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The Spanish Red seabream fishery of the Strait of Gibraltar: an update of the available information

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Abstract

This paper includes the available information of the Red seabream (Pagellus bogaraveo) Spanish fishery in the Strait of Gibraltar and updates the documents presented in previous years with the information from 2016. So, data about landings, CPUEs, spatial distribution and landings length frequencies are presented and analyzed.

1. Introduction and fishery description

Since the earlies 1980´s a Spanish artisanal fishery targeting to Red seabream (*Pagellus bogaraveo*, namely "*voraz*") have been developed in the Strait of Gibraltar area (ICES IXa South). This fishery has already been broadly described in previous Working Documents presented to the ICES WGDEEP (Gil *et al*., 2000; Gil & Sobrino, 2001, 2002 and 2004; Gil *et al*., 2003, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015 and 2016). Spanish Red seabream fishery in the Strait of Gibraltar is almost a mono-specific fishery with a clear target species which represents the 74% from the total landed species which constitutes a fleet component by itself (Silva *et al*., 2002).

In 2006, 2008, 2010, 2012 and 2016 different trials were attempted to assess this resource within the ICES WGDEEP (ICES, 2006, 2008, 2010, 2012 and 2016). Finally, 2016 scientific advice was based on abundance indexes (DLS category 3). The abundance index used, as well as all the available information from this target fishery, were updated with last year info. Further work will made within the 2017 WGDEEP discussions to estimate MSY proxy reference points for stocks with DLS category 3 or 4 following methods developed in WKLIFE and WKProxy. Besides,

Thus, the main objective of this paper is to provide to the 2017 ICES WGDEEP a summary of the available information of this deep-water fishery located in a very narrow place of the ICES area IXa.

2. Material and methods

Fishery information from the sale sheets was gathered for the period 1983-2016: monthly landings, monthly number of sales (as a proxy of fishing trip) and the number of days in which those sales were carried out. Moreover, landings length distributions was also estimated from the data collected by IEO monitoring programme (Gil *et al*., 2000).

Geo-referenced information from SLSEPA devices (a sort of Vessel Monitoring System) on the "*voracera*" fleet operating at the Strait of Gibraltar were more recently available (from 2009 onwards): this monitoring system, locally called "green boxes" (to differentiate them from the EU VMS "blue boxes"), send every three minutes to a control centre several information about the fishing boat: time, positions, course and speed. Data were filtered and analyzed, according to the protocols proposed by Burgos *et al*. in 2013, to estimate fishing effort, catch rates and the spatial distribution of the Red seabream fishery.

3. Results and discussion

- Landings data: Figure 1 shows a continuous increase of Spanish landings from the beginning of the time series to reach a maximum in 1994. Since then landings´ trend decreased till 2002, despite the peaks in 1996 and 1997. Again, it shows an increasing trend from 2003 to 2009, followed by a new decrease till 2013 with the lowest value of the time series. In 2014 landings increase more than the 100% in comparison with the previous year. The increasing trend stills in 2015, when 166 tons were landed at the two main ports (Tarifa and Algeciras) falling again to about 100 tons in 2016.

Till now, discards can be assumed to be zero or negligible. However, the combination of a future minimum size of 33 centimeters for the species in the NE Atlantic (which is already applied in the Mediterranean) and the landing obligation (EU Regulation 2013/1380) might have an effect on this fishery.

So, at the moment, landings can be used as a proxy of catches: but it should be noted that not all the Spanish catches/landings come exclusively from ICES area IX. However, it was considered from the same stock unless the fishing area is placed between different Regional Organizations/Commissions (ICES, GCFM and CECAF) borders (Figure 2). In fact, Spanish Red seabream landings available at InterCatch tool comprise three different areas: 27.9.a (ICES), 34.1.11 (CECAF) and 37.1.1 (GFCM).

