WORKSHOP TO REVIEW AND UPDATE OSPAR STATUS ASSESSMENTS FOR STOCKS OF LISTED SHARK, SKATES AND RAYS IN SUPPORT OF OSPAR (WKSTATUS)

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International Council for the Exploration of the Sea
Conseil International pour l’Exploration de la Mer

H.C. Andersens Boulevard 44-46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

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WORKSHOP TO REVIEW AND UPDATE OSPAR STATUS ASSESSMENTS FOR STOCKS OF LISTED SHARK, SKATES AND RAYS IN SUPPORT OF OSPAR (WKSTATUS)

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Editors

Paddy Walker

Authors

Thomas Barreau • Jurgen Batsleer • Gérard Biais • Cristina Cabello • Jim Ellis • Graham Johnston • Armelle Jung • Claudia Junge • Pascal Lorance • Inigo Martinez • Teresa Moura • Joana Silva • James Thorburn • Paddy Walker

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i Executive summary

WKSTATUS was formed to address a Special Request from OSPAR to provide the scientific knowledge basis to prepare the OSPAR Quality Status Report 2023 (QSR2023). The group met online to review and update draft assessments for angel shark (*Squatina squatina*), basking shark (*Cetorhinus maximus*), common skate complex (common blue skate (*Dipturus batis (=D. flossada)*), flapper skate (*Dipturus intermedius*)), gulper shark (*Centrophorus granulosus*), leafscale gulper shark (*Centrophorus squamosus*) porbeagle (*Lamna nasus*), Portuguese dogfish (*Centroscymnus coelolepis*), spurdog (*Squalus acanthias*), spotted ray (*Raja montagui*), thornback ray (*Raja clavata*) and white skate (*Rostroraja alba*).

The assessments had been prepared before the meeting according to the Guidance on the Development of Status Assessments for the OSPAR List of Threatened and/or Declining Species and Habitats (referred to as OSPAR List in the report) as well as the Criteria for the Identification of Species and Habitats in need of Protection and their Method of Application (the Texel-Faial Criteria). The assessments covered the period since the previous assessment, 10 or 11 years ago, depending on the species. This work has resulted in tabulations for each of the species for: 1) status assessment; 2) overview of Texel-Faial criteria; and 3) an update of priority actions and measures. Information that could not be included in these tables is given as background information / audit trail for each species in Annex 2.

In the conclusions per species, WKSTATUS has commented on whether the species continues to justify inclusion in the OSPAR List. For the white skate, the information was so limited that it was not possible to ascertain a change. Data were also limited for the deep-water species, but target fisheries have stopped and recent surveys should provide new information in the future. For both the basking shark and angel shark, there is no change. The common blue skate appears to be slowly improving, but the flapper skate may be more vulnerable to overfishing. Given the revised taxonomy, it is recommended that both species be considered separately and, if accepted, listed separately. For porbeagle and spurdog progress has been made with assessment methodologies and there appears to be small improvements in the population status, but this is as yet not fully quantified for porbeagle in the entire OSPAR area. Thornback and spotted rays have increased in abundance in the areas where they were previously considered depleted, and are considered not to continue to justify inclusion in the OSPAR List for this criterion. However, measures to address selectivity and discard survival should be further developed for these species.

The output of this workshop will feed directly into the ICES Advisory process and the advice will be of relevance for the further work of OSPAR with regard to the OSPAR Recommendations and Agreements with regard to the Threatened and/or Declining Species and Habitats listed by OSPAR.

ii Expert group information

Expert group name	Workshop to review and update OSPAR status assessments for stocks of listed shark, skates and rays in support of OSPAR (WKSTATUS)
Expert group cycle	Annual
Year cycle started	2020
Reporting year in cycle	1/1
Chair	Paddy Walker, Netherlands
Meeting venue and dates	26–30 June 2020 via Webex (14 participants)

1 Introduction

1.1 Terms of Reference

WKSTATUS - Workshop to review and update OSPAR status assessments for stocks of listed shark, skates and rays in support of OSPAR

2020/2/FRSG41 **The workshop to review and update OSPAR status assessments for stocks of listed shark, skates and rays in support of OSPAR**, chaired by Paddy Walker, The Netherlands, will meet in Horta, Azores, Portugal from 25–27 June 2020 (this was changed to meeting online from 26–30 June 2020 due to Covid-19 measures) to:

a) Review the first drafts of the OSPAR status assessments for Basking shark, Porbeagle, Spurdog, Angel shark, Common skate complex, Spotted ray, Thornback ray, White skate and, if available, the three deep sea sharks (Gulper shark, Leafscale gulper shark and Portuguese dogfish) ICES assessed at WKSHARK6

b) Update, where available, information about recent changes in species distribution, including seasonal aspects and habitats, changes in abundance or relative abundance

c) Conform, as far as possible, with the data elements and format of the OSPAR Guidance on the Development of Status Assessments for the OSPAR List of Threatened and/or Declining Species and Habitats

The Status assessments should include, where available, information on the most relevant human activities that have an effect on the status of the species, changes in human activities and pressures that are threats to the species and the current measures with regard to human activities affecting the status of the species, including fisheries.

WKSTATUS will report by 10 of July 2020 for the attention of FRSG and ACOM.

1.2 Participants

The following people attended the meeting:

Thomas Barreau	France
Jurgen Batsleer	Netherlands
Gérard Biais	France
Cristina Cabello	Spain
Jim Ellis	UK
Graham Johnston	Ireland
Armelle Jung	France
Claudia Junge	Norway
Pascal Lorance	France
Inigo Martinez	ICES Secretariat
Teresa Moura	Portugal
Joana Silva	UK
James Thorburn	UK
Paddy Walker	Netherlands

See also Annex 1

1.3 Background

This work has been carried out following a Special Request from OSPAR to provide the scientific knowledge basis to prepare the OSPAR Quality Status Report 2023 (QSR2023). The output of this workshop will feed directly into the ICES Advisory process and the advice will be of relevance for the further work of OSPAR with regard to the OSPAR Recommendations and Agreements with regard to the Threatened and/or Declining Species and Habitats listed by OSPAR, henceforth referred to as the OSPAR List. In order to address this request ICES organised a dedicated workshop of experts (*Workshop to review and update OSPAR status assessments for stocks of listed shark, skates and rays in support of OSPAR - WKSTATUS*) which met via Webex between 26–30 June, rather than meeting on Horta in the Azores as planned before the Covid-19 crisis.

Prior to the workshop the OSPAR technical guideline document **Guidance on the Development of Status Assessments for the OSPAR List of Threatened and/or Declining Species and Habitats (JAMP B3) (OSPAR Agreement 2019-05**) was used to generate draft assessments for angel shark (*Squatina squatina*), basking shark (*Cetorhinus maximus*), common skate complex (common blue skate (*Dipturus batis (=D. flossada*)), flapper skate (*Dipturus intermedius*)), gulper shark (*Centrophorus granulosus*), leafscale gulper shark (*Centrophorus squamosus*) porbeagle (*Lamna nasus*), Portuguese dogfish (*Centroscymnus coelolepis*), spurdog (*Squalus acanthias*), spotted ray (*Raja montagui*), thornback ray (*Raja clavata*) and white skate (*Rostroraja alba*). All of these species are included in the OSPAR list of Threatened and/or Declining Species and Habitats (referred to in the document as 'OSPAR List'). For each species the Background document produced by the OSPAR Commission at last assessment (in 2009 or 2010) was used as a starting point, therefore the new assessments covered an 10 or 11 period, depending on the species. These Background documents are referenced in the relevant species status assessments.

The draft assessments were discussed and updated by the WKSTATUS participants, taking into account recent changes in species distribution, including seasonal aspects and habitats, changes in abundance or relative abundance. Furhtermore, the scientific evidence was examined on the basis of the relevant Texel/Faial criteria for the identification of species in need of protection. The guideline document **Criteria for the Identification of Species and Habitats in need of Protection and their Method of Application (The Texel-Faial Criteria) (OSPAR Agreement 2019-3)** was used to comment on the last asssesment. These criteria have been assessed per species and the findings are tabulated with the previous overview from the Background documents. The tables of priority actions and measures from the respective Background Documents were also updated with the most recent information.

In all cases the best available distribution maps were used, but there may still be some inaccuracies in distribution due to updated taxonomic insights and/or species misidentification. In 2002, the ICES Study Group Elasmobranch Fishes carried out an evaluation of the quality and suitability of data for the listing of the species which are now being considered (ICES, 2002). For many species, the latest IUCN Assessment was also noted as additional information (Nieto *et al.*, 2015).

The assessments are presented per species in Chapters 2–12. Each chapter consists of: a status assessment; an overview of the Texel-Faial criteria; and an update of priority actions and measures. Information that could not be included in the status assessment format is available in Annex 2 as background information / audit trail.

1.4 OSPAR Regions and ICES Areas

For reference, the OSPAR Regions are shown in Figure 1 and the ICES subareas and divisions in Figure 2. The regions do not overlap completely and for this report, we have used the following classification:

OSPAR Regions	ICES Divisions
I : Arctic waters	1.a, 1.b, 2.a1, 2.a2, 2.b1, 2.b2, 5.a1, 5.a2, 5.b1a, 5.b1b, 5.b2, 12.a3, 12.a4, 14.a, 14.b2
II : Greater North Sea	3.a, 4.a, 4.b, 4.c, 7.d, 7.e (part)
III: Celtic Seas	6.a, 6.b2, 7.b, 7.c2, 7.e (part), 7.f, 7.g, 7.h, 7.j1, 7.j2, 7.k2
IV: Bay of Biscay and Iberian Coast	8.a, 8.b, 8.c, 8.d1, 8.d2, 9.a
V: Wider Atlantic	6.b1, 7.c1, 7.k, 8.e1, 9.b1, 9.b2, 10.a1, 10.a2, 10.b, 12.a1, 12.a3, 12.b, 12.c, 14.b1

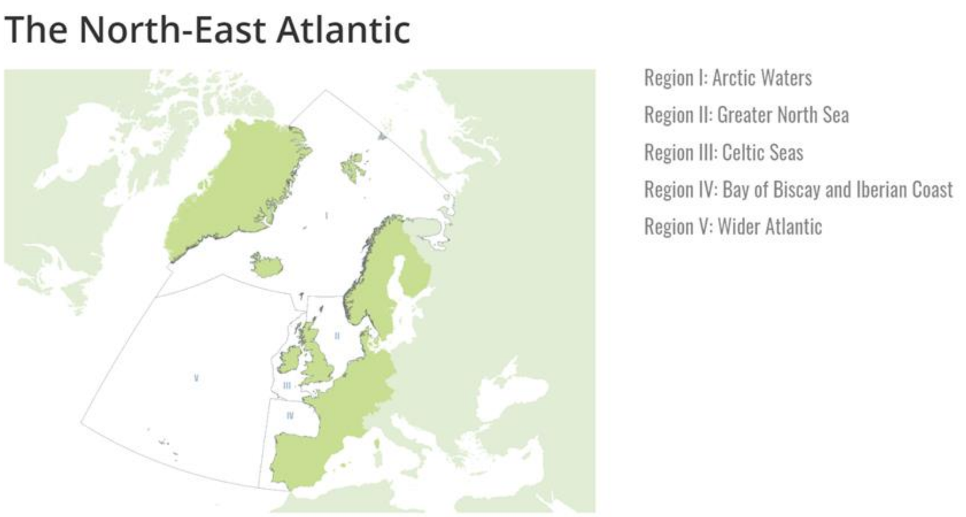

Figure 1. OSPAR Convention Area and OSPAR Regions. Source: www.ospar.org/convention/the-north-east-atlantic

Figure 2. ICES Area showing divisions and subdivisions. Source: www.ices.dk

1.5 References

ICES. 2002. Report of the Study Group Elasmobranch Fishes. ICES CM 2002/G:08 Ref. ACFM 123 pp.

Nieto, A., Ralph, G.M., Comeros-Raynal, M.T., Kemp, J., García Criado, M., Allen, D.J., Dulvy, N.K., Walls, R.H.L., Russell, B., Pollard, D., García, S., Craig, M., Collette, B.B., Pollom, R., Biscoito, M., Labbish Chao, N., Abella, A., Afonso, P., Álvarez, H., Carpenter, K.E., Clò, S., Cook, R., Costa, M.J., Delgado, J., Dureuil, M., Ellis, J.R., Farrell, E.D., Fernandes, P., Florin, A-B., Fordham, S., Fowler, S., Gil de Sola, L., Gil Herrera, J., Goodpaster, A., Harvey, M., Heessen, H., Herler, J., Jung, A., Karmovskaya, E., Keskin, C., Knudsen, S.W., Kobyliansky, S., Kovačić, M., Lawson, J.M., Lorance, P., McCully Phillips, S., Munroe, T., Nedreaas, K., Nielsen, J., Papaconstantinou, C., Polidoro, B., Pollock, C.M., Rijnsdorp, A.D., Sayer, C., Scott, J., Serena, F., Smith-Vaniz, W.F., Soldo, A., Stump, E. and Williams, J.T. 2015. European Red List of marine fishes. Luxembourg: Publications Office of the European Union, iv + 81 pp. This will be referred to as Nieto, A. *et al.* 2015. European Red List of marine fishes. Luxembourg: Publications Office of the European Union, iv + 81 pp. in the reference lists throught the document.

2 Angel shark

2.1 Species information

Angel shark (*Squatina squatina)* Linnaeus, 1758

Angel shark (*Squatina squatina)* is a large-bodied (>200 cm) demersal elasmobranch which produces few (<25) young over a biennial reproductive cycle. It favours inshore grounds, with females migrating inshore to give birth and having coastal nursery grounds. The species has often been reported from sand bank habitats and similar topographic features. Their populations are thought to have limited connectivity. This ambush predator buries into the sand for camouflage, and angel sharks are usually nocturnally active (Standora and Nelson, 1977).

Angel shark was once widespread throughout Europe's seas, but are now lost from much of their former range. In particular, the angel Shark (*Squatina squatina*) historically ranged from Scotland and southern Scandinavia down to north-western Africa and the Canary Islands, including the Mediterranean Sea. Over the past several decades, overfishing and high bycatch of this species has severely depleted and fragmented these populations, leading to this species being listed as Critically Endangered on the IUCN Red List in 2006.

Following a longer-term decline in abundance and distribution, European fisheries regulations have prohibited the retention of angel shark since 2009. Whilst there have been records from parts of the OSPAR Area in recent years, primarily Region III, the current population is still considered severely depleted and angel shark remains a threatened species.

The assessment by WKSTATUS has led to perceived changes in how the Texel-Faial criteria may be met in relation to global and regional importance, due to new information on biogeographic distribution. Whilst it is considered that the species does not qualify for the criterion global importance, populations in the OSPAR area may be considered regionally important. Furthermore, it is the only member of its Genus, Family and Order in the OSPAR area.

WKSTATUS concludes that the species continues to justify inclusion in the OSPAR List.

See Chapters 2.2 for the Status Assessment, 2.3 for the overview of the Texel-Faial criteria and 2.4 for an update of priority actions and measures for this species. Extra information is available in Annex 2.

2.1.1 References

Standora, E. A. and Nelson, D. R. 1977. A telemetric study of the behavior of free-swimming Pacific angel sharks, *Squatina californica.* Bulletin of the Southern California Academy of Sciences, 76: 193–201.

2.2 Status Assessment

	OSPAR Assessment – angel shark *Squatina squatina*
Sheet reference	BDC2020/Angel shark
Area assessed	Angel shark occurs in OSPAR Regions II, III, IV, and is listed as a threatened/declining species in OSPAR Regions II, III and IV.
Title	Angel shark. OSPAR 2020 status assessment
Key message 50 words	Following a longer-term decline in abundance and distribution, European fisheries regulations have prohibited the retention of angel shark since 2009. Whilst there have been records from parts of the OSPAR Area in recent years, primarily Region III, the current population is still considered severely depleted and angel shark remains a threatened species.

1 - direct data driven
2 – indirect data driven
3 – third party assessment close geographic match
4 – third party assessment partial geographic match
5 – expert judgement

Key message	Region				
	I	II	III	IV	V
Distribution		⟷[2]	⟷[2]	⟷[2]	
Population size		?	?	?	
Demographics, e.g. productivity		?	?	?	
Evidence and trend of status		?	⟷[2]	?	
Key pressure Excessive mortality		↓/?[2]	↓/?[2]	↓/?[2]	
Key pressure Habitat damage		⟷[2]	⟷[2]	⟷[2]	
Key pressure Prey availability		?	?	?	
Evidence of threat or impact		?	?	?	

Background information 100 words	Angel shark was first nominated in 2001, listed as a threatened/declining species from 2008, and last assessed by OSPAR in 2010. The key criteria for listing were rarity, sensitivity and decline. The identified threats were excessive mortality, habitat damage and prey availability. The decline in geographical extent of angel shark, which is very sensitive to overfishing, is particularly marked. Recent population trends are unknown, given the current rarity of the species.
Geographical range and distribution 100 words + map/infographic	The biogeographical range of angel shark extends from Scotland and southern Scandinavia to North-west Africa, Canary Islands and the Mediterranean Sea (where it may enter the Black Sea close to the Sea of Marmara). This area covers OSPAR Regions II-IV. The geographic extent of angel shark has declined, with refuge populations in Welsh waters (OSPAR Region III) and outside the OSPAR Area (Canary Islands and eastern Mediterranean). The reported decline in area of extent of the species is the main data source for gauging population status, as data on population abundance are too limited for this rare species.

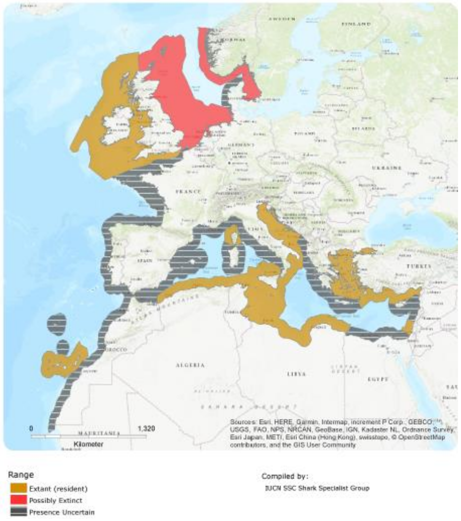

Figure 1. Distribution of angel shark showing areas where it is considered extant (a sighting since 1987), former range with no sightings (despite monitoring surveys) and areas of uncertain presence. Source: Morey *et al.* (2019)

Population / abundance
100 words + figure

Given the rarity of angel sharks, there are insufficient contemporary data to evaluate either current population size, or recent trends in relative abundance. Numerous scientific studies have evidenced the longer-term decline in angel sharks across much of their geographical range, both in and outside the OSPAR Area, with angel sharks becoming increasingly rare from the late 1960s to 1990s. Prohibitions on commercial landings (since 2010) and some national measures protecting the species will have benefitted the species, but the rarity of this species means it is not sampled effectively in current monitoring programmes.

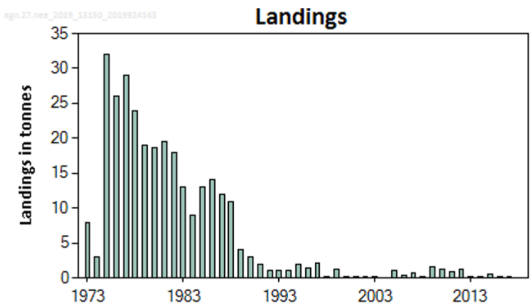

Figure 2: Reported landings (tonnes) of angel shark from ICES subareas 6 and 7 from 1973 and subarea 6, 7, and 8 from 1996. Angel shark has been on the prohibited list since 2010, with minimal bycatch landings reported since then. Source: ICES (2019a,b).

Condition
100 words + figure

Given the rarity of angel shark, there are insufficient data to examine the condition of the stock in the OSPAR Area, in terms of either the length composition or sex ratio. Recent analyses of the lengths of angler-caught ‘specimen fish’ from Irish waters showed a decline in the numbers of large angel sharks over the time-series analysed (1958-2002; Shephard *et al.*, 2019).

Figure 3: Lengths of specimen-caught *Squatina squatina* in Tralee Bay (top) and Clew Bay (bottom) in Ireland. Blue and green dashed lines are 10th and 90th percentiles of observed length, respectively, by group and the pink line (128 cm) is the published length-at-maturity of females. Source: Shephard *et al.* (2019).

Threats and impacts 100 words	Threats to angel shark identified in the 2010 OSPAR assessment were excessive mortality (with all life stages of this low productivity stock susceptible to capture in fisheries), habitat damage and prey availability. Fishing mortality (including recreational fisheries) is the main pressure. The prohibited listing should reduce mortality in commercial fisheries to a degree, depending on discard survival, which is variable. Recreational fisheries may result in additional mortality in areas where the species is not fully protected. The potential impact of habitat deterioration is undocumented, whilst prey availability is likely of limited impact, given that it may predate on a wide range of demersal fish.
Measure that address key pressures 100 words	In 2008, ICES advised that angel shark should receive the highest protection possible, it has since been listed as a prohibited species on EU fishery regulations, thus minimising mortality from commercial fisheries. EU Regulation 2015/812 requires all angel shark discards to be recorded. Some nations (e.g. UK) have protected angel shark under national legislation, thus affording protection from other activities (e.g. recreational fishing). Angel shark may have received indirect protection through the designation of MPAs in parts of their coastal range, although this has not been evaluated. Whilst protective measures are in place, the low productivity and high site fidelity of angel shark means that population recovery and recolonization of former habitat would only be expected to occur over a decadal time-frame.
Conclusion (incl. management considerations) 250 words	Management considerations: Angel shark is a prohibited species on EU fishing regulations. This should reduce mortality in commercial fisheries, depending on spatial overlap between fisheries and angel shark populations and discard survival, but this measure has not been quantified. Full species protection (to minimise potential mortality from recreational fisheries) does not apply across its OSPAR range. Angel sharks display limited mixing and may form discrete stocks. Whilst angel shark may occur in some designated MPAs, the potential role of existing MPAs in affording protection to their populations has not been evaluated. There are ongoing efforts to better protect it in some remaining areas, including Wales (Region III) and Canary Islands (outside the OSPAR Area). Angel shark was listed on Appendices I and II of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) in 2017. Contracting parties to CMS "*shall endeavour to provide immediate protection*" for species on Appendix I. Angel shark is listed as Critically Endangered by the IUCN. Angel shark is still a rare species over its biogeographical range, including OSPAR Regions II-IV. It is a very sensitive species that has declined severely in the OSPAR Area and adjacent waters (e.g. Mediterranean Sea). This decline occurred during the 20th century, with angel shark lost from large parts of the OSPAR Area from the 1960s to the 1990s. Their low productivity and limited movements means that any perceptible improvement in status would only occur over a decadal time-frame. This is still the case in the current assessment and, whilst there is no evidence of further deterioration, there is no sign of improving status. In conclusion, the angel shark continues to justify inclusion in the OSPAR List .

Knowledge gaps 100 words	There is a lack of information on current range and the efficacy of the prohibited listing. Dedicated, non-destructive surveys of areas of former local abundance are needed to inform on current habitat and range, and to assess the possibilities of spatial management. Improved liaison and training with the fishing industry is required to ensure that any specimens captured are released alive. National at-sea observer programmes encountering this species could usefully collect information on the vitality of discarded individuals, and have increased observer coverage in areas where encounter rates are expected to be higher.
References	ICES. 2008. Demersal elasmobranchs in the Celtic Seas (ICES Areas VI, VIIa c, e k). ICES Advice 2008, Book 5, 13 pp. ICES. 2019a. Working Group on Elasmobranch Fishes (WGEF). ICES Scientific Reports. 1:25. 964 pp. http://doi.org/10.17895/ices.pub.5594 ICES. 2019b. Angel shark (*Squatina squatina*) in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters). *In* Report of the ICES Advisory Committee, 2019. ICES Advice 2019, agn.27.nea, https://doi.org/10.17895/ices.advice.4826 Morey, G., Barker, J., Hood, A., Gordon, C., Bartolí, A., Meyers, E. K. M., Ellis, J., Sharp, R., Jimenez-Alvarado, D., and Pollom, R. 2019. *Squatina squatina.* The IUCN Red List of Threatened Species 2019: e.T39332A117498371. https://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T39332A117498371.en. Downloaded on 04 May 2020. OSPAR Commission. 2010. Background document for angel shark *Squatina squatina*. 20 pp. Shephard, S., Wögerbauer, C., Green, P., Ellis, J.R., and Roche W.K. 2019. Angling records track the near extirpation of angel shark *Squatina squatina* from two Irish hotspots. *Endangered Species Research*, 38: 153–158.
Method used	The assessment is derived from a mix of OSPAR data assessment and assessments from third parties. These included ICES Expert Group reports, the IUCN account and the scientific literature. The assessment is based mainly on expert opinion with very limited data.

2.3 Overview of Texel-Faial Criteria

Overview of the assessment by WKSTATUS of the Texel-Faial Criteria for the angel shark *Squatina squatina*.

Criterion	Initial assessment of angel shark (*Squatina squatina*) against the Texel-Faial criteria. From OSPAR Commission (2010)	Assessment by WKSTATUS
1. Global importance	Possibly qualifies, increasingly likely to qualify in future *Populations of Squatina squatina occur in OSPAR Regions II, III and IV, which encompass approximately half of the historic global distribution of this species. For this reason, ICES WGEF (2007) did not consider that the OSPAR Area is of global importance to the species.* *The global historic distribution outside the OSPAR Area lies within the adjacent Atlantic off Morocco, Western Sahara and the Canary Islands, and in the Baltic, Mediterranean and Black Seas. Although information on the current distribution of S. squatina is limited, best available information indicates that the populations that historically occurred in these areas have undergone serious declines and in some cases (including the Baltic, Black Sea, northern Mediterranean and West Africa) extirpation. These declines are ongoing and are unlikely to cease or be reversed under current or foreseeable management regimes. The exception is in the Canary Islands, where it is reportedly still relatively common.* *Although populations have also been seriously depleted (and in some locations extirpated) within the OSPAR Area, the possibility cannot be excluded that the remaining stocks here may now represent 75% of the global population. There is also potential for management to improve the status of S. squatina within the OSPAR Area, increasing its global importance in future.*	Does not qualify The distribution of *S. Squatina* extends out of the OSPAR Area into the Mediterranean Sea, the coasts of North-west Africa and the Canary Islands. Additional comments on the initial assessment: There have been further studies examining the biogeographic distribution of angel shark since the earlier assessment (Morey *et al.,* 2019; Lawson *et al.,* 2020). Whilst the distributional range extends to southern Scandinavia, the Baltic Sea is no longer considered to be within the species' geographic range. Similarly, the only reliable records of angel shark from the Black Sea are from that part immediately next to the Sea of Marmara (based on recent records) and it was not more widespread (based on historic accounts).
2. Regional importance	Possibly qualifies *Since S. squatina is reported to be locally abundant, it is possible that the surviving populations within the OSPAR Area could be of regional importance. Lack of information on current distribution and abundance makes it impossible, however, to determine whether 90% of the population in the OSPAR Area is now restricted to a small number of locations, or to identify these areas.*	Qualifies Whilst data are limited, information for both *S. squatina* and other species of angel shark indicate that this group of fish may form discrete populations. The presence of discrete angel shark stocks in the OSPAR Convention area is considered to make such stocks regionally important. WKSTATUS also notes that angel shark is the only member of its genus, family and order in the OSPAR Convention Area, and so may be considered an important part of its regional biodiversity.
3. Rarity	Qualifies *This species is now only very rarely recorded within its historic distribution in the OSPAR Area and elsewhere. ICES WGEF (2007) noted that it could now be considered as rare due to its absence in research vessel surveys and extreme scarcity in commercial catches.*	Qualifies WKSTATUS notes that angel shark remains a rare species in the OSPAR area, given the very limited records from trawl survey and other monitoring programmes.
4. Sensitivity	Qualifies – very sensitive *Very sensitive biology (very low resistance and very low resilience). S. squatina reach maturity at a large size and likely several years old, give birth*	Qualifies – very sensitive As noted in the initial assessment, the low fecundity and protracted reproductive cycle are ex-

	to a relatively small number of large pups after a long gestation and have a low intrinsic rate of population increase. They are therefore very slow to recover from depletion. Their large size and morphology also make Angel sharks highly vulnerable to bycatch in trawl and net fisheries from birth.	pected to confer a low rate of population increase. The large size, and large size at birth, of this demersal fish means that it may be taken in a variety of bottom fishing gears. WKSTATUS also notes that the largely coastal distribution (including inshore parturition and nursery grounds) have potentially high spatial overlap with human activities. Furthermore, the potential for discrete stocks with limited mixing means that populations may be subject to localised depletion.
5. Keystone species	Unknown *May formerly have been sufficiently common and important a demersal predator to have had a controlling influence upon its community, but now probably ecologically extinct in the OSPAR Area.*	Does not qualify Whilst a higher trophic level (>4.0) predator, angel shark may feed on a range of demersal fish (and large crustaceans), and there is no evidence that it serves the role of a 'keystone species'.
6. Decline	Qualifies *Severely declined in all three of the OSPAR coastal regions where it occurs during the past 50–100 years and elsewhere in its global range. Now extirpated from substantial areas of its former range and extremely uncommon throughout most of the remainder of this range. The population increasingly fragmented and records are now extremely infrequent.*	Qualifies All available historical information show a longer-term decline in angel shark, with this decline documented for OSPAR Regions II-IV. This is primarily evidenced by a reduction in geographical range, with angel sharks seemingly lost from many areas of former habitat. The current rarity of the species means that the current status of the population, and recent trends in population size, are unknown.

Lawson, J. M., Gordon, C. A., Hood, A. R., Barker, J., Bartoli, A., Ellis, J. R., Fowler, S. L., Morey, G., Fordham, S., Jimenez Alvarado, D., Meyers, E. K. M., Pollom, R. A., Sharp, R., Zidowitz, H., and Dulvy, N. K. (2020). Extinction risk and conservation of Critically Endangered angel sharks in the Eastern Atlantic and Mediterranean Sea. *ICES Journal of Marine Science*, 77: 12–29.

Morey, G., Barker, J., Hood, A., Gordon, C., Bartolí, A., Meyers, E. K. M., Ellis, J., Sharp, R., Jimenez-Alvarado, D., and Pollom, R. 2019. *Squatina squatina.* The IUCN Red List of Threatened Species 2019: e.T39332A117498371. https://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T39332A117498371.en. Downloaded on 04 May 2020.

2.4 Update of priority actions and measures

Summary of key priority actions and measures which could be taken for angel shark (*Squatina squatina*) as formulated in the Background document (OSPAR 2010) and an update of information from WKSTATUS.

	From Background document (OSPAR 2010)*	WKSTATUS information update
Key threats	Fisheries mortality: - Bycatch in commercial fisheries - Target fishing (primarily sport angling and possibly obtaining specimens for aquaria)	- Angel shark has been listed as a prohibited species on annual EU fisheries regulations from 2009. - It is currently listed as a prohibited species on Regulation (EU) 2019/1241 - Regulation (EU) 2015/812 requires that all angel shark caught and discarded should be reported. - Angel shark is listed on the UK Wildlife and Countryside Act (WCA), which gives legal protection against deliberate killing, taking or injuring. This would apply to recreational fisheries etc.

