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Stock Annex: Lesser-spotted dogfish (*Scyliorhinus canicula*) in subareas 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)

Stock specific documentation of standard assessment procedures used by ICES.

Stock:	Lesser-spotted dogfish (*Scyliorhinus canicula*) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)
Working Group:	Working Group on Elasmobranch Fishes (WGEF))
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A. General

Lesser-spotted dogfish (*Scyliorhinus canicula*, L., 1758) is an abundant species occurring on a range of substrates (from mud to rock) on the European continental shelves, from coastal waters to the upper continental slope, but is most abundant on the shelf. Its distribution ranges from Norway and the British Isles to the Mediterranean Sea and Northwest Africa (Ebert and Stehmann, 2013).

A.1. Stock definition

The meta-population structure is not known, but tagging data indicate that movements are generally quite limited (Rodriguez-Cabello *et al*., 2004; 2007). In relation to lesser-spotted dogfish, STECF (2003) assumed that "separate stocks reside in separate ICES Divisions and that immigration and emigration from adjacent populations are either insignificant or on a par" and that such species would best be managed as local populations (i.e. on the level of an ICES Division or adjacent Divisions).

A recently genetic studied carried out on *S. canicula* in NE Atlantic waters revealed that the spatial genetic structure supports the management approach defined for the species, which assumes the existence of multiple local populations (ICES, 2015). However, the sharp genetic discontinuity and reduced gene flow found between the south of Portugal and the remaining northward collections of *S. canicula* suggest the species might have distinct stocks along the Portuguese coast (Manuzzi *et al*., 2019).

ICES currently consider 4 stock units for this species: (i) North Sea ecoregion (Subarea 4 and Divisions 3.a and 7.d), (ii) Celtic Seas and west of Scotland (Subarea 6 and Divisions 7.a–c and 7.e–j), (iii) northern Bay of Biscay (Divisions 8.a–b and 8.d), and (iv) Atlantic Iberian waters (Divisions 8.c and 9.a).

A.2. Fishery

Catsharks are a bycatch of demersal trawl, gillnet and longline fisheries over much of the ICES area. They are usually of low commercial value and, with the exception of some seasonal, small-scale fisheries in some coastal areas, are not subject to target fisheries.

The retention patterns of catsharks in most of the fishing areas (Atlantic Iberian waters, North Sea and Celtic Seas ecoregions) are highly variable, with varying proportions retained/discarded (Santos *et al*., 2010; Silva *et al*., 2013). Larger individuals are landed for human consumption (particularly in the southern parts of the ICES area).

A.2.1 General description

Nominal landings data for *S. canicula* (including possible mixing with *S. stellaris*) from Divisions 8.c and 9.a are reported mainly by Spain and Portugal.Very few landings in Div. 8.c are also reported by France. (Table 1)

A.2.2 Fishery management regulations

These species are not subject to fisheries management in EU waters.

A.3. Ecosystem aspects

Scyliorhinus canicula inhabits shallow waters of continental shelves and uppermost slopes, occurring on a range of substrates: sandy, coralline algal, gravelly or muddy bottoms at depths from a few meters to 400 m (commonly down to 110 m). Elasmobranchs apparently play an ecological role of relevance in the demersal community of the Cantabrian Sea (Sanchez *et al*., 2005).

Scyliorhinus canicula is a generalist species that feeds on a great variety of benthic preys and some pelagic, from which Crustacea (mostly Decapoda), Teleostei, Polychaeta and Mollusca (essentially cephalopods) are the most common (Machado, 1996; Nunes, 2008; Martinho *et al*., 2012; Olaso *et al*., 2002; 2005). The possibility of cannibalism, as observed in other areas of the Atlantic, is also hypothesized (Martinho *et al*., 2012). It is also a species that benefits from discards being opportunistic scavengers (Olaso *et al*., 1998; 2002). The broad diet of this elasmobranch and its consumption of discarded fish make them good indicators of fishing induced change in the Cantabrian Sea ecosystem (Olaso *et al*., 2005; Sánchez *et al*., 2005)

B. Data

B.1. Commercial catch

B.1.1 Landings data

Landings of this species were traditionally reported in the category groups of dogfishes and hounds in some countries, though in recent years more species-specific landings have become available (Table 1, Figure 1).

Table 1. Catsharks (Scyliorhinidae) in the Northeast Atlantic. ICES estimates of landings (t) of lesser-spotted dogfish *Scyliorhinus canicula* in Divisions 8.c and 9.a (Bay of Biscay).

	France	Spain	Portugal	Total
2005	1	297	568	866
2006	1	333	591	925
2007	1	327	595	923
2008	1	272	546	819
2009	1	229	535	765
2010	0	336	522	858
2011	0	354	551	905
2012	0	555	544	1099
2013	0	577	520	1097
2014	0	464	521	985
2015	0	417	554	971
2016	0	398	589	987
2017	0	448	619	1067
2018	0	505	530	1035
2019	0	449	588	1038
2020	0	853	555	1408

