Southern Megrim Species Results from Spanish Discard Sampling Programme

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Abstract

A discard megrims (Megrim, Lepidorhombus whiffiagonis and Four spot megrim, L. boscii) composition estimates for the Spanish bottom otter trawl fleets operating in the Northeast Atlantic ICES Divisions VIIIc and North IXa are presented. Information has been obtained by sampling Spanish fleets under the "Spanish Discard Sampling Programme" carried out by the IEO. Trip was the sampling unit, being raised to different fleet level using fishing effort as auxiliary variable and total fleet landings. Raising to total fleet landings was used for discard fleet estimation due to the lower CV obtained. Time series on discards of both species since 1993 to 2010 are presented. Discard age distributions of both southern megrims species, are also showed. Discard estimates for these species show high between-years variation, exceeding almost 25% CV in almost all cases in both species but with lower values in four spot megrim. MLS and low market value for small fish are the main factors that force the fleet to discard most of megrims species.

Keywords: Discards, Megrims, Northeast Atlantic waters, Bottom Trawl.

1. Introduction

The "Spanish Discards Sampling Programme" for Otter Bottom Trawlers (OTB) fleets, covering *ICES Divisions VIIIc and North IXa,* was started in 1994 (Table 1), however, it did not have yearly continuity until 2003. This lack of continuity and the short series were the main reason that led to omit discard estimation in previous WG.

Table 1 Summary of funded projects which have supported the Spanish Discards Sampling Programme

Year	Project
1994	EC Project: Pem/93/005
1997	EC Project: 95/ 094
1999-2000	EC Project: 98/095
2001	EC Project: 99/063
2003-2010	DCF

Spanish data on megrims species (Megrim, *Lepidorhombus whiffiagonis* and Four spot megrim, *L. boscii)* discards from the Instituto Español de Oceanografía (IEO) have never been provided to ICES WGHMM in the past. The main objective of this working document is to provide information about megrims species discarded by the Spanish fleets operating in ICES Divisions VIIIc and IXa (Spanish Iberian Waters).

2. Material and methods

2.1 Sampling strategy

The sampling strategy and the estimation methodology used in the `Spanish Discards Sampling Programme' has been little modified since 1988, and since 2003 follows the guidelines established in the ICES `Workshop on Discard Sampling Methodology and Raising Procedures' (2003). The observers-on-board programme is based on a stratified random sampling design. Métier is the lower stratum and trips (the sampling unit considered in the former raising protocol) sampling allocation within métiers is quasi-random. Until 2009 the DCF asked for annual estimates and, hence, sampling was organised so as to obtain annual results.

2.2 Fleets stratification

Fishing area, gear and target species are the auxiliary covariates used to stratify fleets into métiers. One métier is considered within the Spanish bottom otter trawl fleets operating in the Spanish Iberian waters, OTB_DEF_>=55_0: trips targeting a mixed of demersal species in VIIIc and North IXa. Pair and Great Vertical Open trawlers catch very small amounts of megrims and amounts of discarded are negligible. Other gears (i.e., long line, gillnet, etc.) were also evaluated, but total catches and discard levels for these species were found to be negligible along the areas under study (Pérez et al., 1996).

2.3 Raising procedures

For each trip sampled in a given métier, several hauls are, in turn, sampled. A random sample of discarded species is selected. Individuals of a given species present in this sample are measured for size information. Estimates of weight are calculated from length distribution using weight/length relationships. The resulting by-species weight obtained from the sample is raised to haul level according to the total discarded weight of the haul and the proportion of these species in the sample. Length/weight relationship is used again to calculate numbers of discarded in the haul. Estimates are further raised to trip level taking into account the total number of hauls in the trip. Trip estimates are subsequently raised to year using; the available fishing effort (total trips) of the former métier as auxiliary variable and the total landing yearly value.

Length size distribution is obtained for both species when presented in the sample, and this information is converted to age using available ALK´s.

3. Results

Sampling level values (Table 2) steady increase in the Divisions VIIIc, IXa. Short trips and low effective hauls characterizing the Southern waters require higher sampling covertures within trip than the Subarea VII; therefore the mean rate of sampled hauls was ~0.8 in VIIIc, IXa. The information can be considered representative of the discard behaviour of the whole fleets operating in the areas.

