to be exhausted for both species within the year.

1.7. Other relevant information

Some selectivity studies were carried out on pair trawlers during late 90ies and early 2000. Additionally, some technical measures have been implemented during the hake recovery plan (i.e. change of the minimum mesh size from 80 mm to 100 mm, determination of the number of meshes round in the codend or codend twine thickness). Since these last changes the selectivity has not been studied in this metier.

In 2014, a selectivity study focused on this métier will start. The aim of the study is to determine the selectivity of the trawl gear and to test selective devices in order to reduce the catch of the pelagic choke species. There are some evidences pointing at to the escapement of pelagic species through square mesh panels. The results obtained are expected to be available for the preparation of the discard plans in June 2015.

2. Bottom otter trawl targeting demersal species in the Bay of Biscay (OTB_DEF_>=70)

2.1.Fleet

Vessels involved in this métier use a bottom otter trawl to target mixed demersal species in ICES Divisions VIIIabd. All the vessels included for this analysis are based in the ports of Ondarroa and Pasajes (Basque Country, Spain). Spanish Vessels outside Basque ports were not considered in the sampling. The activity is constant along the year, with slight effort reduction during summer period. Average duration of fishing trips is about 6 days. Vessel length range is 31-42 meters. Total landings reach 2836 tons in 2013.

Table1. Spanish demersal otter bottom trawl in the Bay of Biscay: number of vessels, trips, and sampling coverage.

	No vessels			No trips		
	2011	2012	2013	2011	2012	2013
Total	9	9	8	124	102	254
Sampled	4	2	4	7	3	12
Sampling coverage (%)	44%	22%	50%	5.6%	2.9%	4.7%

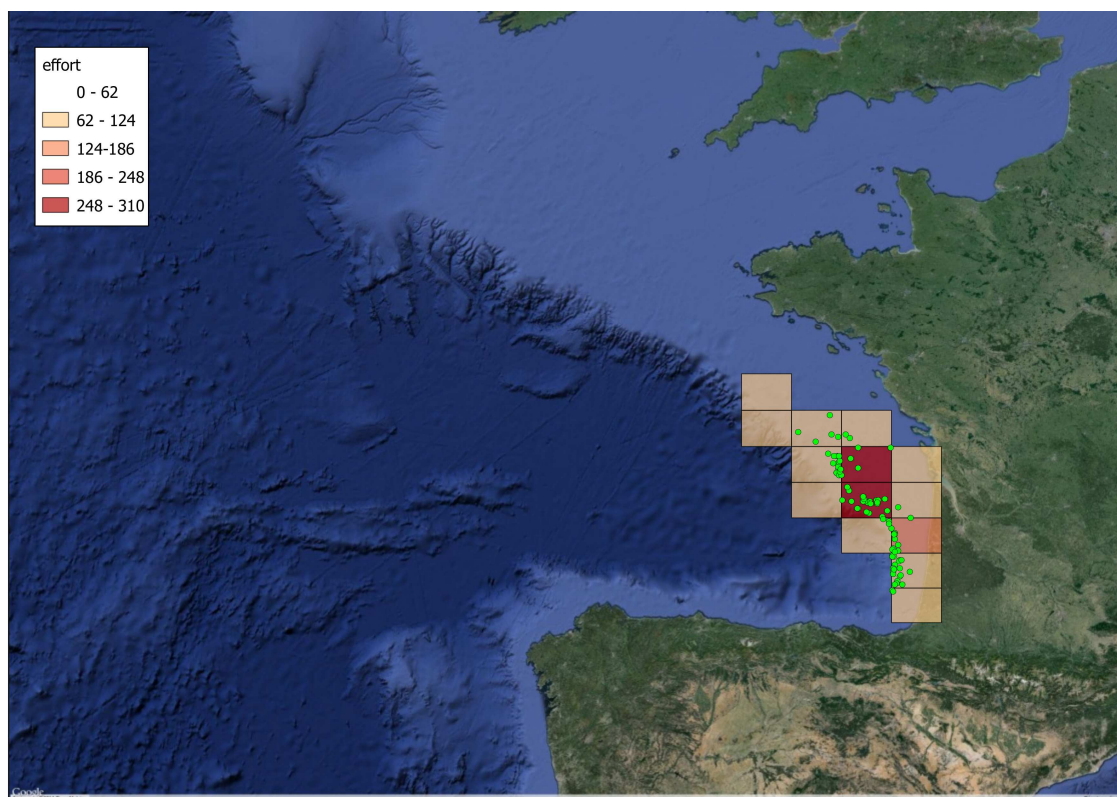


Figure1. Spanish demersal otter bottom trawl effort. Total number of fishing operation by statistical rectangles, and sampled fishing operations (green dots).

2.2. Current management measures

Hake, megrims, and anglerfish are the main target species in this métier. However this is a very mixed métier including many other species (pout, dogfish...), most of them not subject to any TAC or MLS. The MLS for megrims is 20 cm and 27 cm for hake. There is no MLS for monkfish, but a minimum marketable size (0.5 kg) was implemented by local administration. The minimum mesh size in codend is 70 mm, but hake must be less than 20% of all the catch. In addition a 2 meters long and 1 meter width 100 mm square mesh panel should be set in the upper panel extension piece of the trawl to permit the entry in some areas. The number of meshes around the codend should be 120 in the maximum and the twine of the meshes should be 6 mm when single twine is used and 4 when double is used.

Moreover, these vessels are not allowed to fish in the area closer to 12 miles from the French coast.

2.3. Catch and discard estimates

Table2. Estimated total catch (tons) and estimated discard percentage by quarter for OTB_DEF_ $\geq$ 70 operating in the Bay of Biscay during 2013. (CI: confidence interval)

Quarter	Area	Metier	Catch	Landing	Discard	CI	Percent discarded	Observed trips	total trips
1	VIIIabd	OTB_DEF_ $\geq$ 70	2319	791	1528	(921 - 2135)	66%	4	68
2	VIIIabd	OTB_DEF_ $\geq$ 70	1803	867	936	(641 - 1231)	52%	4	78
3	VIIIabd	OTB_DEF_ $\geq$ 70	1037	418	618	(296 - 957)	60%	2	43
4	VIIIabd	OTB_DEF_ $\geq$ 70	1501	566	935	(183- 1731)	62%	2	65
total	VIIIabd	OTB_DEF_ $\geq$ 70	6661	2642	4019	(2042 - 6055)	60%	12	254

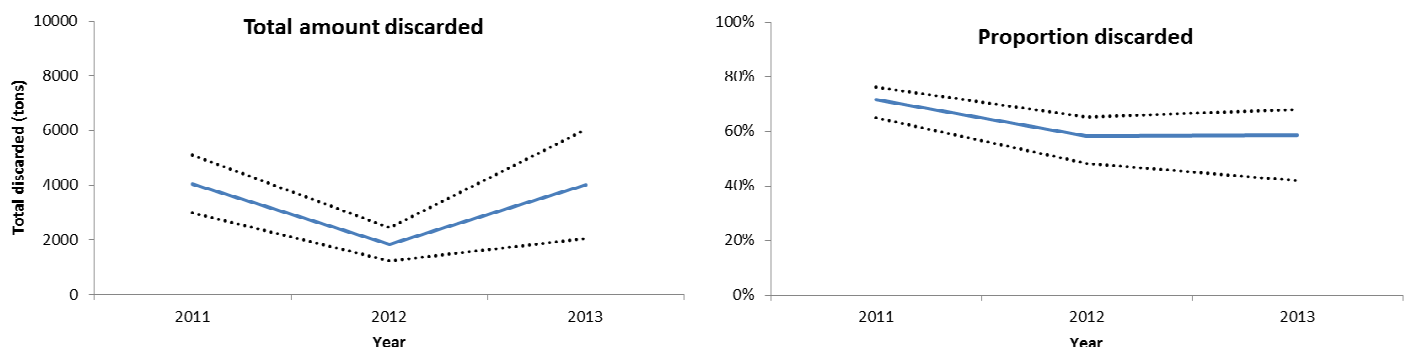


Figure2. Estimated total amount and proportion discarded for the period 2011-2013

Table 3. Estimated proportion discarded in weight, of the main quota species caught by Basque demersal otter bottom trawlers in the Bay of Biscay (with 95% confidence interval). Percentage of undersize individuals within the discarded fraction is also presented in the last column for the year 2013.

Species	Percent discarded (%)									% undersize
	2011			2012			2013			2013
	%	CI -	CI +	%	CI -	CI +	%	CI -	CI +	
Horse mackerel	95%	93%	96%	83%	78%	87%	87%	85%	88%	64%
Mackerel	99%	98%	99%	80%	72%	84%	99%	99%	99%	12%
Hake	65%	62%	68%	27%	19%	33%	39%	36%	41%	93%
Blue whiting	99%	98%	99%	95%	74%	97%	99%	99%	100%	
Black-bellied angler	5%	4%	7%	2%	1%	4%	3%	2%	4%	
Megrim	4%	2%	6%	1%	0%	2%	3%	2%	5%	100%
Anglerfish	3%	2%	3%	0%	0%	0%	2%	2%	3%	

Table 4. Catch and estimated discards in weight of the main quota species caught by the Basque demersal otter bottom trawlers in the Bay of Biscay.

Species	discards (T)			Catch (T)		
	2011	2012	2013	2011	2012	2013
Horse mackerel	1096	633	782	1160	758	903
Mackerel	1218	102	898	1235	127	907
Hake	100	60	194	153	224	499
Blue whiting	61	77	191	62	81	192
Black-bellied angler	5	2	10	96	110	353
Megrim	5	1	8	112	138	249
Anglerfish	3	0	5	114	70	205

Hake, anglerfish and megrim are the main landed species, but there are more than 65 other landed species (pouts, dogfish, triglids...). Total discards are around 60-65 % of the total catch. Hake individuals under MLS and pelagic species (horse mackerel and mackerel) are main component of the discarded catch fraction. A wide range of other species complete the rest of the discarded fraction, some of them under TAC regulation (blue whiting, anglerfish, etc), but most of them not subject to quotas.

2.4.Length structure 2013

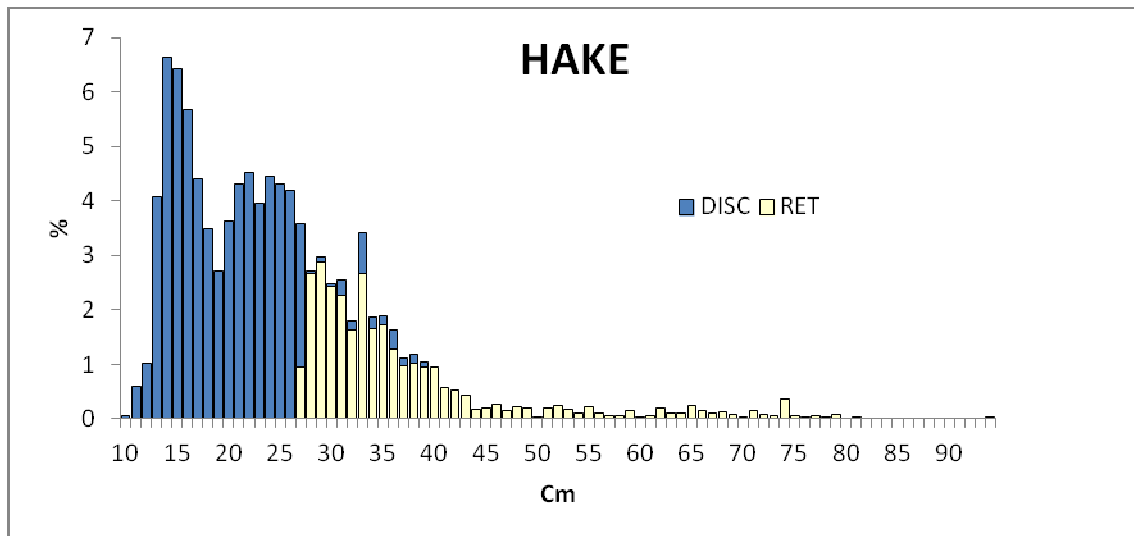


Figure 3. Retained and discarded hake length distribution. 93 % of hakes discarded are below the MLS (27 cm)

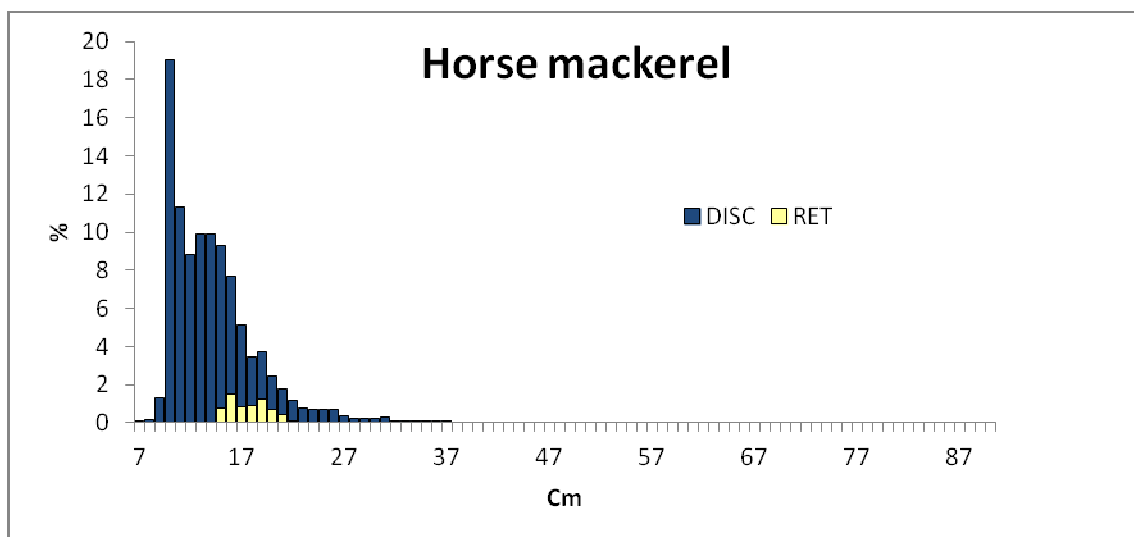


Figure 4. Retained and discarded horse mackerel length distribution. 64% of horse mackerel discarded is below the MLS (15 cm)

2.5.Reasons for discarding

There are both market and regulation reasons for discarding within this métier. Hake and mackerel are discarded due to legal reasons; MLS is main reason for the first one and quota exhaustion for the second. On the other hand, commercial reasons lie behind blue whiting and horse mackerel discards; both species have a relatively low market price in comparison with main target species, thus blue whiting and horse mackerel are discarded frequently. Moreover,

in both cases the price volatility is highly influenced by freshness, thus catch from last sets is mainly retained.

2.6. Likely choke species, and impact of the landing obligation

Main choke species are likely to be mackerel, horse mackerel, blue whiting and hake. Nevertheless, it should be said that, any other species subject to TAC could be included in this list depending on available quotas and catches.

Currently, with the former regulation, hake individuals under the MLS are discarded without being registered. Under the landing obligation (2016), these undersized individuals should be landed and registered against quota, so a portion of the already short quota will be consumed.

The lack of enough mackerel quota will also be a difficulty for this métier under the landing obligation. Currently, this quota is exhausted early in the year, and from that moment onwards this species is discarded by this métiers.

Most of the horse mackerel and blue whiting are discarded due to market reasons. Both species are retained punctually only when there is a real demand in the market. In the new regulatory situation, with the landing obligation, the quota is likely to be exhausted for both species within the year.

On the other hand, the handling and storage of the currently discarded fish according to regulatory specifications, can lead to; slow down the operations on board, increase of workload and reduction of trip duration increasing the steaming time and reducing profitability.

2.7. Other relevant information

Several selectivity studies have been carried out in this métier within the period 2009-2012. During those studies the selectivity of the codend as well as the escapement through the mandatory square mesh panel was assessed. According to these observations, escapement of some pelagic species was observed through the square mesh panel, while very few hake individuals do so. Regarding the selectivity of the 70 mm codend it was observed that a fraction of the hake under the MLS was retained. An increase in the mesh size could be the solution, nevertheless it would affect in the retention for many species without MLS that are present in the landings. Some of these species like squids, red mullet, thickback sole or argentine will contribute significantly to the incomes of the métiers.

3. Bottom otter trawl targeting mixed cephalopod and demersal species in the Bay of Biscay (OTB_MCF_ ≥ 70)

3.1. Fleet

Vessels involved in this métier use a bottom otter trawl to target mixed cephalopod and demersal species in ICES Divisions VIIIabd. All the vessels included for this analysis are based in the ports of Ondarroa and Pasajes (Basque Country, Spain). Spanish Vessels outside Basque ports were not considered in the sampling. The activity is higher during winter season; quarters 1 & 3. Average duration of fishing trips is about 6 days. Vessel length range is 31-42 meters. Total landings reach 655 tons in 2013.

Table 1. Spanish mixed otter bottom trawl (OTB_MCF_ ≥ 70) in the Bay of Biscay: number of vessels, trips, and sampling coverage.

	No vessels			No trips		
	2011	2012	2013	2011	2012	2013
Total	11	9	8	129	162	62
Sampled	4	6	1	7	11	1
Sampling coverage (%)	36%	67%	13%	5.4%	6.8%	1.6%

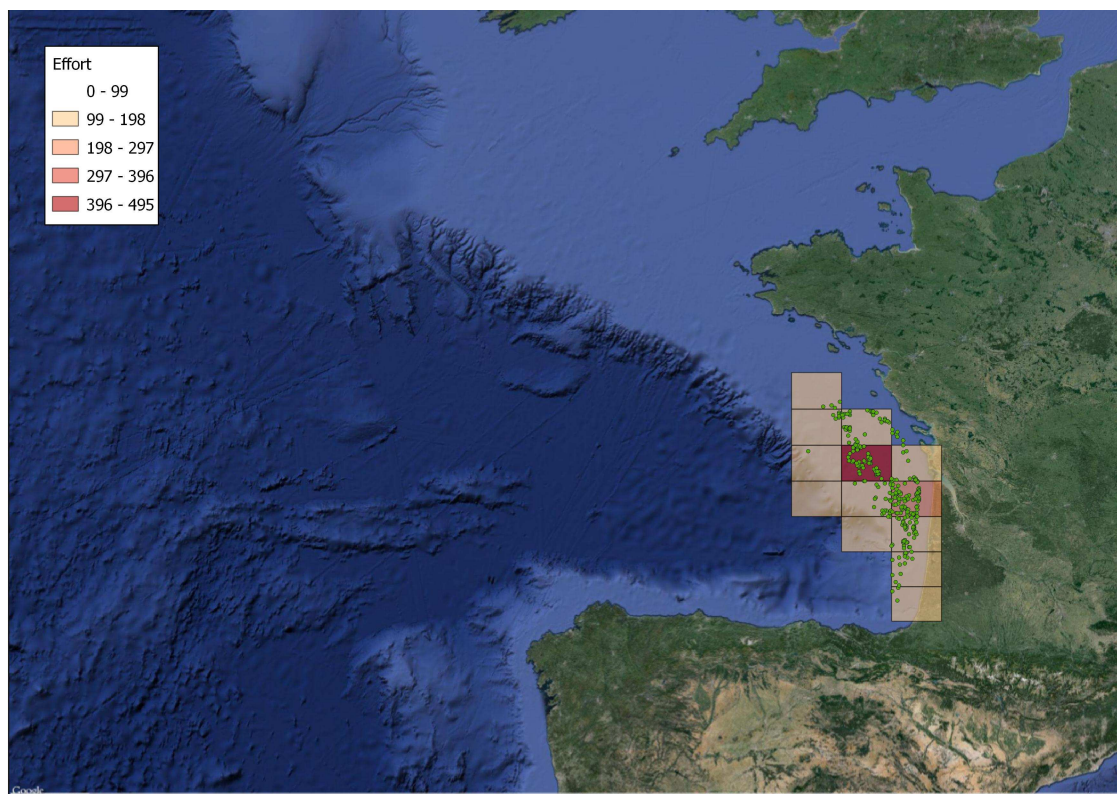


Figure1. Spanish mixed otter bottom trawl effort. Total number of fishing operation by statistical rectangles, and sampled fishing operations (green dots).

3.2. Current management measures

Squids, cuttlefish, and mullets are the main target species in this métier. However this is a very mixed métier including many other species (pout, seabass, hake...), most of them not subject to any TAC or MLS. The minimum mesh size in codend is 70 mm but hake must be less than 20% of all the catch. In addition a 2 meters long and 1 meter width 100 mm square mesh panel should be set in the upper panel extension piece of the trawl to permit the entry of the vessel in some areas. The number of meshes around the codend should be 120 in the maximum and the twine of the meshes should be 6 mm when single twine is used and 4 when double is used.

Moreover, these vessels are not allowed to fish in the area closer to 12 miles from the French coast.

3.3. Catch and discard estimates

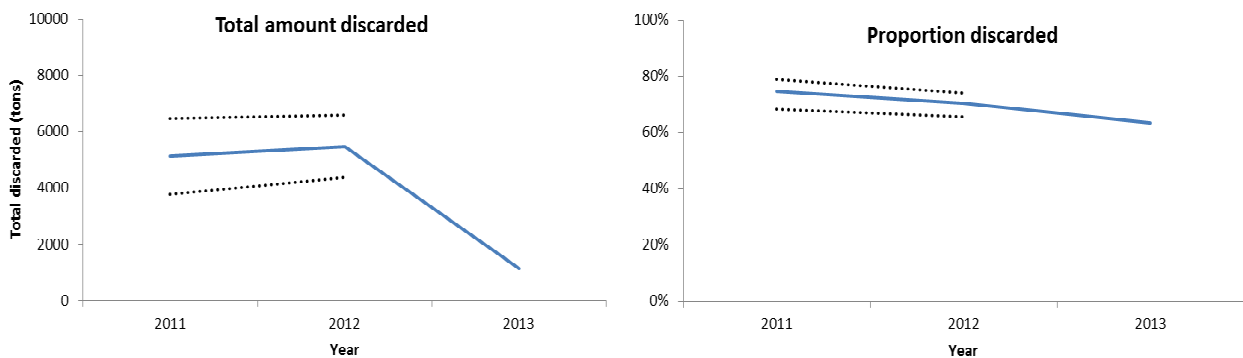


Figure2. Total amount and proportion discarded for the period 2011-2013. Only one trip was sampled during 2013, thus CI was not calculated for this year.

Table3. Estimated proportion discarded in weight, of the main quota species caught by Basque demersal otter bottom trawlers in the Bay of Biscay (with 95% confidence interval). Percentage of undersize individuals within the discarded fraction is also presented in the last column for the year 2013.

Species	Percent discarded (%)									% undersize
	2011			2012			2013			2013
	%	CI -	CI +	%	CI -	CI +	%	CI -	CI +	
Horse mackerel	100%	99%	100%	96%	95%	96%	98%	Na	Na	75%
Mackerel	97%	95%	98%	99%	99%	100%	100%	Na	Na	1%
Hake	64%	59%	69%	74%	71%	76%	77%	Na	Na	100%
Blue whiting	100%	100%	100%	100%	100%	100%	Na	Na	Na	
Black-bellied angler	30%	14%	41%	1%	1%	2%	0%	Na	Na	
Megrim	3%	1%	5%	Na	Na	Na	0%	Na	Na	
Anglerfish	0%	0%	0%	0%	0%	1%	1%	Na	Na	

Table4. Catch and estimated discards in weight of the main quota species caught by the Basque demersal otter bottom trawlers in the Bay of Biscay.