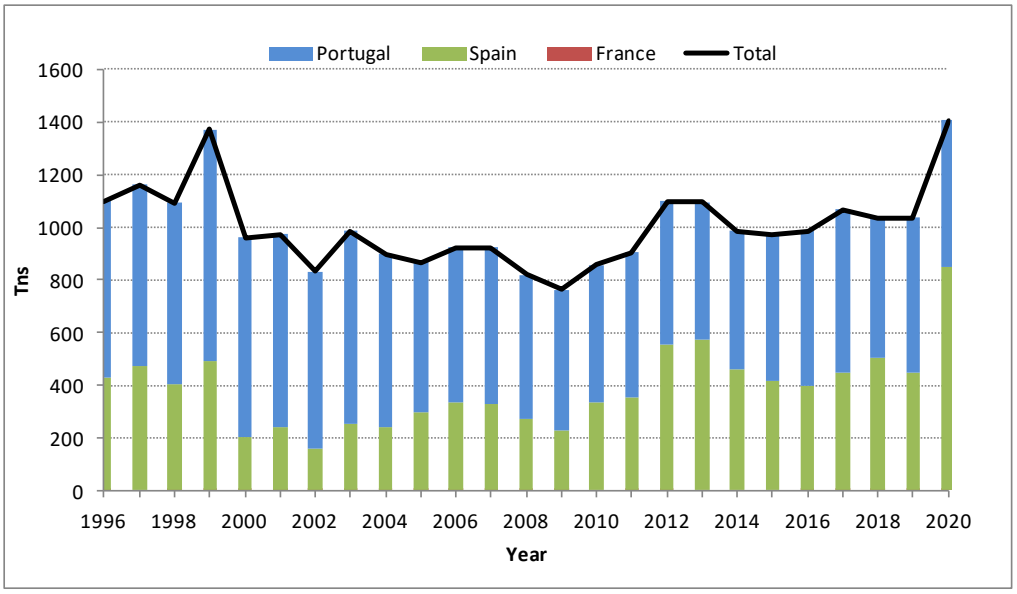

Figure 1. ICES estimates of landings (t) of lesser-spotted dogfish *Scyliorhinus canicula* in Divisions 8.c and 9.a (Bay of Biscay).

B.1.1.1.1 Data coverage and quality

Landings data for the period 2005-2015 were revised in 2016, following the WKSHARK2 workshop (ICES, 2016) and the dedicated data call where the 10-year time-series was requested. Some reported data were corrected, allocation to stocks were consolidated based on expert knowledge.

i) Some landings of catsharks have probably been reported in generic ´dogfish´ categories, this fraction of the landings is reducing in recent years to a few percent since 2016;

ii) Some landings reported as either *S. canicula* or *S. stellaris* may comprise a fraction of the other species. For example, Portuguese landings from 9.a assigned to *S. stellaris* are likely to correspond to *S. canicula* only;

iii) It is unclear whether catsharks used for pot bait are reported in landings data or not.

B.1.2. Discards estimates

Scyliorhinus canicula and other catsharks are often discarded from continental shelf fisheries (e.g. Silva *et al*., 2013 WD; Araujo *et al*., 2017). The potentially high discard survival of species in the Scyliorhinidae family, at least for continental shelf fisheries, means that landing data are likely to be more representative of dead removals. Low market value is the main factor that forces the fleet to discard these species at least in Spanish waters.

Discard data for *S. canicula* from Spanish fleets waters generally occur in trawlers and affects mainly smaller individuals (Santos *et al*., 2010 WD; Araujo *et al*., 2017). Despite some variations in the percentage of discards of the Spanish fleet according to métiers or ICES fishing area, the discard rates of *S. canicula* is very high, reaching, in some cases, the 100%. In the Portuguese crustacean bottom otter trawl fishery operating in Division 9.a, *S. canicula* is also among the most frequently discarded demersal elasmobranchs (together with *G. melastomus*) (Prista and Fernandez, 2013; Fernandes, 2021). Discard estimates for the artisanal fleet are not available, but proportions of discards by métier in sampled trips are reported (Moura *et al.*, 2015; Figueiredo *et al*., 2017).

In 2017, several aspects of the discards were investigated in WKSHARKS3, however overall estimates of discards were not achieved (ICES, 2017b).

B.1.2.1 Country discards

Historical series of discard estimates are mainly available for Spain and Portugal (Table 2)

Table 2. Discard estimates (t) of *S. canicula* by country in Divions 8.c and 9.a. (*) denotes estimates from the trawl fleet only.

	Spain (9.a, 8.b–c)	Portugal (9.a)	TOTAL
2003	1933		1933
2004	799		799
2005	397		397
2006	1723		1723
2007	954		954
2008	300		300
2009	954		954
2010	635	30*	665
2011	721	164*	885
2012	753	N.A.	753
2013	1137	N.A.	1137
2014	2081	140*	2221
2015	1864	N.A.	1864
2016	1072	69*	1141
2017	699	0	699
2018	686	0	686
2019	562	67	629
2020	109	72	181

B.1.2.1.1 Data coverage and quality

Discarding can be high, but is variable. Furthermore, there is potentially high discard survival, at least for *Scyliorhinus* spp., and further studies are required to estimate 'dead removals'. *Scyliorhinus canicula* have been shown to have a high discard survival in beam and otter trawl fisheries (Revill *et al*., 2005; Rodriguez-Cabello *et al*., 2005), and anecdotal observations suggest that it would also have high survival in coastal longline fisheries. There are no data for discard survival of these species in gillnet fisheries.

B 2.3 Recreational catches

Do not take place.

B.2. Biological sampling

Catsharks can have protracted spawning periods, with *S. canicula* bearing egg cases observed over the year. This protracted egg-laying season may result in no apparent cohorts in length distributions. Age and growth parameters are uncertain however several attempts have been done to age this species by using vertebrae readings (Henderson and Casey, 2001; Ivory *et al*., 2005; Machado, 1996; Moreira *et al*., 2018) and tag-recapture data (Rodríguez-Cabello *et al*., 2005).

B.2.1. Maturity

The reproductive biology of *S. canicula* has been studied in different regions by different authors. A summary of some of these studies carried out in ICES area and adjacent

waters are shown on Table 3. According to Ellis and Shackley (1997), males in the Bristol Channel mature at lengths of 49–54 cm (L_{50} at 52 cm) and females at 52–64 cm (L_{50} at 55 cm). In the Cantabrian Sea, ICES areas 8.c, females mature at 49.7–59.1 cm (L_{50} at 54.2 cm) and males at 49.9–56.5 cm (L_{50} at 55.9 cm) (Rodriguez-Cabello *et al.*, 1998; 2008). Cardoso (2014) estimated the length at first maturity (L_{50}) as 53.2 and 50.6 cm for males and females respectively, caught in commercial fisheries operating off Matosinhos (north of Portugal). In Portuguese waters (extended area) Moura *et al.* (2017) reported TL_{50} estimates of 45.3 and 45.7 for females and males, respectively. According to the literature the egg-laying season lasts at least ten months with a peak in June and July, and fecundity increases with fish length. A study conducted in ICES areas 8.c and northern 9.a indicated that the maximum proportion of egg-carrying females was found in April, May and June, however, the low number of specimens sampled in autumn did not allow to determine whether differences exist with regard to spawning intensity throughout the year (Rodriguez-Cabello *et al*., 1998). In Portuguese waters egg-laying is also likely to occur all along the year with higher intensity in May (Moura *et al*., 2017 WD).

