



ISEAS



Discards in North Spanish Iberian trawl fisheries Quantification of discards in target fisheries

Instituto Español de Oceanografía

Grupo de investigación en Descartes Pesqueros IEODESMAR

Julio Valeiras xulio.valeiras@vi.ieo.es IEO-Vigo



OPROMAR

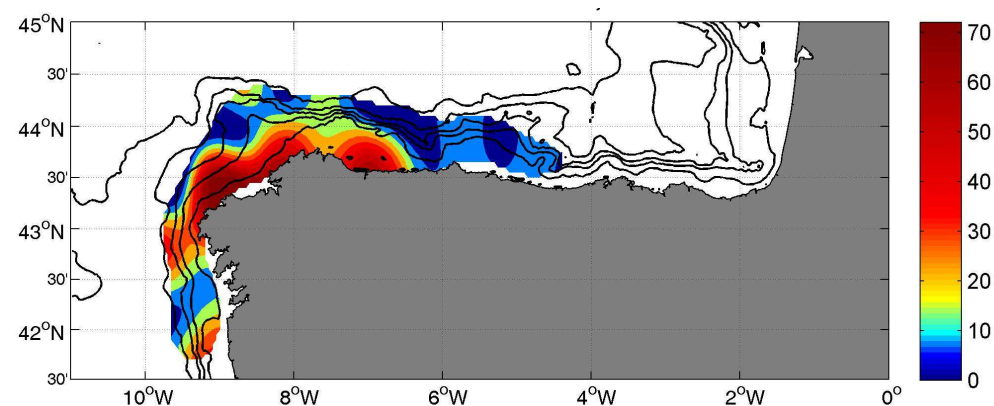


Talleres JOSMAR, S.L.