Species	Discards (T)			Catch (T)		
	2011	2012	2013	2011	2012	2013
Horse mackerel	1834	1243	568	1843	1297	578
Mackerel	1737	1477	85	1796	1486	85
Hake	80	157	64	124	213	83
Blue whiting	45	39	0	45	40	0
Black-bellied angler	6	1	0	20	59	27
Megrim	0.2	0	0	8	0	9
Anglerfish	0.1	0.4	0.2	60	78	19

Squids, cuttlefish and red mullet are the main landed species, but there are more than 60 other landed species (pouts, hake, monkfish...). Total discards are around 65-70 % of the total catch. Pelagic species (horse mackerel and mackerel) are main component of the discarded catch fraction. Hake individuals under MLS are also discarded. A wide range of other species complete the rest of the discarded fraction, some of them under TAC regulation (blue whiting, anglerfish, etc), but most of them not subject to quotas.

3.4.Length structure 2013

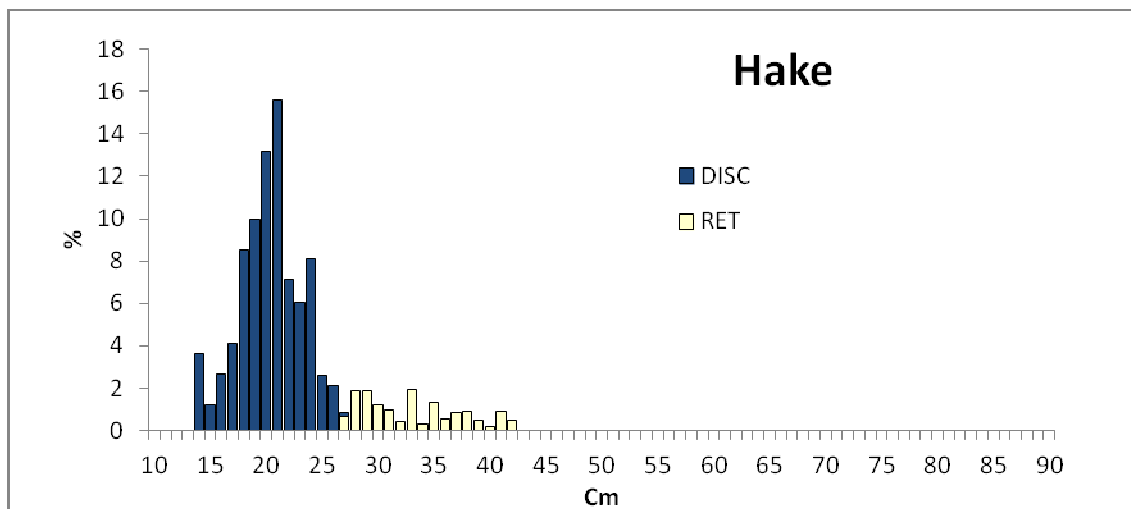


Figure 3. Retained and discarded hake length distribution. 99.9 % of hakes discarded (numbers) are below the MLS (27 cm)

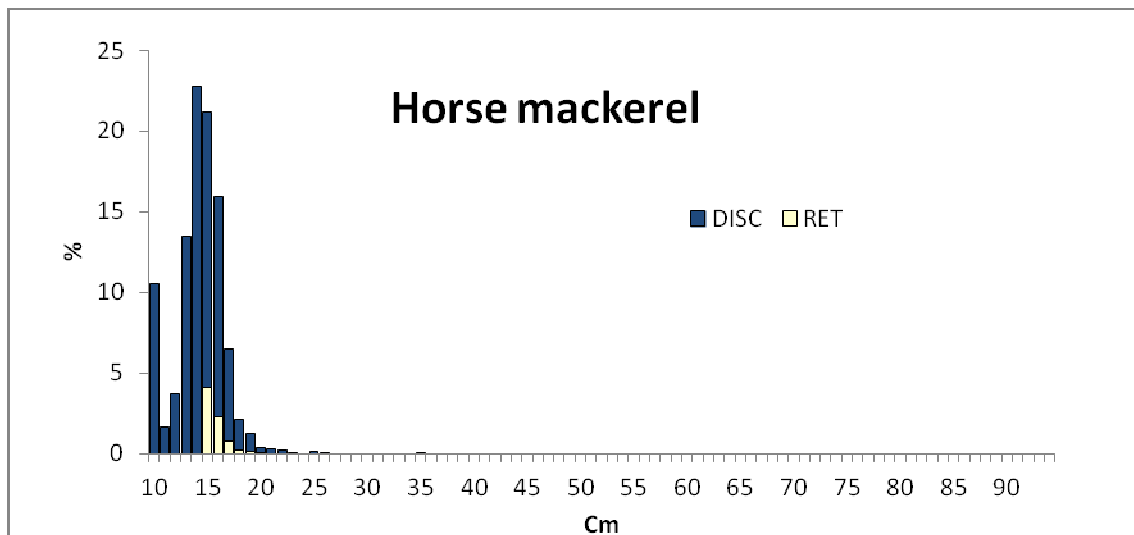


Figure 4. . Retained and discarded horse mackerel length distribution. 75% of horse mackerel discarded (numbers) is below the MLS (15 cm)

3.5.Reasons for discarding

There are both market and regulation reasons for discarding within this métier. Hake and mackerel are discarded due to legal reasons; MLS is main reason for the first one and quota exhaustion for the second. On the other hand, commercial reasons lie behind horse mackerel discards, which has a relatively low market price in comparison with main target species, thus horse mackerel are discarded frequently. Moreover, the price volatility is highly influenced by freshness, thus catch from last sets is mainly retained.

3.6.Likely choke species, and impact of the landing obligation

Main choke species are likely to be mackerel, horse mackerel, blue whiting and hake. Nevertheless, it should be said that, any other species subject to TAC could be included in this list depending on available quotas and catches.

Currently, with the former regulation, hake individuals under the MLS are discarded without being registered. Under the landing obligation (2016), these undersized individuals should be landed and registered against quota, so a portion of the already short quota will be consumed.

The lack of enough mackerel quota will also be a difficulty for this métier under the landing obligation. Currently, this quota is exhausted early in the year, and from that moment onwards this species is discarded by this métiers.

Most of the horse mackerel and blue whiting are discarded due to market reasons. Both species are retained punctually only when there is a real demand in the market. In the new regulatory situation, with the landing obligation, the quota is likely to be exhausted for both species within the year.

On the other hand, the handling and storage of the currently discarded fish according to regulatory specifications, can lead to; slow down the operations on board, increase of workload and reduction of trip duration increasing the steaming time and reducing profitability.

3.7. Other relevant information

Several selectivity studies have been carried out in this métier within the period 2009-2012. During those studies the selectivity of the codend as well as the escapement through the mandatory square mesh panel was assessed. According to these observations, escapement of some pelagic species was observed through the square mesh panel (while very few hake individuals do so). Regarding the selectivity of the 70 mm codend it was observed that a fraction of the hake under the MLS was retained. An increase in the mesh size could be the solution, nevertheless it would affect in the retention for many species without MLS that are present in the landings. Some of these species like squids, red mullet, thickback sole or argentine will contribute significantly to the incomes of the métiers.

French métiers

1 Bottom-trawlers in the Bay of Biscay

1.1 Fleet

The vessels which operate this métier use a bottom otter-trawl or otter twin trawls to target fish and cephalopods in ICES areas VIIIa and VIIIb. Vessels trawl for sole, wedge sole and cephalopods in coastal areas and the Southern Bay of Biscay (VIIIb). Demersal fish are also targeted offshore, including monkfish by large vessels in the Northern Bay of Biscay (VIIIa). Trip duration varies from 1 to 14 days with an average 4 days.

TABLE 1.1 – French bottom-trawlers in the Bay of Biscay : vessels, landings, trips, and sampled fraction 2011 - 2013

Harbour	No trips landed in the harbour 2013	No observed trips 2013	Vessel length range (m) (average)	2013 Total landings (mt)
Guilvinec	1796	13	12-25(19)	4159
La Cotinière (Saint-Pierre d'Oléron)	4026	17	9-21(15)	3219
La Turballe	3799	1	8-23(14)	3210
Les Sables-d'Olonne	2641	11	9-24(15)	1746
Lorient	1301	6	9-28(16)	995
La Rochelle	2488	3	9-23(15)	942
Le Croisic	533	1	8-21(18)	768
Quiberon	1042	3	9-16(11)	334
Bourcefranc-le-Chapus	282	1	9-12(11)	66
L'Aiguillon-sur-Mer	256	3	9-11(10)	52
Le Château-d'Oléron	158	2	11-12(12)	34
Autres ports (N = 61)	7006	0	8-37(16)	6064
Total	25328	61	8-37(16)	21589

	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	389	386	374	17788	18978	25328	34551	37334	47552
Observed	45	42	47	60	55	61	150	261	247
Sample fraction (%)	11.6	10.9	12.6	0.3	0.3	0.2	0.4	0.7	0.5

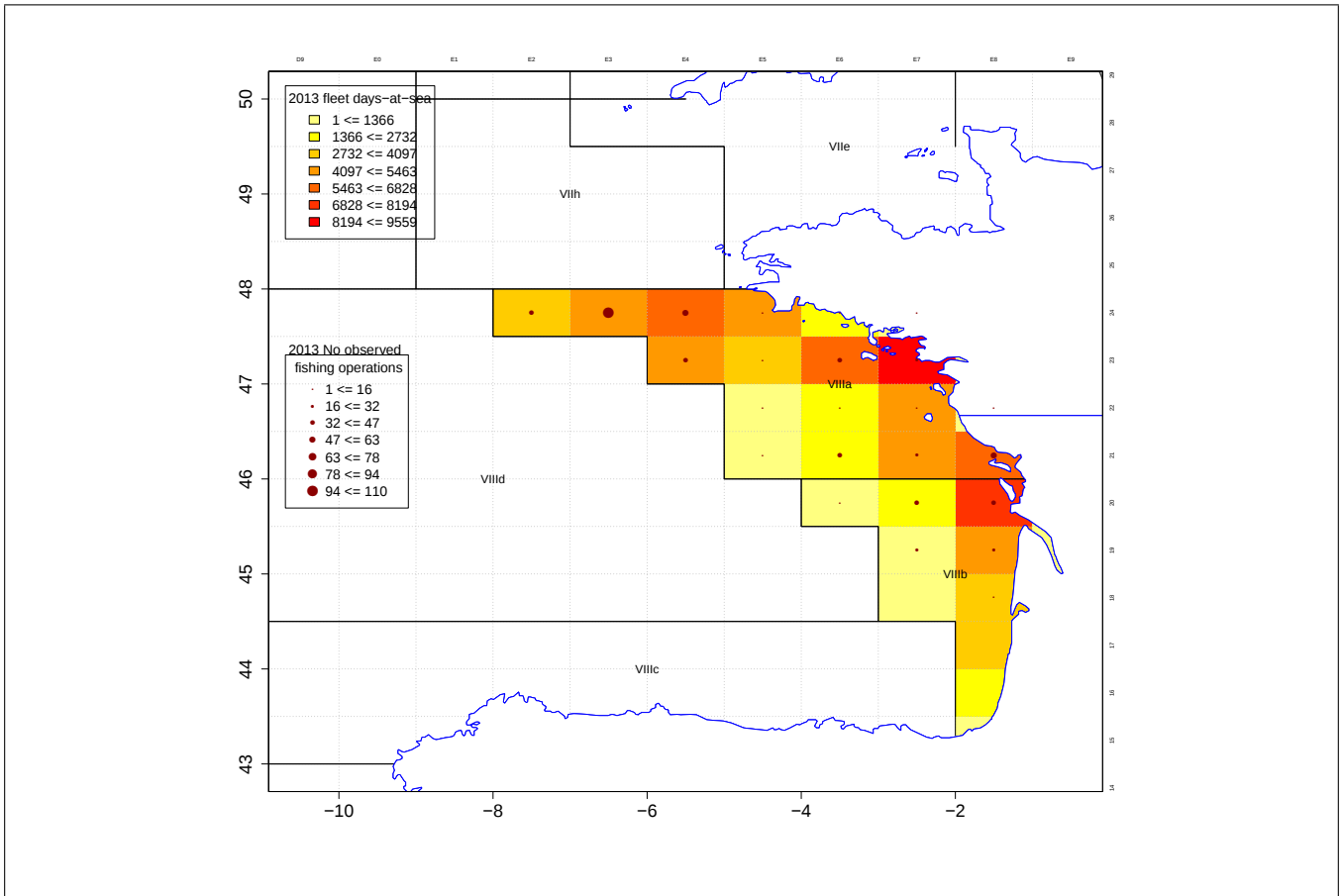


FIGURE 1.1 – Fleet activity (rectangle colours, days-at-sea) versus sampling effort (circles, no observed fishing operations) (2013)

Sampling in 2011-13 was reasonably representative of the fleet fishing activity, although there is generally a lack of samples in the most trawled coastal areas, especially rectangle 23E7 which was frequently fished but not observed in 2012 and 2013.

1.2 Catch and discard estimates

TABLE 1.2 – Total catch and discards estimates by French bottom-trawlers in the Bay of Biscay per stratum in 2013, Confidence Interval (CI) is provided for the catch ; landings and discards have CI with similar amplitude. FO fishing operations.

Quarter	Area	Métier	Catch (mt)	CI	Landing (mt)	Discard (mt)	Percent discarded (%)	No observed FO
2013 - 1	27.8.a	OT_DEF	4253	[1789-6716]	3708	544	12.8	37
2013 - 2	27.8.a	OT_DEF	3833	[1409-6257]	3241	592	15.4	40
2013 - 2	27.8.b	OT_DEF	1353	[1222-1483]	951	402	29.7	9
2013 - 3	27.8.a	OT_DEF	4776	[4182-5370]	3777	999	20.9	53
2013 - 3	27.8.b	OT_DEF	1734	[1588-1881]	1361	373	21.5	14
2013 - 4	27.8.a	OT_DEF	5495	[3121-7869]	4063	1432	26.1	45
2013 - 4	27.8.b	OT_DEF	2986	[2674-3299]	2165	822	27.5	19

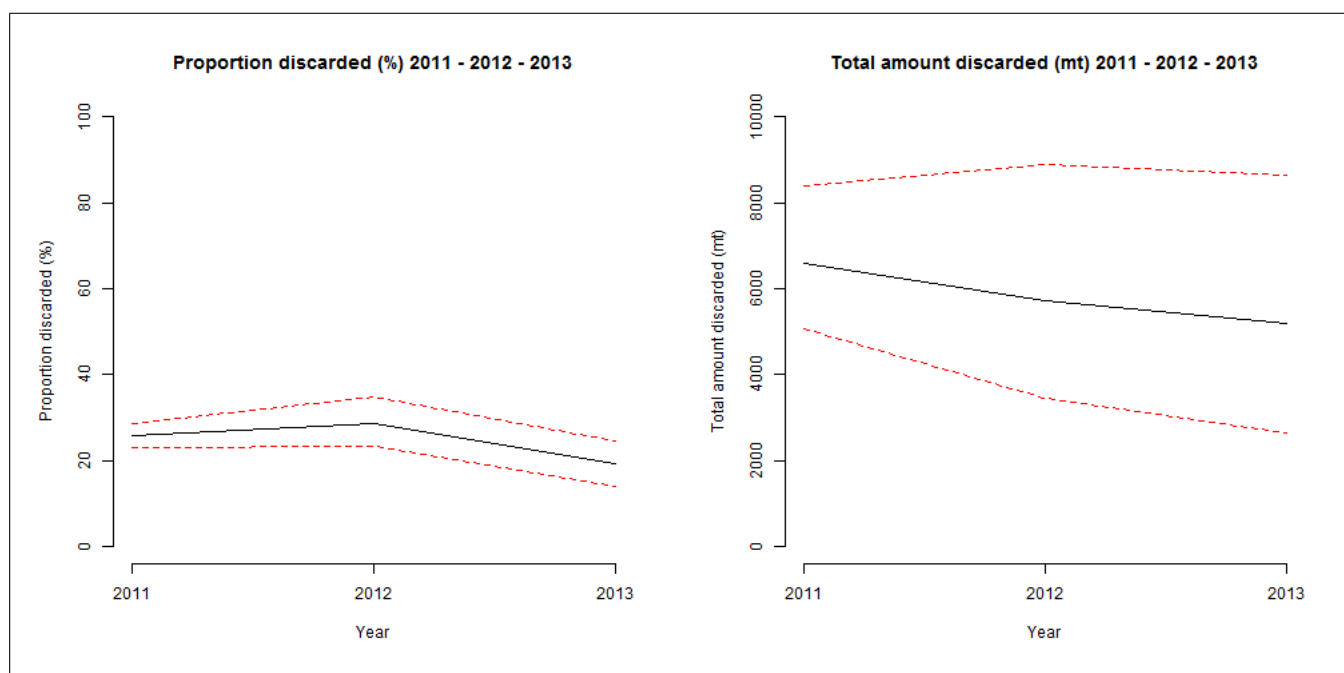


FIGURE 1.2 – Total amount and proportion discarded per year (2011 - 2013) by French bottom-trawlers in the Bay of Biscay

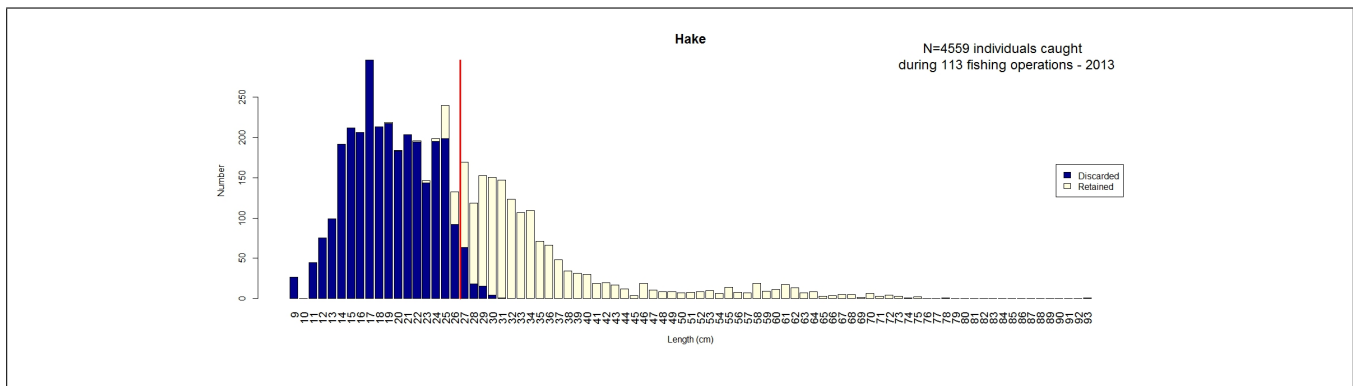
TABLE 1.3 – Estimated proportions discarded per species in weight, by French bottom-trawlers in the Bay of Biscay, with their confidence interval (95%)

Species	Percent discarded (%)			Percent undersize in the species discards (%)		
	2011	2012	2013	2011	2012	2013
Hake	16.8 [8.9 - 25.9]	9 [5.7 - 16.4]	4 [1.4 - 25.8]	90.2	45.4	70.7
Anglerfish	7.3 [4.4 - 11.2]	6.4 [4.4 - 8.9]	3 [2.1 - 3.9]	55.3	82.5	82.9
Black-bellied angler	2.3 [0.3 - 5.8]	7.2 [4.7 - 9.8]	10 [7.7 - 12.3]	100	90.4	95.9
Megrim	16.9 [2.7 - 39.2]	9.5 [5.5 - 14.7]	5.4 [3.7 - 7.5]	12.9	1.7	12.8
Mackerel	14.7 [6.5 - 36.2]	92.1 [52.3 - 98.3]	5.7 [1.8 - 34.9]	3.1	0.3	3.2
Haddock	24.2 [5.1 - 35.3]	6.3 [3.3 - 10.8]	10.1 [5.5 - 17.7]	0.0	84.5	56.9
Whiting	24.7 [14.2 - 43.6]	13.7 [6.7 - 27.2]	33.9 [26 - 39.9]	83.7	96.9	64.8
Sole	8.1 [3.6 - 14.3]	5.7 [2.7 - 10.3]	3.6 [1.6 - 6.3]	84.6	91.3	100
Boarfish	100 [100 - 100]	100 [100 - 100]	100 [100 - 100]	NA	NA	NA
Horse mackerel	70.6 [45.7 - 95.3]	98.8 [95.8 - 99.8]	61 [43.7 - 85.2]	28	29.2	15.4

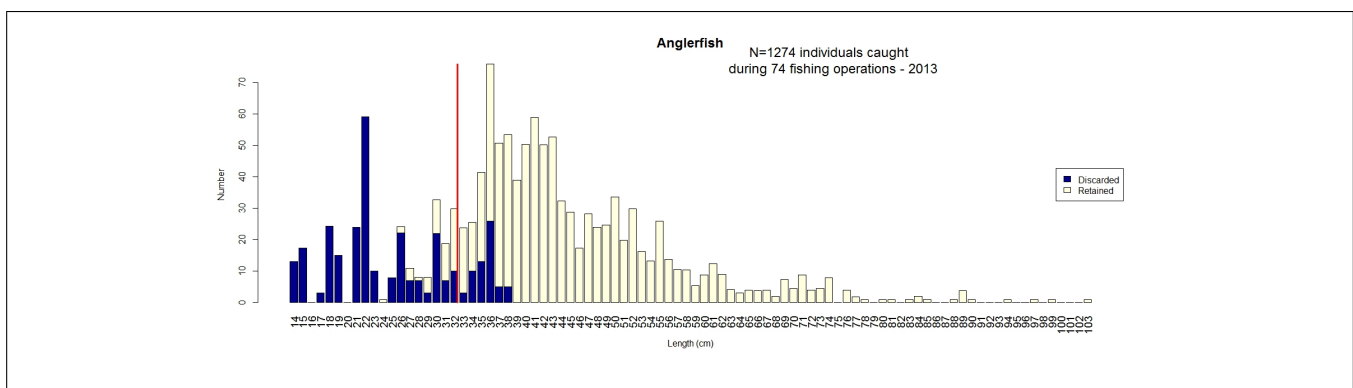
TABLE 1.4 – Caught and discarded weight of the main quota species caught by French bottom-trawlers in the Bay of Biscay

Species	Catch (mt)			Discards (mt)		
	2011	2012	2013	2011	2012	2013
Hake	898 [606-1269]	1928 [692-4016]	5342 [689-13746]	160 [90-255]	174 [82-320]	216 [90-429]
Anglerfish	1557 [947-2342]	2285 [1331-3630]	3458 [1756-5822]	84 [37-150]	146 [73-253]	103 [46-199]
Black-bellied angler	510 [268-824]	1085 [579-1824]	2498 [1263-4205]	11 [1-31]	78 [32-154]	249 [114-453]
Megrim	346 [156-619]	528 [284-886]	1362 [668-2368]	75 [19-193]	50 [18-110]	74 [32-144]
Mackerel	719 [297-1478]	1265 [150-3780]	697 [72-2441]	208 [129-311]	1165 [99-3641]	40 [14-87]
Haddock	110 [30-238]	402 [156-822]	389 [154-797]	27 [1-71]	25 [8-57]	39 [15-83]
Whiting	841 [447-1498]	229 [73-520]	344 [64-1072]	196 [100-337]	31 [10-72]	116 [19-369]
Sole	806 [461-1299]	527 [240-988]	342 [157-643]	75 [37-127]	30 [11-64]	12 [3-30]
Boarfish	25 [0-29]	161 [52-353]	306 [45-987]	13 [5-25]	161 [52-353]	306 [45-987]
Horse mackerel	1009 [551-1774]	396 [130-851]	237 [79-547]	713 [458-1055]	391 [124-864]	144 [53-310]