Table 3. Length at maturity of *Scyliorhinus canicula* reported for some ICES areas.

Authors	Ocean	Location	ICES Area	Length range (cm)	Number sampled	L_{50} (cm) Male	L_{50} (cm) Female
Ellis and Shackley, 1997	NE Atlantic	Bristol channel	7f	37-67	972	52.0	55.0
Rodriguez-Cabello et al., 1998	NE Atlantic	Cantabrian Sea	8c-9aN	12-70	1094	55.9	54.2
Henderson and Casey, 2001	NE Atlantic	Ireland	7b-7j	40-76	258	57.5	58.1
Cardoso, 2014	NE Atlantic	Portugal	9a	44-65	476	53.2	50.6
Ivory et al., 2004	NE Atlantic	Celtic Sea	7a-7g	10-71	745	53.5	57.0

B.2.2. Natural mortality

Natural mortality (M) is a critical factor in determining the status of exploited species and is typically one of the most difficult variables to estimate. In most cases indirect estimation of M is used and is based on observed relationships between direct M estimates and various life-history parameters (maximum length, growth coefficient, maturity, etc.) e.g.,(Pauly 1980, Hoenig 1983, Jensen 1996, Chen and Watanabe 1989, Lester *et al*. 2004; Charnov *et al*. 2013 among others).

In particular for *S. canicula*population in the Cantabrian Sea (ICES 8.c and 9.a N) an estimation of mortality rate, based on EcoPath model (Sánchez *et al.*, 2005), provided a Z=0.25, (M=0.14 and F=0.11). Estimates based on tag-recapture data in the same area gave a Z=0.11 (Rodríguez-Cabello and Sánchez, 2005). A review of different indirect estimations of M/Z for this species can be also found in (Rodríguez-Cabello, 2008).

Following the study of Then *et al., (*2015) an estimate of natural mortality (0.2) was used for this species in exploratory assessments (LBI- Length base indicators). Further studies to determine natural mortality rates for different life-history stages are recommended.

B 2.3. Length and age composition of landed and discarded fish in commercial fisheries

The length distribution of *Scyliorhinus canicula* landed by the Spanish trawl fleet for the period (2018-2020) is shown in Figure 2a. In 2020, market sampling was reduced due to COVID-19 issues and weighting can produce some bias in the length distribution. The total length (TL) of fish landed and sampled ranged from 25-74 cm.

Landings data for the Portuguese polyvalent fleet for the same period are shown in Figure 2b. Length range of the fish landed correspond to 34-68 cm TL.

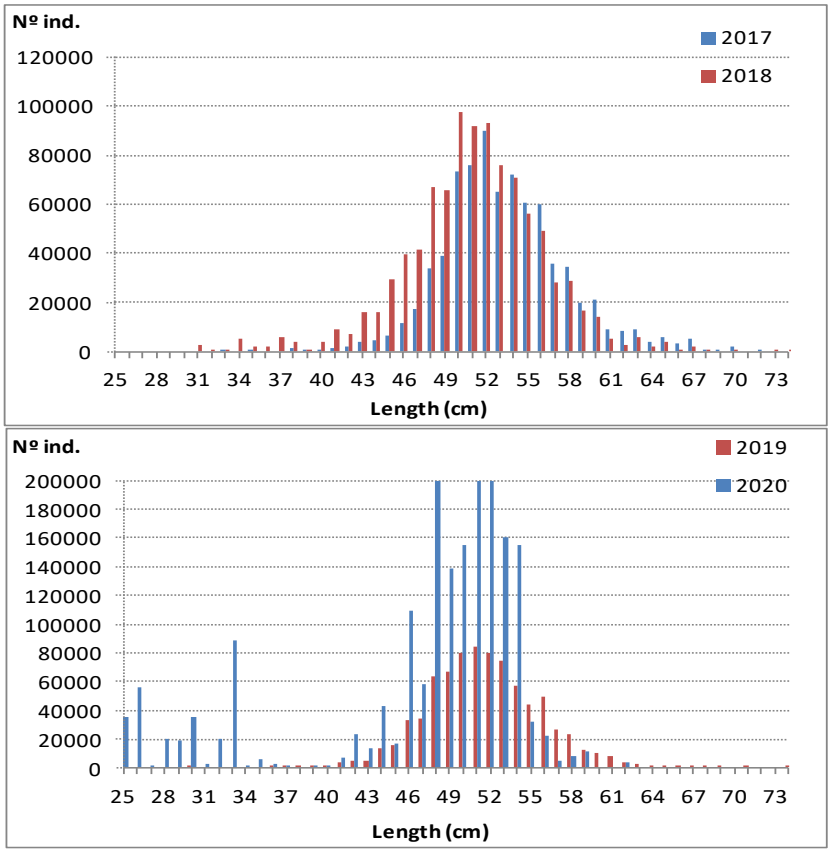

Figure 2a. Annual length distribution (2018–2020) of *Scyliorhinus canicula* landed in Iberian waters by the Spanish trawl fleet in ICES areas 8.c and 9.a.