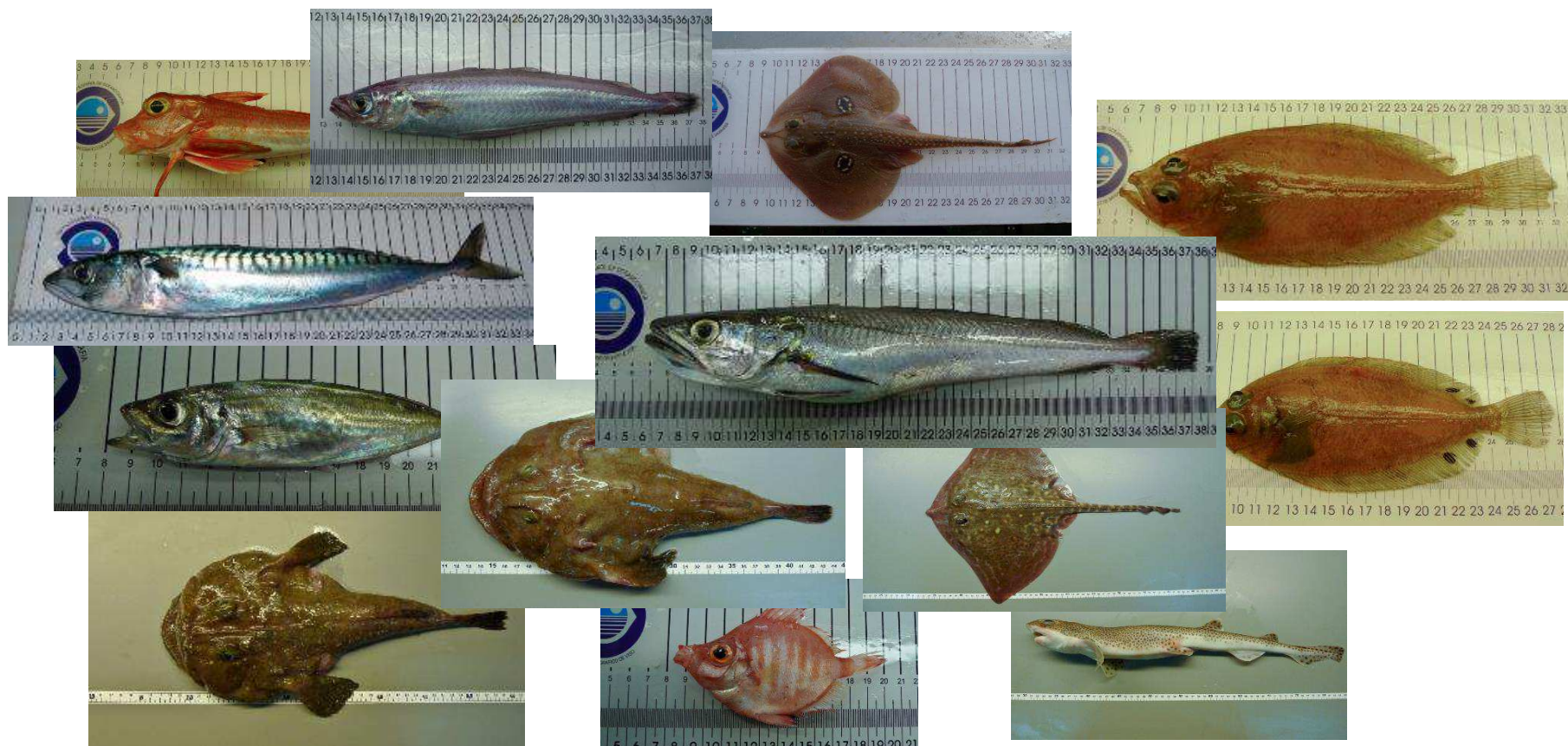


North Spanish Iberian trawl fisheries: The metiers

1. Otter bottom trawl targeting demersal species (OTB_DEF_ ≥ 55) in north Iberian waters ('Baca')
2. Otter bottom trawl targeting pelagic and demersal species (OTB_MPD_ ≥ 55) in north Spanish Iberian waters ('Gran abertura')
3. Pair bottom trawl targeting pelagic and demersal species (PTB_MPD_ ≥ 55) in north Spanish Iberian waters ('Pareja')



North Spanish Iberian trawl fisheries: The species





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

Metier patterns:

- Operating in the Northern and Western coastal waters (ICES Divisions VIIIc and IXa)
- Fishing grounds: continental shelf and upper slope of NW Spanish waters and Cantabrian Sea and several vessels in Portugal waters.
- All year around. Trips short/large
- Vessels with 28 m of average length.
- From about 12 fishing ports: Galicia (A Coruña, Burela, Celeiro, Corme, Marin, Muros, Muxia, Ribeira, Vigo), Asturias (Avilés, Gijón) and Cantabria

Targeting demersal species, standing out:

- Hake (*Merluccius merluccius*)
- Megrims (*Lepidorhombus boscii* and *L. whiffiagonis*)
- Anglerfish (*Lophius piscatorius* and *L. budegassa*)
- Norway lobster (*Nephrops norvegicus*)
- Blue whiting (*Micromesistius poutassou*)
- Horse mackerel, (*Trachurus trachurus*)
- Mackerel (*Scomber scombrus*)



	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

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

IEO onboard observer program (UE-DCF)



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

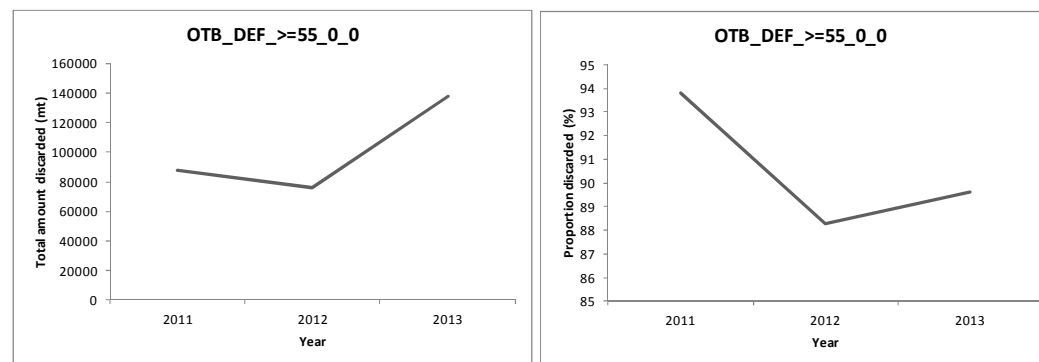
Catch and discard estimates

Mixed bottom trawl fishery

Large variability by haul, species, vessel...

Interannual and season variability

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')



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

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.