	Habitat deterioration and loss of prey species (secondary threats)		- The potential impact of habitat deterioration is either undocumented, or not fully evaluated - Key habitats for angel sharks may include nursery grounds (typically in coastal areas), feeding grounds (areas that may serve as optimal 'ambush' habitats) and overwintering grounds. - As a higher-level predator in coastal waters, angel shark may biomagnify certain contaminants, although it is uncertain whether this would impact populations - Prey availability is likely of limited impact, given that angel shark may predate on a wide range of flatfish, other demersal fish, and larger crustaceans.
Other responsible authorities	- EC and Council of Fisheries Ministers (Common Fisheries Policy, TACs) - OSPAR Contracting Parties - ICES (e.g. provision of advice on trends, assessment criteria and triggers) and other RFOs - Council of Europe?		- The EU (e.g. in relation to fishing regulations) - OSPAR Contracting Parties - Parties to the Convention on Migratory Species (CMS) - Angel shark was listed on Appendices I and II of CMS in 2017. Parties to the CMS should endeavour to protect species listed on Appendix I. Additionally, it was listed on Annex I of the CMS Sharks-MoU in 2018.
Already protected? Measures adequate?	EU: Zero TAC and mandatory release (2009)	- Too recent to be able to assess impact. Must be extended into future years. Should not prohibit the participation of anglers in genuine tag and release research programmes.	- Angel shark has been listed as a prohibited species since 2009. There is no direct evidence of population recovery at the present time. There have been recent reports of angel shark, though such reporting may be due to increased interest in the species rather than increased encounter rates.
		- Impact unknown, but now superseded by the introduction of a zero TAC and mandatory release.	No change
	EC Regulation No. 1185/2003 on the removal of shark fins on board fishing vessels	- Too recent to be able to assess impact. Similar measures needed in other range States to complement the EU zero TAC. Licensing needed for angling tag and release programmes.	- Updated finning regulations now apply for EU vessels (Regulation (EU) No 605/2013) - As a coastal species, non-EU fishing vessels operating outside EU waters but elsewhere in the OSPAR area are unlikely to encounter angel sharks
	Schedule 5 WCA(1981) protection in Great Britain (2008)	- Voluntary measure that discourages killing catches. Should be extended to other countries where sport angling is popular.	Section 9 of the WCA states that "*if any person intentionally kills, injures or takes any wild animal included in Schedule 5, he shall be guilty of an offence*". Hence, it is not a 'voluntary' measure.
	Exclusion from Irish Specimen Fish List	- Communicate to the Commission the status of *S. squatina* and its need for conservation under biodiversity instruments and the Community Plan of Action for Sharks	Angel shark was removed from the list of eligible specimen fish in Ireland in 2006. New record claims can only be considered where the species is weighed, photographed and returned alive.

Recommended Actions and Measures	OSPAR Commission	- Communicate to ICES and other scientific bodies the need for research and advice on distribution and habitat requirements	Not for WKSTATUS to comment on
		- Consider how national and regional fisheries conservation and management measures, marine protected areas, and species protection legislation may be used to improve the status of *S. squatina* and take action to apply these, as appropriate	Not for WKSTATUS to comment on
	Contracting Parties	- Disseminate to commercial and sports fishers information on the threatened status of *S. squatina* and the legal and voluntary measures that protect it.	- Angel shark was listed on the UK Wildlife and Countryside Act in 2008, which confers additional protection (e.g. in relation to recreational fisheries).
	Research needs	- Life-history information	- Whilst some life-history parameters are known for angel shark (e.g. Capapé *et al.*, 1990), the lack of recent records in the OSPAR Area means than changes in the condition of the stock (e.g. length/age composition; sex ratio) cannot be evaluated. -The collection of contemporary life history information is of lower priority than non-destructive surveys of refuge populations and former habitat to better evaluate current stock status and population status (see below).
		- Location of surviving populations and critical habitats	- Many habitats and former habitats have been identified. Non-destructive surveys of current habitat could usefully be conducted to determine and monitor stock status. -Former and potential habitat could usefully be surveyed (e.g. through eDNA in the first instance) to inform on options for further monitoring. -Improved at-sea observer coverage of those fleets operating in areas with perceived greater potential of encountering angel sharks could be considered under national discard observer programmes. -Angel sharks display limited mixing and may form discrete stocks. Whilst angel shark may occur in some designated MPAs, the potential role of existing MPAs in affording protection to their populations could be evaluated. -There are ongoing efforts to better protect it in some remaining areas, including Wales (Region III) and Canary Islands (outside the OSPAR Area).

*** Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.**

References:

Capapé C., Quignard J. P., and Mellinger J. 1990. Reproduction and development of two angel sharks, *Squatina squatina* and *S. oculata* (Pisces: Squatinidae), off Tunisian coasts: semi-delayed vitellogenesis, lack of egg capsules, and lecithotrophy. Journal of Fish Biology, 37: 347–356.

3 Basking shark

3.1 Species information

Basking shark (*Cetorhinus maximus*) Gunnerus, 1765

The basking shark is the world's second largest fish and is widely distributed in coastal waters on the continental shelves of boreal and warm temperate regions in both the northern and southern hemispheres. The basking shark, a plankton-feeding pelagic shark, can reach 12 m in length and weigh up to 4 tonnes (OSPAR, 2009). Length-at-maturity for males is thought to be between 5 and 7 m, and 12 and 16 years, whereas females mature at 8–10 m and possibly 16–20 years (Compagno, 1984). Basking sharks have a strong tendency to aggregate in coastal areas of continental shelves dominated by transitional waters between stratified and mixed water columns (Sims *et al*., 2005). The basking shark feeds upon zooplankton prey by swimming with an open mouth so that a passive water flow passes across the gill-raker apparatus, but exactly how the particulate prey is filtered remains unresolved (Sims *et al*., 2008). In the Western English Channel, groups numbering between three and twelve individuals have been closely tracked (Sims and Quayle, 1998; Sims *et al*., 1997). Aggregations of apparently up to 200–400 individuals have been reported from U.K. regions such as southwest England and northwest Scotland (Doyle *et al*., 2005).

The low productivity and aggregating nature of this species makes it particularly vulnerable to overexploitation. At present, there is no directed fishery for this species.

The assessment by WKSTATUS has led to changes in the Texel-Faial criteria as far as regional importance is concerned due to the aggregations of large numbers of individuals in OSPAR Region III.

WKSTATUS concludes that the species continues to justify inclusion in the OSPAR List.

See Chapters 3.2 for the Status Assessment, 3.3 for the overview of the Texel-Faial criteria and 3.4 for an update of priority actions and measures for this species. Extra information is available in Annex 2.

3.1.1 References

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OSPAR 2009. Background Document for Basking Shark *Cetorhinus maximus*. OSPAR Commission Report 36 pp.

Sims, D. W. 2008. Sieving a living. A review of the biology, ecology and conservation staus of the plankton-feeding basking shark *Cetorhinus maximus*. Advances in marine biology 2008: 171-220

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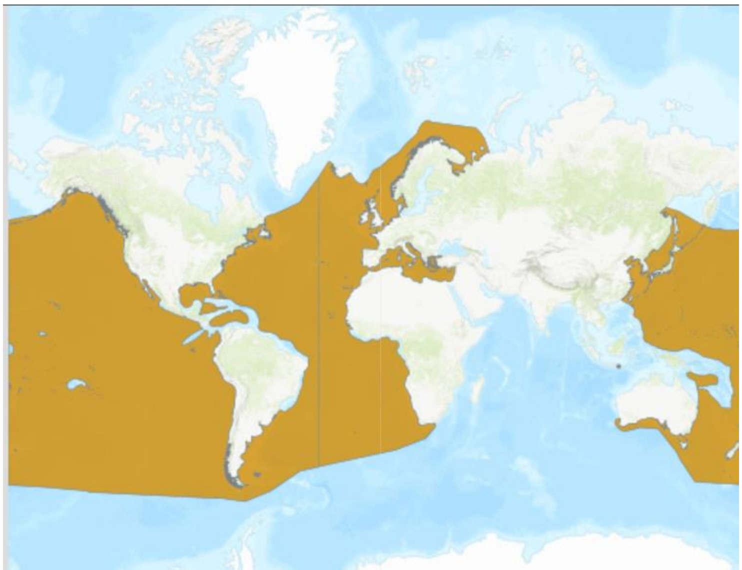
Sims, D. W., Southall, E. J., Tarling, G. A., and Metcalfe, J. D. 2005. Habitat-specific normal and reverse diel vertical migration in the plankton-feeding basking shark. J. Anim. Ecol. 74, 755–761.

3.2 Status assessment

	OSPAR Assessment – basking shark *Cetorhinus maximus*					
Sheet reference	BDC2020/Basking shark					
Area assessed	I,II,III,IV and V					
Title	Basking shark; 2020 status assessment					
Key message 1 - direct data driven 2 – indirect data driven 3 – third party assessment close geographic match 4 – third party assessment partial geographic match 5 – expert judgement	The low productivity and aggregating nature of this species makes it particularly vulnerable to overexploitation. The recent population status and trend are unknown. At present there is no directed fishery for this species, and any incidental bycatch should be discarded.					
	Key message	Region				
		I	II	III	IV	V
	Distribution	←→[2]	←→[2]	←→[2]	←→[2]	←→[2]
	Population size	?	?	?	?	?
	Demographics, e.g. productivity	low	low	low	low	low
	Evidence of status	?	?	?	?	?
	Key pressure Incidental catch	?	?	?	?	?
	Key pressure Increase in recreational boat traffic and wildlife watching	?	?	↑[5]	?	?
	Key pressure Habitat degradation and changes in zooplankton composition	?	?	?	?	?
	Key pressure Shark fin market	?	?	?	?	?
	Evidence of threat or impact	?	?	?	?	?
Background information 100 words	Basking sharks are included on the OSPAR List of Threatened and/or Declining Species and Habitats since 2003. Despite targeted fishing of basking sharks having ceased in the OSPAR maritime area, the main data sets, which are derived from sighting schemes, indicate large interannual variations and do not allow us to identify population trends (OSPAR 2009). The precautionary approach should still be applied, as there is no evidence of a change in status since listing in OSPAR 2004. The pronounced migratory character and vulnerability of this species underlines the need to strengthen our knowledge of current status.					

Geographical range and distribution 100 words + map/infographic	 Figure 1 : Geographical range of basking shark. Source: IUCN (https://www.iucnredlist.org/species/4292/166822294) Basking shark inhabits boreal to warm-temperate waters of the continental and insular shelves circumglobally (Sims 2008). In the Northeast Atlantic (NEA), basking sharks are present from Iceland and the southern Barents Sea southwards to the Mediterranean Sea and north-west Africa (ICES 2019a) with aggregation sites around the UK and Ireland. Transatlantic and trans-equatorial migrations as well as movements into tropical areas and mesopelagic depths have been shown (Braun *et al*. 2018, Dewar *et al*. 2018, Gore *et al*. 2008, Skomal *et al*. 2009). They undertake extensive horizontal and vertical movements throughout the year (Sims *et al*. 2003, Sims 2008) with a variety of movement patterns and distances (Dolton *et al*. 2020) and seasonal patterns (Doherty *et al*. 2019).
Population / abundance 100 words + figures	WGEF considers that the basking shark in the NEA exists as a single stock and management unit (ICES 2019a). Current stock status is unknown. WGEF considers that no directed fishery should be permitted unless a reliable estimate of a sustainable exploitation rate is available (ICES 2019a). Landings declined drastically since the mid-1970s. However, landings data are not necessarily informative of population size. There is no quantitative information on population size and abundance for this species. There are two preliminary estimates of population size from genetic studies (Hoelzel *et al*. 2006; Lieber *et al*. 2019) but these should be taken with caution. Photo id and tagging may not be conclusive for population size estimation.
Condition 100 words + figures	Hoelzel *et al*. (2006) considered their effective population size estimate as surprisingly low given the global distribution of the species and urge for appropriate management strategies to prevent further loss of genetic diversity. No further information on size/age structure has been collected since the last status assessment.
Threats and impacts 100 words	Fins and livers were historically in demand and highly valued on the market (ICES 2019a). The biomass, and revenue, of fins being landed in Norway decreased between 2005 and 2008 (ICES 2019c). There is currently no targeted fishery for basking sharks in the NEA. The main threat is accidental by-catch in setnets, trawls and through entanglement in pot lines. Surface feeding activity and vertical movement increase interactions with boat traffic, wildlife tourism and fishing activities, both industrial and recreational (ICES 2019a). Coastal development, pollution and bottom fishing affect coastal waters quality and food sources of this filter-feeding species (e.g. Beaugrand *et al*. 2002). Research supports the hypothesis that behavioural responses at small scales are linked by broad-scale responses to climate changes (Sims 2008).
Measure that address key pressures 100 words	There are international measures addressing fisheries (EU Prohibited species list) and finning (EU Finning Regulation), trade (CITES listing), conservation (CMS) as well as national measures in Norway, the Isle of Man and the UK such as a designated site for basking sharks which has been established in waters off the West coast of Scotland (STECF 2019). Basking shark is listed

	as a prohibited species for EU vessels in all waters, and it is forbidden for EU vessels to fish for, retain on board, tranship, land, store, sell, display or offer to sell.
Conclusion (incl. management considerations) 250 words	There is no evidence to suggest that the current assessment status of the basking shark should change. Although management and conservation measures have been developed, the current population status is still unknown. Moreover international coordination of measures is still needed. The species continues to justify inclusion in the OSPAR List. OSPAR does not have a programme or measures concerning a question relating to the management of fisheries but has a number of management recommendations which are addressed in the table of management measures in Chapter 3.4. For The ICES Working Group Elasmobranch Fishes (2019a,b,c) concludes that: No directed fishery should be permitted unless a reliable estimate of a sustainable exploitation rate is available. The species may be found in all ICES areas, and thus the TAC-area should correspond to the entire ICES area. Proper quantification of bycatch and discarding both in weight and numbers of this species in the entire ICES area is required. Where national legislation prohibits landing of bycaught basking sharks, measures should be put in place to ensure that incidental catches are recorded in weight and numbers, and carcasses or biological material made available for research.
Knowledge gaps 100 words	Although the level of knowledge has increased in the past 11 years, there are still gaps: - Quantification of bycatch, fate and discarding, in numbers and estimated weight, is required. Discard survival rates have not been estimated. - Migratory patterns and population structure should be further studied. - Impacts of range shifts in prey species as well as ocean warming and acidification should be investigated. Special attention should be drawn to any coastal development project and potential habitat and hotspots included in national or regional marine spatial planning frameworks. - The importance of individual gatherings in the OSPAR Region is unknown at the global scale, but they might be associated with critical areas linked foraging or reproduction.
References	Beaugrand, G., Reid, P. C., Ibanez, F., Lindley, J. A., and Edwards, M. 2002. Reorganisation of North Atlantic Marine Copepod Biodiversity and Climate. Science 296. 1692-1694. Braun, C., Skomal, G., and Thorrold, S. 2018. Integrating archival tag data and a high-resolution oceanographic model to estimate basking shark (*Cetorhinus maximus*) movements in the western Atlantic. Frontiers in Marine Science, 5, p.25. Dewar, H., Wilson, S. G., Hyde, J. R., Snodgrass, O. E., Leising, A., Lam, C.H., Domokos, R., Wraith, J. A., Bograd, S. J., Van Sommeran, S. R., and Kohin, S. 2018. Basking Shark (*Cetorhinus maximus*) Movements in the Eastern North Pacific Determined Using Satellite Telemetry. Front. Mar. Sci. 5:163. doi: 10.3389/fmars.2018.00163 Doherty, P. D., Baxter, J. M., Godley, B. J., Graham, R. T., Hall, G., Hall, J., Hawkes, L. A., Henderson, S. M., Johnson, L., Speedie, C., and Witt, M. J. 2019. Seasonal changes in basking shark vertical space use in the north-east Atlantic. Marine Biology, 166(10), p.129. Dolton, H. R., Gell, F. R., Hall, J., Hall, G., Hawkes, L. A., and Witt, M. J. 2020. Assessing the importance of Isle of Man waters for the basking shark *Cetorhinus maximus*. Endangered Species Research, 41, pp.209-223. Gore, M., Rowat, D., Hall, J., Gell, F. R., and Ormond, R. F. 2008. Trans-Atlantic migration and deep midocean diving by basking shark. Biology Letters, 4: 395–398. Hoelzel, A. R., Shivji, M. S., Magnussen, J., and Francis, M. P. 2006. Low worldwide genetic diversity in the basking shark (*Cetorhinus maximus*). Biol. Lett. 2, 639–642. ICES. 2019a. Working Group on Elasmobranch Fishes (WGEF). ICES Scientific Reports. 1:25. 964 pp. http://doi.org/10.17895/ices.pub.5594. ICES. 2019b. Basking shark (*Cetorhinus maximus*) in subareas 1–10, 12, and 14 (Northeast Atlantic and adjacent waters). *In* Report of the ICES Advisory Committee, 2019. ICES Advice 2019, bsk.27.nea, https://doi.org/10.17895/ices.advice.4827. ICES. 2019c. Working Group on Elasmobranch Fishes (WGEF). Basking Shark Stock Annex Lieber, L., Hall, G., Hall, J., Berrow, S., Johnston, E., Gubili, C., Sarginson, J., Francis, M., Duffy, C., Wintner, S. P., and Doherty, P. D. 2020. Spatio-temporal genetic tagging of a cosmopolitan planktivorous shark provides insight to gene flow, temporal variation and site-specific re-encounters. Scientific reports, 10(1), pp.1-17.

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Method used	The assessment is derived from a mix of OSPAR data assessment and assessments from third parties: ICES WGEF (incl. Stock Annex and assessments); OSPAR Assessments; scientific literature. The assessment is based mainly upon extrapolation from a limited amount of data and expert opinion.

3.3 Overview of Texel-Faial Criteria

Overview of the assessment by WKSTATUS of the Texel-Faial Criteria for the basking shark *Cetorhinus maximus*.

Criterion	Initial assessment of basking shark (*Cetorhinus maximus*) against the Texel-Faial criteria. From OSPAR Commission (2009)	Assessment by WKSTATUS
1. Global importance	Does not qualify *This species occurs throughout temperate seas in all oceans. Although sightings of surface feeding sharks are frequent in the OSPAR area, there is no evidence to suggest that populations in the OSPAR region are of particular global importance.*	Does not qualify The populations in the OSPAR area are not considered to be of particular global importance
2. Regional importance	Does not qualify *In the OSPAR maritime area, basking sharks are observed most frequently in the waters around the British Isles and the Republic of Ireland and along the coast of northern France. The coast of Norway is presumably also important, since there has been such a large fishery there. Our current state of knowledge has not allowed us to identify this species' reproductive zones. Only one report of a birthing event was recorded in the coastal waters of the Isle of Man in 2006 (www.manxbaskingsharkwatch.com).*	Qualifies Aggregation sites have been described in Region III. The Irish Sea is one of the seasonal migratory corridors used by basking sharks to reach specific sites. Although, behaviours associated with mating and feeding have been observed, the function of those sites in the OSPAR regions is still largely unknown. An estimate using genetic data revealed a local effective population size of 383 which translates to roughly 800 individuals using the waters around the Isle of Man at different temporal scales.
3. Rarity	Qualifies *Basking sharks are a highly mobile species for which the global population size and structure remains unknown. It is therefore very difficult to define its degree of rarity. Nevertheless, the collapse of landings in the North-East Atlantic could indicate this species is increasingly rare.*	Qualifies Basking shark are observed in localised hotspots, but display pronounced seasonality and inter-annual variability. Overall scarce abundance of basking sharks in OSPAR Area.

		There has been one published attempt to estimate the size of the global basking shark population, suggesting an effective population size of 8200. The authors considered this to be surprisingly low given the global distribution of the species. This estimate has to be considered with caution however, as the accuracy of the estimation was limited by e.g. sample size and temporal spread, and the genetic marker available.
4. Sensitivity	Qualifies *Compagno (1984) considers basking sharks to be extremely vulnerable to overfishing, because they spend long periods surface feeding (Sims & Quale, 1998) and ascribes this to a slow growth rate, lengthy maturation time, probable low fecundity and probable small size of existing populations. The population productivity estimated at 0.013 – 0.023 (Musik et al, 2000) is very low for a marine fish species, making basking sharks very sensitive.*	Qualifies The low productivity and aggregating nature of this species makes it particularly vulnerable to overexploitation. Therefore, this species can still be considered as very sensitive.
5. Keystone species	Not mentioned	Unknown
6. Decline	Qualifies *There are no firm estimates for the global population or regional populations of basking sharks. The total number of records is usually in tens, hundreds or, at most, low thousands, including repeat sightings. The total number removed from the whole of the NE Atlantic during the past 50 years is probably between 80–106 000 animals (Sims & Reid, 2002). Most basking shark fisheries appear to have collapsed after initial high yields. Landings throughout the northeast Atlantic have also fluctuated, but a continued downwards trend is evident over the past few decades. A few well-documented declines in catches by directed fisheries for the basking shark suggest that reduction in numbers caught of at least 50% to over 90% have occurred in some areas over a very short period (usually ten years or less, Fowler, 2005). These apparent declines have persisted into the long-term with no apparent recovery several decades after exploitation has ceased. The main threat to basking sharks is accidental by-catch.*	Qualifies There is no improvement evident since the last assessment. The population is thought to have declined substantially over the past 50 years. The current population status is unknown, as population numbers could not be estimated reliably.

3.4 Update of priority actions and measures

Summary of key priority actions and measures which could be taken for basking shark (*Cetorhinus maximus*) as formulated in the Background document (OSPAR, 2009) and an update of information from WKSTATUS.

	From Background document (OSPAR, 2009)*	**WKSTATUS information update**
Key threats	- Incidental captures	Basking shark is listed as a prohibited species in EU waters and for EU vessels therefore fish for, retain on board, tranship, land, store, sell, display or offer for sale is forbidden ((EU) 2019/1241). However, no specific regulation exists to avoid or minimise incidental captures.
	- Increase of recreational boat traffic and wildlife watching	Impact of increasing boat traffic is unknown. Local codes of conduct for basking shark watching have been developed in some areas.
	- Habitat degradation and alterations in zooplankton composition	Habitat degradation and effects of changes in zooplankton composition on basking sharks are still unquantified, although changes in copepod composition in some areas have been shown.
	- Shark fin market	The practice of shark finning was forbidden in EU waters for all vessels fishing there and in all waters for vessels operating under the flag of an EU Member State in 2007. To close loopholes in the legislation and to facilitate monitoring and control of the ban, it was been reinforced in 2013 by a strict "fins-naturally-attached" policy (FNAP) through Regulation (EU) No 605/20134 (STECF, 2019). There are recent records of small amounts of basking shark fins on Asian markets (Fields *et al*. 2017), but these may not be from the OSPAR Area.
Other responsible authorities	EC, FAO, RFMOs [OSPAR Contracting Parties: Iceland, Norway, Denmark, Sweden, Netherlands, Belgium, Germany, UK, Ireland, France, Portugal, Spain]	Since 2019 the basking shark is considered by ICCAT to fall under the scope of the convention as an “oceanic, pelagic, and highly migratory” species (ICCAT REC 19-01 MISC)
Already protected? Measures adequate?	- EC regulation n°41/2007 of the 21/12/2006 (article 5.6) banning basking shark fishing in the EC - EC regulation n°1185/2003 of the 26/06/03 banning finning in the EC - Norwegian fishing regulations - IUCN Red List (Endangered A1ad+2d) - CITES Appendix II - CMS Appendix I, II (Bonn - European regulations limit global fishing effort on this vulnerable species in a significant way. Nevertheless, as basking sharks carry out ocean-wide migrations, protection measures need to extend beyond territorial and community waters.	International: ICES advice has been for a zero TAC since 2006 (ICES, 2019b) Article 14 of Council Regulation (EU) 2019/124 prohibits Union fishing vessels from fishing for, retaining on board, transhipping, or landing basking shark in all waters. Article 50 of Council Regulation (EU) 2019/124 prohibits third-country vessels fishing for, retaining on board, transhipping, or landing basking shark from EU waters. Basking shark is listed as “Endangered” on the Red List of European marine fish (Nieto *et al.*, 2015) and on the Norwegian Red List (Sjøtun *et al.,* 2010). Basking shark was listed on Appendix II of the Convention on International Trade in Endangered Species (CITES) in 2002. Basking shark was listed on Appendices I and II of the Convention on the Conservation of Migratory Species (CMS) in 2005.

	convention) – not fully implemented by all Parties in the OSPAR area. - Bern convention - Barcelona convention - Fully protected within the territorial waters of the United Kingdom, Guernsey and Isle of Man - UK Biodiversity Action Plan		Basking shark is listed on Annex I, Highly Migratory Species, of the UN Convention on the Law of the Sea (UNCLOS). In 2005, the North-East Atlantic Fisheries Commission (NEAFC) adopted its first ban on directed Basking Shark fisheries in the Convention Area. This measure has since been regularly renewed; the current ban, adopted in 2015, expires at the end of 2019 and will be reconsidered based on scientific advice (ICES 2016). The Basking Shark is listed on Appendix II of the Bern Convention for the Conservation of European Wildlife and Habitats. In 2012, the General Fisheries Commission for the Mediterranean (GFCM) banned retention and mandated careful release for the Basking Shark and 23 other elasmobranch species listed on the Barcelona Convention Annex II. Implementation by GFCM Parties, however, has been very slow. The practice of shark finning was forbidden in EU waters for all vessels fishing there and in all waters for vessels operating under the flag of an EU Member State in 2007. To close loopholes in the legislation and to facilitate monitoring and control of the ban, it was been reinforced in 2013 by a strict "fins-naturally-attached" policy (FNAP) through Regulation (EU) No 605/20134 (STECF, 2019). National: Based on ICES advice, Norway banned all directed fisheries and landing of basking shark in 2006 in the Norwegian Economical Zone and in ICES subareas 1–14. The ban has continued since. During this period, live specimens caught as bycatch had to be released immediately, although dead or dying specimens could be landed. Since 2012, bycatch that is not landed should also be reported, and landings of basking sharks are not remunerated. Bycatch should be reported both in number of individuals and weight (since 2009). Basking shark has been protected from killing, taking, disturbance, possession and sale in UK territorial (twelve nautical miles) waters since 1998. They are also protected in two UK Crown Dependencies: Isle of Man and Guernsey (Anon., 2002). Furthermore, in the UK Basking Sharks are protected under: Schedule 5 of the Wildlife and Countryside Act 1981; Countryside Rights of Way Act 2000; Wildlife (Northern Ireland) Order 1985; and Nature Conservation (Scotland) Act 2004 (https://www.sharktrust.org/basking-shark-conservation) Sweden has forbidden fishing for or landing basking shark since 2004. In recent years, a designated site for flapper skate (*Dipturus intermedius*) and one for basking shark (*Cetorhinus maximus*) have been established in waters off the West coast of Scotland (STECF, 2019).
Recommended Actions and Measures	OSPAR Commission	- OSPAR should emphasise to relevant scientific bodies the following research needs: - Pooling research efforts between different countries and	Not for WKSTATUS to comment on

		strengthening transnational communication between research teams - Improving our knowledge of this species by furthering or initiating research programs: - to quantify and monitor population size, structure, dynamics and movement patterns and range of individuals occurring - to elucidate migration and over-wintering areas which may identify locations where basking sharks mate and the pregnant females reside - to grasp the relationship between zooplankton availability and basking shark presence - to continue surveillance of basking shark sightings (casual users and observers embarked on fishing vessels and using effort-based observation from fixed points on land) distribution trends over time in order to fully understand the impacts of climate change on this species. These studies should be run concurrently between all range states in the OSPAR region using the same methodology over a number of ears. - initiate or further develop satellite telemetry research projects on basking shark populations - Develop research programs on basking shark population genetics in order to determine the degree of mixing between populations.	

	Contracting Parties	- Encourage OSPAR Members that are Party to CMS to implement the Appendix I listing by protecting the species within their waters	Not for WKSTATUS to comment on
		- Statutory protection	No changes
		- Extend protection under the UK Wildlife and Countryside Act to all UK waters (including the EEZ) and apply similar measures in northern Ireland, the republic of Ireland and France, where basking sharks are usually sighted	Unknown
		- Develop a boating code of conduct	Local codes of conduct for basking shark watching have been developed in some areas.
		- Develop local management measures, including provision of guidelines and codes of conducts to sea-users and establish surveys of sea-users to determine whether boat strike and disturbance is a regular occurrence.	Whilst some data may be collected on sightings and vessel strike (e.g. during sightings programmes for cetaceans), there does not appear to be a coordinated and standardised programme for data collection on basking shark sightings and vessel strike across the OSPAR Area.
	OSPAR should communicate to relevant authorities the need for:	- Improved fishery bycatch knowledge	Data are collected through onboard observer program (where possible). Collection of life history data is needed. Current data are still insufficient for any improvement of knowledge
		- Improve accidental bycatch data collection	Regulation (EU) No. 1380/2013 of the European Parliament and of the Council of 11 December 2013 (Article 15(4)) states that "*The landing obligation referred to in paragraph 1 shall not apply to: (a) species in respect of which fishing is prohibited and which are identified as such in a Union legal act adopted in the area of the CFP*". Consequently, all catches and discards of basking shark should be reported. Based on ICES advice, Norway banned all directed fisheries and landing of basking shark in 2006 in the Norwegian Economical Zone and in ICES subareas 1–14. The ban has continued since. During this period, live specimens caught as bycatch had to be released immediately, although dead or dying specimens could be landed. Since 2012, bycatch that is not landed should also be reported, and landings of basking sharks are not remunerated. Bycatch should be reported both in number of individuals and weight (since 2009).
		- obligatory declarations in the log books	Regulation (EU) 2015/812 of the European Parliament and of the Council of 20 May 2015 (Article 7, 2 (c)) states that "*Masters of Union fishing vessels shall also record in their fishing logbook all estimated discards in*

		volume for any species not subject to the landing obligation pursuant to Article 15(4) and (5) of Regulation (EU) No 1380/2013 of the European Parliament and of the Council". This is currently country-specific and not yet implemented for the entire OSPAR area.
	- embarking scientific observers on board fishing vessels	On-board observer programs do exist in some countries and record bycatch of basking sharks, but few occurrences are observed (ICES, 2017).
	- Extending the Bern Convention listing to OSPAR waters	No information
	- Listing basking sharks on the Habitats Directive	Not done.

*** Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.**

References:

Fields, A. T., Fischer, G. A., Shea, S. K. H., Zhang, H., Abercrombie, D. L., Feldheim, K. A., Babcock, E. A., and Chapman, D. D. 2017. Species composition of the international shark fin trade assessed through a retail-market survey in Hong Kong. Conserv. Biol. 32, 376–389.

ICES. 2016. Report of the Workshop to compile and refine catch and landings of elasmobranchs (WKSHARK2), 19–22 January 2016, Lisbon, Portugal. ICES CM 2016/ACOM:40. 69 pp.

ICES. 2017. Report of the Workshop to compile and refine catch and landings of elasmobranchs (WKSHARK3), 20-24 February 2017, Nantes, France . ICES CM 2017/ACOM:38. 119 pp.

Nieto, A. *et al.* 2015. European Red List of marine fishes. Luxembourg: Publications Office of the European Union, iv + 81 pp.

Scientific, Technical and Economic Committee for Fisheries (STECF) – Review of the implementation of the shark finning regulation and assessment of the impact of the 2009 European Community Action Plan for the Conservation and Management of Sharks (STECF-19-17), Walker, P. and Pinto, C. editor(s), EUR 28359 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-11287-7 (online), doi:10.2760/487997 (online), JRC119051.

Sjøtun, K., Fredriksen, S., Heggøy, E., Husa, V., Langangen, A., Lindstrøm, E., Moy, F., Rueness, J., and Åsen, P. A. 2010. Cyanophyta, Rhodophyta, Chlorophyta, Ochrophyta. In: The 2010 Norwegian Red List for Species, Kålås JA, VikenÅ, Henriksen S, Skjelseth S (eds). Norwegian Biodiversity Information Centre: Trondheim; 79–86.

4 Common skate

4.1 Species information

Common skate (*Dipturus batis*) Linnaeus, 1758

What was regarded as a single species (common skate *Dipturus batis*) over much of the 20th century has been shown to be a complex of two species (Iglésias *et al*., 2010), which are now termed common blue skate *Dipturus batis* and flapper skate *D. intermedius* (Last *et al*., 2016). Earlier data ascribed to *D. batis* refers to the species-complex. The larger-bodied *D. intermedius* may be the more vulnerable to overfishing.

Common blue skate *D. batis* has a maximum total length (L_{max}) of *ca.* 150 cm, and the length at 50% maturity (L_{50}) is 115 cm (male) and 122.9 cm (female). The larger-bodied flapper skate *D. intermedius* may reach ca. 250 cm), and L_{50} occurs at 185.5 cm (male) and 197.5 cm (female). The characteristics to distinguish these two species are given in Iglésias *et al*. (2010). As with all skates, they are oviparous, laying eggs on the sea floor. Whilst information has been published on the age and growth (Du Buit, 1977), this study would relate to the species complex, and contemporary, species-specific growth parameters are not available.