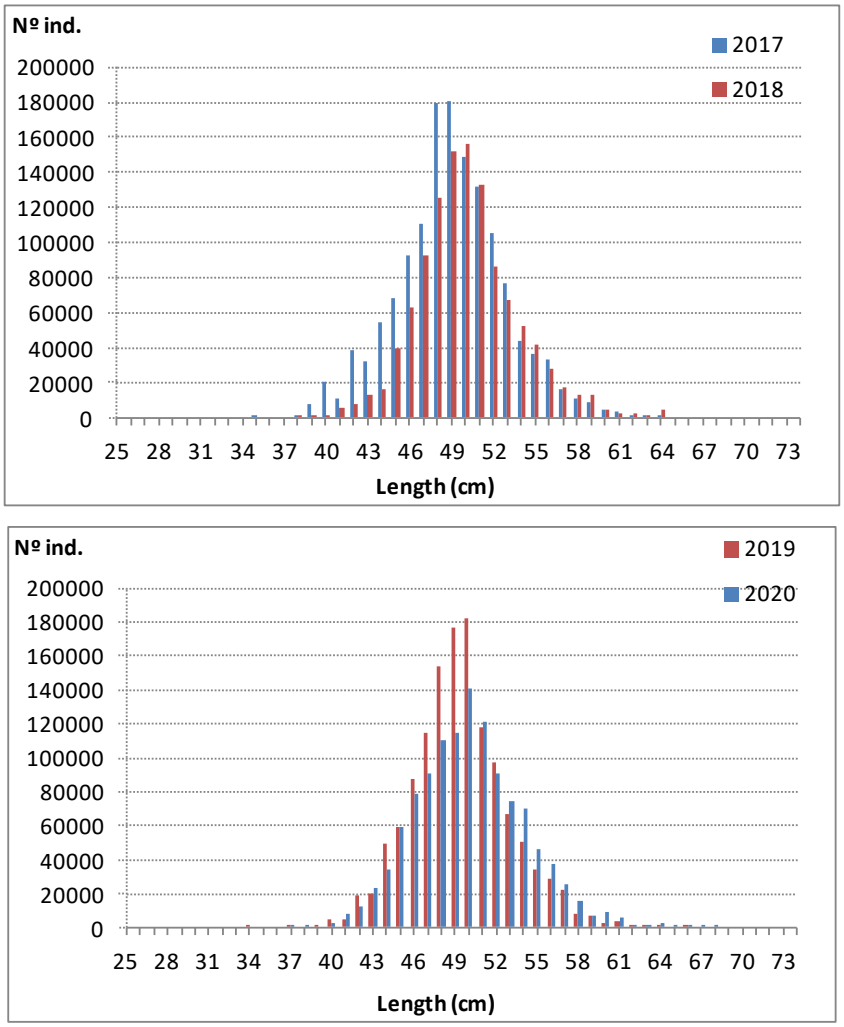

Figure 2a. Annual length distribution (2018–2020) of *Scyliorhinus canicula* landed in Iberian waters by the Portuguese polyvalent fleet in ICES area 9.a.

The length distribution of *Scyliorhinus canicula* discarded in Iberian waters (expressed in thousands of indivuals) by the Spanish trawl fleet for the period (2011–2016) is shown on Figure 2c (Araujo *et al.*, 2017 WD).

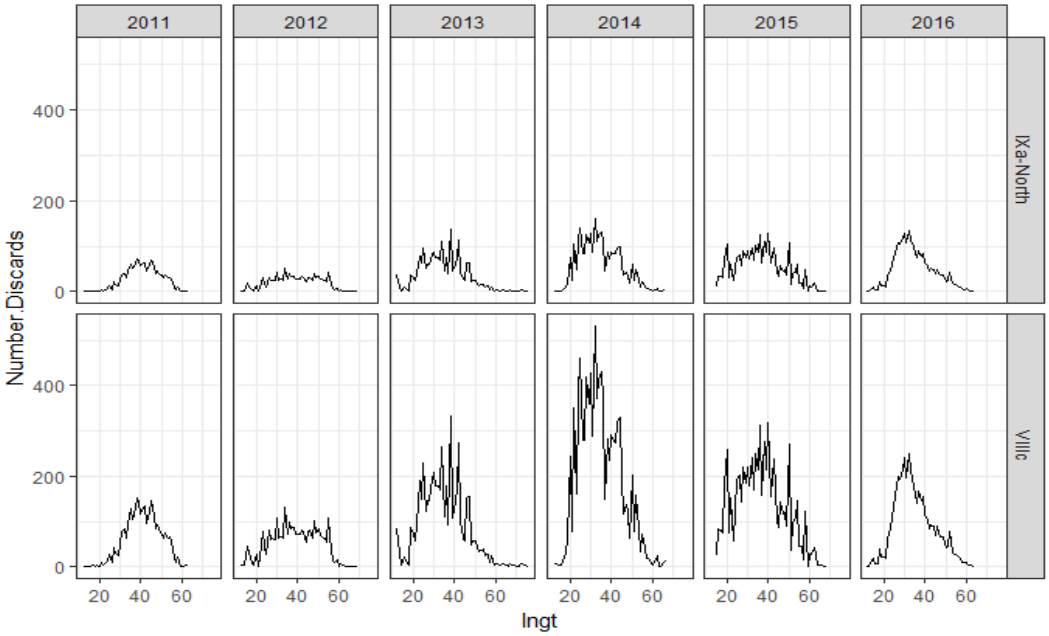

Figure 2c. Annual length distribution (2011-2016) of *Scyliorhinus canicula* discarded in Iberian waters (in thousands of indivuals) by the Spanish trawl fleet.

Length-distributions of *S. canicula* from the Portuguese trawl and artisanal fleets (2017–2020) were similar for both nets and trawlers, and between years (Figure 3; ICES, 2021; Moura *et al*., 2017). Length-frequency distributions of *S. canicula* retained and discarded in fishing trips using set nets, between 2011 and 2014 (n=49) are presented in Figure 4 (Figueiredo *et al*., 2017).