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

Catch and discard estimates

Discard ratios

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 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%)



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

Catch and discard estimates Length structure

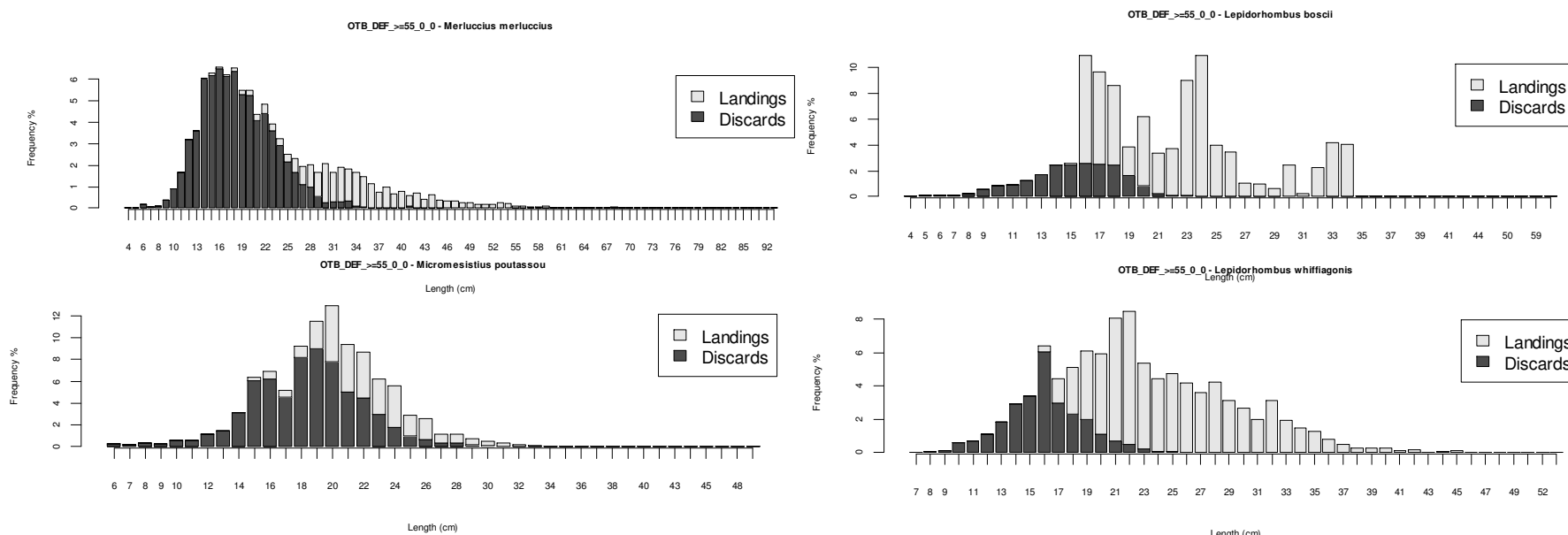


Figure 3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by Spanish otter bottom-trawlers in north Spanish Iberian waters OTB_DEF_>=55 ('Baca')

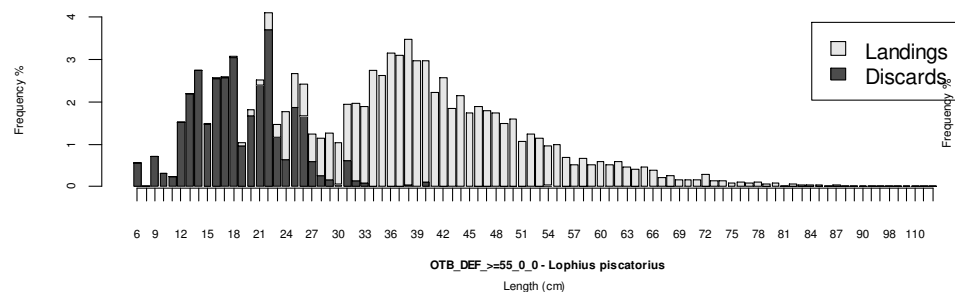


Otter bottom trawl targeting demersal species (OTB_DEF_>=55) in north Spanish Iberian waters ('Baca')

