12 Blackspot seabream (*Pagellus bogaraveo*)

12.1 Stock description and management units

The stock structure of blackspot seabream in ICES area is still unknown. Thus, for stock assessment and scientific advice on management purposes ICES considers three different components: a) Subareas 6, 7, and 8; b) Subarea 9, and c) Subarea 10 (Azores region).

The interrelationships of the blackspot seabream from subareas 6, 7, and 8, and the northern part of Division 9.a, and their migratory movements within these areas have been observed by tagging studies (Gueguen, 1974). However, there is no evidence of movement to the southern part of 9.a where different longline fisheries targeting the species take place, extending outside the ICES area.

Genetics studies show that there is no genetic differentiation between populations from different locations within the Azores region (east, central and west group of Islands, and Princesa Alice Bank) but there are genetic differences between the Azores (ICES Subdivision 10.a.2) and mainland Portugal, ICES Division 9.a (Stockley et al., 2005; Castilho et al., 2022 WD). These results, combined with the known distribution of the species by depth, suggest that Subarea 10 component of this stock can effectively be considered as a separate assessment unit. Not genetic structure has been found on the Atlantic continental shelf with small genetic differentiation between the Mediterranean Sea and the Atlantic (Stockley et al., 2005, Pinera et al., 2007). Unpublished genomic results, using a high number of SNP markers henchwith higher differentiation power than previous studied, show evidence for genetic differentiation between the Atlantic eastern continental margin and the Gulf of Cadiz (Castilho et al., 2022 WD).

12.2 Blackspot seabream (*Pagellus bogaraveo*) in Subareas 6, 7 & 8

12.2.1 The fishery

From the 1950s to the 1970s, the blackspot seabream was exploited mainly by French and Spanish bottom offshore trawlers, by artisanal pelagic trawlers in the eastern Bay of Biscay (ICES Divisions 8.a,b), and by Spanish longliners in the Cantabrian Sea (ICES Division 8.c), with smaller contributions from other fisheries (Lorance, 2011). Currently, EU Regulations state that no directed fisheries are permitted under the quota, therefore catches should be only bycatches.

In the period considered (1988–2021), most of the estimated landings from the subareas 6, 7 and 8 were taken by Spain (70%), followed by France (18%), UK (10%) and Ireland (1%).

The fishery in Subareas 6, 7 and 8 strongly declined in the mid-1970s, and the stock is seriously depleted (Figure 12.2.1a and Table 12.2.1b). Since the 1980s, the species is mainly a bycatch from otter trawl, longline and gillnet fleets and only a few small-scale hand liners have been targeting the species. Since 1988 the landings from Subarea 8 represent 68% and 32% of total accumulated landings are from subareas 6 and 7. At present the blackspot seabream reported catches in these areas are almost all bycatches of longline and otter trawl fleets from France, Ireland and Spain.

12.2.2 Landings trends

Landings data by ICES Subareas reported to the working group are shown in Table 12.2.1a–c. Figure 12.2.1a presents an overview of the historical series of landings in Subareas 6, 7 and 8 since the middle of the last century. Figure 12.2.1b shows, in greater detail, landings of the same subareas since 1988. In 2014, UK (Scotland) reported landings for the first time in 7.j, and Netherlands since 2017 and UK (Scot) since 2014 in Subarea 7 respectively. This ICES division represents part of the historical species distribution area (Olivier, 1928; Desbrosses, 1932).

For those three subareas combined, landings decreased from 461 t in 1989 to 52 t in 1996, increased again to a peak in 2007 (324 t) and then decreased to 91 tonnes in 2022. The main driver for the decreasing landings in recent years is considered to be the effect of the TAC, which decreased from 350 tonnes in 2003 to 95 t in 2022.

12.2.3 ICES Advice

In 2020, ICES advises that when the precautionary approach is applied, there should be zero catch in each of the years 2021 and 2022.

12.2.4 Management

The EU TAC for subareas 6, 7, and 8 was set for the first time in 2003 and has been reducing since then from 350 t to 95 t in 2022. Landings in 2007, 2010, 2012, 2014, 2015, 2016, 2018 and 2021 were slightly above the TAC. A minimum landing size of 35 cm applied from 2010 to 2012 and a minimum conservation reference size of 33 cm applies since 11 May 2017 (commission implementing regulation (EU) 2017/787 of 8 May 2017).

Pagellus bogaraveo **TACs and total landings in European countries in Subarea 27.6, 7, and 8 in recent years.**

Pagellus bogaraveo			
year	**EU TAC**	**UK TAC**	**landings**
2003	350		129
2004	350		183
2005	298		158
2006	298		139
2007	298		324
2008	298		159
2009	253		203
2010	215		281
2011	215		177
2012	215		257
2013	196		295

Pagellus bogaraveo			
2014	178		256
2015	169		177
2016	160		164
2017	144		126
2018	130		133
2019	117		98
2020	102		91
2021	95	11	98
2022	95	11	91
2023	95	11	

Under Common Fisheries Policy it is stated that "Recreational fisheries can have a significant impact on fish resources and Member States should, therefore, ensure that they are conducted in a manner that is compatible with the objectives of the CFP" (Regulation (EU) no 1380/2013 of the European Parliament and of the Council). Therefore, a short account of regulations relevant to blackspot seabream in recreational fisheries is given here.

The Irish Specimen Fish Committee recommends that all recreational catches be returned alive, and the SI No. 747 of 2004 forbids commercial catching of blackspot seabream except where it is less than 5% of the total catch. In France, specific regulation for blackspot seabream set in 2019 forbids the landings of individuals smaller than 35 cm and the fishing of this species from 1st of January to 30th of June. Moreover, the French regulation, forbids the catch, landing and sale of this species to the purse seine fleet and established several catch limits by trip or by year to the rest of the fleets (trawlers, gillnetters and liners).

Since 2019 Spain has established closure areas with the aim to protect the juveniles of this species (MAPA 2019). The regulation bans the Spanish trawling and deep-water long-liners fleets to fish in several areas of the centre and west of Division 8.c from April to September. Spain also established annually a maximum catch per day to the vessels involved in the fishery in subareas 6, 7, 8.

12.2.5 Data available

12.2.5.1 Landings and discards

The Spanish, French and UK extended landing time-series of *P. bogaraveo* in Northeast Atlantic were updated (Figure 12.2.1b). In recent years landings have been dropping in accordance to the continuous reduction of the biannual TAC since 2003.

Historically, discards are considered negligible, and estimates are available since 2014 representing between 0.0 % and 2.7% of the annual catches in all subareas (Table 12.2.2). Discards resulting from low quotas are compulsory as the fishery for the species ceases. In 2015 and 2016, discards in French fisheries may have resulted from legal closures of quota (MEDDE, 2015; MEEM, 2016). As the blackspot seabream is a highly valued species, it is likely that these reported discards are carcasses in bad condition recovered from nets, misidentification of the species in on-board

observation and discards related to low quotas. Table 12.2.3 shows that since 2017 there were not catches inside the NEAFC Regulatory Area (RA)

Misidentification in on-board observer program may occur as *P. bogaraveo* occurs at low abundance and closely related sparids species, to which it may be confused, also occur (*P. acarne*, *P. erythrinus*, *P. bellotii* and *Pagrus pagrus*).

12.2.5.2 Length compositions

Length–frequency distribution of commercial landings and discards in 2015-2022, are presented (Figure 12.2.2). Length frequency distribution of discards reported data in InterCatch in 2017 were very scarce, therefore length distribution for this year is not presented. No length–frequency distribution for discards were presented in 2020 and 2022 as in these years reported discards were 0.

12.2.5.3 Age compositions

No age data were available to the working group. No age estimations are carried out for this stock.

12.2.5.4 Weight-at-age

Mean size and weight-at-age (Table 12.2.4) derived from Guéguen (1969) and Krug (1998) were used by Lorance (2011) as input data for the yield-per-recruit model used to simulate the effect of fishing mortality on the blackspot seabream stock of Bay of Biscay.

12.2.5.5 Maturity and natural mortality

Natural mortality of 0.2 was estimated by Lorance (2011). M was derived from the presumed longevity in the population according to the rule M ¼ 4.22/t_{max}, where t is the maximum age in the population derived from data from many populations (Hewitt and Hoenig, 2005).

12.2.5.6 Catch, effort and research vessel data

Regarding the research vessels data of blackspot seabream, the Subareas 6, 7 and 8 are covered by four surveys (Figure 12.2.3), but at the current level of abundance, the blackspot seabream is rarely caught in the northern surveys by French EVHOE IBTS (G9527) divisions 7.f-j and 8.a,b,d, Irish IGFS (G7212) in divisions 6.a South and 7.b,g,j, is a scarce species in the Northern Spanish Shelf Groundfish Survey (G2784) SP-NGFS in Divisions 8c and 9a, and is not caught in the Spanish Groundfish Survey on the Porcupine bank -SP-PorcGFS (G5768) in divisions 7.c and 7.k,

In the Northern Spanish Shelf Groundfish Survey, in 2020 zero catches were reported for this species. The trend in recent years show a decreased since in 2019 in which a biomass of 0.11 Kg·haul^{-1} and an abundance of 0.53 ind·haul^{-1} were recorded. (see figures 12.2.4, 12.2.5 and 12.2.6 for previous series) (Fernández-Zapico *et al.*, 2023). Last information available indicated that specimens caught in 2019 ranged from 22 cm to 29 cm, with a mode in 25-26 cm (Figure 12.2.7) (Fernández-Zapico *et al.*, 2020).

In French surveys, similar to the current western IBTS, from early 1980s when the stock was already low, blackspot seabream was still presented in 40–60% of the hauls. This proportion dropped to around zero by 1985 (Lorance, 2011). This observation indicates that the current survey would allow monitoring the stock if it recovers to past levels. Catch of blackspot seabream in the EVHOE survey have been too rare to allow the calculation of a survey indicator. However, data from the survey are in accordance with a possible recent increase of the stock. In particular, a large catch of more than 1000 individuals in a single hauls occurred in the 2016 survey. In subsequent years only 3 individuals were caught over years 2018-2021 (no survey in 2017), which represent on average for these years less than one catch for 100 hauls. The level of occurrence that would be expected if the stock rebuilt to past levels can be appraised from two surveys

carried out in the Bay of Biscay in 1973 and 1976 with the same protocol and gear as the current EVHOE survey (Figure 12.2.8). In 1973 and 1976, blackspot seabream was caught in 25% and 55 % of the hauls respectively (Figure 12.2.9). Since the start of the current survey series in 1987, it has always been caught in less than 5% of the hauls in the same strata, some years not at all. Therefore, a ten to thirty-fold increase in occurrence might occur to consider that the stock rebuilt to level from the 1960s and 1970s, where catch amounted to 15 000 t/year. The current monitoring with on-board observations and the EVHOE survey is insufficient to monitor this rebuilding accurately, while the stock is still low. The increasing occurrence in on-board observations is however consistent with fishers reporting more encounters.

In the Irish IGFS blackspot seabream is also very scarce and since 2010 only few kg in were caught in four years of the series. Also, the occurrence along the whole stations in the survey is very low ranging since 2010 from 0% to 4.3% (Table 12.2.5).

12.2.6 Data analyses

Landings since 1988 are well below those recorded in the period from 1960 to 1986 in which landings ranged from 2000 t to up to 13 000 t (Figure 12.2.1a). Catches recorded in the surveys are very scarce and are mainly juveniles smaller than 30 cm.

In 2003, when TACs were set for this species there were conflicts between fishing métiers in this area, small artisanal handliners requesting vessels targeting pelagic species, mostly sardine with trawls and seine, to avoid any bycatch of blackspot seabream. The introduction of the TAC and national quota had an impact on fishing practices.

In the same area, fishers report to encounter more frequently the species in recent years. This was investigated using French on-board observations (Figure 12.2.10). The method used consisted in estimating the proportion of fishing operations where the species was caught (landings and discards combined) in French on-board observations to the south of 49°N. The limit at 49°N was set to include the south of the Celtic Sea to the West of Brittany, where the species was historically abundant. This was made for all bottom trawl types combined, and all bottom nets combined for years 2010 to 2016. Some increasing trend in the proportion of hauls with catch of the species can actually be seen for bottom trawls, although the proportion of positive hauls is still small (Figure 12.2.11).

12.2.7 Biological reference points

WKLIFE has not yet suggested methods to estimate biological reference points for stocks which have only landings data or are bycatch species in other fisheries. Therefore, no attempt was made to propose reference points for this stock.

12.2.8 Exploratory assessment

Ongoing studies carried out as part of the H2020 Pandora and the French National DynRose projects were presented to the group in 2021. These included an analysis of the essential habitats of the species and approaches to assess the current biomass.

The study of the habitats modelling applies several Species Distribution Model (SDM) in an Ensemble modelling approach. The study is carried out at the scale of whole species distribution area, including therefore not only the stock in the Celtic Sea and Bay of Biscay but also the area of the two other stock units considered by ICES (in Iberian and Azorean waters) and the

Mediterranean western basin. Occurrence data from a number of sources including (1) French on-board observation, carried out in application of the EU data collection framework (DCF), (2) surveys, (3) CPUEs derived from the vessel monitoring system installed on Spanish artisanal vessels in the Strait of Gibraltar using GPRS/GSM (Burgos et al., 2013) and (4) data available from the WEB such as OBIS. Occurrence data were modelled using several physical chemical and biological environment variables including bathymetric, hydrological, seafloor and water data. Preliminary results suggest that only a low fraction of its potential habitat is occupied (realized habitat) by the blackspot seabream in the Bay of Biscay in recent years (Figure 12.2.12).

Approaches to assess the current biomass include acoustics and environmental DNA (eDNA) investigations. Acoustics surveys were carried out to the West of Brittany in 2019 and were presented during the 2020 meeting (ICES, 2020). In September 2020, a three-day eDNA survey was carried out in the same area as the acoustic survey of 2019 (Figure 12.2.13). The results from the two approaches were consistent is terms of spatial distribution of the species. So far none of these methods allowed to derive a direct quantitative estimate of the biomass in the area surveyed and both have advantages and inconveniences. For acoustics, one drawback is that fishing operation are needed for identification of echoes and their classification. In the rocky area surveyed, this was done by handlining, which appeared to be selective as more species were identified from eDNA. In particular, with eDNA seabass seemed to occur at a similar abundance as blackspot seabream in the surveyed area, while it was not caught on handlines and the two species may have similar echoes. eDNA has a number of advantages, it covers all species (from microbes to mammals), all habitats (e.g.; both trawlable grounds and waters above rocky outcrops came be sampled with the same method) and does not depend on behaviour (egg daily vertical migration) and does not need identification fishing. However, as no catches are implied, eDNA provides no information of population composition (size, sex).

12.2.9 Management considerations

In the 2014 advice, ICES recommend the establishment of a recovery plan for the stock and in 2016, 2018, 2020 and 2022 the general advice recommended zero catch. This stock is collapsed, however, a recovery plan was never applied, and instead a TAC that is reduced every two years was stablished. In this sense, landings in 2007, 2010, 2012, 2014, 2015, 2016, 2018 and 2021 were slightly above the TAC. Measures such as a minimum landing size of 35 cm was applied but only for the period from 2010–2012, and since 2019 Spain has established closure areas with the to protect the juveniles in Division 8c. The recreational fisheries may be a significant proportion of the mortality of those juveniles owing to their coastal distribution. This was confirmed for the stock in Subarea 10 (Pinho, 2015).

Based on the STECF conclusions in previous assessments in which studies represented reasonably sound scientific evidence for the survival of red seabream, the Commission Delegated Regulation (EU) 2020/2015, of 21 August 2020 specified the details of the implementation of the landing obligation to red seabream caught with the artisanal gear voracera in ICES division 9a and with hooks and lines (gear codes: LHP, LHM, LLS, LLD) until 31 December 2022 in ICES subareas 8 and 10 and in ICES division 9a. The regulation specifies that according to the survivability exemption when discarding red sea bream caught shall be released immediately.

12.2.10 Tables and Figures

Table 12.2.1a. Blackspot seabream in subareas 6 and 7; landings by country.

YEAR	FRANCE*	IRELAND	SPAIN	UK (E & W)	UK (Scot)	CH. ISLANDS*	NETHERLANDS	TOTAL
1988	52	0	47	153		0		252
1989	44	0	69	76		0		189
1990	22	3	73	36		0		134
1991	13	10	30	56		14		123
1992	6	16	18	0		0		40
1993	5	7	10	0		0		22
1994	0	0	9	0		1		10
1995	0	6	5	0		0		11
1996	0	4	24	1		0		29
1997	0	20	0	36				56
1998	0	4	7	6				17
1999	2	8	0	15				25
2000	4	n.a.	3	13				20
2001	2	11	2	37				52
2002	4	0	9	13				25
2003	13	0	7	20				40
2004	33		4	18				55
2005	29		4	7				41
2006	36	0	8	19				63
2007	46	0	27	57				130
2008	39	0	2	22				63
2009	34	1	16	10				61
2010	22	0	40	1				62
2011	21		11	4				37
2012	38		118					156
2013	28		146	4				178
2014	15		35	9	0			60

YEAR	FRANCE*	IRELAND	SPAIN	UK (E & W)	UK (Scot)	CH. ISLANDS*	NETHERLANDS	TOTAL
2015	13	0	21					34
2016	24	0	15	1	0			40
2017	15	1	19	1		0	0	37
2018	17	0	2	1			1	22
2019	19	0	15	1				35
2020	8		13	0				21
2021	6	0	9	+				15
2022		4	0	6	0		0	11

*Channel Islands

Table 12.2.1b. Blackspot seabream in Subarea 8; landings by country.

YEAR	FRANCE*	SPAIN	UK (E & W))	TOTAL
1988	37	91	9	137
1989	31	234	7	272
1990	15	280	17	312
1991	10	124	0	134
1992	5	119	0	124
1993	3	172	0	175
1994	0	131	0	131
1995	0	110	0	110
1996	0	23	0	23
1997	18	7	0	25
1998	18	86	0	104
1999	13	84	0	97
2000	11	189	0	200
2001	8	168	0	176
2002	10	111	0	121
2003	6	83	0	89
2004	37	82	8	128
2005	28	90	0	118

YEAR	FRANCE*	SPAIN	UK (E & W))	TOTAL
2006	20	57	0	77
2007	44	149	1	193
2008	55	40	0	95
2009	5	137	0	142
2010	61	157	0	218
2011	19	122	0	141
2012	18	82	0	101
2013	26	91	0	117
2014	36	161	0	196
2015	18	125	0	143
2016	7	117	0	124
2017	3	85	0	89
2018	6	105	0	111
2019	4	59	0	63
2020	4	59		63
2021	7	77		84
2022	6	74		80

Table 12.2.1c Blackspot seabream in Subareas 6, 7 and 8; landings by subarea.

YEAR	6 AND 7	8	TOTAL
1988	252	137	389
1989	189	272	461
1990	134	312	446
1991	123	134	257
1992	40	124	164
1993	22	175	197
1994	10	131	141
1995	11	110	121
1996	29	23	52
1997	56	25	81

YEAR	6 AND 7	8	TOTAL
1998	17	104	121
1999	25	97	122
2000	20	200	220
2001	52	176	227
2002	25	121	147
2003	40	89	129
2004	55	128	183
2005	41	118	158
2006	63	77	139
2007	130	193	324
2008	63	95	159
2009	61	142	203
2010	62	218	281
2011	37	141	177
2012	156	101	257
2013	178	117	295
2014	60	196	256
2015	34	143	177
2016	40	124	164
2017	37	89	126
2018	22	111	133
2019	35	63	98
2020	21	71	91
2021	15	84	98
2022	11	80	91

Table 12.2.2. Blackspot seabream in subareas 6, 7 and 8; discards reported to ICES in subareas 6, 7 and 8 since 2014.