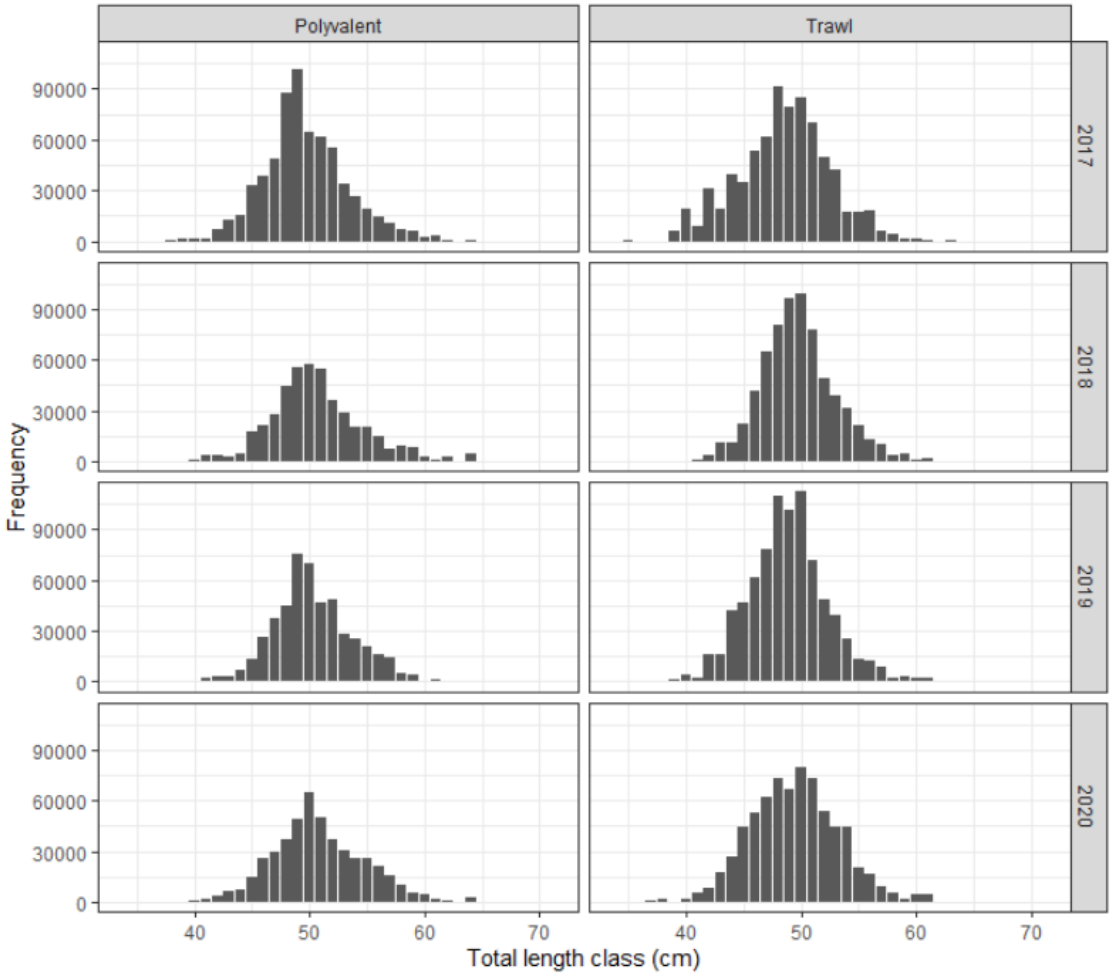

Figure 3. Length–frequency distribution of *S. canicula* specimens sampled at Portuguese landing ports from polyvalent (mostly gillnets and trammel nets) and trawl fleets raised to total landings (2017–2020).

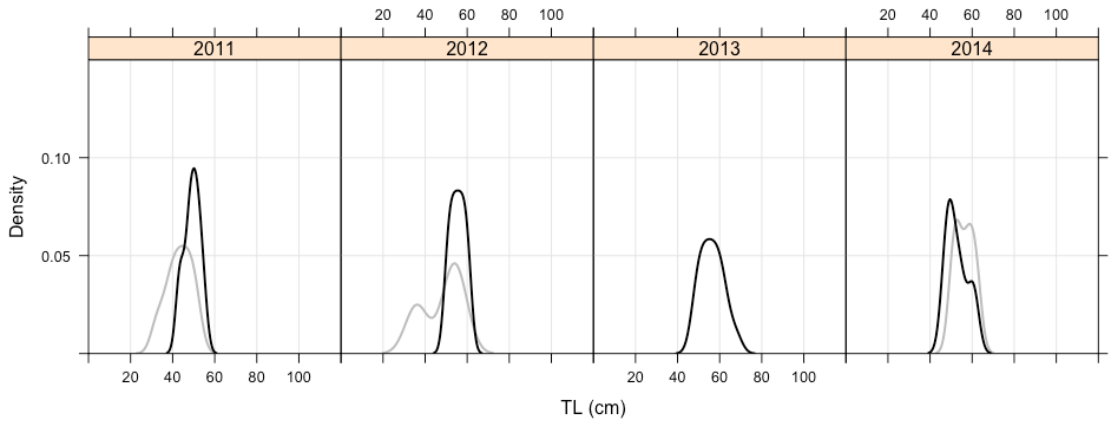

Figure 4. Length frequency distribution of *S. canicula* retained (black) and discarded (grey) fractions observed onboard vessels using set nets, between 2011 and 2014. The length frequencies were not raised to the total landings. n = 227 sampled individuals.

B.3. Surveys (Northen Spanish, Portuguese and Gulf of Cadiz)

Three bottom trawl surveys are conducted in the study area of this stock. Two of them are carried out by the Spanish Institute of Oceanography (IEO) and the other one by the Portuguese Institute for the Sea and Atmosphere (IPMA). The Spanish ones covered the 8.c ICES area and northen and southern part of 9.a whereas the Portuguese survey covers all central 9.a ICES area. Therefore the surveys comprise all area of the stock. More information about surveys is available on IBTS Manual (ICES, 2017c) and in WKSKATES report (ICES, 2021).

B.3.1. Survey design and analysis

B.3.1.1. The Northern Spanish shelf groundfish survey (Sp-N-GFS–WIBTS– Q4)

The Northern Spanish shelf groundfish survey (Sp-N-GFS–WIBTS– Q4) on the Cantabrian Sea and off Galicia coast (Divisions 8.c and Northern part of 9.a; SPNGFS) has been carried out annually since 1983 except in 1987, by the Spanish Institute of Oceanography (IEO) however was not standardized until 1993. The survey is usually conducted in September-October The area covered extends from longitude 1° W to 10° W and from latitude 42° N to 44.5° N, following the standard IBTS methodology for the western and southern areas (ICES, 2017). The sampling design is random stratified with five geographical sectors (MF. Miño-Finisterre, FE. Finisterre-Estaca de Bares, EP. Estaca de Bares-Peñas, PA. Peñas-Ajo, AB. Ajo-Bidasoa) (Figure 5). Depth stratification was changed in 1997 from 30–100 m, 101–200 m, 200–500 m to 70–120 m, 121–200 m and 201–500 to overcome the shortage of grounds shallower than 70 m that hindered the coverage of this stratum.

Nevertheless, some extra hauls are carried out every year, if possible, to cover shallower (<70 m) and deeper (>500 m) grounds. These additional hauls are plotted in the distribution and bathymetric maps, although they are not included in the calculations of the stratified abundance indices, since the coverage of these grounds (shallower and deeper) are not considered representative of the area (Ruiz-Pico *et al*., 2017; Fernandez-Zapico, 2021).

