25 Catsharks (*Scyliorhinidae*) in the Northeast Atlantic

25.1 Stock distribution

This section addresses four species of catsharks that occur on the continental shelf and upper slope of the ICES area: lesser-spotted dogfish (or small-spotted catshark) *Scyliorhinus canicula*, greater-spotted dogfish *Scyliorhinus stellaris*, black-mouth dogfish (or black-mouth catshark) *Galeus melastomus* and Atlantic catshark *Galeus atlanticus.* Other catsharks that occur in deeper waters (*Apristurus* spp. and *Galeus murinus*) are not included here (see Section 5). All catsharks are demersal and oviparous (egg-laying) species.

These species have been referred to as catsharks, dogfishes and other names including hounds. Names recognised by FAO may not be suitable to minimise confusions with *Scyliorhinus canicula* being referred to as small-spotted catshark and *S. stellaris* as nursehound. Therefore, ICES refer to these species as follows:

English name	Scientific name
Lesser-spotted dogfish	*Scyliorhinus canicula*
Greater-spotted dogfish	*Scyliorhinus stellaris*
Black-mouth dogfish	*Galeus melastomus*
Atlantic catshark	*Galeus atlanticus*

Lesser-spotted dogfish: *S. canicula* 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). 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).

See stock annexes for information about *S. canicula* in northern Bay of Biscay (divisions 8.a–b and 8.d) and in the Cantabrian Sea and Atlantic Iberian waters (divisions 8.c and 9.a).

Greater-spotted dogfish: *S. stellaris* is a locally frequent inshore shark of the Northeast Atlantic continental shelf and is generally found from shallow water to depths of about 125 m on rough or rocky bottoms, including areas with algal cover (e.g. kelp forests) (Ebert and Stehmann, 2013). It is Europe's largest catshark, growing to at least 130 cm.

This species is currently only assessed for the subareas 6 and 7, as it is locally common in parts of this area, and data are limited for other parts of the species' biogeographic range, where it occurs at lesser density.

See stock annex for information about *S. stellaris* in subareas 6 and 7.

Black-mouth dogfish*: G. melastomus* is a small-sized shark (<90 cm), found on the upper slope in the Mediterranean Sea and the Atlantic from northern Norway and the Faroe Islands to Senegal (Ebert and Stehmann, 2013).

This species is currently assessed over two management units (i) Celtic Seas and west of Scotland (Subarea 6 and divisions 7.a–c and 7.e–j), and (ii) Bay of Biscay and Atlantic Iberian waters (Subarea 8 and Division 9.a).

See stock annex for information about *Galeus melastomus* in Atlantic Iberian waters (Subarea 8 and Division 9.a).

Atlantic catshark: *Galeus atlanticus* is a small catshark found on the continental slopes living in depths of 330–790 m. Its distribution in the Eastern Atlantic ranges from North of Spain to Portugal into the Mediterranean and further south to Morocco and possibly to Mauritania. Northern range limits are unknown (Ebert and Stehmann, 2013), as there is confusion between this species and *G. melastomus* (see Rey *et al.*, 2006 for distinguishing characters). The stock status of *G. atlanticus* is not assessed.

25.2 The fishery

25.2.1 History of the 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 the North Sea and Celtic Seas ecoregions are highly variable, with varying proportions retained/discarded (Silva and Ellis, 2019). Larger individuals are landed for human consumption (more so in the southern parts of the ICES area). They are also landed in some areas as bait for pot fisheries, especially in fisheries for whelk *Buccinum undatum* or brown crab *Cancer pagurus* around the British Isles.

25.2.2 The fishery in 2021

No new information.

25.2.3 ICES Advice applicable

Before 2012, ICES advice on catsharks was included in the regional demersal elasmobranch advice. Species-specific advices for catsharks have been given since 2012.

The last assessments of catsharks were carried out in 2021 valid for 2022 and 2023. The table below presents a summary of the 2021 assessments.

STOCK	STOCK CODE	ASSESSMENT CATEGORY	ADVICE BASIS	ADVISED LANDINGS (2022–2023)
Lesser-spotted dogfish (*Scyliorhinus canicula*) in Subarea 4 and divisions 3.a and 7.d	syc.27.3a47d	3	Precautionary	2389 tonnes
Lesser-spotted dogfish (*Scyliorhinus canicula*) in Subarea 6 and divisions 7.a-c and 7.e–j	syc.27.67a-ce-j	3	Precautionary	3597 tonnes
Lesser-spotted dogfish (*Scyliorhinus canicula*) in divisions 8.a-b and 8.d	syc.27.8abd	3	Precautionary	ICES has not been requested to provide advice on fishing opportunities for this stock.
Lesser-spotted dogfish (*Scyliorhinus canicula*) in divisions 8.c and 9.a	syc.27.8c9a	3	Precautionary	ICES has not been requested to provide advice on fishing opportunities for this stock.
Greater-spotted dogfish (*Scyliorhinus stellaris*) in subareas 6 and 7	syt.27.67	3	Precautionary	
Black-mouth dogfish (*Galeus melastomus*) in subareas 6 and 7 (West of Scotland, southern Celtic Seas, and English Channel)	sho.27.67	3	Precautionary	Catches in each of the years 2022 and 2023 should be decreased by no less than 18% compared to the average catches in 2018-2020
Black-mouth dogfish (*Galeus melastomus*) in Subarea 8 and Division 9.a	sho.27.89a	3	Precautionary	Catches in each of the years 2022 and 2023 should be decreased by no less than 36% compared to the average catches in 2018-2021

25.2.4 Management applicable

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

Galeus melastomus was originally included in the list of deep-water sharks, but Council Regulation (EC) 1182/2013 removed this species from this list following ICES advice. This review was based on the fact that its main distribution extended to upper slope and outer shelf habitats, which are not considered deep-water habitats, and that it had different life-history traits from other species on the list (with the assumption of lower vulnerability towards fishing pressure). No management has been applied for this species since.

25.3 Catch data

25.3.1 Landings

Landings of catsharks were traditionally reported in category groups (e.g. dogfishes and hounds) in some countries, though in recent years more species-specific landings have become available. The lack of historical landings data and the uncertainty associated with recent species-specific information suggest data herein should be viewed with caution.

Nevertheless, in areas where S*cyliorhinus canicula* is much more abundant than *S. stellaris*, reported landings may be regarded as representative of the former species. The species is of minor interest to small-scale fisheries and local markets and most landings have been sold through fish auction markets.

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. In 2017, the data call for WGEF requested an update of 2015 and report of 2016 landings. The ICES estimates of data presented (tables 25.1a–f) are based upon an analysis of landings data since 2005 reported in the 2016 and subsequent data calls. Some reported data were corrected, allocation to stocks were consolidated based on expert knowledge.

i. Some landings of catsharks have previously 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 as to whether catsharks used for pot bait are reported in landings data.

The confusion between *S. canicula* and *S. stellaris* is likely to have a greater impact on the lesser abundant *S. stellaris*.

Nominal landings data for *S. canicula* (including possible mixing with *S. stellaris*) from Subarea 4 and divisions 3.a and 7.d (Table 25.1a), subareas 6 and 7 (Table 25.1a), divisions 8.a–b and 8.d (Table 25.1.c) are reported mainly from France and Spain, while those from divisions 8.c and 9.a are reported by Spain and Portugal (Table 25.1d).

Nominal landings data for *G. melastomus* from subareas 6 and 7 (Celtic Seas) have only been declared by France and Spain (Table 25.1e) and amount to zero in the last two years. There are no reported landings prior to 2002. It is likely that this species was caught in deep-water fisheries prior to these years, but was discarded or reported under generic landing categories.

Landings data for *G. melastomus* from Subarea 8 are reported mainly by Spain, whereas most landings from Division 9.a are from both the Portuguese and the Spanish fleets (Table 25.1f). In 2010, reported landings declined due to the introduction of the zero-TAC for deep-water sharks (where this species was previously included). Following the removal of this species from the list of deep-water sharks in 2013, international landings increased to reach their highest value in 2018 (181 tonnes).

Given the widespread discarding of catsharks, reported landings are not considered representative of catch.

25.3.2 Discards

Scyliorhinus canicula and other catsharks are often discarded from continental shelf fisheries (e.g. Silva and Ellis, 2019). 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.

In 2017, several aspects of the discards were investigated in WKSHARK3, however overall estimates of discards were not achieved (ICES, 2017b).

Discard data for *G. melastomus* and *S. canicula* from the Iberian and Celtic Sea are available from Spanish on board observations. The Spanish discard sampling carried out in application of the EU-DCF (Data Collection Framework) consists of at-sea a simple random sampling (SRS) program design with recording of refusals (Santos *et al*., 2010 WD).

Discard information of *S. canicula* and *G. melastomus* is also available from several countries in Subarea 8 and Division 9.a (Table 25.2a and 25.2b). For *S. canicula,* discard estimates in the period 2009–2016 ranged from 33–195% of the total landed weight, with trawlers being the main fleet considered. Discards of *G. melastomus* in Subarea 8 and Division 9.a have been higher than

reported landings throughout the time-series. However, these preliminary estimates may be an artefact of raising factors applied to the subsampling of commercial catches.

In the Portuguese crustacean bottom otter trawl fishery operating in Division 9.a, the most frequently discarded demersal elasmobranchs were *G. melastomus* and *S. canicula*. Discard information (sampling effort, species frequencies of occurrence and discard estimates) was compiled for this fleet and the two species for the period 2016-2020 by Fernandes (WD11 - 2021). In 2020, the Portuguese onboard sampling programme was compromised by the pandemic situation due to Covid-19 and the sampling only occurred in the first quarter of the year. For this reason, the sampling effort was not representative of the fishing effort of the bottom otter trawl fleet (OTB) and new discard estimation procedures were applied for the two species: discards of 54 t were obtained for *G. melastomus* in OTB_CRU fishery based on the last 3-year estimates (2017-2019); due to an irregular frequency of occurrence pattern in discards a new preliminary approach using standardized DPUE series was developed for *S. canicula* (WD11 – Fernandes, 2021). *Scyliorhinus canicula* and *G. melastomus* are among the most discarded species by commercial fishing vessels with a fishing permit to set gillnets or trammel nets (LOA >= 12 m) (Figueiredo *et al*., 2017 WD). Frequency of occurrence (%) of both species in the discards from hauls with gillnets and/or trammel nets from those vessels range between 31 and 57% for *S. canicula* and between 0 and 6% for *G. melastomus* (Figueiredo *et al.*, 2017 WD). For further details regarding estimated total discarded weight, length distribution and sex ratio for both species please refer to ICES (2014), Prista and Fernandes (2013 WD), Figueiredo *et al.* (2017 WD) and Fernandes (2021 WD11).

Discards in French fisheries from 2011 to 2016 have been estimated for stocks syc.27.347d, syc.27.8abd, syc.27.7a-ce-j, syt.27.67, sho.27.67, sho.27.89a (and presented at WKSHARK3) using two methods: i) standard method for raising discards to the landings of the species and ii) method where observed discards are raised to the total landings of all species combined (ICES, 2017a). *S. canicula* is a bycatch in most French fisheries and a high number of DCF level 6 métiers catch it. For métiers which do not land the species (100% discards) discards were estimated by raising to the total landings (all commercial species of fish, molluscs and crustaceans combined). An overall discarding rate (discards/landings) was calculated to 170%. This rate varied from 10–100% across métiers. French discards data from 2011-2020 where available.

Discards from Irish vessels of syc.27.7a-ce-j are provided annually.

25.3.3 Discard survival

S. 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; Barragán-Mendez *et al*., 2020), and anecdotal observations suggest that it would also have high survival in coastal longline fisheries. A review of survival studies on this species and other sharks can be found in Ellis *et al*., (2016). There are no data for discard survival of these species in gillnet fisheries. There are also no data for the survival of *G. melastomus* caught in fisheries operating along the outer continental shelf and upper slope. A study of survival of deep-water sharks caught by longline indicated some survivorship for this species using this fishing gear (Rodríguez-Cabello and Sanchez, 2017).