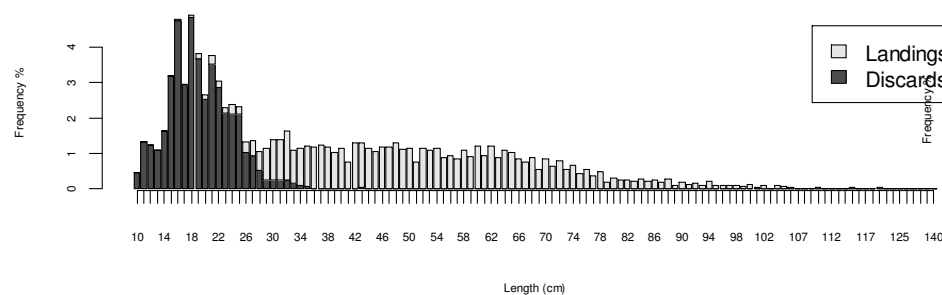
Catch and discard estimates

Length structure

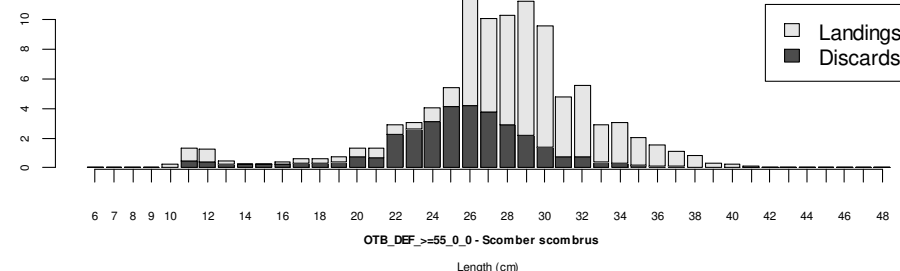
OTB_DEF_>=55_0_0 - *Lophius budegassa*



OTB_DEF_>=55_0_0 - *Lophius piscatorius*



OTB_DEF_>=55_0_0 - *Trachurus trachurus*



OTB_DEF_>=55_0_0 - *Scomber scombrus*

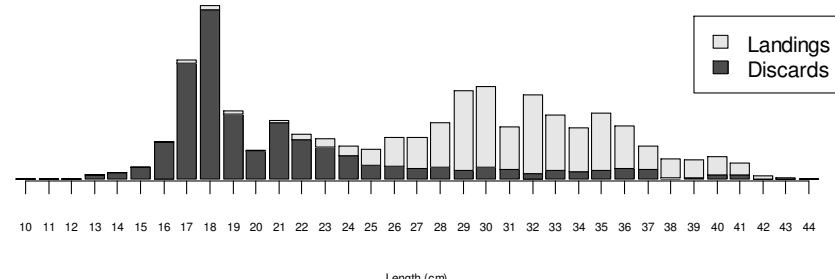


Figure 3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by Spanish otter bottom-trawlers in north Spanish Iberian waters OTB_DEF_>=55 ('Baca')



Otter bottom trawl targeting pelagic and demersal species (OTB_MPD_>=55) in north Spanish Iberian waters ('Gran abertura')

Metier patterns:

- Operating in the Northern and Western coastal waters (ICES Divisions VIIIc and IXa)
- Fishing grounds: continental shelf and upper slope of NW Spanish waters and Cantabrian Sea.
- All year around. Daily trips
- Vessels with 28 m of average length.
- From about 12 fishing ports: Galicia (A Coruña, Burela, Celeiro, Corme, Marin, Muros, Muxia, Ribeira, Vigo), Asturias (Avilés, Gijón) and Cantabria

Targeting demersal species, standing out:

- Horse mackerel, (*Trachurus trachurus*)
- Mackerel (*Scomber scombrus*) –seasonally-



OTB_MPD_>=55_0_0	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	62	68	58	4315	4132	2862	5123	5003	3630
Observed	10	7	9	28	31	35	34	36	40
Sample fraction (%)	16.1	10.3	15.5	0.65	0.75	1.223	0.66	0.72	1.102