	Discards (t)	Landings (t)	Catches (t)	Discards/Catches (%)
2014	2.40	256	258	0.9

	Discards (t)	Landings (t)	Catches (t)	Discards/Catches (%)
2015	2.33	177	179	1.3
2016	0.91	164	165	0.6
2014	2.40	256	259	0.9
2015	2.33	177	179	1.3
2016	0.91	164	165	0.6
2017	1.17	126	127	0.9
2018	2.3	133	136	1.7
2019	2.7	98	101	2.7
2020	0	91	91	0
2021	0.4	98	99	0.4
2022	0	91	91	0

Table 12.2.3. Blackspot seabream in Subareas 6, 7 and 8.Landings inside and outside the NEAFC Regulatory Area (RA) as estimated by ICES for the stock in WGDEEP.

WGDEEP Stock sbr.27.6-8	Catch Inside NEAFC RA (t)	Catch Outside NEAFC RA (t)	Total Catches	Proportion of catch inside the NEAFC RA (%)
2017	0	126	126	0%
2018	0	136	136	0%
2019	0	101	101	0%
2020	0	91	91	0%
2021	0	99	99	0%
2022	0	91	91	0%

Table 12.2.4 Mean size and weight-at-age of Blackspot seabream in Bay of Biscay. From Lorance (2011), derived from Guéguen (1969b) and Krug (1998).

Age group	Mean size (total length, cm)	Mean weight (g)	Proportion of mature females
0			0
1	11.2	18	0
2	17.6	72	0
3	22.3	149	0
4	26	239	0

Age group	Mean size (total length, cm)	Mean weight (g)	Proportion of mature females
5	29.2	342	0
6	31.9	449	0.007
7	34.3	562	0.05
8	36.1	658	0.15
9	37.9	765	0.31
10	39.5	870	0.45
11	40.9	969	0.54
12	42.3	1076	0.62
13	43.7	1190	0.68
14	44.8	1285	0.73
15	45.9	1386	0.77
16	46.7	1462	0.80
17	47.8	1572	0.83
18	49.2	1719	0.86
19	49.9	1796	0.88
20	50.2	1830	0.89

Table 12.2.5. Occurrence (kg and % of occurrence in the sampled stations) of the Blackspot seabream (*P. bogaraveo*) in Irish IGFS survey time-series (2010–2020).

	kg	% of occurrence in the stations
2010	0.2	0.8%
2011	0	0
2012	0.1	0.6%
2013	0	0
2014	0	00
2015	0	0
2016	2.1	2.4%
2017	8.2	4.3%
2018	0	0
2019	0	0

2020	0	0
2021	0	0
2022	0	0

Table 12.2.6. References and sources of reconstructed landings data in the Figure 12.2.1a.

France	-Years 1977–1987: Landings of P.bogaraveo (sic?) from the Northeast Atlantic. M. Pinho, pers. com. Source: SGDeep 1995. -Years 1950–1984: Landings of Pagellus sp. ("seabreams") from the Northeast Atlantic. Source: Dardignac (1988), quoted by Castro (1990). SGDeep
Portugal	-Years 1948–1987 Subarea 10: Landings of *P.bogaraveo* (*sic*). M.Pinho, pers. com. Source: H. Krug (for 1948–1969) and SGDeep 1995 (for 1970–1987). -Years 1948–1987, Subarea 9: Landings of *P.bogaraveo* (*sic*?). M.Pinho, pers. com. Source: H. Krug (for 1948–1969) and SGDeep 1995 (for 1970–1987).
Spain	-Years 1960–1986: Landings of *Pagellus* sp. ("seabreams") from the Northeast Atlantic. Source: Anuarios de Pesca maritima. Castro (1990). SGDeep 1996.Table 12.2.3. -Years 1983–1987: Landings of *P.bogaraveo* (*sic*) from Division 9.a correspond only to southern 9.a (Tarifa and Algeciras ports). Source: Cofradias de Pescadores.(WD Gil, 2004) and Cofradias de Pescadores. (Lucio, 1996). -Years 1985–1987: Landings of *Pagellus* sp. (mainly *P. bogaraveo*). Source: SGDeep 1996. Table 12.2.4. -Years 1948–1984: Landings of *P.bogaraveo* (*sic*) from "Division 8.c" mainly Division 8.c (eastern) and Division VIIIb (southern) correspond only to the Basque
UK	-Years 1978–1987: Landings of *P.bogaraveo* (*sic*?) from the Northeast Atlantic. M .Pinho, pers. com. Source: SGDeep 1995.
All countries	-Years 1979–1985 SGDeep official data -Years 1988–2022 landings reported to ICES

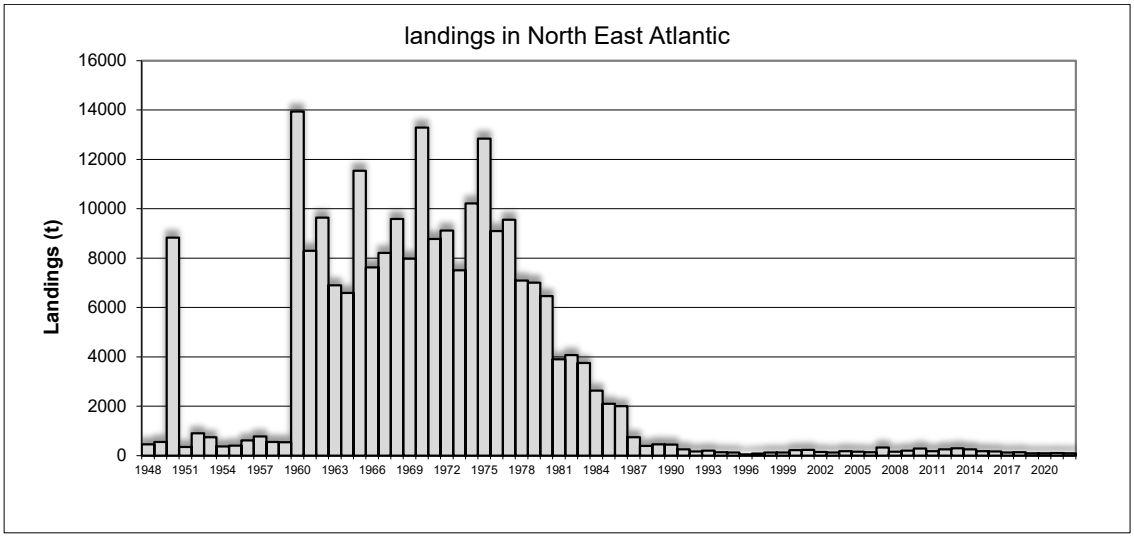

Figure 12.2.1a. Blackspot seabream in Subareas 6, 7 and 8. Source of the reconstructed landings of blackspot seabream in the Bay of Biscay from 1948 to 2022.

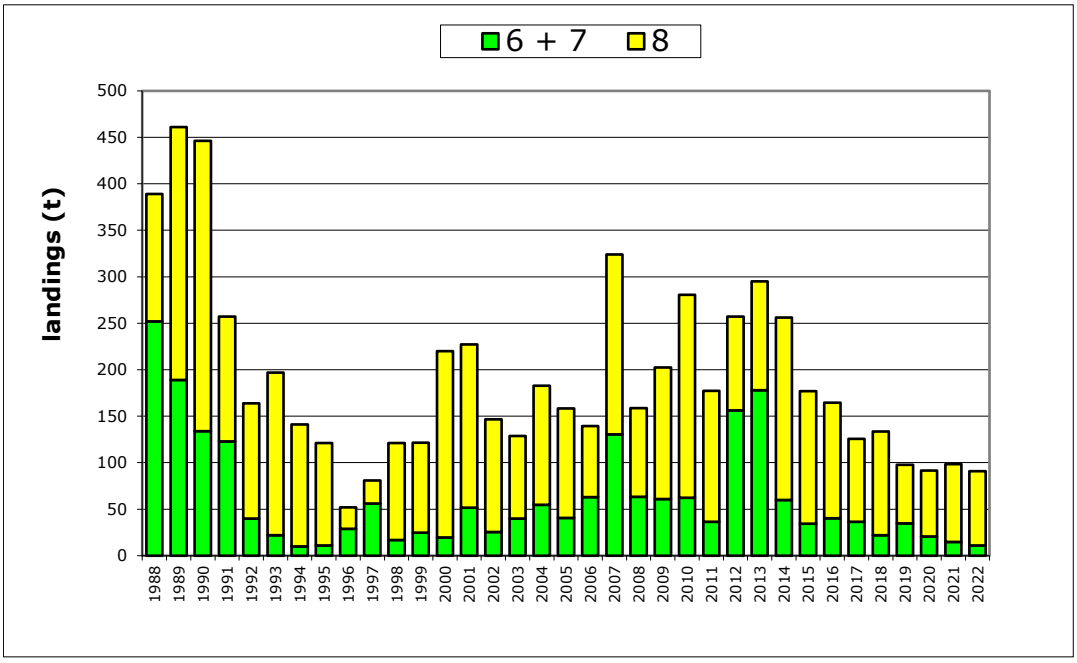

Figure 12.2.1b. Blackspot seabream landing trends in ICES subareas 6 and 7 combined and Subarea 8 since 1

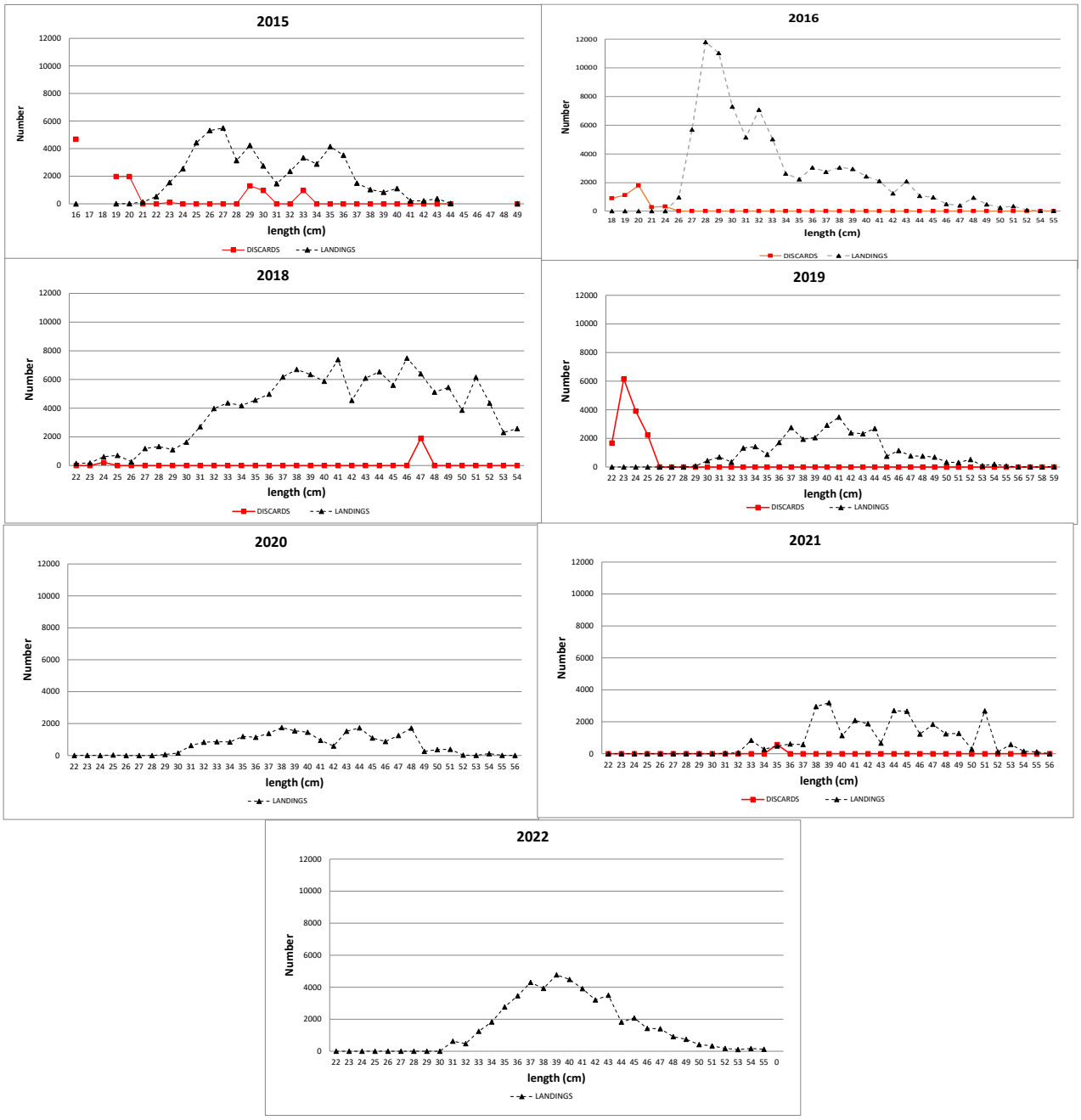

Figure 12.2.2. Length frequencies of the blackspot seabream in commercial catches, landings and discards since 2015, in Subareas 6, 7 and 8 in the period 2015-2022.

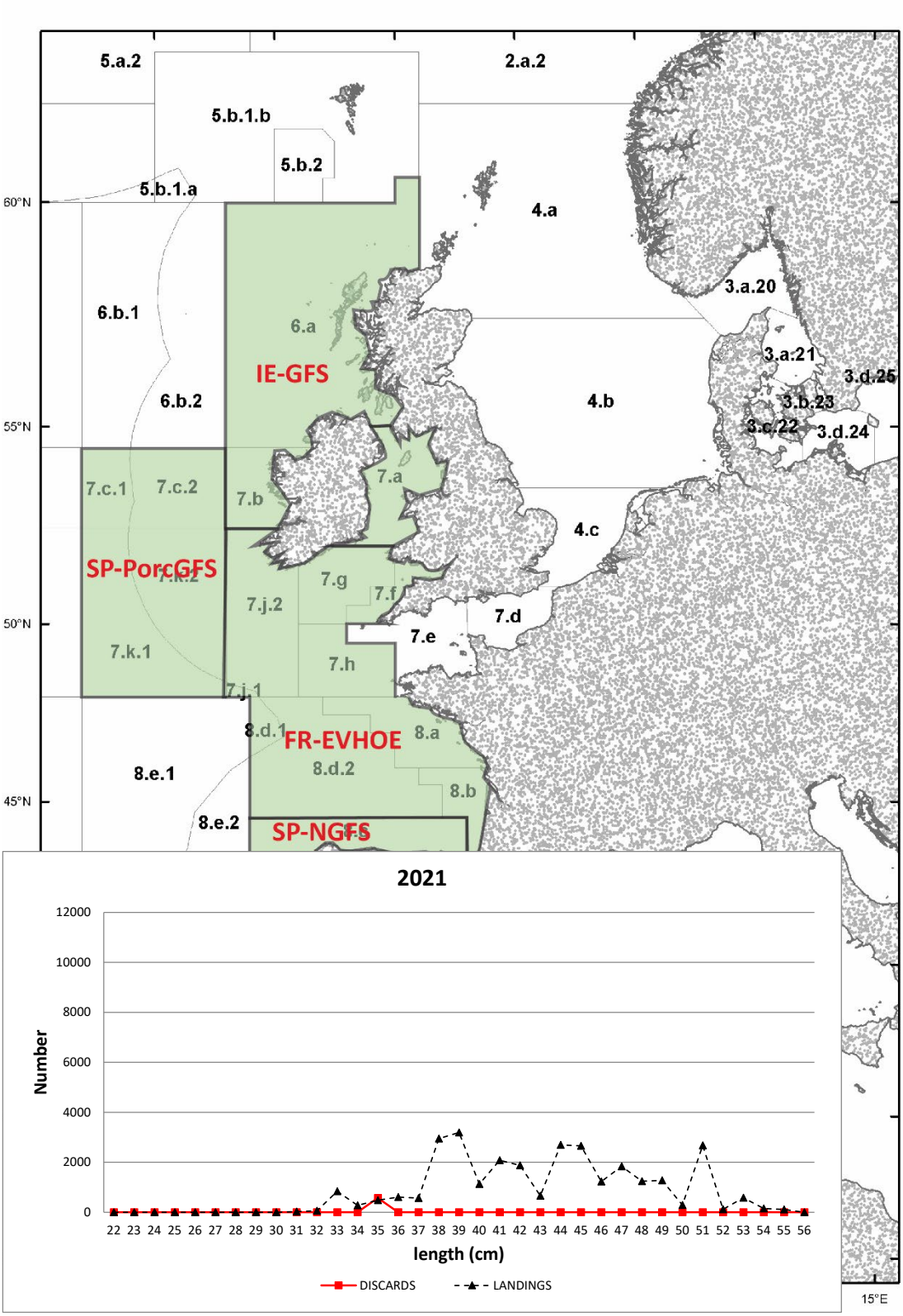

Figure 12.2.3. Map of the Divisions and the four surveys covering the stock rsb.27. 6-8.

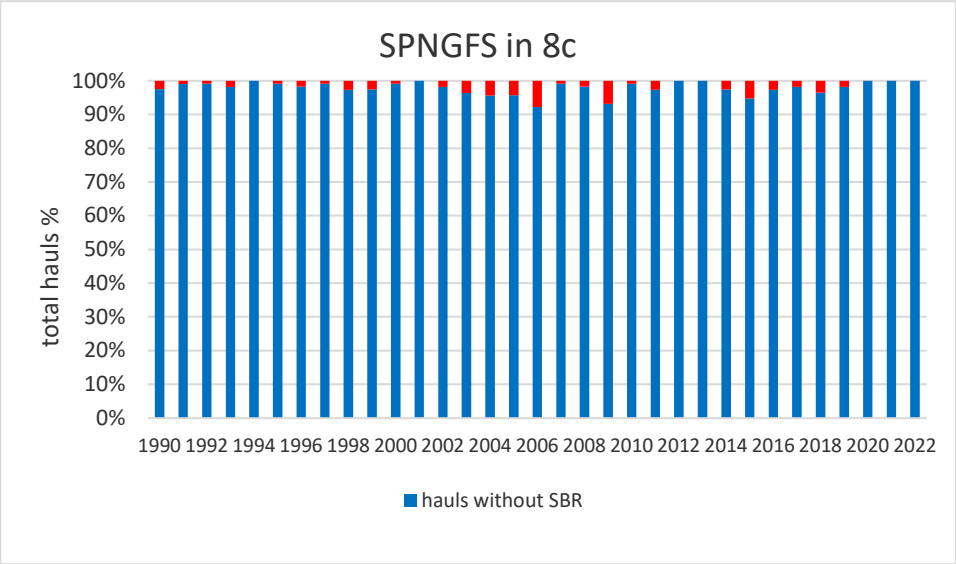

Figure 12.2.4. Occurrence (%) of the Blackspot seabream (*P. bogaraveo*) in Northern Spanish Shelf survey time-series (1990–2022).