25.3.4 Quality of catch data

Accurate species-specific landings data are not currently available. The ongoing (since 2012) French programme "Elasmobranches On Shore" aims to better evaluate the relative proportion of species mixed under a single landing name, as it is for *S. canicula* and *S. stellaris* (Mayot *et al.*, 2021). This programme will enable to correct a large part of the French Landings Data. To date, the results have been only partially communicated. In the past, only *S. canicula* was used for

catsharks landing but labelling has been improving in recent years in France with the progressive appearance of the landing name *S. stellaris* in fish markets.

25.4 Commercial catch composition

Data from national observer programmes have provided information on the size distribution of the retained proportions of the catch. Generally, only larger individuals (L_T larger than 45 cm) are retained (Silva and Ellis, 2021. However, retention of *S. canicula* and *S. stellaris* may depend locally more on market demand rather than size as these species can be often landed as bait for pot fisheries (Silva and Ellis, 2021).

The length distributions for *S. canicula* from France (divisions 7.a-c.e.k, for stocks syc.27.3a47d and syc.27.8abd; 2011–2015) and Spain (OTB Basque fleet for stock syc.27.8abd; 2011–2015) were shown in ICES (2017a). Length-distributions of *S. canicula* from the Basque country trawl fleet are shown on Figure 25.1a. Catch length ranges from 10 cm to 73 cm. However, the proportion retained is from 40 cm to 73 cm, while fish of lengths from 10 cm to 50 cm are mostly discarded. Length distributions of *S. canicula* landed from the Spanish trawl fleet in ICES division 8.c and 9.a for the period 2015–2019 is shown on Figure 25.1b. Catch length for stock syc.27.8c9a by Spanish trawl fleet, ranges from 10 cm to 70 cm but the proportion retained is from 40 cm to 65 cm. Length distribution of *S. canicula* landed and discarded by the Spanish fleet (mainly trawl fleet) in 2021 is shown in Figure 25.1.c.

S. canicula caught by the Dutch beam trawl fleet included some smaller fish (35–40 cm L_T) in 2014 than in previous years (Figure 25.2), but most sampled fish were in the 50–65 cm L_T size categories.

Length frequency distributions of *S. canicula* in Portuguese landings are provided annually for the trawl and polyvalent fleets. Data from 2017–2020 was updated. Length-distributions of *S. canicula* from the Portuguese trawl and artisanal fleets (2009–2020) were similar for both nets and trawlers, and between years (ICES, 2016; Moura *et al.*, 2017a; Figure 25.3a). 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 25.3b (Figueiredo *et al.*, 2017). A DCF pilot study on trammel nets (GTR_DEF_>=100_0_0; 2012–2014) showed no major differences in the length frequencies of *S. canicula* between sexes or between years (Moura *et al.*, 2015b WD). Length frequency distributions of *G. melastomus* in Portuguese discards are provided annually for the trawl fleet (OTB_CRU) (Figure 25.3c).

The length-range for *S. stellaris* caught by the French fleet in 2012–2014 was 44–124 cm (ICES, 2014).

25.5 Commercial catch–effort data

Commercial catch and effort data have not been analysed for most scyliorhinid stocks in the ICES area.

Landings per unit of effort data from the Basque Country OTB fleet (divisions 8.abd; Figure 25.4) showed an increasing trend over the period 2001–2018.

25.6 Fishery-independent information

Groundfish surveys provide valuable information on the spatial and temporal patterns in the species composition, size composition, sex ratio and relative abundance of catsharks. It is noted that these surveys were not designed primarily to inform on these populations, and so the gears

used, timing of the surveys and distribution of sampling stations may not be optimal. However, these surveys provide the longest time-series of species-specific information.

Depending on the area and species, one to several surveys provide reliable time-series of data (see table below).

ICES stock code	Survey used for assessment
syc.27.3a47d	IBTS-Q1 and Q3, BTS-Eng-Q3, CGFS-Q4, and BTS-BE-Q3 (included since 2021).
syc.27.67a-ce-j	EVHOE-WIBTS-Q4, IGFS-WIBTS-Q4, Spanish Porcupine Bank survey SP-PORC-WIBTS-Q3, and UK (E&W)-BTS-Q3 (2005-2020).
syc.27.8abd	EVHOE-WIBTS-Q4
syc.27.8c9a	Spanish surveys in the South (Gulf of Cadiz) SpGFS-GC-WIBTS-Q1-Q4 (ARSA) and in the North of Spain (SpNGFS-WIBTS-Q4) and Portuguese survey (PtGFS-WIBTS-Q4)
syt.27.67	UK (E&W)-BTS-Q3 and CGFS-Q4 (included since 2021)
sho.27.67	Spanish Porcupine Bank survey SP-PORC-WIBTS-Q3
sho.27.89a	EVHOE-WIBTS-Q4 survey in Subarea 8, Spanish IBTS-CG-Q1-Q4 (ARSA) and the Portuguese Crustacean Surveys/*Nephrops* TV Surveys (PT-CTS UWTV (FU 28-29)).

For syc.27.3a47d, previous assessments of the biomass trend were based on the time-series of four surveys. (IBTS-Q1 and Q3, BTS-Eng-Q3 and, CGFS-Q4). Following WKSKATE (ICES, 2021) recommendation to explore and evaluate spatial coverage, catch rates and size distribution, of category 3 stocks the Belgian Beam trawl survey in quarter 3 (BTS-BEL-Q3) was investigated.

This North Sea survey is organized yearly at the end of August and beginning of September since 1992 on-board of the *RV* Belgica and covers an important area in the south-western part of the North Sea (i.e. Greater Thames estuary and the Wash), covering a significant part of the distribution area of *S. canicula* in divisions 4.c and 4.b. Over the entire time series *S. canicula* was the most abundant elasmobranch species across the entire survey area and was captured over a wide length range (10–67 cm L_T) consistently. Catches consisted predominantly of individuals <40 cm L_T, however, in recent periods there has been an increase in larger individuals >50 cm L_T being caught.

To conclude, the BTS-BEL-Q3 met the agreed criteria of representativeness of survey stock abundance defined by WKSKATE (ICES, 2021) and is decided to be included in the syc.27.3a47d survey trend assessment. Currently only 2010–2020 BTS-BEL-Q3 survey data have been uploaded to DATRAS. Historical data (prior to 2010) are being prepared for uploading to DATRAS and data since 2004 were available to be extracted from the national database. In this context, catch rates (n. h^{-1} and n. $km^{-2)}$ for the period 2004–2020 are available for this survey, truncating the combined survey index from 1993 to 2004.

For syc.27.67a-ce-j, earlier analyses of the Scottish surveys in Division 6.a suggested increasing catch rates (see ICES, 2010), but updated analyses are required. Despite survey catch trends in the UK-Q1SWBeam (Q1SWECOS) in 7.e not being used for assessment, *S. canicula* is the most frequently caught elasmobranch across the survey area, over a wide length range (8–75 cm L_T). This species is most abundant in the outer parts of Lyme Bay, Eddystone grounds and parts of the Normano-Breton Gulf and at the southern entrance to St George's Channel (Silva *et al.*, 2020 WD; Silva and Ellis, 2021 WD). Updated biomass index from Spanish Porcupine survey (SpPGFS–WIBTS–Q4) is presented in 2022 WD06 (Fernández-Zapico *et al.*, 2022).

Previously, the Basque ITSASTEKA survey reported two demersal sharks, *G. melastomus* and *S. canicula*, the latter was the second most abundant species in the survey and often encountered

in all trawl stations except areas of shallower waters where they were less abundant (depths <250 m) (ICES, 2014). This survey ceased in 2014 and is therefore no longer used for assessment (for further information, see ICES, 2014).

For syt.27.67, it is noteworthy that *S. stellaris* has a more restricted distribution than *S. canicula*, preferring rocky and inshore habitats. Hence, most surveys do not sample their main habitats effectively, resulting in low catch rates, especially the smallest size groups. The catchability of larger individuals may also be low in some survey trawls. The UK (E&W)-BTS-Q3 is one of the few surveys to encounter this species regularly, especially around Anglesey and Lleyn Peninsula and in Cardigan Bay. The FR-CGFS survey in Division 7.d also catch significant number of *S. stellaris* and is used for biomass indicator of the stock since 2021.

For syc.27.8c9a, three surveys provide reliable time series of abundance or biomass index which are used in the assessment of this stock. These are the Spanish bottom trawl survey carried out in the north of Spain waters (Galician and Cantabrian Sea shelf) (Fernández-Zapico *et al*., 2021b WD04; Blanco et al., 2022 WD07)) and in the south of Spain (Gulf of Cádiz) which is carried out in two seasons in Spring (Q1) and Autumn (Q4). The surveys in Gulf of Cadiz were not conducted in 2021 due to a vessel breakdown. The Portuguese survey (PtGFS-WIBTS-Q4) also included covers all the central area of Division 9.a.

In 2021, the biomass of *S. canicula* in Division 9.a decreased compared to 2020 and the sharp increase of 2019. In Division 8.c this species also decreased in 2021 after three years remaining among the highest values in the historical series. Nevertheless, the mean biomass of the last two years was slightly higher to the previous five years in 9.a and slightly lower in 8.c.

In 2019, both PtGFS-WIBTS-Q4 and PT-CTS UWTV (FU 28–29) were not conducted due to legal issues. In 2020, the PT-CTS UWTV (FU 28–29) was still not conducted, due to the same issues and the PtGFS-WIBTS-Q4 survey was only partly (6% of hauls) carried out because of the combination legal/logistic constraints and the COVID-19 pandemic. The effect of the Portuguese surveys in the stock indicators for lesser-spotted dogfish and black-mouthed dogfish was evaluated and discussed during the WGEF (WD05 - Moura *et al*., 2021). The lack of data in 2019 and 2020 for these surveys appeared to have only minor effect on the stock size indicators.

Other surveys: Whilst *S. stellaris* is caught only occasionally in the North Sea ecoregion, it is captured regularly in the eastern Channel (Division 7.d). It is taken in small numbers during the UK (E&W)-BTS-Q3 in 7.d and the French CGFS-Q4. Whilst data for the former are too limited to inform on trends in relative abundance, this species is observed in most years (Ellis, 2015 WD).

The Spanish SpN-GFS-WIBTS-Q4 survey catches *G. melastomus.* However, data are only shown as general trends and not used for assessment since most of the biomass (nearly the 75%) is caught in the additional deeper hauls (depths over 500 m) that are not standardized (Fernández-Zapico *et al*., 2021b WD04; Blanco *et al*., 2022). In 2021, the biomass of *G. melastomus* in standard hauls, for the areas 8.c and 9.a combined remained higher than in the previous five years. However, the species decreased slightly in Division 8.c, reaching the second highest value after the highest value of biomass in the historical series in the previous year but maintaining the highest in Division 9.a (Figure 25.11a). In additional deeper hauls, biomass of *G. melastomus* increased in Division 9.a compared to the previous year but decreased slightly in Division 8.c (Blanco *et al.*, 2022 WD 07). There seems to be no clear pattern to their geographical distribution. The length-distribution of *G. melastomus* ranges from 14–71 cm over standard stratification (70–500 m) (Ruiz-Pico *et al*., 2017 WD). In 2021, the length distribution of *G. melastomus* showed more abundance of specimens between 15 and 50 cm than in previous years in Division 8.c. In additional deeper hauls, most of the specimens were adults, from 36 to 74 cm in 9.a, with a mode around 47 cm, and from 24 to 77 cm in 8.c, with a mode around 44 cm (Blanco *et al*., 2022)

Catsharks occur out of the range of assessment stock units. *S. stellaris* is a coastal species that is caught only occasionally in surveys in the Biscay and Iberian ecoregions. *G. melastomus* is caught in the northern North Sea (Division 4.a) and Norwegian Deep, but most IBTS-Q1 and Q3 survey stations are <200 m deep, and so catch rates may not be informative of stock size.

25.7 Life-history information

There is no recent information available for life-history parameters in the study area. However some new studies have been published regarding social behaviour, sexual dimorphism or population genomics (Barragán-Méndez, *et al.*, 2020; Manuzzi *et al.*, 2019). Summaries of knowledge on life history of the various species are provided in the corresponding stock annexes.