Following longer-term declines in abundance and distribution, European fisheries regulations have prohibited the retention of both common blue skate and flapper skate since 2009. Whilst there are recent, initial signs of population recovery in parts of the OSPAR Area, the populations have not fully re-established over their ranges and both remain threatened species.

The populations of neither species have fully recovered, and WKSTATUS concludes that the common skate complex still continues to justify inclusion in the OSPAR List. Given the revised taxonomy, it is recommended that both species be considered separately and, if accepted, listed separately.

See Chapters 4.2 for the Status Assessment, 4.3 for the overview of the Texel-Faial criteria and 4.4 for an update of priority actions and measures for this species. Extra information is available in Annex 2.

4.1.1 References

Du Buit, M.H. 1977. Age et croissance de *Raja batis* et de *Raja naevus* en Mer Celtique. ICES Journal of Marine Science, 37: 261–265.

Iglésias, Samuel & Toulhoat, Lucile & Sellos, Daniel. (2010). Taxonomic confusion and market mislabelling of threatened skates: Important consequences for their conservation status. Aquatic Conservation: Marine and Freshwater Ecosystems. 20. 319 - 333. 10.1002/aqc.1083.

Last, P. R., White, W. T., de Carvalho, M. R., Séret, B., Stehmann, M. F. W., and Naylor, G. J. P. 2016. Rays of the world. CSIRO Publishing & Cornell University Press, Comstock Publishing Associates, vii + 790 pp.

4.2 Status assessment

	OSPAR Assessment – common skate complex *Dipturus batis*
Sheet reference	BDC2020/Common_skate_complex
Area assessed	I, II, III, IV, V
Title	Common skate complex. OSPAR 2020 status assessment
Key message 50 words	Following longer-term declines in abundance and distribution, European fisheries regulations have prohibited the retention of common blue skate and flapper skate since 2009. Whilst there are recent, initial signs of population recovery in parts of the OSPAR Area, the populations have not fully re-established over their ranges and both remain threatened species.

1 - direct data driven
2 – indirect data driven
3 – third party assessment close geographic match
4 – third party assessment partial geographic match
5 – expert judgement

Key message	Region				
	I	II	III	IV	V
Distribution	?	↑[1]	↑[1]	?	?
Population size	?	↑[1]	↑[1]	?	?
Demographics, e.g. productivity	?	?	?	?	?
Evidence of status	?	↑[1]	↑[1]	?	?
Key pressure 1: Excessive mortality	?	←→[2]	←→[2]	←→[2]	?
Key pressure 2: Habitat damage	?	?	?	?	?
Key pressure 3: Prey availability	?	?	?	?	?
Evidence of threat or impact	?	↓[2]	↓[2]	?	?

Background information 100 words	Common skate was nominated for inclusion on the OSPAR List in 2001, and accepted due to rarity, sensitivity and decline. The previous assessment in 2010 noted that ‘common skate’ was a complex of two species. The current, accepted taxonomic names are common blue skate *Dipturus batis* and flapper skate *Dipturus intermedius.* Earlier data ascribed to *D. batis* refers to the species-complex. The larger-bodied *D. intermedius* may be the more vulnerable to overfishing. Four species (*D. batis, D. intermedius,* Norwegian skate *D. nidarosiensis* and long-nosed skate *D. oxyrinchus*) may be misidentified with each other, affecting the accuracy of survey and landings data. All but the latter are on the list of prohibited species over large parts of their distribution in EU waters.
Geographical range and distribution 100 words + map/infographic	The distributions and stock boundaries of both species are uncertain, but the complex occurs in all OSPAR Regions. *Dipturus intermedius* occurs in the north-western North Sea, north and western Scotland (where it is the dominant species in coastal areas) and southwards to the Celtic Sea. *Dipturus batis* is locally common in the Celtic Sea northwards to the Rockall Bank and Iceland. The main Celtic Sea distribution is expanding eastwards through the Channel to the southern North Sea and southwards to the northern Bay of Biscay. Tagging studies indicate limited dispersal from tagging sites, most individual remaining in the region where they were tagged.

Figure 1. Distribution map of the common skate complex. Source: IUCN (https://www.iucnredlist.org/species/39397/10198950#geographic-range)

Population / abundance 100 words + figure	Catch rates of the species complex in North Sea trawl surveys have increased in recent years from a very low level in years preceding their prohibited listings. Recent catches generally relate to *D. intermedius* in the northern North Sea and western Scotland. Catch rates of *D. batis* in trawl surveys in the western Channel, Rockall and Celtic Sea have also increased in recent years. Incidental reports of reappearance from elsewhere in their former range are also recorded. However, these increases should be viewed in the context of the longer-term decline in distribution.

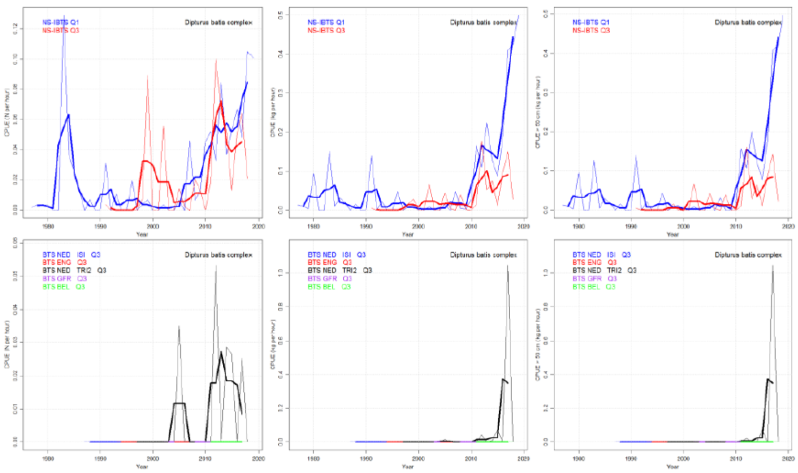
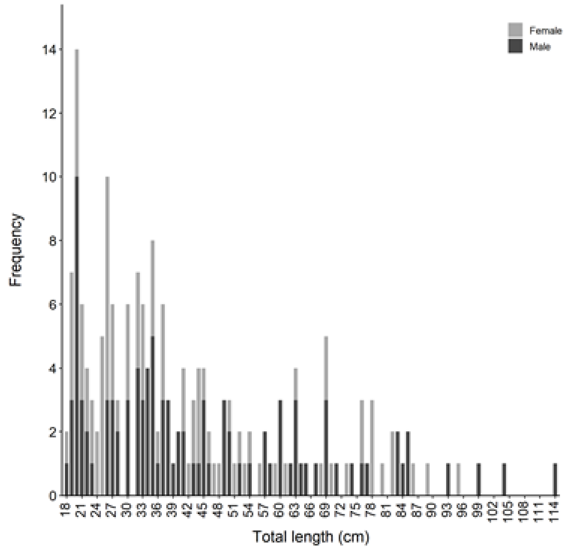


Figure 2. Demersal elasmobranchs in the North Sea, Skagerrak, Kattegat and eastern Channel. 'Common skate complex'. Abundance index (n. hr-1), biomass index (kg hr-1) and exploitable biomass (kg hr-1), including their three year running means, during the North Sea IBTS (in roundfish areas 1–7), BTS, and CGFS surveys in the years 1977–2018. Data extracted from the DATRAS database (selected for CPUE per length per haul) on 12 June 2019. Source ICES (2019b).

Condition 100 words + figure	Catch rates in the North Sea trawl surveys remain too limited to ascertain the condition (e.g. length distribution) of the *D. intermedius* stock. A broad length range of *D. batis* has been recorded in the Celtic Sea, including neonates. There are no recent data on the age composition of either species.

	 Figure 3. Length-frequency by sex of the common skate complex as observed during a 4 m beam trawl survey of the western Channel and Celtic Sea (2006-2019). It is noted that beam trawls are expected to have a low selectivity for larger skates. Source: Silva *et al.* (2020).
Threats and impacts 100 words	Fishing pressure is considered the most important threat to the populations of both species. It has been prohibited to land both species from EU waters since 2009, which should reduce mortality. Both species are a bycatch in bottom trawl and setnet fisheries and discard survival, though likely to occur, has not been quantified. ICES noted an increase in reported landings of long-nosed skate since the prohibition on landing 'common skate-complex', which may reflect some misreporting. The impacts of other fisheries (e.g. deep-water and recreational fisheries) have not been evaluated. Other OSPAR-listed threats are habitat damage and prey availability, which are still considered as minor and potential, respectively. Common skate predate on a wide variety of demersal fish and crustaceans, suggesting prey availability may not be limiting.
Measure that address key pressures 100 words	EU fishing regulations have listed *D. batis* and *D. intermedius* as prohibited species in EU waters since 2009, which should reduce fishing mortality. Both species should be promptly released unharmed by fishers, and they cannot be landed. Regulation (EU) 2015/812 requires that all discards of common skate in EU waters are recorded by commercial fishers. Catch rates of species in the complex have increased in scientific trawl surveys since the prohibition, suggesting the measure has benefitted the populations. The Loch Sunart to the Sound of Jura Marine Conservation Order (2016) lists 'common skate' as the designation feature of this MPA, which should reduce fishing mortality and maintain habitat in an important area for the species.
Conclusion (incl. management considerations) 250 words	The common skate complex (as *Dipturus batis*) is considered 'Critically Endangered' globally by the IUCN, with both species considered Critically Endangered in European waters. Whilst there have been positive signs in the stocks of both species in parts of OSPAR Regions II-III, in terms of increasing catch rates, both species are still infrequent or absent from some former parts of geographic range. Consequently, the populations of neither species have fully recovered, and the common skate complex still justifies inclusion in the OSPAR List of Threatened and/or Declining Species and Habitats. Given the revised taxonomy, it is recommended that both species be considered separately and, if accepted, listed separately. Whilst there have been a number of scientific studies on these species since the OSPAR listing, especially in Region III, further studies on stock delineation, habitat use, and discarding are required to inform future management options.
Knowledge gaps 100 words	Information on essential habitats for reproduction, nursery grounds, and feeding is needed to assess options for potential spatial management measures. Such work is required for both inshore habitats (e.g. sea lochs) and shelf seas. The quantities of discards and associated discard survival need to be quantified for relevant fisheries and métiers to determine the efficacy of the prohibited listing. The southern limits (Region IV), and the bathymetric and geographical ranges of the two species (and other *Dipturus*) in offshore waters (Region V) needs to be better documented. The status of other *Dipturus* spp. in the OSPAR Area could usefully be evaluated.
References	Bendall, V. A., Nicholson, R., Hetherington, S., Wright, S., and Burt, G. 2018. Common skate survey of the Celtic Sea. Working Document to the ICES Working Group on Elasmobranch Fishes, Lisbon, June 19–28 2018; 26 pp.

	Du Buit, M.H. 1977. Age et croissance de *Raja batis* et de *Raja naevus* en Mer Celtique. ICES Journal of Marine Science, 37: 261–265. Dulvy, N. K., Notarbartolo di Sciara, G., Serena, F., Tinti, F., and Ungaro, N., Mancusi, C. & Ellis, J. 2006. *Dipturus batis*. The IUCN Red List of Threatened Species 2006: e.T39397A10198950. https://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T39397A10198950.en. Downloaded on 26 June 2020. ICES. 2019. Working Group on Elasmobranch Fishes (WGEF). ICES Scientific Reports. 1:25. 964 pp. http://doi.org/10.17895/ices.pub.5594 Iglésias, S. P., Toulhoat, L., and Sellos, D. Y. 2010. Taxonomic confusion and market mislabelling of threatened skates: important consequences for their conservation status. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 20: 319–333. Last, P. R., White, W. T., de Carvalho, M. R., Séret, B., Stehmann, M. F. W., and Naylor, G. J. P. 2016. Rays of the world. CSIRO Publishing & Cornell University Press, Comstock Publishing Associates, vii + 790 pp. OSPAR Commission. 2010. Background Document for Common Skate *Dipturus batis*. OSPAR Commission 2010 19 pp. Neat, F., Pinto, C., Burrett, I., Cowie, L., Travis, J., Thorburn, J., Gibb, F., and Wright, P. 2014. Site fidelity, survival and conservation options for the threatened flapper skate (*Dipturus* cf. *intermedius*). *Aquatic Conservation: Marine and Freshwater Ecosystems*, 25: 6 –20. Nieto, A. *et al.* 2015. European Red List of marine fishes. Luxembourg: Publications Office of the European Union, iv + 81 pp. Pinto, C., Thorburn, J.A., Neat, F., Wright, P., Wright, S., Scott, S., Cornulier, T., and Travis, J. 2016. Using individual tracking data to validate the predictions of species distribution models. *Diversity and Distributions*, 22: 682–693.
Method used	The assessment is derived from a mix of OSPAR data assessment and assessments from third parties. These included ICES Expert Group reports and Working Documents, the IUCN account and the scientific literature. The assessment is based mainly on expert opinion with very limited data.

4.3 Overview of Texel-Faial Criteria

Overview of the assessment by WKSTATUS of the Texel-Faial Criteria for the common skate complex *Dipturus batis.*

Criterion	Initial assessment of common skate *Dipturus batis* species complex against the Texel-Faial criteria. From OSPAR Commission (2010)	Assessment by WKSTATUS
1.Global importance	Uncertain *The OSPAR Area may include 75 % or more of the global population of Common skate (it is rare in the Mediterranean, and extends south to Senegal).*	Qualifies Common blue skate *Dipturus batis* may extend outside the OSPAR Convention Area, although most reports of this species are from OSPAR Regions I-III. Flapper skate *Dipturus intermedius* is thought to be found entirely in the OSPAR Convention Area, with most records from OSPAR Regions II-III. Consequently, the OSPAR Convention Area is considered to be of global importance to the 'common skate complex'.
2.Regional importance	Uncertain *The Greater North Sea/Celtic Sea may be the most important region for this species, amounting to around 75 % of the North Atlantic population, but further confirmation is required (Daan, pers. comm. in OSPAR Commission 2006).*	Qualifies The only reported location where common blue skate *D. batis* is locally abundant is in parts of the Celtic Sea (OSPAR Region III). Flapper skate *D. intermedius* is observed regularly on the western and northern coasts of Scotland, with locally high abundance in some coastal regions on the west coast of Scotland (OSPAR Regions II-III).

		Consequently, the OSPAR Convention Area is considered to be of regional importance to the 'common skate complex'.
3. Rarity	Qualifies *The Common skate was originally one of the most common and commercially important skates fished in shelf waters of the OSPAR Area. It is now very rare in most of the OSPAR Area.*	Qualifies Common blue skate *D. batis* is locally common in some areas, but rare elsewhere in its former range. Flapper skate *D. intermedius* is generally reported only in small numbers and so may be considered a rare species. Consequently, the 'common skate complex' is considered rare in the OSPAR Convention Area.
4. Sensitivity	Qualifies *This is a large, long-lived species with a low fecundity. Its age and very large size at maturity makes all size classes vulnerable to capture by bottom trawls and other demersal fisheries. Mortality of the large juveniles is high.*	Qualifies Common blue skate *D. batis* (maximum length (L_{max}) of *ca.* 150 cm) is a larger-bodied skate with a large length-at-maturity (L_{50} = 115 cm (male) and 122.9 cm (female)). It is therefore considered a very sensitive species. Flapper skate *D. intermedius* is an even larger species (L_{max} *ca.* 250 cm), with a larger length-at-maturity (L_{50} = 185.5 cm (male) and 197.5 cm (female)), and so is considered a very sensitive species. The large length-at-maturities of both species in the common skate complex, and that both species are susceptible to capture in demersal trawl and setnet fisheries from hatching, means that the complex is considered very sensitive.
5. Keystone species	Unknown	Does not qualify There is no evidence that either common blue skate *D. batis* or flapper skate *D. intermedius* are keystone species. It is noted, however, that larger individuals of the common skate complex are known to predate on smaller skates, and so these species could be an important source of natural mortality affecting smaller-bodied skate species.
6. Decline	Qualified *Once abundant in the OSPAR Area. Catch statistics and fishery independent survey data document declines throughout its range, particularly on the shelf, since the end of the 19th Century. The proportion of D. batis in some skate fisheries has declined from ~40 % of the skate catch in the early 20th Century, to 10 % in 1970, to zero (see Figure 1). D. batis has been commercially extinct in the Irish Sea for some years and has declined severely in the North Sea. Dutch by-catch records indicate a 75 % decline during 1947-1981. Fishing pressure in the North Sea has been calculated to have resulted in a 34-37 % decrease in numbers annually. It is assessed by ICES as nearly extirpated in the Irish and North Seas. Apparently stable landings in other parts of the species' range were formerly attributed by ICES to the redirection of fishing effort from shelf seas, where D. batis is seriously depleted, into deeper water where previously unfished populations are now being taken, but are now known to be due to misreporting.*	Qualifies As noted in the original case study, both common blue skate *D. batis* and flapper skate *D. intermedius* have shown longer-term declines in distribution, having formerly been common species in the Irish Sea, the wider areas of the North Sea and the Bay of Biscay. Consequently, the 'common skate complex' is considered to have declined in the OSPAR Convention Area. There is, however, evidence of recent, gradual, increases in catch-per-unit-effort in trawl surveys for the complex, and initial signs of recolonisation of former habitat by both species. These positive signs have occurred since the species complex was listed as prohibited species on EU fishing regulations. These short-term initial increases should, however, be viewed in relation to the preceding, longer-term decline.

4.4 Update of priority actions and measures

Summary of key priority actions and measures which could be taken for common skate complex (*Dipturus batis*) as formulated in the Background document (OSPAR 2010) and an update of information from WKSTATUS.

	From Background document (OSPAR 2010)*	**WKSTATUS information update**
Key threats	- Fisheries mortality	EU fishing regulations have listed *D. batis* and *D. intermedius* as prohibited species in EU waters since 2009, which should reduce fishing mortality. Both species should be promptly released unharmed by fishers, and they cannot be landed.
	- By-catch in commercial fisheries	Regulation (EU) 2015/812 requires that all discards of both common blue skate and flapper skate (the common skate complex) in EU waters are recorded by commercial fishers.
	- Target fishing (primarily sport angling and possibly obtaining specimens for aquaria)	There are recreational fisheries for this species, including for the flapper skate. Recreational fishers for these species generally practice catch-and-release. In Scotland, the Sharks, Skates and Rays (Prohibition of Fishing, Trans-shipment and Landing) (Scotland) Order 2012, prohibits the landing of listed elasmobranch from rod-and-line capture. This list includes 'common skate *Dipturus batis*'.
	- Habitat deterioration (secondary threat)	Habitat damage is unquantified, but is still considered a secondary threat. The Loch Sunart to the Sound of Jura Marine Conservation Order (2016) lists 'common skate' as the designation feature of this MPA, which should reduce fishing mortality and maintain habitat in an important area for flapper skate.
Other responsible authorities	EC and Council of Fisheries Ministers (Common Fisheries Policy, TACs) OSPAR Contracting Parties ICES (e.g. provision of advice on trends, assessment criteria and triggers) and other RFOs Council of Europe?	No change
Already protected? Measures adequate?	EU: Zero TAC and mandatory release (2009) Too recent to be able to assess impact. Must be extended into future years. Should not prohibit the participation of anglers in genuine tag and release research programmes.	Catch rates of the species complex in North Sea trawl surveys have increased in recent years from a very low level in years preceding their prohibited listings. Recent catches generally relate to *D. intermedius* in the northern North Sea and western Scotland. Catch rates of *D. batis* in trawl surveys in the western Channel, Rockall and Celtic Sea have also increased in recent years. Incidental reports of reappearance from elsewhere in their former range are also recorded. However, these increases should be viewed in the context of the longer-term decline in distribution.

		Supplement with national and EC biodiversity conservation measures	Scotland's "The Sharks, Skates and Rays (Prohibition of Fishing, Trans-shipment and Landing) (Scotland) Order 2012" prohibits the landing of "Common skate *Dipturus batis*" when caught by rod-and-line.
Recommended Actions and Measures	OSPAR Commission	- Communicate to the Commission the status of *D. batis* and its need for conservation under biodiversity instruments and the Community Plan of Action for Sharks;	Not for WKSTATUS to comment on
		- Communicate to ICES and other scientific bodies the need for research and advice on distribution and habitat requirements	Not for WKSTATUS to comment on
	Contracting Parties	- Consider how national and regional fisheries conservation and management measures, marine protected areas, and species protection legislation may be used to improve the status of *D. batis* and take action to apply these, as appropriate;	The Loch Sunart to the Sound of Jura Marine Conservation Order (2016) lists 'common skate' as the designation feature of this MPA, which should reduce fishing mortality and maintain habitat in an important area for the species.
		- Disseminate to commercial and sports fishers information on the threatened status of *D. batis* and the legal and voluntary measures that protect it and require captures to be released alive;	Ongoing
		- License tag and release programmes	There have been tagging programmes for both members of the common skate complex around the British Isles. *D. intermedius* tagged off the west coast of Scotland exhibited pronounced site fidelity to highly localised areas, suggesting that spatial management of such sea loch habitats may be effective (Wearmouth & Sims, 2009; Thorburn *et al.,* 2018). *Dipturus batis* tagged in the Celtic Sea were observed to remain in the Celtic Sea and northernmost part of the Bay of Biscay (Bendall *et al.*, 2018).
		- Assist industry to develop techniques and equipment to facilitate safe release of *D. batis* from commercial fishing gear.	- Various national and regional training and identification material have been developed, but their uptake by industry has not been evaluated
	Research needs	Life history information	There are currently insufficient data to assess longer-term changes in the condition (length composition or age structure) of the populations of either species. More species-specific data (length, weight, sex, maturity) are being collected on scientific trawl surveys, with some surveys also tagging and releasing specimens caught in good condition.

		Locations of surviving populations and critical spawning and mating habitats	Information on essential habitats for reproduction, nursery grounds, and feeding is still needed to assess options for potential spatial management measures. Such work is required for both inshore habitats (e.g. sea lochs) and shelf seas.

*** Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.**

References:

Bendall, V. A., Nicholson, R., Hetherington, S., Wright, S., and Burt, G. 2018. Common skate survey of the Celtic Sea. Working Document to the ICES Working Group on Elasmobranch Fishes, Lisbon, June 19–28 2018; 26 pp.

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Wearmouth V. J. and Sims, D. W. 2009. Movement and behaviour patterns of the critically endangered common skate *Dipturus batis* revealed by electronic tagging. Journal of Experimental Marine Biology and Ecology, 380:77-87.

5 Gulper shark

5.1 Species information

Gulper shark (*Centrophorus granulosus*) Bloch & Schneider, 1801

The gulper shark (*Centrophorus granulosus*) is a deep-water shark which distributes in the NE Atlantic, from Senegal to France (Ebert and Stehmann, 2013). A study conducted in Galician waters (North of Spain) concluded that the species is more abundant in the Galician Bank than in the continental slope (Bañon *et al*., 2008). In the area, females may reach 166 cm and produce 1 to 6 young. Information about the species is deficient and uncertain given the misidentification issues identified with morphologically similar species.

Information about this species is very limited. Misidentification with other *Centrophorus* species has been detected. There is no directed fishery for this species. Information from discarding is insufficient to monitor the species. Fishery-independent data are lacking and the status of the population is unknown.

WKSTATUS concludes that the species continues to justify inclusion in the OSPAR List.

See Chapters 5.2 for the Status Assessment, 5.3 for the overview of the Texel-Faial criteria and 5.4 for an update of priority actions and measures for this species. Extra information is available in Annex 2.

5.1.1 References

Bañón, R., Piñeiro, C., and Casas, M. 2008. Biological observations on the gulper shark *Centrophorus granulosus* (Chondrichthyes: Centrophoridae) off the coast of Galicia (north-western Spain, eastern Atlantic). Journal of the Marine Biological Association of the United Kingdom, 88(2), 411-414.

Ebert, D. A., & Stehmann, M. F. (2013). Sharks, batoids and chimaeras of the North Atlantic. FAO, Roma (Italia).

5.2 Status assessment

	OSPAR Assessment – Gulper shark *Centrophorus granulosus*
Sheet reference	BDC2020/Gulper_shark
Area assessed	IV, V
Title	Gulper shark: 2020 status assessment
	Information about this species is very limited. Misidentification with other *Centrophorus* species has been detected. There is no directed fishery for this species. A limited TAC for deep-water shark bycatch in longline fisheries targeting black scabbardfish was established in 2017. Information from discarding is insufficient to monitor the species. Fishery-independent data are lacking and the status of the population is unknown.
Key message 50 words 1 - direct data driven 2 – indirect data driven 3 – third party assessment close geographic match 4 – third party assessment partial geographic match 5 – expert judgement	(see table below)

Key message	Region				
	I	II	III	IV	V
Distribution				←→[1]	←→[1]
Population size				?	?
Demographics, e.g. productivity				?	?
Evidence of status				?	?
Key pressure Fisheries				↓[1]	↓[1]
Evidence of threat or impact				↓[1]	↓[1]

Background information 100 words	The gulper shark was nominated for inclusion on the OSPAR List of Threatened and/or Declining Species and Habitats in 2006 and has been included since 2009. The original evaluation against the Texel-Faial criteria listed sensitivity and decline in the OSPAR Regions where it occurs (IV and V) as reasons for listing. There is ongoing taxonomic confusion across the genus *Centrophorus,* which has implications for the interpretation of all data on this genus.
Geographical range and distribution 100 words + map/infographic	The species is thought to be distributed from France to South Africa, including Madeira and Azores Archipelagos. It possibly occurs in other areas, but geographic range is uncertain due to misidentification with similar species in the Atlantic and other oceans (Ebert and Stehmann, 2013). A study conducted in the north of Spain shows that the species is more common around the Galicia Bank than on the continental slope (Bañon *et al*., 2008). In the NE Atlantic, misidentification issues have occurred in the past throughout the distribution area, with two species of *Centrophorus* being landed under the unique scientific name of *C. granulosus*: *Centrophorus uyato*, a more southerly species that also occurs in the Mediterranean; and *C. granulosus* known to inhabit the Iberian continental slope (and more northern areas) in >740 m depths.

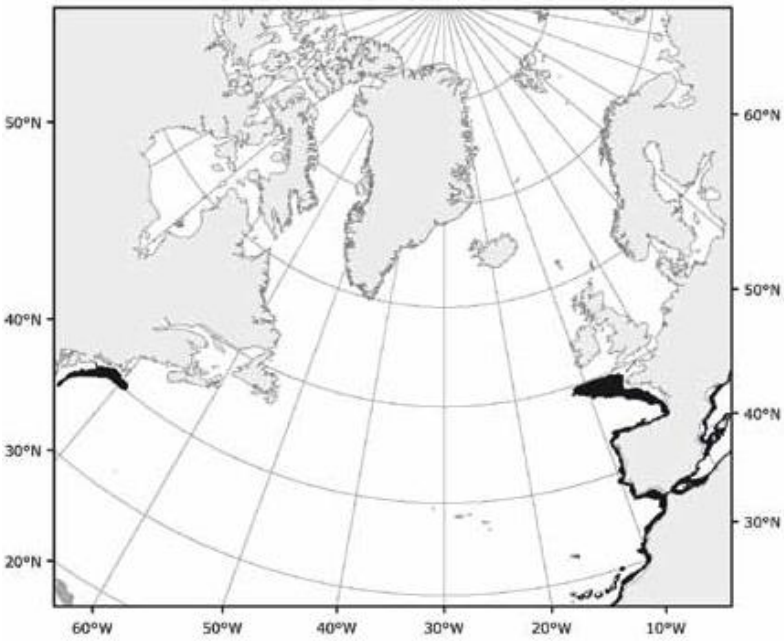

Figure 1. Distribution of *Centrophorus granulosus.* Source: Ebert and Stehmann (2013).

Population / abundance 100 words + figure	The stock structure of this species in the NE Atlantic is unknown. Data are insufficient to evaluate either current population size, or recent trends in relative abundance. Very little new information is available, as this species is rarely caught in scientific research surveys. ICES does not provide advice for this species.
Condition 100 words + figure	Reproductive parameters are available (Bañon *et al*., 2008) but not updated since last assessment. The species is assumed to have a slow growth rate and high longevity, similarly to related species (Clarke *et al.* 2002). These life history traits render them vulnerable to high levels of fishing mortality. The recent European Red List of marine fishes considers gulper shark *Centrophorus granulosus* to be Critically Endangered (Guallart *et al*., 2015; Nieto *et al*., 2015).
Threats and impacts 100 words	There was a target longline fishery that started in 1983 in the north of Portugal, but this fishery stopped in 2006 (ICES, 2006). Currently, the species is an occasional bycatch species in deep-water fisheries but landings are prohibited (exception for deep-water longline where a small by-catch is allowed). Fishing effort has strongly decreased in the last 15 years given the EU management measures adopted to reduce the impact of deep-water fisheries on deep-water species, including sharks.
Measure that address key pressures 100 words	In the EU, a 0-TAC for a list of deep-water sharks, including gulper shark, was adopted in 2010 with a 0 bycatch allowance introduced from 2012. Since 2017, a limited TAC for deep-water sharks has been allowed for "*by-catches in longline fishery targeting black scabbardfish*", with no directed fisheries permitted. Given the potential negative impact on deep-water species, gillnets, entangling nets and trammel nets were banned for fisheries at depths >600 m from 2007 onwards. In order to mitigate the potential damaging impacts of bottom trawling, fishing with bottom trawls was permitted only ≤800 metres after 2016. In the NEAFC Regulatory Area, the species is designated as Category 2, which mean that directed fisheries are not authorized and that bycatches should be minimized.
Conclusion (incl. management considerations) 250 words	Fishing pressure, identified as the only threat to the gulper shark in the last assessment, has declined. Several regulations concerning both species and fisheries in the NE Atlantic have been adopted within and beyond EU waters. However, abundance and biomass index estimates are lacking and the data derived from discards sampling are not adequate to estimate the quantities caught. Therefore, available data are insufficient to evaluate the current status of the population, which are known to exhibit life-history traits that make the recovery process slow. Given the above, the gulper shark continues to justify inclusion in the OSPAR List. Among the bycatch mitigation measures possible for this species in deep-water fisheries in place, it should be considered the possibility for gear-based technical measures to improve the selectivity. In addition, spatial management could be also be considered to minimise bycatch (e.g. avoidance of some fishing grounds or times of the year where the spatial overlap between

	the target species of the fisheries and deep-water shark species) (ICES, 2020). However, the information available is not adequate to frame such measures at present.
Knowledge gaps 100 words	There is a worldwide concern about misidentification issues among *Centrophorus* species and further efforts should be made to clarify the genus and consequently species occurrences. For the NE Atlantic, the knowledge on gulper shark distribution and stock structure is highly deficient. Life-history and biological information are lacking. A major scientific investment is required to gain a full understanding of the spatial and temporal population dynamics that enables estimates of sustainable exploitation levels: i) increase of close monitoring of deep-water shark populations; ii) development of specific studies to assess the distribution patterns of species and estimate the spatial overlap with fisheries; iii) evaluation of the effect on the bycatch of deep water sharks of modifications in deep water fishing operations. (ICES, 2019).
References	Bañón, R., Piñeiro, C., and Casas, M. 2008. Biological observations on the gulper shark *Centrophorus granulosus* (Chondrichthyes: Centrophoridae) off the coast of Galicia (north-western Spain, eastern Atlantic). Journal of the Marine Biological Association of the United Kingdom, 88(2), 411-414. Clarke, M. W., Connolly, P. L. and Bracken, J. J. 2002. Age estimation of the exploited deep-water shark *Centrophorus squamosus* from the continental slopes of the Rockall Trough and Porcupine Bank. Journal of Fish Biology, 60: 501–514. Ebert, D. A., and Stehmann, M. F. 2013. Sharks, batoids and chimaeras of the North Atlantic. FAO, Roma (Italia). ICES. 2006. Report of the Working Group on Elasmobranch Fishes (WGEF), 14–21 June 2006, ICES Headquarters. ICES CM 2006/ACFM:31. 291 p ICES. 2019. Working Group on Elasmobranch Fishes (WGEF). ICES Scientific Reports. 1:25. 964 pp. http://doi.org/10.17895/ices.pub.5594 ICES. 2020. Workshop on the distribution and bycatch management options of listed deep-sea shark species (WKSHARK6). ICES Scientific Reports. 2:76. 85 pp. http://doi.org/10.17895/ices.pub.7469 Guallart, J., Walls, R. H. L. and Bariche, M. 2015. *Centrophorus granulosus*. The IUCN Red List of Threatened Species 2015: e.T70705777A48911382. NEAFC. 2016. The NEAFC approach to conservation and management of deep-sea species and categorization of deep-sea species/stocks. Adopted at the 35th Annual Meeting, November 2016. https://www.neafc.org/basictexts. Nieto, A., *et al*. 2015. European Red List of marine fishes. Luxembourg: Publications Office of the European Union 81 pp.
Method used	The assessment is derived from a mix of OSPAR data and assessments from third parties: ICES Stock assessments; ICES WGEF; ICES WKSHARK6; OSPAR Assessment; IUCN. The assessment is based mainly on expert opinion with very limited data.