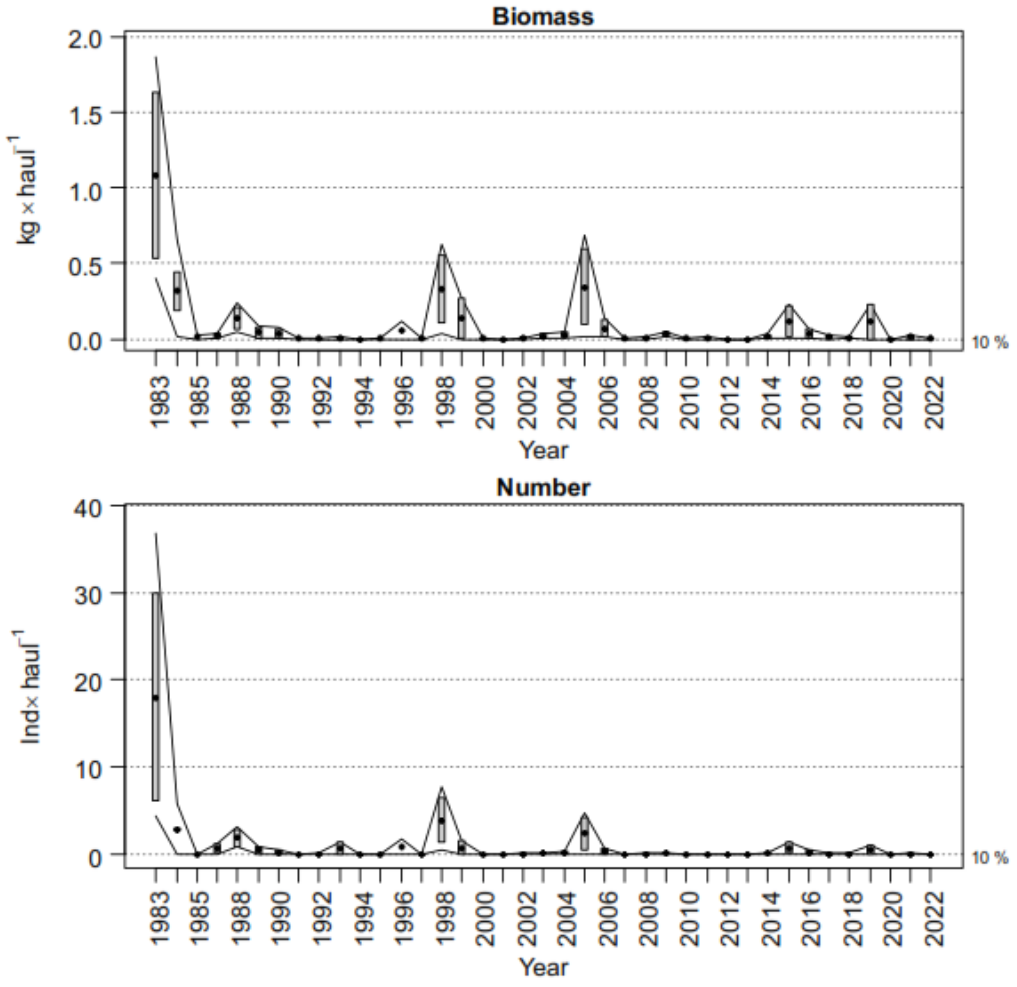

Figure 12.2.5. Evolution of Blackspot seabream (*P. bogaraveo*) mean stratified biomass (upper panel) and abundance (lower panel) in Northern Spanish Shelf survey time-series (1983–2022).

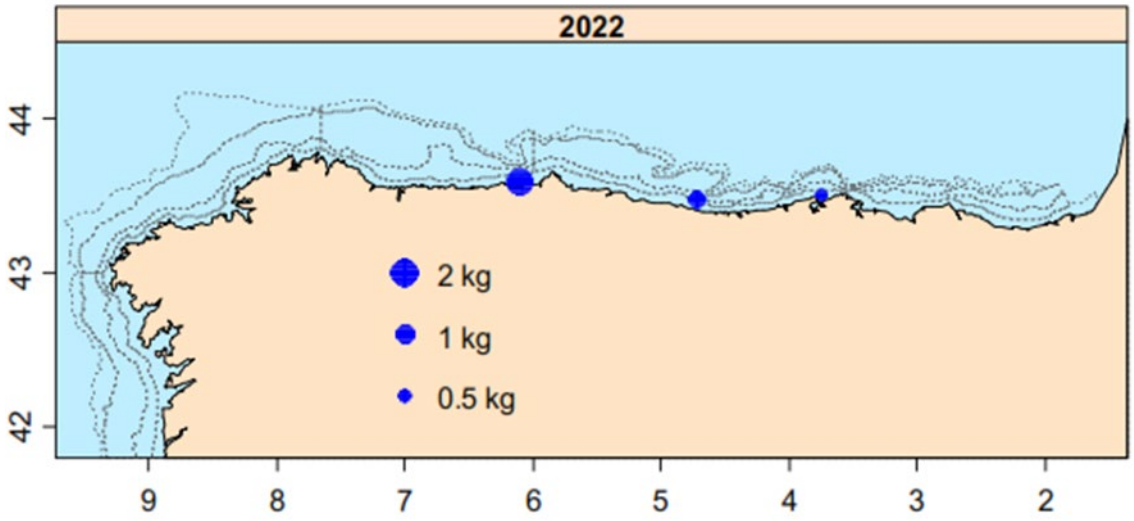

Figure 12.2.6. Catches in biomass of Blackspot seabream on the Northern Spanish Shelf bottom-trawl surveys in 2022.

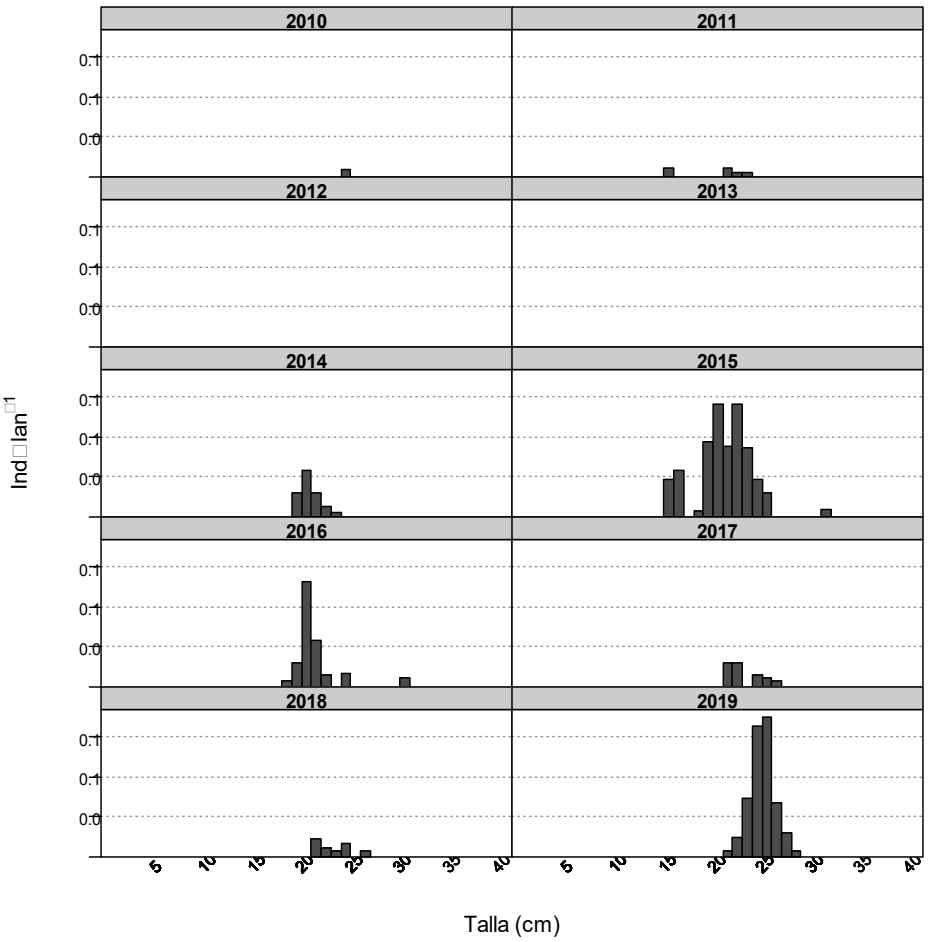

Figure 12.2.7. Mean stratified length distributions of Blackspot seabream (*P. bogaraveo*) in Northern Spanish Shelf surveys (2010–2019), no data before 2009.

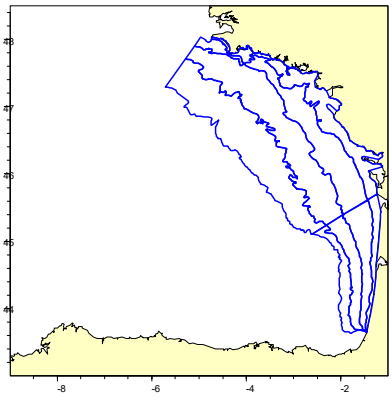

Figure 12.2.8. Strata covering the Bay of Biscay shelf, sampled in the current EVHOE survey and in two previous surveys in 1973 and 1976.

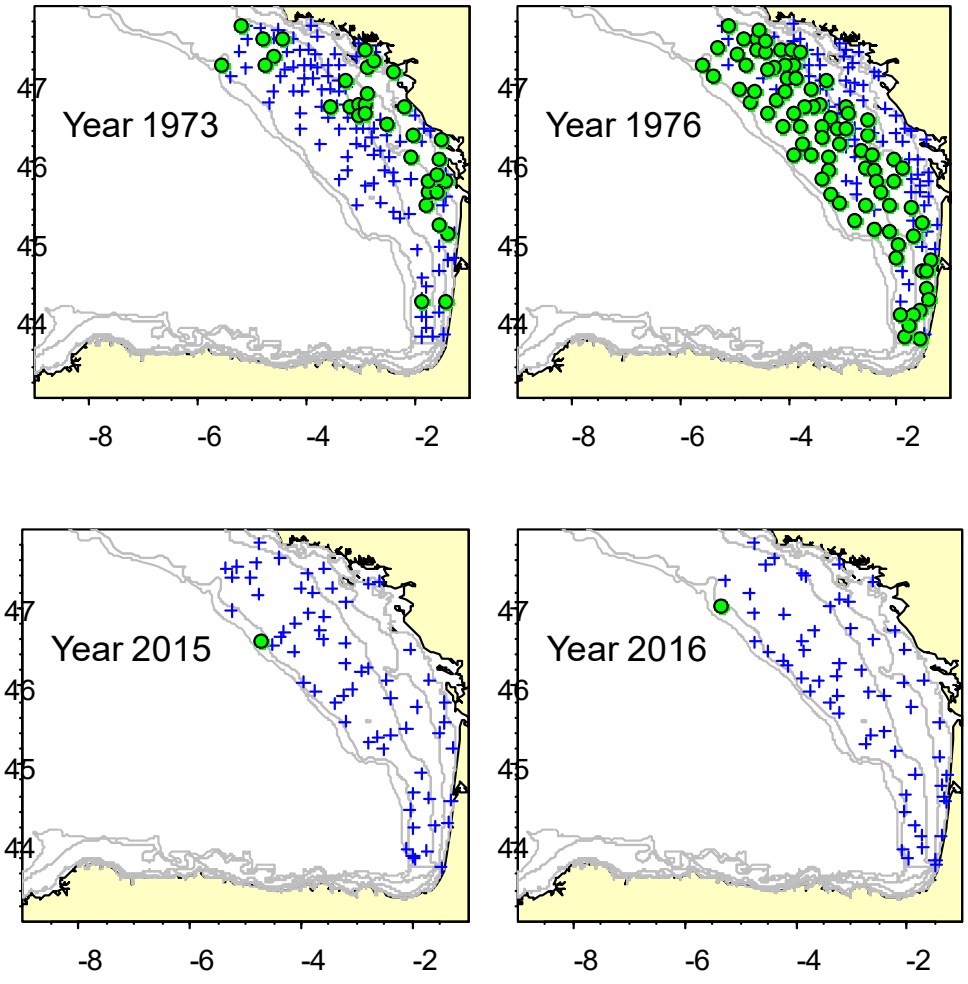

Figure 12.2.9. Occurrences of Blackspot seabream in surveys carried out in 1973 and 1976 and in the EVHOE survey in 2015 and 2016.

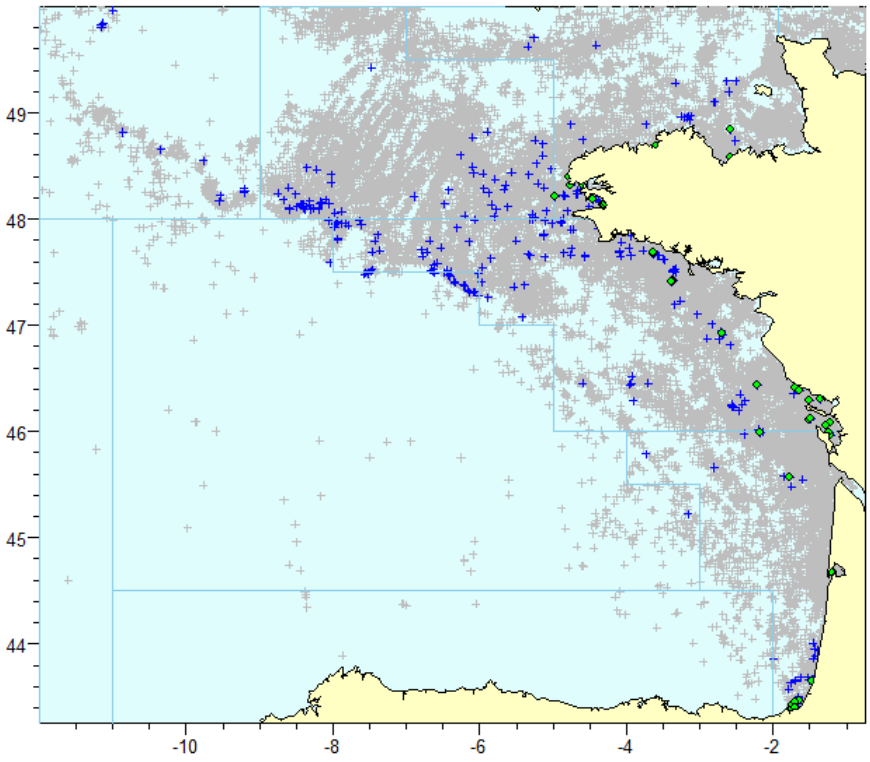

Figure 12.2.10. Geographical distribution on catch of the Blackspot seabream in French on-board observations 2010–2016 in the Bay of Biscay and southern Celtic Sea, all métiers. (Grey) all haul/sets observed, (Blue crosses) hauls with catch of blackspot seabream, (Green dots) hauls with catch of blackspot seabream <20 cm which species identification may be uncertain.

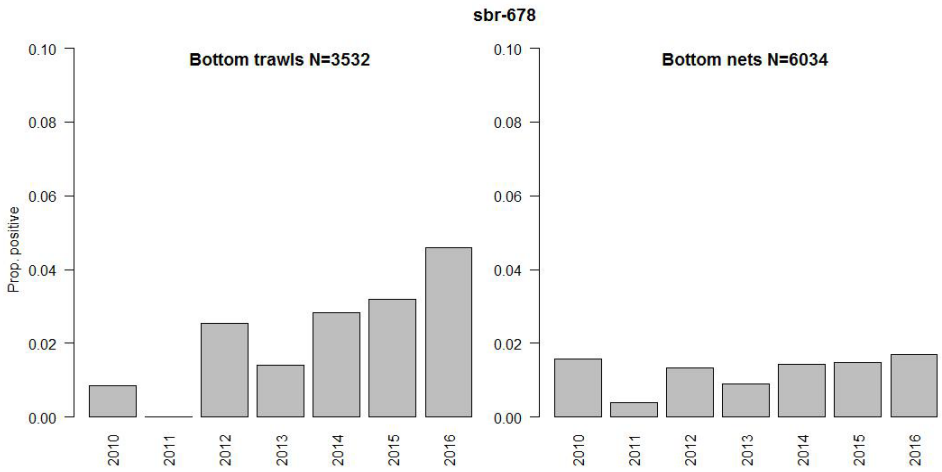

Figure 12.2.11. Proportion of fishing operations with catch of Blackspot seabream in bottom trawls (left) and bottom net (right) in French fisheries to the south of 49°N (ICES divisions 8.a–d and the southern part of 7.d and 7.h–k).

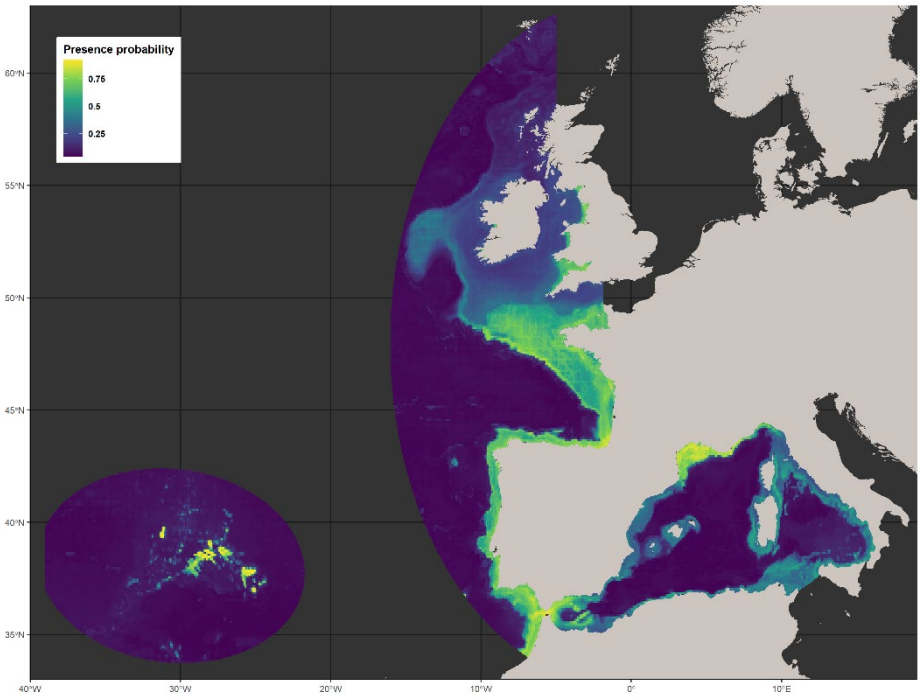

Figure 12.2.12. Potential habitat of the blackspot seabream in the Mediterranean Sea, Azorean waters and European Atlantic shelf estimated from the ensemble modelling.

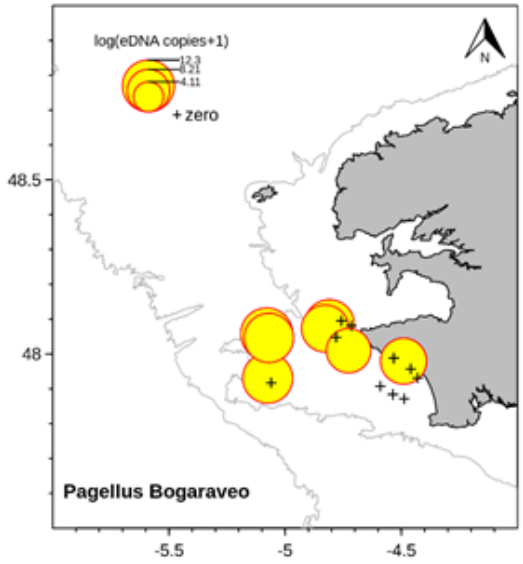

Figure 12.2.13. Number of eDNA copies (log scale) of blackspot seabream by location sampled in September 2020.