Catsharks can have protracted spawning periods, with *S. canicula* bearing egg cases observed for much of the year. This protracted egg-laying season may result in no apparent cohorts in length distributions. Age and growth parameters are uncertain for all the species considered here.

The reproductive biology of *S. canicula* has been studied in different regions by different authors. 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). The egg-laying season lasts at least ten months with a peak in June and July, and fecundity increases with fish length. Egg cases are often laid on erect, sessile invertebrates (e.g. bryozoans, poriferans and hydroids). Although, data for *S. stellaris* in the Atlantic may be lacking, studies in the Mediterranean suggested that for both sexes length-at-maturity ranges from 76–79 cm (Capapé, 1977).

The reproductive biology of *G. melastomus* was studied from specimens collected off the Portuguese southern slope by Costa *et al.* (2005). Sex ratio from specimens caught by commercial crustacean trawlers was 1:1. This species is sexually dimorphic with males approaching maturity at smaller sizes than females ($L_{50\%}$ males = 49.4 cm; $L_{50\%}$ females = 69.7 cm). Mating and egg deposition were found to take place all year round, with peaks of reproductive activity in winter and in summer.

A large nursery ground for *G. melatomus* was found in an Irish offshore Special Area of Conservation in 2018 (Marine Institute, 2019).

25.8 Exploratory assessment models

ICES (2014) report GAM analyses of survey trends for *S. canicula* in the CGFS-Q4, UK (E&W)-BTS-Q3 in 7d, IBTS-Q1 and IBTS-Q3 surveys.

Biomass indices of *S. canicula* for Portuguese waters (Division 9.a) were standardized using the catch rates by haul from the Portuguese groundfish survey PtGFS-WIBTS-Q4. In the standardization process of CPUE, a generalized linear mixed model (GLMM) with Tweedie distributed errors was applied. CPUE index time-series was estimated based on the relationship between CPUE and available predictive factor variables, selected depending on their significance after model adjustment. In the tested models, the logarithm of catch rate of the species in each haul (kg h^{-1}) was the response variable used. Apart from factor year, the final model included the variables depth stratum (intervals of 100 meters) and fishing sector, the latter as the random variable. More details on the methodology used are presented in Figueiredo and Serra-Pereira (2012 WD) and Moura *et al.* (2015b WD).

Biomass indices of *G. melastomus* for Portuguese waters (Division 9.a) were standardized using catch rates by haul during the Portuguese Crustacean Surveys/*Nephrops* TV Surveys (PT-CTS (UWTV (FU 28–29))). Data were restricted to depths >500 m. In the standardization process of CPUE, a generalized linear model (GLM) was applied. In the tested models, the logarithm of

catch rate of the species in each haul (kg h^{-1}) was the response variable. The final model included the variables year and fishing sector, and followed a Gaussian distribution (Moura *et al.*, 2015a WD).

25.9 Stock assessment

25.9.1 Approach

Scyliorhinidae stocks were assessed in 2021 using survey trends. Indices of the total biomass were used for all stocks except greater-spotted dogfish in subareas 6 and 7 where exploited biomass indices were used. These stocks are ICES category 3 using the ratio of the (possibly combined) survey index in the two last years to the previous five years. Survey data used are described above (see Section 25.6).

25.9.2 Lesser-spotted dogfish (*S. canicula*) in Subarea 4, and divisions 3.a and 7.d (North Sea, Skagerrak and Kattegat, Eastern English Channel)

Survey indices in 2021 have been updated following WKSKATE methodology with these based on DATRAS exchange data (ICES, 2021). For further details please refer to Section 15 (North Sea Demersal skates and rays) of this report. Survey indices show diverging trends. The combined index from the two NS-IBTS surveys (Q1 and Q3) showed a 14% decrease. The index of the BTS-Eng-Q3 shows a lesser decrease of 5%, while the CGFS-Q4 index gives a contrasting signal with a 32% increase. Note that for this later survey, the 2020 sampling was restricted to French waters (i.e. ICES rectangles 29F1 and 30E9 were not sampled) and therefore the value derived for 2020 was deemed not representative. Following the ICES missing data approach, the 2020 CGFS-Q4 data were excluded from the derivation of the index ratio. The newly included BTS-BE-Q3 survey index shows a minor decrease (-1%). The combined index (Figure 25.5a) showed that catch rates for 2019–2020 were stable (+0.4%) compared to the five preceding years (2014–2018). In addition, the precautionary buffer was not applied (last applied in 2019).

25.9.3 Lesser-spotted dogfish (*S. canicula*) in Subarea 6 and divisions 7.a–c and 7.e–j (Celtic Seas and West of Scotland)

The results of 2021 analyses indicated an overall stability of the stock size indicator (Figure 25.6a). This is based on the combination of standardised survey indices from four surveys IGFS-WIBTS-Q4, Spanish Porcupine Bank survey SP-PORC-WIBTS-Q3, UK-(E&W)-BTS-Q3, EVHOE-WIBTS-Q4. Surveys IGFS-WIBTS-Q4, SP-PORC-WIBTS-Q3 and UK(E&W)-BTS-Q3 showed around 20% decrease in its index (Figure 25.6a). The index based on the EVHOE-WIBTS-Q4 survey shows the higher rate of change, with an increase of 16% (Figure 25.6a). Therefore, the combined index (Figure 25.6a) showed an overall stability, with catch rates for 2019–2020 being 2% higher than the five preceding years (2014–2018). It should be noted that the combined index did not include UK(E&W)-BTS-Q3 data from 2020, results are considered to be misleading since these data only relate to the fished area in 7.f, with remaining survey area (7.a.g) missed due to COVID-19 pandemic (Silva and Ellis, 2021 WD10).

25.9.4 Lesser-spotted dogfish (*S. canicula*) in divisions 8.a–b and 8.d (Bay of Biscay)

The results of 2021 analyses indicated that survey indices in the EVHOE-WIBTS-Q4 survey (Figure 25.7) for the last two years (2019–2020) were 14.6% higher than the five preceding years (2014–2018, no data was available for year 2017). After a decrease in 2018, the survey index has increased reaching almost the highest values of the time series (2009–2011).

25.9.5 Lesser-spotted dogfish (*S. canicula*) in divisions 8.c and 9.a (Atlantic Iberian waters)

The results of 2021 analyses indicated that there was an overall sustained increase in the biomass indices (Figure 25.8a). The combined index is based on standardised survey indices from four surveys; Sp-GC-WIBTS-Q1 and Q4 (average of spring and summer Spanish surveys in the Gulf of Cádiz), Portuguese survey (PtGFS-WIBTS-Q4, no data in 2019–2020) and Sp-N-WIBTS-Q4 (North Spanish Shelf bottom survey). The combined survey index (Figure 25.8b) showed that catch rates for 2019–2020 were 12% higher than the five preceding years (2014–2018). ICES has not been requested to provide advice on this stock.

25.9.6 Greater-spotted dogfish (*S. stellaris*) in subareas 6 and 7 (Celtic Seas and West of Scotland)

The results of 2021 analyses are that the biomass index in 2019 was 2% higher than the average index during the five preceding years (2014–2018, Figure 25.9). The index calculation was changed, following methods from WKSKATE (ICES, 2021) two indices of exploitable biomass (individuals ≥50 cm TL) were used instead of one single index of total abundance (number/hour). The standardized survey index was calculated from the UK(E&W)–BTS–Q3 index in $kg.h^{-1}$ and the CGFS-Q4 index in $kg.km^{-2}$. The latter have been used for the first time whilst previous assessments were based on UK(E&W)–BTS–Q3 only. The standardized index is the average of the two indices standardized to their long-term mean for years 1997–2019.

The small increase of the index cannot be considered as a significant short-term (between the 2 last and the previous 5 years) increase, however the index suggests a longer-term increase over the entire time-series (Figure 25.9). Reported landings are increasing but this is mainly explained by the labelling improvement for *Scyliorhinus stellaris* in auctions. Therefore, landings data were not used in the assessment.

Data from 2020 were not included because UK(E&W)-BTS-Q3 covered only Division 7.f, so that the main part of the stock area, Cardigan Bay and Anglesey in 7.a, was not sampled due to COVID-19 (Silva and Ellis, 2021 WD10) and CGFS Q4 only covered the French part of 7.d. As a consequence, the assessment is based on the comparison of the combined index in 2019 to the average of the index in 2014–2018.

25.9.7 Black-mouth dogfish (*Galeus melastomus*) in subareas 6 and 7 (Celtic Sea and West of Scotland)

The stock size indicator in $kg.hr^{-1}$ for 2019–2020 was 34% lower than the five preceding years (2014–2018) (Table 25.3 and Figure 25.10a). The biomass index was calculated only from SP-PORC-WIBTS-Q3 survey. Uncertainty on data did not allow to use landings.

25.9.8 Black-mouth dogfish (*Galeus melastomus*) in Subarea 8 and Division 9.a (Bay of Biscay and Atlantic Iberian waters)

The combined survey index is based on survey indices of total biomass in kg.km^{-2} from Sp-GC-WIBTS-Q1 and Q4 (average of spring and Autumn Spanish surveys in the Gulf of Cádiz), PT-CTS UWTV (FU 28–29) (not data in 2019–2020) and EVHOE-IBTS-Q4 standardized to the mean of each series then averaged per year (Figure 25.11b). Results from the analyses showed that catch rates for 2019–2020 were 125% higher than the five preceding years (2014–2018). This is related to the strong increases observed in EVHOE-IBTS-Q4 since 2018 and the lack of data on this last survey in 2017. The value reported for PT-CTS UWTV (FU 28–29) in 2018 is consistent with this increase (highest estimate of the time series in the latest years) but the survey was not conducted in 2019 and 2020. The ARSA survey showed no major trends in the abundance of *G. melastomus* in the Gulf of Cadiz, with peaks in 2006 and 2013.

25.10 Quality of the assessments

Although the trawl surveys used in this report were not designed to sample catsharks, *S. canicula* and *G. melastomus* are sampled in large numbers in various surveys. Survey indices are considered to properly track stock abundance trends for these species.

In relation to *G. melastomus*, fisheries-independent data in the Portuguese surveys suggest that this species may have been historically aggregated with *G. atlanticus*, and there may be some problems with misidentification of these two species, especially historically (Moura *et al.*, 2015a WD; Moura *et al.*, 2017b WD). Data from the Portuguese crustacean surveys/*Nephrops* TV Surveys (PT-CTS (UWTV (FU 28–29))) conducted in 2014 showed that *G. melastomus* is more abundant and distributed mainly >500 m deep, and so data from depths ≥500 m were considered for assessment purposes.

Survey effort on rocky, inshore grounds is limited, and so catch rates for the larger-bodied *S. stellaris* are low in some surveys, as this species favours rocky, inshore habitats.

Commercial data are more problematic due to the widespread use of generic categories (e.g. "dogfish"), especially in earlier years. Although a greater proportion of the data is reported to species or genus level, the quality of these data has not been evaluated. Other issues may constrain the use of these data, for example possible misidentification in areas such as the Celtic Seas where both *S. canicula* and *S. stellaris* occur. Furthermore, historical data may be underestimated as these species may have not been marketed for human consumption, and might therefore not have all been included in official landings, e.g. in those areas where *S. canicula* may be landed for use as bait in pot fisheries. Therefore, landings data are not considered to be accurate and should be viewed as preliminary results.

Catsharks are mainly caught as bycatch and have a moderate market value (including no human consumption market for the smaller fraction) resulting in a high level of discarding. Previous studies have shown that *S. canicula* may have a high survival rate (see Section 25.3.3), and while there are no current studies for *S. stellaris*, it can be assumed that the survival of this shallow-water species may be high. Therefore, discards of Scyliorhinidae should not be considered exclusively as dead removals. However, for *G. melastomus* anecdotal information suggests survival will be lower. Further studies should be considered if more accurate information on the level of discarding is to be inferred for the two latter species.