5.3 Overview of Texel-Faial Criteria

Overview of the assessment by WKSTATUS of the Texel-Faial Criteria for the gulper shark *Centrophorus granulosus.*

Criterion	Initial assessment of gulper shark (*Centrophorus granulosus*) against the Texel-Faial criteria. From OSPAR Commission (2010)	Assessment by WKSTATUS
1. Global importance	Does not qualify *Widely distributed in tropical and temperate seas*	Does not qualify *Centrophorus granulosus* has a wide distribution in all ocean basins except the Eastern Pacific. Although its currently reported distribution is somewhat scattered, this is likely due to the difficulties in accurately identifying *Centrophorus* species.
2. Regional importance	Does not qualify *There is no information about genetic differentiation of regional populations The OSPAR Area not of regional importance at stock or species level.*	Does not qualify There is still no information about genetic differentiation of regional populations. The OSPAR Area not of regional importance at stock or species level.
3. Rarity	Does not qualify *C. granulosus is considered by ICES WGEF (2007) to be rare in deep-water north of Portugal.*	Does not qualify Although not being so frequent as other deep-water sharks, the species is not rare in the range of its distribution.
4. Sensitivity	Qualifies – very sensitive *Very sensitive to depletion by deep-water fisheries (primarily taken by longline and gillnet) and stocks very slow to rebuild because of its severely limiting life history characteristics (late maturity, a single pup born after a two year gestation).*	Qualifies Very sensitive to depletion by deep-water fisheries and stocks very slow to rebuild because of its limiting life history characteristics (slow growth, late maturity, long intervals between litters and high longevity). Fecundity is low, as described for *Centrophorus* species.
5. Keystone species	Unknown *No information*	Unknown No information
6. Decline	Qualifies *Where catch per unit effort (CPUE) data are available, these are initially high, then decline quickly. A decline of 80-95% from baseline has been estimated in the OSPAR Area, based on data from the Portuguese target long line fishery within the main distribution range of this species.* *Declines in deep-water fisheries for Centrophorous species are also reported from elsewhere in their global range.*	Qualifies The Portuguese target longline fishery stopped completely its activity in 2006. Also, management measures have been adopted, including a 0-TAC in 2010 and regulations concerning fisheries with gillnets, entangling and trammel nets and deep-water trawl fisheries. Pressures and threats have declined but data are insufficient to evaluate either current population size or trends in relative abundance.

5.4 Update of priority actions and measures

Summary of key priority actions and measures which could be taken for gulper shark (*Centrophorus granulosus*) as formulated in the Background document (OSPAR 2010) and an update from WKSTATUS.

	From Background document (OSPAR 2010)*		**WKSTATUS update**
Key threats	Fisheries mortality (target and bycatch) in unsustainable deep-water fisheries		- There are no target fisheries and by-catch has been reduced due to the EU regulations and mitigation of by-catch; - A limited by-catch TAC for deep-water sharks was allowed for each of the years from 2017 to 2020, on a trial basis, in the directed artisanal deep-sea longline fisheries for black scabbardfish (Council regulation (EU) 2016/2285; Council regulation (EU) 2018/2025). - Data are insufficient to evaluate either current population size, or recent trends in relative abundance. Very little new information available as this species is rarely caught in scientific research surveys. ICES does not provide advice for this species. The stock structure of this species in the NE Atlantic is unknown. - Data are insufficient to examine the condition of the stock in the OSPAR Region.
Other responsible authorities	- EC and Council of Fisheries Ministers (Common Fisheries Policy, Regulations, TACs) - OSPAR Contracting Parties - NEAFC and ICES		No change
Already protected? Measures adequate?	EU: TAC, effort regulation and gill net bans	- Grouped bycatch TACs for deep-water sharks are restrictive in some areas and will fall to near zero (10 % of 2009 TAC) in 2010.	In the EU, a 0-TAC for a list of deep-water sharks, including the gulper shark, was adopted in 2010 with a 0 bycatch allowance introduced from 2012. See above for recent changes to the TAC.
		- An observer programme is in place for deep-water fisheries.	- Under the EU Data Collection Framework, there are observers in the longline fleet but discards are difficult to quantify given the features of the fishery. In Spain this is limited to the trawl fleet on the continental shelf and is not directed at deep-water fisheries.
		- Gill net bans do not cover all OSPAR areas and depths where mature and pregnant female deep-water sharks occur.	- Regulation 41/2007 and 2016/2336 prohibits the use of static nets or bottom trawling at depths ≥600 and ≥800 m, respectively. - All the deep-water sharks are subject to 0-TAC advice under the deep-water TAC and quota regulation (EU2019/124). In the NEAFC Regulatory Area, the species is designated as Category 2, which mean that directed fisheries are not authorized and that bycatches should be minimized (NEAFC, 2016). However, the information available is not adequate to frame such measures at present. That effectively is a license to discard these species and being caught at such depths the likelihood of survival is very low.

			- The existing legislation is not designed to mitigate by-catch. - - There is also an allowed limited by-catch in target fisheries for black scabbardfish fishery, for scientific purposes.
		- Trawl fisheries are regulated through a fishing effort management programme.	- Regulation 41/2007 and 2016/2336 prohibits the use of static nets or bottom trawling at depths ≥600 and ≥800 m, respectively. - Among the bycatch mitigation measures possible for this species in deep-water fisheries in place, it should be considered the possibility for gear-based technical measures to improve the selectivity. In addition, spatial management could be also be considered to minimise bycatch (e.g. avoidance of some fishing grounds or times of the year where the spatial overlap between the target species of the fisheries and deep-water shark species). However, the information available is not adequate to frame such measures at present.
	NEAFC: gill net ban	- Covers all international waters below 200 m, thus protecting *C. coelolepis.*	- Still in place.
	EU: species specific catch records	- The majority of Member States are not providing species-specific data for deep-water sharks.	For the years before 2005 it was not possible to determine identity to species level for some countries (excluding Portugal) but efforts were done by WGEF to assign mixed landings by species. Landings estimates from 2005 onwards were revised following WKSHARKS2, and are presented by species (ICES, 2016).
Recommended Actions and Measures	OSPAR Commission	- Monitor information and advice of the ICES Working Group on Elasmobranch Fisheries and bring this to the attention of CPs.	Not for WKSTATUS to comment on
	Contracting Parties	- Make identification guides available to industry and agencies to ensure that accurate species-specific catch records are collected.	Various national and regional training and identification materials have been developed (e.g. Seret, 2010; Ebert & Stehmann, 2013; Iglesias, 2014; http://www.vliz.be/en/harokit). WKSTATUS cannot comment on the uptake.
		- Support ICES and EC recommendations in the Council of Ministers and NEAFC.	Not for WKSTATUS to comment on
		- Improve observer coverage on deep-water fishing vessels.	EU Regulation 2016/2336 requires an at least 20 % on-board observer coverage of activities of bottom trawls and bottom set gillnets with a fishing authorisation to target deep-sea species. This applies in EU waters and to EU vessels in the NEAFC Regulatory Area. WKSTATUS notes that dedicated surveys, such as Palprof in the Basque country, might also be useful in providing the appropriate data.
	Research needs	- Life history, biology, stock discrimination and trend data	There is a worldwide concern about misidentification issues among *Centrophorus* species and further efforts should be made to clarify the genus and consequently species occurrences. For the NE Atlantic, the knowledge on gulper shark distribution and stock structure is highly deficient. Life-history and biological information is lacking.

		For the NE Atlantic, the knowledge on deep-water shark species distribution and on their stock structure are highly deficient. Life-history and biological information is only available for some areas and that information should be updated. A major scientific investment is required to gain a full understanding of the spatial and temporal population dynamics that enables estimates of sustainable exploitation levels: i) increase of close monitoring of deep water shark populations; ii) development of specific studies to assess the distribution patterns of species and estimate the spatial overlap with fisheries; iii) evaluation of the effect on the bycatch of deep water sharks of modifications in deep water fishing operations. (ICES, 2019).

*** Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.**

References:

Ebert, D. A., and Stehmann, M. F. 2013. Sharks, batoids and chimaeras of the North Atlantic. FAO, Roma (Italia).

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6 Leafscale gulper shark

6.1 Species information

Leafscale gulper shark (*Centrophorus squamosus*) Bonnaterre, 1788.

The leafscale gulper shark (*Centrophorus squamosus*) is a deep-water shark widely distributed in the Atlantic, Indian and Pacific Oceans (Compagno *et al*., 2005). Available information suggests that this species is highly migratory (Clarke *et al*., 2001; Moura *et al*., 2014; Rodríguez-Cabello *et al*., 2016), with females being less dispersive than males and possibly philopatric (Verissimo *et al*., 2012). The species is known to give birth in the Madeira Archipelago and in Iceland (Severino *et al*., 2009; Moura *et al*., 2014). This is a large bodied viviparous species, with females reaching 166 cm in the NE Atlantic (Moura *et al*., 2014). Pregnancy is expected to last more than one year and females produce 2 to 10 young (Severino *et al*., 2009). This species presents high longevity, reaching around 70 years (Clarke *et al*., 2002).

Following a decline in abundance in some ICES areas, European fisheries regulations implemented a zero TAC in 2010 for a list of deep-water sharks, including this species, with a limited TAC for deep-water shark bycatch in longline fisheries targeting black scabbardfish since 2017. Information from discarding is insufficient to monitor the species. Fishery-independent data are limited and the status of the population is unknown.

WKSTATUS concludes that the species continues to justify inclusion in the OSPAR List.

See Chapters 6.2 for the Status Assessment, 6.3 for the overview of the Texel-Faial criteria and 6.4 for an update of priority actions and measures for this species. Extra information is available in Annex 2.

6.1.1 References

Compagno, L., Dando, M., and Fowler, S. 2005. A field guide to the sharks of the world. Collins field guide.

Figueiredo, I., Moura, T., Neves, A., and Gordo, L. S. 2008. Reproductive strategy of leafscale gulper shark *Centrophorus squamosus* and the Portuguese dogfish *Centroscymnus coelolepis* on the Portuguese continental slope. Journal of Fish Biology, 73(1), 206-225.

Clarke, M. W., Connolly, P. L., and Bracken, J. J. 2001. Aspects of reproduction of deep-water sharks *Centroscymnus coelolepis* and *Centrophorus squamosus* from west of Ireland and Scotland. Journal of the Marine Biological Association of the United Kingdom, 81: 1019–1029.

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Moura, T., Jones, E., Clarke, M. W., Cotton, C. F., Crozier, P., Daley, R. K., Diez, G., Dobby, H., Dyb, J. E., Fossen, I., Irvine, S. B., Jakobsdottir, K., López-Abellán, L. J., Lorance, P., Pascual-Alayón, P., Severino, R. B., and Figueiredo, I. 2014. Large- scale distribution of three deep-water squaloid sharks: integrating data on sex, maturity and environment. Fisheries Research, 157: 47–61.

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Severino, R., Afonso-Dias, I., Delgado, J., and Afonso-Dias, M. 2009. Aspects of the biology of the leaf-scale gulper shark *Centrophorus squamosus* (Bonnaterre, 1788) off Madeira archipelago. Arquipélago-Life and Marine Sciences, 26: 57–61.

Veríssimo, A., McDowell, J. R., and Graves, J. E. 2012. Genetic population structure and connectivity in a commercially exploited and wide-ranging deep-water shark, the leafscale gulper (*Centrophorus squamosus*). Marine and Freshwater Research, 63: 505–512.

6.2 Status assessment

	OSPAR Assessment – leafscale gulper shark *Centrophorus squamosus*
Sheet reference	BDC2020/Leafscale_gulper_shark
Area assessed	I, III, IV, V
Title	Leafscale gulper shark: 2020 status assessment
Key message 50 words	Following a decline in abundance in some ICES areas, European fisheries regulations resulted in a zero TAC in 2010 for a list of deep-water sharks, including this species. A limited TAC for deep-water shark bycatch in longline fisheries targeting black scabbardfish was established in 2017. Information from discarding is insufficient to monitor the species. Fishery-independent data are limited and the status of the population is unknown.

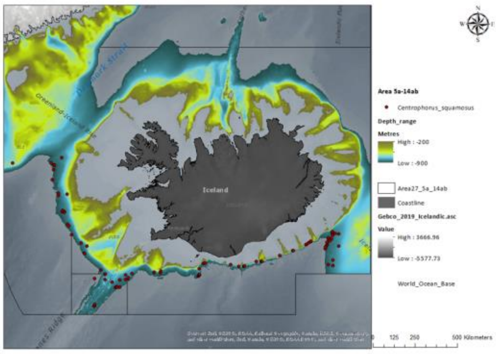
1 - direct data driven 2 – indirect data driven 3 – third party assessment close geographic match 4 – third party assessment partial geographic match 5 – expert judgement	*Key message*	Region				
		I	II	III+NW II	IV	V
	Distribution	←→[1]		←→[1]	←→[1]	←→[1]
	Population size	?		?	?	?
	Demographics, e.g. productivity	?		?	?	?
	Evidence of status	?		?	?	?
	Key pressure Fisheries: targeted and bycatch	↓[1]		↓[1]	↓[1]	↓[1]
	Key pressure: Ghost fishing	?/ ↓[2]		?/ ↓[2]	?/ ↓[2]	?/ ↓[2]
	Evidence of threat or impact	↓1		↓[1]	↓[1]	↓[1]

Background information 100 words	The leafscale gulper shark was included on the OSPAR List of Threatened and Declining Species in 2010, according to the Texel-Faial criteria for sensitivity and decline. The genus *Centrophorus* is considered to be sensitive to depletion by fisheries given their life-history characteristics (low productivity, high longevity, slow growth rates). Following a decline in abundance in some ICES areas, European fisheries regulations included a zero TAC in 2010 for a list of deep-water sharks, including this species. A limited TAC for deep-water shark bycatch in longline fisheries targeting black scabbardfish was provided from 2017. Discards from deep-water fisheries are likely to occur, but have not been quantified for all areas.

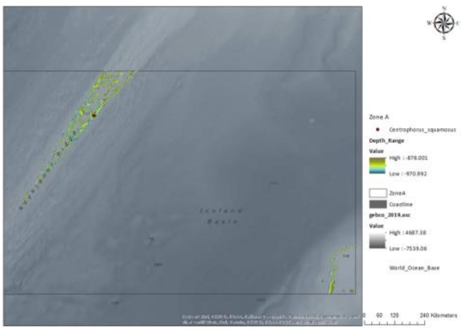
Geographical range and distribution 100 words + map/infographic	

Figure 1. Distribution of leafscale gulper shark. Note: This distribution is not considered fully accurate, given that leafscale gulper shark does not occur in the Irish Sea and Bristol Channel. Source: IUCN (https://www.iucnredlist.org/species/41871/10581731)

a)



b)



c)

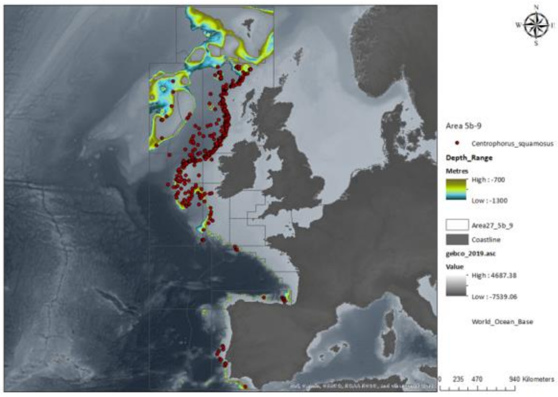


Figure 2. Reported distribution of *Centrophorus squamosus* in a) ICES Divisions 27.5.a, 27.14; b) ICES Division 27.14c; c) ICES Divisions 27.5.b-27.9. Red dots represent the species occurrences in research surveys; the small number of occurrences in the Bay of Biscay and Iberian waters should not be interpreted as low occurrence of the species in the area as it is a consequence of the lack of deep-water hauls (>800m) in bottom trawl scientific surveys or regular longline surveys. Source: ICES (2020).

The species has a wide distribution in the Atlantic (Iceland to Senegal, including the Mid-Atlantic Ridge from Iceland to the Azores), at depths ranging from 230 – 2360 m (Ebert and Stehmann, 2013). The species is widely distributed, and the stock is likely to extend outside the OSPAR area, in particular to Madeira Archipelago where concentrations of gravid females have been reported (Severino *et al.*, 2009; Moura *et al.*, 2014).

Population / abundance

100 words + figure

In the absence of clear information on stock identity, a single assessment unit of the Northeast Atlantic has been adopted. ICES advises that when the precautionary approach is applied, there should be zero catches in each of the years 2020–2023.

Landings of deep-water sharks (primarily leafscale gulper shark and Portuguese dogfish) peaked in 2001-2004 but declined thereafter in response to restrictive management measures. The data derived from discards sampling are not adequate to provide accurate estimates of the quantities caught (ICES, 2019b).

Fishery-independent data are insufficient to evaluate either current population size, or recent trends in relative abundance. Data from the Scottish deep-water survey are not considered to be informative given the limited spatial and temporal coverage, but suggests an increase in abundance from 2011 to 2017 (ICES, 2019). Recent data from a longline survey initiated in the Bay of Biscay in 2015 shows no clear trend in the CPUE (Diez *et al.*, 2020 WD).

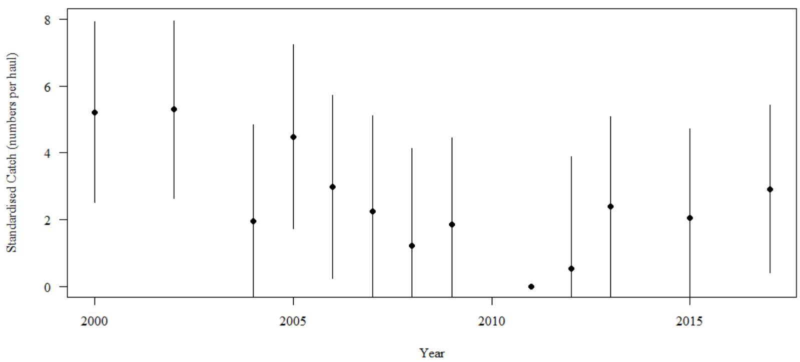


Figure 3. Leafscale gulper shark in the Northeast Atlantic (subareas 4–14). Standardized abundance index for leafscale gulper shark in Scottish deep-water surveys 2000 to 2017. Source: ICES, 2019a

Condition

100 words + figure

The species is thought to undertake large scale migrations associated to reproduction, where females would give birth off the Madeira Archipelago and in Icelandic waters (Moura *et al.*, 2014; Rodriguez-Cabello *et al.*, 2016). Segregation by sex, size and maturity stage seems to occur, likely linked to factors such as depth and temperature.

Reproductive parameters are available from several studies across the NE Atlantic (Girard *et al.*, 1999; Clarke *et al.*, 2001; Bañon *et al*., 2006; Figueiredo *et al.*, 2008) but have not been updated

	since the last assessment. The species has a slow growth rate and high longevity (Clarke *et al.,* 2002). These life history traits render them vulnerable to high levels of fishing mortality.
Threats and impacts 100 words	This is a bycatch species in deep-water fisheries but landings are prohibited since 2010 (with the exception for a limited by-catch in the deep-water longline fisheries targeting black scabbard-fish). Fishing pressure has strongly decreased in the last 15 years, given the EU management measures adopted, such as Regulation 2016/2336, which prohibits the use of static nets or bottom trawling at depths ≥600 and ≥800 m. Ghost fishing is no longer considered a major threat to Leafscale gulper shark given the regulations in place that prohibit the use of static nets or bottom trawling at depths ≥600 and ≥800 m, respectively. However, although being unlikely that lost nets keep fishing over decades it is unknown for how long previously lost nets could have an impact on deep-water shark populations.
Measure that address key pressures 100 words	In the EU, a 0-TAC for a list of deep-water sharks, including leafscale gulper shark, was adopted in 2010 with a 0 bycatch allowance introduced from 2012. Since 2015, the leafscale gulper shark has been included on the EU prohibited species list for Union waters of Division 2.a and Subarea 4 and in all waters of Subareas 1 and 14 (Council Regulation (EC) No 2014/0311, Art. 13:1(e)). In some other areas, there is a limited TAC for deep-water sharks that are a bycatch in longline fisheries targeting black scabbardfish. Given the potential negative impact on deep-water species, gillnets, entangling nets and trammel nets were banned for fisheries at depths >600 m from 2007 onwards. In order to mitigate the potential damaging impacts of bottom trawling, fishing with bottom trawls was permitted only ≤800 metres after 2016. In the NEAFC Regulatory Area, the species is designated as Category 2, which mean that directed fisheries are not authorized and that bycatches should be minimized.
Conclusion (incl. management considerations) 250 words	All the pressures identified in the last assessment of the leafscale gulper shark have declined. Several regulations concerning both species and fisheries in the NE Atlantic have been adopted within and beyond EU waters. However, abundance and biomass index estimates are highly variable and uncertain, and the data derived from discards sampling are not adequate to provide robust estimates of the quantities caught (ICES, 2019b). Therefore, it is not possible to evaluate the current status of the species, which is known to exhibit life-history traits that make the recovery process slow. Given the above, the inclusion of leafscale gulper shark in the OSPAR List is still justified. Among the bycatch mitigation measures possible for this species in deep-water fisheries in place, it should be considered the possibility for gear-based technical measures to improve the selectivity. In addition, spatial management could be also be considered to minimise bycatch (e.g. avoidance of some fishing grounds or times of the year where the spatial overlap between the target species of the fisheries and deep-water shark species) (ICES, 2020). However, the information available is not adequate to frame such measures at present.
Knowledge gaps 100 words	For the NE Atlantic, the knowledge on deep-water shark species distribution and stock structure are highly deficient. Life-history and biological information are only available for some areas and that information should be updated. A major scientific investment is required to gain a full understanding of the spatial and temporal population dynamics that enables estimates of sustainable exploitation levels: i) increase of close monitoring of deep-water shark populations; ii) development of specific studies to assess the distribution patterns of species and estimate the spatial overlap with fisheries; iii) evaluation of the effect on the by catch of deep-water sharks of modifications in deep-water fishing operations. (ICES, 2019).
References	Bañón, R., Piñeiro, C., and Casas, M. 2006. Biological aspects of deep-water sharks *Centroscymnus coelolepis* and *Centrophorus squamosus* off Galician waters (NW Spain). Journal Marine Biology Association U.K., 86, 847–852. http://38 · Zootaxa 0000 (0) © 2016 Magnolia Press Clarke, M. W., Connolly, P. L., and Bracken, J. J. 2001. Aspects of reproduction of deep water sharks *Centroscymnus coelolepis* and *Centrophorus squamosus* from west of Ireland and Scotland. J. Mar. Biol. Ass. U.K., 81: 1019-1029. Clarke, M. W., Connolly, P. L. and Bracken, J. J. 2002. Age estimation of the exploited deep-water shark *Centrophorus squamosus* from the continental slopes of the Rockall Trough and Porcupine Bank. Journal of Fish Biology, 60: 501-514. Diez, G., Arregi, L., Basterretxea, M., Cuende, E., and Oyarzabal, I. 2020. Abundance, biomass and CPUE of deep-water sharks through a five-year deep-water longline survey in the Bay of Biscay (ICES 8c). Working Document presented to the Working Group on Elasmobranch Fishes. 16th – 25th, June 2020. 9 p. Ebert, D. A., and Stehmann, M. F. 2013. Sharks, batoids and chimaeras of the North Atlantic. FAO, Roma (Italia).

	Figueiredo, I., Moura, T., Neves, A., and Gordo, L. S. 2008. Reproductive strategy of leafscale gulper shark *Centrophorus squamosus* and the Portuguese dogfish *Centroscymnus coelolepis* on the Portuguese continental slope. Journal of Fish Biology, 73(1), 206-225. Girard, M., and De Buit, M. H. 1999. Reproductive biology of two deep-water sharks from the British Isles, *Centroscymnus coelolepis* and *Centrophorus squamosus* (Chondrichthyes: Squalidae). Journal of the Marine Biological Association of the United Kingdom, 79 (5): 923–931 DOI: 10.1017/S002531549800109X. ICES. 2019a. Report of the Working Group Elasmobranch Fishes (WGEF). ICES Scientific Reports. 1:25. 964 pp. http://doi.org/10.17895/ices.pub.5594 . ICES. 2019b. Leafscale gulper shark (*Centrophorus squamosus*) in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters). *In* Report of the ICES Advisory Committee, 2019. ICES Advice 2019, guq.27.nea, https://doi.org/10.17895/ices.advice.4830. ICES. 2020. Workshop on the distribution and bycatch management options of listed deep-sea shark species (WKSHARK6). ICES Scientific Reports. 2:76. 85 pp. http://doi.org/10.17895/ices.pub.7469 Moura, T., Jones, E., Clarke, M. W., Cotton, C. F., Crozier, P., Daley, R. K., Diez, G., Dobby, H., Dyb, J. E., Fossen, I., Irvine, S. B., Jakobsdottir, K., López-Abellán, L. J., Lorance, P., Pascual-Alayón, P., Severino, R. B., and Figueiredo, I. 2014. Large- scale distribution of three deep-water squaloid sharks: integrating data on sex, maturity and environment. Fisheries Research 157:47–61. NEAFC. 2016. The NEAFC approach to conservation and management of deep-sea species and categorization of deep-sea species/stocks. Adopted at the 35th Annual Meeting, November 2016. https://www.neafc.org/basictexts. Neat, F. C., Burns, F., Jones, E., and Blasdale, T. 2015. The diversity, distribution and status of deep-water elasmobranchs in the Rockall Trough, north-east Atlantic Ocean. Journal of fish biology, 87(6), 1469-1488. OSPAR. 2010. Background Document for Leafscale gulper shark *Centrophorus squamosus.* OSPAR Commission. 18 pp. Rodríguez-Cabello, C., González-Pola, C., and Sánchez, F. 2016. Migration and diving behavior of *Centrophorus squamosus* in the NE Atlantic. Combining electronic tagging and Argo hydrography to infer deep ocean trajectories. Deep Sea Research Part I: Oceanographic Research Papers, 115: 48–62. DOI: 10.1016/j.dsr.2016.05.009 Severino, R. B., Afonso-Dias, I., Delgado, J., and Afonso-Dias, M. 2009. Aspects of the biology of the leaf-scale gulper shark *Centrophorus squamosus* (Bonnaterre, 1788) off Madeira archipelago. Arquipélago-Life and Marine Sciences, 57-61.
Method used	The assessment is derived from a mix of OSPAR data and assessments from third parties: ICES Stock assessments; ICES WGEF; ICES WKSHARK6; OSPAR Assessment; IUCN. The assessment is based mainly upon extrapolation from a limited amount of data and expert opinion.

6.3 Overview of Texel-Faial Criteria

Overview of the assessment by WKSTATUS of the Texel-Faial Criteria for the leafscale gulper shark *Centrophorus squamosus*

Criterion	Initial assessment of leafscale gulper shark (*Centrophorus squamosus*) against the Texel-Faial criteria. From OSPAR Commission (2010)	Assessment by WKSTATUS
1. Global importance	Does not qualify *Widely distributed in the Atlantic, Indian and Pacific Oceans.*	Does not qualify Widely distributed in the Atlantic, Indian and Pacific Oceans.
2. Regional importance	Does not qualify *There is assumed to be a single migratory stock of C. squamosus in the OSPAR Area, probably linked to the western African populations. The OSPAR Area is likely of regional importance at a stock level, but not at species level.*	Does not qualify In the absence of clear information on stock identity, a single assessment unit of the Northeast Atlantic is assumed. This is a highly migratory species and with distribution patterns likely associated to reproduction

3. Rarity	Does not qualify *Not rare.*	Does not qualify Not rare.
4. Sensitivity	Qualifies – very sensitive *Life history characteristics are poorly known, but genus Centrophorus is considered to be among the deep-water sharks most sensitive to depletion by fisheries because of their life history characteristics (very slow growth, late maturity, long intervals between litters, and extreme longevity) and adaption to a very stable, cold, low-productivity environment. Preliminary age estimates suggest that this is the longest lived shark species yet examined.*	Qualifies Life-history characteristics available show that the species has slow growth, late maturity, long intervals between litters and high longevity. The population recovery from low abundance levels is likely to be long. It can, therefore, still be considered to be very sensitive
5. Keystone species	Unknown *No information.*	Unknown No information.
6. Decline	Qualifies *Steep declines have been reported in virtually all fisheries for this species within the OSPAR Area where catch per unit effort (CPUE) data are available. These declines frequently took place in only a few years. ICES considers that the stock is depleted and likely to be below any candidate limit reference point. Recent landings have been much lower than the Total Allowable Catch (TAC) available and declining landings may reflect an overall decline in stocks, particularly in the north.* *Declines in deep-water fisheries for Centrophorous species are also reported from elsewhere in their global range.*	Qualifies Steep declines have been reported in the last assessment for this species within the OSPAR Area based on catch per unit effort (CPUE) data available for some areas. Management measures have been adopted since then, including a 0-TAC in 2010 and regulations concerning fisheries with gillnets, entangling and trammel nets and deep-water trawl fisheries. Pressures and threats have declined but data are insufficient to evaluate either current population size or trends in relative abundance.

6.4 Update of priority actions and measures

Summary of key priority actions and measures which could be taken for leafscale gulper shark (*Centrophorus squamosus*) as formulated in the Background document (OSPAR 2010) and an update from WKSTATUS.

<table>
<tr><th></th><th colspan="2">From Background document (OSPAR 2010)*</th><th>WKSTATUS update</th></tr>
<tr><td>Key threats</td><td colspan="2">Fisheries mortality (target and bycatch) in unsustainable deep-water fisheries</td><td>- There are no target fisheries and by-catch has been reduced due to the EU regulations and mitigation of by-catch;
- In Union waters of Division 2.a and Subarea 4 and in all waters of Subareas 1 and 14, this species has been included in the EU prohibited species list since 2015.
- A limited by-catch TAC for deep-water sharks was allowed for each of the years from 2017 to 2020, on a
trial basis, in the directed artisanal deep-sea longline fisheries for black scabbardfish (Council regulation (EU) 2016/2285; Council regulation (EU) 2018/2025).
- there has been increased monitoring (e.g. dedicated research surveys for deep-water species), though fishery-independent data are insufficient to evaluate either current population size, or recent trends in relative abundance.
- Data are insufficient to examine the condition of the stock in the OSPAR Region. ICES advises that when the precautionary approach is applied, there should be zero catches in each of the years 2020–2023.</td></tr>
<tr><td>Other responsible authorities</td><td colspan="2">- EC and Council of Fisheries Ministers (Common Fisheries Policy, Regulations, TACs)
- OSPAR Contracting Parties
- NEAFC and ICES</td><td>No change</td></tr>
<tr><td rowspan="3">Already protected?