Moroccan longliners have been fishing Red seabream in the Strait of Gibraltar area since 2001. The information is available on FAO CopeMed Reports (CopeMed II, 2015) and, when possible, is included in the WGDEEP landings table estimates because Moroccan boats fish in the same area as the Spanish ones so, obviously, targets the same population (ICES, 2016).

- CPUEs: Nominal abundance index shows ups and downs throughout the historical series (Figure 3). It is important to emphasize that the effort unit chosen (number of sales) may not be appropriate as does not consider the missing effort. So in the most recent years, when the resource is not quite abundant, the missing effort might increase substantially (fishing boats with no catches and no sale sheet records). Therefore, the LPUE trend since the first fishery´s decline (1997) should be interpreted with caution because it cannot be a real image of the resource abundance. A severe decreasing trend is observed since 2010, whereas it increases in the last two years (2014 and 2015),similarly to landings. But, like in landings in 2016 the signal fall again.

Table 1 updates the available information from regional VMS (SLSEPA), following the data compilation and its process described by Burgos *et al*. in 2013.

Table I. Estimates of fishing effort and CPUEs from the "*voracera*" fleet targeting Red seabream based on regional VMS (SLSEPA) and fishery statistics (sales sheets). Data from 2009 to 2011 extracted from Burgos *et al.* (2013).

Data Source / Year		2009	2010	2011	2012	2013	2014	2015	2016
Fleet equipped with SLSEPA devices (green boxes)	No. Boats	85	82	82	60	60	61	60	47
	No. Sales	7,200	5,863	4,711	2,946	2,086	2,989	3,079	1,873
	Fishing days (trips)	8,373	7,238	6,160	3,686	2,695	4,191	4,234	2,724
	Fishing operations (hauls)	60,593	46,579	38,345	22,329	14,140	21,110	21,449	12,930
	Blackspot seabream Landings (kg)	459,010	274,882	190,786	79,163	39,799	94,261	137,344	73,508
	CPUE 1 (Landings/Sales)	64	47	40	27	19	32	45	39
	CPUE 2 (Landings/Fishing days)	55	38	31	21	15	22	32	27
	CPUE 3 (Landings/Hauls)	8	6	5	4	3	4	6	6
	Proportion (%) of missing effort ([Fishing days-No. Sales]/Fishing days)	14	19	24	20	23	29	27	31
Total voracera fleet	No. Boats	98	94	86	68	62	61	62	58
	No. Sales	8,892	6,932	5,659	3,638	2,222	3,527	3,384	2,418
	Estimated Fishing days (trips) (Landings/VMS CPUE2)	10,564	9,627	7,741	5,867	4,480	6,119	5,137	3,696
	Fishing operations (hauls)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Blackspot seabream Landings (kg)	579,140	316,546	239,751	126,006	66,159	137,623	166,651	99,727
	CPUE 1 (Landings/Sales)	67	52	42	35	30	39	49	41

It can be observed in Figure 3 that (nominal) CPUE 1 estimated from total landings and number of sales decreased in the period 2009-2013 from 65 to 30 k fishing trip^{-1} for the total "*voracera*" fleet as well as the (nominal) CPUE 1 for the fleet equipped with the SLSEPA device (64 to 19 k fishing trip^{-1}). Afterwards, it increases till 49 and 45 k fishing trip^{-1} in 2015, respectively. As expected, CPUE 2 (landings/fishing days), where the effort is estimated from the VMS device also declined with lower values than CPUE 1 because the fact of the missing effort. Again the values in the last two years were higher but didn't reach the CPUE 1 ones. In

2016 values decreased to 39 and 27 k fishing trip^{-1}, in nominal and VMS respectively. So, 2009 - 2016 estimated CPUE from VMS analysis shows the same trend but lower values than the nominal one from sale sheets (Figure 3).