Portuguese surveys ((PtGFS-WIBTS-Q4 and PT-CTS UWTV (FU 28–29)) were not conducted in 2019 and in 2020 but the effect in the stock size indicators of syc.27.8c9a and sho.27.89a is thought to be minimal (see Section 25.6; WD05 – Moura *et al.*, 2021).

Although discussions during WKSKATE highlighted the importance of using DATRAS datasets instead of national databases, there are remaining discrepancies in species mapping on historical data within UK(E&W)-BTS-Q3 (in 7.afg) survey series on DATRAS (e.g. *Scyliorhinus stellaris*). Therefore, to make calculations similar across sharks and skate species (with the latter shown in Silva and Ellis, 2020 WD), survey indices presented in 2021 relate to national data (Silva and Ellis, 2021 WD10).

In 2021, EVHOE-WIBTS-Q4 survey indices were updated following WKSKATE methodology using data available on DATRAS (ICES, 2021), contrary to previous advice where calculations were based on national data.

25.11 Reference points

No reference points have been proposed for these stocks.

25.12 Conservation considerations

Both *S. canicula* and *G. melastomus* are listed as Least Concern, *S. stellaris* previous listed as near threaten is now included in the category of vulnerable (Finucci et al., 2021a) and *G. atlanticus* is listed as Near Threatened (Finucci et al., 2021b) on the IUCN Red List (IUCN, 2021) and in the Red List of European marine fish (Nieto *et al.*, 2015).

S. canicula, *S. stellaris* and *G. melastomus* are listed as Least Concern on the Irish Red List of Cartilagenous Fish (Clarke *et al.*, 2016).

25.13 Management considerations

Catsharks are generally viewed as relatively productive in comparison to other elasmobranchs (e.g. McCully Phillips *et al.*, 2015). Given this, and that they are a low value, bycatch species, catsharks are typically of lower management interest in comparison to other elasmobranchs.

Landings data are highly uncertain, and further efforts are required to construct a meaningful time-series. Discarding is known to occur for most of these Scyliorhinidae species and is known to be very high and variable between fleets. Therefore, further efforts are needed to best estimate discard rates.

In recent years, catch rates of *S. canicula* have been increasing in almost all surveys. As one of the more productive demersal elasmobranchs that is often discarded (with a high discard survival) and is known to scavenge on discards, it is unclear as to whether or not the increasing catch rates observed are a sign of a healthy ecosystem.

Discard survival of *Scyliorhinus* spp. is considered to be high, but estimates for discard survival for *Galeus* spp. are currently unavailable.

25.14 References

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Table 25.1a. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Preliminary estimates of landings (t) of lesser-spotted dogfish *Scyliorhinus canicula* in Subarea 4 and divisions 3.a and 7.d (North Sea, Skagerrak and Kattegat, Eastern English Channel). Values prior to 2017 are based on WGEF revised landings. NOTE: These data should be viewed with caution as some countries may have aggregated both *S. canicula* and *S. stellaris* as Scyliorhinidae and the proportion of species-specific may be unknown as both species occur in this area.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Belgium	238	267	264	337	309	290	311	249	231	325	416	343	338	305	328	256	270
France	2265	1857	1843	1822	1758	2055	2150	2061	2021	2189	2090	2173	1641	1580	1640	1613	1425
UK	92	121	104	94	118	146	185	181	184	146	185	330	287	275	302	293	270
Netherlands	56	48	32	29	37	37	47	35	36	45	85	122	141	180	218	186	168
Total	2652	2293	2243	2282	2222	2528	2693	2526	2472	2705	2776	2968	2406	2340	2488	2448	2133

Table 25.1b. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Preliminary estimates of landings (t) of lesser-spotted dogfish *Scyliorhinus canicula* in the subareas 6 and 7 (Celtic Seas). Values prior to 2017 are based on WGEF revised landings. NOTE: These data should be viewed with caution as some countries may have aggregated both *S. canicula* and *S. stellaris* as Scyliorhinidae and the proportion of species-specific may be unknown as both species occur in this area.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Belgium	240	225	199	165	168	165	227	236	216	141	252	194	209	181	194	176	172
Spain	34	33	37	12	17	28	48	109	26	18	20	9	12	25	7	6	3
France	2936	2873	3101	2728	2479	2368	2359	2060	2284	2292	2024	1919	1677	1518	1479	1277	1305
UK	123	22	115	191	226	111	111	241	380	389	1282	1333	1067	1628	1510	1364	1250
Ireland	92	42	128	248	190	232	317	221	310	336	367	425	524	411	235	224	222
Netherlands		0			0	6	1	1	4	0	3	1	0		4	2	1
Total	3426	3195	3579	3344	3080	2909	3064	2868	3219	3176	3948	3881	3489	3763	3429	3048	2953

Table 25.1c. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Preliminary ICES estimates of landings (t) of lesser-spotted dogfish *Scyliorhinus canicula* in divisions 8.a–b and 8.d (Bay of Biscay).

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Belgium	10	13	13	18	24	28	28	32	23	26	27	32	26	25	24	20	8
Spain	355	338	327	460	445	302	303	472	54	92	130	239	495	370	332	223	275
France	1229	1247	1352	1382	1117	1085	1000	912	883	720	735	731	731	698	600	459	498
UK	3						0	2									
Ireland				2													
Total	1597	1598	1691	1863	1586	1415	1330	1418	960	838	892	1002	1193	1093	957	702	781

Table 25.1d. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Preliminary estimates of landings (t) of lesser-spotted dogfish *Scyliorhinus canicula* in divisions 8.c and 9.a (Atlantic Iberian waters).

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
France	1	1	1	1	0		0	0	0	0	0	0	0	0	0	0	0
Spain	297	333	327	272	229	336	364	555	577	464	417	398	448	484	449	853	1001
Portugal	568	591	595	546	535	522	551	544	520	521	554	589	619	530	588	555	493
Total	866	925	923	819	765	858	915	1099	1097	985	971	987	1067	1014	1037	1408	1495

Table 25.1e. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Preliminary estimates of landings (t) black-mouth dogfish *Galeus melastomus* in subareas 6 and 7 (Celtic Seas). Data 2005–2016 revised at WGEF 2017.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
France	.	.	.				0.1	0	0.4	0.05	0.02	0		0.26	0.13	0.1	0.0	0.2	0.0	0.2
Spain	9	1	.	0.1	2.9	0.4							0					0.0		
Total	9	1	0	0.1	2.9	0.4	0.1	0	0.4	0.05	0.02	0	0	0.26	0.13	0.1	0.0	0.2	0.0	0.2

Table 25.1f. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Preliminary estimates of landings (t) of black-mouth dogfish *Galeus melastomus* in Subarea 8 and Division 9.a (Bay of Biscay and Atlantic Iberian waters). Data for the period 2005–2016 were revised at WGEF 2017. Data for 2018 were revised in 2021.

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Subarea 8	France										1	1	2	2
	UK													
	Spain							4	3	6	36	46	67	74
	Spain (Basque Country)	4	3	6	2	3	1	1	1	1	*	*	*	*
	Total	4	3	6	2	3	1	5	4	7	37	47	69	76
Division 9.a	Portugal	17	17	16	20	37	29	35	29	57	37	28	24	12
	Spain										17	22	37	29
	Total	17	17	16	20	37	29	35	29	57	53	50	61	41
Subarea 8 and Division 9.a combined	Portugal	17	17	16	20	37	29	35	29	57	37	28	24	12
	Spain	0	0	0	0	0	0	4	3	6	53	68	103	103
	Spain (Basque Country)	4	3	6	2	3	1	1	1	1	*	*	*	*
	France										1	1	2	2
	UK													
	Total	21	20	22	22	40	30	40	33	64	91	97	130	116

*** Included in Spanish landings.**

Table 25.1f (continued). Catsharks (Scyliorhinidae) in the Northeast Atlantic. Preliminary estimates of landings (t) of black-mouth dogfish *Galeus melastomus* in Subarea 8 and Division 9.a (Bay of Biscay and Atlantic Iberian waters). Data for the period 2005–2016 were revised at WGEF 2017. Data for 2018 were revised in 2021.

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Subarea 8	France	3	0	0	1	0	1			0	0	0		
	UK			1										
	Spain	53	21		8	13	49	47	37	34	36	15	49	22
	Spain (Basque Country)	*	*	*	*	*	*	*	*	*		*	*	*
	Total	56	22	1	9	13	50	47	37	34	34	15	49	22
Division 9.a	Portugal	16	7	2	2	1	21	25	26	34	31	35	42	40
	Spain	22	3		0	2	5	76	104	90	84	50	91	9
	Total	38	10	2	2	3	25	101	130	124	115	84	133	49
Subarea 8 and Division 9.a combined	Portugal	16	7	2	2	1	21	25	26	34	31	35	42	40
	Spain	75	24		8	15	54	123	141	124	119	65	140	31
	Spain (Basque Country)	*	*	*	*	*	*	*	*	*		*	*	*
	France	3	0	0	1	0	1			0	0	0		
	UK			1										
	Total	93	32	3	11	16	75	148	167	158	151	100	183	71

*** Included in Spanish landings.**

Table 25.2a. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Discard estimates (t) of *S. canicula* by country in Subarea 8 and Division 9.a

	S. canicula					
	Spain (9.a, 8.b–c)	Spain (Basque country) (8.a–b, 8.d)	Portugal (9.a)	France (8.a–b, 8.d)	Belgium (8.a–b, 8.d)	TOTAL
2003	1933	348				2281
2004	799	654				1453
2005	397	275				672
2006	1723	173				1896
2007	954	417				1371
2008	300	641				941
2009	954	1092				2046
2010	635	688	30*			1353
2011	721	1054	164*	3342		5281
2012	753	905	N.A.	4835	34	6527
2013	1137	64	N.A.	2497	22	3720
2014	2081	499	140*	4432	192	7204
2015	1864	534	N.A.	8616		11014
2016	1072	389	59*	8821		10341
2017	699		N.A.	6102		6812
2018	686	744	N.A.	5574	52	7056
2019	562	1048	67*	4024	71	5772
2020	109	1197	72*	2450	71	3899
2021	654	851		1328	0	2833

*** denotes estimates from the trawl fleet OTB_CRU only**

Table 25.2b. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Discard estimates (t) of *G. melastomus* by country in Subarea 8 and Division 9.a.

	G. melastomus				
	Spain (9.a, 8.b–c)	Spain (Basque country) (8.a–b, 8.d)	Portugal (9.a)	France (8.a–b, 8.d)	TOTAL
2003	589	0			589
2004	244	227			470
2005	527	5			533
2006	553	1			554
2007	1063	N.A.			1063
2008	226	23			249
2009	904	0			904
2010	1272	34			1306
2011	731	7			737
2012	1433	0	36*		1469

	G. melastomus				
	Spain (9.a, 8.b–c)	**Spain (Basque country) (8.a–b, 8.d)**	**Portugal (9.a)**	**France (8.a–b, 8.d)**	**TOTAL**
2013	749	3	17*		769
2014	1123	9	N.A.		1131
2015		13	35*		48
2016		2	167*		169
2017	251		40*		291
2018	242	0	31*	5	278
2019	465	+	91*		557
2020	128	35	54		217
2021	166	29	289	5	489

*** denotes estimates from the trawl fleet OTB_CRU only**

Table 25.3 Black-mouthed dogfish in subareas 6 and 7. Assessment summary, biomass index from the Spanish Porcupine (SP-PORC-WIBTS-Q3) trawl survey (in kg tow^{-1}).