1.3 Length structure 2013

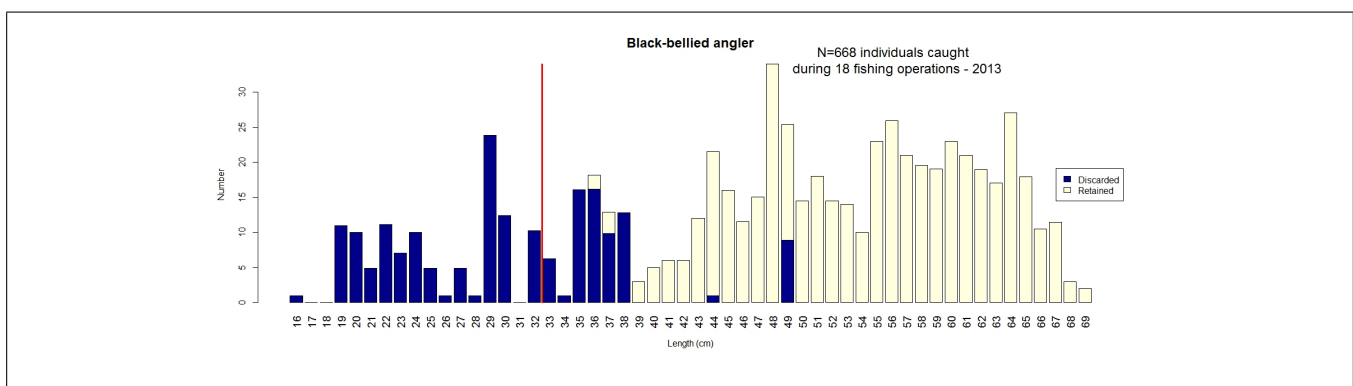


96% of Hake discards in number are below the minimum landing size (27 cm)



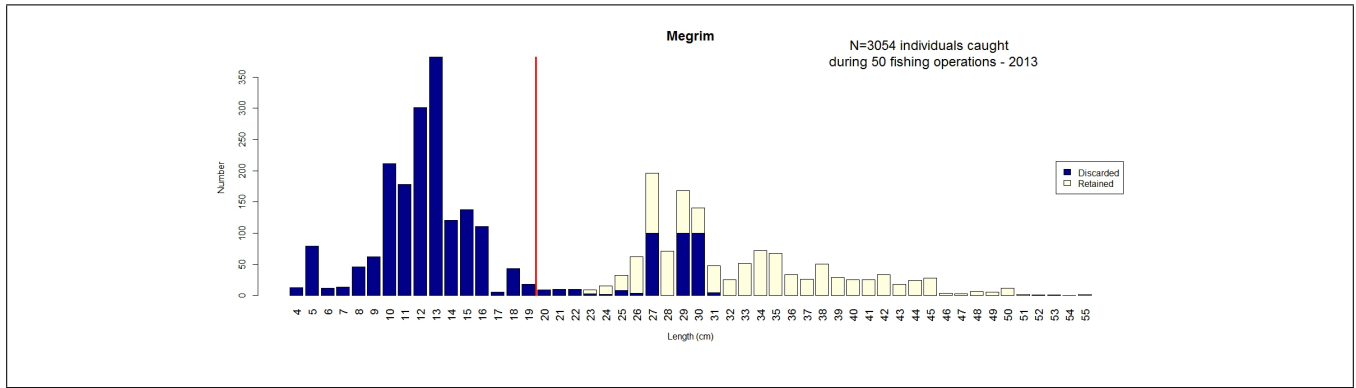
80% of Anglerfish discards in number are below the minimum marketing size (33 cm)

Note : a French national regulation prohibits to sell anglerfish < 0.5 kg, that is 33 cm.

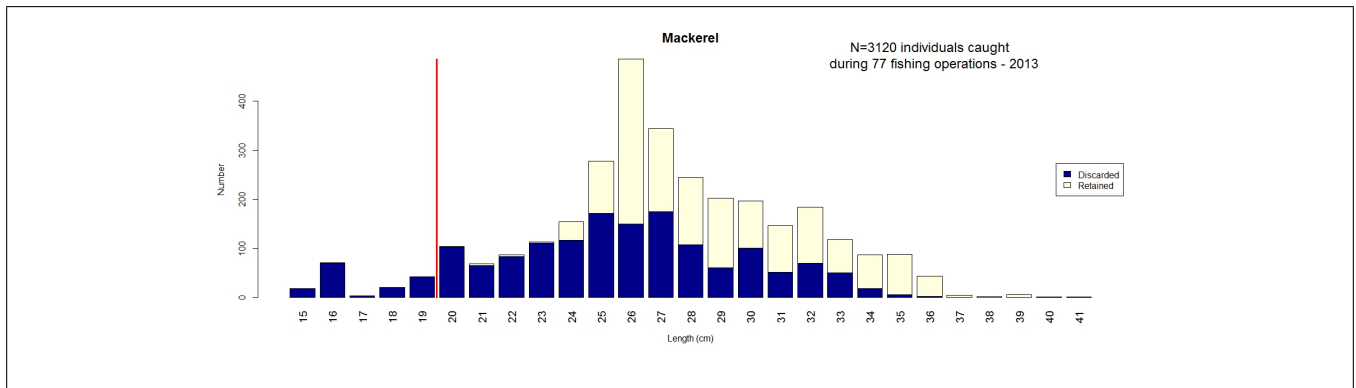


61% of Black-bellied angler discards in number are below the minimum marketing size (33 cm)

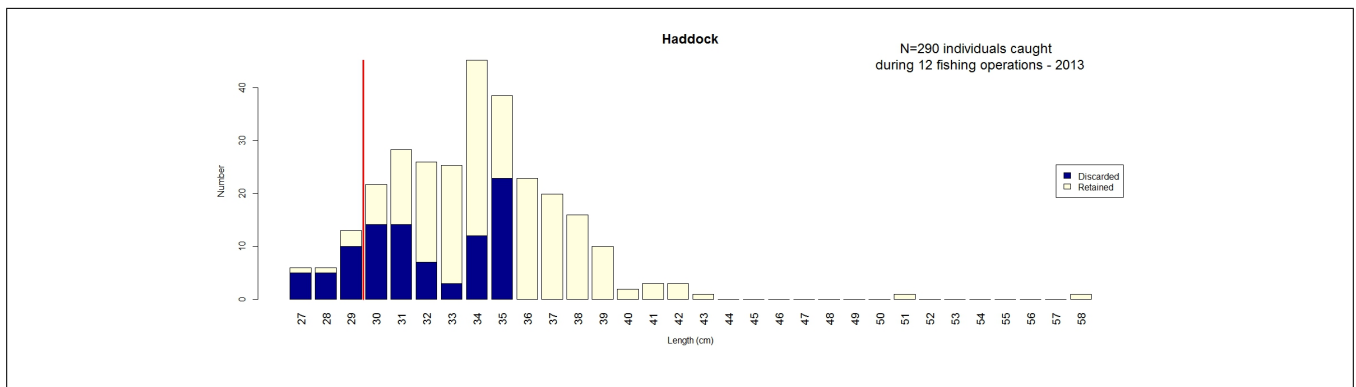
Note : a French national regulation prohibits to sell black-bellied angler < 0.5 kg, that is 33 cm.



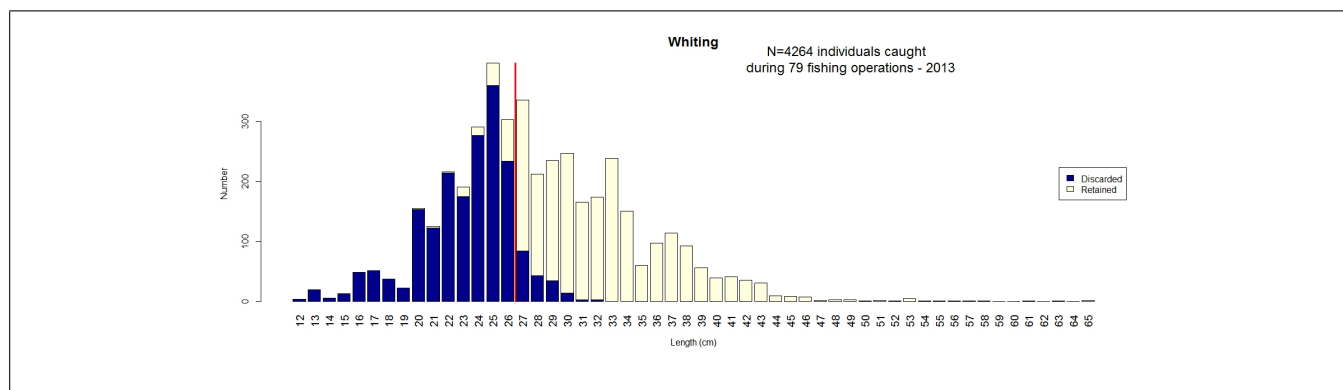
83% of Megrim discards in number are below the minimum landing size (20 cm)



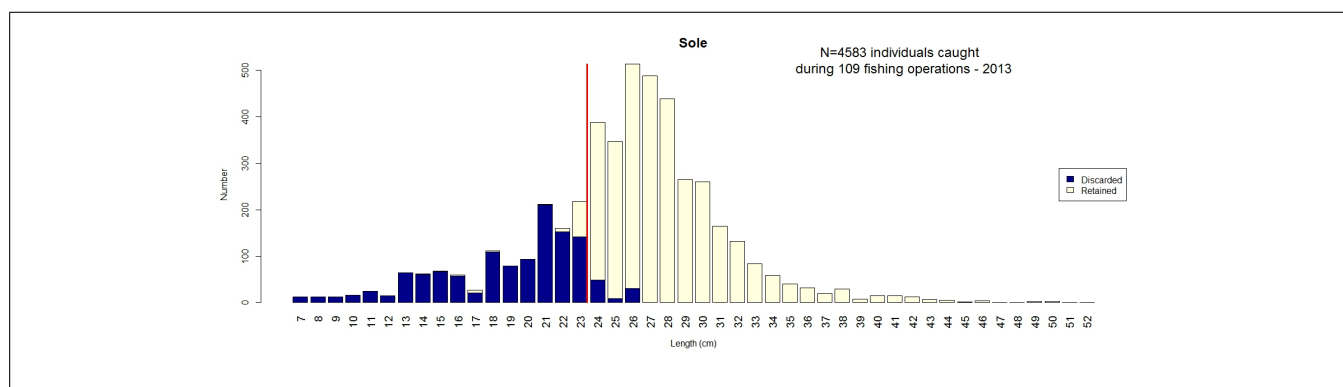
9% of Mackerel discards in number are below the minimum landing size (20 cm)



21% of Haddock discards in number are below the minimum landing size (30 cm)



91% of Whiting discards in number are below the minimum landing size (27 cm)



93% of Sole discards in number are below the minimum landing size (24 cm)

FIGURE 1.3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by French bottom-trawlers in the Bay of Biscay

This group includes a wide diversity of métiers targeting a variety of species in different areas and seasons; whatever the target, a wide diversity of species is caught, of which many are landed – overall 20% of the catch is discarded. Undersized individuals of the target species which have a minimum landing size (hake, monkfish, sole) are discarded. These métiers also discard other, less valuable fish species such as haddock and whiting, and occasionally large amounts of mackerel.

1.4 Reasons for discarding

Around half of the vessels use trawl mesh less than 80 mm and catch small-sized fish, of which much is undersized (for species with minimum landing size) or of the smallest commercial category with a lower value, thus discarded. Lack of quota was identified as a cause for discarding mackerel (Leleu *et al.*, 2014). Another regulation about catch composition limits the amount of hake to 20% of the catch retained onboard, and may cause some hake discarding (Leleu *et al.*, 2014).

1.5 Potential problematic species

Sole as early as 2016 and whiting, mackerel and anglerfish may become choke species as the landing obligation extends to these species. Fishers also mention blue whiting as a potentially problematic species although they catch small amounts.

1.6 Other relevant information

We are not aware of any survival studies specific to this metier. Several selectivity trials are undertaken as part of the REDRESSE project : square mesh panels or cylinders fit with T90 (which consists in turning the meshes by 90°), and other devices meant to let small pelagic fishes escape.

2 Bottom-trawlers targetting *Nephrops* in the Bay of Biscay

2.1 Fleet

The vessels which operate this métier use a bottom otter-trawl or otter twin trawls to target *Nephrops* in ICES areas VIIIa and VIIIb. Vessels from South-Brittany (Concarneau, Lorient, Le Guilvinec) trawl for *Nephrops* all year round on the *Grande Vasière* (Great Mud Bank, Northern Bay of Biscay). Some vessels also target demersal fish during part of the year. Vessels from Southern ports (La Cotinière, Les Sables-d'Olonne et Le Croisic) target *Nephrops* only during summer in more Southern areas, such as around Yeu Island. Trip duration is 1 to 4 days - 1.9 day on average.

TABLE 2.1 – French *Nephrops* trawlers in the Bay of Biscay : vessels, landings, trips, and sampled fraction 2011 - 2013

Harbour	No trips landed in the harbour 2013	No observed trips 2013	Vessel length range (m) (average)	2013 Total landings (mt)	2013 <i>Nephrops</i> landings (mt)
Guilvinec	7834	16	11-17(14)	1956	742
Lorient	2766	10	9-21(16)	1798	636
La Cotinière	778	6	10-21(15)	516	134
Autres ports (N = 22)	3978	0	9-21(15)	2081	820
Total	15356	32	9-21(15)	6350	2332

	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	234	227	188	15710	19678	15356	19532	26707	21227
Observed	30	22	24	33	28	32	55	45	62
Sample fraction (%)	12.8	9.7	12.8	0.21	0.1	0.2	0.28	0.2	0.3

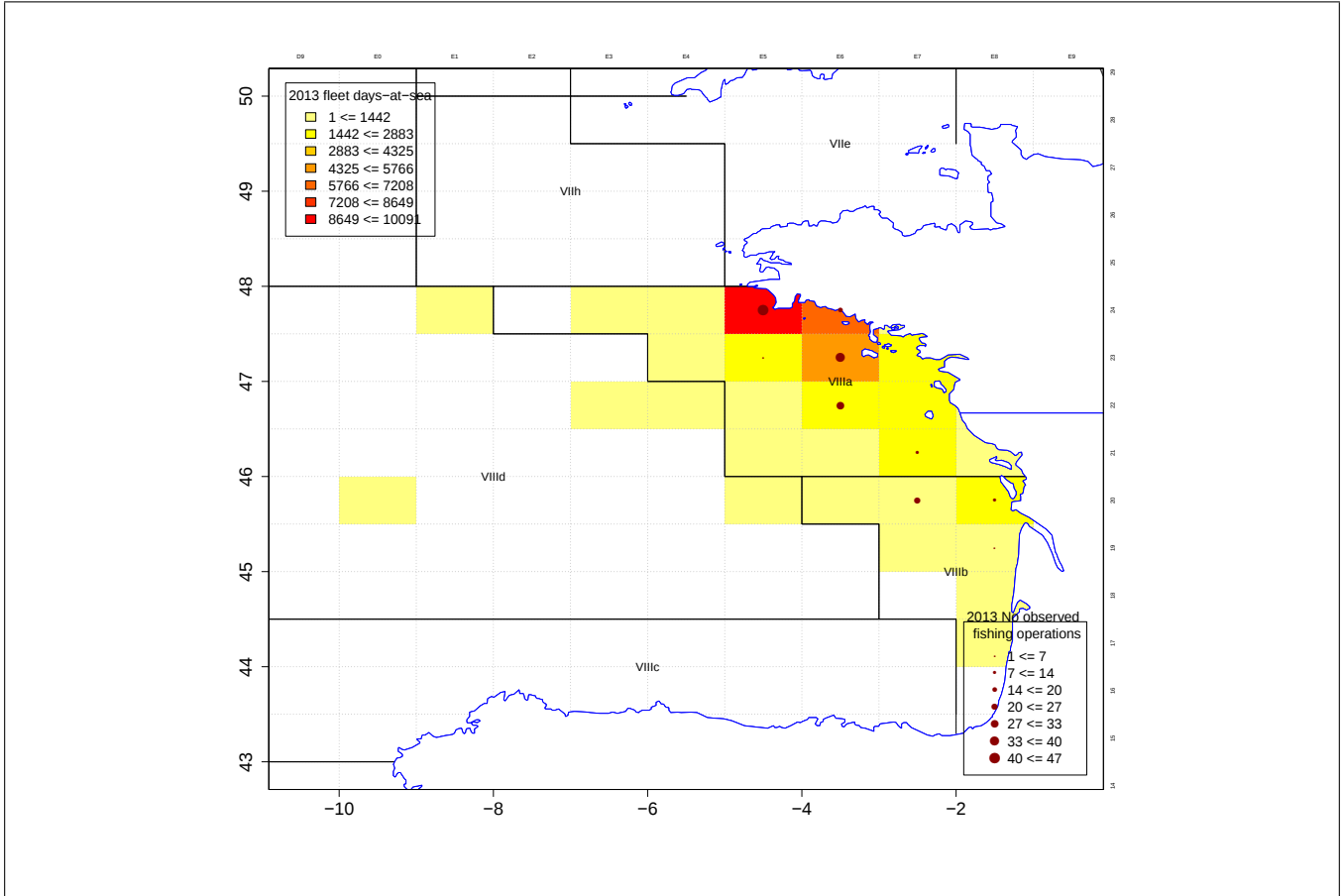


FIGURE 2.1 – Fleet activity (rectangle colours, days-at-sea) versus sampling effort (circles, no observed fishing operations) (2013)

Sampling in 2011-13 was reasonably representative of the fleet fishing activity both spatially and seasonally. There was a lack of sampling onboard the smallest vessels though, especially in 2013.

2.2 Current management measures

Since December 2005, a minimum landing size of 26 mm Cephalothoracic Length (CL), i.e. 9 cm total length, has been agreed for marketing reasons by French Producers' Organisations, above the European regulatory MLS (20 mm CL). This is a limited entry fishery with current fleet size 230 vessels (*numerus clausus* licence system). The minimum permitted codend mesh size for *Nephrops* trawl is 70 mm. Since 2005 all vessels must be equipped with a selective device for hake, a 100 mm square-mesh panel (dorsal square mesh panel). Moreover, to decrease *Nephrops* discards, since 2008 all vessels catching more than 50 kg of *Nephrops* per day must use at least one of three selective devices : a ventral square mesh panel of minimum 60 mm ; a flexible grid (13 mm spaced circular bars) at the bottom of the codend ; or an 80 mm codend mesh size.

2.3 Catch and discard estimates

TABLE 2.2 – Total catch and discards estimates by French *Nephrops* trawlers in the Bay of Biscay per stratum in 2013, Confidence Interval (CI) is provided for the catch; landings and discards have CI with similar amplitude. FO fishing operations.

Quarter	Area	Métier	Catch (mt)	CI	Landing (mt)	Discard (mt)	Percent discarded (%)	No observed FO
2013 - 1	8.a	OT_CRU	1513	[1227-1798]	601	912	60.2	12
2013 - 2	8.a	OT_CRU	5575	[4585-6566]	2598	2977	53.4	22
2013 - 2	8.b	OT_CRU	324	[297-351]	264	60	18.5	8
2013 - 3	8.a	OT_CRU	3572	[3372-3771]	1704	1868	52.3	18
2013 - 4	8.a	OT_CRU	2086	[1786-2387]	1087	999	47.9	12

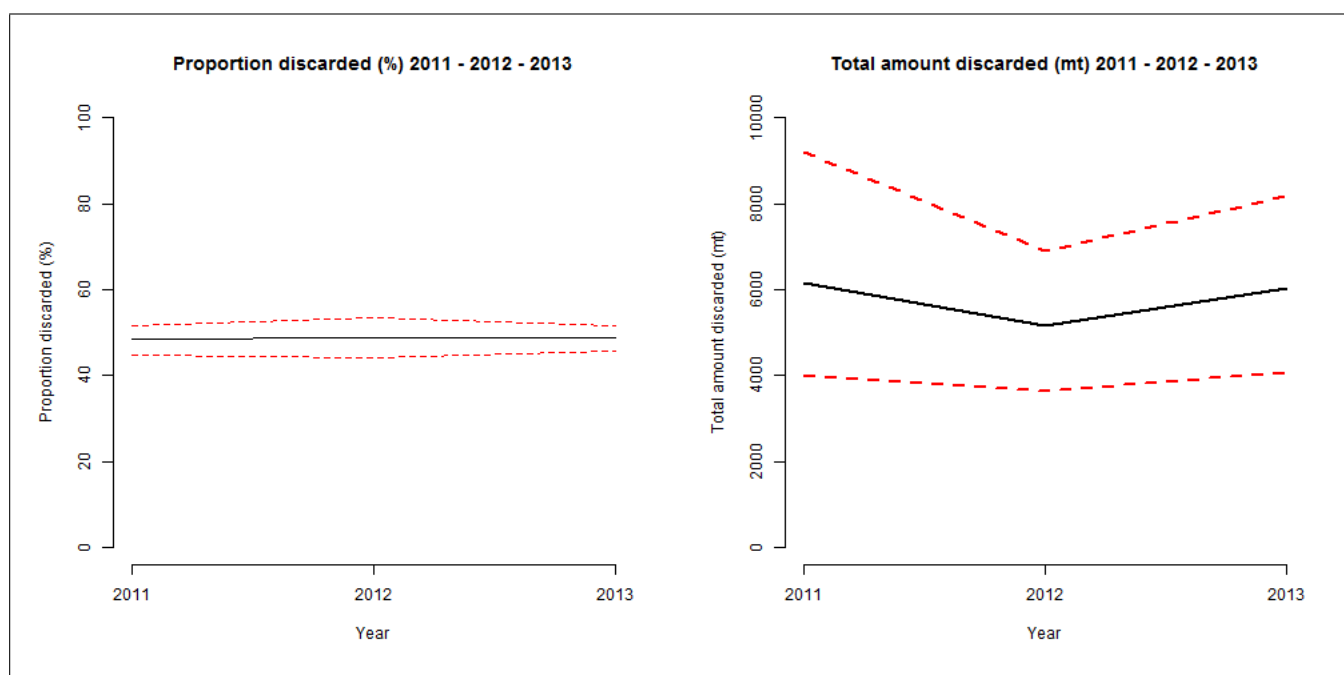


FIGURE 2.2 – Total amount and proportion discarded per year (2011 - 2013) by French *Nephrops* trawlers in the Bay of Biscay