12.2.11 References

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12.3 Blackspot seabream (*Pagellus bogaraveo*) in Subarea 9 (Atlantic Iberian waters)

12.3.1 The fishery

Pagellus bogaraveo is caught by Spanish and Portuguese fleets in ICES Subarea 27.9. Spanish landings data from this area are available from 1983, Portuguese data from 1988 and Moroccan information from 2001. 2016–2022 European landings in Subarea 27.9, most of which are taken with lines, are from Portugal (~48%) and Spain (~52%). Important to note that these changes partially reflect restrictive TAC constrains in recent years.

An update of the available information on the Spanish target fishery, from the southern part of Subarea 27.9, Strait of Gibraltar region, has been provided to the WGDEEP (Gil *et al.*, WD 12 to the 2023 WGDEEP). Currently, less than 20 Spanish vessels are involved in the fishery. The fishing grounds of the Spanish fleet are located on both sides of the Strait of Gibraltar and near, i.e. mostly less than 20 nautical miles, from the main ports (Tarifa and Algeciras). It should be noted that not all the catches/landings come exclusively from ICES Subarea 9 although it was considered to belong to the same stock, the fishing grounds encompass areas of different Regional Organizations/Commissions (ICES, General Fisheries Commission for the Mediterranean (GFCM) and Fishery Committee for the Eastern Central Atlantic (CECAF). Fishing takes advantage of the fluctuation of the tide at depths from 350 to 700 m with "voracera" gear, a mechanized handline. Since 2002 artisanal vessels from Conil port have joined the blackspot seabream fishery. Those boats operate in other fishing grounds and use longlines. This section of the Spanish fleet is currently composed by about six vessels. Species landings are disaggregated into different commercial categories due to the wide size range of the catch and size-varying prices. Historically these categories have varied but from 1999 onwards have remained the same in all ports.

Since 2001, Moroccan longliners held a fishery in the Strait of Gibraltar area. These are about 102 vessels that are mainly based in Tangier. The average technical characteristics of these vessels are: 20 GRT and 160 HP. Moreover, 435 artisanal vessels (±15 CV, ≤2 GRT and 4–6 m length) also target this species in the Strait of Gibraltar area. The WGDEEP considers the account of Moroccan catches appropriate as the fishery operates in the same area as the Spanish fishery and obviously targets the same stock. Landings information until 2021 was also available from GFCM WGSAD sessions for the assessment of blackspot seabream in GSAs 1-3 (2022).

Detailed information from Portuguese fisheries has been updated in the Working Group by Farias and Figueiredo (WD 15 to the 2023 WGDEEP). As well as in other Spanish places in Subarea 27.9, it is admitted that there are no fisheries targeting the blackspot seabream in Portugal mainland although the species can be seasonally targeted: the species is usually caught as bycatch of fisheries targeting other species. In mainland Portugal, most of species landings are as fresh specimens and are derived from the polyvalent fleet, which uses mainly longlines. The main landing ports (≈89% of the species mainland Portugal total landings) from North to South are: Matosinhos (Portugal North), Aveiro, Nazaré and Peniche (Portugal Centre) and Sagres (Portugal Algarve).

In the Portuguese area of 27.9.a stock, Peniche is the most important landing port for blackspot seabream (landings between 1999 and 2022 represented nearly 50% of the Portuguese landings of the species. The species is mainly landed between December and March: this seasonal fishery pattern can reflect differences on the species' availability (coinciding with the spawning season) or differences on skippers' seasonal fishing grounds preferences (Farias and Figueiredo, WD 7 to the 2020 WGDEEP).

12.3.1.1 Landing trends

Since 1990, the maximum catch was reached in 1993–1994 and 1997 (about 1000 t) whereas the minimum (about 50 t) in 2022 (Figure and Table 12.3.1). It should be reinforced that not all Spanish landings from the Strait of Gibraltar come from ICES Subarea 27.9. Moroccan landings from the Strait of Gibraltar area are supposed to be outside ICES Subarea 27.9: 2022 landings were not available yet.

12.3.2 ICES Advice

The ICES advices for 2023 and 2024 was "*that when the precautionary approach is applied, catches should be no more than 114 tonnes in each of the years 2023 and 2024. All catches are assumed to be landed.*"

12.3.3 Management

Since 2003, TAC and Quotas have been applied to the blackspot seabream fishery in Subarea 27.9. The table below shows a summary of *P. bogaraveo* recent years' TACs and European countries landings in this Subarea.

Pagellus bogaraveo **TACs and total landings in European countries in Subarea 27.9 in recent years.**

P. bogaraveo	2016–2017		2018–2019		2020–2021		2022–2023	
ICES Subarea	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings
9	183 – 174	165 (77*) – 130 (17*)	165 – 149	87 (8*) – 56 (4*)	149 – 119	59 (3*) – 45 (4*)	119 – 114	40 (2*) –

***from InterCatch info: landings from adjacent waters of the Strait of Gibraltar (FAO 34.1.11 and FAO 37.1.1).**

There is a minimum conservation reference size of 33 cm for this species in the Regions 1–5 (as defined in Article 2 of Regulation (EC) No 850/98) since 11 May 2017 (Commission Implementing Regulation (EU) 2017/787 of 8 May 2017). This size coincides with the previously applied minimum size in the Mediterranean Sea. The European Commission granted the exemption for the Strait of Gibraltar target fishery, which is expressed in the discard plan for certain demersal fisheries in South-Western waters for the period 2019-2021 (Commission Delegated Regulation (EU) 2018/2033).

European landings have always been below the adopted TACs although these have been reduced over the years. However, in the year 2016 (considering other areas such as FAO 34.1.11 and FAO 37.1.1) European countries landings (242 t) are above the 2016 TAC (183 t) for ICES Subarea 27.9 (Figure 12.3.1).

12.3.4 Stock identity

Stock structure of the species in ICES Subarea 27.9 is still unknown. Genetic studies showed a restricted gene flow among the populations located in the Azores (ICES Division 27.10.a.2) and those on the Portuguese continental slope (ICES Division 27.9.a) and Madeira (CECAF FAO Division 34.1.2) (Stockley *et al*., 2005; Piñera *et al*., 2007). Recent genetic studies using mitochondrial control region indicated a similar genetic diversity among sampling sites in the NE Atlantic and the Mediterranean, and no differentiation between the Azores and the remaining locations (Robalo *et al*., 2021). Derived from a genomic study, latest genetic results on the stock structure of

blackspot seabream in the NE Atlantic were shown to the WGDEEP (Castilho *et al*., 2022): these results confirm the poor connectivity between the Azorean population and the Atlantic eastern continental margin locations with additional evidences for genetic differentiation within off Iberian waters (ICES subarea 27.9.a) and the Strait of Gibraltar.

In the Strait of Gibraltar area tagging surveys (56 days at sea in 2001, 2002, 2004, 2006 and 2008) have been conducted. A total of 4500 fish were tagged, of which 423 recaptures have been reported. The main results indicate the inexistence of significant movements. Although strict movements were noted: feeding grounds are distributed along the entire Strait of Gibraltar and the species seems to remain within this area as a resident population (Gil, 2006). Recaptures of tagged fish have also been reported by the Moroccan fishery.

Farias and Figueiredo (WD 14 to the WGDEEP 2019) present information on blackspot seabream spatial distribution from Portuguese research surveys, considering the relative frequency of fishing hauls with species catch rates higher than 5 specimens in the 1990-2017 surveys. It is concluded that the species is not evenly distributed along the surveyed area, being more frequently caught at specific grounds, suggesting a patchy distribution. In the northern coast of Portugal, the species is caught down to 100 m deep, whereas preferred habitats are between 200 and 400 m deep in the south-western coast (Figure 12.3.2). There is no evidence of movements between the northernmost component and the southern part of Subarea 27.9 where Spanish fishery takes place.

12.3.5 Data available

12.3.5.1 Landings and discards

Historical landing data series available to the Working Group are described in Section 12.3.1 and detailed in Table 12.3.1. It should be noted that since 2015 Spanish landings include adjacent areas outside ICES Subarea 27.9 (data are not separated in earlier years). In addition, Morocco landings from the Strait of Gibraltar area are available since 2001 (not in 2022), although fishing is supposed to have taken place outside ICES Subarea 27.9. Table 12.3.2 presents the WG estimates of landings restricted to the ICES Subarea 9, without considering those from the Strait of Gibraltar target fishery.

Portuguese and Spanish discard information was available to the Working Group from on-board sampling programme (EU DCF/NP). Given the low levels of discards, the discarded rate is admitted to be nearly zero for most assessment purposes and those that do occur are mainly related to catches of small individuals. Consequently all catches of blackspot seabream in management are 27.9a. are assumed to be landed. Survival studies taken in ICES 27.9.a are consistent with a high survival rate after capture and release to the see

12.3.5.2 Length compositions

Length frequencies of landings are available for the Spanish "*voracera*" blackspot seabream target fishery in the Strait of Gibraltar (1997–2022). Figure 12.3.3 show the updated length distribution data (from Gil *et al*., WD 12 to the 2023 WGDEEP). The table below shows the mean and median landed size since 1998:

Summary statistics of *Pagellus bogaraveo* landed sizes by year since 1998.

Year	Mean	Std. Dev.	Median	Year	Mean	Std. Dev.	Median
1998	34.33	5.07	34	2010	36.03	5.28	35
1998	35.98	5.07	35	2011	36.33	6.36	34

Year	Mean	Std. Dev.	Median	Year	Mean	Std. Dev.	Median
1999	36.23	5.30	36	2012	36.40	5.91	35
2000	36.79	4.81	36	2013	34.80	3.64	34
2001	37.11	5.45	37	2014	37.11	5.14	36
2002	38.10	5.93	38	2015	39.15	5.79	38
2003	38.35	6.27	38	2016	37.47	5.28	37
2004	36.56	5.69	35	2017	37.72	4.37	37
2005	36.79	6.02	35	2018	37.84	4.67	37
2006	35.87	5.58	35	2019	37.27	4.21	37
2007	37.26	5.95	36	2020	37.37	4.30	37
2008	37.76	6.22	36	2021	42.19	5.90	41
2009	38.29	6.23	37	2022	36.77	3.96	36

Only one mean value (in 1998) is lower than the 2013 year´s mean landing size. However, changes are small and gradual. 2021 year's increase should be interpreted with caution and must be revised because is not consistent with previous and following years (Figure 12.3.3).

Landings length distribution by fishing segment (polyvalent and trawlers) from 2014 until 2022 are presented in Figure 12.3.4 (from Farias and Figueiredo, WD 15 to the WGDEEP 2023). Differences in length distribution between the polyvalent the trawl segments indicate that polyvalent fleet catch larger fish than the trawl fleet because operate in areas farther from the coast and at higher depths, where larger fish are more common (Farias *et al*., WD to the 2018 WGDEEP).

12.3.5.3 Age compositions

No new information was presented to the group.

12.3.5.4 Weight-at-age

No new information was presented to the group.

12.3.5.5 Maturity and natural mortality

No new information was presented to the group.

12.3.5.6 Catch, effort and research vessel data

Figure 12.3.5 and Table 12.3.2 present CPUE information, restricted to the Strait of Gibraltar fishery (Gil *et al*., WD 12 to the 2023 WGDEEP). Effort, as indicated, from sales sheets is not standardized and is potentially underestimated in some years as the effort unit chosen may be inappropriate while CPUE estimated from VMS analysis shows the same trend.

Farias and Figueiredo (WD 15 to the 2023 WGDEEP) identify two reference fleets landing at Peniche port: a total of 36 fishing vessels (with more than 9 fishing trips per year and more than 6 months with positive landings of the species) were selected for the polyvalent (longliners) while 10 fishing vessels (with more than 9 fishing trips per year and more than 5 months with positive landings of the species) were selected for the trawl fleet. The GLM estimates of the

reference fleets' CPUE, considered as landed weight per fishing trip, for the selected model are also presented in the WD. Catch rates derived from longliners are slightly higher than those from trawl – this probably reflects a difference on the species length composition between the two fleets (Figure 12.3.6 and Table 12.3.4).

12.3.5.7 Data analyses

The stock identity is still unclear linkages between the Strait of Gibraltar populations and the populations in the northern and central area of Subarea 27.9 are unlikely.

The trend is clear in the target fishery of the Strait of Gibraltar. Landings declined significantly until 2013 which may be considered as an indication of a substantial reduction in exploitable biomass. Current CPUE low levels may also be consistent with an almost depleted population: the fishing grounds of this target fishery partially overlap the southern limit of ICES Subarea 27.9 (Figure 12.3.7). Moroccan fleet also targets this species in the Strait of Gibraltar since 2001.

However, the analysis from the Portuguese (Peniche port) reference fleets' CPUE is not in accordance with the clear decreasing trend observed in the Strait of Gibraltar target fishery: longlines and bottom trawl catch rates from West Portugal coast are relatively stable. Furthermore, preliminary genomic studies confirmed low connectivity between the Azorean population and the Atlantic eastern continental margin locations and suggested genetic differentiation between the Strait of Gibraltar and locations further north in Iberian waters (Castilho et *al*., WD 5 to the 2022 WGDEEP).

Length-based indicators (LBI) screening methods were applied to the length data for continental Portugal (Farias and Figueiredo, WD 15 to the 2023 WGDEEP). Lmat (35.1 cm, females) and Linf (62 cm, both sexes) estimates were adopted from Gil (2006) and CopeMed II (2019), respectively. The length-weight relationship parameters ($W = 1.17542e\text{-}05 \times L^{3.0366}$) were estimated based on biological sampling data collected in 2020 and following the procedure in fishR Vignette (Ogle, 2013). Results from the LBI screening method are shown in Figure 12.3.8.

WGDEEP experts suggest that the stock in 27.9 should be assessed based on biomass indices which cover a representative fraction of the area of ICES Subarea 27.9. It is not clear that the fishery biomass index currently used fill this criterion, as it is derived from a fishery that takes place on the southern edge of ICES 27.9. This fishery targets blackspot seabream do not appear to mix greatly with blackspot seabream in western and northerly areas of 27.9, and are furthermore targeted in a fishery that mostly extends outside of 27.9.

In 2022 as in previous WGDEEP attempts, SPiCT results were quite uncertain with wide confidence intervals. The WG considered that if SPICT will be essayed again a dedicated working group would be set (next SPiCT benchmark, late 2023 – early 2024) including both stock experts and model developers to explore the adequacy of SPiCT to this stock. Adjustments on the code and extensive sensitivity analyses, particularly concerning on the choice of priori distributions, are expected to take a decision on the appropriateness of the method for this stock.

12.3.6 Management considerations

A TAC regime (114 t) was established for 2023 and 2024 for whole Subarea 27.9. Although the advice aims to reduce total catch within the whole fishing area, it should be noted that the current TAC does not limit the whole fishery because it only applies to Subarea 27.9, nevertheless catches in the GFCM area 37.1.1 and CECAF area 34.1.11 should be reported (Council Regulation (EU) 2016/2285). Recent landings are below the corresponding TAC levels but in 2016, European landings (including other areas such as FAO 34.1.11 and FAO 37.1.1) were above the 2016 TAC.

The combination of the minimum size of 33 cm for this species and the landing obligation (EU Regulation 2013/1380) might have an effect on certain fisheries: the exemption from the landing obligation of the target fishery of the Strait of Gibraltar ("*voracera*" gear) does not apply to other blackspot seabream catches in ICES Subarea 27.9.

GFCM established a management plan for the blackspot seabream fishery of the Strait of Gibraltar in 2022 (GFCM/45/2022/3 on a multiannual management plan for the sustainable exploitation of blackspot seabream in the Alboran Sea, geographical subareas 1 to 3). The update of benchmark assessment (gadget model) for blackspot seabream in the Strait of Gibraltar was presented in the last GCFM WGSAD (December 2022): results indicated that the stock is depleted with unsustainable exploitation and low fishing mortality. The recommendation was to proceed with immediate reduction of fishing mortality, implementing also a recovery plan (GFCM, 2022). WGDEEP still expresses its concern on the fact that the population of blackspot seabream in the Strait of Gibraltar is being assessed within two different advisory bodies (ICES and GFCM), who derive scientific advice to managers: coordination between all parties would be welcomed.

As well as in other ICES Subareas (27.6, 27.7, 27.8 and 27.10), measures should include protection for areas where juveniles occur: recreational fisheries may be a significant proportion of the mortality of those juveniles owing to their coastal distribution.

Trends in abundance at the western coast of Portugal is not consistent with the trend in the Strait of Gibraltar: the CPUE of the Peniche reference fleets does suggest a different trend than the Strait of Gibraltar "*voracera*" fleet and there is no evidence of movements between the northernmost component and the southern part of Subarea 27.9, where Spanish fishery takes place. In fact, according to Castilho *et al*. (WD 5 to the 2022 WGDEEP), recent genetic results support the existence of three well-differentiated clusters in the Atlantic: (i) the Azores; (ii) Cadiz (Strait of Gibraltar) and (iii) the continental Atlantic coast. These results provided evidence for genetic differences between the populations off ICES subarea 27.9, clearly separating the population from the Strait of Gibraltar that might be more related to Mediterranean components. Therefore, it might not be appropriate to infer the stock status in all ICES Division 9a from the Strait of Gibraltar target fishery CPUE. Besides, this biological evidence could provide the scientific basis for the revision of the ICES management components adopted for blackspot seabream the Iberian waters.

12.3.7 Tables and Figures

Table 12.3.1. Blackspot seabream (*Pagellus bogaraveo*) in Subarea 27.9: Working Group estimates of landings (in tonnes). Spanish landings from 2012 are official statistics.

Year	Portugal	Spain	Morocco*	Unallocated	TOTAL
1983		101			101
1984		166			166
1985		196			196
1986		225			225
1987		296			296
1988	370	319			689
1989	260	416			676
1990	166	428			594
1991	109	423			532
1992	166	631			797
1993	235	765			1000
1994	150	854			1004
1995	204	625			829
1996	209	769			978
1997	203	808			1011
1998	357	520			877
1999	265	278			543
2000	83	338			421
2001	97	277	17		374 (17*)
2002	111	248	32		359 (32*)
2003	142	329	20		471 (20*)
2004	183	297	30		480 (30*)
2005	129	365	37		494 (37*)
2006	104	440	70		544 (70*)
2007	185	407	85		592 (85*)
2008	158	443	72		601 (72*)

Year	Portugal	Spain	Morocco*	Unallocated	TOTAL
2009	124	594	90		718 (90*)
2010	105	379	142		484 (142*)
2011	74	259	148		333 (148*)
2012	143	60	135	92	295 (135*)
2013	90	91	106		181 (106*)
2014	59	203	131		262 (131*)
2015	66	87 (142**)	224		295 (224*)
2016	70	95 (77**)	161		242 (161*)
2017	69	61 (18**)	190		148 (190*)
2018	58	29 (8**)	76		95 (76*)
2019	36	20 (4**)	119		60 (119*)
2020	43	16 (3**)	83		62 (83*)
2021	29	16 (4**)	114		49 (114*)
2022	33	7 (2**)			42 (N/A*)

***Morocco landings are available from the GFCM Working Group on Stock Assessment of Demersal species (GFCM 2022)**

****Figures in brackets includes blackspot seabream from other areas (FAO 34.1.11. and FAO 37.1.1).**

Table 12.3.2. Blackspot seabream (*Pagellus bogaraveo*) estimated landings in strictly Subarea 27.9, without considering those from the Strait of Gibraltar.