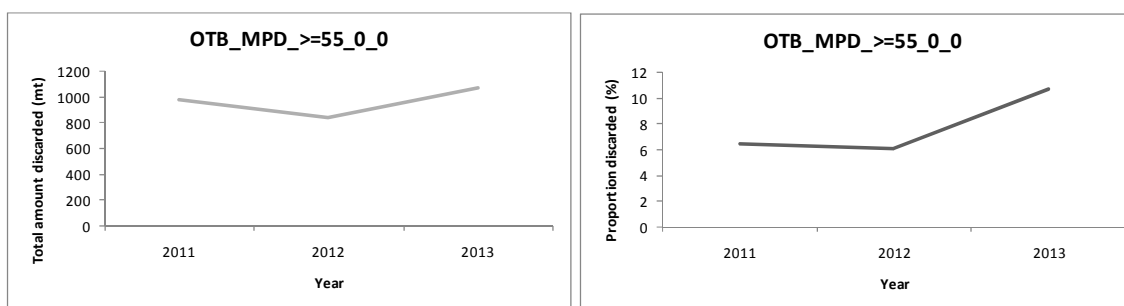
Table 1 – Spanish pair bottom trawl fleet (OTB_MPD_>=55_0_0): vessels, landings, trips, and sampled fraction 2011 – 2013

IEO onboard observer program (UE-DCF)



Otter bottom trawl targeting pelagic and demersal species (OTB_MPD_ \geq 55) in north Spanish Iberian waters ('Gran abertura')

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



Catch and discard estimates

Mixed bottom trawl fishery

Large variability in discard ratios by haul

Interannual and season variability

Quarter	Area	Métier	Catch (mt)	Landing (mt)	Discard (mt)	Percent discarded (%)	Nº observed hauls
1	8C	OTB_MPD_ \geq 55_0_0	3223	3000	223	6.9	20
2	8C	OTB_MPD_ \geq 55_0_0	2902	2568	333	11.5	42
3	8C	OTB_MPD_ \geq 55_0_0	2258	1562	696	30.8	17
4	8C	OTB_MPD_ \geq 55_0_0	704	695	9	1.3	1
1	9AN	OTB_MPD_ \geq 55_0_0	269	269		0.0	
2	9AN	OTB_MPD_ \geq 55_0_0	1510	1476	34	2.2	11
3	9AN	OTB_MPD_ \geq 55_0_0	1837	1837		0.0	
4	9AN	OTB_MPD_ \geq 55_0_0	532	532		0.0	
All	8c9aN	OTB_MPD_ \geq 55_0_0	13235	8940	1072	10.7	71

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



Otter bottom trawl targeting pelagic and demersal species (OTB_MPD_ \geq 55) in north Spanish Iberian waters ('Gran abertura')

Catch and discard estimates

Discard ratios

Species	Percent discarded (%)			Percent undersize in the species discards (%)		
	2011	2012	2013	2011	2012	2013
OTB_MPD_\geq55_0_0						
Rapes (<i>Lophius spp.</i>)	14 (0 - 38)	5 (0 - 40)	3 (0 - 100)	100.0	19.6	100.0
Merluza (<i>Merluccius merluccius</i>)	22 (0 - 100)	39 (0 - 100)	62 (0 - 100)	88.0	59.3	93.7
Jurel negro (<i>Trachurus trachurus</i>)	0.4 (0 - 2)	0.2 (0 - 8)	7 (0 - 52)	0.0	30.1	0.5
Gallos (<i>Lepidorhombus spp.</i>)	2 (0 - 45)	18 (0 - 100)	15 (0 - 49)	83.4	60.5	41.6
Caballa (<i>Scomber scombrus</i>)	43 (0 - 100)	26 (0 - 100)	12 (0 - 100)	9.1	3.9	3.0
Bacaladilla (<i>Micromesistius poutassou</i>)	95 (0 - 100)	43 (0 - 100)	74 (0 - 100)	2.0	8.2	0.0
Ochavo (<i>Capros aper</i>)	100 (100 - 100)	100 (100 - 100)	100 (100 - 100)	0.0	0.0	0.0

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



Otter bottom trawl targeting pelagic and demersal species (OTB_MPD_>=55) in north Spanish Iberian waters ('Gran abertura')