The surveys were carried out on board the R/V *Cornide de Saavedra* until 2013 were a change of vessel took place being now R/V *Miguel Oliver.*

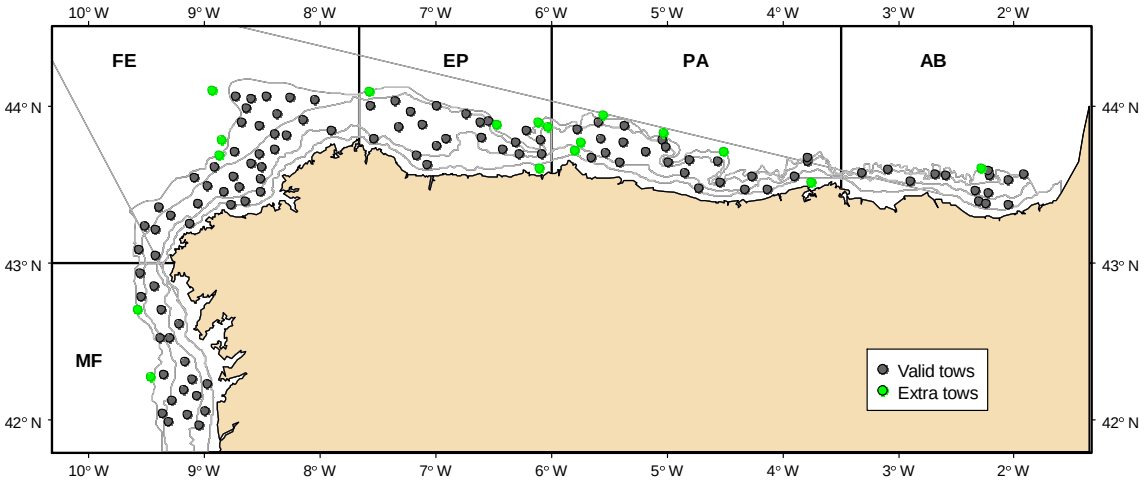

Figure 5. Stratification design and hauls on the Northern Spanish shelf groundfish survey (Sp-N-GFS–WIBTS– Q4). Depth strata are: A) 70–120 m, B) 121–200 m and C) 200–500 m. Geographic sectors are MF: Miño-Finisterre, FE: Finisterre-Estaca, EP: Estaca-cabo Peñas, PA: Peñas-cabo Ajo, and AB: Ajo-Bidasoa.

B.3.1.2. The The Portuguese survey (Pt-GFS-WIBTS-Q4)

The Portuguese survey (Pt-GFS-WIBTS-Q4) has been conducted by the Portuguese Institute for the Sea and Atmosphere (IPMA, ex-IPIMAR) and has the main objective to monitor the abundance and distribution of hake *Merluccius merluccius* and horse mackerel *Trachurus trachurus* recruitment (Cardador *et al.*, 1997). PT-GFS is performed along the Portuguese continental coast, extending from latitude 41°20'N to 36°30'N (ICES Division 9.a) from 20 to 500 m deep (Figure 6). The surveys were carried with the Portuguese RV "Noruega", which is a stern trawler of 47.5 m length, 1500 horse power and 495 GRT and using a Norwegian Campell Trawl (1800/96 NCT) with a 20 mm codend mesh size and groundrope with bobbins. PT-GFS fishing operations are performed during daylight and the duration of each tow change in 2002 from 60 to 30 min. The surveyed area is stratified into 12 sectors (from north to south: CAM: Caminha, MAT: Matosinhos, AVE: Aveiro, FIG: Figueira, BER: Berlenga, LIS: Lisboa, SIN: Sines, MIL: Vila Nova de Mil Fontes, SAG: Sagres, POR: Portimão, VSA: Vila Real de Santo António), each further divided into four depth strata: 1) 20–100 m, 2) 101–200 m, 3) 201–500 m, and 4) 501–750 m. In 1996, 1999, 2003 and 2004 the RV "Noruega" was unavailable, and the surveys were conducted using a different vessel, the RV "Capricórnio" and operating a different bottom trawl net, CAR type FGAV019, without rollers in the groundrope (ICES, 2007). In 2012, no survey was conducted. Generalized linear mixed models (GLMM; Bolker *et al.*, 2009) were adjusted (see Figueiredo and Serra-Pereira, 2012 WD for further details).

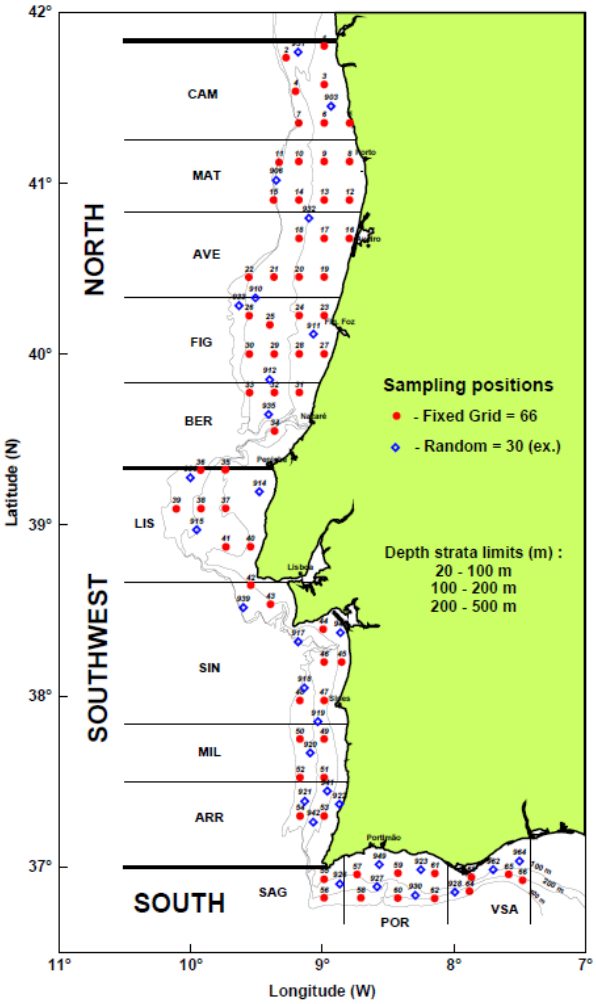

Figure 6. Stratification design and hauls on the Portuguese groundfish survey (Pt-GFS-WIBTS-Q4) Depth strata are: A)20–100 m, B) 100–200 m and C) 200–500 m.