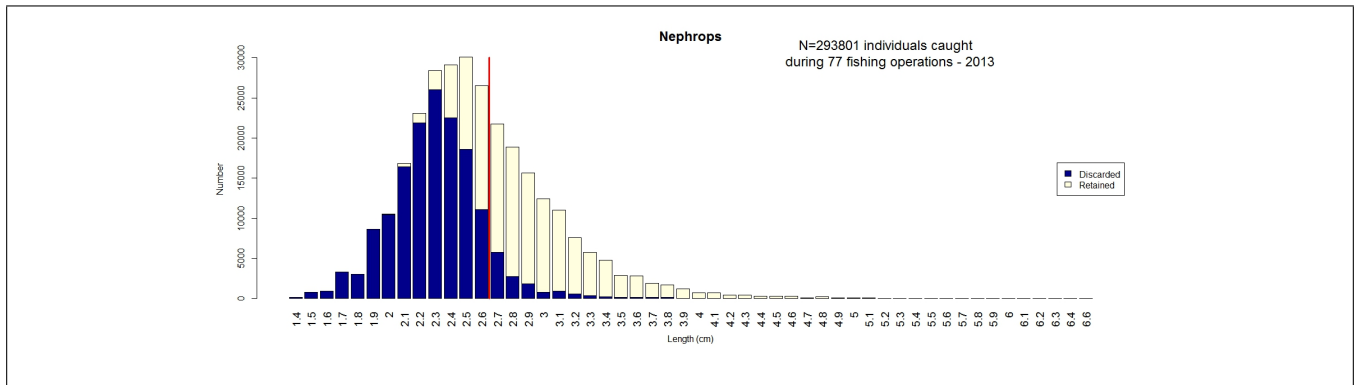
TABLE 2.3 – Estimated proportions discarded per species in weight, by French *Nephrops* trawlers in the Bay of Biscay, with their confidence interval (95%)

Species	Percent discarded (%)			Percent undersize in the species discards (%)		
	2011	2012	2013	2011	2012	2013
<i>Nephrops</i>	31.1 [26.8 - 35.3]	35.8 [27.8 - 43.5]	35.6 [31.5 - 39.3]	72.8	87.9	85.1
Hake	40.6 [33.6 - 48.4]	49.8 [37 - 61]	55.3 [48.8 - 61.3]	81.9	90.8	89.1
Black-bellied angler	9.1 [4.6 - 14.2]	13.6 [6.3 - 23.2]	6.8 [3.5 - 10.9]	100	78.8	100
Sole	5.1 [1.5 - 9.7]	6 [3.3 - 9.2]	0.8 [0.1 - 1.9]	79.7	100	100
Anglerfish	13.0 [6.5 - 20.6]	9.6 [5.3 - 15.8]	6.4 [3.4 - 10.4]	100	100	100
Blue whiting	100 [100 - 100]	100 [100 - 100]	100 [100 - 100]	NA	NA	NA
Megrim	35.4 [19.1 - 52.4]	23.4 [15.8 - 34.8]	44 [36.5 - 50.6]	14	90.6	56.9

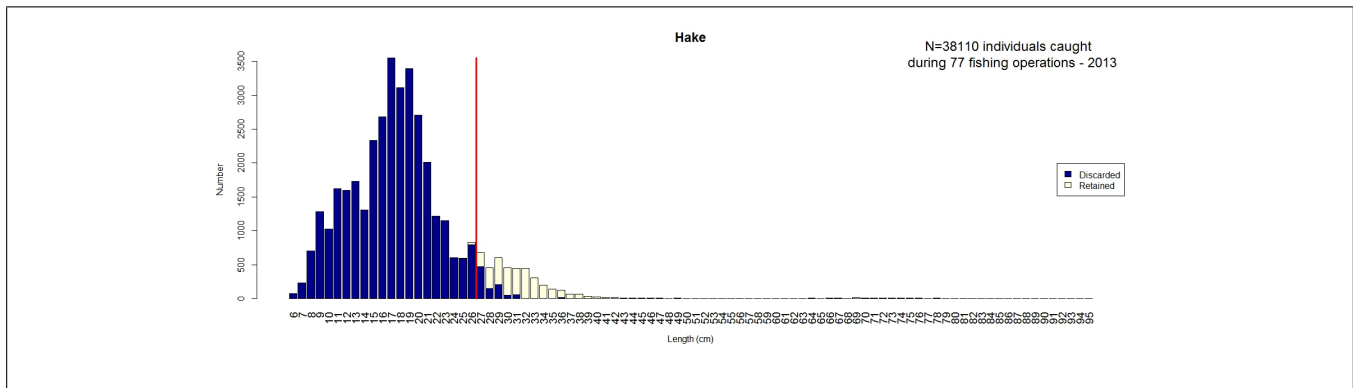
TABLE 2.4 – Caught and discarded weight of the main quota species caught by French *Nephrops* trawlers in the Bay of Biscay

Species	Catch (mt)			Discards (mt)		
	2011	2012	2013	2011	2012	2013
<i>Nephrops</i>	5291 [3919-6837]	2876 [1862-4143]	3897 [2597-5407]	1666 [1141-2308]	1029 [571-1661]	1386 [852-2044]
Hake	1837 [1301-2538]	2359 [1500-3439]	2406 [1571-3403]	755 [529-1028]	1174 [611-1936]	1329 [813-1980]
Black-bellied angler	346 [205-528]	222 [117-368]	482 [268-769]	32 [12-60]	30 [10-64]	33 [12-66]
Sole	464 [287-678]	311 [170-530]	423 [241-677]	24 [5-52]	19 [7-37]	4 [0-10]
Anglerfish	640 [407-907]	494 [298-757]	409 [236-634]	98 [44-180]	48 [21-92]	26 [10-51]
Blue whiting	130 [67-220]	78 [34-148]	377 [160-723]	132 [67-220]	78 [34-148]	377 [160-723]
Megrim	268 [119-431]	181 [78-331]	174 [86-299]	88 [35-159]	165 [70-305]	77 [35-138]

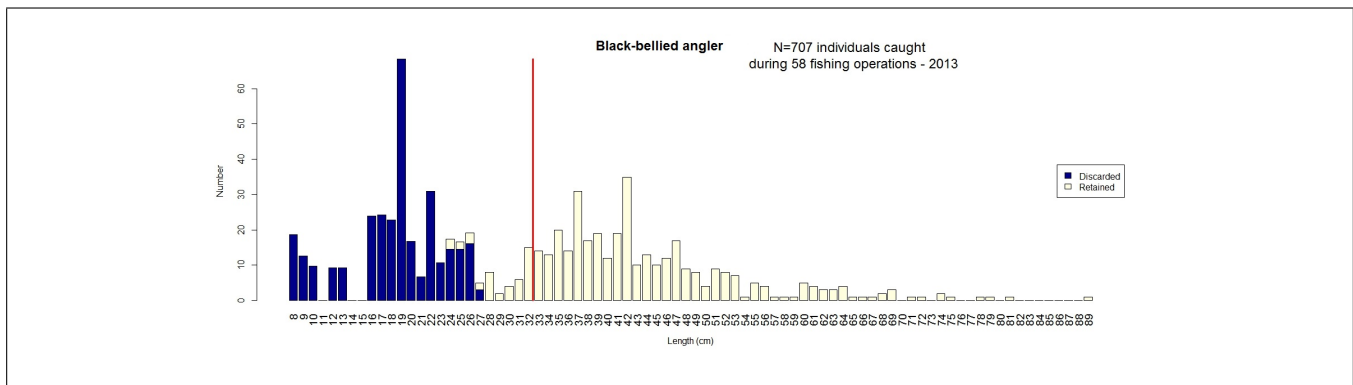
2.4 Length structure 2013



91% of *Nephrops* discards in number are below the minimum landing size (2.7 cm)

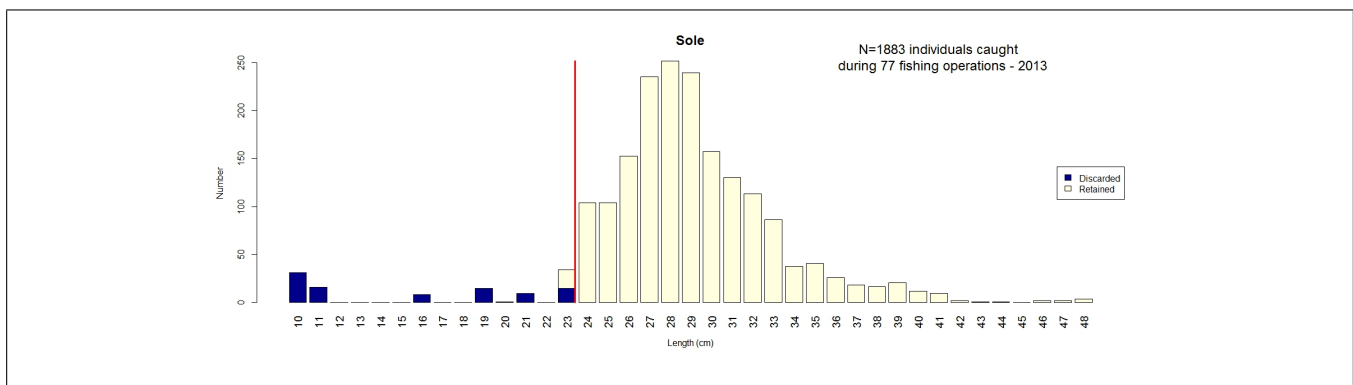


97% of Hake discards in number are below the minimum landing size (27 cm)

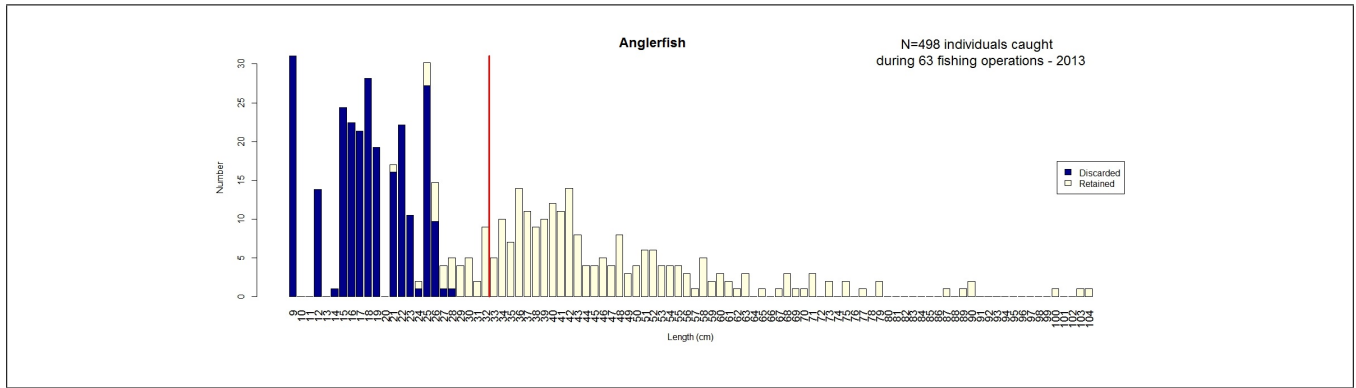


100% of Black-bellied angler discards in number are below the minimum marketing size (33 cm)

Note : a French national regulation prohibits to sell black-bellied angler < 0.5 kg, that is 33 cm.

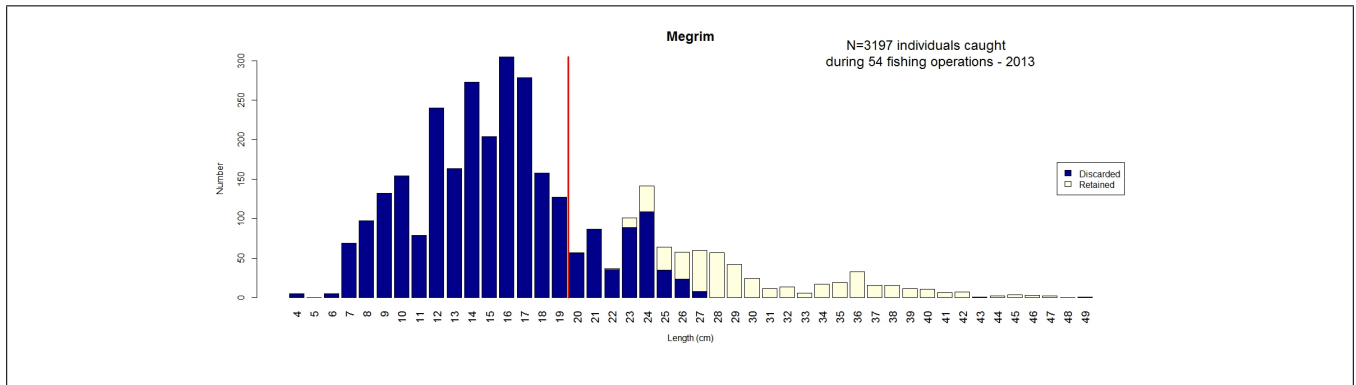
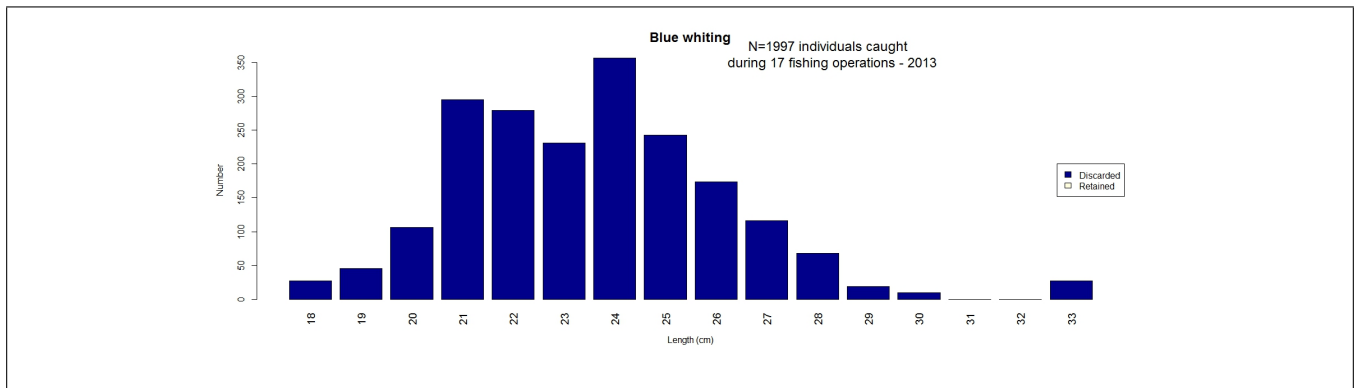


100% of Sole discards in number are below the minimum landing size (24 cm)



100% of Anglerfish discards in number are below the minimum marketing size (33 cm)

Note : a French national regulation prohibits to sell anglerfish < 0.5 kg, that is 33 cm.



84% of Megrim discards in number are below the minimum landing size (20 cm)

FIGURE 2.3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by French *Nephrops* trawlers in the Bay of Biscay

This métier lands mainly *Nephrops*, but also a part of the valuable bycatch, including hake, monkfish, and sole. The discarded proportion with respect to total catch fluctuated around 50% 2011-2013. *Nephrops*, hake, and squat lobster made up more than 50% of total discards, in proportions that varied between years. This métier also discarded other species, such as poor cod, small spotted catshark, blue whiting, and horse mackerel. Undersized individuals of the valuable bycatch species completed the discards.

2.5 Reasons for discarding

Most of the vessels used trawl mesh less than 80 mm, consequently large quantities of small fish were caught, and much of this bycatch was undersized and discarded. For most of the commercial species, undersized individuals made up the most part of discards (more than 75 %) over the last ten years (Catchpole *et al.*, 2013). The mandatory deployment of selective gears seems to have had limited efficacy – the most efficient ones in reducing discards do not increase marketable catch in a sufficient amount as to compensate for the increased costs; therefore, uptake by fishers has been limited (Nikolic *et al.*, In preparation). In addition, some *Nephrops* with marketable size were also discarded, mostly for quality reasons (“soft” *i.e.* moulting individuals). The remainder of discards included species with low or no market value, which were not worth landing given the high value of the target species. According to ICES advice, the *Nephrops* TAC has not been fished over the three years; for some other species such as hake and sole, the agreed TAC was exceeded at least some years; however, for these species only undersized individuals were discarded, suggesting that quotas have not been binding for this métier.

2.6 Impact of the landing obligation

This métier is going to be severely impacted by the new regulation, unless specific measures are taken. These measures might include among others measures meant to improve size-selectivity : larger mesh sizes, and perhaps temporary closures during the season of hake (winter) and *Nephrops* (summer) recruitment. Potential choke species are hake in 2016, and blue whiting and anglerfishes later on. This potentially high impact of the landing obligation is due to the mixed nature of the fishery. These vessels land a mix of species, several of which have high value. Any device meant to reduce the unwanted by catch of some species is likely to affect the marketable catch of another species.

2.7 Other relevant information

Experiments with selective devices in the Bay of Biscay demonstrated that the grid allowed juvenile benthic fish (Dupouy *et al.*, 1997; Massart, 2000) and *Nephrops* (Loaec *et al.*, 2006) to escape. While *Nephrops* discards were reduced by 50% (Graham and Ferro, 2004), a loss of marketable catch was also detected (Loaec *et al.*, 2006). Experiments in the Bay of Biscay with square mesh panels dedicated to reduce the capture of juvenile hake decreased the retention of mature and juvenile hakes by 30 to 50% (Graham and Ferro, 2004). However, when deployed at the fleet level these devices do not seem to have had the efficacy expected from the sea trials (Nikolic *et al.*, In preparation).

There has been abundant literature about survival of discarded *Nephrops*; reviews of these studies have been undertaken as part of various projects, but they are not available yet. A brief provisional summary would be that survival of discarded *Nephrops* is highly variable across and within studies depending on fishery and sorting conditions, weather, time on the deck, and many other factors. Most studies conclude that over 50% of discarded *Nephrops* die within a few days. Several studies evaluated the physiological damages caused by the catching, sorting and discarding processes, but none evaluated their consequences for the probability of being eaten by predators

after returning to sea.

3 Gillnetters smaller than 15 m in the Bay of Biscay

3.1 Fleet

This métier uses gillnets and trammel nets to target a wide diversity of fish, cephalopods and crustaceans in coastal areas in the Bay of Biscay (VIIIa & VIIIb). This métier is operated by a large number of small vessels, which deploy a diversity of gears with a wide range of mesh sizes throughout the year. Trip duration is 1 day. The most targeted species is sole (30 to 40% of observed fishing operations).

TABLE 3.1 – French Gillnetters smaller than 15 m in the Bay of Biscay : vessels, landings, trips, and sampled fraction 2011 - 2013

Harbour	No trips landed in the harbour 2013	No observed trips 2013	Vessel length range (m) (average)	2013 Total landings (mt)
Lorient	3293	5	5-13(11)	800
Arcachon	2575	41	5-15(11)	522
Les Sables-d'Olonne	2179	4	8-15(12)	513
Audierne	1177	4	8-12(11)	447
Capbreton	1602	4	7-15(12)	427
Saint-Jean-de-Luz, Ciboure	1351	4	6-15(11)	406
La Rochelle	1659	1	4-15(11)	344
La Cotinière	1942	16	5-14(12)	338
Concarneau	1720	4	6-12(10)	301
Saint-Guérolé (Penmarch)	796	3	4-12(10)	280
Guilvinec	713	4	4-12(9)	143
Loctudy	1338	8	4-12(9)	134
Le Croisic	298	1	7-13(12)	131
La Vigne (Lège-Cap-Ferret)	363	19	5-12(9)	73
Lesconil (Plobannalec)	325	1	6-9(8)	52
La Forêt-Fouesnant	515	1	7-10(8)	49
L'Herbe (Lège-Cap-Ferret)	200	3	6-10(9)	38
Doëlan (Clohars-Carnoët)	382	1	6-10(8)	24
Gujan-Mestras	219	1	6-8(8)	11
Pirailan (Lège-Cap-Ferret)	257	4	8	11
Andernos-les-Bains	104	2	6-8(7)	3
Port le Four (Lège-Cap-Ferret)	12	8	6	1
Audenge	22	2	8	0
Grand Piquey (Lège-Cap-Ferret)	8	5	8	0
Autres ports (N = 95)	13013	0	4-15(11)	2067
Total	36063	146	4-15(11)	7117

	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	343	366	467	27122	30803	36063	29093	32966	38883
Observed	53	57	68	131	140	146	135	140	146
Sample fraction (%)	15.5	15.6	14.6	0.5	0.5	0.4	0.5	0.4	0.4

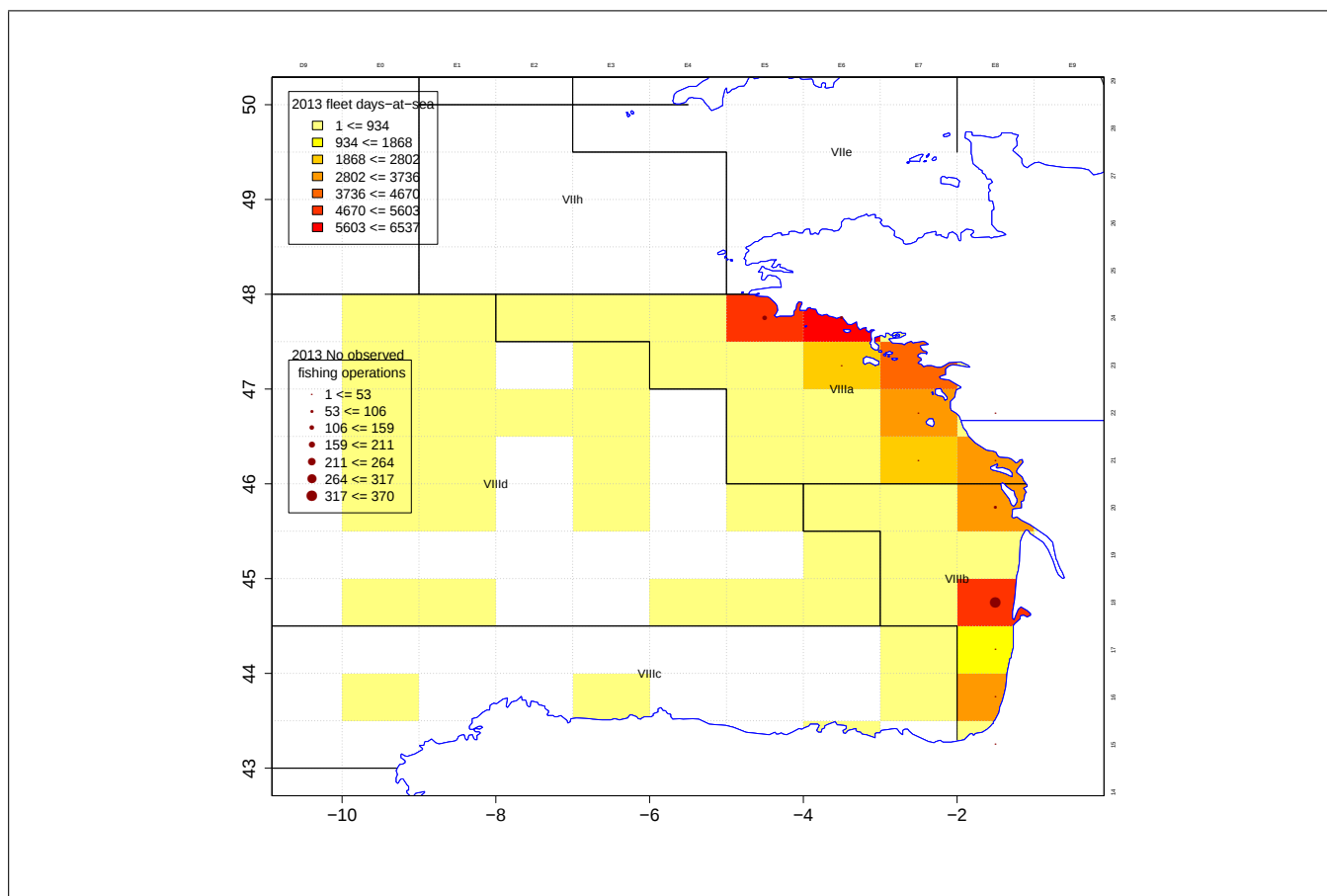


FIGURE 3.1 – Fleet activity (rectangle colours, days-at-sea) versus sampling effort (circles, no observed fishing operations) (2013)

Sampling has been reasonably representative of fishing activity over 2011-2013, seasonally and throughout the length distribution of vessels. There has been a lack of observations in Southern Brittany, although a large part of fishing activity took place there in 2012 and 2013.