Year	kg tow^{-1}
2001	5.40
2002	7.16
2003	11.33
2004	18.52
2005	22.74
2006	14.59
2007	17.91
2008	19.46
2009	24.31
2010	29.91
2011	26.04
2012	59.03
2013	43.76
2014	51.09
2015	62.88
2016	54.14
2017	38.49
2018	61.35
2019	50.83
2020	30.90
2021	64.17

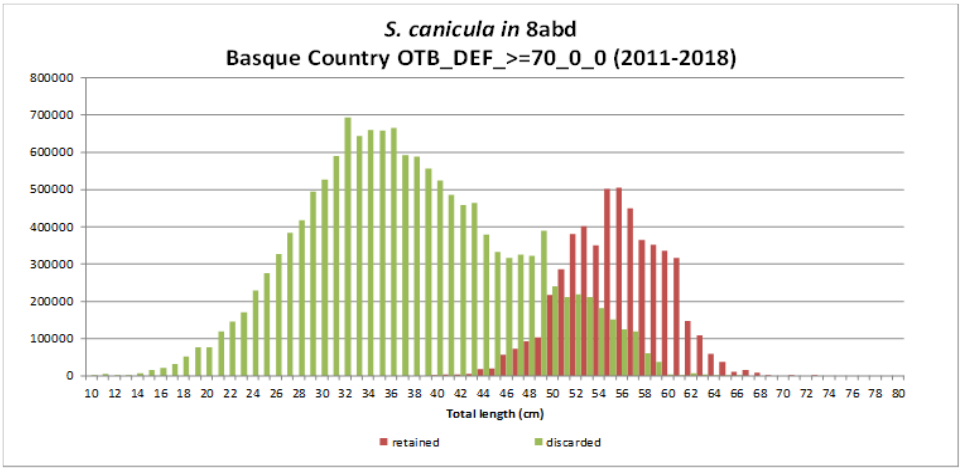

Figure 25.1a. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Length frequencies of *S. canicula* retained (in red) and discarded (green) recorded from the trawl fleet of the Basque country from 2011 to 2018 in ICES divisions 8.a-b, d.

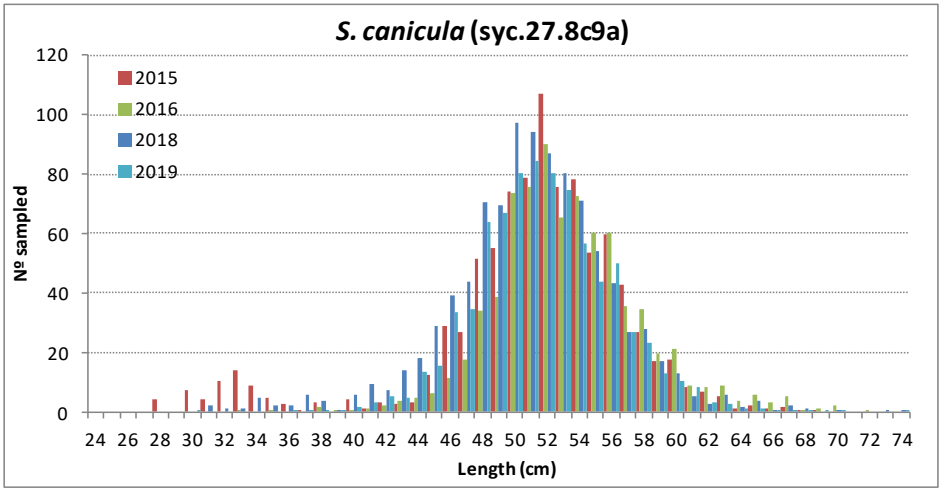

Figure 25.1b. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Length frequency distribution of *S. canicula* recorded from the Spanish trawl fleet in ICES areas 8.c and 9.a landed from 2015 to 2019.

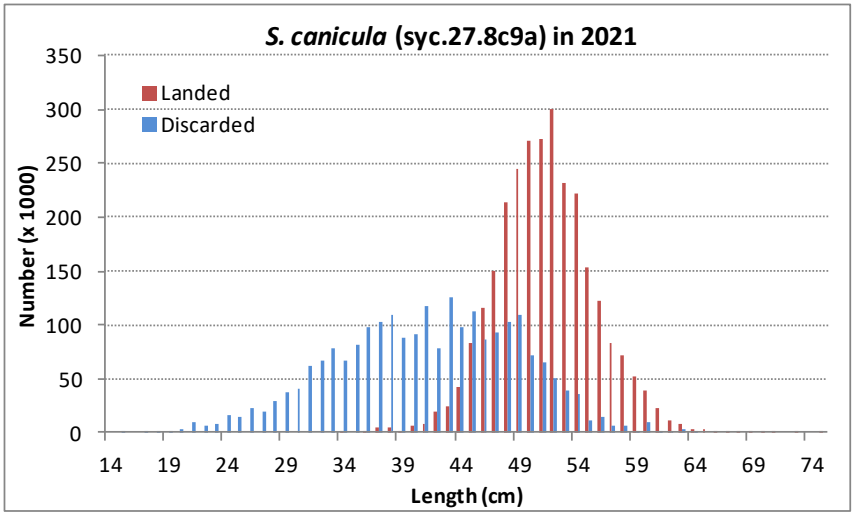

Figure 25.1c. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Length frequency distribution of *S. canicula* landed and discarded by the Spanish trawl fleet in 2021 in ICES areas 8.c and 9.a.

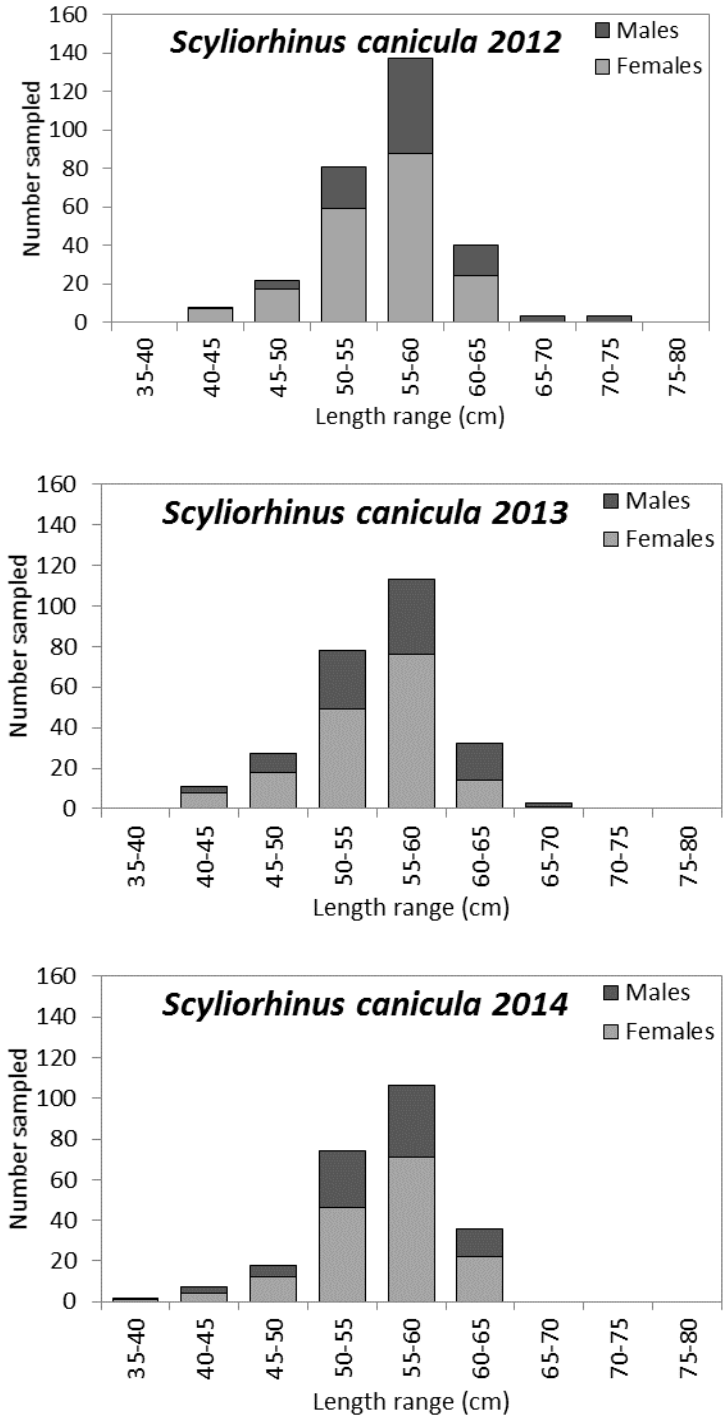

Figure 25.2. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Length–frequency distribution of *S. canicula* measured during a pilot market sampling programme of the Dutch beam trawl fleet (2012–2014).

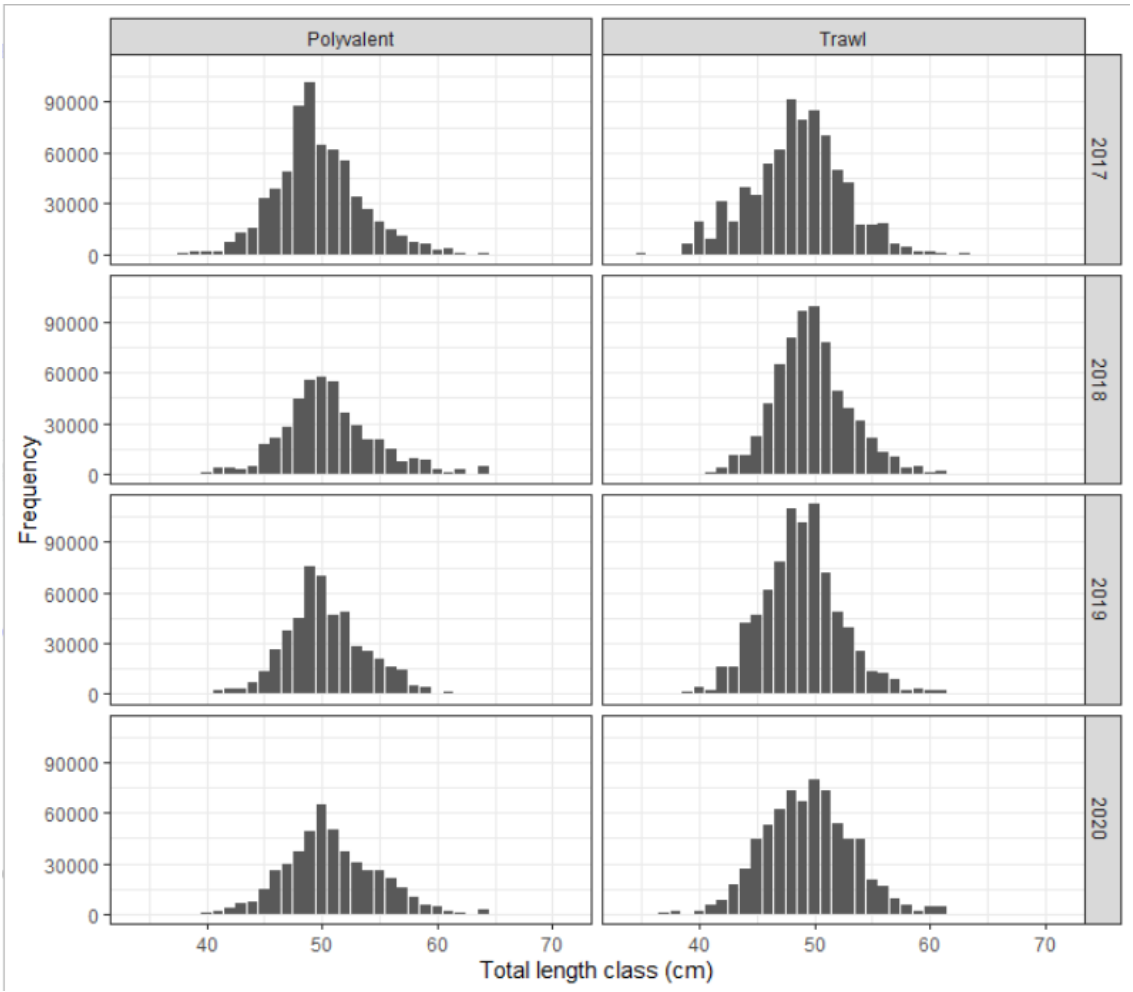

Figure 25.3a. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Length–frequency distribution of *S. canicula* from specimens sampled at Portuguese landing ports from polyvalent and trawl fleets raised to total landings (2017–2021).