Different discard estimates (raising to effort in number of trips or landings in tons) and associated coefficients of variation (CVs) are showed in Figure 1. High differences were found between CV of the two raising procedures. It was adopted the estimations raised to total yearly landings for both species due to the lower CV obtained.

Table 3 shows total discarded weight (tons) of OTB demersal megrims species and CV of estimations:

- Megrim series show a progressive discard reduction since the 1997 highest value (52t) to 2007 (0.4t) the lowest of the series. In 2010 discard of megrim was estimated in 4.6 tons. Estimated CVs showed an increasing trend since 2003, with a minimum found for 2007 estimations (19.9%).

- Four spot megrim discard have remained relatively stable at low levels since the highest values of the initial years of the series (420-520 tons in 1993-1994). Discard age composition of 1993 are not available due to very low length sampling level. In 2010 discard of four spot megrim was estimated in 266 tons, similar to recent year. However, ages composition show the highest age 1 discards amount of the series. This value is in agreement with high recruitment (age 1) peak found in the Spanish (SP-GFS) survey (Velasco, com. pers.). CVs show high variability at low levels along the periods with the highest values in 1993 and 2006.

Minimum Legal Size (MLS) and low market value for small fish are the main factors that force the fleet to discard most of megrims species.

Discard per age for both species are shown in Figure 2. The numbers of age 0 megrim discarded in recent years are negligible (Table 4). Discard age 0 numbers have also decrease since 2003 for four spot megrim (Table 5). Discard are basically composed for ages 1 and 2.

References
ICES, 2003. Report of ICES Workshop on Discard Sampling Methodology and Raising Procedures. Charlottenlund, Denmark, 2-4 September 2003.

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.

Table 2. Sampling effort, per quarter on Spanish trawl fleets operating in the Divisions VIIIc, IXa north.

Year	Quarter	Trips
1994	1	10
1994	2	15
1994	3	16
1994	4	12
1997	1	19
1997	2	15
1997	3	16
1997	4	16
1999	1	-
1999	2	-
1999	3	27
1999	4	17
2000	1	22
2000	2	22
2000	3	25
2000	4	17
2003	1	-
2003	2	8
2003	3	8
2003	4	6
2004	1	8
2004	2	4
2004	3	7
2004	4	7
2005	1	13
2005	2	5
2005	3	10
2005	4	5
2006	1	8
2006	2	6
2006	3	6
2006	4	4
2007	1	8
2007	2	8
2007	3	8
2007	4	13
2008	1	11
2008	2	11
2008	3	10
2008	4	2
2009	1	4
2009	2	11
2009	3	8
2009	4	10
2010	1	16
2010	2	37
2010	3	27
2010	4	20

Table 3.Total weight discarded (t) of OTB demersal megrims species and CV of estimations

	Megrim (t)	CV	Four spot Megrim (t)	CV
1993	0.0		419.5	42.5
1994	13.9	50.8	517.2	23.2
1997	52.3	32.2	308.4	11.2
1999	47.1	33.4	316.3	14.4
2000	35.1	48.4	373.2	16.5
2003	14.9	19.9	190.7	10.2
2004	10.9	29.2	348.0	23.1
2005	19.4	43.2	375.2	24.0
2006	15.7	31.6	334.8	48.4
2007	0.4	55.0	292.1	18.3
2008	10.8	58.8	202.1	22.6
2009	11.4	52.9	278.6	21.1
2010	4.6	61.6	265.9	18.8