Year	Portugal	Spain	TOTAL
1988	370	0	370
1989	260	0	260
1990	166	0	166
1991	109	0	109
1992	166	0	166
1993	235	0	235
1994	150	0	150
1995	204	0	204
1996	209	0	209
1997	203	0	203

Year	Portugal	Spain	TOTAL
1998	357	0	343
1999	265	0	262
2000	83	33	116
2001	97	41	138
2002	111	82	193
2003	142	117	259
2004	183	57	240
2005	129	35	164
2006	104	93	197
2007	185	45	230
2008	158	27	185
2009	124	15	139
2010	105	13	118
2011	74	19	93
2012	143	26	169
2013	90	24	114
2014	59	65	124
2015	66	61	127
2016	70	72	142
2017	69	35	104
2018	58	29	87
2019	36	6	42
2020	43	7	49
2021	29	11	40
2022	33	8	41

Table 12.3.3. Spanish "*voracera*" blackspot seabream fishery of the Strait of Gibraltar (ICES Subarea 27.9): Estimated CPUE using sales sheets or VMS data as effort unit (adapted from Gil *et al.*, WD 12 to the 2023 WGDEEP).

Year	cpue	VMS cpue
1983	78	
1984	76	
1985	71	
1986	61	
1987	76	
1988	73	
1989	89	
1990	77	
1991	70	
1992	86	
1993	85	
1994	94	
1995	60	
1996	104	
1997	77	
1998	61	
1999	55	
2000	45	
2001	56	
2002	47	
2003	53	
2004	47	
2005	68	
2006	70	
2007	51	
2008	52	
2009	67	55

Year	cpue	VMS cpue
2010	46	38
2011	42	31
2012	35	21
2013	30	14
2014	39	22
2015	49	32
2016	41	27
2017	33	14
2018	18	4
2019	24	8
2020	24	13
2021	21	10
2022	7	1

Table 12.3.4. Standardized CPUE series estimates for Portuguese reference fleets, predicted values and its 95% confidence interval lower – upper values in brackets (adapted from Farias and Figueiredo., WD 15 to the 2023 WGDEEP).

Year/ Reference fleet	Polyvalent	Trawl
2015	7.31 (6.18 – 8.65)	7.51 (6.22 – 9.06)
2016	7.03 (5.88 – 8.40)	6.41 (5.32 – 7.73)
2017	8.44 (7.03 – 10.12)	6.21 (5.19 – 7.43)
2018	7.82 (6.51 – 9.39)	5.35 (4.43 – 6.45)
2019	6.33 (5.23 – 7.65)	4.38 (3.59 – 5.35)
2020	6.13 (7.28 – 8.65)	5.66 (4.63 – 6.92)
2021	6.82 (5.61 – 8.29)	4.40 (3.64 – 5.33)
2022	8.10 (6.51 – 10.08)	4.45 (3.63 – 5.47)

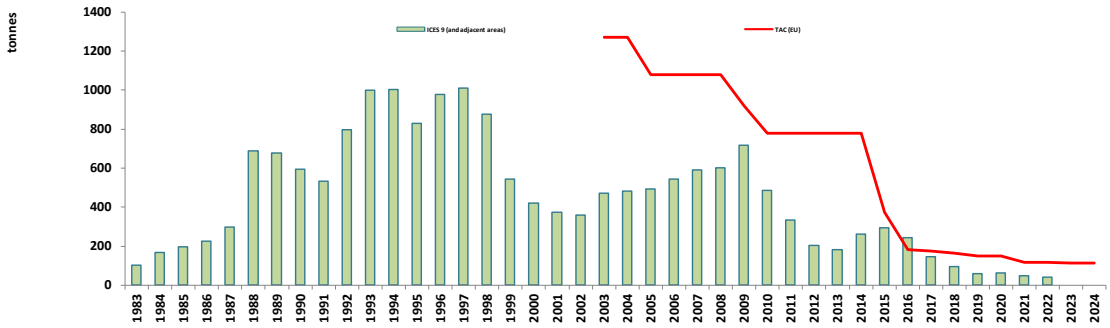

Figure 12.3.1. Blackspot seabream in ICES Subarea 27.9 (and adjacent waters): Total European landings (Morocco landings are not included) and EU TACs. Since 2015 landings from Strait of Gibraltar includes other areas (FAO 34.1.11 and FAO 37.1.1).

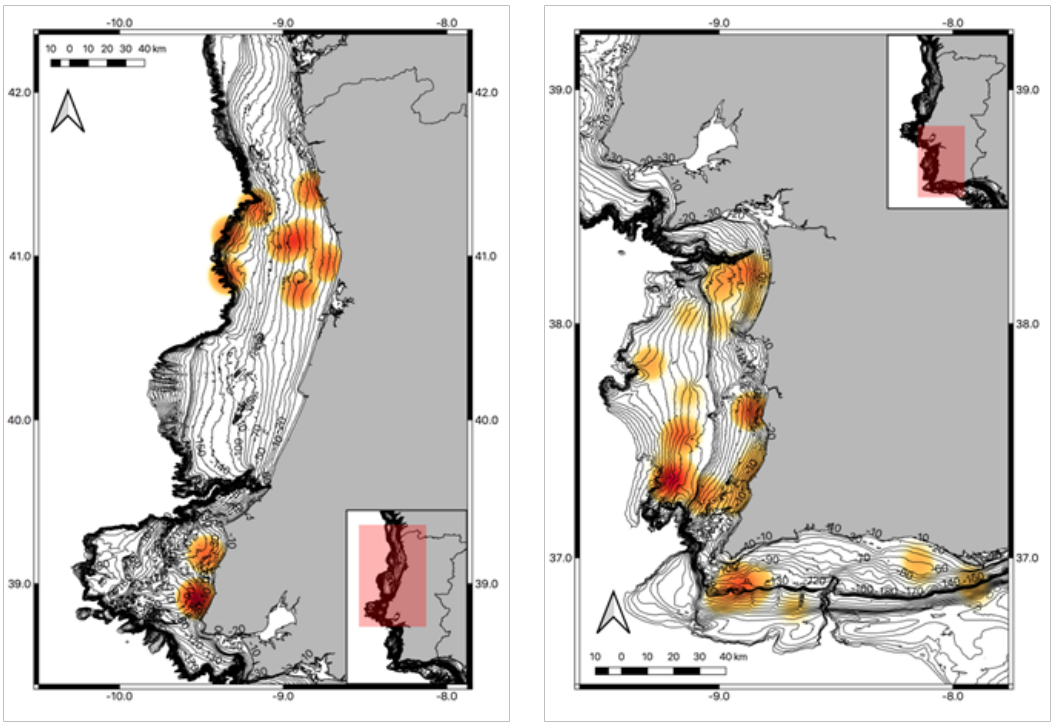

Figure 12.3.2. Blackspot seabream in ICES Subarea 9: Distribution *of Pagellus bogaraveo* along the Portuguese coast based on Portuguese surveys from the period between 1997-2011 and 2013-2017. The coloured blotches are hauls with *Pagellus bogaraveo* catches over 5 n.h-1. The colour intensity of the blotches reflects species occurrence (from Farias and Figueiredo, WD 14 to the 2019 WGDEEP).

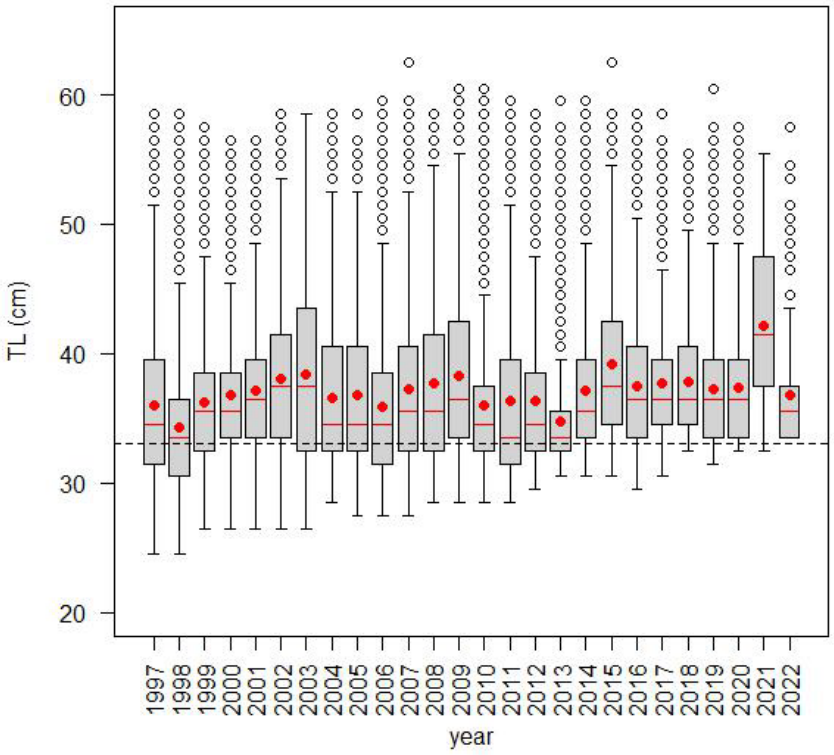

Figure 12.3.3. Spanish "*voracera*" blackspot seabream fishery of the Strait of Gibraltar: 1997–2021 (from Gil *et al.*, WD 12 to the 2023 WGDEEP). Dashed line (at 33 cm) represents the current minimum landing size for the species in Atlantic NE and Mediterranean European waters. Red dot are the mean value while red line represents the median.

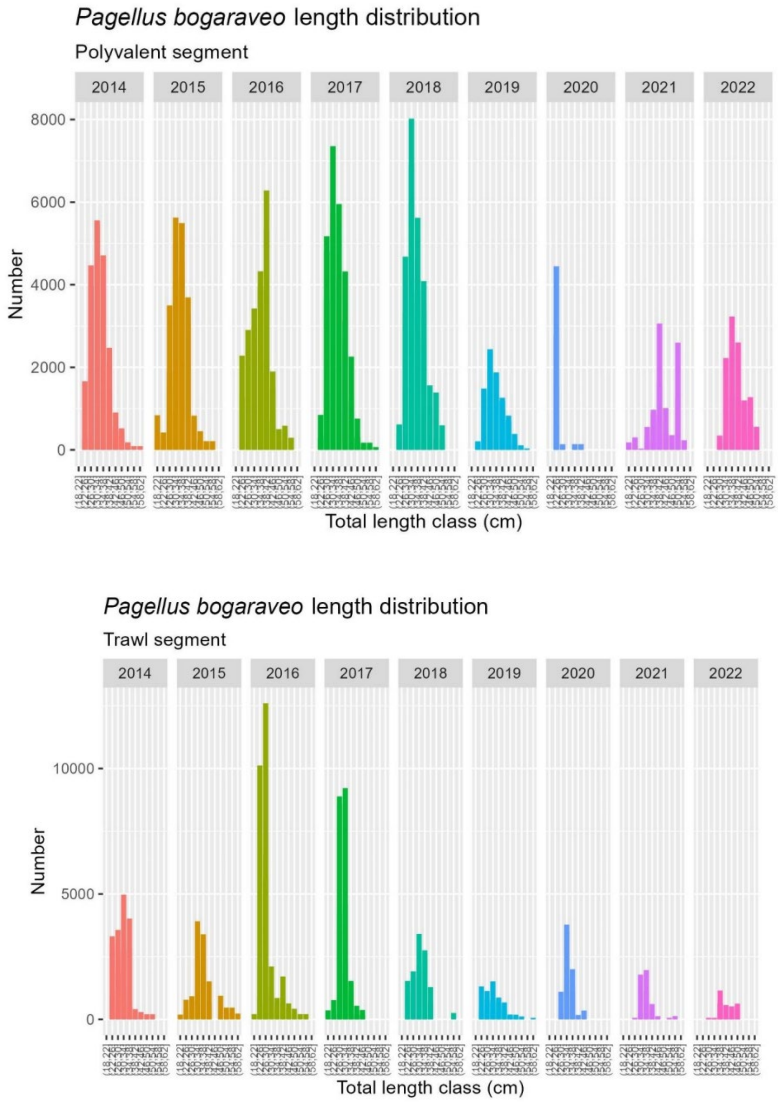

Figure 12.3.4. Peniche (Portugal) landing port: *Pagellus bogaraveo* **length frequency distribution by fishing gear (polyvalent and trawl fleet) for the years 2014 to 2022 (from Farias and Figueiredo, WD 15 to the 2023 WGDEEP). Length classes are aggregated by 4 cm range (from 18-22 and 20-24 in polyvalent and trawl fleets, respectively).**

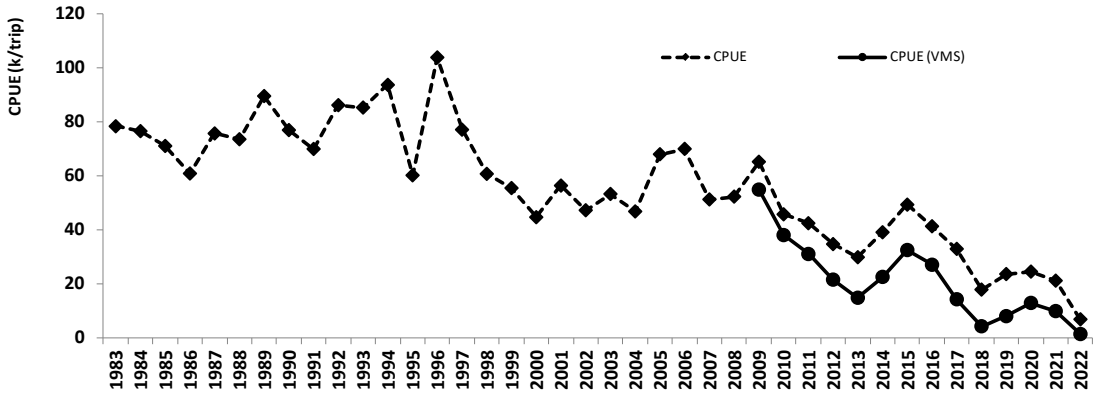

Figure 12.3.5. Blackspot seabream in ICES Subarea 27.9: Spanish "voracera" target fishery of the Strait of Gibraltar estimated CPUE, using sales sheets (dashed line: 1983-2022) and VMS data as unit of effort (solid line: 2009-2022) (from Gil et al., WD 12 to the 2023 WGDEEP).

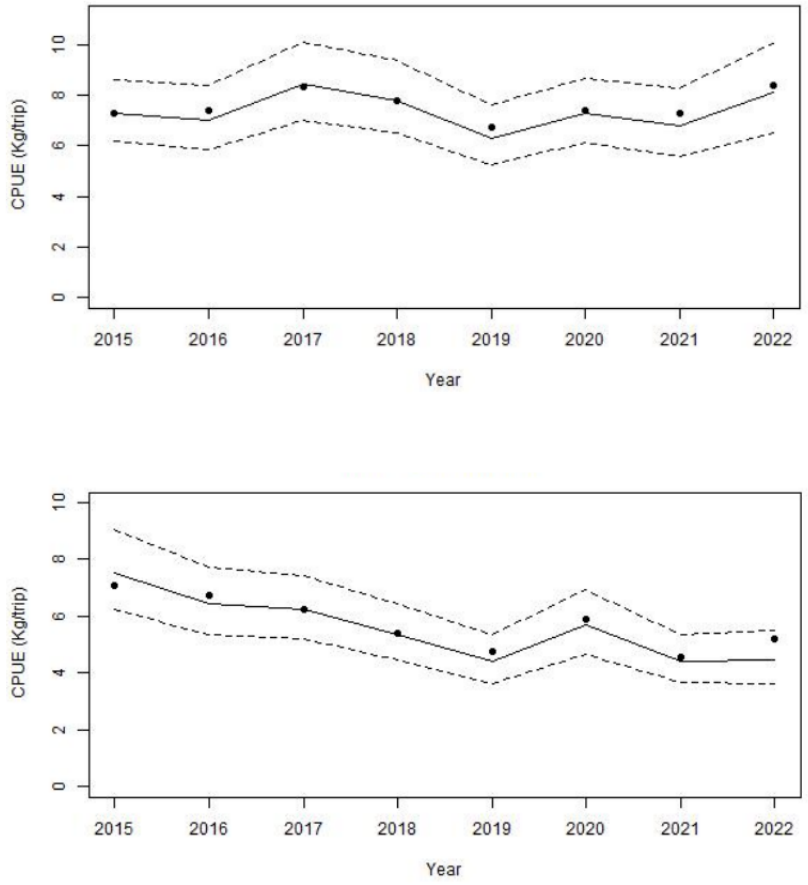

Figure 12.3.6. Blackspot seabream in ICES Subarea 27.9: Standardized annual estimates of CPUE by fleet segment (polyvalent and trawl) from the Peniche´s port reference fleets in 2015 - 2022 (from Farias and Figueiredo, WD 15 to the 2023 WGDEEP).

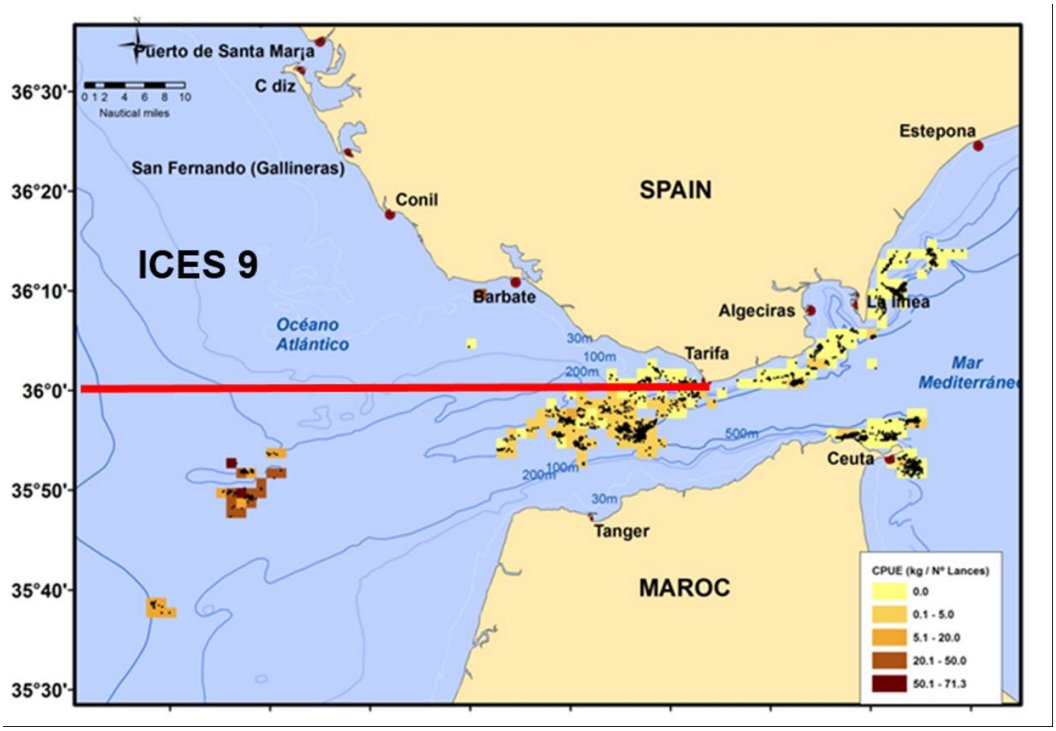

Figure 12.3.7. Blackspot seabream in ICES Subarea 27.9: Spanish "*voracera*" fleet footprint (from VMS data).