3.2 Catch and discard estimates

TABLE 3.2 – Total catch and discards estimates by French Gillnetters smaller than 15 m in the Bay of Biscay per stratum in 2013, Confidence Interval (CI) is provided for the catch; landings and discards have CI with similar amplitude. FO fishing operations.

Quarter	Area	Métier	Catch (mt)	CI	Landing (mt)	Discard (mt)	Percent discarded (%)	No observed FO
2013 - 1	8.a	Fil.DEF	1637	[1558-1716]	1520	117	7.2	9
2013 - 1	8.b	Fil.DEF	870	[796-944]	664	205	23.6	74
2013 - 2	8.a	Fil.DEF	1814	[1709-1920]	1525	290	16.0	76
2013 - 2	8.b	Fil.DEF	705	[686-723]	609	96	13.6	138
2013 - 3	8.a	Fil.DEF	1249	[1099-1398]	952	297	23.8	67
2013 - 3	8.b	Fil.DEF	499	[479-518]	432	67	13.3	98
2013 - 4	8.a	Fil.DEF	863	[836-890]	806	57	6.6	32
2013 - 4	8.b	Fil.DEF	724	[637-811]	521	203	28.0	96

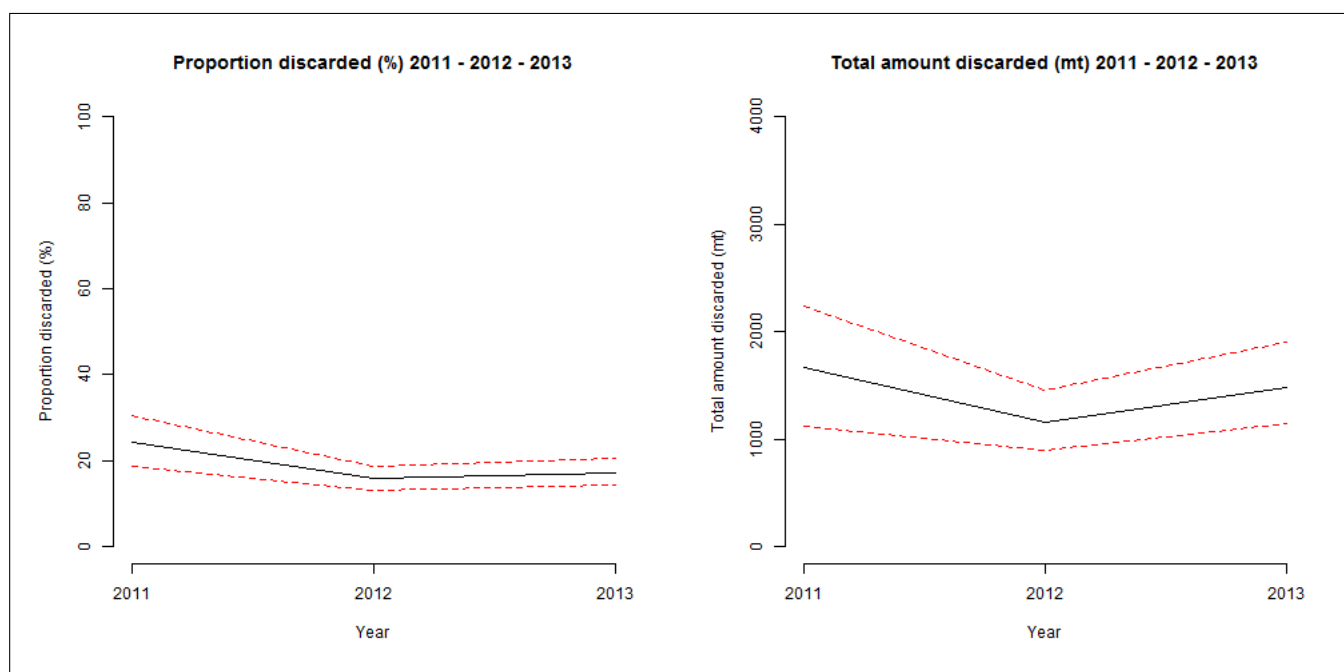


FIGURE 3.2 – Total amount and proportion discarded per year (2011 - 2013) by French Gillnetters smaller than 15 m in the Bay of Biscay

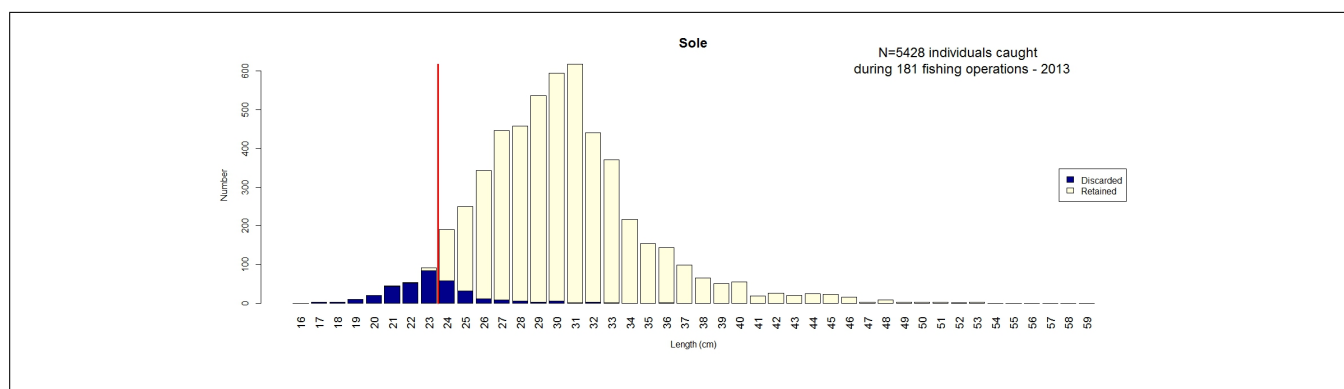
TABLE 3.3 – Estimated proportions discarded per species in weight, by French Gillnetters smaller than 15 m in the Bay of Biscay, with their confidence interval (95%)

Species	Percent discarded (%)			Percent undersize in the species discards (%)		
	2011	2012	2013	2011	2012	2013
Sole	1.1 [0.7 - 1.7]	2.7 [1.9 - 3.8]	1.4 [0.8 - 2.3]	42.4	47.6	50.6
Sea bass	2.0 [1.1 - 3.4]	2.6 [1.2 - 6.3]	4.5 [2.8 - 7.2]	85.2	91	85.5
Pollack	0.6 [0.1 - 1.4]	4.3 [1.7 - 8.6]	3.7 [1.6 - 7.2]	18.2	0	4.2
Whiting	26.7 [17.1 - 38.8]	27.1 [17.2 - 40]	34.1 [17.7 - 54.5]	17.0	8.7	8
Hake	4.9 [2.3 - 9.5]	16.1 [9.9 - 25]	35.7 [21.9 - 47.5]	5.0	18.3	8.5
Anglerfish	8.3 [3.3 - 15]	5.7 [2.3 - 10]	2.7 [1 - 6.4]	27.5	17.9	56

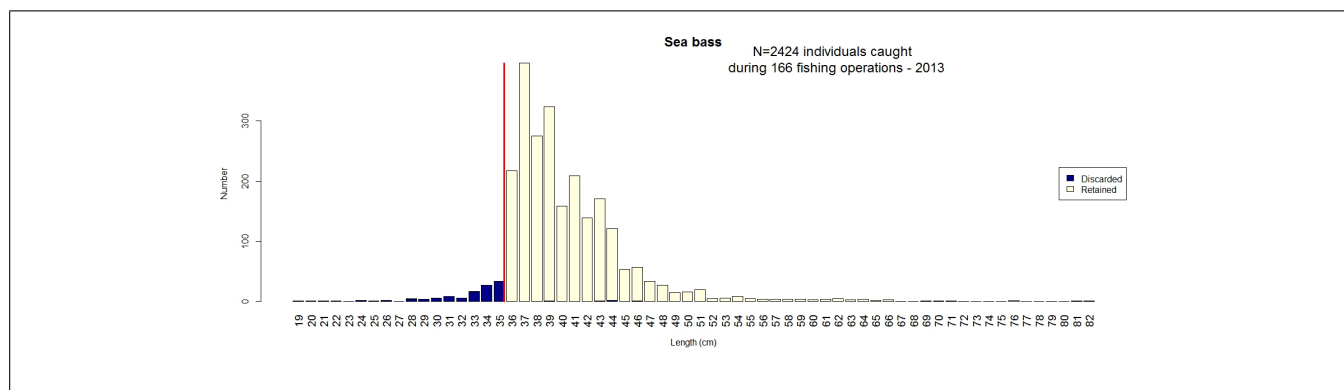
TABLE 3.4 – Caught and discarded weight of the main quota species caught by French Gillnetters smaller than 15 m in the Bay of Biscay

Species	Catch (mt)			Discards (mt)		
	2011	2012	2013	2011	2012	2013
Sole	791 [554-1086]	612 [440-826]	811 [492-1298]	9 [5-15]	17 [10-27]	11 [7-16]
Sea bass	470 [294-693]	647 [282-1318]	646 [355-1097]	10 [5-17]	17 [8-29]	29 [14-51]
Pollack	417 [210-708]	404 [216-652]	523 [283-820]	2 [0-7]	17 [7-32]	19 [8-35]
Whiting	564 [339-864]	358 [223-538]	361 [200-596]	151 [83-244]	97 [55-154]	123 [56-214]
Hake	371 [210-597]	178 [108-277]	283 [180-416]	18 [8-34]	29 [17-45]	101 [44-180]
Anglerfish	108 [56-184]	546 [280-884]	243 [130-395]	9 [3-20]	31 [9-61]	7 [2-13]

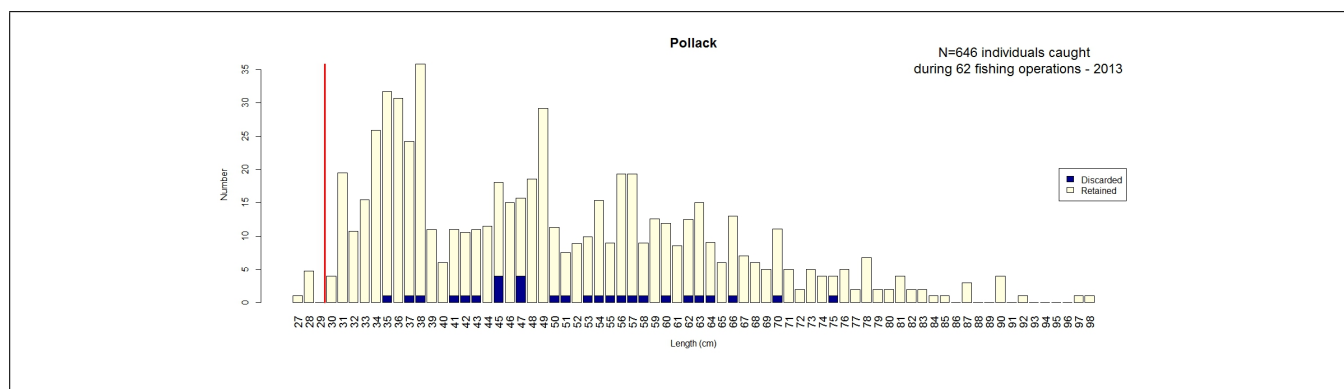
3.3 Length structure 2013



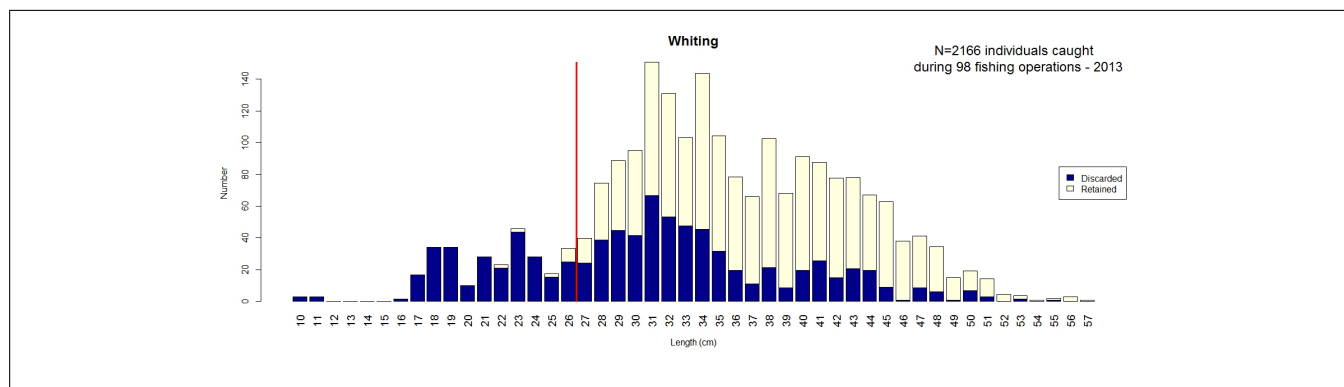
62% of Sole discards in number are below the minimum landing size (24 cm)



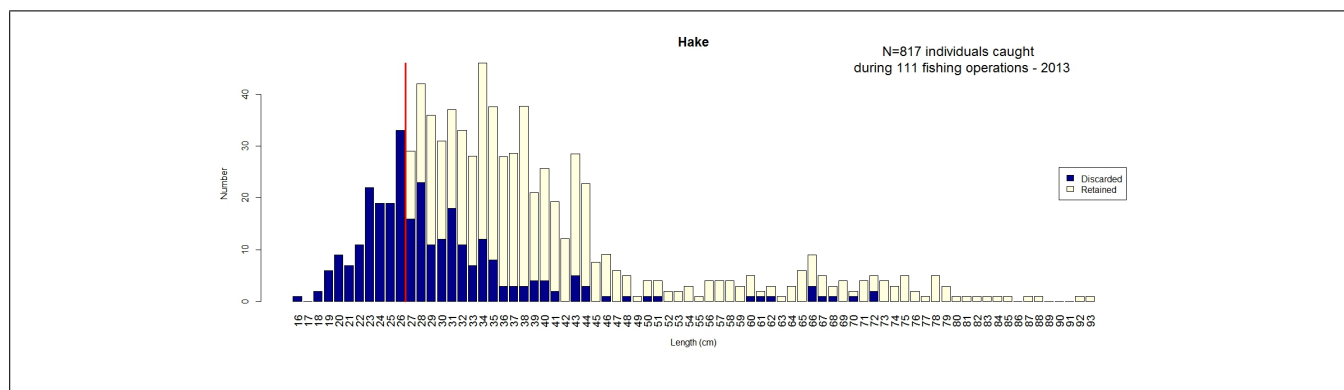
96% of Sea bass discards in number are below the minimum landing size (36 cm)



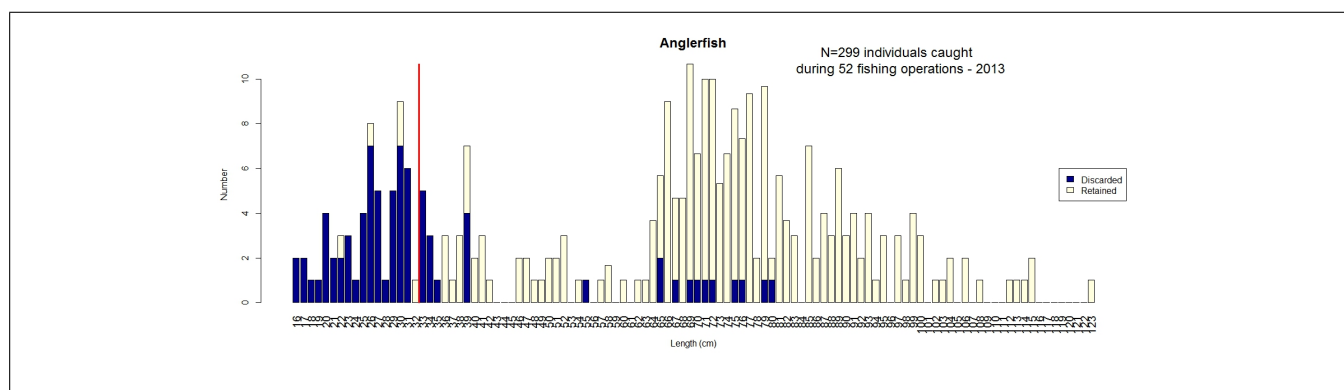
0% of Pollack discards in number are below the minimum landing size (30 cm)



31% of Whiting discards in number are below the minimum landing size (27 cm)



45% of Hake discards in number are below the minimum landing size (27 cm)



68% of Anglerfish discards in number are below the minimum marketing size (33 cm)

Note : a French national regulation prohibits to sell anglerfish < 0.5 kg, that is 33 cm.

FIGURE 3.3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by French Gillnetters smaller than 15 m in the Bay of Biscay

Gillnetters would typically discard less than 10% of their catch, mostly of non-target species such as rays, horse mackerel, and bib. Trammel nets discard 15 to 30% of their catch, a large part of which are large crustaceans which become entangled in the nets, and a mix of non-target species.

3.4 Reasons for discarding

Discards of target species (sole, seabass, anglerfish) are mostly undersized. Other species may be discarded for low value (whiting). Crustaceans are difficult to disentangle from the net and therefore often smashed. A part of the catch is also damaged by sea lice or other predators, which attack the catch before the net is towed.

3.5 Impact of the landing obligation

From 2016 on sole might be a choke species for this métier. In the following years (depending on the calendar of full implementation of the landing obligation), anglerfish, pollack and whiting may become choke species as well. Whiting and mackerel are deemed to be potentially problematic species by professional fishers. Apart from choke species, impact of landing obligation on this métier might concern the landing of catch damaged by sea lice which will have no value at all.

3.6 Other relevant information

Informal trials made by professional fishers suggest that little progress is expected to improve selectivity with respect to species. Size selectivity may be improved by increased mesh sizes (project REDRESSE).

4 Gillnetters larger than 15 m in the Bay of Biscay

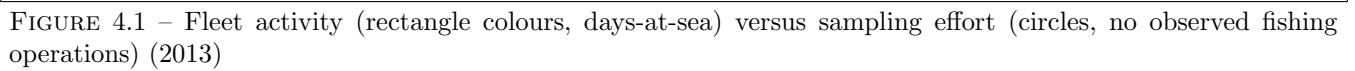
4.1 Fleet

This métier uses gillnets and trammel nets to target either sole in coastal areas, or hake farther offshore, in the Bay of Biscay (VIIIa & VIIIb). The two most important fleets operating this métier are based in the Loire area (Yeu, Noirmoutier), or in the Southern Basque area (Bayonne). Trips last 1 to 9 days with a 4 days average.

TABLE 4.1 – French Gillnetters larger than 15 m in the Bay of Biscay : vessels, landings, trips, and sampled fraction 2011 - 2013

Harbour	No trips landed in the harbour 2013	No observed trips 2013	Vessel length range (m) (average)	2013 Total landings (mt)
Lorient	181	4	15-35(24)	2677
Les Sables-d'Olonne	1028	1	15-25(18)	2213
Yeu Port Joinville (L'Ile-d'Yeu)	483	2	15-23(20)	917
La Rochelle	172	1	15-34(18)	723
L'Herbaudière	258	2	15-23(19)	557
La Cotinière	379	3	16-20(16)	197
Autres ports (N = 28)	1346	0	15-35(18)	5091
Total	3847	13	15-35(19)	12375

	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	75	73	69	3223	3811	3847	12364	14620	14581
Observed	9	8	7	17	12	52	55	52	52
Sample fraction (%)	12.0	11.0	10.1	0.5	0.3	0.4	0.4	0.4	0.4



96

4.2 Catch and discard estimates

TABLE 4.2 – Total catch and discards estimates by French Gillnetters larger than 15 m in the Bay of Biscay per stratum in 2013, Confidence Interval (CI) is provided for the catch; landings and discards have CI with similar amplitude. FO fishing operations.