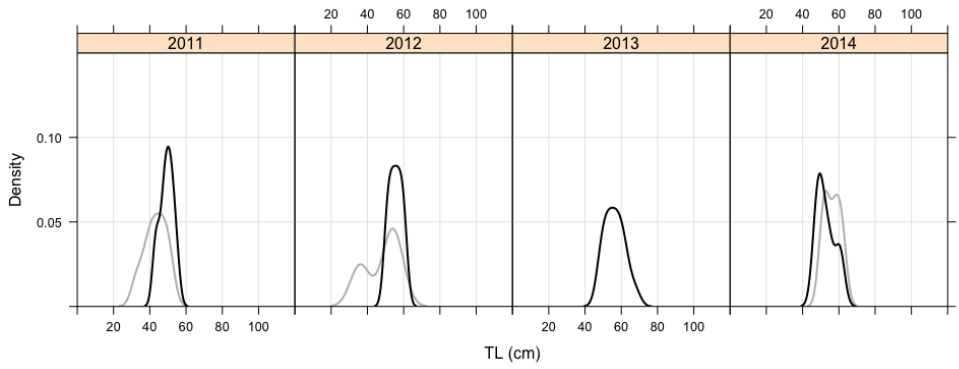

Figure 25.3b. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Length frequency distribution of *S. canicula* retained (black) and discarded (grey) fractions observed onboard vessels using set nets, between 2011 and 2014. The length frequencies were not raised to the total landings. n = 227 sampled individuals.

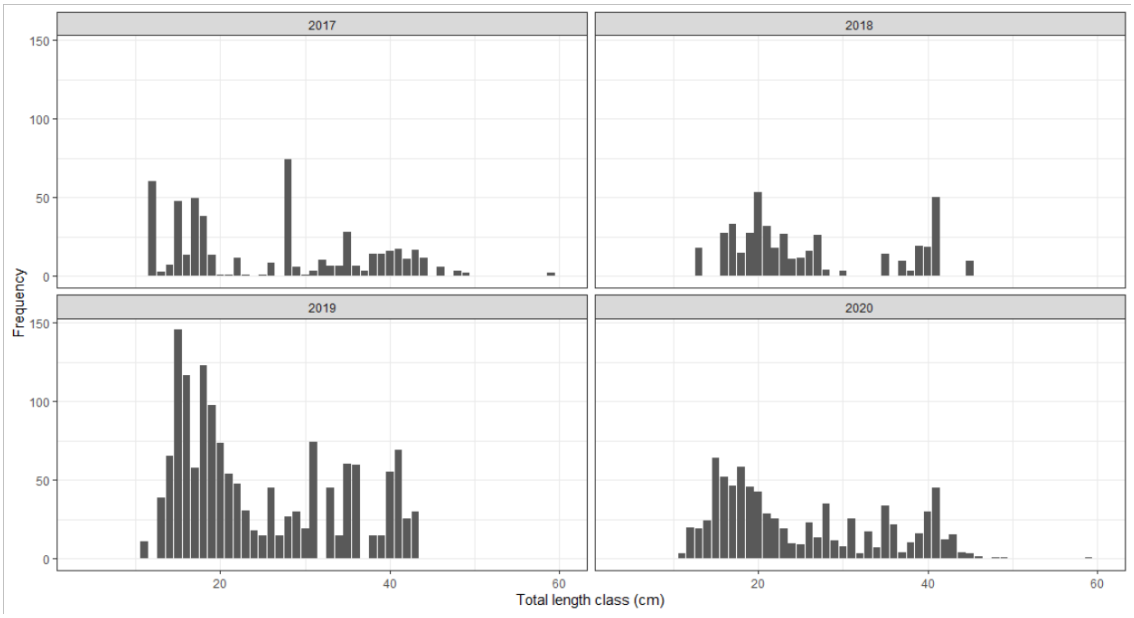

Figure 25.3c. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Length frequency distribution of *G. melastomus* of discards in the Portuguese trawl fleet (OTB_CRU_55; 2017–2020).

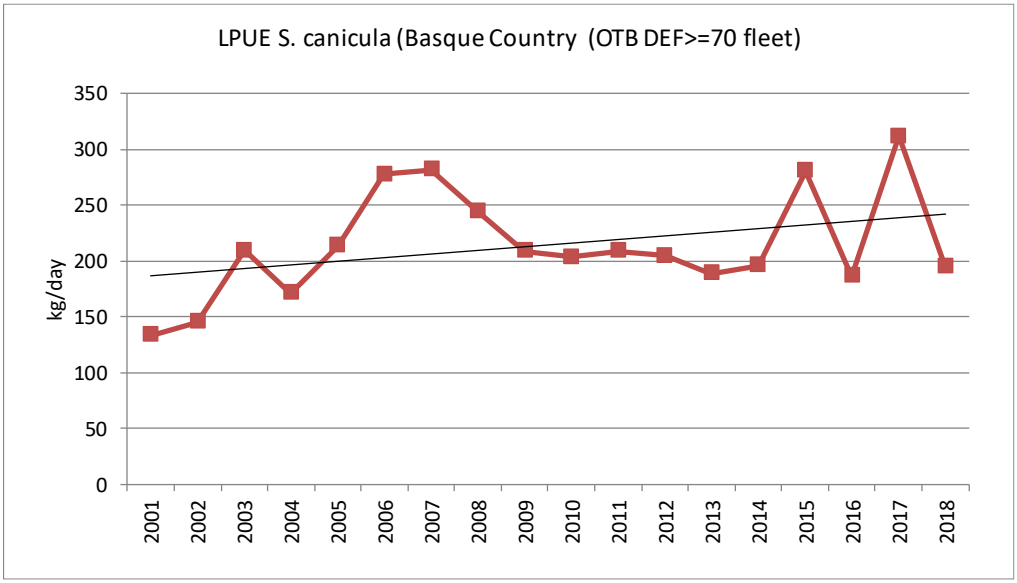

Figure 25.4. Landings per unit of effort data (LPUE) from the Basque Country trawl fleet (OTB_DEF_70) in ICES divisions 8.a-b, d) for *S. canicula*.

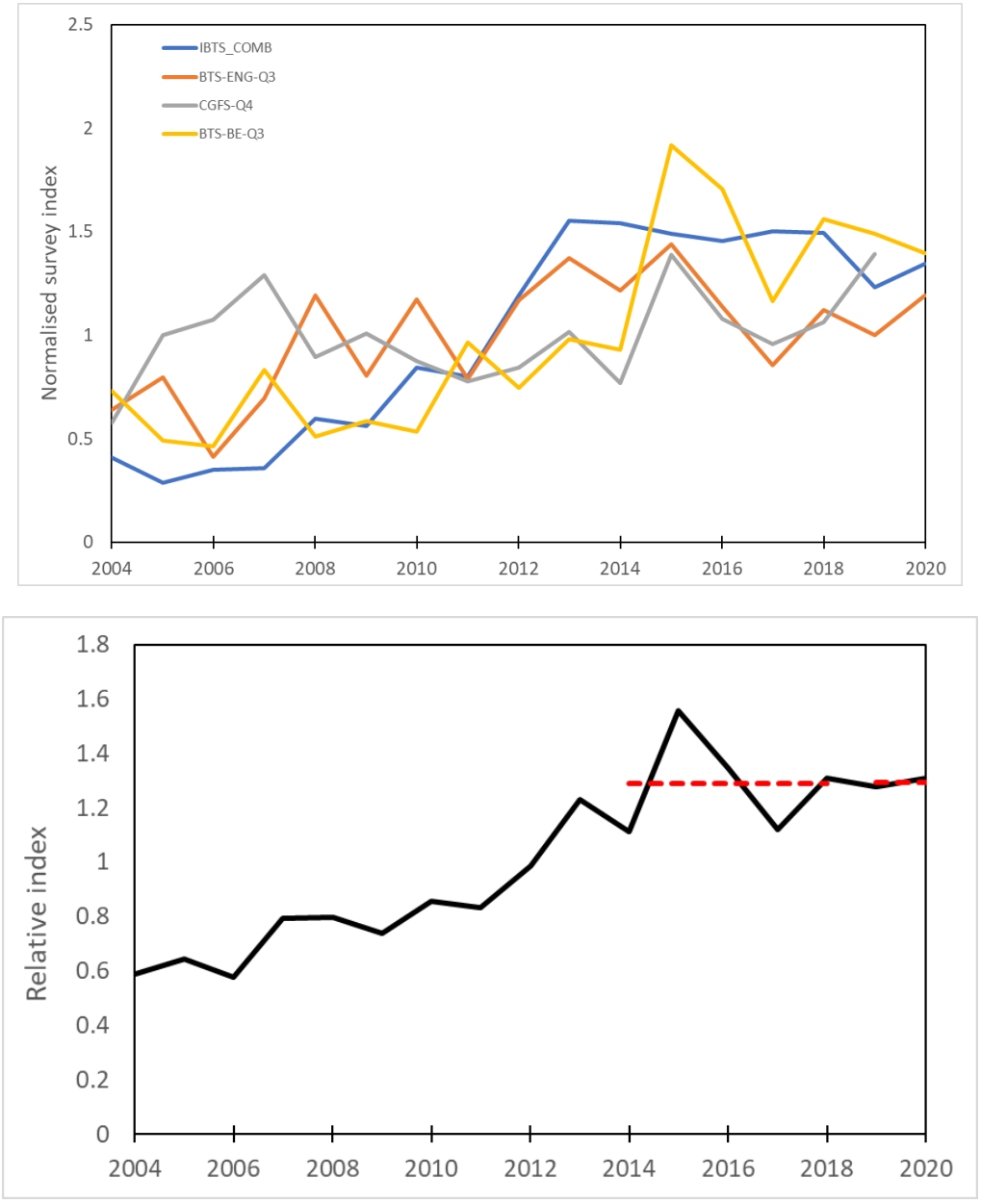

Figure 25.5a. Catsharks (Scyliorhinidae) in the Northeast Atlantic. *Scyliorhinus canicula* in the North Sea, Skagerrak, Kattegat and eastern Channel. Standardised survey indices from five surveys the combined IBTS-Q1 and Q3, CGFS-Q4, BTS-Eng-Q3, and BTS-BEL-Q3 (top) and overall stock size indicator (bottom) for the time period 2004–2020. Dotted lines indicate the average of the last two years and the average catch for the preceding five years.