B.3.1.3. The Southern Spanish Groundfish Survey on the Gulf of Cádiz (Sp-GC-GFS-WIBTS-Q1 and Q4)

The Southern Spanish Groundfish Survey on the Gulf of Cádiz (Sp-GC-GFS-WIBTS-Q1 and Q4) (ARSA survey) is conducted in the southern part of ICES Division 9.a, the Gulf of Cádiz. The covered area extends from 15 m to 800 m depth, during spring (March) and autumn (November). The whole area (7224 km2) has been separated into five depth strata (15–30, 31–100, 101–200, 201–500 and 501–800 m). The sampling design is random stratified with proportional allocation with a total of 42 fishing stations according to the design (Figure 7). The Sp-GC-GFS-WIBTS-Q1 and Q4 has been usually carried out with RV Cornide de Saavedra, but from 2013 it has been carried out on the RV Miguel Oliver as in Sp-N-GFS–WIBTS– Q4. The gear used is also the one used in SP-NSGFS, a Baca trawl 44/60 with a 43.6 m footrope and a 60.1 m headline. Hauls last 60 minutes from the end of shooting the gear and the warp (locking the winches), and the start of hauling back the gear.

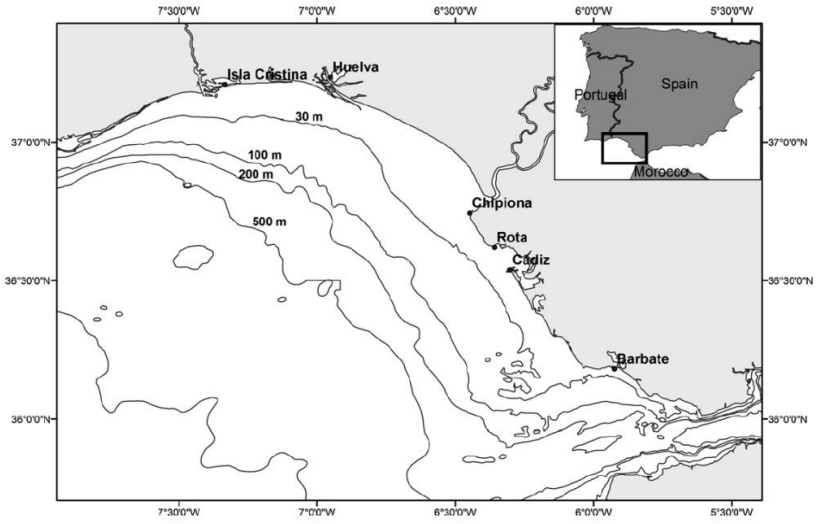

Figure 7. Map of the Gulf of Cadiz (south Spain) showing the stratification used in the Spanish surveys (15-30, 31–100, 101–200, 201–500 and 501–800 m) in that area.

B.3.2. Survey data used

The biomass indices of each survey, previously described in section B.3.1, are used. Each survey index is standardized to its time series before averaging. In the surveys carried out in the Gulf of Cadiz,(9.a southern part) the average of both ARSA surveys conducted one in spring (Q1) and other in autumn (Q4) is previously estimated (Table 4).

Portuguese surveys were not conducted in 2019 and in 2020, due to issues external to IPMA and to the covid-19 outbreak. Due to the change of the Portuguese research vessel, the use of PT surveys for future assessments will be evaluated in the next years(s). However, as biomass series are available for other areas where the stock distributes, and will continue to inform on their status. The biomass indicator used in the assessments is the average of the three standardized surveys.

Table 4. Biomass indices from the three trawl surveys (Sp-GC-GFS-WIBTS-Q1 and Q4, Pt-GFS-WIBTS-Q4, and Sp-N-GFS–WIBTS– Q4; kg h–1) and the combined stock size indicator (the annual mean of the normalized surveys).

Year	SPAIN		PORTUGAL	Combined stock size
	SP-GC-GFS-Q1Q4	SP-N-GFS-Q4	PT-GFS-Q4	
1993	0.19	0.51	0.97	0.55
1994	0.45	0.50	0.76	0.57
1995	0.48	0.33	1.10	0.63
1996	0.43	0.47		0.45
1997	0.65	0.47	1.13	0.75
1998	0.16	0.41	0.78	0.45
1999	0.27	0.35		0.31
2000	0.32	0.56	1.73	0.87
2001	0.41	0.79	1.06	0.75
2002	0.23	0.50	0.45	0.39
2003	0.29	0.58		0.43
2004	0.54	0.53		0.53
2005	0.97	0.75	0.87	0.86
2006	1.51	0.87	0.81	1.06
2007	0.96	1.03	0.72	0.90
2008	1.37	0.75	1.05	1.06
2009	0.86	0.89	1.06	0.94
2010	1.10	0.81	0.64	0.85
2011	1.14	0.77	0.98	0.96
2012	1.06	1.05		1.05
2013	1.70	2.62	0.99	1.77
2014	1.48	1.93	0.76	1.39
2015	1.64	1.63	1.03	1.44
2016	1.94	1.77	0.91	1.54
2017	2.24	1.44	1.37	1.68
2018	1.87	1.86	1.84	1.86
2019	2.36	1.94		2.15
2020	1.39	1.92		1.65

B.4. Commercial CPUE

Commercial catch and effort data have not been analysed for most scyliorhinid stocks, including this stock. Historical series of landings per unit of effort are only available from the Basque Country OTB fleet (OTB DEF=70) since 2001 and in ICES 8.abd area (Figure 8).