Figure 1. Total weight discarded (t) of OTB demersal megrims species and CV of estimations per different raising (R) procedure.
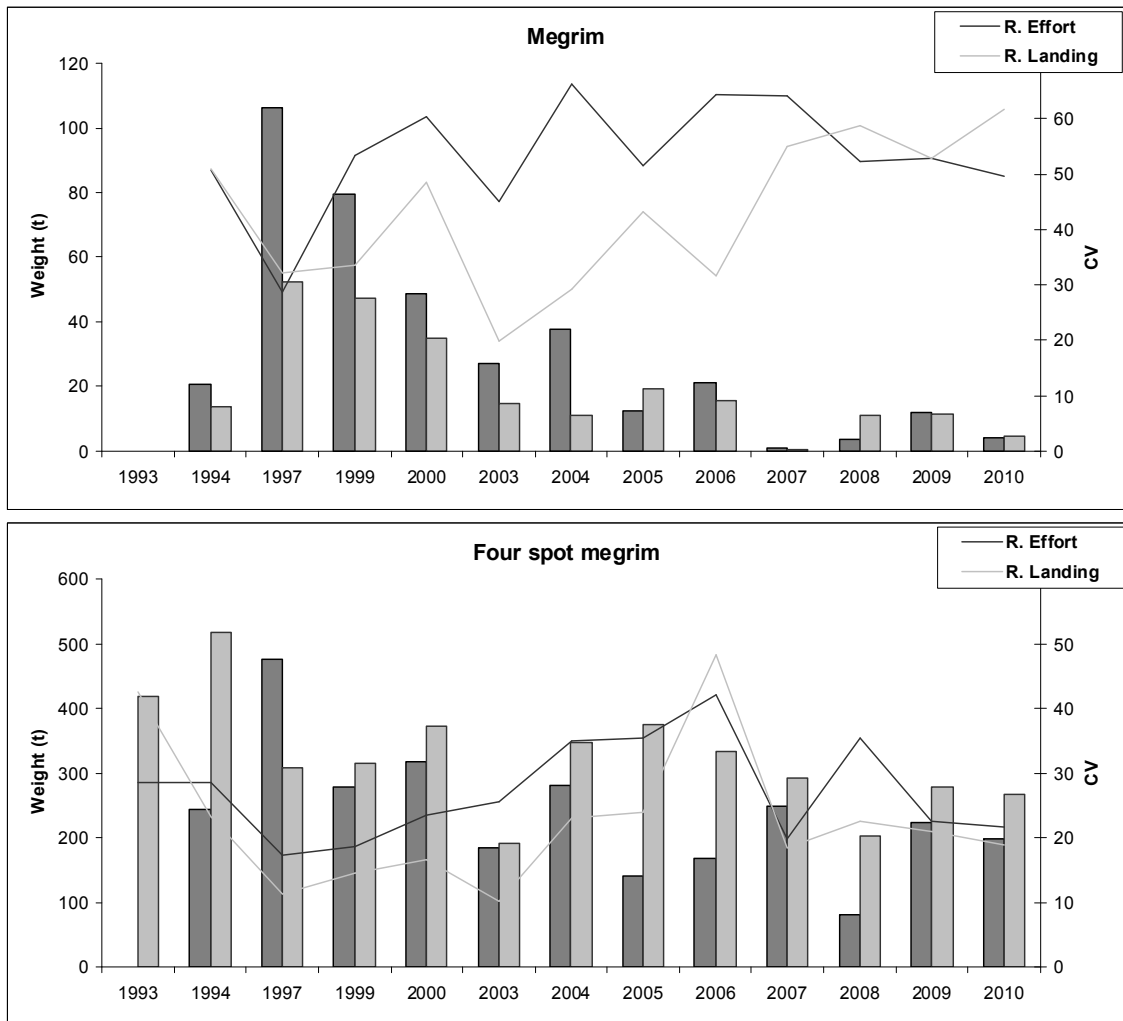
Figure 2. Total number (thousand) per age discarded of Megrim and Four spot megrim in Divisions VIIIc, IXa.
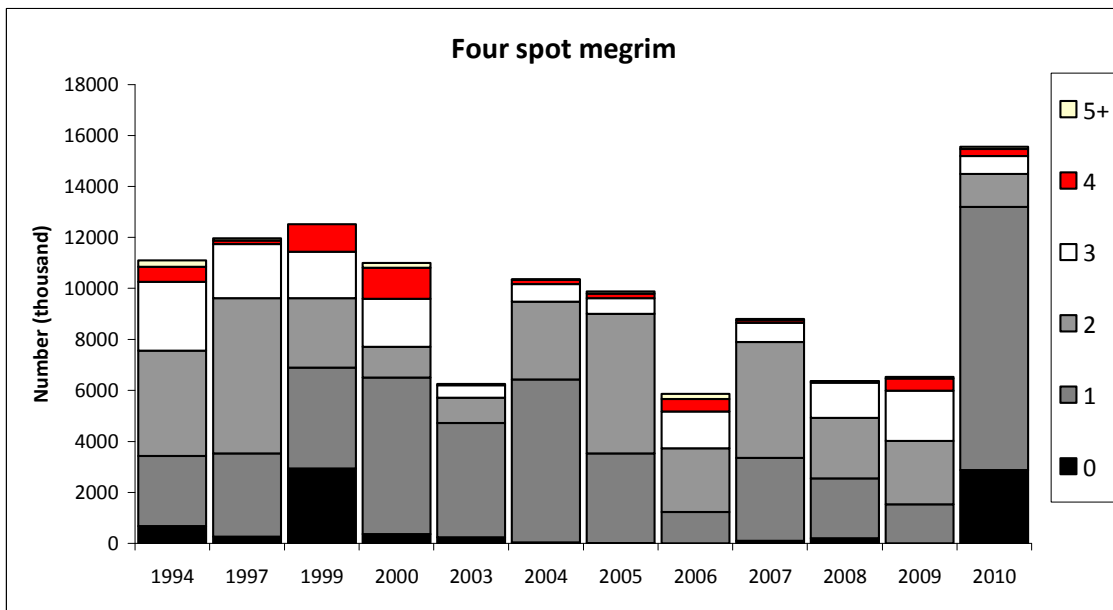
Table 4. Total number (thousand) per age discarded of megrim species and their respectively mean weight at age.