Catch and discard estimates

Length structure

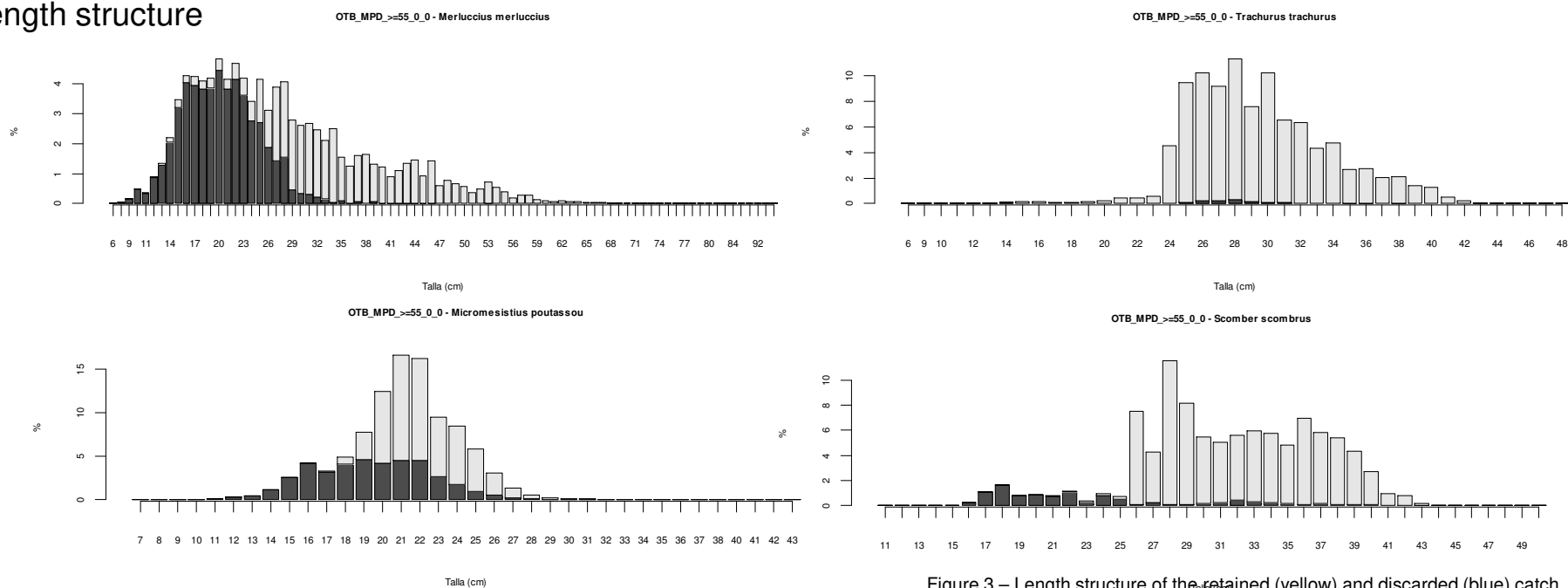


Figure 3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by Spanish pair bottom-trawlers in north Spanish Iberian waters OTB_MPD_>=55 ('Pareja')

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



Metier patterns:

- Operating in the Northern and Western coastal waters (ICES Divisions VIIIc and IXa)
- Fishing grounds: continental shelf and upper slope of NW Spanish waters and Cantabrian Sea.
- All year around. Daily trips
- Vessels with 28 m of average length.
- From about 4 fishing ports: Galicia (Ribeira, Celeiro y Burela) and Aviles (Asturias)

Targeting demersal species, standing out:

- Blue whiting (*Micromesistius poutassou*)
- Hake (*Merluccius merluccius*)
- Mackerel (*Scomber scombrus*) –seasonally-

IEO onboard observer program (UE-DCF)



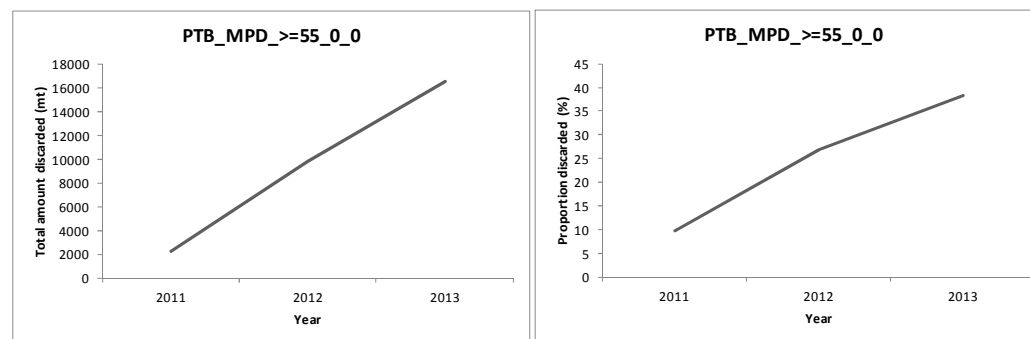
	No vessels			No trips			No days-at-sea		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Total	52	44	44	4988	5543	6549	6701	6994	7197
Observed	7	5	5	26	30	25	30	36	29
Sample fraction (%)	13.5	11.4	11.4	0.521	0.541	0.382	0.448	0.515	0.403