- Length frequencies:

The mean length of landings seems to have decreased in two different periods: from 1995 to 1998 and from 2009 to 2013 (Figure 4). It is necessary to point out that this species probably do not have a homogeneous geographic and bathymetric distribution related to their length. This fact could explain the different landed mean length between the main landing ports: Tarifa and Algeciras. So the mean length became lower since 2010 but again (like landings and CPUE) increases in last two years. Last year, 2016, total length median and mean values decreased again till 36 and 37.6 cm, respectively.

4. Main conclusions

Last year signals (landings, CPUEs and length distribution) show again falling values. CPUEs and landing´s mean length ups and downs throughout these last years may be a consequence of an overexploitation status of the fishery. Moreover, a discrete biomass–abundance dynamic model was implemented by Gutiérrez-Estrada *et al*. in 2017 to obtain a simulated monthly time series of Red seabream biomass from the available Spanish information: the proportion of variance non-explained by the AutoRegressive Integrated Moving Average (ARIMA) fitted models was correlated with a time series of sea surface temperature (SST) and North Atlantic Oscillation (NAO). The analysis of global, annual and winter correlation between the proportion of variance not explained by the ARIMA models and environmental variables showed that significant associations were not detected over the full time series. So, overexploitation might be the main factor for the commercial depletion of the Strait of Gibraltar Red seabream population.

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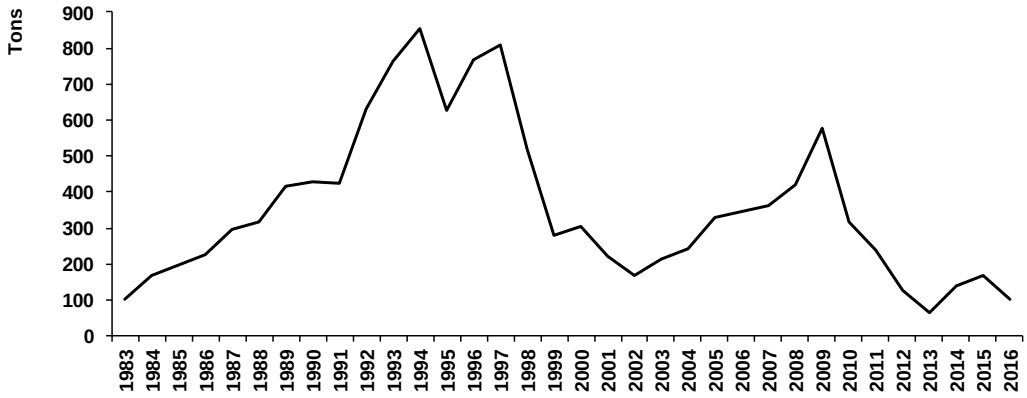

Figure 1. Red seabream Spanish "*voracera*" fishery of the Strait of Gibraltar: total landings (1983-2016).