Measures adequate?</td><td rowspan="3">EU: TAC, effort regulation and gill net bans</td><td>- Grouped bycatch TACs for deep-water sharks are restrictive in some areas and will fall to near zero (10 % of 2009 TAC) in 2010.</td><td>In the EU, a 0-TAC for a list of deep-water sharks, including leafscale gulper shark, was adopted in 2010 with a 0 bycatch allowance introduced from 2012.
See above for further details.</td></tr>
<tr><td>- An observer programme is in place for deep-water fisheries.</td><td>Under the EU Data Collection Framework, there are observers in the longline fleet but discards are difficult to quantify given the features of the fishery. In Spain this is limited to the trawl fleet on the continental shelf and is not directed at deep-water fisheries.</td></tr>
<tr><td>- Gill net bans do not cover all OSPAR areas and depths where deep-water sharks occur.</td><td>- Regulations 41/2007 and 2016/2336 prohibits the use of static nets or bottom trawling at depths ≥600 and ≥800 m, respectively
- All the deep-water sharks are subject to 0-TAC advice under the deep-water TAC and quota regulation (EU2019/124). In the NEAFC Regulatory Area, the species is designated as Category 2, which mean that directed fisheries are not authorized and that bycatches should be minimized (NEAFC, 2016). That effectively is a license to discard these species and being caught at such depths the likelihood of survival is very low.</td></tr>
</table>

			- The existing legislation is not designed to mitigate by-catch. There is also an allowed limited by-catch in target fisheries for black scabbardfish fishery, for scientific purposes.
		- Trawl fisheries are regulated through a fishing effort management programme.	- Regulations 41/2007 and 2016/2336 prohibits the use of static nets or bottom trawling at depths ≥600 and ≥800 m, respectively - Among the bycatch mitigation measures possible for this species in deep-water fisheries in place, it should be considered the possibility for gear-based technical measures to improve the selectivity. In addition, spatial management could be also be considered to minimise bycatch (e.g. avoidance of some fishing grounds or times of the year where the spatial overlap between the target species of the fisheries and deep-water shark species). However, the information available is not adequate to frame such measures at present.
	NEAFC: gill net ban	- Covers all international waters below 200 m, thus protecting *C. squamosus*.	Still in place.
	EU: species specific catch records	- The majority of Member States are not providing species-specific data for deep-water sharks. IUU fishing is taking place in international waters.	For the years before 2005 it was not possible to determine identity to species level for some countries but efforts were done by WGEF to assign mixed landings by species Landings estimates from 2005 onwards were revised following WKSHARKS2, and are presented by species (ICES, 2016). - Illegal, unreported and unregulated (IUU) fishing may occur in the wider areas of the species distribution, but the threat in EU waters is unknown.
Recommended Actions and Measures	OSPAR Commission	- Monitor information and advice of the ICES Working Group on Elasmobranch Fisheries and bring this to the attention of CPs.	Not for WKSTATUS to comment on
	Contracting Parties	- Make identification guides available to industry and agencies to ensure that accurate species-specific catch records are collected.	Various national and regional training and identification materials have been developed (e.g. Seret, 2010; Ebert & Stehmann, 2013; Iglesias, 2014; http://www.vliz.be/en/harokit). WKSTATUS cannot comment on the uptake.
		- Support ICES and EC recommendations in the Council of Ministers and NEAFC.	Not for WKSTATUS to comment on
		- Improve observer coverage on deep-water fishing vessels.	EU Regulation 2016/2336 requires an at least 20 % on-board observer coverage of activities of bottom trawls and bottom set gillnets with a fishing authorisation to target deep-sea species. This applies in EU waters and to EU vessels in the NEAFC Regulatory Area. Data are missing in many areas because there is no more deep-water fisheries. WKSTATUS notes that an overview of those fisheries currently not under an observer programme might be relevant. WKSTATUS notes that dedicated surveys, such as Palprof in the Basque country, might also be useful in providing the appropriate data.

	Research needs	- Life history, biology, stock discrimination and trend data	For the NE Atlantic, the knowledge on deep-water shark species distribution and stock structure are highly deficient. Life-history and biological information is only available for some areas and that information should be updated. A major scientific investment is required to gain a full understanding of the spatial and temporal population dynamics that enables estimates of sustainable exploitation levels: i) increase of close monitoring of deep- water shark populations; ii) development of specific studies to assess the distribution patterns of species and estimate the spatial overlap with fisheries; iii) evaluation of the effect on the by catch of deep- water sharks of modifications in deep water fishing operations. (ICES, 2019).

*** Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.**

References:

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ICES. 2019. Report of the Working Group Elasmobranch Fishes (WGEF). ICES Scientific Reports. 1:25. 964 pp. http://doi.org/10.17895/ices.pub.5594.

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7 Porbeagle

7.1 Species information

Porbeagle shark (*Lamna nasus)* Bonnaterre, 1788

Porbeagle (*Lamna nasus*) is a large pelagic shark (maximum total length >300 cm) found throughout the North Atlantic, between 30°–75°N (Aasen, 1961; Compagno, 2001), and circumglobally between 25–60°S in the southern hemisphere. For fishery management, two porbeagle stocks are considered in the North Atlantic by ICES and ICCAT; one to each side of the 42°W meridian, with very limited exchanges between them (ICES, 2019). Their distributions include both the ocean and coastal areas, with a strong affinity for the shelf break. They can migrate remotely during the winter before returning to the spring-summer feeding areas where they were the previous year (Biais *et al,* 2017). Their reproductive areas are not well known, but there are records of newborn pups and gravid females in late gestation on the western European shelf break and also, but more rarely, on the shelf itself in spring. The reproductive capacity is estimated to be moderate with a maturity of females at 13 years, four pups by litter in average (in NW Atlantic; Jensen *et al*, 2002), and a possible biennial reproductive cycle (in NW Atlantic; Natanson *et al*. 2019).

The population was considered depleted by ICES for a number of years, but ICES revised its assessment of the stock size in 2015, changing its qualitative evaluation from depleted to unknown. This revision was the result of an examination of the changes in Scandinavian fishing effort over the time-series, especially from 1950 to 1970 (Biais *et al.*, 2015). Currently, because of the measures adopted since 2010 to prohibit or to reduce landings of porbeagle in in the OSPAR Area, the threat of mortality, due to directed fishery and bycatch, has been greatly reduced. Exploratory assessments, as well as available survey data, indicate an abundance increase. However, due to the uncertainty about the present stock size and its moderate intrinsic rate of increase, WKSTATUS concludes that the species continues to justify inclusion of the species in the OSPAR List of Threatened and/or Declining Species and Habitats until its next (benchmarked) assessment by ICES.

See Chapters 7.2 for the Status Assessment, 7.3 for the overview of the Texel-Faial criteria and 7.4 for an update of priority actions and measures for this species. Extra information is available in Annex 2.

7.1.1 References

Aasen, O. 1961. Some observations on the biology of the porbeagle shark (*Lamna nasus* L.). ICES document C.M. Near Northern Seas Committee: 109. 7 pp.

Biais, G., Coupeau, Y., Séret, B., Calmettes, B., Lopez, R., Hetherington, S., and Righton, D. 2017. Return migration patterns of porbeagle shark (*Lamna nasus*) in the Northeast Atlantic and implications for stock range and structure, ICES Journal of Marine Science, 74(5), 1268–1276. doi:10.1093/icesjms/fsw233.

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Compagno, L. J. V. 2001. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Bullhead, mackerel and carpet sharks (Heterodontiformes, Lamniformes and Orectolobiformes). Species Catalogue for Fishery Purposes No. 1, Volume 2. FAO, Rome. 269 pp.

Jensen, C.F., Natanson, L.J., Pratt Jr, H.L., Kohler, N. and Campana, S.E., 2002. The reproductive biology of the porbeagle shark (*Lamna nasus*) in the western North Atlantic Ocean. Fish. Bull. 100:727–738.

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Natanson, L.J., Deacy, B.M., Joyce, W., and Sulikowski, J.. 2019. Presence of a resting population of female porbeagles (*Lamna nasus*), indicating a biennial reproductive cycle, in the western North Atlantic Ocean. Fish. Bull. 117: 70-77.

7.2 Status assessment

	OSPAR Assessment – porbeagle *Lamna nasus*
Sheet reference	BDC2020/Porbeagle
Area assessed	I, II, III, IV, V
Title	Porbeagle: 2020 status assessment
Key message 1 - direct data driven 2 – indirect data driven 3 – third party assessment close geographic match 4 – third party assessment partial geographic match 5 – expert judgement	Because of the measures adopted since 2010 to prohibit or to reduce the porbeagle landings in the OSPAR Area, the threat of mortality, due to directed fishery and bycatch, has been greatly reduced. Exploratory assessment as well as available survey data indicate an abundance increase.

Key message	Region				
	I	II	III	IV	V
Distribution	?	?	←→[1]	←→[1]	?
Population size	?	?	↑[1]	↑[1]	?
Demographicse.g. productivity	?	?	←→[1]	←→[1]	?
Evidence and trend of status	?	?	↑[1]	↑[1]	?
Key pressure target fisheries	←→[1]	←→[1]	←→[1]	←→[1]	←→[1]
Key pressure bycatch	←→[1]	←→[1]	←→[1]	←→[1]	←→[1]
Evidence of threat or impact	←→[1]	←→[1]	←→[1]	←→[1]	←→[1]

Background information 100 words	The porbeagle qualified for the OSPAR List of Threatened and/or Declining Species and Habitats in 2008 according to the sensitivity and decline criteria (OSPAR 2010). Low intrinsic rate of population increase and slow recovery from depletion qualified the species for the sensitivity criterion. The decline was estimated severe from the reduction in landing since the 1930s. The greatest threat to porbeagle was mortality in target fisheries and bycatch. The recovery to the biomass at which a maximum sustainable yield would be possible was estimated to take 15-34 years with a complete closure of fisheries from 2010 onwards.
Geographical range and distribution 100 words + map/infographic	ICES considers that there is a single stock of porbeagle *Lamna nasus* in the Northeast Atlantic (ICES, 2019b, Testerman, 2014). Its distribution area spreads over the five OSPAR Regions. Pop-up satellite archival tag deployments in OSPAR Regions III and IV have shown that annual migrations can occur throughout a very large part of the stock area. These deployments as well as conventional tagging have also revealed a site fidelity to spring-summer residential areas across the western regions (Biais *et al*., 2017; Camaron *et al.,* 2019).

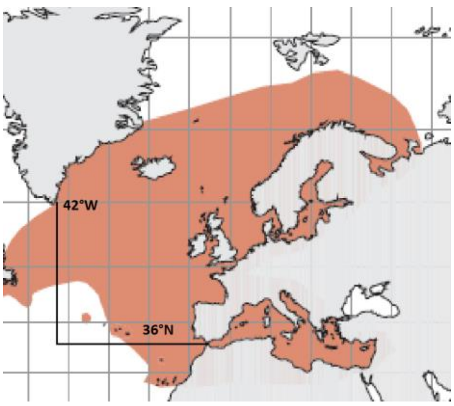


Figure 1. Porbeagle distribution in the Northeast Atlantic. Source: Compagno (2001) with ICES stock boundaries.

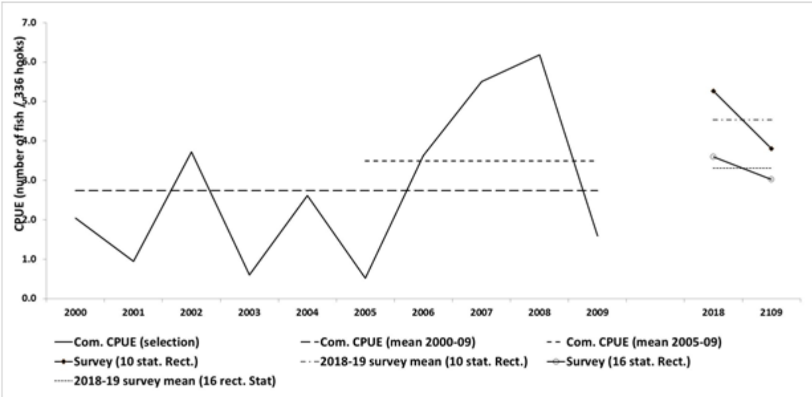
<table>
<tr>
<td>Population / abundance
100 words + figures</td>
<td>Exploratory analyses with the SPiCT model (Albert, 2018) led to the conclusion that the stock biomass was either above or not too far below Bmsy (=the biomass that enables a fish stock to deliver the maximum sustainable yield).
A porbeagle abundance survey was carried out on the shelf edge westwards of France (2018-2019). In comparison with similar abundance indices provided by detailed data of a commercial vessel in the same area, porbeagle abundance is likely at or above the 2005-2009 abundance. Consequently, because the increase of the proportion of large fish (fork length ≥ 190 cm), an increase in mature biomass from 2009 to 2019 is likely (Biais, 2019). The species is globally assessed as vulnerable by IUCN (Rigby et al., 2019).


Figure 2. CPUE of porbeagle caught in longline survey (2018-2019) and commercial fishery (2000-2009). Source: Biais (2019).</td>
</tr>
<tr>
<td>Condition
100 words</td>
<td>The porbeagle has a low biological productivity with small litters, late age-at-maturity, and a life span of 26 years in the North Atlantic. Population growth rate is low but is likely countered by high juvenile survival rates to produce an overall moderate population growth rate in the North Atlantic of 0.052–0.081 (Dulvy et al. 2008, Cortés et al. 2015). Since 2009, the proportion of mature fish has increased in the Bay of Biscay and in the southern Celtic Sea (Biais, 2019). An analysis of the decline in landing from 1950 to 1970 suggests that the northern fisheries ceased partly because of the attraction of other fisheries (Biais et al., 2015).</td>
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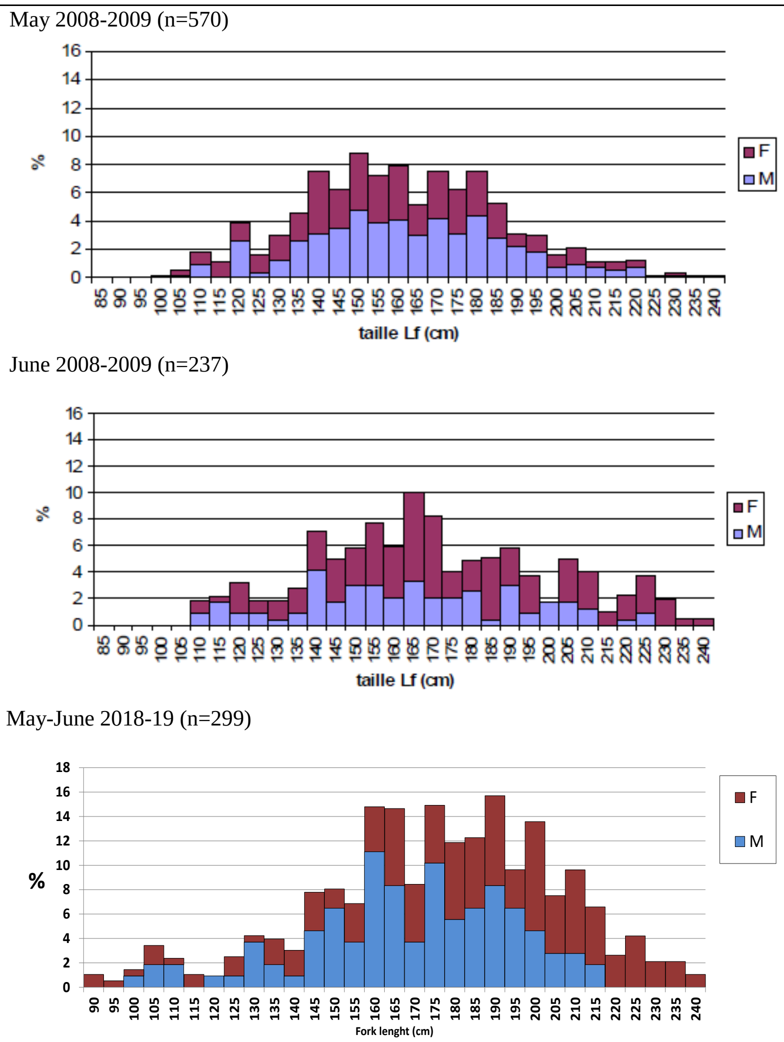


Figure 3. Length-frequency distribution of porbeagle sampled in May-June 2008-2009 and 2018-2019: Source: Biais (2019).

Threats and impacts 100 words	The measures taken in the past 10 years (see below) mean that the threat of mortality due to directed fishery and bycatch has been greatly reduced. However, if fishing opportunities are reinstated without an adequate assessment procedure in place, this may lead to over-exploitation. The species is highly valued by recreational fishers, and although many practice catch-and-release, post-release mortality is unquantified.
Measure that address key pressures 100 words	In 2010, the total allowable catch (TAC) was reduced to zero, and EU vessels were prohibited from landing porbeagle from international waters. It has been prohibited for EU vessels to land porbeagle from all waters, and non-EU vessels to land porbeagle in the EU, since 2015 (EU, 2019). This species has been listed in Appendix II of CMS since 2008, and in Appendix II of CITES since 2014 (ICES, 2019a). OSPAR identified a number of management measures for the Commission and Contracting parties for cooperation with ICES and ICCAT (OSPAR 2010). See additional information in table below.
Conclusion (incl. management considerations) 250 words	The moderate intrinsic rate of population increase qualified the porbeagle to be on the OSPAR List in 2008, since this rate allows only a slow recovery from depletion. This sensitivity to overexploitation remains unchanged, however, ICES has revised its assessment of the stock size in 2015, changing its qualitative evaluation from depleted to unknown. The decline in landings, assumed to relate to population size, also qualified porbeagle for the OSPAR listing in 2008. However, this assessment did not evaluate changes in Scandinavian fishing effort over the time-series, especially from 1950 to 1970. Furthermore, recent dedicated surveys (2018-2019) and an exploratory assessment provide converging evidence of increase in the stock biomass since 2010. Hence, a benchmarked assessment is required to better evaluate current stock status.

	Nevertheless, the porbeagle in OSPAR Region appears to be a species that is less threatened than estimated in 2008, because the fishing mortality has been greatly reduced by the fishing limitations which have been implemented since 2010. Despite that, the uncertainty on the present stock size as well as its moderate intrinsic rate of increase mean that the species continues to justify inclusion of the species in the OSPAR List of Threatened and/or Declining Species and Habitats until its next (benchmarked) assessment by ICES.
Knowledge gaps 100 words	Research is still needed on life-history, population trends and discard survival. Research should also be developed to identify important areas for life-history stages (e.g. mating, pupping and nursery grounds) and the different subpopulations that may compose the stock. In this regard, continuing the spring-summer survey carried out in the Bay of Biscay and the Southern Celtic Sea in 2018 and 2019, in combination with tagging and with an expansion to other areas within the stock distribution, would be advantageous (ICES 2019b).
References	Albert, O. T. 2018. Porbeagle: Data limited stock assessment, using the SPICT model. Working document to WGEF 2018, Lisbon 19-28 June 2018 Biais, G., Coupeau, Y., Séret, B., Calmettes, B., Lopez, R., Hetherington, S., and Righton, D. 2017. Return migration patterns of porbeagle shark *(Lamna nasus*) in the Northeast Atlantic and implications for stock range and structure, ICES Journal of Marine Science, 74(5), 1268–1276. doi:10.1093/icesjms/fsw233. Aasen, O. 1961. Some observations on the biology of the porbeagle shark (*Lamna nasus* L.). ICES document C.M. Near Northern Seas Committee: 109. 7 pp. Biais, G. 2019. Porbeagle abundance survey in the Bay of Biscay and the Celtic Sea in 2018 and 2019. Working Document to the ICES Working Group on Elasmobranch Fishes, Lisbon, June 18–27 2019 Biais, G., Coupeau, Y., Séret, B., Calmettes, B., Lopez, R., Hetherington, S., and Righton, D. 2017. Return migration patterns of porbeagle shark (*Lamna nasus*) in the Northeast Atlantic and implications for stock range and structure, ICES Journal of Marine Science, 74(5), 1268–1276. doi:10.1093/icesjms/fsw233. Biais, G., Helle, K., and Hareide, N. 2015. Trends in the Northern European porbeagle fishery from 1950 to 1970. Working Document to ICES Working Group on Elasmobranch Fishes (WGEF), Lisbon, 2015; WD2015-11, 5 pp.Cameron, L. W. J., Roche, W. K., Houghton, J. D. R., and Mensink, P. J. 2019. Population structure and spatial distribution of porbeagles (*Lamna nasus*) in Irish waters. – ICES Journal of Marine Science, doi:10.1093/icesjms/fsz046. Compagno, L. J. V. 2001. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Bullhead, mackerel and carpet sharks (Heterodontiformes, Lamniformes and Orectolobiformes). Species Catalogue for Fishery Purposes No. 1, Volume 2. FAO, Rome. 269 pp. Hennache, C., and Jung, A. 2010. Etude de la pêche palangrière de requin taupe de l'île d'Yeu. Rapport Final. Association pour l'étude et la conservation des sélaciens (APECS), http://www.asso-apecs.org/IMG/pdf/APECS_EPPARTIY_Rapport_ final_BD.pdf. 64 pp. ICES. 2019a. Porbeagle (*Lamna nasus*) in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters). *In* Report of the ICES Advisory Committee, 2019. ICES Advice 2019, por.27.nea, https://doi.org/10.17895/ices.advice.4831. ICES. 2019b. Working Group on Elasmobranch Fishes (WGEF). ICES Scientific Reports. 1:25. http://doi.org/10.17895/ices.pub.5594 Jensen, C. F., Natanson, L.J., Pratt Jr., H.L., Kohler, N. E., and Campana, S. E. 2002. The reproductive biology of the porbeagle shark (*Lamna nasus*) in the western North Atlantic Ocean. Fish. Bull. 100:727–738. Natanson, L. J., Deacy, B. M., Joyce, W., and Sulikowski, J. 2019. Presence of a resting population of female porbeagles (*Lamna nasus*), indicating a biennial reproductive cycle, in the western North Atlantic Ocean. Fish. Bull. 117: 70-77. OSPAR 2010. Background document for porbeagle shark *Lamna nasus*. OSPAR Publication 17 pp. Testerman, C. M. 2014. Molecular ecology of globally distributed sharks. PhD thesis. Nova Southeastern University Rigby, C. L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M. P., Herman, K., Jabado, R. W., Liu, K. M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R. B., and Winker, H. 2019. *Lamna nasus*. The IUCN Red List of Threatened Species 2019: e.T11200A500969. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T11200A500969.en
Method used	The assessment is derived from a mix of OSPAR data and assessments from third parties: ICES Stock assessments; ICES WGEF; OSPAR Assessment The assessment is based upon surveys but also extrapolation from a limited amount of data and expert opinion.

7.3 Overview of Texel-Faial criteria

Overview of the assessment by WKSTATUS of the Texel-Faial Criteria for the porbeagle *Lamna nausus.*

Criterion	Initial assessment of porbeagle (*Lamna nasus*) against the Texel-Faial criteria. From OSPAR Commission (2010)	Assessment by WKSTATUS
1. Global importance	Does not qualify *Wide-ranging and widely distributed globally.*	Does not qualify The species is widely distributed in temperate waters of the Northern and Southern Hemisphere.
2. Regional importance	Does not qualify *One or two stocks are largely restricted to the OSPAR Area, which is of regional importance for these stocks, but not for the species globally.*	Does not qualify One stock has been identified in the OSPAR region - the NE Atlantic stock.
3. Rarity	Uncertain *Seriously depleted, but aggregations still occur and it is not naturally rare..*	Uncertain Although the species is widely distributed, and locally abundant in some areas, there is no quantitative information on the total population size in the OSPAR Area.
4. Sensitivity	Qualifies *Very sensitive to fisheries because of its low intrinsic rate of population increase and slow recovery from depletion.*	Qualifies The species has low biological productivity with small litters, late age-at-maturity, and a life span of 26 years in the North Atlantic and can be considered to be very sensitive.
5. Keystone species	Unknown *An apex marine predator, but may now be too severely depleted still to have a role in ecosystem function and regulation.*	Unknown Potentially, but without information on population size and distribution this is unknown.
6. Decline	Qualifies *Severely declined, with landings from various target fisheries in the OSPAR Area reduced by 85% to 99% of their baseline in the 1930s, or 50% in ~30 years, with a slight decline in catch per unit effort during the past decade.*	May still qualify Species was listed as being severely declined, because of the important reduction in landings. However, ICES has revised its assessment of the stock size in 2015, changing its qualitative evaluation from ‘depleted’ to ‘unknown’. A survey and a preliminary assessment were presented at the 2019 WGEF of ICES. They show an increase in stock size, but the use of this information has not yet bet validated by a benchmark working group within ICES. IUCN has listed porbeagle as globally “vulnerable”.

7.4 Update of priority actions and measures

Summary of key priority actions and measures which could be taken for porbeagle (*Lamna nasus*) as formulated in the Background document (OSPAR 2010) and an update from WKSTATUS.

	From Background document (OSPAR 2010)*		**WKSTATUS update**
Key threats	Fisheries mortality (target and bycatch) in unsustainable fisheries		The measures taken in the past 10 years mean that the threat of mortality due to directed fishery and bycatch has been greatly reduced. However, if fishing opportunities are reinstated without an adequate assessment procedure in place, this may lead to over-exploitation. The species is highly valued by recreational fishers, and although many practice catch and release, although post-release mortality is unquantified.
Other responsible authorities	EC and Council of Fisheries Ministers (Common Fisheries Policy, Regulations, TACs) OSPAR Contracting Parties ICCAT, ICES		No change
Already protected? Measures adequate?	EC Regulation No. 1185/2003 on the removal of shark fins on board fishing vessels	- Impact unknown, but *L. nasus* is generally retained for its valuable meat, except in some high seas fisheries.	There are recent records of small amounts of porbeagle fins on Asian markets (Fields *et al*. 2017), but these may not be from the OSPAR Area.
	Appendix II of CMS	- A new listing. Migratory Shark Memorandum of Understanding and Action Plan for listed species are not yet available.	This species has been listed in Appendix II of CMS since 2008, and in Appendix II of CITES since 2014
	EU: TAC, prohibited list	- TACs are restrictive, but scientific advice is a reduction to zero	In 2010, the total allowable catch (TAC) was reduced to zero, and EU vessels were prohibited from landing porbeagle from international waters. Since 2015, it has been prohibited for EU vessels to fish for, to retain on board, to tranship or to land porbeagle, with this applying to all waters.
	Maximum landing size	- Maximum landing size should protect mature females	Since other measures have been adopted by almost all European countries, the maximum landing size is currently a measure which probably has very little impact when it remains in place.
Recommended Actions and Measures	OSPAR Commission	- Monitor information and advice of the ICES Working Group on Elasmobranch Fisheries and the ICCAT Shark Working Group and bring this to the attention of CPs.	Not for WKSTATUS to comment on
	Contracting Parties	- Support ICES, ICCAT and Commission recommendations in the Council of Ministers.	Not for WKSTATUS to comment on
	Research needs	- Life history and trend data, discard survival studies	Research is still needed on life-history, population trends and discard survival. Research should also be developed to identify important areas for life-history stages (e.g. mating, pupping and

			nursery grounds) and the different sub-populations that may compose the stock.
		- modelling impact of maximum landing sizes upon stock recovery	This could be done in the future if there is a likelihood of the fishery being reopened with the implementation of a sampling programme on fish length and age distribution in catches.

*** Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.**

References:

Fields, A. T., Fischer, G. A., Shea, S. K. H., Zhang, H., Abercrombie, D. L., Feldheim, K. A., Babcock, E. A., and Chapman, D.D. 2017. Species composition of the international shark fin trade assessed through a retail-market survey in Hong Kong. Conserv. Biol. 32, 376–389.

8 Portuguese dogfish

8.1 Species information

Portuguese dogfish (*Centroscymnus coelolepis*) Barbosa du Bocage & Brito Capello, 1864

The Portuguese dogfish (*Centroscymnus coelolepis*) is a deep-water shark widely distributed in the Atlantic, Indian and Pacific Oceans, usually found near the bottom (Compagno *et al*., 2005). This is a large bodied viviparous species, with females reaching 130 cm in the NE Atlantic (Moura *et al.*, 2011, Moura *et al*., 2014). Pregnancy is expected to last more than one year and is followed by a resting stage (Figueiredo *et al*., 2008). It is an opportunistic benthopelagic species that feeds on other fishes, on cephalopods and also on decapod crustaceans (Mauchline and Gordon, 1983).

Following a decline in abundance in some ICES areas, European fisheries regulations implemented a zero TAC in 2010 for a list of deep-water sharks, including this species, with a limited TAC for deep-water shark bycatch in longline fisheries targeting black scabbardfish since 2017. Information from discarding is insufficient to monitor the species. Fishery-independent data are limited and the status of the population is unknown.

All the pressures identified in the last assessment of the Portuguese dogfish have declined. Several regulations concerning both species and fisheries in the NE Atlantic have been adopted within and beyond EU waters. However, abundance and biomass index estimates are highly variable and uncertain, and the data derived from discards sampling is not adequate to provide robust estimates of the quantities caught (ICES, 2019). Therefore, available data are insufficient to evaluate the current status of the species, which is known to exhibit life-history traits that make the recovery process slow. Given the above, WKSTATUS concludes that the Portuguese dogfish continues to justify inclusion in the OSPAR List.

See Chapters 8.2 for the Status Assessment, 8.3 for the overview of the Texel-Faial criteria and 8.4 for an update of priority actions and measures for this species. Extra information is available in Annex 2.

8.1.1 References

Compagno, L., Dando, M., and Fowler, S. 2005. A field guide to the sharks of the world. Collins field guide.

Moura, T., Nunes, C., Bandarra, N., Gordo, L. S., and Figueiredo, I. 2011. Embryonic development and maternal–embryo relationships of the Portuguese dogfish *Centroscymnus coelolepis*. Marine Biology, 158(2): 401-412.

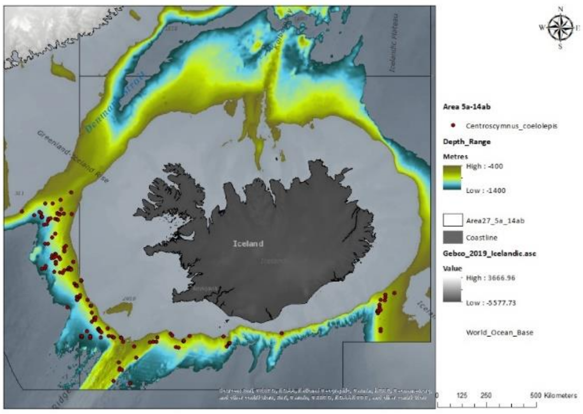
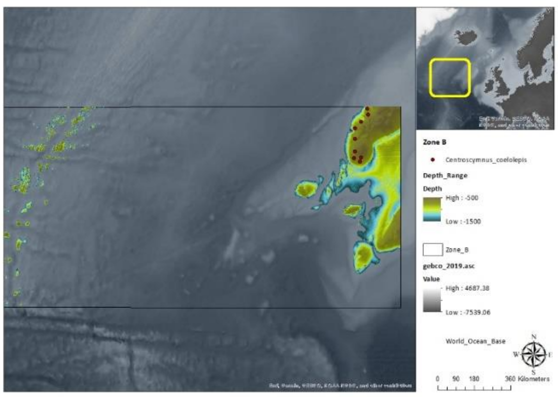
Moura, T., Jones, E., Clarke, M. W., Cotton, C. F., Crozier, P., Daley, R. K., Diez, G., Dobby, H., Dyb, J. E., Fossen, I., Irvine, S. B., Jakobsdottir, K., López-Abellán, L. J., Lorance, P., Pascual-Alayón, P., Severino, R. B., and Figueiredo, I. 2014. Large- scale distribution of three deep-water squaloid sharks: integrating data on sex, maturity and environment. Fisheries Research, 157: 47–61.

Figueiredo, I., Moura, T., Neves, A., and Gordo, L. S. 2008. Reproductive strategy of leafscale gulper shark *Centrophorus squamosus* and the Portuguese dogfish *Centroscymnus coelolepis* on the Portuguese continental slope. Journal of Fish Biology, 73(1), 206-225.

Mauchline, J., and Gordon, J. D. M. 1983. Diets of the sharks and chimaeroids of the Rockall Trough, northeastern Atlantic Ocean. Marine Biology, 75(2-3): 269-278.