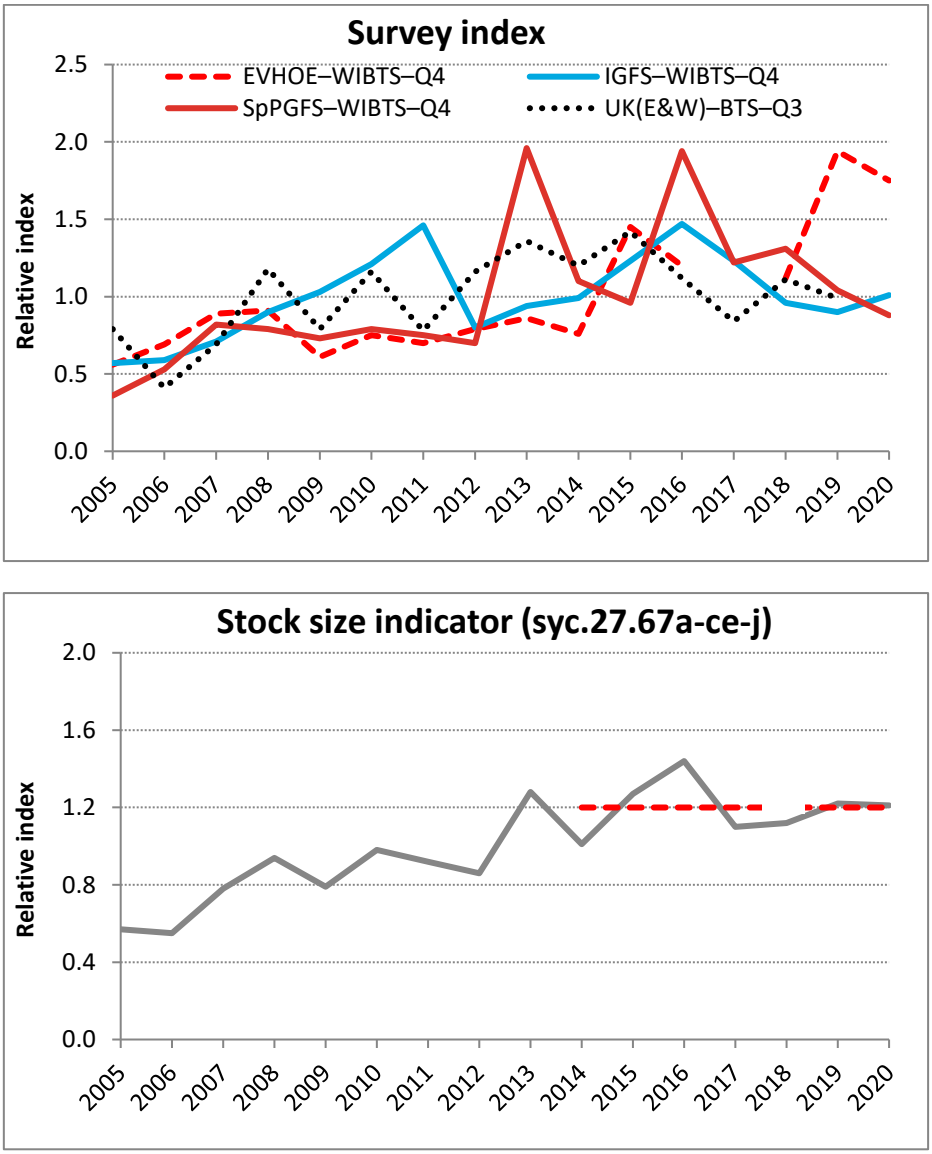

Figure 25.6a. Catsharks (Scyliorhinidae) in the Northeast Atlantic. *Scyliorhinus canicula* in the Celtic Seas Ecoregion. Standardised survey indices from four surveys IGFS-WIBTS-Q4, Spanish Porcupine Bank survey SP-PORC-WIBTS-Q3, UK-(E&W)-BTS-Q3, EVHOE-WIBTS-Q4 (top) and overall stock size indicator (bottom) for the time period 2005–2020. Dotted lines indicate the average of the last two years and the average catch for the preceding five years.

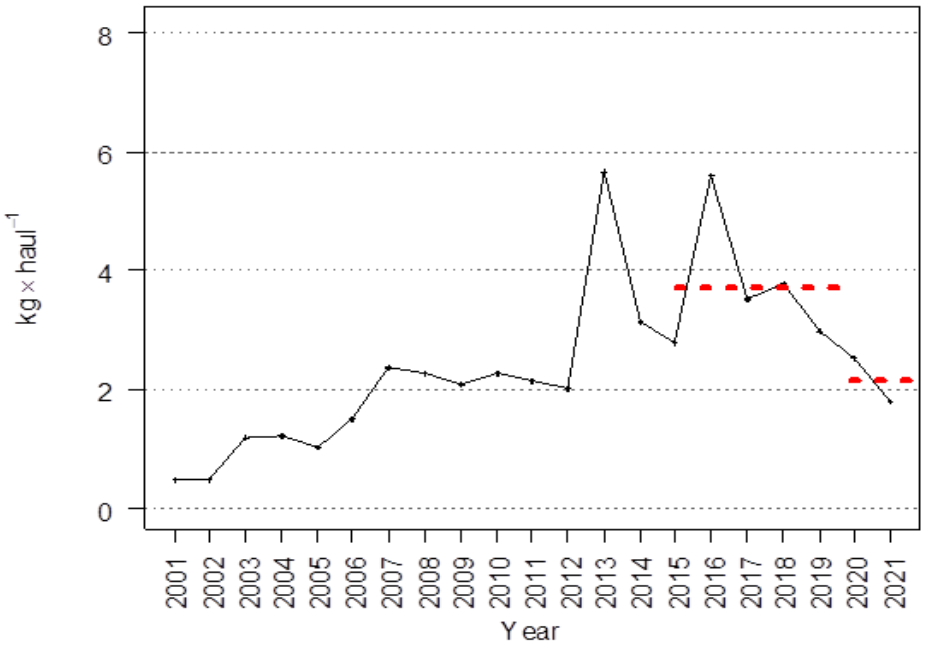

Figure 25.6b. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Changes in the *S. canicula* biomass index during the Porcupine Bank survey (2001–2021). Dotted lines compare mean stratified biomass in the last two years compared to the preceding five years.

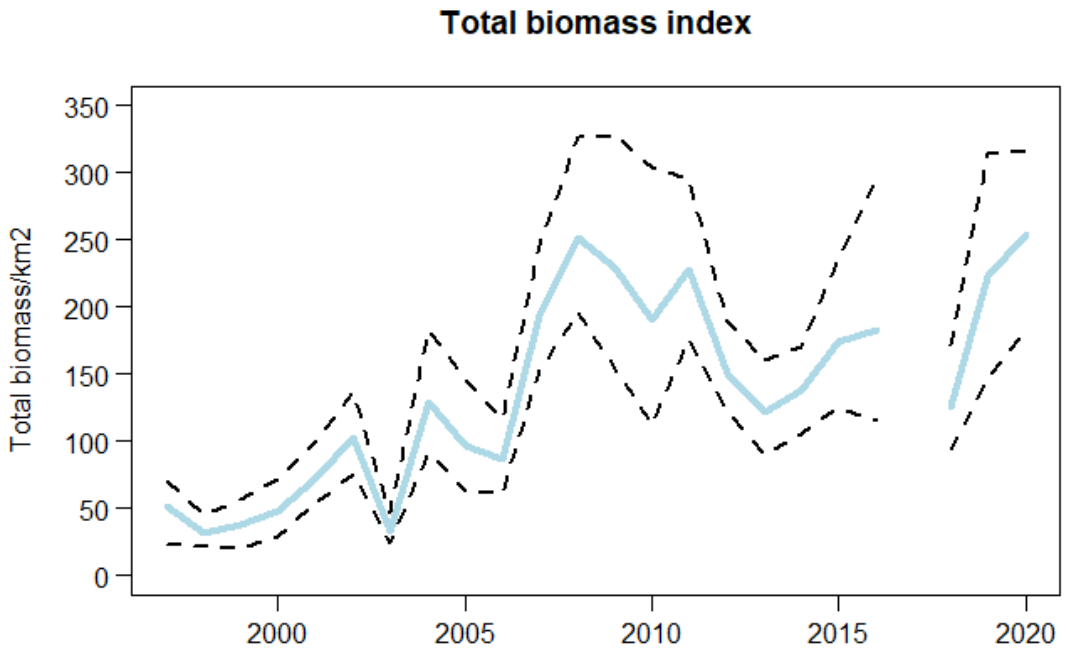

Figure 25.7. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Trends in the stock size of *Scyliorhinus canicula* in the Bay of Biscay (ICES divisions 8.a-b, d), as estimated from the EVHOE survey. Solid line survey index (total biomass.km^{-2}) and dashed line 95% bootstrapped confidence intervals.

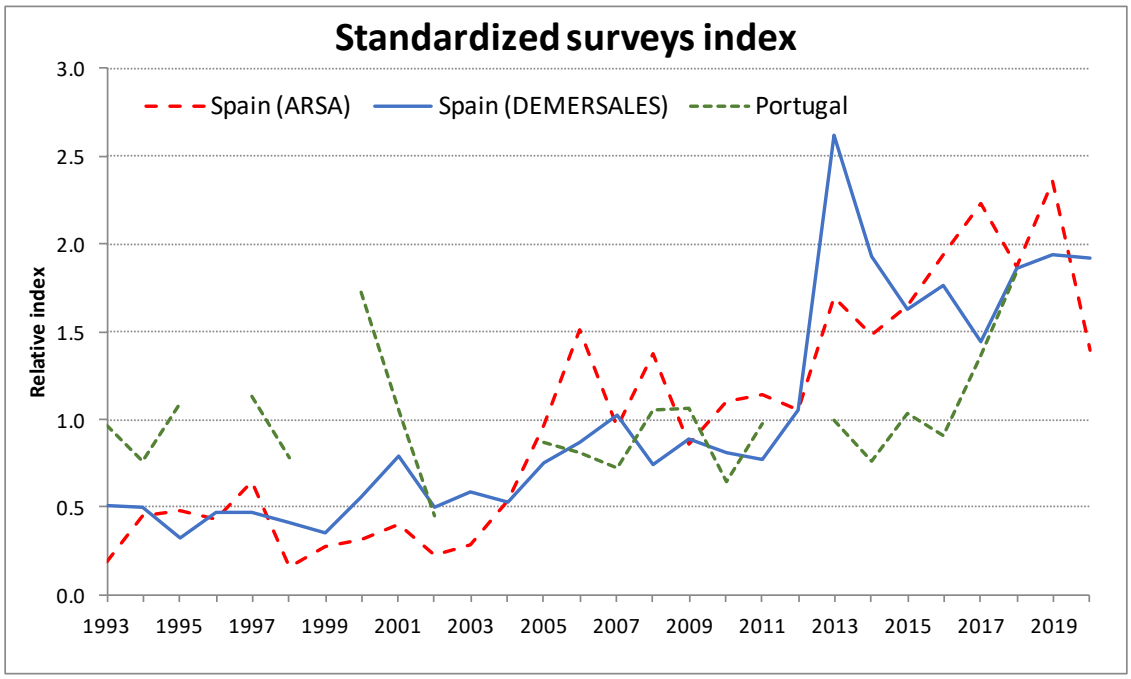

Figure 25.8a. Catsharks (Scyliorhinidae) in the Northeast Atlantic. *Scyliorhinus canicula* in the Atlantic Iberian waters (divisions 8.c and 9.a). Standardised survey indices from three surveys; Spain (ARSA) (average of spring and summer surveys in Gulf of Cádiz), Portuguese PT-GFS and North Spanish Shelf bottom survey (DEMERSALES).

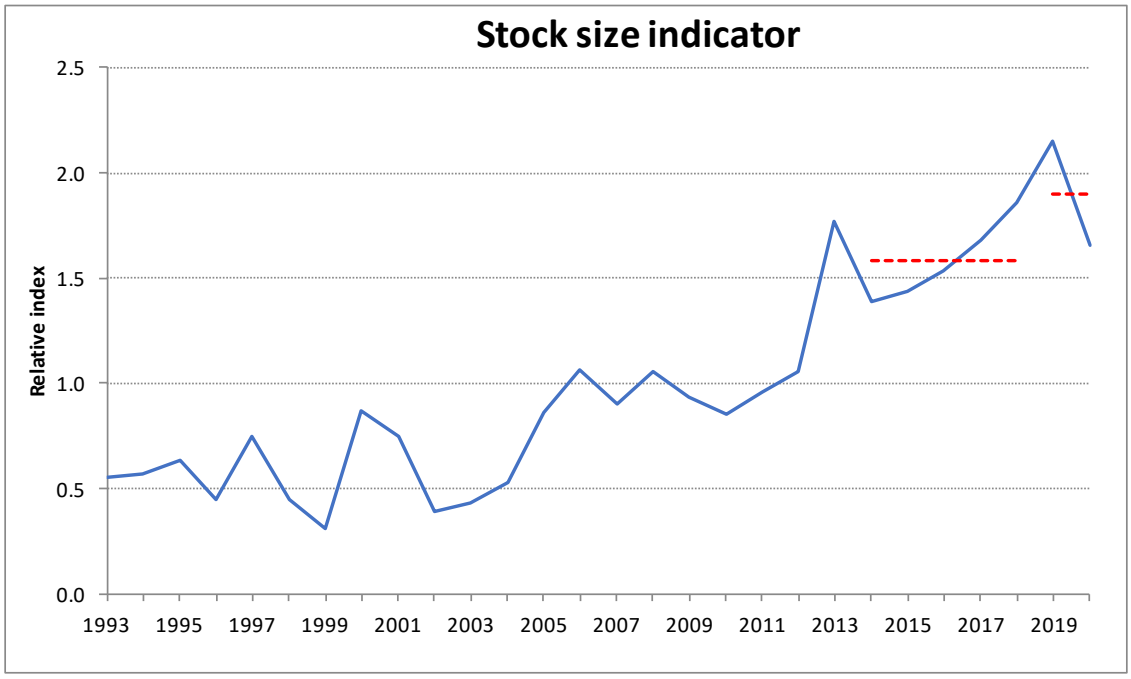

Figure 25.8b. Catsharks (Scyliorhinidae) in the Northeast Atlantic. *Scyliorhinus canicula* in the Atlantic Iberian waters (divisions 8.c and 9.a). Overall stock size indicator combined for these surveys (bottom). Dotted lines indicate the average of the last two years and the average catch for the preceding five years.