Number*10^3

Age	1994	1997	1999	2000	2003	2004	2005	2006	2007	2008	2009	2010
0	103.6	41.5	270.4	26.9		4.3	19.5				95.6	16.0
1	93.2	452.9	471.3	611.0	238.5	163.5	223.3	18.9	11.0	126.3	141.8	118.8
2	135.5	856.6	284.1	160.4	56.5	28.4	61.2	108.4	0.2	86.2	21.1	5.6
3	50.8	141.8	196.7	73.5	12.2	5.9	37.9	115.3		7.9	15.2	0.5
4	2.8	0.8	25.5	19.3	4.1	4.7	10.6	28.0		4.7	6.9	1.5
5	0.7	4.9	6.2		0.2	2.6	3.8	13.3		2.1	6.6	0.4
6		3.0				1.9	1.4	4.1		0.1	3.4	0.6
7						0.5	0.2	0.3			0.6	0.1
8												
9												

Mean weight at age

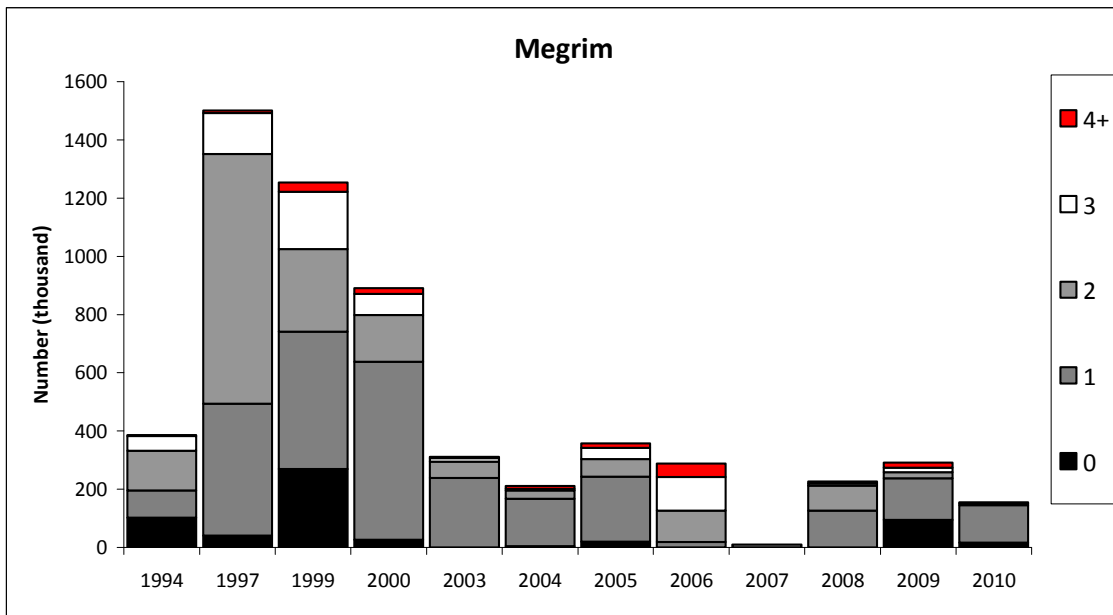| Age	1994	1997	1999	2000	2003	2004	2005	2006	2007	2008	2009	2010
0	0.010	0.006	0.014	0.011		0.013	0.008				0.009	0.007
1	0.036	0.029	0.032	0.037	0.042	0.044	0.045	0.027	0.034	0.032	0.025	0.031
2	0.044	0.037	0.048	0.046	0.060	0.061	0.065	0.047	0.050	0.058	0.075	0.077
3	0.063	0.044	0.059	0.049	0.088	0.098	0.085	0.060		0.091	0.144	0.085
4	0.084	0.087	0.089	0.066	0.086	0.128	0.105	0.066		0.105	0.160	0.121
5	0.089	0.103	0.112		0.125	0.153	0.139	0.074		0.123	0.202	0.211
6		0.111				0.162	0.191	0.088		0.140	0.201	0.211
7						0.173	0.191	0.112			0.232	0.211
8												
9												

Table 5.Total number (thousand) per age discarded of four spot megrim species and their respectively mean weight at age.

Number*10^3

Age	1994	1997	1999	2000	2003	2004	2005	2006	2007	2008	2009	2010