8.2 Status assessment

	OSPAR Assessment – Portuguese dogfish *Centroscymnus coelolepis*					
Sheet reference	BDC2020/Portuguese_dogfish					
Area assessed	I, III, IV, V					
Title	Portuguese dogfish: 2020 status assessment					
Key message 50 words	Following a decline in abundance in some ICES areas, European fisheries regulations have advised a zero TAC in 2010 for a list of deep-water sharks, including this species. Information from discarding is insufficient to monitor the species. Fishery-independent data are limited and the status of the population is unknown.					
1 - direct data driven 2 – indirect data driven 3 – third party assessment close geographic match 4 – third party assessment partial geographic match 5 – expert judgement	*Key message*	Region				
		I	II	III	IV	V
	Distribution	←→[1]		←→[1]	←→[1]	←→[1]
	Population size	?		?	?	?
	Demographics, e.g. producitivity	?		?	?	?
	Evidence of status	?		?	?	?
	Key pressure Fisheries: targeted and bycatch	↓[1]		↓[1]	↓[1]	↓[1]
	Key pressure Ghost fishing	?/ ↓[2]		?/ ↓[2]	?/ ↓[2]	?/ ↓[2]
	Evidence of threat or impact	↓[1]		↓[1]	↓[1]	↓[1]
Background information 100 words	The Portuguese dogfish (*Centroscymnus coelolepis*) was nominated for inclusion in the OSPAR List of Threatened and/or Declining Species in 2006 according to the sensitivity and decline criteria (OSPAR 2010). Following a decline in abundance in some ICES areas, European fisheries regulations have implemented a zero TAC in 2010 for a list of deep-water sharks, including this species, with a limited TAC for deep-water shark bycatch in longline fisheries targeting black scabbardfish since 2017. Discards from deep-water fisheries are likely to occur, but have not been quantified for all areas.					

Geographical range and distribution 100 words + map/infographic	 Figure 1. Distribution of Portuguese dogfish. Source: IUCN (https://www.iucnredlist.org/species/41747/10552910) The species has a wide but patchy distribution in the Atlantic (Iceland to South Africa, including the western Mediterranean; and from the Grand Banks to Delaware Bay), occurring from 600 to 1900 m deep (ICES, 2020). a)  b) 

c)

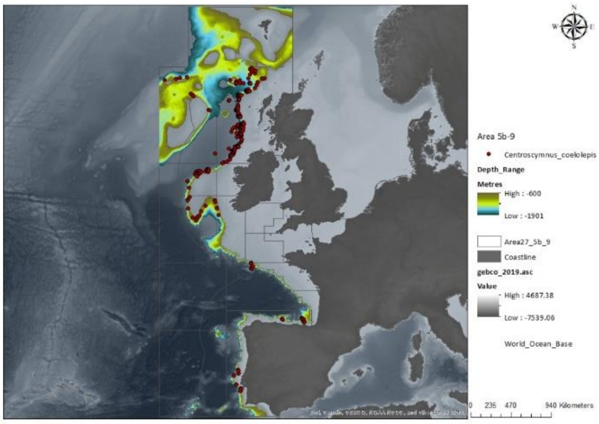


Figure 2. Reported distribution of *Centroscymnus coelolepis* in a) ICES Divisions 27.5.a, 27.14; b) ICES Division 27.14c; c) ICES Divisions 27.5.b-27.9. Red dots represent the species occurrences in research surveys; the small number of occurrences in the Bay of Biscay and Iberian waters should not be interpreted as low occurrence of the species in the area as it is a consequence of the lack of deep-water hauls (>800m) in bottom trawl scientific surveys or regular longline surveys. Source: ICES (2020).

Population / abundance

100 words + figuer

In the absence of clear information on stock identity, a single assessment unit of the Northeast Atlantic has been adopted. ICES advises that when the precautionary approach is applied, there should be zero catches in each of the years 2020–2023. Landings of deep-water sharks (primarily leafscale gulper shark and Portuguese dogfish) peaked in 2001-2004 but declined thereafter in response to restrictive management measures. The data derived from discards sampling are not adequate to provide robust estimate the quantities caught (ICES, 2019a).

Fishery-independent data are insufficient to evaluate either current population size, or recent trends in relative abundance. Data from the Scottish deep-water survey are not considered to be informative, given the limited spatial and temporal coverage, but abundance estimates show no consistent trend for Portuguese dogfish (ICES, 2019b). Recent data from a longline survey initiated in the Bay of Biscay in 2015 indicates that the CPUE from this species is higher than the CPUE estimated for other deep-water shark species (Diez *et al*., 2020 WD).

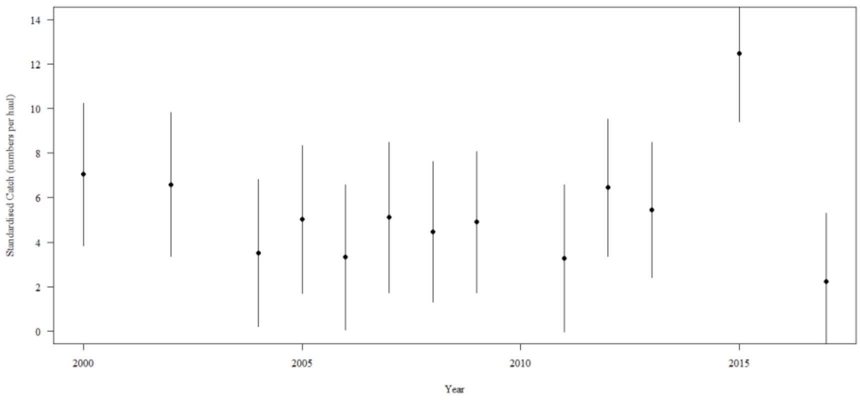


Figure 3. Portuguese dogfish. Standardized abundance index for Portuguese dogfish in Scottish deep-water surveys 2000 to 2017. Source: ICES (2019b).

Condition

100 words + figure

The occurrence of all adult reproductive stages within the same geographical area and, in many cases, in similar proportions, suggests that this species is able to complete its life cycle within these areas. Newborns have been recorded only rarely, but with occasional occurrences in the NE Atlantic; the existence of undiscovered concentration areas of juveniles in the NE Atlantic may be hypothesized (Moura *et al*., 2014).

Reproductive parameters available from several studies across the NE Atlantic and elsewhere suggest a low population productivity. These parameters were not updated since the last assessment. Portuguese dogfish has a slow growth rate and high longevity, similarly to other related species (Clarke *et al*., 2002; Irvine *et al.,* 2006).

Threats and impacts 100 words	This species is a bycatch species in deep-water fisheries, but landings have been prohibited since 2010 (exception for a limited by-catch TAC in the deep-water longline fisheries targeting black scabbardfish). Fishing effort has strongly decreased in the last 15 years, given the EU management measures adopted. Ghost fishing is no longer considered a major threat to Portuguese dogfish given the regulations in place that prohibit the use of static nets or bottom trawling at depths ≥600 and ≥800 m, respectively. However, although being unlikely that lost nets keep fishing over decades it is unknown for how long previously lost nets could have an impact on deep-water shark populations.
Measure that address key pressures 100 words	In the EU, a 0-TAC for a list of deep-water sharks, including Portuguese dogfish, was adopted in 2010 with a 0 bycatch allowance introduced from 2012. In Union waters of Division 2.a and Subarea 4 and in all waters of Subareas 1 and 14, this species has been included in the EU prohibited species list. Given the potential negative impact on deep-water species, gillnets, entangling nets and trammel nets were banned for fisheries at depths >600 m. In order to mitigate the potential damaging impacts of bottom trawling, fishing with bottom trawls was permitted only ≤800 metres. In the NEAFC Regulatory Area, the species is designated as Category 2, which mean that directed fisheries are not authorized and that bycatches should be minimized (NEAFC, 2016).
Conclusion (incl. management considerations) 250 words	All the pressures identified in the last assessment of the Portuguese dogfish have declined. Several regulations concerning both species and fisheries in the NE Atlantic have been adopted within and beyond EU waters. However, abundance and biomass index estimates are highly variable and uncertain, and the data derived from discards sampling is not adequate to provide robust estimates of the quantities caught (ICES, 2019b). Therefore, available data are insufficient to evaluate the current status of the species, which is known to exhibit life-history traits that make the recovery process slow. Given the above, the Portuguese dogfish continues to justify inclusion in the OSPAR List. Among the bycatch mitigation measures possible for this species in deep-water fisheries in place, it should be considered the possibility for gear-based technical measures to improve the selectivity. In addition, spatial management could be also be considered to minimise bycatch (e.g. avoidance of some fishing grounds or times of the year where the spatial overlap between the target species of the fisheries and deep-water shark species) (WKSHARKS 6). However, the information available is not adequate to frame such measures at present.
Knowledge gaps 100 words	For the NE Atlantic, the knowledge on deep-water shark species distribution and stock structure are highly deficient. Life-history and biological information are only available for some areas and that information should be updated. A major scientific investment is required to gain a full understanding of the spatial and temporal population dynamics that enables estimates of sustainable exploitation levels: i) increase of close monitoring of deep-water shark populations; ii) development of specific studies to assess the distribution patterns of species and estimate the spatial overlap with fisheries; iii) evaluation of the effect on the bycatch of deep-water sharks of modifications in deep water fishing operations (ICES, 2019b).
References	Clarke, M. W., Connolly, P. L. and Bracken, J. J. 2002. Age estimation of the exploited deep-water shark *Centrophorus squamosus* from the continental slopes of the Rockall Trough and Porcupine Bank. Journal of Fish Biology, 60: 501–514. Diez, G., Arregi, L., Basterretxea, M., Cuende, E., and Oyarzabal, I. 2020. Abundance, biomass and CPUE of deep-water sharks through a five-year deep-water longline survey in the Bay of Biscay (ICES 8c). Working Document presented to the Working Group on Elasmobranch Fishes. 16th – 25th, June 2020. 9 p. ICES. 2019a. Portuguese dogfish (*Centroscymnus coelolepis, Centrophorus squamosus*) in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters). *In* Report of the ICES Advisory Committee, 2019. ICES Advice 2019, cyo.27.nea, https://doi.org/10.17895/ices.advice.4828. ICES. 2019b. Working Group on Elasmobranch Fishes (WGEF). ICES Scientific Reports. 1:25. 964 pp. http://doi.org/10.17895/ices.pub.5594 ICES. 2020. Workshop on the distribution and bycatch management options of listed deep-sea shark species (WKSHARK6). ICES Scientific Reports. 2:76. 85 pp. http://doi.org/10.17895/ices.pub.7469 Irvine, S. B., Stevens, J. D., and Laurenson, L. J. 2006. Comparing external and internal dorsal-spine bands to interpret the age and growth of the giant lantern shark, *Etmopterus baxteri* (Squaliformes: Etmopteridae). In Special Issue: Age and Growth of Chondrichthyan Fishes: New Methods, Techniques and Analysis (pp. 253-264). Springer, Dordrecht. Moura, T., Jones, E., Clarke, M. W., Cotton, C. F., Crozier, P., Daley, R. K., Diez, G., Dobby, H., Dyb, J. E., Fossen, I., Irvine, S. B., Jakobsdottir, K., López-Abellán, L. J., Lorance, P., Pascual-Alayón, P.,

	Severino, R. B., Figueiredo, I., 2014. Large- scale distribution of three deep-water squaloid sharks: integrating data on sex, maturity and environment. Fisheries Research 157:47–61. NEAFC. 2016. The NEAFC approach to conservation and management of deep-sea species and categorization of deep-sea species/stocks. Adopted at the 35th Annual Meeting, November 2016. https://www.neafc.org/basictexts OSPAR. 2010. Background Document for Portuguese dogfish *Centroscymnus coelolepis.* OSPAR Commission, 19 pp.
Method used	The assessment is derived from a mix of OSPAR data and assessments from third parties: ICES Stock assessments; ICES WGEF; ICES WKSHARK6; OSPAR Assessment; IUCN. The assessment is based upon extrapolation from limited survey data and expert opinion.

8.3 Overview of Texel-Faial criteria

Overview of the assessment by WKSTATUS of the Texel-Faial Criteria for the Portuguese dogfish *Centroscymnus coelolepis*.

Criterion	**Initial assessment of Portuguese dogfish (*Centroscymnus coelolepis*) against the Texel-Faial criteria. From OSPAR Commission (2010)**	**Assessment by WKSTATUS**
1. Global importance	Does not qualify *Widely distributed in the Atlantic, Indian and Pacific Oceans.*	Does not qualify Widely distributed in the Atlantic, Indian and Pacific Oceans.
2. Regional importance	Does not qualify *There is likely a single stock of C. coelolepis in the /OSPAR Area. There may be some distinct local populations within this stock. At, The OSPAR Area is likely of regional importance at a stock level, but not at species level.*	Does not qualify In the absence of clear information on stock identity, a single assessment unit of the Northeast Atlantic is assumed. The existence of local populations within this stock is hypothesized. The OSPAR Area is likely of regional importance at a stock level, but not at species level.
3. Rarity	Does not qualify *Not rare.*	Does not qualify Not rare.
4. Sensitivity	Qualifies *Very sensitive to depletion by fisheries. Life history characteristics are poorly known, but likely similar to that of related species (very slow growth, late maturity, long intervals between litters, and extreme longevity). Where catch per unit effort (CPUE) data are available for different locations, these are initially high, then decline quickly, suggesting that this species is sedentary. Recovery of depleted populations will be slow and likely take longer than 25 years, even if deep-water fisheries close and all bycatch ceases. If the species is sedentary, recolonisation of depleted stocks from neighbouring areas will also be extremely slow, and most unlikely to take place within 25 years*	Qualifies Life-history characteristics available suggest that the species has slow growth, late maturity, long intervals between litters and high longevity. The population recovery from low abundance levels is likely to be long. This makes the species very sensitive.
5. Keystone species	Unknown *No information.*	Unknown No information.

6. Decline	Qualifies *ICES considers that the stock is depleted. Declines within the OSPAR Area are estimated conservatively as greater than 50% and are possibly greater than 80% across the whole population. Recent landings have been much lower than the Total Allowable Catch (TAC) available and* *declining landings may reflect an overall decline in stocks, particularly in the north. Declines in deep-water fisheries for C. coelolepis are also reported from elsewhere in its global range.*	Qualifies Steep declines have been reported in the last assessment for this species within the OSPAR Area, based on catch per unit effort (CPUE) data available for some ICES areas. Management measures have been adopted, including a 0-TAC in 2010 and regulations concerning fisheries with gillnets, entangling and trammel nets and deep-water trawl fisheries. Pressures and threats have declined but data are insufficient to evaluate either current population size or trends in relative abundance.

8.4 Update of priority actions and measures

Summary of key priority actions and measures which could be taken for Portuguese dogfish (*Centroscymnus coelolepis*) as formulated in the Background document (OSPAR 2010) and an update from WKSTATUS.

	From Background document (OSPAR 2010)*		WKSTATUS update
Key threats	Fisheries mortality (target and bycatch) in unsustainable deep-water fisheries		- There are no target fisheries and by-catch has been reduced due to the EU regulations and mitigation of by-catch; - In Union waters of Division 2.a and Subarea 4 and in all waters of Subareas 1 and 14, this species has been included in the EU prohibited species list since 2015. - A limited by-catch TAC for deep-water sharks was allowed for each of the years from 2017 to 2020, on a trial basis, in the directed artisanal deep-sea longline fisheries for black scabbardfish (Council regulation (EU) 2016/2285; Council regulation (EU) 2018/2025). - there has been increased monitoring (e.g. dedicated research surveys for deep-water species), though fishery-independent data are insufficient to evaluate either current population size, or recent trends in relative abundance. - Data are insufficient to examine the condition of the stock in the OSPAR Region. ICES advises that when the precautionary approach is applied, there should be zero catches in each of the years 2020–2023.
Other responsible authorities	- EC and Council of Fisheries Ministers (Common Fisheries Policy, Regulations, TACs) - OSPAR Contracting Parties - NEAFC and ICES		No change
Already protected?	EU: TAC, effort regulation and gill	- Grouped bycatch TACs for deep-water sharks are restrictive in some areas and will fall to near zero	In the EU, a 0-TAC for a list of deep-water sharks, including Portuguese dogfish, was adopted in 2010 with a 0 bycatch allowance introduced from 2012. See above for further details

Measures adequate?	net bans	(10 % of 2009 TAC) in 2010.	
		- An observer programme is in place for deep-water fisheries.	- Under the EU Data Collection Framework, there are observers in the longline fleet but discards are difficult to quantify given the features of the fishery. In Spain this is limited to the trawl fleet on the continental shelf and is not directed at deep-water fisheries.
		- Gill net bans do not cover all OSPAR areas and depths where mature and pregnant female deep-water sharks occur.	- Regulations 41/2007 and 2016/2336 prohibits the use of static nets or bottom trawling at depths ≥600 and ≥800 m, respectively - All the deep-water sharks are subject to 0-TAC advice under the deep-water TAC and quota regulation (EU2019/124). In the NEAFC Regulatory Area, the species is designated as Category 2, which mean that directed fisheries are not authorized and that bycatches should be minimized (NEAFC, 2016). However, the information available is not adequate to frame such measures at present. That effectively is a license to discard these species and being caught at such depths the likelihood of survival is very low. - - The existing legislation is not designed to mitigate by-catch. There is also an allowed limited by-catch in target fisheries for black scabbardfish fishery, for scientific purposes. However the amount of discarding is unknown.
		- Trawl fisheries are regulated through a fishing effort management programme.	- Regulations 41/2007 and 2016/2336 prohibits the use of static nets or bottom trawling at depths ≥600 and ≥800 m, respectively - Among the bycatch mitigation measures possible for this species in deep-water fisheries in place, it should be considered the possibility for gear-based technical measures to improve the selectivity. In addition, spatial management could be also be considered to minimise bycatch (e.g. avoidance of some fishing grounds or times of the year where the spatial overlap between the target species of the fisheries and deep-water shark species)
	NEAFC: gill net ban	- Covers all international waters below 200 m, thus protecting *C. coelolepis.*	Still in place.
	EU: species specific catch records	- The majority of Member States are not providing species-specific data for deep-water sharks.	For the years before 2005 it was not possible for all countries (except Portugal) to determine identity to species level and hence the landings used by the ICES Working Group Elasmobranch Fishes are of "siki" sharks. "Siki" landings are a mixed category comprising mainly *C. squamosus* and *C. coelolepis* but also including unknown quantities of other species. Landings estimates from 2005 onwards were revised following WKSHARKS2, and are presented by species (ICES, 2016)
Recommended Actions and Measures	OSPAR Commission	- Monitor information and advice of the ICES Working Group on Elasmobranch Fisheries and bring this to the attention of CPs.	Not for WKSTATUS to comment on

Contracting Parties	- Make identification guides available to industry and agencies to ensure that accurate species-specific catch records are collected.	Various national and regional training and identification materials have been developed (e.g. Seret, 2010; Ebert & Stehmann, 2013; Iglesias, 2014; http://www.vliz.be/en/harokit). WKSTATUS cannot comment on the uptake.
	- Support ICES and EC recommendations in the Council of Ministers and NEAFC.	Not for WKSTATUS to comment on
	- Improve observer coverage on deep-water fishing vessels.	EU Regulation 2016/2336 requires an at least 20 % on-board observer coverage of activities of bottom trawls and bottom set gillnets with a fishing authorisation to target deep-sea species. This applies in EU waters and to EU vessels in the NEAFC Regulatory Area. Data are missing in many areas because there is no more deep-water fisheries. WKSTATUS notes that an overview of 'unobserved' fisheries might be relevant. WKSTATUS notes that dedicated surveys, such as Palprof in the Basque country, might also be useful in providing the appropriate data.
Research needs	- Life history, biology, stock discrimination and trend data	The occurrence of all adult reproductive stages within the same geographical area and, in many cases, in similar proportions, suggests that this species is able to complete its life cycle within these areas. Newborns have been barely recorded, but with occasional occurrences in the NE Atlantic; the existence of undiscovered concentration areas of juveniles in the NE Atlantic may be hypothesized (Moura *et al*., 2014). Reproductive parameters available from several studies across the NE Atlantic and suggest a low productivity. These parameters were not updated since the last assessment. Portuguese dogfish has a slow growth rate and high longevity, similarly to other related species (Clarke *et al*. 2002; Irvine *et al.* 2006). For the NE Atlantic, the knowledge on deep-water shark species distribution and on their stock structure are deficient. Life-history and biological information is only available for some areas and that information should be updated. A major scientific investment is required to gain a full understanding of the spatial and temporal population dynamics that enables estimates of sustainable exploitation levels: i) increase of close monitoring of deep-water shark populations; ii) development of specific studies to assess the distribution patterns of species and estimate the spatial overlap with fisheries; iii) evaluation of the effect on the by catch of deep-water sharks of modifications in deep water fishing operations. (ICES, 2019).

*** Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.**

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9 Spotted ray

9.1 Species information

Spotted ray (*Raja montagui*) Fowler, 1910

Spotted ray *Raja montagui* is a small-bodied species of the family Rajidae. It is widespread in the North-east Atlantic, ranging from Morocco in the south to the Shetland Isles and Skagerrak in the northern North Sea, including the Mediterranean Sea (Ellis *et al.*, 2007). This species attains a maximum total length of ca. 75 cm and often occurs on sandy sediments in inshore coastal waters and shelf seas (Wheeler, 1978; Ellis *et al.*, 2005). Data for spotted ray may be confounded with the similar-looking blonde ray *R. brachyura*, and neonates may be misidentified with both *R. clavata* and *R. brachyura* (ICES. 2019b). Spotted ray is currently listed on the IUCN Red List as globally of 'Least Concern' and was also listed as 'Least Concern' on the European Red List (Nieto *et al.*, 2015).

The population of spotted ray has increased, given the increasing stock-size indicator in Regions II, III and IV, with recent years above the long-term average. Fisheries measures and species-specific data collection have improved. Measures to address selectivity and discard survival should be further developed. Whilst the distribution in Region II may still be low in Belgian waters, compared to historical data (but see Annex 2 for further information), spotted ray is more abundant further north. According to the stock size indicator in Region II, the species may not justify consideration as a declining species. Whilst there have been improvements to our biological understanding, knowledge of their life-cycle and population structure is incomplete.

Based on the above, WKSTATUS concludes that spotted ray does not justify inclusion in the OSPAR List.

See Chapters 9.2 for the Status Assessment, 9.3 for the overview of the Texel-Faial criteria and 9.4 for an update of priority actions and measures for this species. Extra information is available in Annex 2.

9.1.1 References

Ellis, J. R., Cruz-Martinez, A., Rackham, B. D. and Rogers, S. I. 2005. The distribution of chondrichthyan fishes around the British Isles and implications for conservation. Journal of Northwest Atlantic Fishery Science, 35, 195–213.

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Nieto, A. *et al.* 2015. European Red List of marine fishes. Luxembourg: Publications Office of the European Union, iv + 81 pp.

Wheeler, A. 1978. Key to the fishes of northern Europe. Frederick Warne, London; 380 pp.

9.2 Status assessment

	OSPAR Assessment – spotted ray *Raja montagui*
Sheet reference	BDC2020/Spotted ray
Area assessed	II, III, IV
Title	Spotted ray: 2020 status assessment
Key message 1 - direct data driven 2 – indirect data driven 3 – third party assessment close geographic match 4 – third party assessment partial geographic match 5 – expert judgement	The population of spotted ray has increased, given the increasing stock-size indicator in Regions II, III and IV with recent years above the long-term average. Fisheries measures and species-specific data collection have improved, although our understanding of the life-cycle and population structure is incomplete. Measures to address selectivity and discard survival should be further developed.

Key message	Region				
	I	II	III	IV	V
Distribution		←→[1]	←→[1]	←→[1]	
Population size (stock size indicator)		↑[1]	↑[1]	↑[1]	
Demographics, e.g. productivity		←→[1]	←→[2]	←→[1]	
Evidence and trend of status – stock size indicator		↑[1]	↑[1]	↑[1]	
Key pressure Excessive mortality (bycatch fisheries)		↓[1,2]	↓[1,2]	↓[1,2]	
Key pressure Habitat damage		?	?	?	
Evidence of threat or impact		↓[2]	↓[2]	↓[2]	

Background information 100 words	Spotted ray was first nominated for inclusion in the OSPAR List of threatened and/or declining species and habitats in 2001 and last assessed in 2010. The key criteria for listing were a decline, sensitivity and rarity within Belgian waters (Region II), where spotted ray was considered a common occurrence in the mid-1900s. Since then, the "severe" decline/scarcity had persisted only in the southern and eastern North Sea and eastern Channel (OSPAR 2010). Whilst elsewhere in the North Sea (Region II), and in other parts of the OSPAR Area, spotted ray had shown an increase in abundance.
Geographical range and distribution 100 words + map/infographic	Spotted ray is a small-bodied skate that is widely distributed in the Northeast Atlantic, ranging from Morocco in the south to the Shetland Isles and Skagerrak in the north, including the Mediterranean Sea (Ellis *et al.*, 2007). Within the North-eastern Atlantic (OSPAR Regions II, III and IV), it tends to occur in shelf seas at depths of 8 to 283 m (Ellis *et al.*, 2005), though it is most abundant in waters less than 100 m. Juveniles tend to occur closer inshore on sandy sediments, with adults common further offshore on sand and coarse sand-gravel substrates.

Figure 1. Distribution of spotted ray (*Raja montagui*). Source: IUCN (https://www.iucnredlist.org/species/63146/12623141).

Population / abundance

100 words + figures

ICES provides advice on fishing opportunities for five stocks of spotted ray: (1) ICES Subarea 4 and Divisions 3.a and 7.d (Region II); (2) Divisions 7.a,e-h, and (3) Subarea 6 and Divisions 7.b and 7.j (Region III); and (4)Subarea 8 and (5) Division 9.a (Region IV). An increasing stock size indicator is observed for OSPAR Region II (Figure 2a), since 2009. Stock size indicators are also increasing in recent years in OSPAR Regions III and IV.

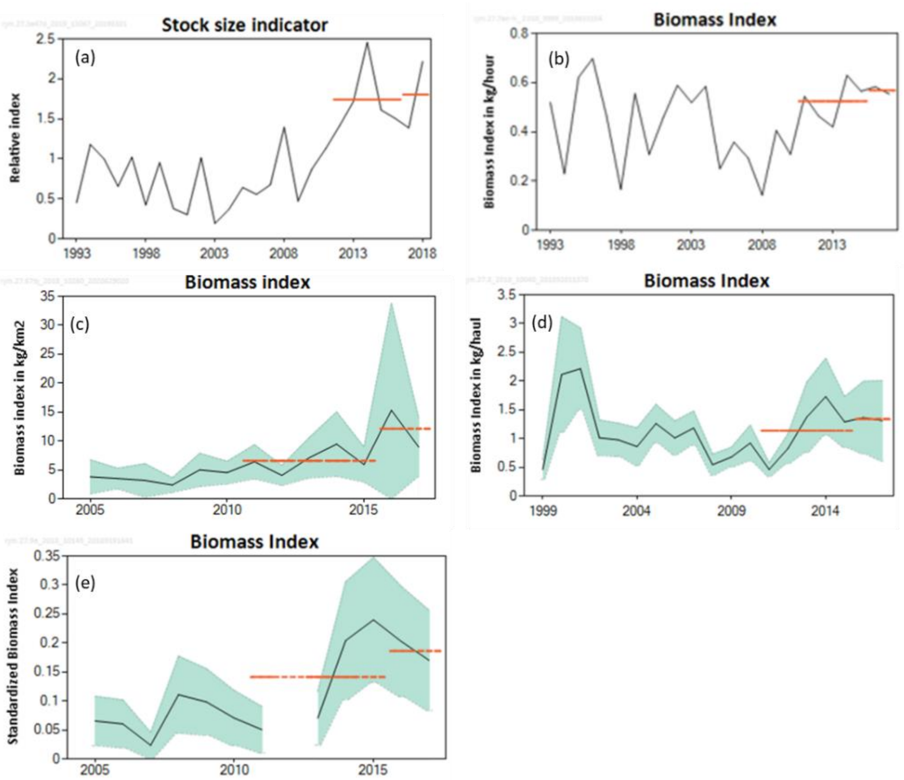

Figure 2. Stock-size indicator for (a) Area II; (b) Area III (Divisions 7a,e-h); (c) Area III (Subarea 6 and Divisions 7bj); (d) Area IV (Subarea 8) and (e) Area IV (Division 9a). Source: ICES (2018a–d) and ICES (2019a). Red lines indicate the mean of the stock size indicators for the periods 2012–2016 and 2017–2018 as used in the stock assessment.

Condition

100 words + figures

Length data of spotted ray in the North Sea, Skagerrak, Kattegat and eastern Channel derived from scientific surveys show there is no trend in average length over time, and relatively stable in terms of length range. Individuals up to the expected maximum length have been reported consistently over the time series. The length distribution of spotted ray obtained from a Portuguese survey in Division 9a is also relatively stable over the time-series (ICES, 2019b).

This species may be still confounded occasionally with blonde ray *R. brachyura*, including neonatal species identification with *R. clavata* and *R. brachyura* (ICES, 2019b).

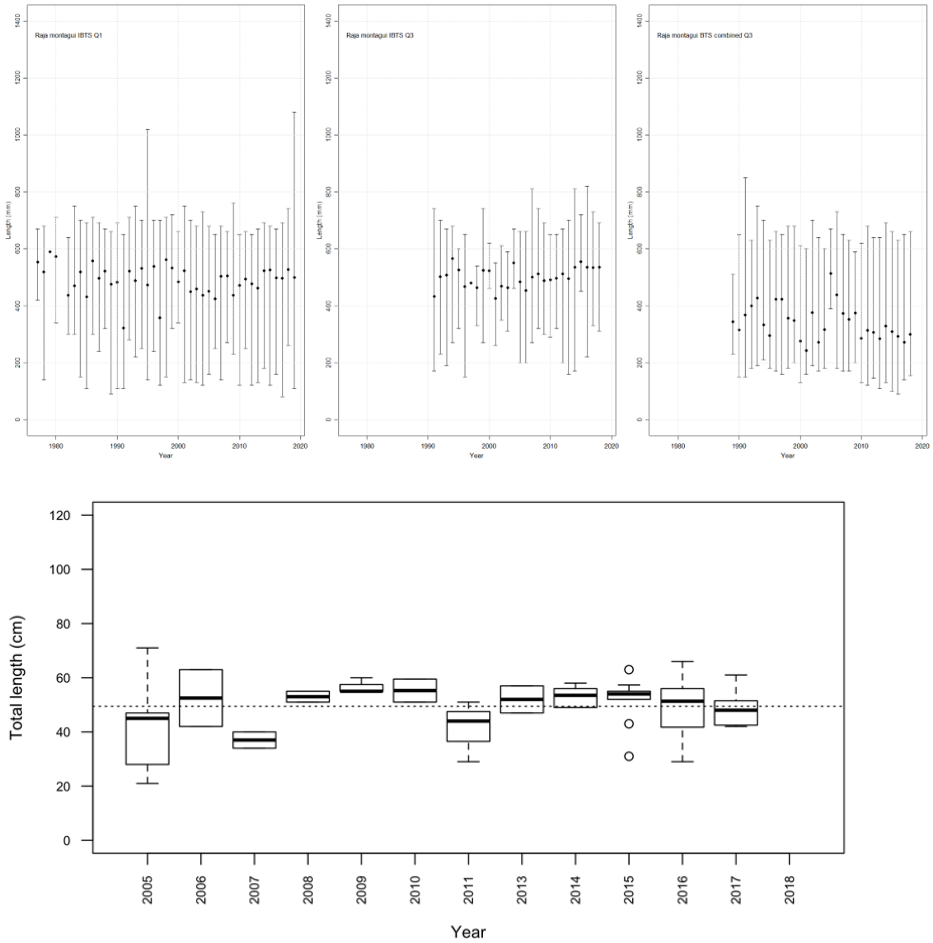

Figure 3. (top) average length (dots) and length range during the North Sea IBTS (Q1 and Q3) and BTS surveys for *Raja montagui* and (bottom) total length variation of *Raja montagui*, by year on PTGFS-WIBTS-Q4 (dashed line represents the mean annual length for 2005-2018). Source: ICES (2019b).