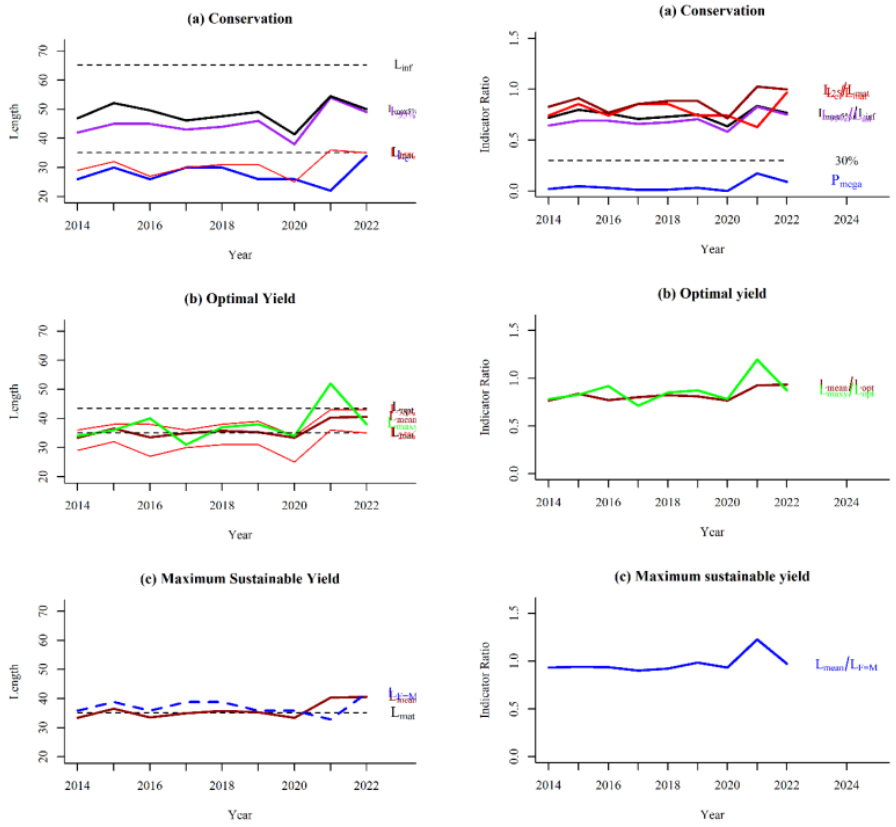

Figure 12.3.8. Blackspot seabream in ICES Subarea 27.9: Results from LBI screening (left) and LBI screening ratios (left) from length data of continental Portugal (from Farias and Figueiredo, WD 15 to the 2023 WGDEEP).

12.3.8 References

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12.4 Blackspot seabream (*Pagellus bogaraveo*) in Division 10.a.2

12.4.1 The fishery

Blackspot seabream (*Pagellus bogaraveo*) has been exploited in the Azores (ICES Division 10.a.2), at least since the XVI century as part of the Azorean demersal fishery. A directed hook exploits the species and line fishery that encompasses two fleet components: the artisanal (handlines) and the longliners (Pinho and Menezes, 2009; Pinho *et al.,* 2014). Important expansion of the fishery to offshore seamounts occurred during the 2000s (Ordinance No. 101/2002). This expansion was particularly held by the longline fleet because of the regional spatial management measures introduced (Santos et al., 2019). The artisanal fleet is composed of small open deck boats (<12 m) that operate in local areas near the coast of the islands using several types of handlines. Longliners are closed deck boats (>12 m) that operate in all areas but during the last years the fishery is only authorized to operate on offshore (>6 nm) banks and seamounts (Pinho *et al.,* 2014; Santos et al., 2021). The tuna fishery caught, until the end of the nineties, juveniles (age 0) of blackspot seabream as live bait, but in a seasonal and irregular way because these catches depend on tuna abundance and on the occurrence of other preferred bait species like *Trachurus picturactus* (Pinho *et al*., 2014).

The Azorean demersal fishery is a multispecies and multigear fishery where *P. bogaraveo* is considered the target species. The effect of these characteristics on the dynamics of the target fishery is not well understood given the plasticity of the fishery to the target effect related with variability of abundance and markets (prices of the fish in general along the year).

Landings trends

Historically, landings increased from 400 t at the start of the eighties to approximately 1000 t at the start of the nineties (Figure 12.4.1). This increase was mainly due to the development of new markets, increased fish value, entry of new and modern boats, better professional education of the fisher and introduction of bottom longline gear, permitting the expansion of the exploitable area to deeper waters, banks, and seamounts as well as the expansion of the fishing season (ICES, 2006). Between 1990 and 2009 the annual landings have fluctuated around 1000 t, with a peak in 2005. During the period 2010–2012 the landings decreased significantly to an average of 641 t, which correspond to about 57% of the TAC adopted for that period, maintaining thereafter around this value due to the TAC introduced. Since 2005 a continuous decrease of the landings has been observed. Currently the fishery is highly constrained by management measures. Landings of the last four years (2019, 2020, 2021 and 2022) were: 474t,491t, 559t and 482t respectively.

12.4.2 ICES Advice

Latest ICES advise that when the precautionary considerations are applied, catches in 2022 should be no more than 610 tonnes for area 10. All catches are assumed to be landed.

12.4.3 Management

Under the European Union Common Fisheries policy, a TAC was introduced in 2003 (EC. Reg. 2340/2002). The recent time-series of TACs and landings from ICES Subarea 10 is given below.

Year	2008	2009	2010	2011	2012	2013	2014	2015
EU TAC	1136	1136	1136	1136	1136	1022	920	678

Landings	1089	1042	687	624	613	692	663	701
Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
EU TAC	507	517	517	576	553	610	610	610
Landings	515	499	445	474	491	559	482	

Since 2003 deep-water fishing within 100 miles of the Azores baseline is restricted to vessels registered in the Azores under the management of fishing effort of the common fishery policy for deep-water species (EC. Reg. 1954/2003). In 2006 the Regional Azorean Government introduced a quota system by island and vessel. Specific access requirements and conditions applicable to fishing for deep-water stocks were established (EC. Reg 2347/2002). Fishing with trawl gears (EC. Reg. 1811/2004) and bottom gillnets (EC. Reg. 91/2005) are forbidden in the Azores region.

In 2009, the Regional Government introduced (Ordinance No. 1/2010) new technical measures, including the minimum landing size (30 cm total length), area restrictions by vessel size and gear, and gear restrictions (hook size and maximum number of hooks on the longline gear). The seamount (Condor), located approximately 17 km to the southwest off Faial Island, was closed to fisheries (Ordinance No. 48/2010) to allow multidisciplinary research (ecological, oceanography and geological). During 2015, 2016 and 2017 additional technical measures were introduced which included limitation of the fishing area for long-liners, update of the minimum landing size to 33 cm (Ordinance No. 120/2016) and introduction of marine protected areas for coastal and oceanic areas (Santos *et al*., 2019). During 2017 license limitations were introduced for littoral hook and line fisheries. Since 2018 the Azorean quota is managed by quarter, island, and vessel. In 2019 some techniques measures have been changed by the Regional Government and European Union, as for example a closed season (Ordinance No. 74/2015) implemented in 2016, to reduce effort during the spawning aggregations (among January 15 and end of February), was revoked by Ordinance No. 63/2019 which allows fishing throughout the year. By the end of 2022 the Council Regulation (EU) proceeded the roll-over of Blackspot seabream fishery opportunities assigned to the European Union in 2023 to 610 t.

12.4.4 Data available

12.4.4.1 Landings and discards

Total annual landings data for ICES Division 10.a.2 are available since 1980. However, detailed, and precise landing data are available for the assessment since 1990 (WD08 Medeiros-Leal *et al*., 2022). Landings ICES Division 10.a.2 Area are presented in the Table 12.4.1 and Figure 12.4.2.

Information on the discards in the Azorean longline fishery has been collected by a team of observers on board the longline fleet as part of the European Commission Data Collection Framework (DCF; EU, 2008). During 2018 about 6% (12.7 t) of the total landings were discarded. However, no new information about discards for the period of 2019-2022 are available.

12.4.4.2 Length compositions

Fishery length composition from the landings collected as part of the European Commission Data Collection Framework (DCF; EU, 2008) is available for the most recent period 2019-2022 (Figure 12.4.3). Length composition from the fishery showed a stable pattern, however, a small increase of the larger individuals (>40 cm) was observed in the last years (Figure 12.4.3). This increase could be a result of the several changes in minimum landing size implemented since 2010 as a management measure in the Azores (Figure 12.4.1).

Length compositions from survey (Figure 12.4.4) showed a mode around 25-31 cm, evidencing a relative selectivity of the fishing gear for this cohort. Besides that, since 2017 the survey also has presented a decrease for larger length classes in the last years (2017, 2018, 2019 and 2021). These results indicate that there were not changes in the exploitation patterns of the commercial fishery.

12.4.4.3 Age compositions

The information is available from the survey until 2021 but are not presented here because it is not relevant to the current assessment.

12.4.4.4 Weight-at-age

No new information was presented to the WGDEEP2023 because there are no relevant changes on the biology of the species.

12.4.4.5 Maturity, sex-ratio and natural mortality

Maturity and sex-ratio data were updated in accordance with the methods outlined in the stock annex. Natural mortality was reviewed by Silva et al. (2021) exploring several empirical methods for the M estimation. A mean value of M=0.3 was estimated but with a considerable uncertainty.

12.4.4.6 Catch, effort and research vessel data

Standardized fishery CPUE was updated (WD13 Novoa-Pabon et al., 2020) only until 2017 because fishery data collected by DCF was not available between 2018-2022 (Table 12.4.2). A new standardized fishery LPUE is available, but also only until 2017 because the fishery data collected by DCF was not available for 2018-2022 (WD17, Medeiros-Leal et al. 2023).

Due to survey issues, the abundance index derived from the annual Azorean spring bottom longline survey data were updated (WD09 Medeiros-Leal et al., 2022) based on the data availability and reliability of the indexes. This information is resumed on Table 12.4.3, Figure 12.4.5 and Figure 12.4.6.

12.4.5 Data analyses

The standardised fishery CPUE has been variable (Figure 12.4.7). In recent years, the CPUE appears to have shown a declining trend from a high point in 2005 with current CPUE around the lowest observed level. A new standardised fishery dependent (LPUE) index is now available (Figure 12.4.7). The LPUE, presented a high variability on the estimates mainly between 1985-2005 and in recent years a declining trend (Figure 12.4.7). The variability in the beginning of the LPUE time series could be related with changes in the data collection, where first were performed by the Department of Oceanography and Fisheries of the University of the Azores and after 2000s as part of the Data Collection Framework (DCF; EU, 2008). Besides that, this trend pattern coincides with a declining trend in landings (Figure 12.4.2) and survey abundance indices (Figure 12.4.5) over the same period, except for the last five years (2016-2021) for the survey case.

The Azorean bottom longline survey targeting *Pagellus bogaraveo* is considered reliable for abundance estimates (Pinho et al., 2020), since the survey design is adapted to the stock behaviour covering most of the species' habitat (with exception of seamounts around Mid-Atlantic Ridge) (Table 12.4.3). The survey time-series is not continuous because in 1998, 2006, 2009, 2014, 2015 and 2020 there was no survey, and in 2021 just coverage 50% of the survey area. Detailed information about the statistical procedures to estimates the abundance indices from the survey areas coverage in 2021 are provided in WD09 Medeiros-Leal et al. (2022). The annual values were computed using sampling statistical areas I-II because the areas III and IV was not sampled in 2021,

however the abundance trend derived from Areas I-II are like the trends from Areas I-IV (Figure 12.4.5).

Survey indices from 1995 to 2021 show no trend with a high value every three years until 2005 and for the years of 2017, 2018, 2019 and 2021 (Figure 12.4.5). The 2017 and 2019 correspond to the year with the highest index value observed in the time series. These high values may be related with some sort of catchability variability (fish are more available to the gear in some years than in others) as a function of the feeding behaviour (benthopelagic), reproduction (protandric forming spawning aggregations) of the species, due to environmental effects or result of management measures. However, the survey abundance indices from 2010–2013 are in the range of lowest values and with a decrease trend. This period corresponds to the lowest catch observed during the last 21 years being on average 60% of the precedent years (1995–2009) (Figure 12.4.2).

The stock is classified under ICES category 3 and the WGDEEP tried to implement the methods recommended by WKLIFE X: SPiCT model and "rfb" rule to replace the former 2 over 3 advice. The SPiCT results were quite robust using the three abundance indexes available (CPUE, LPUE and Survey), but not applicable because the time series of the indexes did not present the most recent year (2022). Detailed information about the SPiCT results and others exploratory stock assessment methods as JABBA and LBI, is presented in the exploratory analysis section and WD XX Medeiros-Leal et al. (2023). For this reason, the assessment was performed based on the "rfb" rule with the survey abundance index trends and fishery length composition.

Due to the interruption of COVID-19 and a strike of the crew members of the research vessel, the annual Azorean spring bottom longline survey was not carried out in 2020 and 2022. Given these considerations, it was decided present two alternative bases for advice this year, following the "rfb" rule for advice opportunities:

- Scenario A: Previous catch advice Ay (2023). The index A were calculated using only 2021 and B based on an interpolation of the 2020 (2018, 2019, 2020). These indices were calculated to estimate the r - stock biomass trend (index ratio A/B); The fishing pressure proxy (f) were calculated using the length-composition from the fishery for the period 2019-2022.
- Scenario B: Previous catch last three years Cy (average 2020-2022). The index A were calculated using only 2021 and B based on an interpolation of the 2020 (2018, 2019, 2020). These indices were calculated to estimate the r - stock biomass trend (index ratio A/B). The fishing pressure proxy (f) were calculated using the length-composition from the fishery for the period 2019-2022.

Following the guidance on the parameter determination for the "rfb" rule, possible estimates of the input values and some comments are presented in the table below.

Variable	Estimate	Input data	Comment
r: Stock biomass trend	0.87	The Azorean bottom longline survey was used as the index of stock development.	An important increase in the last five years (2016-2021).
f: Fishing proxy	0.95	Fishery length composition from the landings, collected by DCF (2019-2022).	No changes in the exploitation patterns of the commercial fishery, in terms of length composition.
b: Biomass safeguard $= \min(1,\ I_{y-1}/I_{\text{trigger}})$ $I_{\text{trigger}} = I_{\text{loss}}\ \omega$, considering $\omega = 1.4$	1	Due to the survey indices series continuous increasing trend a question: how realistic is this increase?	The CPUE and LPUE indexes presents the opposite of the survey index.

m linked to von Bertalanffy k	0.95	k estimated from the Von Bertalanffy model, valid for both exercises

Survey data show an important increase in the relative abundance index for the last five years (2016-2021) relative to the previous period. The observed increase is consistent through all statistical survey areas (Figure 12.4.6). The lack of updated fishery abundance data to compare the observed trend makes it difficult to interpret the mean of this large increase; however, it may be a consequence of the severe management measures introduced, as e.g., minimum landing size, fishing area restrictions by vessel size and gears, limitations of the fisheries licence numbers, quotas by island and introduce of marine protected areas (Figure 12.4.1).

Catches in recent years are highly constrained by several management measures.

Exploratory analysis

Length-based Indicators (LBI)

Length-base indicators reported from WKLIFEV were explored and for this exercise were used Azorean commercial fishery length compositions for pooled sexes from 2019–2022 (discards are assumed to be negligible). Main life-history parameters used are resumed in Table 13.4.4. Computations were performed using R software and the codes were available in the GitHub library of ICES.

Results from the analysis are shown in Figure 12.4.8 and Table 13.4.5. Results show that for immature conservation a substantial harvesting occurs after maturity (L_c and L25%>L_{mat}). This was expected since the current relative exploitation pattern corresponds to a L50%$\geq L_{mat}$. This L_{mat} value is already considered low (L_{mat} moved from 32 cm to 29 cm along time) being probably a response of the population to the fishing pressure.

For mature fraction of the population the results suggest that the large individuals are present but decreasing ($L_{max} \leq L_{inf}$). The L_{mat} (29 cm) is considerably lower than L_{opt} (36 cm) and the results of P_{mega} indicator clearly suggest that the mega spawners in the Azorean commercial fishery are lower than 30% throughout the analysed period. The MSY proxy results show that exploitation is close to the MSY level (Lmean>Lopt and Lmean<LF=M; Table 13.4.5 and Figure 12.4.8).

Surplus production models

The JABBA and SPiCT production models were explored using all available information from CPUE (1990-2017), LPUE divided in two-time blocs (1985-2006 and 2006-2017) due to the variability in the index estimates, and exploited biomass (individuals > 33 cm) of bottom longline survey (1996-2019; Figure 12.4.7). As all catches are assumed to be landed and the discards considered negligible, the landings for the period 1985–2019 were used (Figure 12.4.7). Several runs were explored using the four indexes and were analysed different periods of years by excluding uncertainty years. The final set of years used in the base-case model are presented in Table 12.4.6. To reduce the uncertainty of the results and to obtain robust estimates of the reference points, priors (Table 12.4.6) were defined unifying the parametrization between age-structured and

production models as recommended by WKBMSYSPiCT guidelines (ICES, 2021) and detailed information is available on WD17,-Medeiros-Leal et al. (2023).

JABBA

Results of JABBA model suggests a carrying capacity (K) of 14853 t, a B_{MSY} of 5644 t, F_{MSY} = 0.14 $year^{-1}$ and MSY=811 t for blackspot seabream in Azores. The stock biomass at the end of 2019 was 20% of the B_{MSY} and the fishing mortality was 29% of the F_{MSY}. Biomass presented a continuous decreased period from 1995 to 2010, with a stable period between 2011 to 2015, and a very slight increase since thereafter (Figure 12.4.10), while the fishing mortality was above F_{MSY} between 1998 to 2015. The relative biomass (B_{2019}/B_{MSY}) and exploitation level (F_{2019}/F_{MSY}) in 2019 were 0.81 and 0.72 respectively, indicating that the blackspot seabream fishery in the Azores was in a recovering status. The default JABBA plots are shown in Figures 12.4.10. JABBA model presented a good fit of the residual's diagnostics and retrospectivity analysis, and the convergence was achieved (Figures 12.4.11).