Quarter	Area	Métier	Catch (mt)	CI	Landing (mt)	Discard (mt)	Percent discarded (%)	No observed FO
2013 - 1	8.a	Fil.DEF	3893	[3679-4106]	3680	213	5.5	22
2013 - 2	8.a	Fil.DEF	2129	[2125-2132]	1776	353	16.6	10
2013 - 3	8.b	Fil.DEF	436	[434-438]	346	91	20.8	6
2013 - 4	8.a	Fil.DEF	2128	[1883-2372]	1260	868	40.8	39

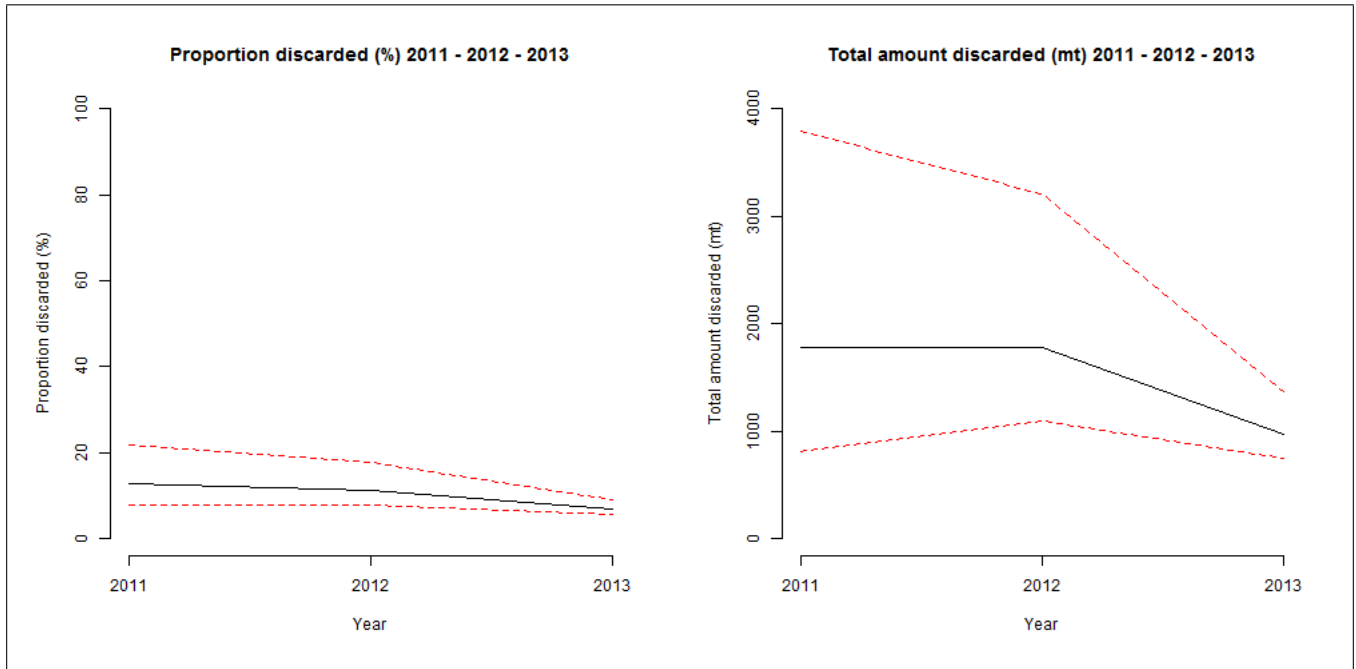


FIGURE 4.2 – Total amount and proportion discarded per year (2011 - 2013) by French Gillnetters larger than 15 m in the Bay of Biscay

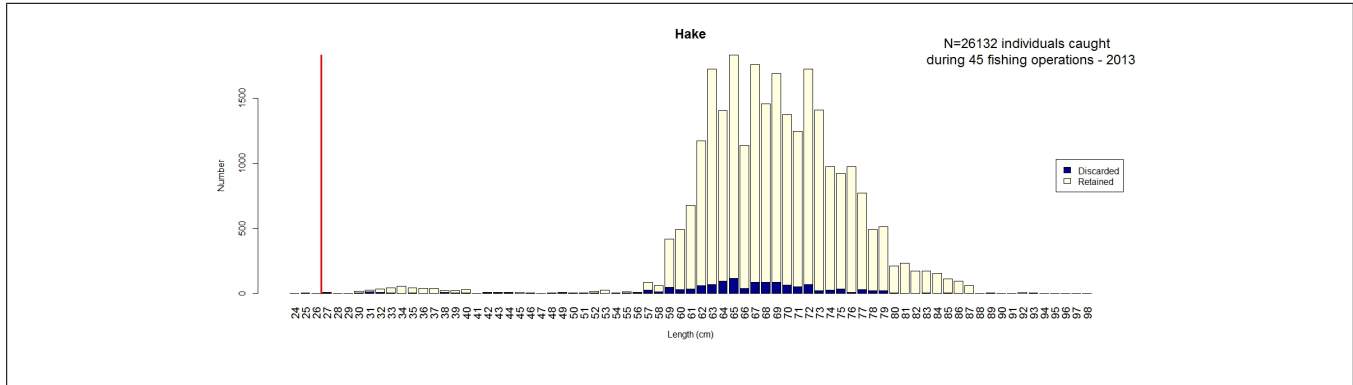
TABLE 4.3 – Estimated proportions discarded per species in weight, by French Gillnetters larger than 15 m in the Bay of Biscay, with their confidence interval (95%)

Species	Percent discarded (%)			Percent undersize in the species discards (%)		
	2011	2012	2013	2011	2012	2013
Hake	0.5 [0.2 - 1.4]	3.3 [1.8 - 5.1]	4.5 [3 - 5.8]	1.0	0.1	0
Sole	0.5 [0.3 - 0.7]	0.6 [0.3 - 1.1]	0.3 [0.1 - 0.6]	67.3	49.1	24.5
Anglerfish	3.7 [1.4 - 6.6]	7.2 [2.9 - 13.9]	1 [0 - 1.8]	21.6	0	100
Sea bass	0.1 [0 - 0.3]	0.5 [0 - 0.9]	0.7 [0 - 2]	0	100	0
Whiting	86.1 [77.4 - 91.8]	73.4 [62.8 - 85.4]	66 [35.5 - 82.4]	7.8	0.8	8.7
Black-bellied angler	100 [100 - 100]	0.1 [0 - 1.1]	13.4 [1.5 - 21.5]	0	34.7	82.7
Pollack	6.5 [0.5 - 18.7]	100 [100 - 100]	69.6 [4.2 - 91.8]	0	1.6	0
Blue whiting	NA	NA	96.2 [88.1 - 100]	NA	NA	NA
Haddock	NA	100 [100 - 100]	100 [100 - 100]	0	0	0

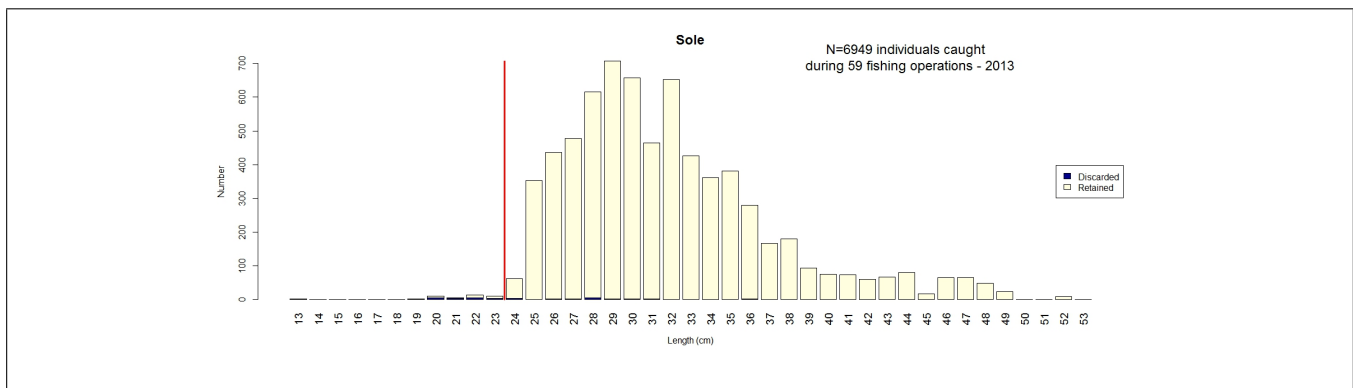
TABLE 4.4 – Caught and discarded weight of the main quota species caught by French Gillnetters larger than 15 m in the Bay of Biscay

Species	Catch (mt)			Discards (mt)		
	2011	2012	2013	2011	2012	2013
Hake	8997 [4248-13509]	12361 [8328-15448]	12900 [11001-14079]	42 [14-103]	414 [184-683]	575 [354-776]
Sole	1773 [767-3839]	924 [453-1978]	565 [255-1328]	8 [3-20]	6 [2-14]	2 [1-4]
Anglerfish	194 [81-442]	185 [83-402]	66 [31-147]	7 [2-19]	13 [4-34]	0.6 [0-2]
Sea bass	435 [120-1115]	303 [71-822]	35 [15-86]	0 [0-1]	1.5 [0-5]	0.2 [0-1]
Whiting	332 [136-730]	97 [40-219]	22 [9-53]	286 [115-645]	71 [30-161]	15 [4-40]
Black-bellied angler	2 [0-8]	138 [13-436]	21 [7-50]	0 [0-0]	0.1 [0-1]	2.8 [0-8]
Pollack	29 [8-74]	3.5 [0-11]	21 [5-47]	1.9 [0-6]	3.5 [0-11]	14 [0-38]
Blue whiting	0 [0-0]	0 [0-0]	14 [4-35]	0 [0-0]	0 [0-0]	13 [4-33]
Haddock	0 [0-0]	1.8 [0-4]	11 [0-26]	0 [0-0]	1.8 [0-4]	11 [0-26]

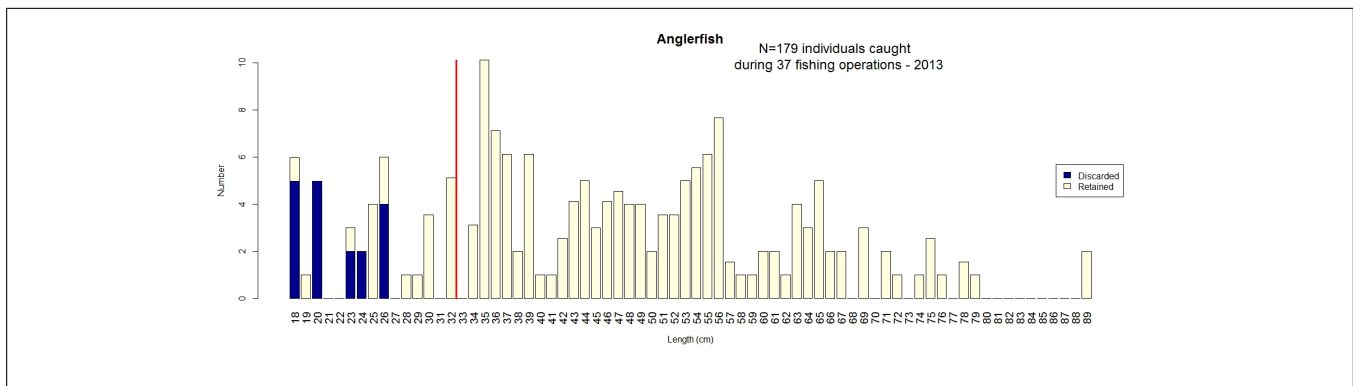
4.3 Length structure 2013



1% of Hake discards in number are below the minimum landing size (27 cm)

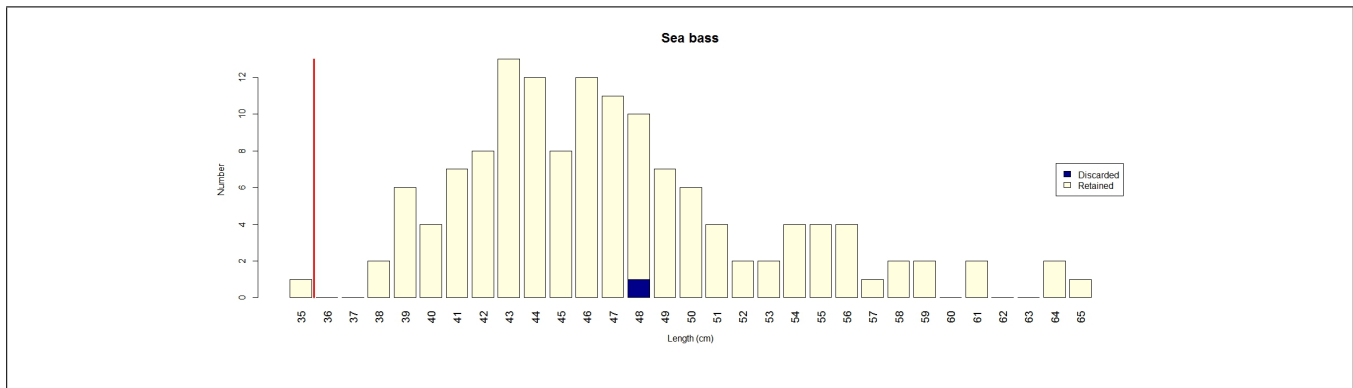


45% of Sole discards in number are below the minimum landing size (24 cm)

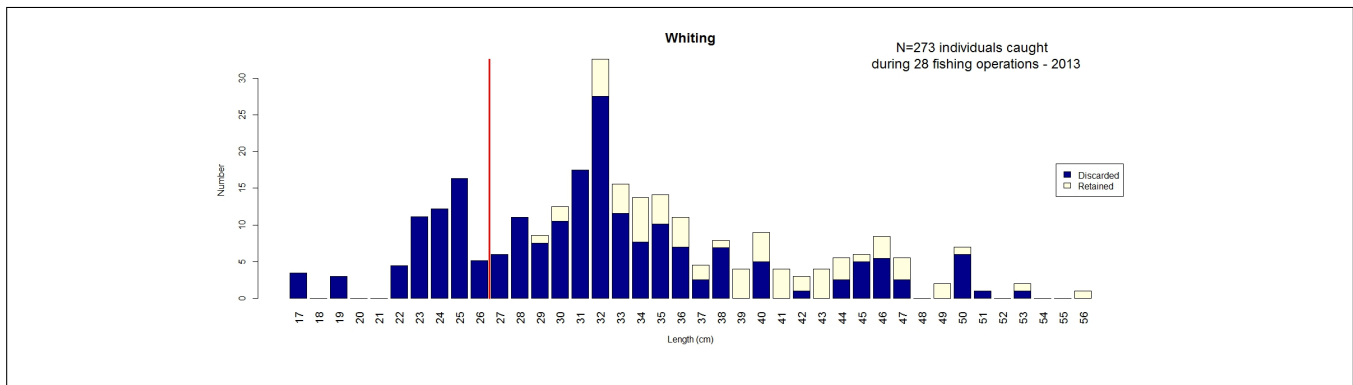


100% of Anglerfish discards in number are below the minimum marketing size (33 cm)

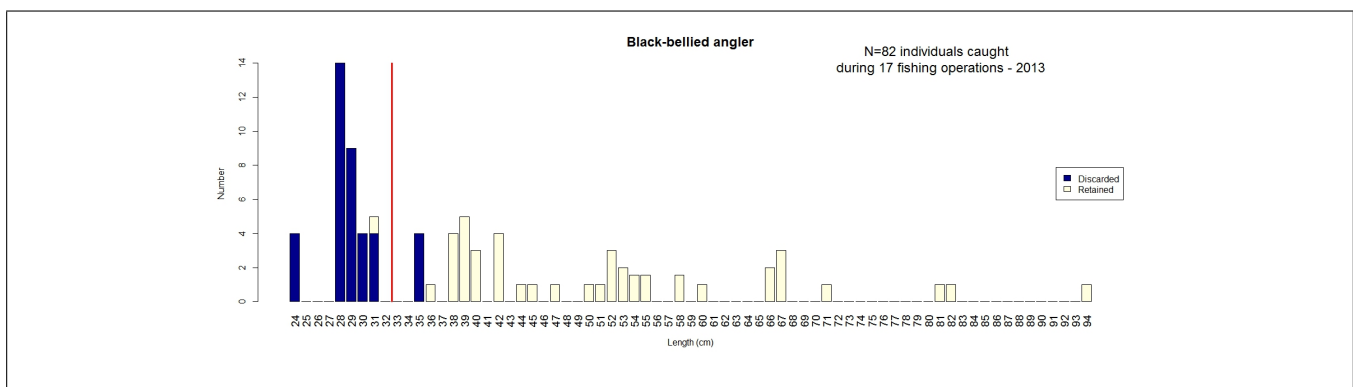
Note : a French national regulation prohibits to sell anglerfish < 0.5 kg, that is 33 cm.



0% of Sea bass discards in number are below the minimum landing size (36 cm)

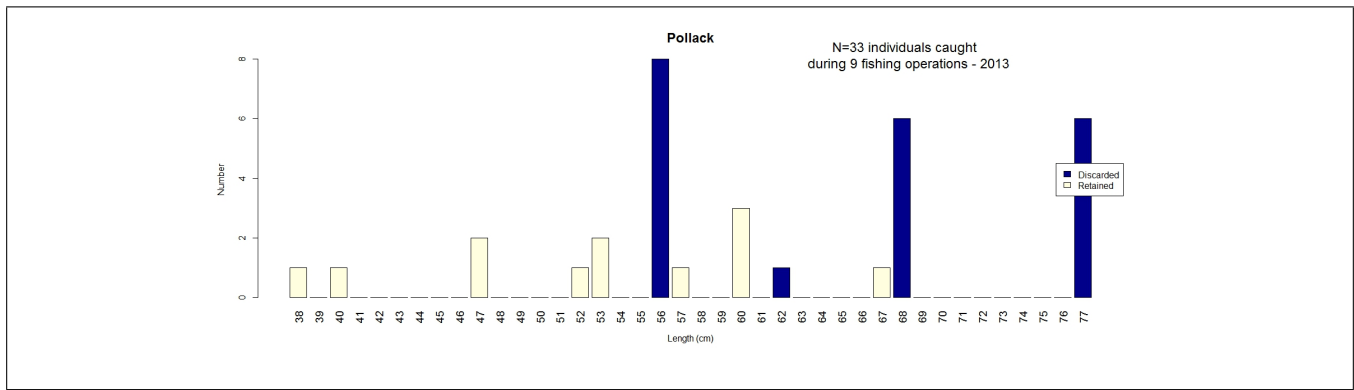


26% of Whiting discards in number are below the minimum landing size (27 cm)



90% of Black-bellied angler discards in number are below the minimum marketing size (33 cm)

Note : a French national regulation prohibits to sell black-bellied angler < 0.5 kg, that is 33 cm.



0% of Pollack discards in number are below the minimum landing size (30 cm)

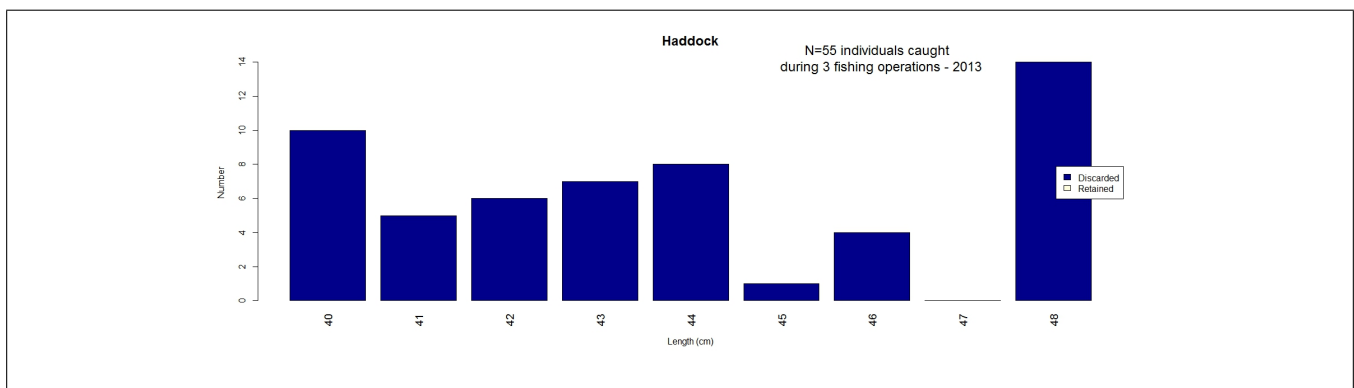
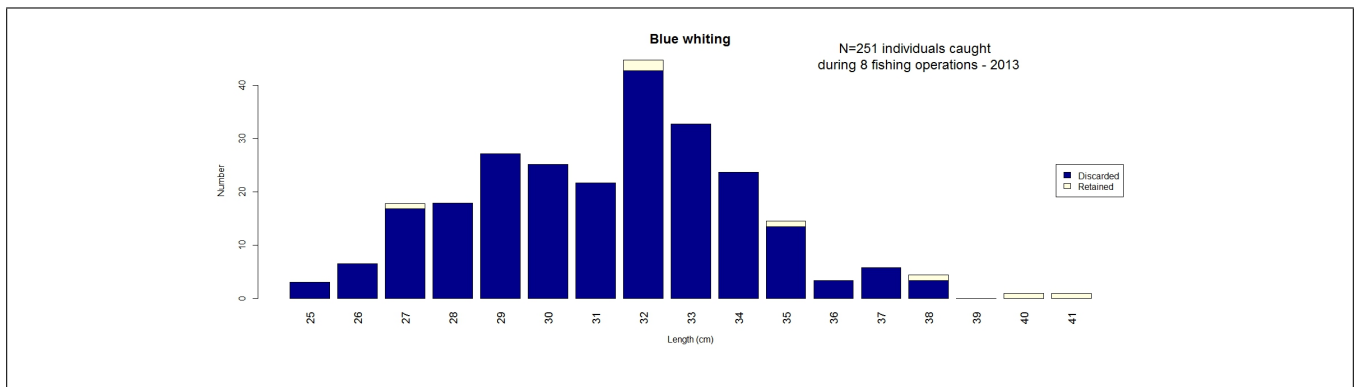


FIGURE 4.3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by French Gillnetters larger than 15 m in the Bay of Biscay

The fishing operations that target sole discard 20 to 30% of their catch, with high seasonal variability; bib, small spotted catshark, crustaceans and a wide diversity of fish species are discarded. The fishing operations that target hake catch mostly hake and generate small amounts of discards – mostly hake; but these figures are to be

taken with caution because they rely on few observations.

4.4 Reasons for discarding

A large part of the discards of commercial species in this métier is due to degradations by sea lice and predators.

4.5 Impact of the landing obligation

From 2016 on sole might be a problematic species for this métier. In the following years (depending on the calendar of full implementation of the landing obligation), anglerfish, pollack and whiting may become problematic species as well. Whiting and mackerel are deemed to be potentially problematic species by professional fishers. Apart from problematic species, impact of landing obligation on this métier might concern landing of catch damaged by sea lice which will have no value at all.

4.6 Other relevant information

Informal trials made by professional fishers suggest that little progress is expected to improve selectivity with respect to species. Size selectivity may be improved by increased mesh sizes (project REDRESSE). Exemption for high survival may be requested for sole, however we are not aware of any specific survival study for this species in this area.

5 LongLiners in the Bay of Biscay

5.1 Fleet

This métier is operated primarily by small vessels in coastal areas, mostly in the Northern Bay of Biscay (VIIIa). A diversity of fish species is targeted with various kinds of hooks and lines, with seabass the most common target in the North, and hake in the South. Trip last 1 day.