Threats and impacts 100 words	The main key threat identified in the last assessment was "fisheries mortality (primarily bycatch in commercial fisheries)". Habitat damage (e.g. mobile fishing gears, pollution, eutrophication) was considered but not evaluated (OSPAR 2010). Current impacts from fisheries have been limited by better management, i.e. the introduction of a Group-TAC for all skates and rays and a decrease in fishing effort, which started to go down in the Northeast Atlantic at the start of the century (e.g. Gascuel *et al*., 2016; Couce *et al.*, 2020; ICES, 2020). This overall decline in fishing pressure has likely had a positive effect on spotted ray populations.
Measure that address key pressures 100 words	Fishing pressure on spotted ray is currently regulated through a Group-TAC which includes all skate and ray species (except those listed as prohibited). The Group-TAC was introduced in 1999 in the North Sea (3.a and 4) and 2009 in the eastern English Channel (7.d) and other areas. Recent studies suggest variable at-vessel mortality and discard survival, depending on several factors (e.g. gear type, soaking time, fish size) (Ellis *et al.*, 2018; Serra-Pereira & Figueiredo, 2019; Schram and Molenaar, 2018). This by-caught small-bodied species may be less susceptible to fishing pressure than the large-bodied skates (e.g. Silva *et al.*, 2012), though further studies on discard survival are required.
Conclusion (incl. management considerations) 250 words	The stock-size indicators show an increasing trend in all Regions where the species is assessed, with Region II showing a more pronounced increase above the long-term average. Whilst the distribution in Region II may still be low in Belgian waters, compared to historical data, spotted ray is more abundant further north. According to the stock size indicator in Region II, the species does not justify consideration as a declining species. The IUCN assessment for spotted ray is 'Least Concern' (Nieto *et al. 2015*). Whilst there have been improvements to our biological understanding, knowledge of their life-cycle and population structure is incomplete. In conclusion, spotted ray does not continue justify inclusion in the OSPAR list.

	Management considerations: The group-TAC and requirement for species-specific reporting of landings has improved the management of skates and rays. In the coming years attention should be given to the species-specific differences in susceptibility to fishing pressure and a species-specific approach could be developed.
Knowledge gaps 100 words	Further research to examine gear selectivity and discard survival is required. Although there have been recent studies (e.g. Ellis *et al.*, 2005, 2012; AFBI, 2009; Serra-Pereira *et al.*, 2014) on ecologically important habitats for this species, spawning and nursery grounds are yet to be fully delineated. Therefore, lack of defined population structure may hamper the development of potential spatio-temporal management measures. Additional tagging programmes (conventional and electronic) and DNA analyses of spotted rays throughout its distribution range could be considered.
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	Schram, E., and Molenaar, P. 2018. Discards survival probabilities of flatfish and rays in North Sea pulse-trawl fisheries. Wageningen, Wageningen Marine Research (University & Research Centre). Wageningen, Wageningen Marine Research report C037/18. **:** 39 pp. Serra-Pereira, B., Erzini, K., Maia, C., and Figueiredo, I. 2014. Identification of potential Essential Fish Habitats for skates based on fisher's knowledge. Environmental Management, 53: 985–998. Serra-Pereira, B., and Figueiredo, I. 2019. Scientific evidences on discard survival of skates and rays (Rajidae) in Portuguese mainland waters (ICES division 27.9.a). Working Document to the Working Group on Elasmobranch Fishes (WGEF) meeting, 18-27th June 2019. 23 pp. Silva, J. F., Ellis, J. R., and Catchpole, T. L. 2012. Species composition of skates (Rajidae) in commercial fisheries around the British Isles, and their discarding patterns. Journal of Fish Biology, 80: 1678–1703.
Method used	The assessment is derived from a mix of OSPAR data and assessments from third parties: ICES Stock assessments; ICES WGEF; ICES Working Documents; OSPAR Assessment; IUCN; scientific literature. The assessment is based upon surveys and statistically robust estimates of stock size indicators, and expert opinion.

9.3 Overview of Texel-Faial criteria

Overview of the assessment by WKSTATUS of the Texel-Faial Criteria for the spotted ray *Raja montagui*.

Criterion	Initial assessment of spotted ray (*Raja montagui*) against the Texel-Faial criteria. From OSPAR Commission (2010)	Assessment by WKSTATUS
1. Global importance	Does not qualify *Widely distributed through the southern North Sea and adjacent shelf waters, including west coast of the British Isles, from Shetland to the southern North Sea, English Channel, off Spain and Portugal, and in the* *western Mediterranean*	Does not qualify
2. Regional importance	Does not qualify *No further information.*	Qualifies Discrete stocks have been identified in the OSPAR, as assessed by ICES. The current assessment has revised the Regions in which this species occurs to Regions II, III and IV. OSPAR (2010) previously considered Region V (coastal areas), but these are excluded here as the species has not been reported from the waters of the Azores and wider area (Santos *et al.,* 1997).
3. Rarity	Does not qualify *Rare in Belgium waters, but not in the whole OSPAR Area (Figures 2 and 3).*	Does not qualify This species is not considered rare, as it is abundant and widespread in OSPAR Regions II, III and IV.
4. Sensitivity	Qualifies *A relatively large (to 80cm), long-lived species with a low fecundity compared with teleosts, which is vulnerable to capture by bottom trawl fisheries. It is, however, smaller, more fecund and less sensitive than* *some other rays in the OSPAR Area (e.g. Thornback ray (R. clavata)).*	Qualifies WKSTATUS considers spotted ray to qualify as a sensitive species.
5. Keystone species	Unknown *No information.*	Does not qualify

		There is no evidence that the species has a controlling influence on the marine community.
6. Decline	Qualifies only in part of OSPAR range *The Spotted ray was proposed for the OSPAR list because it was considered to be a commonly occurring species in Belgian waters in the mid-1900s, but had declined severely since then and become very rare.* *This decline/scarcity has persisted only in the southern and eastern North Sea and eastern Channel. Its range and abundance has, however, reportedly increased significantly elsewhere in the North Sea* *(Region II), and in other parts of its range in the OSPAR Area.*	Does not qualify In OSPAR regions II, III and IV stock-size indicators show an increasing trend, with Region II showing a more pronounced increase above the long-term average. The main distribution of spotted ray in OSPAR Region II is in the western North Sea.

References:

Santos, R. S., Porteiro, F. M., and Barreiros, J. P., 1997. Marine fishes of the Azores: annotated checklist and bibliography: a catalogue of the Azorean marine Ichthyodiversity. Universidade dos Açores.

9.4 Update of priority actions and measures

Summary of key priority actions and measures which could be taken for spotted ray (*Raja montagui*) as formulated in the Background document (OSPAR 2010) and an update from WKSTATUS.

	From Background document (OSPAR 2010)*		WKSTATUS update
Key threats	Fisheries mortality (primarily bycatch in commercial fisheries)		- Fishing pressure on *Raja montagui* is currently regulated through a Group-TAC which includes all skate and ray species (except those on the prohibited species list). The Group-TAC was introduced in 1999 in the North Sea (3.a and 4) and 2009 in the eastern English Channel (7.d) and all other areas. - The stock-size indicators show an increasing trend, in all Regions where the species is assessed, with Region II showing a more pronounced increase above the long-term average.
Other responsible authorities	EC and Council of Fisheries Ministers (Common Fisheries Policy, TACs) OSPAR Contracting Parties ICES (e.g. provision of advice on trends, assessment criteria and triggers) and other RFOs		No change
Already protected? Measures adequate?	EU: TAC and bycatch quotas	Becoming restrictive in some areas. Since larger skate species are preferentially retained and small Spotted rays are discarded, TACs may contribute to limiting capture rates.	The group-TAC and requirement for species-specific reporting of landings has improved the management of skates and rays. In the coming years attention should be given to the species-specific differences in susceptibility to fishing pressure and a species-specific approach could be developed.
	EU: species-specific catch records	Should increase data availability if identification is adequate and accurate records are provided.	Since 2009 it is mandatory to collect species-specific landing data.
	GB Sea Fisheries Committees	Minimum landing sizes protect this small-bodied species in some areas.	Existence of localised measures with minimum landing size (ca. 40 cm disc width) within some IFCA (Inshore Fisheries and Conservation Authorities) districts.
Recommended Actions and Measures	OSPAR Commission	Monitor information compiled by the ICES Working Group on Elasmobranch Fisheries.	Not for WKSTATUS to comment on
	Contracting Parties	Make identification guides available to industry and agencies to ensure that accurate species-specific catch records are collected (ICES is preparing an elasmobranch photoidentification key)	Various national and regional training and identification materials have been developed (e.g. Seret, 2010; Ebert & Stehmann, 2013; Iglesias, 2014; http://www.vliz.be/en/harokit). WKSTATUS cannot comment on the uptake.
		Support ICES and EC recommendations for fishery management measures in the Council of Ministers	Not for WKSTATUS to comment on
		Consider establishing closed areas for seasonal	Not for WKSTATUS to comment on

		aggregations or critical habitat.	
	Research needs	Life history and trend data;	Although there have been recent studies on life-history (e.g. McCully *et al.,* 2012; Pina-Rodrigues, 2012; Serra-Pereira, 2005) around the British Isles (Region II and III) and in Portuguese Iberian waters (Region IV), additional investigations could be considered. Measures to address selectivity and discard survival should be further developed.
		Location of critical habitats, particularly spawning and nursery grounds	Although there have been recent studies (e.g. Ellis *et al.*, 2005, 2012; AFBI, 2009; Serra-Pereira *et al.*, 2014) on ecologically important habitats for this species, spawning and nursery grounds are yet to be fully delineated. Therefore, lack of defined population structure may hamper the development of potential spatio-temporal management measures. Additional tagging programmes (conventional and electronic) and DNA analyses of spotted rays throughout its range could be considered.

*** Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.**

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10 Spurdog

10.1 Species information

Spurdog (*Squalus acanthias*) Linnaeus, 1758

Spurdog is a coastal shark in temperate and boreal waters of the Atlantic and Pacific Oceans, mainly in depths between 10 and 200 m (but has been recorded to depths of 900 m) (Compagno 1984, Fordham *et al*. 2016). Spurdog form schools based on size and/or sex (Burgess, 2002). The species matures late and has a very long reproductive cycle and is hence very vulnerable to overharvesting (e.g. Hammond and Ellis 2005, Albert *et al*. 2019, ICES 2019). The spurdog is an aplacental viviparous species with gestation lasting 18–22 months. The reproductive cycle takes almost two years, one of the longest gestation periods of any living vertebrate (Jones and Ugland 2001, Burgess 2002, NEFSC 2006). Females have a continuous asynchronous reproductive cycle and bear 1-15 pups (Burgess 2002, Stehlik 2007).

There are some signals that the status of the Northeast Atlantic population is improving, but it is still at a low level, about 24% of virgin biomass. Recruitment does seem to be improving in the past 10 years. Spurdog is a prohibited species (with the exception of bycatch for approved avoidance programmes). WKSTATUS concludes that the species continues to justify inclusion in the OSPAR List.

See Chapters 10.2 for the Status Assessment, 10.3 for the overview of the Texel-Faial criteria and 10.4 for an update of priority actions and measures for this species. Extra information is available in Annex 2.

10.1.1 References

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10.2 Status assessment

	OSPAR Assessment – spurdog *Squalus acanthias*
Sheet reference	BDC2020/Spurdog
Area assessed	I, II, III, IV, V
Title	Spurdog: 2020 status assessment
Key message	Although the population is increasing, it is from a very low level. The current population is thought to be at 24% of virgin biomass. Spurdog is a prohibited species in EU waters, with the exception of a limited TAC for approved bycatch avoidance programmes.

Key message	Region				
	I	II	III	IV	V
Distribution	⟷[2]	⟷[2]	⟷[2]	⟷[2]	⟷[2]
Population size Stock assessment (ICES 2018)	?	↑[1]	↑[1]	↑[1]	↑[1]
Population size Survey index (ICES 2020)	⟷[1]	⟷[1]	⟷[1]	⟷[1]	?
Demographics, e.g. productivity	⟷[2]	⟷[2]	⟷[2]	⟷[2]	⟷[2]
Evidence of status	⟷[1]	⟷[1]	⟷[1]	⟷[1]	⟷[1]
Key pressure Fisheries -bycatch (no targeted fisheries)	⟷[1]	⟷[1]	⟷[1]	⟷[1]	⟷[1]
Key pressure Habitat damage and pollution	?	?	?	?	?
Evidence of threat or impact	⟷[1]	⟷[1]	⟷[1]	⟷[1]	⟷[1]

Background information 100 words	Spurdog was nominated for inclusion on the OSPAR List of Threatened and/or Declining Species and Habitats in 2006 and has been included since 2008 (OSPAR Agreement 2008-6). It was included according to the criteria sensitivity (very sensitive to fisheries because of its very low intrinsic rate of increase and is very slow to recover from depletion) and severe decline in all OSPAR Regions. The last assessment was carried out in 2010 (OSPAR 2010). The overall conclusion was that the species is seriously depleted by fisheries throughout the OSPAR Maritime Area.
Geographical range and distribution 100 words + map/infographic	Spurdog has a worldwide distribution in temperate and boreal waters. In the NE Atlantic, it is found from Iceland and the Barents Sea southwards to the coast of Northwest Africa (ICES, 2019). Tagging studies suggest a single NE Atlantic stock, although transatlantic migrations have occurred (ICES, 2019, Hammond and Ellis, 2005). Despite their wide-ranging behaviour, there seem to be resident and migratory individuals in a population, which could be attributed to mating-related migrations (Burgess, 2002, Thorburn *et al.,* 2015, Thorburn *et al*., 2018a). Genetic data from around the UK also shows connectivity throughout this

region, but some temporal variation in the Celtic Sea does suggest population segregation. There was also limited evidence that spurdog remain in kin groups (Thorburn *et al.,* 2018b).

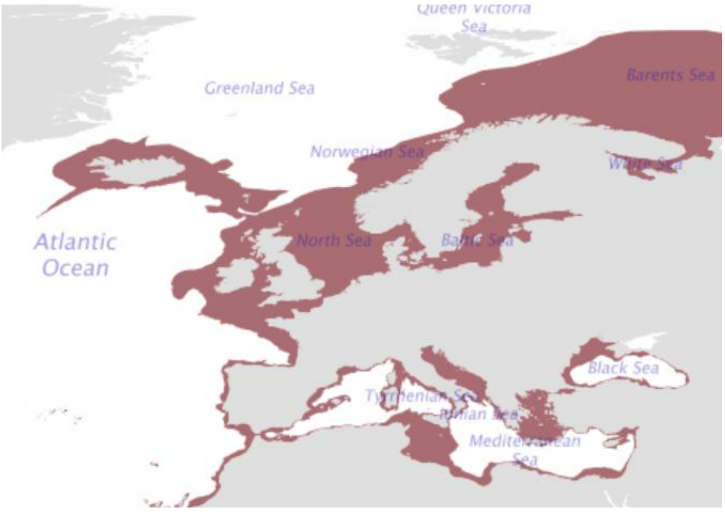

Figure 1. Distribution of spurdog Source: http://www.fao.org/figis/geoserver/factsheets/species.html?species=DGS-m&prj=4326

Population / abundance

100 words + figures

ICES currently carries out a Category 1 assessment for spurdog. ICES (2019) stated that "*All analyses presented in previous reports of WGEF have indicated that the NE Atlantic stock of spurdog declined over the second half of the 20th century, but now appears to be increasing. The current stock size is thought to be ca. 24% of virgin biomass. Although spurdog are less frequently caught in groundfish surveys than they were 20 years ago, there is some suggestion that spurdog are now being more frequently seen in survey hauls, and survey catch rates are starting to increase*".

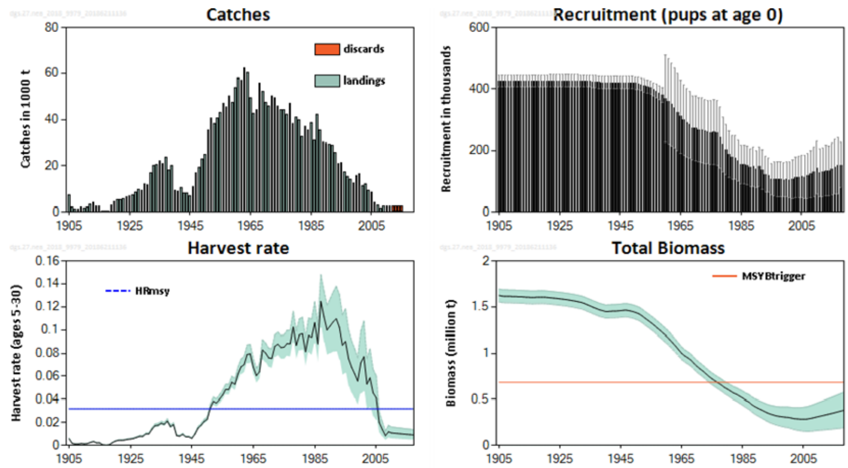

Figure 1 Spurdog in the Northeast Atlantic. Summary of the stock assessment. Long-term trends in catches (including assumed discards since 2010), mean harvest rate (average ages 5–30), recruitment (number of pups), and total biomass. Shaded areas in the bottom panels reflect estimates of precision (±2 standard deviation) and horizontal lines indicate the associated MSY reference points. The final-year recruitment estimate is provisional, taken from the estimated stock–recruit relationship.

Figure 2. Summary of the ICES assessment for spurdog (ICES, 2018)

The current IUCN listing for European waters is endangered (Nieto *et al.*, 2015).

Condition

100 words + figures

The most recent assessment of the species carried out by ICES in 2018, shows that both total biomass and recruitment show slight signs of recovery since 2003 (ICES, 2018).

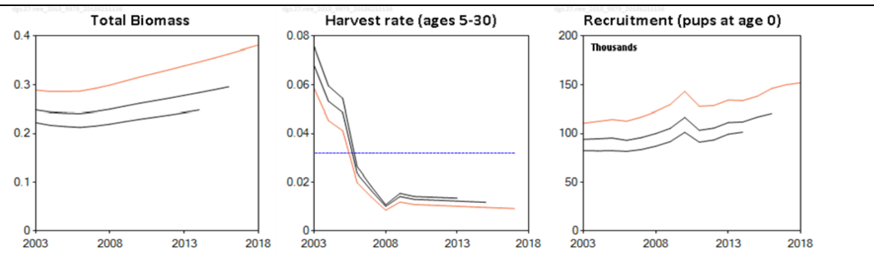

Figure 2 Spurdog in the Northeast Atlantic. Historical assessment results (final-year recruitment estimates are provisional, taken from the estimated stock–recruit relationship).

Figure 3: ICES spurdog assessment. Total biomass, harvest rates and recruitment. Historical assessment results (final-year recruitment estimates are provisional, taken from the estimated stock–recruit relationship). Orange line = 2018 estimates; estimates for 2016 and 2014 are shown in descending order (total biomass, recruitment) or increasing order (harvest rate). Blue dotted line = HR_{MSY}=0.032. Source: ICES (2018)

A recent study in Norwegian waters (parts of OSPAR Regions I and II) found that younger age groups are currently dominating the spawning stock, due to an increase in recruitment of "young adults". This indicates a much steeper increase in year-class strength for this series of year classes than estimated in the current ICES assessments, and, therefore, potential for a much swifter recovery of the spurdog stock (Albert *et al*. 2019).

Threats and impacts 100 words	Since 2011, target fisheries have been prohibited in EU and Norwegian waters. Bycatch still takes place, primarily in mixed demersal and gillnet fisheries, and there might be a call to relax the current restrictions in the future. Any future exploitation should be regulated under an appropriate management plan Discard survival rates are unknown but are likely variable. Habitat damage from mobile fishing gears or pollution is likely to occur. There are potential impacts on spurdog associated with habitat loss and degradation. Coastal development, pollution, dredging and bottom trawling affect coastal or benthic habitat on which spurdog or their prey rely (ASMFC 2002, Fordham *et al.* 2016).
Measure that address key pressures 100 words	Management measures for spurdog have only been restrictive across the stock area since 2009 and harvest rates have been below the MSY level since 2005 (ICES, 2019). In 2009, a maximum landing length (100 cm) was introduced in EU waters, which is thought to have deterred many of the fisheries targeting mature female spurdog. The TAC was reduced by 90% in 2010, and set to zero from 2011. Hence, there have been no targeted fisheries in EU waters since the last OSPAR assessment. In Norwegian waters, there has been a minimum landing size of 70 cm (introduced in 1964) and no directed fishing since 2011.
Conclusion (incl. management considerations) 250 words	There are some signals that the status of the NE Atlantic population is improving, but it is still at a low level, about 24% of virgin biomass. Recruitment appears to be improving in the past 10 years. Spurdog is a prohibited species (with the exception of bycatch for approved avoidance programmes). The species continues to justify inclusion in the OSPAR list. Management considerations: The ICES stock assessment has been proposed for a benchmark assessment in 2021. The current assessment model is considered suitable for the assessment; however additional surveys need to be included for it to cover the entire spatial component of the stock. It is also necessary to investigate the quality of available discard data to include in the assessment and to explore updated information on growth parameters and estimates of natural mortality. The estimation of reference points (e.g. B_{lim}, F_{lim}) should be explored. Little progress has been made with designating marine protected areas for aggregations and nursery grounds. The research carried out in Loch Etive (Thorburn *et al*, 2015) which showed a high level of site association for female spurdog may inform future work.
Knowledge gaps 100 words	There are concerns over the availability of robust input data used for the assessment (ICES, 2018). For example, reliable catch-data since 2010 are not available. Future assessments require updated and validated growth parameters and better estimates of natural mortality (ICES, 2018). There is also a lack of accurate data on the location of pupping and nursery grounds, and their importance to the stock, which precludes spatial management for this species at the present time. There is a lack of knowledge on effects of pollutants or habitat degradation on this species.
References	Albert, O. T., Junge, C., and Myrlund, M. K. 2019. Young mums are rebuilding the spurdog stock (*Squalus acanthias* L.) in Norwegian waters. ICES Journal of Marine Science.

	Atlantic States Marine Fisheries Commission (ASMFC). 2008. Management Report No. 46 of the Atlantic States Marine Fisheries Commission. 172p. Accessed online (August 2015): http://www.asmfc.org/uploads/file/interstateFMPforAtlanticCoastalSharks.pdf Burgess, G. H. 2002. Spiny Dogfish/ *Squalus acanthias* Linnaeus 1758. In: B.B. Collette BB, Klein-MacPhee G, editors, Fishes of the Gulf of Maine, 3rd ed. Washington: Smithsonian Institution Press, p. 54-57. De Oliveira, J. A. A., Ellis, J. R., and Dobby, H. 2013. Incorporating density dependence in pup production in a stock assessment of NE Atlantic spurdog *Squalus acanthias. ICES Journal of Marine Science*, 70: 1341–1353. Fordham, S., Fowler, S. L., Coelho, R. P., Goldman, K., and Francis, M. P. 2016. *Squalus acanthias*. The IUCN Red List of Threatened Species 2016: e.T91209505A2898271. http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T91209505A2898271.en Hammond, T. R., and Ellis, J. R. 2005. Bayesian assessment of Northeast Atlantic spurdog using a stock production model, with prior for intrinsic population growth rate set by demographic methods. *Journal of Northwest Atlantic Fishery Science*, 35: 299–308. ICES. 2018. Spurdog *Squalus acanthias* in the Northeast Atlantic. *In* Report of the ICES Advisory Com-mittee, 2018. ICES Advice 2019 *dgs.27.nea* https://doi.org/10.17895/ices.pub.4543 ICES. 2019. Working Group on Elasmobranch Fishes (WGEF). ICES Scientific Reports. 1:25. 964 pp. http://doi.org/10.17895/ices.pub.5594 Nieto, A. *et al.* 2015. European Red List of marine fishes. Luxembourg: Publications Office of the European Union, iv + 81 pp. OSPAR. 2010. Background Document for Spurdog or Spiny dogfish *Squalus acanthias.* OSPAR Commission, 17 pp. Thorburn, J., Neat, F., Bailey, D. M., Noble, L. R., and Jones, C.S. 2015. Winter residency and site association in the Critically Endangered North East Atlantic spurdog *Squalus acanthias*. Marine Ecology Progress Series. Vol. 526: 113–124. Thorburn, J., Dodd, J., and Neat, F. 2018a. Spatial ecology of flapper skate (*Dipturus intermedius – Dipturus batis* complex) and spurdog (Squalus acanthias) in relation to the Loch Sunart to the Sound of Jura Marine Protected Area and Loch Etive. Scottish Natural Heritage Research Report No. 1011. Thorburn, J., Jones, R., Neat, F., Pinto, C., Bendall, V., Hetherington, S., Bailey, D. M., Noble, L., and Jones, C. 2018b. ' Spatial versus temporal structure : implications of inter-haul variation and relatedness in the North East Atlantic Spurdog *Squalus acanthias* '. Aquatic Conservation: Marine and Freshwater Ecosystems 28 (5) pp1167-1180.
Method used	The assessment is derived from a mix of OSPAR data and assessments from third parties; ICES Stock assessments; ICES WGEF; ICES Working Documents; OSPAR Assessment; IUCN; scientific literature. The assessment is based upon the benchmarked ICES assessment, additional surveys and statistically robust estimates of stock size indicators, and expert opinion.

10.3 Overview of Texel-Faial criteria

Overview of the assessment by WKSTATUS of the Texel-Faial Criteria for the spurdog *Squalus acanthias.*

Criterion	**Initial assessment of spurdog (*Squalus acanthias*) against the Texel-Faial criteria. From OSPAR Commission (2010)**	**Assessment by WKSTATUS**
1. Global importance	Does not qualify *Widely distributed globally.*	Does not qualify The species is widely distributed globally.
2. Regional importance	Does not qualify *A single Northeast Atlantic stock of Spurdog is distributed from the north of the Bay of Biscay to the Norwegian Sea. The OSPAR area is of regional importance for this stock, but not for the species as a whole.*	Does not qualify No change
3. Rarity	Does not qualify *Not rare*	Does not qualify The species is not considered rare.

4. Sensitivity	Qualifies *Very sensitive to fisheries because of its very low intrinsic rate of increase. Is very slow to recover from depletion.*	Qualifies Spurdog is considered very sensitive to fisheries because of its very low intrinsic rate of increase. Is very slow to recover from depletion.
5. Keystone species	Unknown *No information.*	Unknown No information
6. Decline	Qualifies *Severely declined to about 5% of its original population.*	Qualifies Although recruitment seems to be improving, the population is still depleted. Although the population has increased since the previous OSPAR assessment, ICES (2018) estimates the current stock to be at 24% of virgin biomass. The current benchmarked assessment (De Oliveira *et al.,* 2013) indicated the stock to be not as depleted as an earlier, exploratory assessment (Hammond & Ellis, 2005).

10.4 Update of priority actions and measures

Summary of key priority actions and measures which could be taken for spurdog (*Squalus acanthias*) as formulated in the Background document (OSPAR 2010) and an update of information from WKSTATUS.

	From Background document (OSPAR 2010)*		WKSTATUS information update
Key threats	- Fisheries mortality (particularly by-catch) in unsustainable fisheries		Management measures have only been restrictive for the entire stock area since 2009 and harvest rates have been below the MSY level since 2005.
Other responsible authorities	EC and Council of Fisheries Ministers (Common Fisheries Policy, Regulations, TACs) NEAFC Contracting Parties OSPAR Contracting Parties ICES		No change
Already protected? Measures adequate?	EC Regulation No. 1185/2003 on the removal of shark fins on board fishing vessels	- Impact unlikely to be significant, since *S. acanthias* fins are of low value compared with the meat.	No information
	NEAFC Recommendation VIII (2008)	- Prohibition of fisheries within the NEAFC Regulatory Area (unlikely to reduce mortality of this shelf species)	No further information
	Total Allowable Catches and bycatch quotas	- TACs are restrictive and due to be reduced to near-zero in 2010	The TAC was reduced by 90% in 2010, and set to zero from 2011 onwards. There have been no targeted fisheries in EU and Norwegian waters since 2011.
	Minimum and maximum landing sizes	- Maximum landing size should protect the largest, most fecund mature females. Minimum landing size may not influence landings to the same extent, since small animals are often discarded. A slot size has been applied successfully	In 2009, a maximum landing length (100 cm) was introduced in EU waters, which is thought to have deterred many of the fisheries targeting mature female spurdog. Norway has a minimum landing size of 70 cm (first introduced in 1964),

		for the management of other fish species.	and from 2011 no directed fishery has been permitted in Norway.
	Appendix II of CMS	- A new listing. The Migratory Shark Instrument (Memorandum of Understanding and Action Plan) for listed species is not yet available, nor is there agreement whether this will apply to spurdog.	The northern hemisphere populations of spurdog are listed on Appendix II since 2008 of CMS, (this instrument indicates that international cooperation would benefit the management of the stock).
	Effort regulation	- Demersal fishing effort is increasingly regulated, which will reduce bycatch mortality	This has not been evaluated
Recommended Actions and Measures	OSPAR Commission	- Monitor information and advice of the ICES Working Group on Elasmobranch Fisheries and bring this to the attention of CPs.	Not for WKSTATUS to comment on
	Contracting Parties	- Adopt ICES advice. Support ICES and Commission recommendations in the Council of Ministers.	Not for WKSTATUS to comment on
		- Identify and protect critical habitats (for mature females and pups)	Not for WKSTATUS to comment on
	Research needs	- Life history and trend data; discard data and bycatch survival studies; natural mortality rates; growth parameters and other biological data	- There are concerns over the availability of robust input data used for the assessment (ICES, 2018). For example, reliable catch-data since 2010 are not available. Future assessments require updated and validated growth parameters and better estimates of natural mortality (ICES, 2018).
		- pupping and nursery grounds;	- There is a lack of accurate data on the location of pupping and nursery grounds, and their importance to the stock, which precludes spatial management for this species at the present time. Research carried out in Loch Etive (Thorburn *et al*, 2015) showed a high level of site association for female spurdog and this may inform future work in shelf sea habitats. Pregnant females were tagged in Norway and data analysis is ongoing (pers. comm., Junge).
		- modelling impact of maximum landing sizes upon stock recovery.	- Further work on size restrictions could usefully be undertaken to inform on any future management plan.

*** Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.**

References:

ICES. 2018. Spurdog *Squalus acanthias* in the Northeast Atlantic. *In* Report of the ICES Advisory Committee, 2018. ICES Advice 2019 *dgs.27.nea* https://doi.org/10.17895/ices.pub.4543

Thorburn, J., Neat, F., Bailey, D. M., Noble, L. R., and Jones, C.S. 2015. Winter residency and site association in the Critically Endangered North East Atlantic spurdog *Squalus acanthias*. Marine Ecology Progress Series. Vol. 526: 113–124.

11 Thornback ray

11.1 Species information

Thornback ray (*Raja clavata*) Linnaeus, 1758

The thornback is the most common skate species in the OSPAR area. It is also common in the Mediterranean Sea and the Black Sea. It occurs south of the OSPAR area along the northwest African coast around the Canary Islands and Madeira. Around the latter the occurrence of both *R. clavata* and the closely related *R. maderensis* have been confirmed, although the debate as to whether these form two species may not be closed (Ball *et al*., 2016; Last *et al*., 2016; Biscoito *et al*. 2018). Records further south down to South Africa may be misidentification of *R. straeleni*.

Thornback ray occurs from coastal waters including estuaries to offshore seabed down to at least 300 m. It is a medium-size bodied species which reaches a maximum length of about 1 m. ICES considers six assessments units of the species. The species also occur in areas where ICES had not defined a unit for thornback ray, including the Azores (Das & Afonso, 2017) where it is the main species in landings of Rajidae.

The thornback ray has shown an increase in stock-size indicator in the past 8 years in OSPAR Regions II and III. Fisheries measures and species-specific data collection have improved, although progress on understanding life-cycle and population structure is limited. Understanding how to increase avoidance, selectivity and survival should be further researched and measures to address these issues should be developed.

WKSTATUS concludes the species does not continue to justify inclusion in the OSPAR List according to the stock size indicators for Region II. It is noted, however, that there is still an incomplete understanding of the life-cycle and population structure, as recommended for further work by OSPAR. Moreover, the distribution within its range is still less than that reported from the 1960's.