SPiCT

Results of SPiCT model suggests a carrying capacity (K) of 13061 t, a B_{MSY} of 4378 t, F_{MSY} = 0.17 $year^{-1}$ and MSY=753 t for blackspot seabream in Azores. The stock biomass at the end of 2019 was 22 % of the B_{MSY} and the fishing mortality was 12% of the F_{MSY}. Biomass presented a continuous decreased period from 1999 to 2010, with a stable period between 2011 to 2015, and a very slight increase since thereafter (Figure 12.4.12), while the fishing mortality was above F_{MSY} until 2015. The relative biomass (B_{2019}/B_{MSY}) and exploitation level (F_{2019}/F_{MSY}) in 2019 were 0.78 and 0.85 respectively, indicating that the blackspot seabream fishery in the Azores was in a recovering status. The default SPiCT plots are shown in Figures 12.4.12. SPiCT model presented a good fit of the residual's diagnostics and retrospectivity analysis, and the convergence was achieved (Figures 12.4.13 and 12.4.14).

Comments on the explanatory analysis

Results from the methods used in the exploratory analysis seem to be all in agreement suggesting that the stock has been explored at or above the MSY level and still recovering the biomass after an overfishing period. There are some data analyses that should be explored in future works, which can considerably improve the assessment:

- Analyse the effects of factors such as competition, gear saturation and soak time on the survey data to better understand the reliability of the abundance indices for assessment.
- Analyse the reproductive biology of the Blackspot seabream clarifying aspects related to the maturity stages and sex transition phase.
- A benchmark workshop to tailor the simulation process to the knowledge available for the species and to validate the surplus production models assessments.

12.4.6 Tables and Figures

Table 12.4.1. Historical landings of blackspot seabream *Pagellus bogaraveo* from the Azores (ICES Area 10.a.2).

Year	Azores (10.a.2)	Total
1980	415	415
1981	407	407

Year	Azores (10.a.2)	Total
1982	369	369
1983	520	520
1984	700	700
1985	672	672
1986	730	730
1987	631	631
1988	637	637
1989	924	924
1990	889	889
1991	874	874
1992	1090	1090
1993	830	830
1994	989	989
1995	1115	1115
1996	1052	1052
1997	1012	1012
1998	1119	1119
1999	1222	1222
2000	947	924
2001	1034	1034
2002	1193	1193
2003	1068	1068
2004	1075	1075
2005	1113	1113
2006	958	958
2007	1063	1070
2008	1089	1089
2009	1042	1042
2010	687	687

Year	Azores (10.a.2)	Total
2011	624	624
2012	613	613
2013	692	692
2014	663	663
2015	701	701
2016	515	515
2017	499	499
2018	445	445
2019	474	474
2020	491	491
2021	559	559
2022	482	482

Table 12.4.2. Nominal and standardized bottom longline fishery abundance index (scaled cpue to the mean) of the blackspot seabream *Pagellus bogaraveo* in Subarea 10.

YEAR	NOMINAL cpue	STANDARDIZED cpue	Lower CI	Upper CI
1990	0.92	0.97	0.87	1.08
1991	0.92	0.94	0.81	1.07
1992	0.96	0.98	0.78	1.17
1993	0.79	1.01	0.87	1.15
1994	0.97	1.01	0.84	1.18
1995	1.09	1.08	0.92	1.23
1996	1.24	1.5	1.25	1.75
1997	1.63	1.32	1.1	1.53
1998	1.03	1.21	1.06	1.35
1999	1.1	1.3	1.16	1.44
2000	0.82	0.82	0.75	0.9
2001	1.12	0.96	0.84	1.07
2002	1.24	1.02	0.9	1.15
2003	0.98	1	0.91	1.1

YEAR	NOMINAL cpue	STANDARDIZED cpue	Lower CI	Upper CI
2004	1.42	1.08	0.96	1.19
2005	1.71	1.16	1.06	1.27
2006	1.26	0.95	0.86	1.04
2007	1.34	1.22	1.09	1.36
2008	1.21	1.13	1.02	1.24
2009	1.18	0.96	0.88	1.05
2010	0.62	0.72	0.66	0.78
2011	0.59	0.76	0.69	0.82
2012	0.62	0.81	0.74	0.88
2013	0.64	0.91	0.83	0.99
2014	0.67	0.83	0.76	0.90
2015	0.56	0.74	0.68	0.80
2016	0.39	0.61	0.56	0.67
2017	0.48	0.59	0.60	0.57
2018	na	na	na	na
2019	na	na	na	na
2020	na	na	na	na
2021	na	na	na	na
2022	na	na	na	na

Na – not available

Table 12.4.3. Survey relative abundance index in number of blackspot seabream *Pagellus bogaraveo* from the Azores (ICES Area 10.a.2).

Year	Lower	Index	Upper
1995	6	84	6
1996	7	34	6
1997	11	38	9
1998	0		
1999	32	103	32
2000	13	39	15
2001	10	57	10

2002	9	114	8
2003	19	78	17
2004	25	90	26
2005	25	143	23
2006			
2007	25	79	26
2008	17	101	18
2009			
2010	13	67	16
2011	17	60	18
2012	9	48	11
2013	8	38	8
2014			
2015			
2016	22	112	21
2017	21	117	22
2018	21	80	20
2019	30	142	28
2020			
2021	11	99	12
2022	na	na	na

na – not available

Table 12.4.4. Input constant parameters used in Length Based Indicators analysis for blackspot seabream *Pagellus bogaraveo* of the Azores (ICES area 10).

PARAMETERS	VALUE	DEFINITION	OBS.
L_{oo} (cm)	55.12	Asymptotic average maximum length	Medeiros-Leal et al. (2023)
K (year-1)	0.12	Growth coefficient of the von Bertalanffy growth model	Medeiros-Leal et al. (2023)
T_o (year-1)	-1.46	Hypothetical age at which the species has zero length	ICES, 2012
a=	0.0172	Condition factor parameter of length-weight relationship	Rosa et al. (2006)
b=	3.0273	Slope parameter of length–weight relationship	Rosa et al. (2006)
L_{max} (L_F, cm)	55	Maximum length usually observed on the population (not the max ever observed)	Pinho et al. (2012)
L_{mat} (L_F, cm)	29	Length at size first maturity	Santos et al. (2020)
M	0,3	Natural mortality	Silva et al. (2021)
M/k	1,67	Ratio natural mortality over growth coefficient	Medeiros-Leal et al. (2023)

Table 12.4.5. Traffic light indicators for blackspot seabream *Pagellus bogaraveo* from the Azorean commercial fishery (ICES Area 10.a.2).

Year	Conservation				Optimizing Yield	MSY
	L_c / L_{mat}	$L_{25\%}$ / L_{mat}	$L_{max\,5}$ / L_{inf}	P_{mega}	L_{mean} / L_{opt}	L_{mean} / $L_{F=M}$
	> 1	> 1	> 0.8	> 0.3	~ 1 (> 0.9)	≥ 1
2019	1.02	1.05	0.87	0.13	0.95	0.95
2020	1.02	1.05	0.86	0.16	0.97	0.97
2021	1.02	1.05	0.83	0.12	0.95	0.95
2022	1.02	1.05	0.84	0.13	0.96	0.96

Table 12.4.6. Input constant priors used, and years excluded in surplus production model analysis for blackspot seabream *Pagellus bogaraveo* of the Azores (ICES area 10).

Priors	Value	Model	Indexes	Years
r	0.15	JABBA	CPUE	1990, 1991 and 2000
m	1.1	JABBA	LPUE 1	1998
BMSY/B0	0.38	JABBA	LPUE 2	2012
Logpsi	0.6	JABBA	Survey	1996, 1997 and 2017
r	0.15	SPiCT	CPUE	1990, 1991 and 2000
m	1.1	SPiCT	LPUE 1	1998
BMSY/B0	0.38	SPiCT	LPUE 2	2012
Logpsi	0.6	SPiCT	Survey	1996, 1997 and 2017

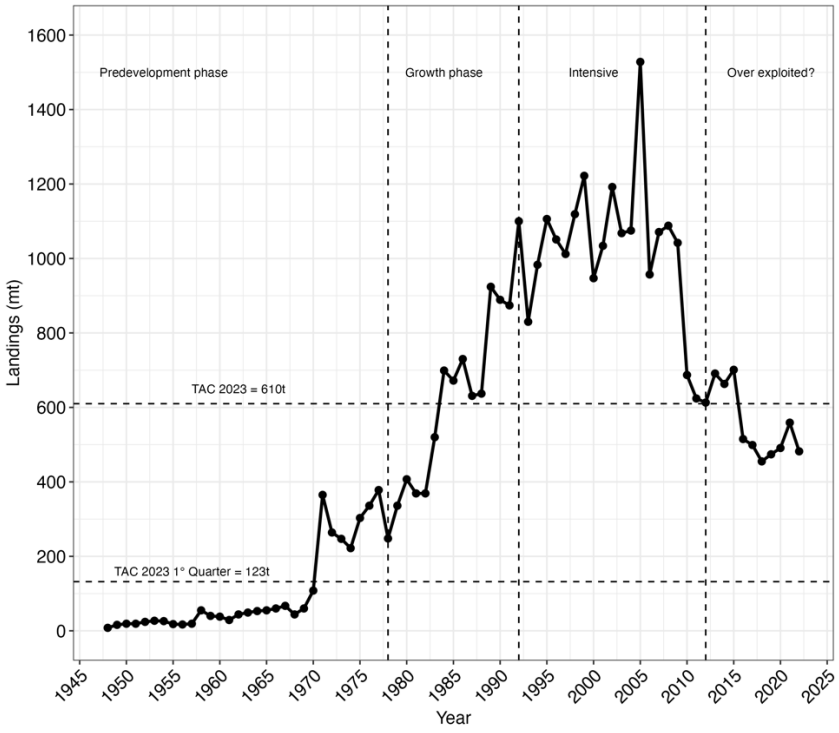

Figure 12.4.2. Historical landings of blackspot seabream *Pagellus bogaraveo* from the Azores (ICES Area 10.a.2).

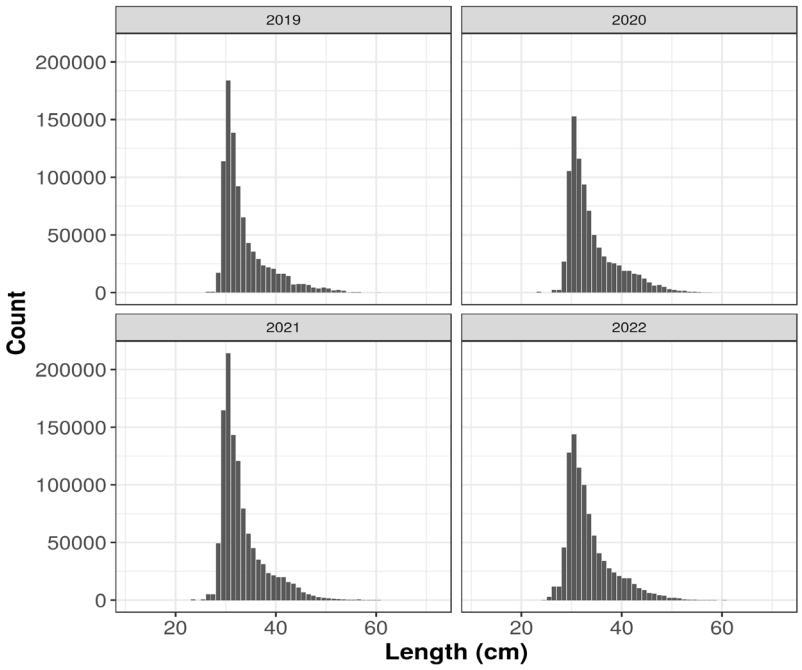

Figure 12.4.3. Annual fishery length composition of blackspot seabream *Pagellus bogaraveo* for the period 2019–2022 (ICES division 10.a.2).

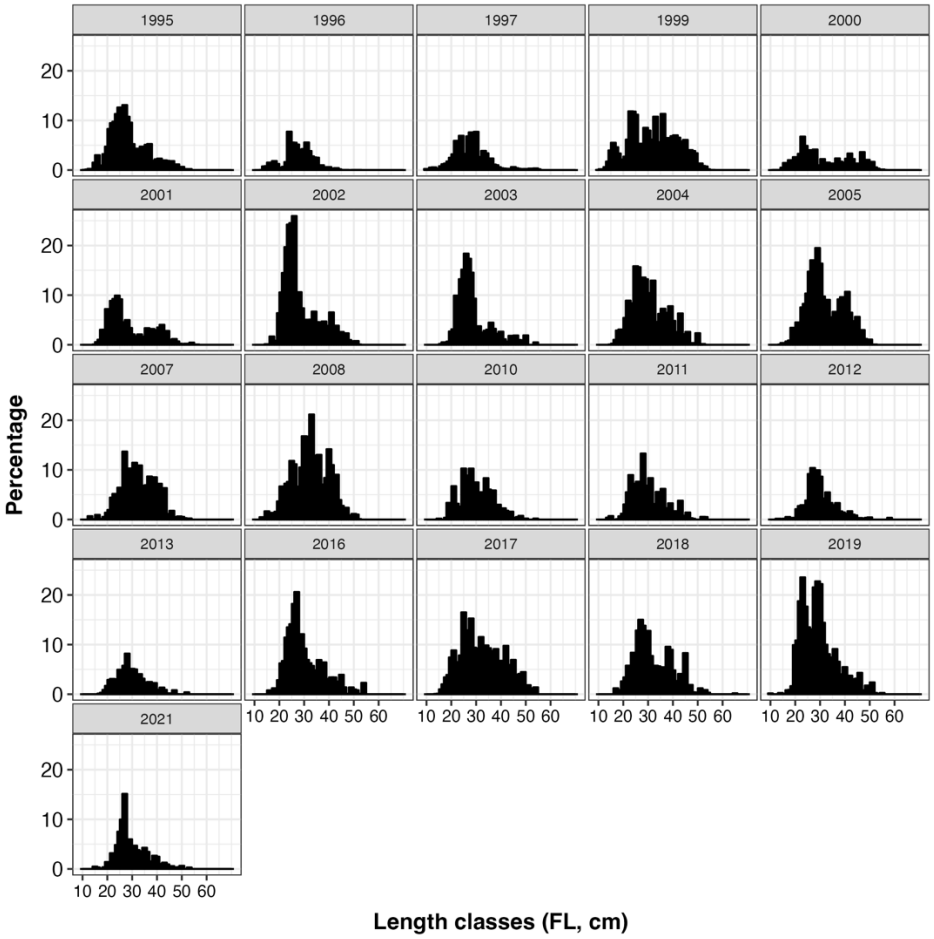

Figure 12.4.4. Annual length composition of blackspot seabream *Pagellus bogaraveo* from the Azorean spring bottom longline survey for the period 1995–2021 for areas I and II (ICES division 10.a.2).

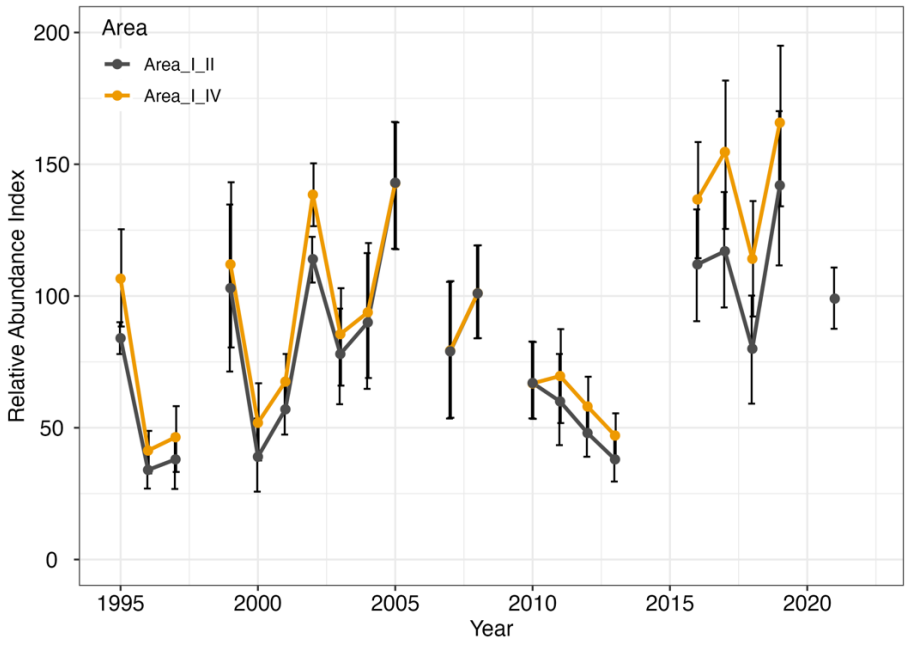

Figure 12.4.5. Annual abundance in number (Relative Population Number) of blackspot seabream *Pagellus bogaraveo* from surveys for the period 1995–2021 (ICES Area 10.a.2).

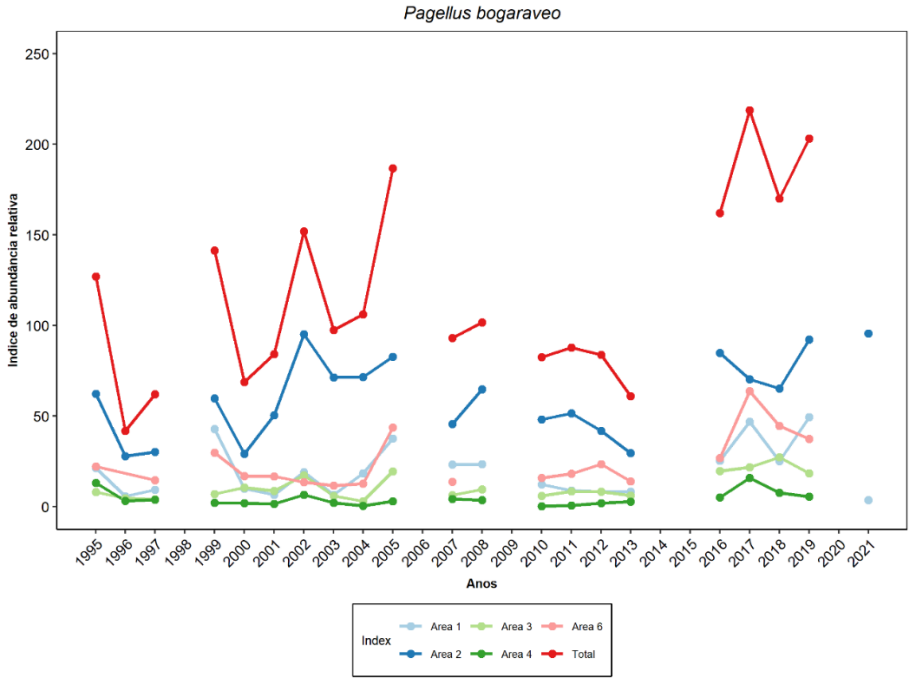

Figure 12.4.6. Annual abundance in number (Relative Population Number) by statistical areas of blackspot seabream *Pagellus bogaraveo* from surveys for the period 1995–2021, by sampling statistical areas (ICES Area 10.a.2).