TABLE 5.1 – French longliners in the Bay of Biscay : vessels, landings, trips, and sampled fraction 2011 - 2013

Harbour	No trips landed in the harbour 2013	No observed trips 2013	Vessel length range (m) (average)	2013 Total landings (mt)
La Cotinière	1508	5	7-16(11)	313
Saint-Jean-de-Luz, Ciboure	1411	9	7-12(11)	305
Royan	1252	1	7-12(10)	228
Les Sables-d'Olonne	1451	3	6-15(10)	171
Le Croisic	507	4	9-10(10)	125
La Rochelle	507	1	8-22(10)	121
Concarneau	415	3	6-25(9)	106
Loctudy	236	2	8-11(8)	28
Boyardville	138	2	7-12(11)	21
Hendaye	90	3	10	11
Arcachon	83	1	5-8(8)	5
La Vigne (Lège-Cap-Ferret)	47	1	8	3
Autres ports (N = 74)	12672	0	5-38(11)	3864
Total	20317	38	5-38(11)	5303

	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	248	225	290	15239	15025	20317	17298	16549	21978
Observed	18	23	24	22	33	38	22	33	38
Sample fraction (%)	7.3	10.2	8.3	0.1	0.2	0.2	0.1	0.2	0.2

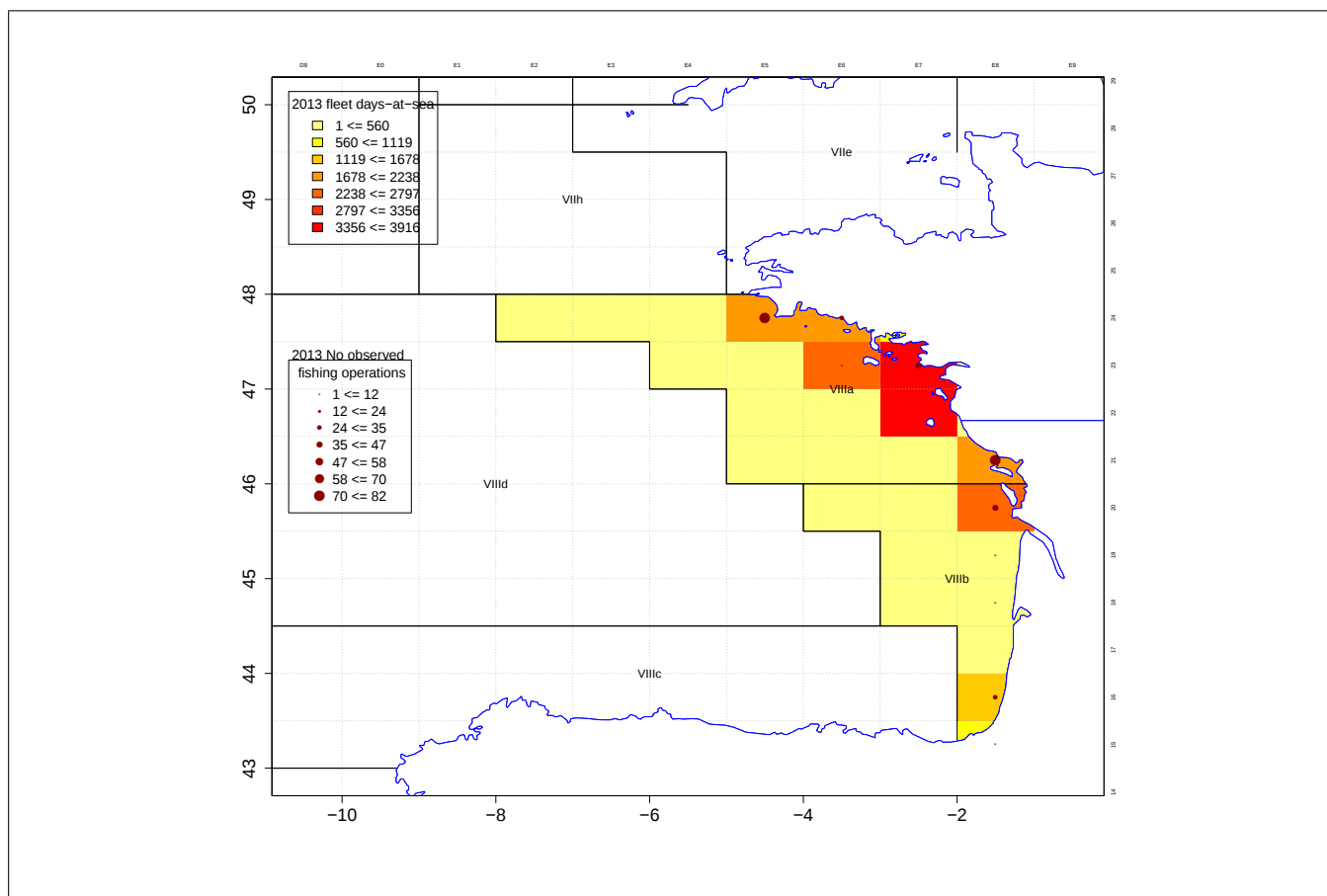


FIGURE 5.1 – Fleet activity (rectangle colours, days-at-sea) versus sampling effort (circles, no observed fishing operations) (2013)

The sampled fraction is low (<0.1%) for this métier. There is a lack of observation on the smallest vessels (<10m) owing to lack of space to accommodate observers. Sampling has generally been representative of seasonal activities, but spatial representativity is limited : the most fished areas around the Loire estuary have been scantily observed in 2012-2013.

5.2 Catch and discard estimates

TABLE 5.2 – Total catch and discards estimates by French longliners in the Bay of Biscay per stratum in 2013, Confidence Interval (CI) is provided for the catch ; landings and discards have CI with similar amplitude. FO fishing operations.

Quarter	Area	Métier	Catch (mt)	CI	Landing (mt)	Discard (mt)	Percent discarded (%)	No observed FO
2013 - 1	8.a	LLS_DEF	1414	[1286-1543]	1209	205	14.5	22
2013 - 1	8.b	LLS_DEF	253	[244-262]	230	22	8.8	17
2013 - 2	8.a	LLS_DEF	1126	[1099-1154]	1098	29	2.5	53
2013 - 3	8.a	LLS_DEF	1033	[986-1080]	989	44	4.3	98
2013 - 3	8.b	LLS_DEF	401	[361-441]	355	46	11.4	17
2013 - 4	8.a	LLS_DEF	1022	[888-1156]	852	170	16.6	26
2013 - 4	8.b	LLS_DEF	185	[176-195]	177	8	4.6	22

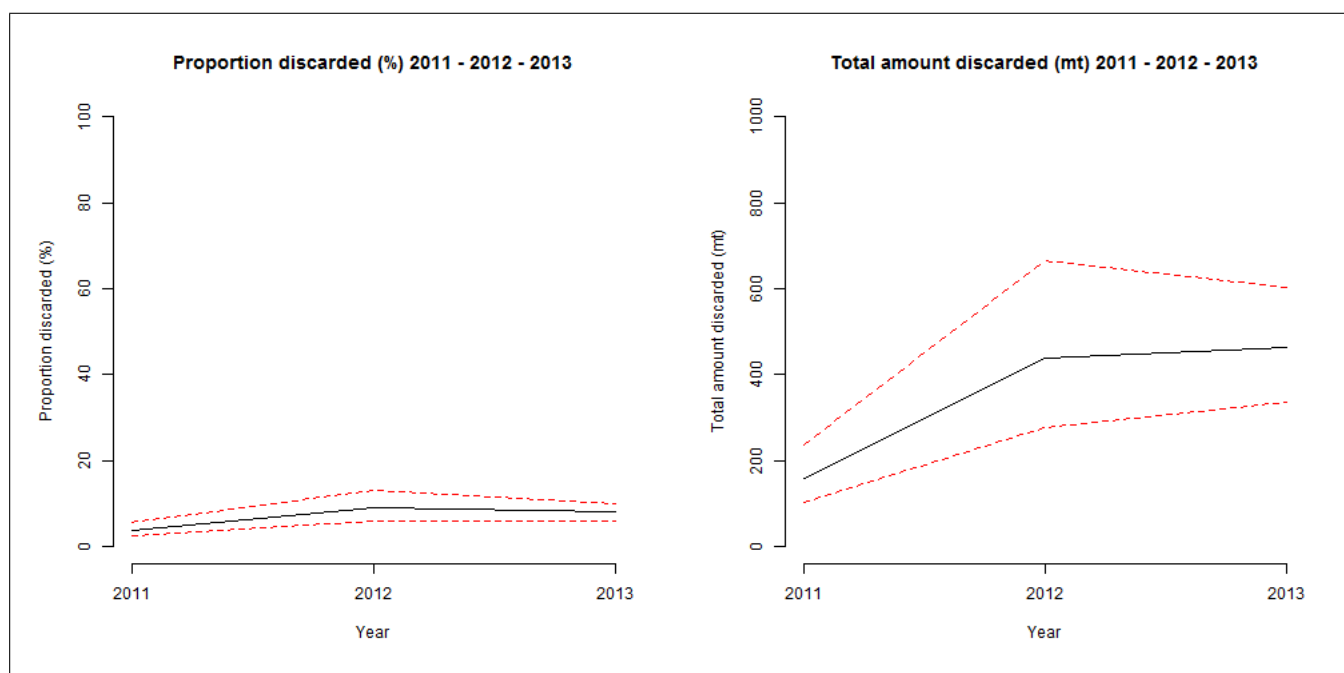


FIGURE 5.2 – Total amount and proportion discarded per year (2011 - 2013) by French longliners in the Bay of Biscay

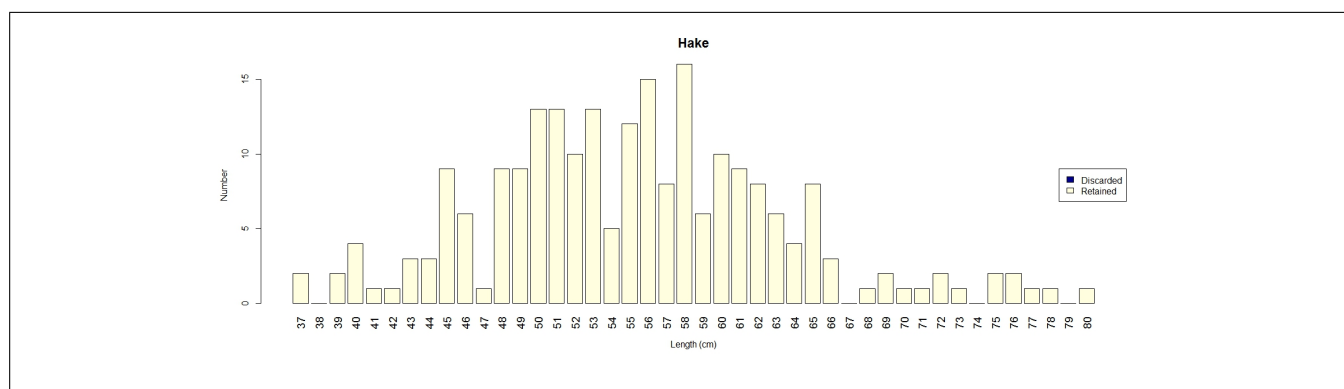
TABLE 5.3 – Estimated proportions discarded per species in weight, by French longliners in the Bay of Biscay, with their confidence interval (95%)

Species	Percent discarded (%)			Percent undersize in the species discards (%)		
	2011	2012	2013	2011	2012	2013
Hake	0 [0 - 0]	5.1 [0 - 15.4]	0.2 [0 - 0.5]	0	0	0
Sea bass	2.0 [1.0 - 3.1]	2.3 [1.1 - 3.4]	1.7 [1.1 - 2.6]	73.1	54.2	100
Whiting	1.9 [0.9 - 4.4]	0.9 [0.4 - 2.8]	0.8 [0.2 - 2.2]	34.0	4.2	10.4
Pollack	1.4 [0.4 - 3.6]	0.2 [0 - 1.1]	0.6 [0.2 - 1.2]	77.2	0	78.2
Blue whiting	26.1 [14 - 32.1]	100 [100 - 100]	53.9 [36.1 - 76]	NA	NA	NA

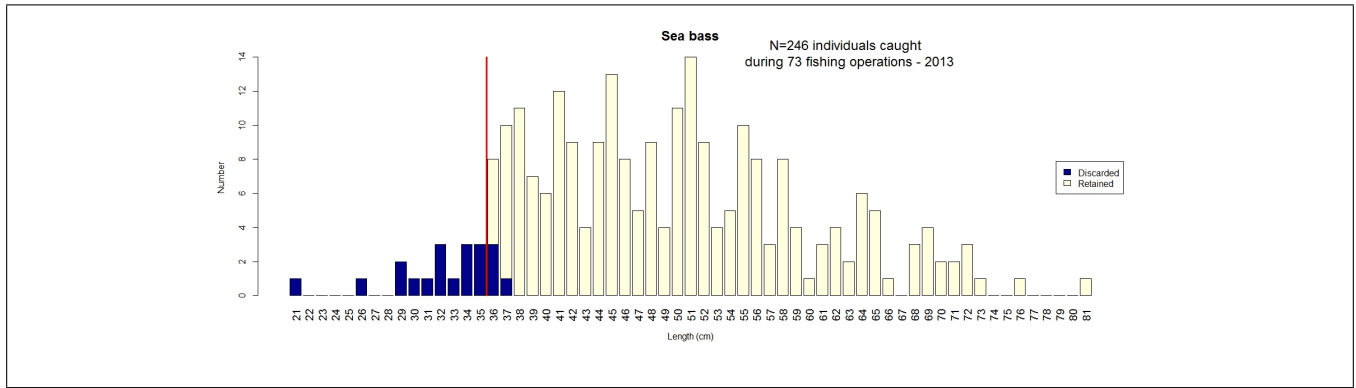
TABLE 5.4 – Caught and discarded weight of the main quota species caught by French longliners in the Bay of Biscay

Species	Catch (mt)			Discards (mt)		
	2011	2012	2013	2011	2012	2013
Hake	469 [144-894]	1098 [606-1726]	1297 [744-1913]	0 [0-0]	56 [0-194]	2 [0-7]
Sea bass	630 [389-1016]	593 [359-942]	1180 [874-1571]	12 [5-23]	14 [5-29]	21 [12-33]
Whiting	1615 [830-2296]	976 [286-1900]	1065 [632-1563]	30 [14-54]	9 [3-18]	8 [2-21]
Pollack	900 [435-1483]	602 [177-1164]	720 [388-1166]	13 [3-37]	1 [0-5]	4 [2-7]
Blue whiting	8 [0-17]	41 [20-70]	41 [18-70]	2 [0-7]	41 [20-70]	22 [10-38]

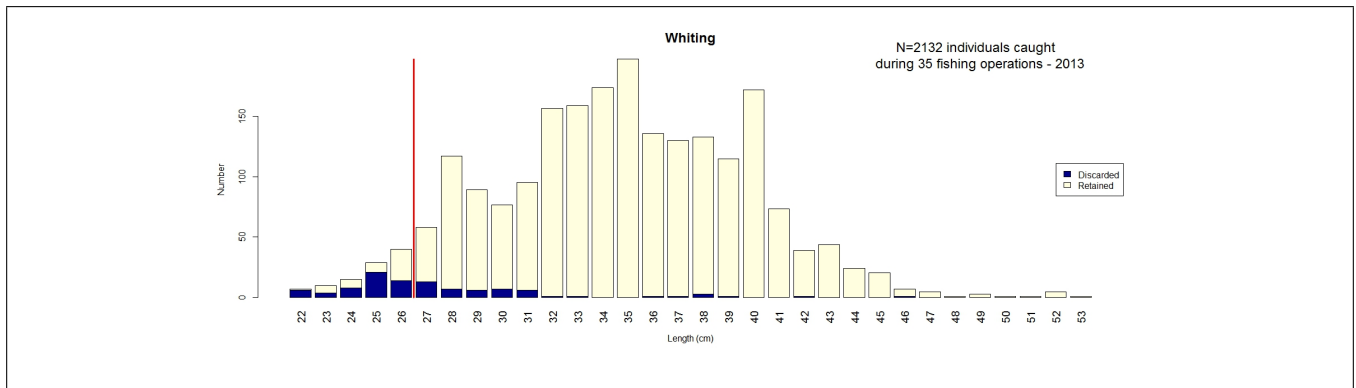
5.3 Length structure 2013



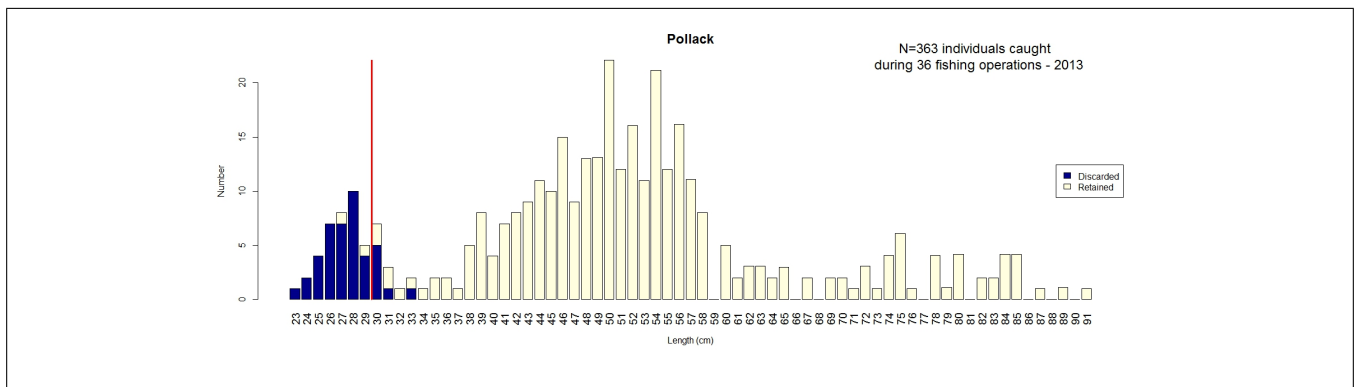
No hake discarded



80% of Sea bass discards in number are below the minimum landing size (36 cm)



52% of Whiting discards in number are below the minimum landing size (27 cm)



83% of Pollack discards in number are below the minimum landing size (30 cm)

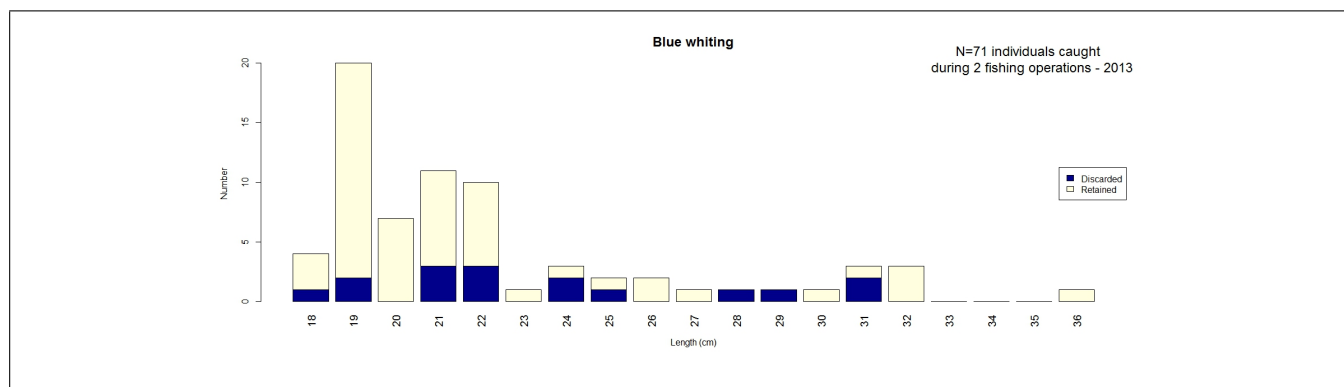


FIGURE 5.3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by French longliners in the Bay of Biscay

This métier generates few discards, less than 10% of the catch. Discards consist mostly of undersized seabass, species with low commercial value, such as conger eel or whiting, and other bycatch species such as rays or blue whiting.

5.4 Reasons for discarding

Discards of target species (seabass and pollack) are mostly undersized. Other species may be discarded for limited market or low value (conger eel, small spotted catshark...), or perhaps limiting quota (blue whiting to be investigated).

5.5 Potential problematic species

Whiting, pollack and blue whiting might become choke species as they become concerned by the landing obligation. However, impact may be limited since this métier discards small amounts.

3.2.4 Belgian métier

Beam trawls targeting sole in the Bay of Biscay TBB_DEF_70-99 (VIIIa en VIIIb)

Métier and fleet

Description of the métier			
Seasonal pattern of the fishing activity of the métier	Seasonal: june-july-august		
Number of vessels involved in metier by LOA group:	2013: 15 vessels with lengths between 34 and 39m 2012: 14 vessels with lengths between 34 and 39m 2011: 15 vessels with lengths between 36 and 39m		
Gear types and selectivity devices used in métier	Minimum mesh size only		
Main target and by-catch species for the métier	Main target: Sole. Main bycatch: Lophius species		
Indicate level of discard of major species (mostly subset of G1 or G2 species):	Species	Level of discarding	
	Hake	Occasional high	
	Monkfish	Occasional high	
Sampling of the metier			
Sampling scheme	Type of sampling	Sampling frame and primary sampling unit for data collection	Data collected and sampling method (concurrent, other)
	Observers at sea	Yes	Concurrent Catch, Discards
	Sampling landings on shore	Yes	Concurrent Stock specific
Particular sampling problems	Limited numbers of vessels and only have access to some of them.		
Additional remarks (historical and others):	Fleet size has contracted considerably due to decommissioning in previous years		

Landings and discards

The Belgian fishery in the Bay of Biscay takes mainly place in area VIIIb, discard sampling of the Belgian fleet takes place in the most fished areas of VIIIab (fig. 7).

Most landed species from the Bay of Biscay are sole and increasingly monkfish. For many species, there is no discard estimate available. Discarded proportion of monkfish varies between 13 and 26%, discarded proportion for sole is low (maximum 6%).

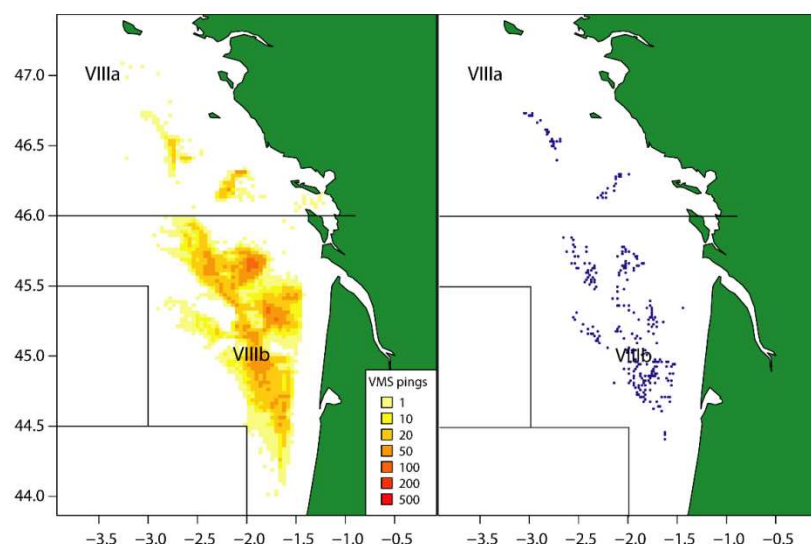


Fig. 1: Spatial distribution based on VMS and effort beam trawl mesh size 70 to 99 (TBB_DEF_70-99) in the Bay of Biscay (VIIIa & VIIIb) in 2009-2013 (left) and the position of sampling for discards in the discard sampling at sea for Belgium during 2009-2013 (right).

Table 1: Landings of main species caught by the Belgian beam trawl, meshsize (TBB_DEF_70-99) in de Bay of Biscay (VIIIab) and the corresponding discarded proportion (DP) calculated based on the onboard observer data.

VIIIab	2009		2010		2011		2012		2013
	Landings	DP	Landings	DP	Landings	DP	Landings	DP	Landings
Sole	359.794	3%	451.343	6%	386.402	2%	384.861		311.934
Anglerfish	197.795	26%	180.022	21%	196.227	13%	197.207	14%	377.440
Lesser spotted dogfish	23.702		28.210		27.371		31.272		22.872
Edible crab	17.022		12.123		3.423		10.896		14.830
Other demersal fish	14.718		13.755		6.844		10.931		1.866
Octopus sp.	9.881		12.469		13.624		14.651		21.802
Tub gurnard	7.180		4.718		8.755		8.303		14.740
Cuckoo ray	5.983		1.625		2.937		1.268		2.216
Megrim	5.533		3.092		10.176		7.183	22%	17.937
Hake	5.493	50%	4.808	46%	4.681	83%	2.486	87%	7.431
Turbot	5.151		4.544		5.614	0%	5.638	0%	2.219
Bib	3.383		7.787		7.390		2.885	99%	3.927
Common cuttlefish	915		474		6.115		16.066		6.675
Grey gurnard					219		320		5.991

The figures in this table were delivered by the Institute for Agricultural and Fisheries Research (ILVO) and are based on data from the onboard observer program from the Data Collection Framework.

The table shows the discarded proportions for sole and anglerfish (*Lophius budegassa* and *Lophius piscatorius*). The discarded proportion mentioned here, is defined as the proportion (%) of the live weight of the discarded fraction compared to the live weight of the catch (discards + landings).

The discarded proportion for *Lophius piscatorius* in 2013 is not mentioned in the table, because it does not meet the minimal quality norms. ILVO indicates that the discarded proportion for this species was unreliable last year.