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

Pair bottom trawl targeting pelagic and demersal species (PTB_MPD_>=55) in north Spanish Iberian waters ('Pareja')



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').



Catch and discard estimates

Mixed bottom trawl fishery

Large variability in discard ratios by haul

Interannual and season variability

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

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.

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



Catch and discard estimates

Discard ratios

Species	Percent discarded (%)			Percent undersize in the species discards (%)		
	2011	2012	2013	2011	2012	2013
PTB_MPD_\geq55_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 3 – Estimated proportions discarded per species in weight, by Spanish pair bottom-trawlers in north Spanish Iberian waters PTB_MPD_ \geq 55 ('Pareja'), with their confidence interval (95%)

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



Catch and discard estimates

Length structure

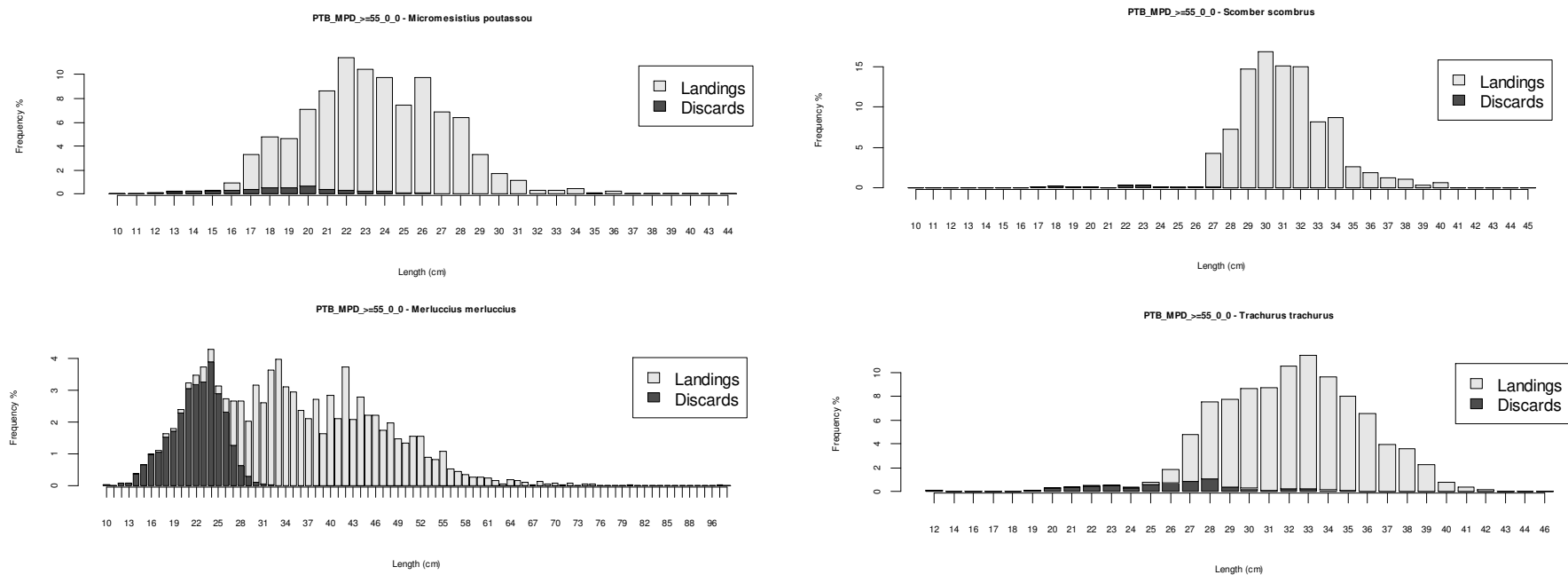


Figure 3 – Length structure of the retained (yellow) and discarded (blue) catch, for the main quota species caught by Spanish pair bottom-trawlers in north Spanish Iberian waters PTB_MPD_ \geq 55 ('Pareja')

Current management measures

Gear: Trawl gear is allowed to use a codend mesh size of 55 mm (most of the fleet using 70 mm).