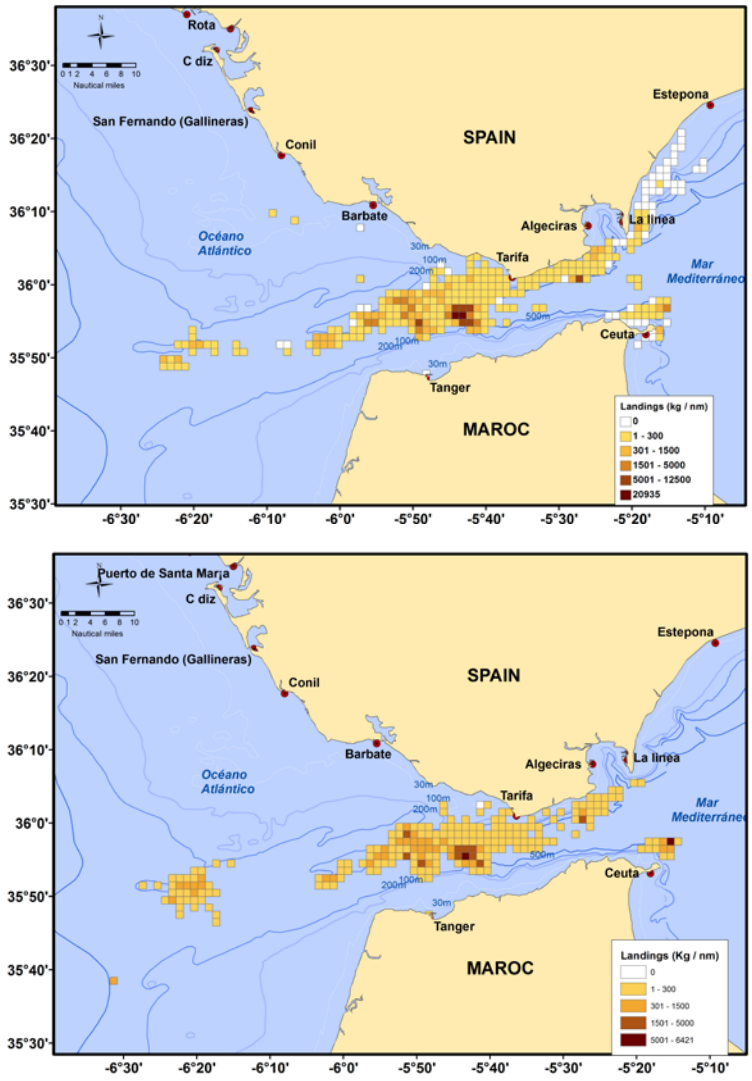

Figure 2. Red seabream Spanish "*voracera*" fishery of the Strait of Gibraltar: spatial distribution of landings (2015-2016).

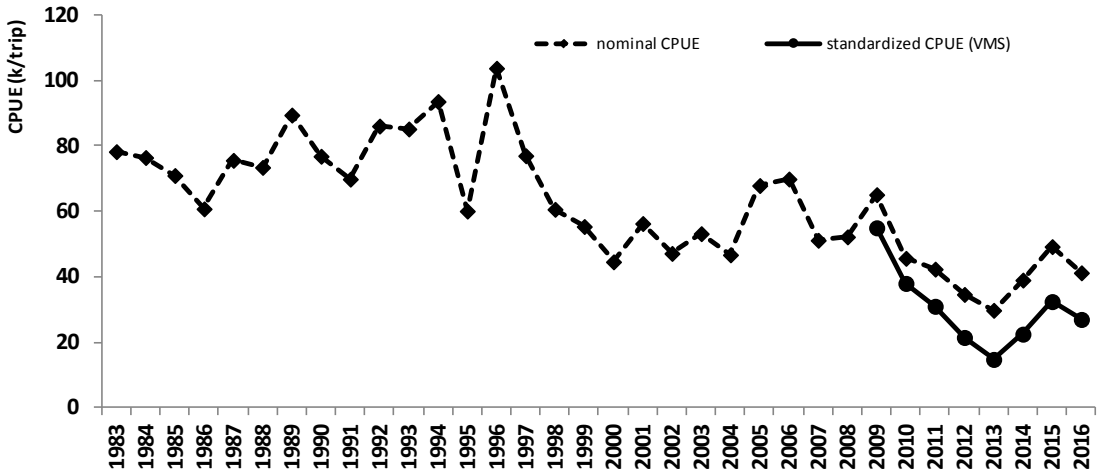

Figure 3. Red seabream Spanish "*voracera*" fishery of the Strait of Gibraltar: nominal (form sale sheets) CPUE (1983-2016) and standardized (from VMS) CPUE (2009-2016).