0	678.0	255.8	2933.2	353.9	237.5	32.9	10.1	0.9	100.3	201.8	2.2	2878.8
1	2740.9	3272.8	3953.8	6147.6	4479.3	6393.2	3515.2	1233.5	3247.9	2341.5	1525.1	10362.0
2	4133.6	6099.2	2734.3	1206.7	989.3	3053.1	5482.3	2497.1	4540.8	2374.0	2489.9	1301.5
3	2710.2	2108.2	1815.4	1887.5	494.7	693.3	609.2	1444.6	757.5	1383.7	1969.9	695.7
4	581.5	145.5	1087.8	1218.1	50.2	162.6	183.0	486.4	104.6	52.5	480.3	283.1
5	189.0	90.1	2.9	171.1	1.9	26.6	55.6	167.7	44.0	10.1	50.6	83.4
6	55.3	3.1	0.5	11.9	0.1		22.8	22.3	6.9	3.2	7.3	11.2
7	10.8	0.0	0.8	2.2			5.8	8.9	0.7	2.6		0.5
8	0.5						0.7					
9	0.1						0.8					

Mean weight at age

Age	1994	1997	1999	2000	2003	2004	2005	2006	2007	2008	2009	2010
0	0.005	0.004	0.006	0.006	0.008	0.006	0.006	0.006	0.005	0.005	0.004	0.004
1	0.023	0.016	0.017	0.023	0.024	0.026	0.020	0.022	0.022	0.017	0.024	0.012
2	0.047	0.025	0.035	0.045	0.052	0.042	0.045	0.049	0.038	0.037	0.041	0.041
3	0.065	0.041	0.045	0.049	0.053	0.057	0.062	0.080	0.049	0.047	0.051	0.055
4	0.089	0.062	0.049	0.056	0.070	0.069	0.073	0.092	0.065	0.085	0.069	0.078
5	0.110	0.073	0.130	0.066	0.105	0.068	0.096	0.121	0.074	0.154	0.109	0.114
6	0.136	0.103	0.189	0.076	0.117		0.105	0.143	0.088	0.189	0.149	0.123
7	0.163	0.117	0.189	0.093			0.156	0.164	0.122	0.189		0.172
8	0.246						0.148					
9	0.260						0.132					