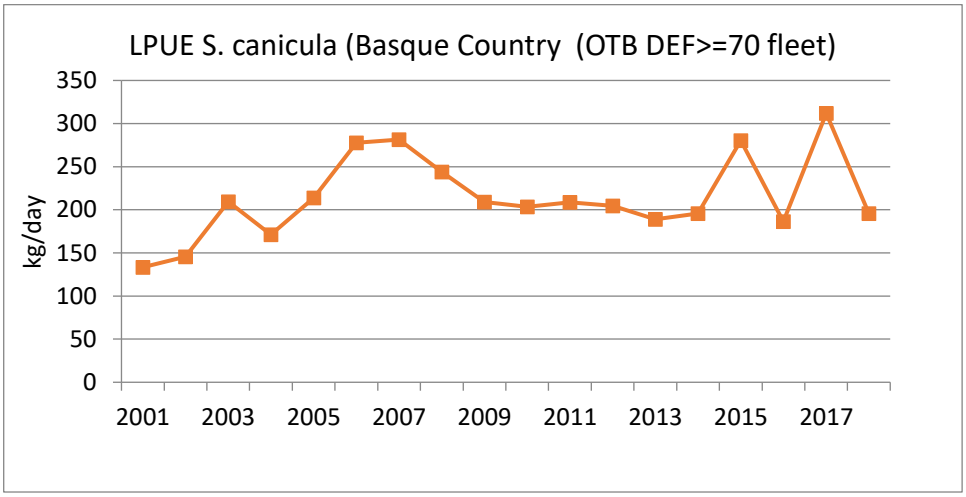

Figure 8. LPUE from Spain OTB Basque fleet in Divisions 8.abd from 2011 to 2018.

B.5. Other relevant data

C. Assessment: data and method

C.1. Choice of stock assess model

Survey trends-based assessment model.

C.2. Model used of basis for advice

In 2021, 2019 and 2012, ICES was not requested to provide advice on this stock. A simulation has been done following previous years assesments based on survey trends-based assessment model (Category 3.9). Table 4 shows the results of this simulation. Two scenarios were developed, one including all surveys previously reported and a second one excluding Portuguese survey which was not conducted in 2019 and 2020. The ICES framework for category 3 stocks (ICES, 2012) was followed. The results of the simulation indicates that the ratio A/B shows some variation between the two scenarios, particularly in 2019 and 2021. However, the perception of the stock status and trend is the same (Moura *et al*., 2021). Figure 9 represents the last year stock size indicator based on all surveys.

A biomass index derived from the average of Sp-GC-GFS-WIBTS-Q1 and Q4, Pt-GFS-WIBTS-Q4, and Sp-N-GFS–WIBTS– Q4surveys were used to provide an overall stock size indicator. The advice change is based on a comparison of the last two values (index A) with the five preceding values (index B). When advice is requested, the ICES framework for category 3 stocks (ICES, 2012) is applied to this species.

Table 4. Lesser-spotted dogfish in divisions 8.c and 9.a. Summary of the assessments in 2015, 2017, 2019 and 2021 under two scenarios.

	All survey indices				Without PtGFS-WIBTS-Q4				
Year	Index A	Index B	Ratio A/B	Advice change	Index A	Index B	Ratio A/B	Advice change	Ratio A/B in the advice
2021	1.90	1.58	1.20	+20% [a]	1.90	1.78	1.07	+ 10% [b]	No advice
2019	1.86	1.53	1.22	+20% [a]	1.99	1.81	1.10	+ 10% [b]	No advice
2017	1.58	1.28	1.23	+20% [a]	1.88	1.47	1.28	+20% [a]	1.32
2015	1.68	1.03	1.64	+20% [a]	2.08	1.05	1.97	+20% [a]	1.41

[A] uncertainty cap applied.

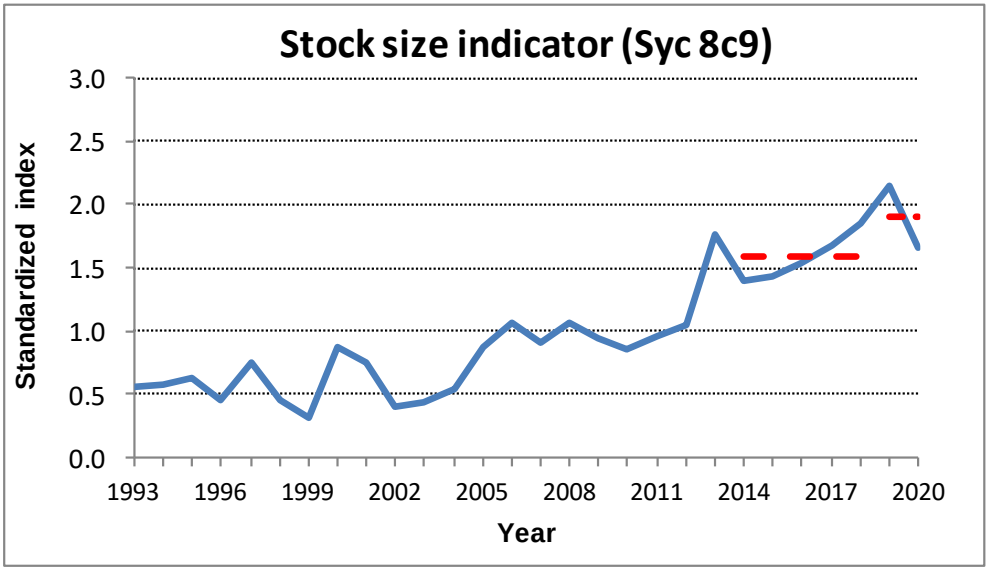

Figure 9. Lesser-spotted dogfish in divisions 8.c and 9.a. Stock size indicator derived from four surveys (Sp-GC-GFS-WIBTS-Q1 and Q4, Pt-GFS-WIBTS-Q4, and Sp-N-GFS–WIBTS–Q4; kg h^{-1}), normalized relative to the time-series mean. The dotted horizontal lines show the mean stock indicators for 2019–2020 and 2014–2018.

C.3. Assessment model configuration

Not other assessment models were appied to this stock

D. Short-Term Projection

Short-term projections are not conducted for this stock.

E. Medium-Term Projections

Medium-term projections are not conducted for this stock.

F. Long-Term Projections

Long-term projections are not conducted for this stock.

G. Biological Reference Points

Biological reference points are not defined for this stock.

H. Other Issues

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