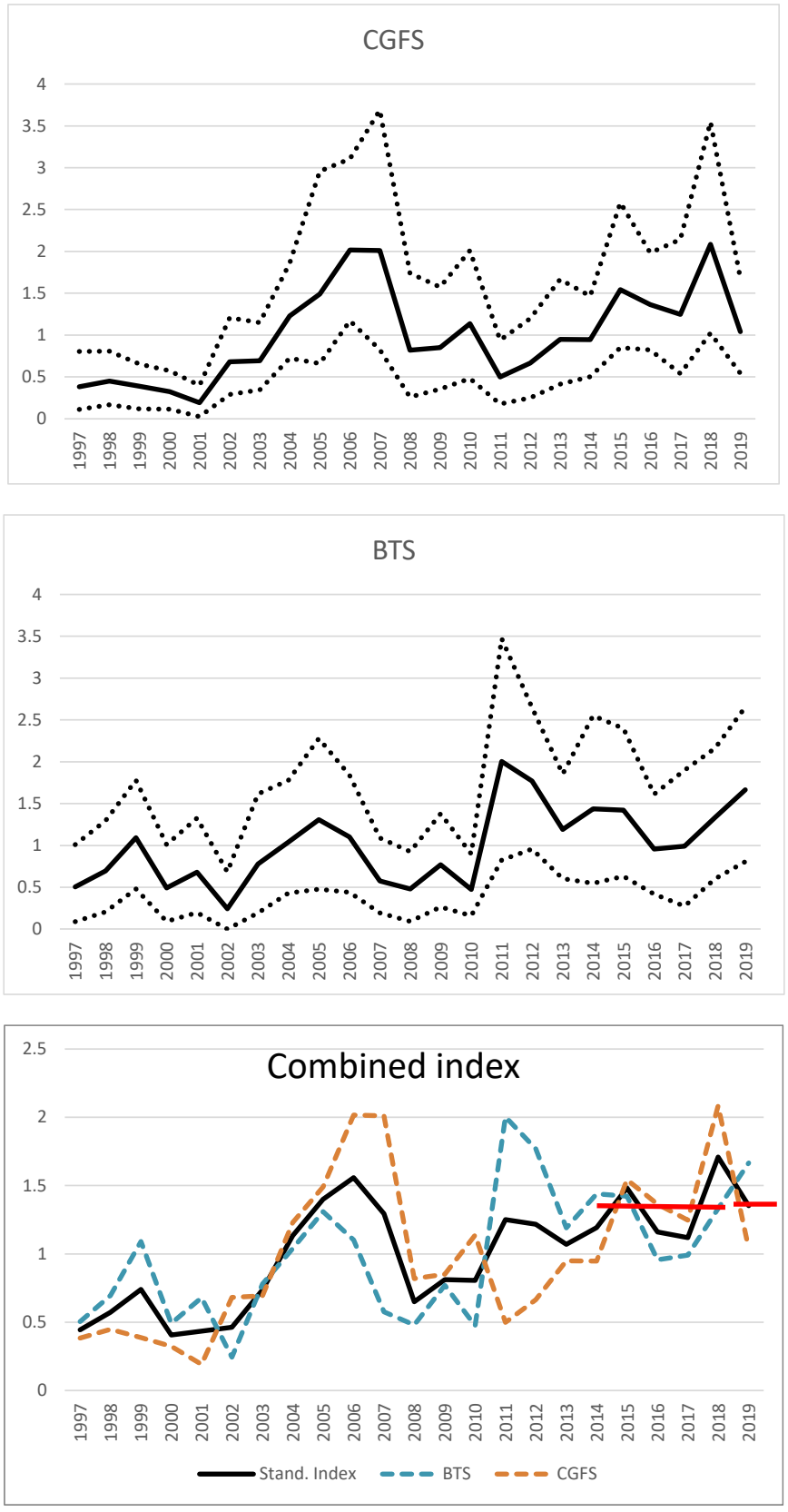

Figure 25.9. Catsharks (Scyliorhinidae) in the Northeast Atlantic. *Scyliorhinus stellaris* in subareas 6 and 7 (Celtic Seas and West of Scotland). Standardized indices of exploited biomass (individuals >50 cm TL) from CGFS-Q3, BTS and combined standardized index red lines represent values for 2019 and 2014–2018 average.

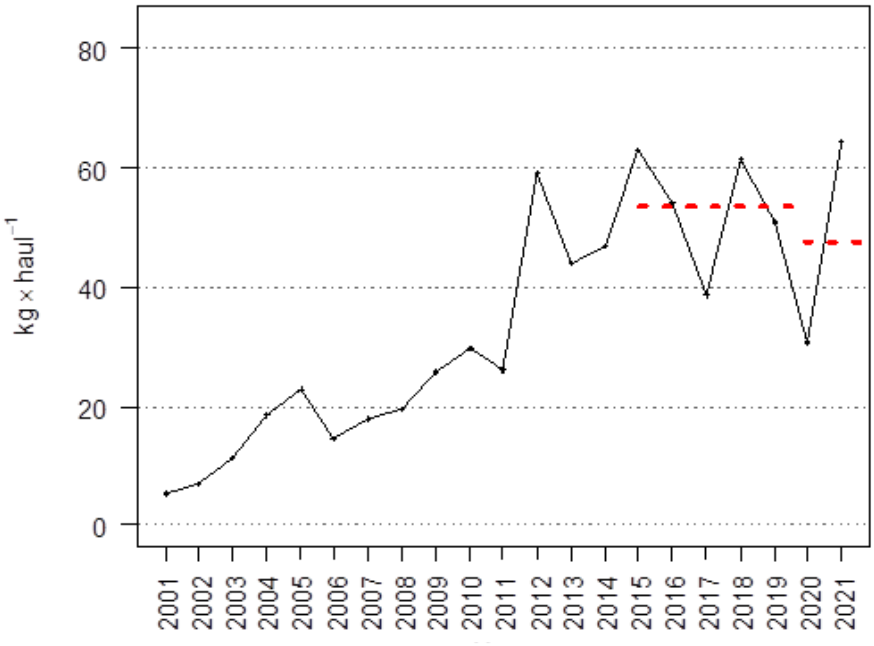

Figure 25.10. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Changes in the biomass index in kg per haul of *Galeus melastomus* during the Porcupine Bank survey SP-PORC-WIBTS-Q3 (2001–2021). Dotted lines compare mean stratified biomass in the last two years and in the preceding five years.

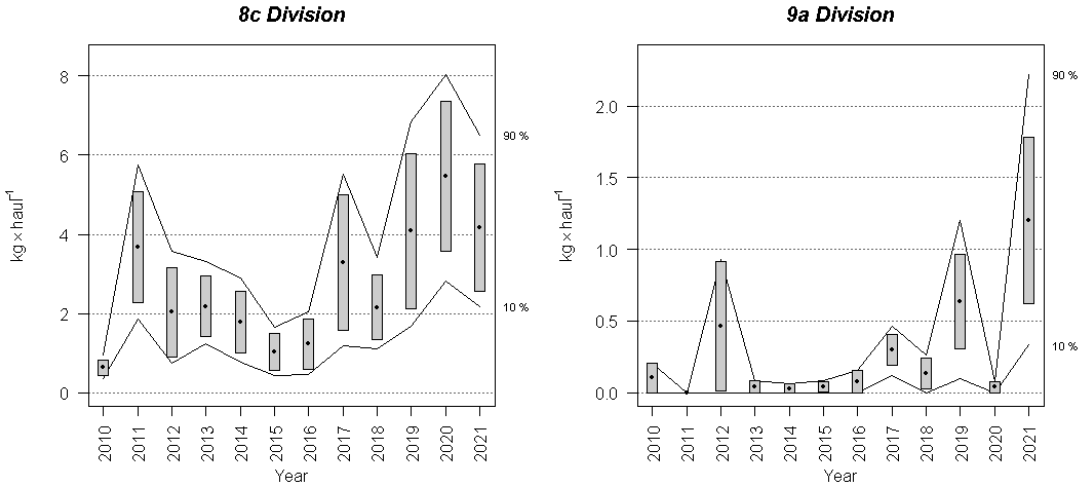

Figure 25.11a. Catsharks (Scyliorhinidae) in the Northeast Atlantic. Changes in *Galeus melastomus* stratified biomass index (only with standard hauls between 70 and 500 m) during the North Spanish shelf bottom trawl survey (SpGFS-WIBTS-Q4) between 2010 and 2021 in the two ICES divisions. Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (P = 0.80 bootstrap iterations = 1000).

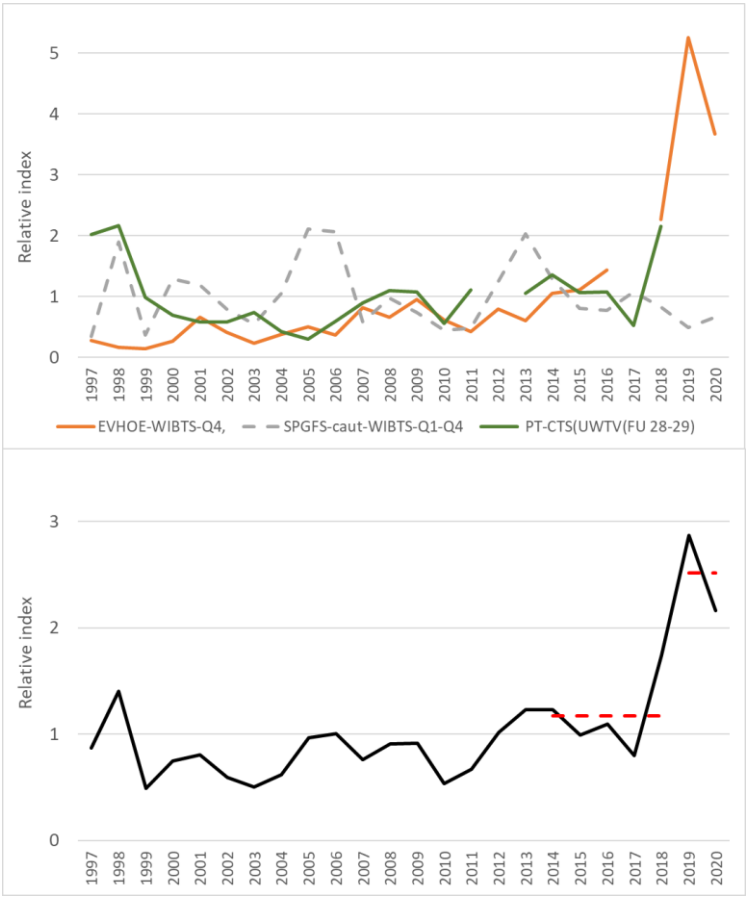

Figure 25.11b. Catsharks (Scyliorhinidae) in the Northeast Atlantic. *Galeus melastomus* in Subarea 8 and Division 9.a (Bay of Biscay and Atlantic Iberian Waters). Standardised survey indices from ARSA (SpGFS-GC-WIBTS-Q1-Q4), Portuguese 9.a (PT-CTS UWTV (FU 28-29)), and EVHOE-WIBTS-Q4 (top) and overall stock size indicator (bottom) for the time period 1997–2020. PT-CTS UWTV (FU 28-29)) was not conducted in 2019 and 2020. Dotted lines indicate the average of the last two years and the average catch for the preceding five years.