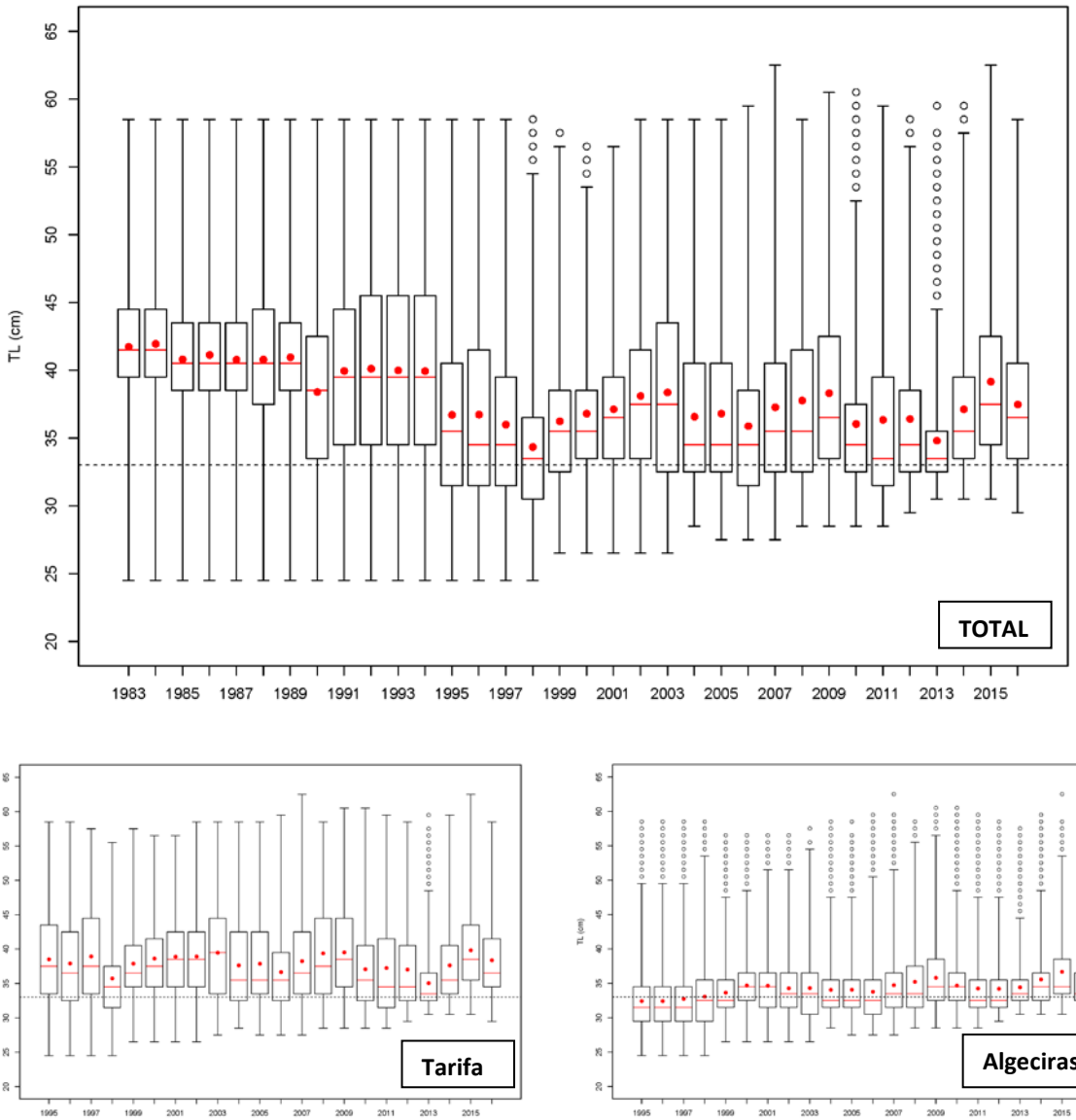

Figure 4. Red seabream Spanish "*voracera*" fishery of the Strait of Gibraltar: landings length distribution (total and by landing port) descriptive statistics (red dot: mean value, red line: median value, box: interquartile range, whisker: most extreme value within 3 times the inter-quartile range, circles: outliers).