ILVO also indicates that the discard data know a high variability and that the observer coverage is low. The Belgian fleet is only active during three months (June – July – August) in area VIIIab. For each year the results are only based on two sampled trips. The discard data are also variable depending on the vessel, area (and depth), catch composition, period of year, etc... Moreover observers warn for a distortion of the discard data because in some cases they find sand in the mouth of the fish. This can lead to a higher discard weight. **Therefore these numbers should be handled with care.**

Year	Species	Métier	Area	Discard rate (%)
2013	<i>Lophius budegassa</i>	TBB_DEF_70-99	VIIIab	15.0
2013	<i>Solea solea</i>	TBB_DEF_70-99	VIIIab	0.3
2012	<i>Lophius budegassa</i>	TBB_DEF_70-99	VIIIab	30.0
2012	<i>Lophius piscatorius</i>	TBB_DEF_70-99	VIIIab	11.0
2012	<i>Solea solea</i>	TBB_DEF_70-99	VIIIab	1.0
2011	<i>Lophius budegassa</i>	TBB_DEF_70-99	VIIIab	72.0
2011	<i>Lophius piscatorius</i>	TBB_DEF_70-99	VIIIab	13.0
2011	<i>Solea solea</i>	TBB_DEF_70-99	VIIIab	2.0

4 Recommendations

In the countries fishing in South Western Waters, as in many other EU member states, the lack of clearly demonstrated benefits of landing all catches undermines the perceived legitimacy of the regulation and thus, the will to comply from the industry. However, in a context where limited resource will be available for monitoring, controlling and enforcing the landing obligation, the will to comply will be a key element in the actual implementation of the regulation. If fishers buy into the purposes of the new regulation and cooperate, discards of the quota species will decrease; if on the other hand, they are not convinced that the measure can do any good, they might keep behaving as under the former CFP. They may underreport their catches, and refuse onboard observers or behave differently when observers are onboard. In that case the landing obligation may result in more pressure on stocks (higher total catches) and a deterioration of the information about catches, both from the logbooks and the sampling programmes. The legitimacy issue is therefore one of the most important and urgent issues to be addressed and resolved to make the implementation of the landing obligation as successful as possible.

Therefore the solutions suggested below are to be taken in a broad sense, and could be implemented in different ways. Partial closures can either be decided top-down and enforced by law; or they can be left to the fishers, with appropriate incentives to encourage them to restrain from fishing in places and/or times with high levels of unwanted bycatch. More bottom-up approaches to implement the landing obligation may help the legitimacy and commitment of the fishers, thus the compliance. Commitment might need to be encouraged with financial incentives – or compensation for initial losses.

As for exemptions for high survival rates, it should be kept in mind that partial survival will result in unaccounted for fishing mortality. For example, if high survival would be defined as 50%, then any species of which 51% of discarded individuals survive would not be concerned by the landing obligation. As a result, almost half of the discards would die. Theoretically, discards should be reported in accordance with the rules related to catch declarations. This would enable to know the amounts of discarded individual, and even estimate the amounts surviving and not surviving if a reliable survival rate estimate is available. However, there will be a trade-off between information and conservation, in the sense that any effort to appraise or measure the amounts discarded will imply more catch handling, and thus work against discard survival. Depending on the level of discards this might generate significant amounts of unaccounted for mortality for these stocks.

Confidence intervals provided for the discard estimates reported in this atlas illustrate that in most cases, the current sampling effort (typically 0.5 – 1% of fishing trips) does not allow to meet the target precision as prescribed by the current DCF (20%). This should encourage to call for higher sampling effort in the future. Furthermore, unless the landing obligation is efficiently enforced, biases in onboard observer programmes might change. Onboard observer programmes are known to incur two kinds of biases: deployment bias (when samples are not representative of the actual fishing activity), and observation bias

(when fishers behave differently when an observer is onboard). These two kinds of bias are likely to increase significantly as discarding a part of the catch becomes prohibited. The only way to avoid these biases is to ensure a 100% observer coverage; this might not be affordable for the fleets operating in the South Western Waters though, as they include large numbers of small vessels which carry out many short (daily) fishing trips. Onboard observer programmes will need to evolve towards *e.g.* self sampling programmes, or other monitoring schemes that need to be defined.

Another recommendation arises from the novelty of questions raised by the landing obligation – those related with survival of discards and the practices that reduce mortality, and the renewal of selectivity studies. When knowledge gaps are identified it is important to continue and improve knowledge, and to develop new research projects.

4.1 Potential choke species in the South Western Waters

Which species are potential choke species is essentially difficult to tell because quota uptake varies at the micro-scale of fishers organizations, for which detailed data are not available. At the country scale, the following species may become choke species:

- France: sole, blue whiting, mackerel, anglerfish, and whiting
- Spain: hake, blue whiting, mackerel, and horse mackerel
- Portugal: hake.

Based on these lists, on the analysis of the métiers results above, and on interviews with fishers in various projects, species that may become choke species for specified métiers under the landing obligation, depending on stock fluctuations, are listed in Table 4.1. The unknown is the pace of implementation of the landing obligation for the species that do not define the fisheries – those species will be concerned by the landing obligation at some time between 2017 and 2019.

One of the mechanisms to deal with choke species (other than *de minimis* exemption) is what is known as interspecies flexibility, which is essentially an old mechanism with a new function. This mechanism works by assigning a part of the quotum of a target species (the donor quotum) to catches of by-catch species (the receiver quota) when the quota for the latter have been exceeded and there is no concern of overexploitation (i.e. they are exploited within safe biological limits of precautionary limits – biomass above Bpa and fishing mortality below Fpa), provided also that a maximum 9% of the donor quotum is assigned to all receiver quota. Even though it was created as a means to allow some flexibility around the quotum for low abundance species which might occasionally exceed the usual abundance levels and otherwise limit the operation of the fleets, it has now also been seen as a mechanism to help accomodate the additional landings resulting from the application of the discard reduction policy. Therefore, with the application of the discard reduction policy to hake, for instance, fleets targetting other species that may catch a significant weight of undersized hake, can assign the landings of the latter to the quotum of the target species, thus freeing up some hake quotum for landings of commercially valuable sized fish. This will reduce the impact on some species as choke species.

Table 4.1. Potential choke species for the demersal métiers operating in South Western Waters.

Métier	Potential choke species in 2016	Potential choke species later on
Portuguese métiers		
OTB_>70mm	Hake	
GNS_>80mm	Hake	
GTR_>100mm, LLS		
Spanish métiers		
PTB_DEF_VIIIabd	Hake	Mackerel, horse mackerel, blue whiting, boarfish
OTB_DEF_VIIIabd	Hake	Mackerel, horse mackerel, blue whiting
OTB_DEF_CEP_VIIIabd	Hake	Mackerel, horse mackerel, blue whiting
PTB_DEF_VIIIc_IXa	Hake	Blue whiting, horse mackerel, mackerel , boarfish
OTB_MPD_VIIIc_IXa	Hake	Blue whiting, horse mackerel, mackerel , boarfish
OTB_DEF_VIIIc_IXa	Hake	Blue whiting, horse mackerel, mackerel , boarfish
GNS_DEF_60-79_VIIIc_IXa	Hake	Mackerel
GNS_DEF_80-99_VIIIc_IXa		Mackerel
LLS_DEF_VIIIc_IXa		

French métiers

OTB_OTT_PTB_DEF_CEP_VIIIab	Sole	Whiting, mackerel, anglerfish, blue whiting, boarfish
OTB_OTT_CRU_VIIIab	Hake, sole	Blue whiting, anglerfish
GTR_GNS_DEF_CRU_Inf15m_VIIIab	Sole	Whiting, mackerel, anglerfish, pollack
GTR_GNS_DEF_CRU_Sup15m_VIIIab	Sole	Whiting, mackerel, anglerfish, pollack
LLS_DEF_LHM_LHP_FIF_VIIIab	None	Whiting, blue whiting, pollack

Belgian métier

TBB_DEF_70-99_VIIIab	Sole
----------------------	------

4.2 Potential measures to comply with the Landing Obligation

4.2.1 Portuguese métiers

Possible recommendations for the Portuguese otter trawl fisheries include the increase in selectivity, particularly by the use of selective devices (Campos, 2003). The increase in mesh size is likely to be non-feasible due to the multi-species nature of the fishery. It would be advisable to conduct additional survival experiments. Avoidance of sensitive periods (recruitment peaks) should be considered. In cases where no survivability is demonstrated and no improvement in selectivity is possible a decrease in the MCRS could also be considered.

For the Portuguese demersal trawl fisheries, avoidance of sensitive areas (recruitment hotspots) is a valid alternative.

4.2.2 Spanish métiers

4.2.2.1 Trawlers operating in the Bay of Biscay

In the case of pair bottom trawlers, some selective devices could significantly reduce the pelagic fraction of the unwanted catches. A study to assess the real impact of these selective devices is planned to start soon. In addition, the codend configuration may have great significance on the selectivity, thus possible alternatives of the codend parameters, such as material and mesh configuration, should be studied.

On the other hand, in the case of otter bottom trawlers, the mixed composition of the catch, with a high number of species caught (>100 spp), makes it difficult to find a selective device for the reduction of the choke species without affecting the catches of the rest of the wide range of target species. Moreover, many of those target species are not subjected to TAC and MCRS. Nevertheless more selectivity studies should be carried out focusing on the main choke species with a time basis, that is, taking into account the

seasonality of each of the choke species. In this way it would be possible to propose more precise solutions.

In relation with the fishermen fishing tactics, fishermen will probably avoid those areas in which the choke species concentration is high because there is a strong regulatory incentive to do so. In this sense, real time communication among fishermen would be essential for the effective avoidance of “Choke areas”. Currently, the communication among fishermen within the same metier is common, sharing information on catches (target and non-target or choke species), and it will be likely more frequent under implementation of the landing obligation.

4.2.2.2 Trawlers operating in Spanish Iberian waters

Over the past ten years several pilot projects aboard commercial vessels have tested selectivity trawl gears, including square meshes and changes on mesh size and geometry. The selectivity projects have been carried out by Instituto Español de Oceanografía (IEO) working together with fisheries companies and associations. Pilot projects set up the theoretical selectivity measures and selectivity trials have been conducted focus on square mesh, mesh netting geometry and mesh size able to balance the roundfish by-catch avoidance.

Most of the selectivity results have not been implemented. Only legal regulation on minimum mesh size have change gears. Due to the mixed nature of trawling fisheries the selectivity changes have limited efficacy and easy to use in practice. Fishermen do not want to use new fishing nets that may interfere or pose significant changes in their way of fishing and produce an unwanted efficacy on catching the target species but also bycatch of several valuable species.

For NWW fisheries, Galician fisherman organizations agreed from 2004 to control landings of megrim under 25 cm size through internal association quota by fishing boat (current mandatory MLS: 20 cm). This fishing sector measure aims at avoiding small megrim fishing and marketing, and high-grading. But in SWW métiers this rule was not implemented. A decrease in the MCRS could be considered if selectivity does not improve in the medium-short term.

Currently several temporal or permanent spatio closures exist in northwest Iberian waters and it will be difficult to reach an effective agreement to close new areas. Despite this, some progress could be expected using real-time closures to avoid high discarding areas, specially choke-species areas.

4.2.2.3 Passive gears operating in the Bay of Biscay

The Spanish gillnet metiers targeting hake mostly discard species with no quota or damaged fish (sea lice and predators). Seasonally, mackerel can be a “choke species” because insufficient quota. Fleet of these metiers suggests more favorable distribution of mackerel quota to reduce the discarding of mackerel.

The duration of soak time and type of seabed are the main reason of fish damaging by scavenger invertebrates.

Also several unwanted species with low value are discarded as bycatch but seems difficult to implement selectivity of gillnets with larger meshsizes.

4.2.3 French métiers

4.2.3.1 Trawlers

Both French trawl métiers in the Bay of Biscay (OTB_OTT_PTB_DEF_CEP_VIIIab and OTB_OTT_CRU_VIIIab) have used small mesh sizes and caught large amounts of undersized fish. An obvious measure would be to encourage these fleets to use larger mesh sizes and abandon completely mesh sizes <80 mm in the codend. Depending on the target species much larger mesh sizes can be deployed.

The *Nephrops* trawlers in the Bay of Biscay have developed many projects to improve the selectivity of their gear. However, many of the technical developments have not been implemented, and for those that are actually implemented (as per the 2008 regulation), they have had limited uptake and efficacy. This is partly because of the mixed nature of the fishery, and thus, also applies to the demersal fish and cephalopods trawlers. These vessels land a mix of species, several of which have high value. Any device which effectively reduces the unwanted bycatch of some species most often also affects the marketable catch of another species. As a result, fishers have little incentive to adopt the new gears. Despite this experience there are a number of trials going on in these fisheries, under *e.g.* the Redresse project. Given the amount of current discards, technology on its own is not going to solve the issue of selectivity with respect to species for these métiers, but some progress can be expected.

The same reasoning applies to spatio-temporal partial closures. Any decrease in *e.g.* hake discards is likely to decrease the marketable catch of *Nephrops* or other target species. So it seems difficult to implement a displacement of effort, especially in a top-down setting.

Recent studies have developed the use of other gears, such as traps, to catch *Nephrops*. This might be an interesting solution as traps generate less discards and yield more valuable catches than trawls. Other gear development and the transfer of effort from trawling to these new gears is an option for *Nephrops*.

4.2.3.2 Gillnetters

The French net-related métiers in the Bay of Biscay (GTR_GNS_DEF_CRU_Inf15m_VIIIab and GTR_GNS_DEF_CRU_Sup15m_VIIIab) discard mostly undersized individuals of target species and damaged catch. The latter might be partly solved by decreasing soak duration, so that the sea lice would not have time to damage the catch too much. Larger mesh sizes might address the size-selectivity issue. Trials along these lines, along with new net materials, have been undertaken as part of the Redresse project.

Another bycatch issue for these métiers is created by occasional large catches of low-value species such as mackerel. According to the fishers, this is generally addressed at the individual vessel level by changing fishing place. It is not likely that any legislation (temporary spatial closure) could be useful here, because the scales of operations are fine.

Fishing places need to be changed within days or weeks and only when mackerel is present, which is variable and unpredictable. It may be more efficient to help implementing these spatio-temporal tactics at the fleet level by sharing information in real time, *e.g.* by supporting the development of a fleet-scale communication system.

4.2.3.3 Longliners

LLS_DEF_LHM_LHP_FIF_VIIIab – this métier is likely to develop the appropriate solutions without any specific measure, given the current, limited amount of discards and the reasons for discarding.

4.3 *Ongoing projects, knowledge gaps and recommended research*

A number of research projects have been undertaken, or will be shortly launched, to investigate the bycatch issues and discard mitigation strategies in the SWW region (Table 4.2). However, a large number of knowledge gaps persist. Further research would be relevant to the move towards reduced bycatch and improved catch utilization necessary to comply with the landing obligation. Since discarding is widely variable in time, space, among countries and fishing activities, and even individual fishers and fishing operations, this research needs to be métier-specific. Important topics to be investigated include:

- Design and testing of selective devices
- Factors influencing the practical deployment of selective devices
- Changes in spatio-temporal fishing strategies – real-time fishing effort control, closed areas, shared information...
- Changes in approaches and tools for sorting the catch
- Survival of discarded bycatch, especially on the longer term (days to months)
- Changes in tactics for managing quotas (at individual or Producer Organization levels)
- Marketing strategies for lower value catch
- Impacts of quota restrictions on discarding
- Incentives for discard reduction.

Table 4.2. Projects related to selectivity recently ended, going on, or expected to start in the near future, relevant to the demersal fisheries in the South Western Waters.

Name	Duration	Main partners	Project objective	Target métier(s)
Redresse	2014-2017	Agria, Ifremer, CNPMM, CCR-Sud	Find and test strategies to reduce discards in the Bay of Biscay by experiments onboard professional vessels	OTB_OTT_PTB_DEF_CEP_VIIIab, OTB_OTT_CRU_VIIIab, GTR_GNS_DEF_CRU_Inf15m_VIIIab, GTR_GNS_DEF_CRU_Sup15m_VIIIab
Simbad	2013-2015	CCR-Sud, AZTI, Ifremer, IPMA	Propose strategies to decrease the volume of discards	PT_OTB_>70
Bakasel	2011-2012	AZTI	Test of square mesh panels on OTB	OTB_DEF_VIIIabd
SELGAV (to be confirmed)	2014-2015	AZTI	Selectivity improvement on PTB	PTB_DEF_VIIIabd
TRASEL	1998	IEO	Selectivity test of mesh	PTB_DEF_>=55
REDES	2009-2011	IEO	Selectivity improvement	OTB_DEF_>=55
ASPAL	2012	IEO	Selectivity test of mesh panels and rope	OTB_DEF_>=55

References

- Anonymous, 2001. Las artes de pesca en el litoral gaditano. Diputación Provincial de Cádiz. 245 pp.
- Anonymous, 2006. Identification and segmentation of mixed-species fisheries operating in the Atlantic Iberian peninsula waters (IBERMIX project). Final Report to European Commission Directorate-General for Fisheries and maritime Affairs (Contract Ref.: FISH/2004/03-33).
- BOE, 2013. Orden AAA/627/2013, de 15 de abril, por la que se establece un Plan de gestión para los buques de los censos del caladero nacional del Golfo de Cádiz.
- Campos, A. 2003. The estimation and improvement of the selectivity in crustacean and fish trawls. Phd Thesis. Universidade do Algarve.
- Castro, M. Araujo, A., Monteiro, P., Madeira, A., Silvert, W. 2003. The efficacy of releasing caught Nephrops as a management measure. Fisheries Research 65: 475-484.
- Catchpole, T. L., Feekings, J., Madsen, N., Palialexis, A., Vassilopoulou, C., Valeiras, X., Garcia, T., Nikolic, N., and Rochet, M. J. 2013. Using inferred drivers of discarding behaviour to evaluate discard mitigation measures. ICES Journal of Marine Science, doi : 10.1093/icesjms/fst170.
- Cornou, A.-S., Dimeet, J., Tetard, A., Gaudou, O., Dubé, B., Fauconnet, L., and Rochet, M. J. 2013. Observations à bord des navires de pêche professionnelle. Bilan de l'échantillonnage 2012. <http://dx.doi.org/10.13155/27787>. 365 pp.
- European Union. 2013. Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC. Official Journal of the European Union L 354:22-61.
- European Union. 2005. Regulation nº 2166/2005. Council Regulation (EC) No 2166/2005 of 20 December 2005 establishing measures for the recovery of the Southern hake and Norway lobster stocks in the Cantabrian Sea and Western Iberian peninsula and amending Regulation (EC) No 850/98 for the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms.
- FAROS Project, 2011. FAROS "Integral Networking of Fishing Sector Actors to Organize a Responsible Optimal and Sustainable exploitation of Marine Resources" Project.
- Fonseca, P., Campos, A., Mendes, B., Fonseca, T., 2006. Grelhas selectivas para exclusão de juvenis de lagostim em arrastões comerciais. IPIMAR divulgação nº 34. In Portuguese.
- Graham, N., and Ferro, R. S. T. 2004. The Nephrops fisheries of the Northeast Atlantic and Mediterranean – A review and assessment of fishing gear design. Ad hoc Group of Fishing Technology and Fish Behaviour and the Working Group on Fishing Technology and Fish Behaviour.
- ICES WGBIE, 2014. Report of the Working Group for the Bay of Biscay and the Iberian waters Ecoregion (WGBIE), 7–13 May 2014, Lisbon, Portugal. ICES CM 2014/ACOM:11. 714 pp. <http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2014/WGBIE/01%20WGBIE%20report%202014.pdf>

- ICES WGEF, 2014. Report of the Working Group on Elasmobranch fishes. http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2014/WGEF/wgef_draft_2014.pdf
- ICES. 2004. The *Nephrops* fisheries of the Northeast Atlantic and Mediterranean – A review and assessment of fishing gear design. ICES Cooperative Research Report, No. 270. 40 pp. Edited by Graham, N., and Ferro, R. S. T.
- Ifremer. 2012. Manuel de l'Observateur à bord des navires de pêche commerciaux. http://sih.ifremer.fr/content/download/5587/40495/file/Manuel_OBSMER_V2_2_2012.pdf
- Jardim, E., Fernandes, A. C., 2013. Estimators of discards using fishing effort as auxiliary information with an application to Iberian hake (*Merluccius merluccius*) exploited by the Portuguese trawl fleets. Fisheries Research 140: 105-113.
- Pérez, N., P. Pereda, A. Uriarte, V. Trujillo, I. Olaso y S. Lens. 1996. Discards of the Spanish fleet in ICES Divisions Study Contract DG XIV. PEM/93/005.
- PNAB DCF National Biological Sampling Program / Data collection Framework.
- Portaria nº 1102-C/2000 Diário da República: I Série-B ; 270. 2.º Suplemento. 2000-11-22, pág. 6692-(9-10). National regulation for the Portuguese line fisheries. In Portuguese.
- Portaria no. 1102-E/2000. Diário da República: I Série-B ; 270. 2.º Suplemento. 2000-11-22, pág. 6692-(12-16). National regulation for the Portuguese trawl fleet. In Portuguese.
- Portaria nº 1102-H/2000 Diário da República: I Série-B ; 270. 2.º Suplemento. 2000-11-22, pág. 6692-(20-22). National regulation for the Portuguese gillnet fisheries. In Portuguese.
- Portaria nº 43/2006. Diário da República: I Série-B; N.º 9—12 de Janeiro de 2006. pág. 319. National regulation. In Portuguese.
- Prista N., Fernandes A.C., Gonçalves P., Costa A.M., Silva A., 2014. Update on the discards of WGWISE species by the Portuguese bottom otter trawl fisheries in ICES Division IXa (2004-2013). Working Document presented to the ICES Working Group on Widely Distributed Stocks (WGWISE), 26 August - 1 September 2014, ICES Headquarters, Copenhagen, Denmark, 18p.
- Silva, L., Castro, J., Punzón, A., Abad, E., Acosta, JJ. and M. Marín. Metiers of the Southern Atlantic Spanish bottom trawl fleet (Gulf of Cádiz). WD 5 presented in WGHMM2007.
- Uhlmann, S. S., van Helmond, A. T. M., Stefánsdóttir, E. K., Sigurðardóttir, S., Haralabous, J., Maria Bellido, J., Carbonell, A., Catchpole, T., Damalas, D., Fauconnet, L., Feekings, J., Garcia, T., Madsen, N., Mallold, S., Margeirsson, S., Palialexis, A., Readdy, L., Valeiras, J., Vassilopoulou, V., and Rochet, M.J. 2013. Discarded fish in European waters: general patterns and contrasts. ICES Journal of Marine Science, doi:10.1093/icesjms/fst030.
- Valeiras, J., Araujo, H. and Pérez, N., 2012. Estimates of Spanish bottom otter trawl boarfish (*Capros aper*) discards by area in the Northeast Atlantic area. Working Document. Report of the ICES Working Group on Widely Distributed Stocks (WGWISE), 21-27 August 2012, Lowestoft, United Kingdom
- Valeiras, J., J. M. Bellido, M. Mendoza, H. Araujo and N. Pérez, 2012. Fishing discards in the Spanish otter-trawl fishery: Discard rates and indicators of bycatch of key species in north Iberian waters. XIII International Symposium on Oceanography of the Bay of Biscay, ISOBAY13. 11-13 April 2012, Santander