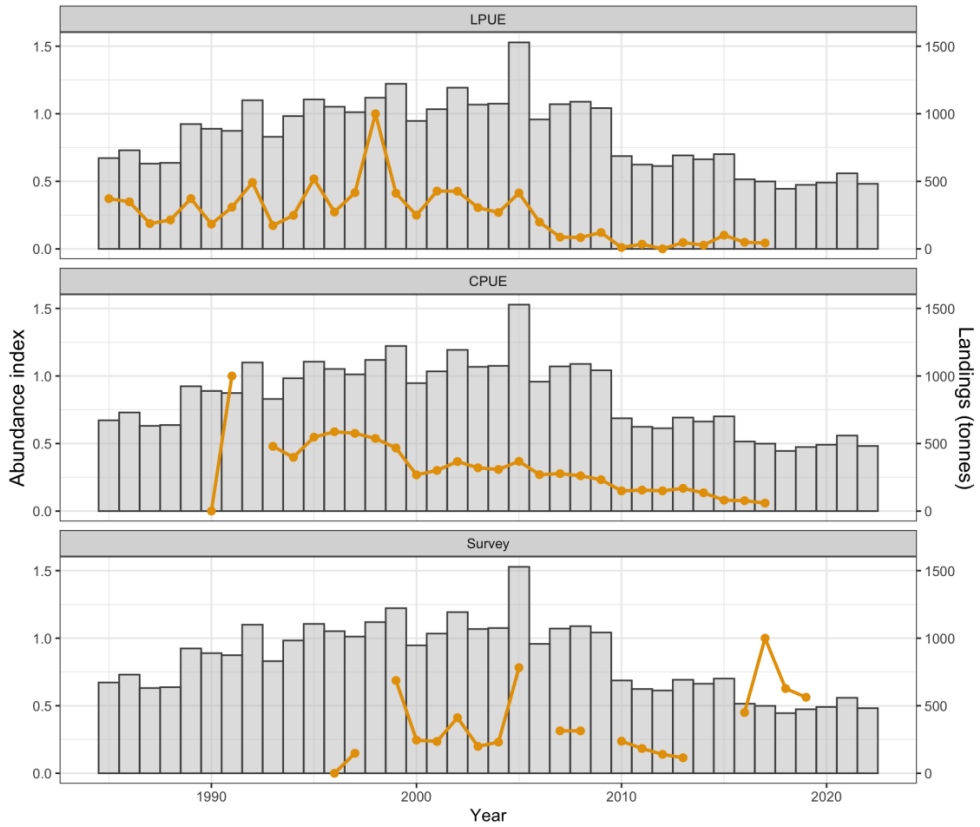

Figure 12.4.7. Standardized and scaled to mean LPUE (Kg landings−1 vessel−1), CPUE Nominal (Kg days at sea−1 vessel−1) from the Azorean bottom longline fishery (1985-2017), and exploited biomass (>33 cm) of Annual abundance in number (Relative Population Number) from the bottom longline survey (1996-2019) for blackspot seabream *Pagellus bogaraveo* from the Azorean bottom longline fishery.

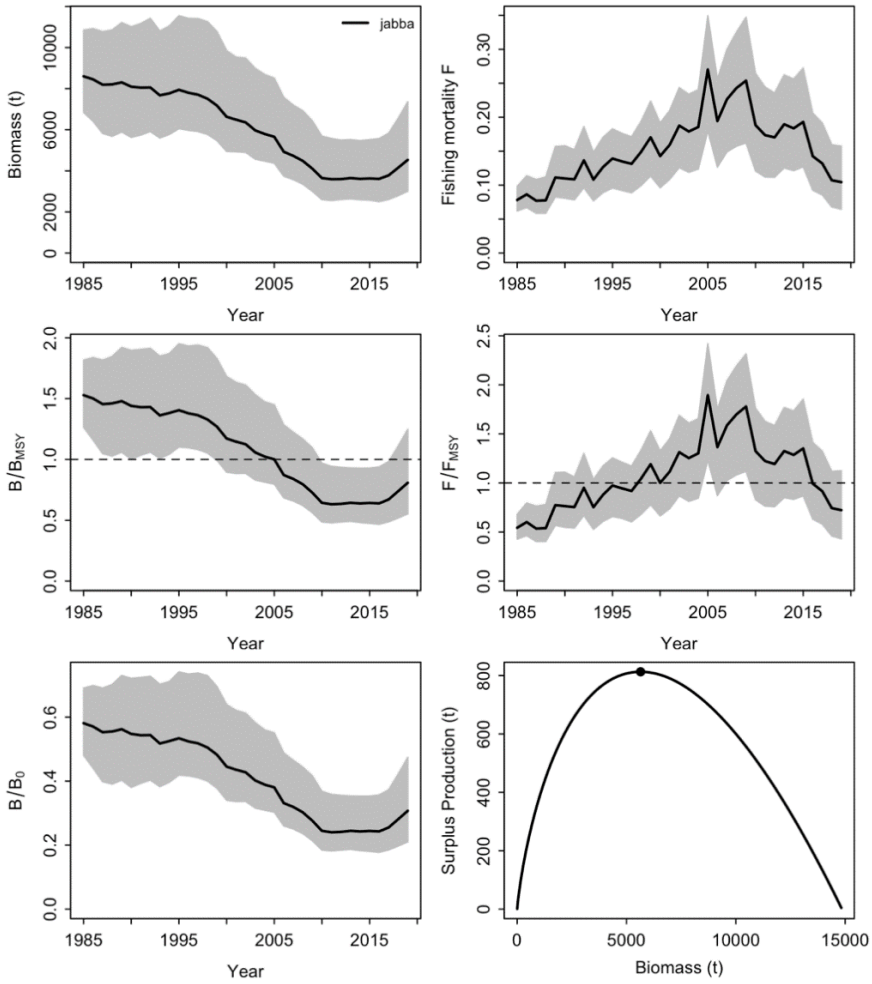

Figure 12.4.9. Basic results of JABBA model for the blackspot seabream *Pagellus bogaraveo* **from the Azores using standardized CPUE, LPUE and Survey data (ICES, 10.a.2).**

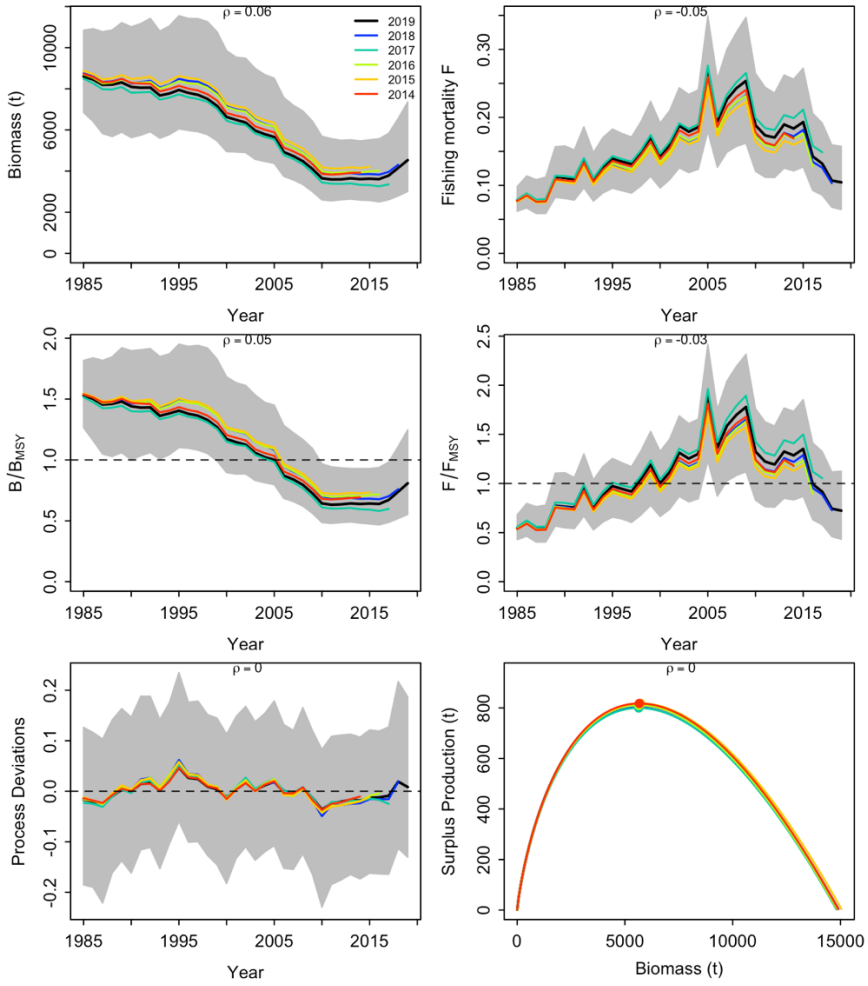

Figure 12.4.10. Retrospectivity analysis from JABBA model applied to the blackspot seabream *Pagellus bogaraveo* **from the Azores using CPUE, LPUE and Survey data (ICES, 10.a.2).**

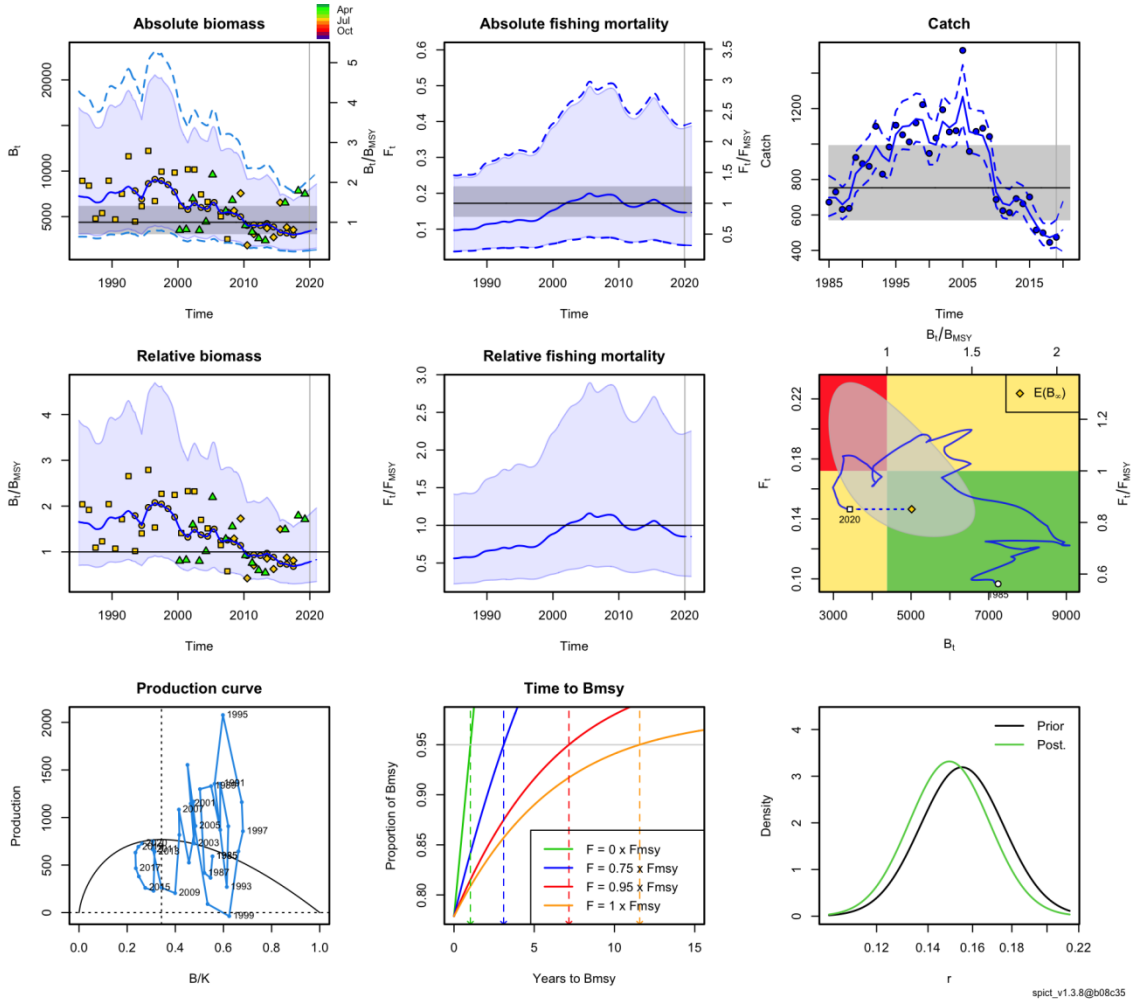

Figure 12.4.11. Basic results of SPICT model for the blackspot seabream *Pagellus bogaraveo* from the Azores using CPUE, LPUE and Survey data (ICES, 10.a.2).

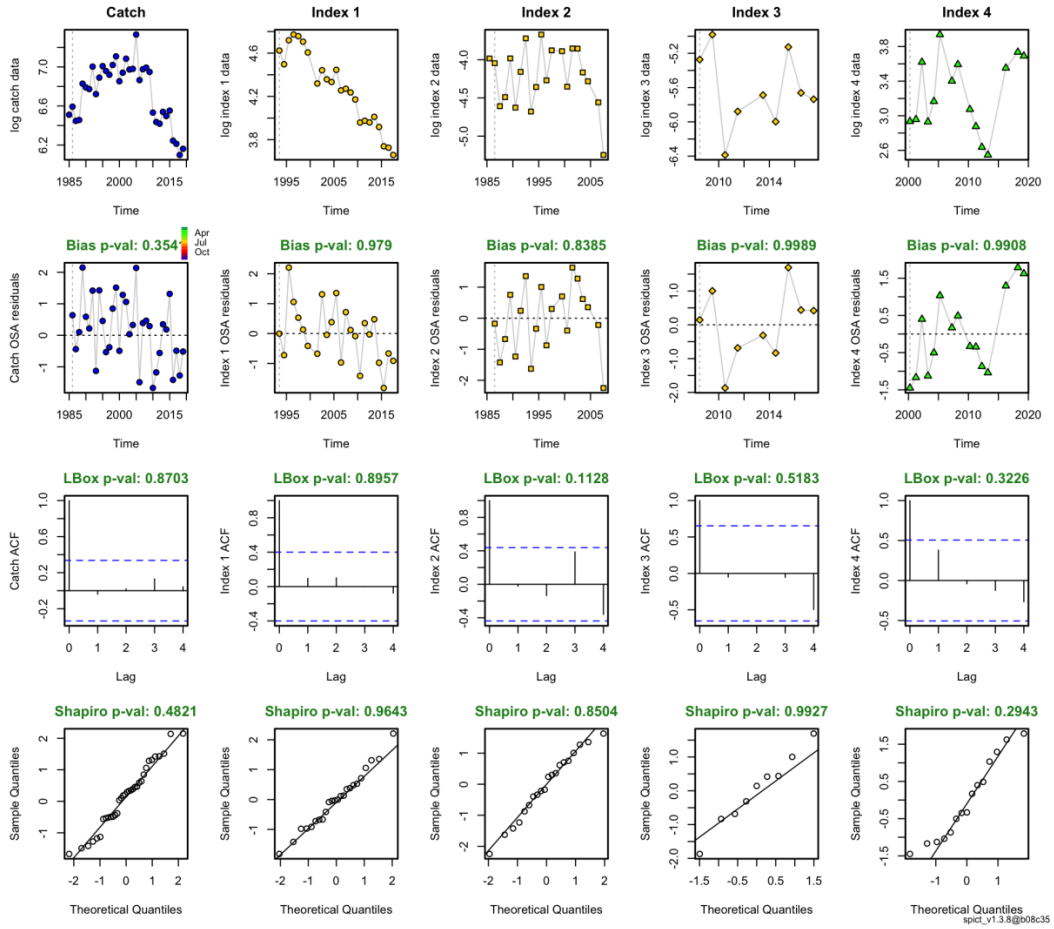

Figure 12.4.12. Residual results from SPICT model applied to the blackspot seabream *Pagellus bogaraveo* from the Azores using CPUE, LPUE and Survey data (ICES, 10.a.2).

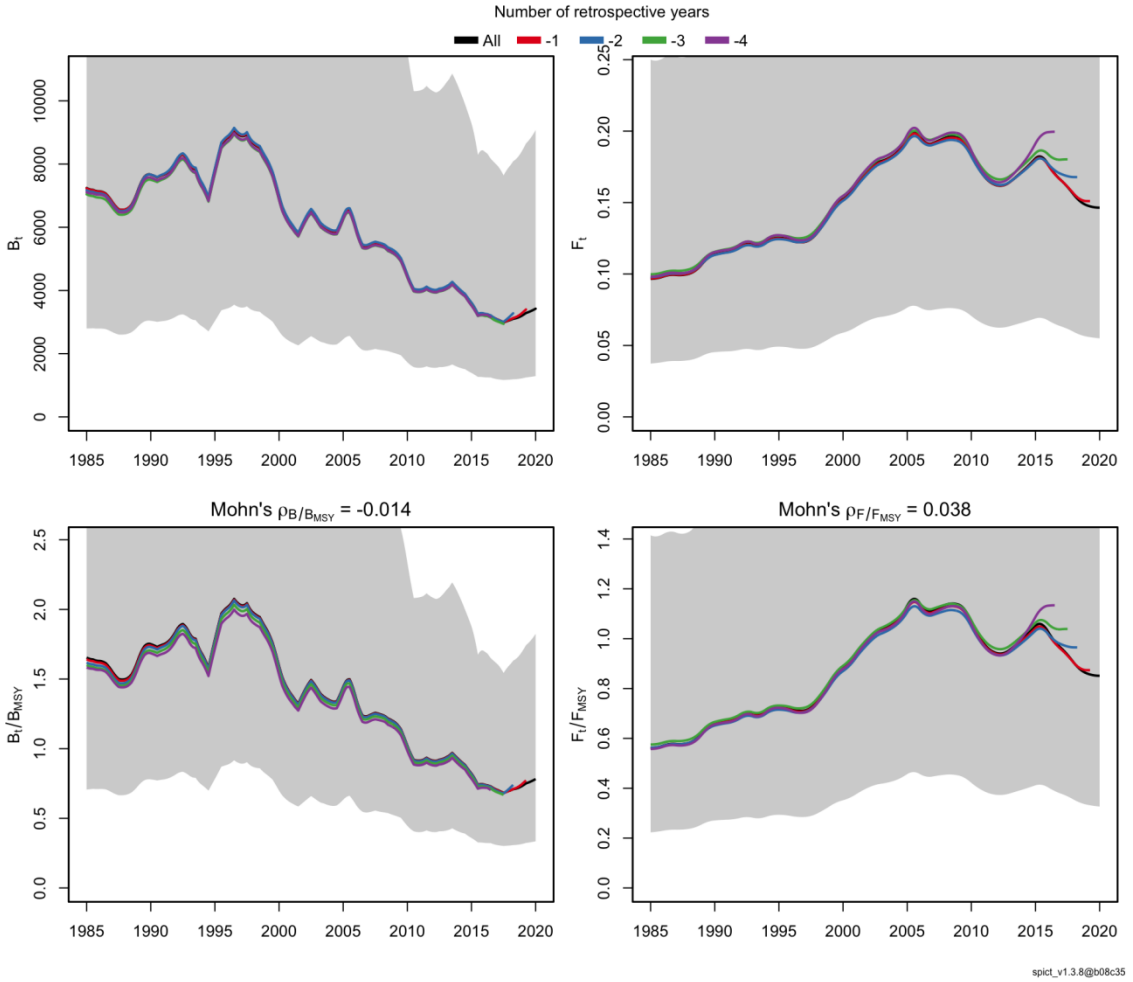

Figure 12.4.13. Retrospectivity analysis results from SPICT model applied to the blackspot seabream *Pagellus bogaraveo* from the Azores using CPUE, LPUE and Survey data (ICES, 10.a.2).

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