Depth: Minimum depth for activity is fixed in 100 meters.

Fishing periods: Maximum activity period is 18 hours per day and they must stop fishing for a 48-hour continuous period per week.

Quota: Annual TACs

Minimum landing size (MLS):

Hake 27cm

Megrim 20cm

Horse mackerel 15cm

Norway lobster 20mm

Anglerfish MLW 500gr

Blue whiting 18cm

Restricted spatial areas



Reasons for discarding

Two main **causes** of discarding:

- A. Fish discarded below the legal minimum landing size
- B. Attributed to fishers' responses to quota restrictions

Other: species with low or no market value, which were not worth landing given the high value of the target species.

Factors of discards amounts: technical, biological, environmental, legislative, economic, cultural, social.

*To develop successful discard mitigation measures, it is necessary to better identify the reasons for discarding.



Reduction projects: selectivity

Selective projects have been carried out to reduce mainly the capture of juvenile hake and avoid blue whiting catches.

Fishing ground	Metier	Species	Experiment of selectivity	Autor	Year
Caladero Cantábrico Noroeste	Bottom trawl	Hake	Mesh size	Rodríguez et al.	1963
Caladero Cantábrico Noroeste	Bottom trawl	Hake	Mesh size	Lozano et al.	1968
Caladero Cantábrico Noroeste	Bottom trawl	Hake, horse mackerel	Materials	Vázquez et al.	1975
Caladero Cantábrico Noroeste	Bottom trawl	Norway lobster	Mesh size	Alonso-Allende et al	1976
Caladero Cantábrico Noroeste	Bottom trawl	Blue whiting, pout, norway lobster and	Mesh size	Fuertes et al.	1977
Caladero Cantábrico Noroeste	Bottom trawl	Juveniles	Mesh size	Iglesias et. Al	1978
Caladero Cantábrico Noroeste	Bottom trawl	Hake	Mesh size	Fernández et al.	1978
Caladero Cantábrico Noroeste	Bottom trawl	Hake	Mesh size	Robles y Pereiro	1985
Caladero Cantábrico Noroeste	Bottom trawl	Hake	Theoretical study	Trujillo et al.	1993
Caladero Cantábrico Noroeste	Bottom trawl	Norway lobster	Mesh size	Fernández et al.	1986
Caladero Cantábrico Noroeste	Bottom trawl	Megrim	Mesh size	Astudillo y Sánchez	1989
Caladero Cantábrico Noroeste	Bottom trawl	Main target species	Mesh size	Fonseca et al.	2000
Caladero Cantábrico Noroeste	Bottom trawl	Main target species	Mesh size, windows	Pérez et al.	2006
Caladero Cantábrico Noroeste	Bottom trawl	Main target species	Mesh size	Pérez et al.	2007
Caladero aguas europeas NWW	Bottom trawl	Main target species	Mesh size, square mesh	Meixide y Pereiro	2001
Caladero aguas europeas NWW	Bottom trawl	Megrim	Mesh size, rigging	Pérez et al.	2006
Caladero Cantábrico Noroeste	Bottom trawl	Main target species	Mesh size	Fariña	1992
Caladero aguas europeas NWW	Bottom trawl	Main target species	Windows, rigging, separation panels	Pérez et al.	2012
Caladero Cantábrico Noroeste	Bottom trawl	Main target species	Theoretical study	Pérez et al.	2014
Caladero Cantábrico Noroeste	Bottom trawl	Main target species	Square mesh window	Fariña	2001
Caladero Cantábrico Noroeste	Bottom trawl	Main target species	Square mesh window	Valeiras et al.	2016
Caladero Cantábrico Noroeste	Bottom trawl	Main target species	Mesh shape	Valeiras et al.	2016



ISEAS



Grupo de investigación en Descartes Pesqueros
IEODESMAR
Instituto Español de Oceanografía

Contacto: Julio Valeiras julio.valeiras@vi.ieo.es IEO-Vigo
@ieodesmar www.mapdescar.org



OPROMAR



Talleres JOSMAR, S.L.