See Chapters 11.2 for the Status Assessment, 11.3 for the overview of the Texel-Faial criteria and 11.4 for an update of priority actions and measures for this species. Extra information is available in Annex 2.

11.1.1 References

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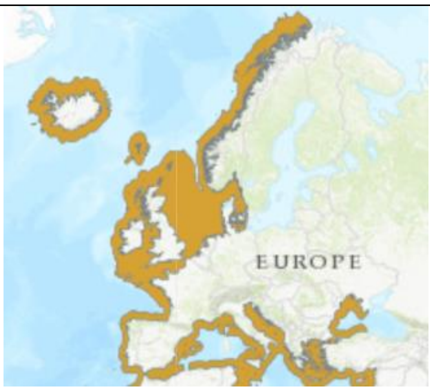
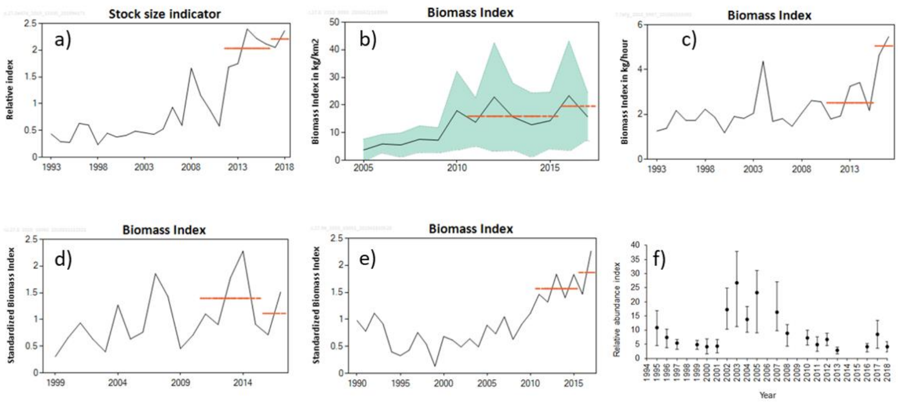
Last, P. R., White, W. T., de Carvalho, M. R., Séret, B., Stehmann, M. F. W., and Naylor, G. J. P. 2016. Rays of the world. CSIRO Publishing & Cornell University Press, Comstock Publishing Associates, vii + 790 pp.

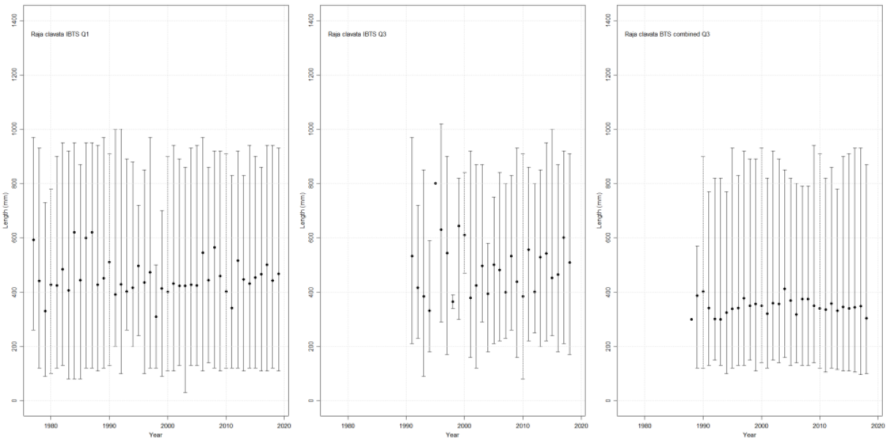
11.2 Status assessment

	OSPAR Assessment – thornback ray *Raja clavata*
Sheet reference	BDC2020/Thornback_ray
Area assessed	I, II, III, IV, V
Title	Thornback ray: OSPAR 2020 status assessment
Key message 1 - direct data driven 2 – indirect data driven 3 – third party assessment close geographic match 4 – third party assessment partial geographic match 5 – expert judgement	The population of thornback ray has increased, as evidenced by the increasing stock-size indicator over the past 8 years in OSPAR Regions II and III. Fisheries measures and species-specific data collection have improved, although progress on understanding life-cycle and population structure is limited. Understanding how to increase avoidance, selectivity and survival should be further researched and measures to address these issues should be developed. [61]

Key message	Region				
	I	II	III	IV	V
Distribution		←→[1]	←→[1]	←→[1]	←→[1]
Population size		?	?	?	?
Demographics, e.g. productivity		←→[1]	←→[1]	←→[1]	←→[1]
Evidence of status – stock size indicator (ICES, 2019a)		↑[1]	↑[1]	↑[1]	←→[1]
Key pressure : fishing pressure		↓[2]	↓[2]	↓[1,2]	?
Key pressure: Lack of management		↓[2]	↓[2]	↓[2]	↓[2]
Evidence of threat or impact		↓[2]	↓[1]	↓[1]	?

Background information 100 words max.	Thornback ray was nominated for inclusion on the OSPAR List of Threatened and/or Declining Species and Habitats in 2006 and has been included since 2008 (OSPAR Agreement 2008-6). The original evaluation against the Texel-Faial criteria listed sensitivity and decline in OSPAR Region II as reasons for listing. Although there were no population estimates, the abundance and range had declined. Owing to its life-history traits, the species has a moderate biological productivity. Therefore, sustainable fishing pressure is moderate and recovery from depletion is slow.
Geographical range and distribution 100 words + map	The species is distributed in shelf seas from Iceland to South Africa, including the Azores, Mediterranean and Black Seas, and it may extend into the western parts of the Baltic. It occurs on a variety of substrates, including mud, sand, shingle, gravel and rocky areas. It occurs in OSPAR Regions II, III and IV and V, and the southern limits of Region I. It is most abundant in coastal areas at 10–60 m depth (shallower in cold temperate waters, deeper in warmer waters), commonly recorded to 100 m, and occasionally to at least 300 m. Outer estuaries and large shallow bays (particularly the Wash and the Thames Estuary) are important spring/summer spawning grounds, nurseries and feeding areas (Wheeler 1969; Stehmann & Buerkel 1984; Ellis *et al*. 2005a; Hunter *et al*. 2006; Fricke *et al.* 2007; Wirtz *et al.* 2008.). [163]

	 Figure 1. Distribution of thornback ray. Note: The distribution also extends to the Azores, and the distribution around Iceland more restricted. Source: IUCN (https://www.iucnredlist.org/species/39399/103110667).
Population / abundance 100 words + figures	ICES assess and provide advice on fishing opportunities for seven stocks of *Raja clavata* in the ICES Area, namely (i) Subarea 4 and Divisions 3.a and 7.d (Region II); (ii) Subarea 6, (iii) Divisions 7.afg, and (iv) Division 7.e (Region III); (v) Subarea 8 and (vi) Division 9.a (Region IV); and (vii) Azores (Region V). Based on ICES advice the population of thornback ray are increasing in Regions II and III, either stable (Subarea 8) or increasing (Division 9.a) in Region IV (Subarea 8), whilst catch rates around the Azores (Region V) are stable at a low level.  Figure 2. Thornback ray stock-size indicator for (a) Area II (Subarea 4 and Divisions 3.a and 7.d); (b) Area III (Subarea 6); (c) Area III (Divisions 7afg); (d) Area IV (Subarea 8); (e) Area IV (Division 9a) and (f) Area V (Subarea 10). (Source: ICES (2018a–d) and ICES (2019a, b). Red lines indicate the mean of the stock size indicators for the periods 2012–2016 and 2017–2018 as used in the stock assessment.
Condition 100 words + figures	Length data of thornback ray in the North Sea, Skagerrak, Kattegat and eastern Channel derived from scientific surveys show there is no trend in average length over time, but relatively stable in terms of the overall length range observed, with no evidence of a decline in the maximum length observed each year.

	 Figure 3. Length data of thornback ray in the North Sea, Skagerrak, Kattegat and eastern Channel. Average length (dots) and length range during the North Sea IBTS (roundfish areas 1–7) and BTS surveys. Source: ICES (2019b). See Annex 2 for information on the Bay of Biscay
Threats and impacts 100 words	The rationale for including this species on the OSPAR list was because it had been depleted by fisheries in most of Region II, where the area of distribution had contracted significantly. There were lesser declines in other parts of the OSPAR Area. Current impacts from fisheries have been limited by better management, i.e. the introduction of a Group-TAC for all skates and rays and a decrease in fishing effort, which started to go down in the Northeast Atlantic at the start of the century (Fernandes and Cook, 2013; e.g. Gascuel et al., 2016; Couce et al., 2020; ICES, 2020). This overall decline in fishing pressure has likely had a positive effect on the thornback ray populations.
Measure that address key pressures 100 words	Fishing pressure on thornback ray is currently regulated through a Group-TAC which includes all skate and ray species (except those listed as prohibited). The Group-TAC was introduced in 1999 in the North Sea (3a and 4) and 2009 in the eastern English Channel (7d) and other areas. Studies on survivability in different metiers show that the thornback ray has a survivability of > 50% in the pulse trawl fishery (Schram and Molenaar, 2018) and > 90% in gillnets (Enever *et al*., 2009; Catchpole *et al*., 2017). Further studies on discard survival are required.
Conclusion including management consideration 250 words	The population size of thornback ray in Region II appears to be increasing in recent years, according to the stock-size indicator. It is also increasing, or is stable, in the other Regions. An analysis made by IFREMER in 2018 of the Texel-Faial criteria for this species led to the conclusion for the species no longer qualified for the criterion 'Decline' stating that "In the most recent ICES assessments, five out of the seven stock units had a stock-size indicator increasing for 10 years or more, for one (OSPAR Region V) there was no long-term trend but strong variations and a low level in recent years.." Conclusion: the species does not continue to justify inclusion in the OSPAR list according to the stock size in Region II. However, further understanding of the life-cycle and population structure as recommended by OSPAR is still required. Understanding how to increase avoidance, selectivity and survival should be further researched and measures to address these issues should be developed. Management considerations: Although the group-TAC and requirement for species-specific reporting of landings have improved the management of skates and rays, in the coming years attention should be given to the species-specific differences in susceptibility to fishing mortality and a species-specific approach should be developed.
Knowledge gaps 100 words	There is still a lack of knowledge on both the spawning and nursery areas (outside the Thames estuary and other UK coastal areas) and the population structure of the species which limits the development of spatio-temporal management measures. Tagging (electronic and conventional) programmes and DNA analyses of thornback rays throughout its range should be considered. Also existing survey data could provide information on the locations of nursery grounds and other juvenile habitats, which should be further investigated to identify sites where there are large numbers of 0-groups and where these life-history stages are found on a regular basis (ICES, 2019c). Understanding how to increase avoidance, selectivity and survival should be further researched and measures should be developed.
References	Catchpole, T., Wright, S., Bendall, V., Hetherington, S., Randall, P., Ross, E., Santos, A. R., Ellis, J., Depestele, J., and Neville, S. 2017. Ray Discard Survival: Enhancing evidence of the discard survival of ray species. CEFAS Report: 1-70.

Couce, E., Schratzberger, M., and Engelhard, G. H. 2020. Reconstructing three decades of total international trawling effort in the North Sea. Earth System Science Data, 12, 373–386. https://doi.org/10.5194/essd-12-373-2020.

Enever, R., Catchpole, T. L., Ellis, J. R. and Grant, A. 2009. The survival of skates (Rajidae) caught by demersal trawlers fishing in UK waters. Fish Res 97: 72-76

Hunter, E., Berry, F., Buckley, A. A., Stewart, C., and Metcalfe, J. D. 2004. Seasonal Migration of Thornback rays and Implications for Closure Management. CEFAS https://www.cefas.co.uk/publications/posters/31308.pdf

ICES. 2018a. Thornback ray (*Raja clavata*) in divisions 7.a, 7.f–g (Irish Sea, Bristol Channel, Celtic Sea North). In Report of the ICES Advisory Committee, 2018. ICES Advice 2018, rjm.27.7ae-h, https://doi.org/10.17895/ices.pub.4547.

ICES. 2018b. Thornback ray (*Raja clavata*) in Subarea 6 (West of Scotland)). In Report of the ICES Advisory Committee, 2018. ICES Advice 2018, rjm.27.67bj, https://doi.org/10.17895/ices.pub.4548.

ICES. 2018c. Thornback ray (*Raja clavata*) in Subarea 8 (Bay of Biscay). In Report of the ICES Advisory Committee, 2018. ICES Advice 2018, rjm.27.8, https://doi.org/10.17895/ices.pub.4557.

ICES. 2018d. Thornback ray (*Raja clavata*) in Division 9.a (Atlantic Iberian waters). In Report of the ICES Advisory Committee, 2018. ICES Advice 2018, rjm.27.9a, https://doi.org/10.17895/ices.pub.4558.

ICES. 2019a. Thornback ray (*Raja clavata*) in Subarea 4 and in divisions 3.a and 7.d (North Sea, Skagerrak, Kattegat, and eastern English Channel). *In* Report of the ICES Advisory Committee, 2019. ICES Advice 2019, rjc.27.3a47d, https://doi.org/10.17895/ices.advice.4836.

ICES 2019b. Working Group on Elasmobranch Fishes (WGEF). ICES Scientific Re-ports. 1:25. 964 pp. http://doi.org/10.17895/ices.pub.5594.

IFREMER. 2018 Assessment of thornback ray *Raja clavata* against Texel-Faial criteria. 12 pp.

Marandel, F., Lorance, P., and Trenkel, V. M. 2016. A Bayesian state-space model to estimate population biomass with catch and limited survey data: application to the thornback ray (*Raja clavata*) in the Bay of Biscay. Aquatic Living Resources 29(2).

Schram, E., and Molenaar, P. 2018. Discards survival probabilities of flatfish and rays in North Sea pulse-trawl fisheries. Wageningen, Wageningen Marine Research (University & Research Centre). Wageningen, Wageningen Marine Research report C037/18. **:** 39 pp.

Walker, N. D., Bird, C., Ribeiro Santos, A., McCully Phillips, S. R., and Ellis, J. R. 2018. Working Document to the ICES Working Group on Elasmobranch Fishes, Lisbon, 19–28 June 2018 Length-based indicators to assess the status of skates (Rajidae)

Method used	The assessment is derived from a mix of OSPAR data and assessments from third parties: ICES Stock assessments; ICES WGEF; OSPAR Assessment The assessment is based upon surveys, statistically robust estimates of stock size indicators and expert opinion.

11.3 Overview of Texel-Faial criteria

Overview of the assessment by WKSTATUS of the Texel-Faial Criteria for the thornback ray *Raja clavata.*

Criterion	**Initial assessment of thornback ray (*Raja clavata*) against the Texel-Faial criteria. From OSPAR Commission (2009)**	**Assessment by WKSTATUS**
1. Global importance	Does not qualify *Widely distributed outside the OSPAR Area in the East Atlantic and Mediterranean.*	Does not qualify It is most likely that at least half of the global population occurs in the OSPAR Maritime Area and the OSPAR area comprises several genetically distinct stocks. Therefore, when applying the Texel-Faial criteria the relevance of the species to OSPAR is high and its global importance cannot be ruled out.
2. Regional importance	Does not qualify	May qualify

	R. clavata is comprised of several distinct genetic stocks. There are some important centres of distribution and areas of essential habitat within the OSPAR Area, including the Wash, Thames Estuary and SoutheastEnglish Channel	Discrete stocks have been identified in the OSPAR, with these stocks all having clear areas where thornback ray is particularly abundant.
3. Rarity	Does not qualify *Nor rare.*	Does not qualify The species cannot be considered rare as it is widespread over several OSPAR Regions and remains one of the most abundant skate species in European shelf seas.
4. Sensitivity	Qualifies *Sensitive to very sensitive to depletion when fishing pressure is high because of its slow growth rates, relatively large size and tendency to form aggregations. Will be slow to recover from depletion.*	Qualifies The thornback ray is sensitive in relation to its slow growth rate and moderate fecundity (Walker and Hislop, 1998) which implies moderate biological productivity of populations.
5. Keystone species	Unknown *No information.*	Does not qualify There is no evidence that the species has a controlling influence on the marine community.
6. Decline	Qualifies *Patterns of decline in R. clavata vary across the OSPAR Maritime Area, where this is one of the most important species of skate and ray in commercial fisheries. Trends are difficult to determine in most areas, due* *to poor species identification and the amalgamation of all skates and rays in landings data. Declines are most marked in OSPAR Region II, where ICES considers R. clavata to be depleted following a long term reduction in abundance over the past century. Local abundance is still high in some areas, but the area occupied has recently contracted to only 44% of its* *extent in the 1980s.*	Does not qualify In OSPAR Regions II, III and IV there has been an increase in the stock-size indicator for the species in the past 8 years; in Region V the stock is stable at a low level.

11.4 Update of priority actions and measures

Summary of key priority actions and measures which could be taken for thornback ray (*Raja clavata*) as formulated in the Background document (OSPAR 2010) and an update from WKSTATUS.

	From Background document (OSPAR 2010)*		**WKSTATUS update**
Key threats	- Fisheries mortality (target and by-catch) in unsustainable fisheries, particularly those targeting aggregations		- Fisheries mortality reduced
Other responsible authorities	- EC and Council of Fisheries Ministers (Common Fisheries Policy, Regulations, TACs) - OSPAR Contracting Parties - ICES		- Unchanged
Already protected? Measures adequate?	EU: TAC, effort regulation	- TACs are restrictive in some areas, but until recently have been higher than scientific advice	- Fishing opportunities in line with ICES scientific advice
		- Demersal fishing effort is regulated	- Demersal fishing effort declined in OSPAR Regions II, III and IV

	EU: catch records	- Most States do not yet provide species-specific data for skates and rays.	- Since 2009 species-specific landing data mandatory
Recommended Actions and Measures	OSPAR Commission	- Monitor information and advice of the ICES Working Group on Elasmobranch Fisheries and bring this to the attention of CPs.	Not for WKSTATUS to comment on
	Contracting Parties	- Make identification guides available to industry and agencies to ensure that accurate species-specific catch records are collected.	Various national and regional training and identification materials have been developed (e.g. Seret, 2010; Ebert & Stehmann, 2013; Iglesias, 2014; http://www.vliz.be/en/harokit). WKSTATUS cannot comment on the uptake.
		- Support ICES and EC recommendations in the Council of Ministers	Not for WKSTATUS to comment on
	Research needs	- Life history and trend data, discard survival studies, modelling impact of maximum landing sizes upon stock recovery	- Trend data available from ICES stock assessments for all Regions - Discard survival studies ongoing in Regions II and III as part of temporary exemption for EU Landing Obligation

*** Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.**

References:

Ebert, D. A., and Stehmann, M. F. 2013. Sharks, batoids and chimaeras of the North Atlantic. FAO, Roma (Italia).

Iglésias, S.P. 2014. Handbook of the marine fishes of Europe and adjacent waters (A natural classification based on collection specimens, with DNA barcodes and standardized photographs), Volume I (Chondrichthyans and Cyclostomata), Provisional version 08 (available from ResearchGate, from http://iccanam.mnhn.fr/ and it is on the dedicate website for French on-board observer.)

Séret, B. 2010 Guide des requins, des raies et des chimères des pêches françaises. Direction de la Pêche Maritime et de l'Aquaculture, Paris. available at https://cites.org/sites/default/files/sharks_id_material/051_Seret2010-guideraies_requins_0.pdf (A field version, waterproof, is available to on-board observers)

12 White skate

12.1 Species information

White skate (*Rostroraja alba*) Lacepède, 1803

White skate is one of Europe's largest skates, reaching a maximum total length of 230 cm. The biology of this species in northern European seas is largely unknown, but white skate in the Mediterranean Sea start to mature at 110 cm (males) and 120 cm (females), and the length at 50% maturity is 119 cm (males) and 129 cm (females). It has been estimated that they may live for 35 years (Kadri *et al.*, 2014). Little is known about the preferred habitats of white skate in the OSPAR Area, but known areas of occurrence (present and historical) include the west coast of Ireland, western English Channel, Brittany and Portuguese coast.

The population of white skate is severely depleted. There is no information suggesting an improvement in the status of this stock since the last assessment. WKSTATUS concludes that the species continues to justify inclusion in the OSPAR List.

See Chapters 12.2 for the Status Assessment, 12.3 for the overview of the Texel-Faial criteria and 12.4 for an update of priority actions and measures for this species. Extra information is available in Annex 2.

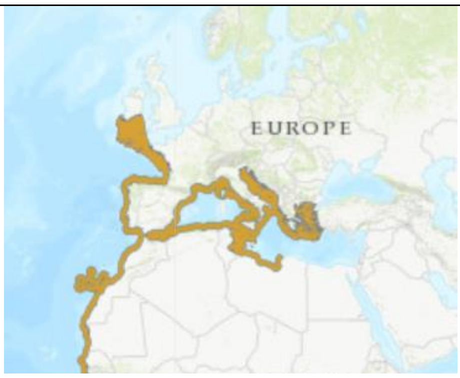
12.1.1 References

Kadri, H., Marouani, S., Bradai, M. N., Bouaïn, A., and Morize, E. 2014. Age, growth, mortality, longevity and reproductive biology of the white skate, *Rostroraja alba* (Chondrichthyes: Rajidae) of the Gulf of Gabès (Southern Tunisia, Central Mediterranean). *Turkish Journal of Fisheries and Aquatic Sciences*, *14:* 193-204.

12.2 Status assessment

<table>
<tr><th></th><th>OSPAR Assessment – white skate Rostroraja alba</th></tr>
<tr><td>Sheet reference</td><td>BDC2020/White_skate</td></tr>
<tr><td>Area assessed</td><td>II, III, IV, V</td></tr>
<tr><td>Title</td><td>White skate; OSPAR 2020 assessment</td></tr>
<tr><td>Key message
50 words

1 - direct data driven
2 – indirect data driven
3 – third party assessment close geographic match
4 – third party assessment partial geographic match
5 – expert judgement</td><td>The population of white skate is severely depleted. There is no information suggesting an improvement in the status of this stock since the last assessment.
<table>
<tr><td>Key message</td><td colspan="5">Region</td></tr>
<tr><td></td><td>I</td><td>II*</td><td>III</td><td>IV</td><td>V</td></tr>
<tr><td>Distribution</td><td></td><td>?</td><td>?</td><td>?</td><td></td></tr>
<tr><td>Population size</td><td></td><td>?</td><td>?</td><td>?</td><td></td></tr>
<tr><td>Demographics, e.g. productivity</td><td></td><td>?</td><td>?</td><td>?</td><td></td></tr>
<tr><td>Evidence of status</td><td></td><td>?</td><td>?</td><td>?</td><td></td></tr>
<tr><td>Key pressure
Excessive mortality</td><td></td><td>?</td><td>←→[2]</td><td>←→[2]</td><td></td></tr>
<tr><td>Key pressure
Habitat damage</td><td></td><td>?</td><td>?</td><td>?</td><td></td></tr>
<tr><td>Key pressure
Prey availability</td><td></td><td>?</td><td>?</td><td>?</td><td></td></tr>
<tr><td>Evidence of threat or impact</td><td></td><td>?</td><td>←→[2]</td><td>←→[2]</td><td></td></tr>
</table>
*The species is considered extirpated from the North Sea but is still present in the Channel (ICES, 2019)</td></tr>
<tr><td>Background information
100 words</td><td>The species was included on the OSPAR List of Threatened and/or Declining Species and Habitats in 2006. The original evaluation against the Texel-Faial criteria listed the criteria rarity, sensitivity and decline as reasons for listing. The last assessment was carried out in 2010 (OSPAR 2010). This data-limited species is perceived as threatened throughout the ICES area (and elsewhere in European waters), and ICES provides advice at the species level (ICES, 2019b).</td></tr>
<tr><td>Geographical range and distribution
100 words + map/infographic</td><td>White skate Rostroraja alba is distributed in the eastern Atlantic from the British Isles to southern Africa, including the Mediterranean Sea (Stehmann and Bürkel, 1984). As such, the species distribution includes OSPAR Regions III and IV, and the Channel part of Region II The stock structure within the overall distribution area is unknown.</td></tr>
</table>

	 Figure 1. Current distribution of white skate. Note: The distribution of white skate may also extend further north than indicated here. Source: IUCN (https://www.iucnredlist.org/species/61408/12473706).
Population / abundance 100 words + figure	This species has disappeared from most areas of former habitat in the Northeast Atlantic. There are very few recent, authenticated records of white skate in this area; these isolated records are from the English Channel, western Irish waters, and Portuguese waters. According to historical literature, it appears to have occurred more frequently in previous decades. ICES therefore considers this stock to be depleted (ICES, 2019a).
Condition 100 words + figure	Because of the low quantities encountered in surveys and fisheries samples, there is no biological information available.
Threats and impacts 100 words	The size of this large benthic skate renders it particularly susceptible to capture by fishing gears, which in combination with its life-history parameters and population demography allow little capacity for it to withstand exploitation by fisheries. This species is likely to be caught as bycatch to multispecies trawl fisheries which operate on much of the continental shelf and upper slope, coinciding with this species habitat (Dulvy *et al*., 2006). While it is prohibited to retain this species, it may not be reliably identified and discard survival is unknown. While habitat degradation and prey availability may have an effect on populations, their impacts are considered minor in comparison to that caused by fishing mortality.
Measure that address key pressures 100 words	White skate has been listed as a prohibited species since 2010 (EU, 2019) for EU waters in ICES subareas 6–10. This is a long-term conservation strategy aimed at very depleted and vulnerable species. There is an EU requirement that all discards of white skate in these subareas be recorded by commercial fishing vessels (Regulation (EU) 2015/812). ICES previously advised that it be retained on the prohibited species list. The species is listed as Critically Endangered on the IUCN Red List (Gibson *et al.*, 2008; Nieto *et al.,* 2015) and it is protected on the UK's Wildlife and Countryside Act.
Conclusion (incl. management considerations) 250 words	The most recent ICES advice described the stock development over time as follows - *this species has disappeared from most areas of former habitat in the Northeast Atlantic. There are very few recent, authenticated records of white skate in this area; these isolated records are from the English Channel, western Irish waters, and Portuguese waters. According to historical literature it appears to have occurred more frequently in previous decades. ICES therefore considers this stock to be depleted.* ICES, 2019a. The population of white skate is severely depleted. There is no information suggesting an improvement in the status of this stock since the last assessment. As there has been no improvement in the status of this stock since the last assessment (2010), it is concluded that the species continues to justify inclusion in the OSPAR List.
Knowledge gaps 100 words	Given the depleted nature of the stock, many fishers and sea-going staff are unfamiliar with this species. Moreover, white skate may be misidentified with other skates, such as large *Dipturus* species (e.g. *D. batis*, *D. intermedius* and *D. oxyrinchus*) and potentially shagreen ray *Leucoraja fullonica*. Improved identification and educational material should be developed and circulated to fishers, in order to aid in data collection and highlight the need for releasing prohibited species.
References	Das, D., and Afonso, P. 2017. Review of the diversity, ecology, and conservation of elasmobranchs in the Azores region, Mid-North Atlantic. *Frontiers in Marine Science*, *4*, 19 pp. Dulvy, N.K., Pasolini, P., Notarbartolo di Sciara, G. Serena, F., Tinti, F., Ungaro, N., Mancusi, C. & Ellis, J.E. 2006. *Rostroraja alba*. *The IUCN Red List of Threatened Species* 2006: e.T61408A12473706. https://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T61408A12473706.en

	Gibson, C., Valenti, S. V., Fordham, S. V. and Fowler, S. L. 2008. The Conservation of Northeast Atlantic Chondrichthyans. Report of the IUCN Shark Specialist Group Northeast Atlantic Red List Workshop; viii + 76 pp.ICES. 2019a. White skate (*Rostroraja alba*) in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters). *In* Report of the ICES Advisory Committee, 2019. ICES Advice 2019, rja.27.nea, https://doi.org/10.17895/ices.advice.4834. ICES. 2019b. Working Group on Elasmobranch Fishes (WGEF). ICES. Scientific Reports. 1:25. 964 pp. http://doi.org/10.17895/ices.pub.5594 OSPAR. 2010. Background Document for White skate *Rostroraja alba*.OSPAR Commission 17 pp. Kadri, H., Marouani, S., Bradai, M.N., Bouaïn, A., and Morize, E. 2014. Age, growth, mortality, longevity and reproductive biology of the white skate, *Rostroraja alba* (Chondrichthyes: Rajidae) of the Gulf of Gabès (Southern Tunisia, Central Mediterranean). *Turkish Journal of Fisheries and Aquatic Sciences*, 14*:* 193-204. Nieto, A. *et al.* 2015. European Red List of marine fishes. Luxembourg: Publications Office of the European Union, iv + 81 pp. Santos, R., Novoa-Pabon, A., Silva, H., and Pinho, M. 2020. Elasmobranch species richness, fisheries, abundance and size composition in the Azores archipelago (NE Atlantic). *Marine Biology Research*, *16*(2), pp.103-116. Sousa, I., Baeyaert, J., Gonçalves, J. M., and Erzini, K. 2019. Preliminary insights into the spatial ecology and movement patterns of a regionally critically endangered skate (*Rostroraja alba*) associated with a marine protected area. Marine and Freshwater Behaviour and Physiology, *52*: 283-299.
Method used	The assessment is derived from a mix of OSPAR data and assessments from third parties: ICES Stock assessments; ICES WGEF; OSPAR Assessment. This assessment is based mainly upon expert opinion with very limited data.

12.3 Overview of Texel-Faial criteria

Overview of the assessment by WKSTATUS of the Texel-Faial Criteria for the white skate *Rostroraja alba.*

Criterion	Initial assessment of white skate (*Rostroraja alba*) against the Texel-Faial criteria. From OSPAR Commission (2010)	Assessment by WKSTATUS
1. Global importance	Does not qualify *The historic distribution of this species includes OSPAR Regions II, III and IV, also recently recorded from V, southwards from the British Isles, but its global range includes the Mediterranean and much of the African coast.*	Does not qualify White skate is not considered to occur in Region V. White skate occurs on the shelf and upper slope, and is not considered to occur around the Azores.
2. Regional importance	Does not qualify *Rostroraja alba may have been of regional importance in the past, when it was reportedly abundant in a few localities (Irish Sea, English Channel, off Brittany). These have now been removed by target fisheries.*	Uncertain The rarity of this species prevents the assessment of regional importance.
3. Rarity	Qualifies *R. alba was formerly common from the British Isles and southwards. It is now absent from research vessel surveys and very rarely recorded in commercial catches.*	Qualifies *R.alba* has disappeared from most areas of former habitat in the Northeast Atlantic. There are very few recent, authenticated records of white skate in this area; these isolated records are from the English Channel, western Irish waters, and Portuguese waters. It is considered rare.
4. Sensitivity	Qualifies *This is a large, long-lived coastal, shelf and upper slope species with a low reproductive rate. Its age and very*	Qualifies

	large size at maturity means that all size classes are vulnerable to capture in demersal fisheries. Mortality of the large juveniles is high for many years before they reach maturity. Recovery of populations will be extremely slow even if fishing pressures are lifted.	The recovery referred to in the previous assessment cannot be shown. The species can still be considered very sensitive.
5. Keystone species	Unknown *No*	Unknown
6. Decline	Qualifies *R. alba was formerly sufficiently abundant in some coastal areas to support localised longline target fisheries in parts of its range. It has declined severely during the past 50 to 100 years around the British Isles, in the Irish Sea, and the Bay of Biscay. It is now absent from research vessel surveys, very rarely recorded in commercial catches, and very infrequent, if not locally extinct in most of its former shelf range. Marked declines have also occurred outside the OSPAR Area, where data are available.*	Qualifies There has been a decline in the population of this species. There is a near-absence of *R. alba* in recent data sources (landings, surveys, observer programmes), sufficient to consider the species severely depleted and near-extirpated from various parts of OSPAR Regions II-IV.

12.4 Update of priority actions and measures

Summary of key priority actions and measures which could be taken for white skate (*Rostroraja alba*) as formulated in the Background document (OSPAR 2010) and an update from WKSTATUS.

	From Background document (OSPAR 2010)*	WKSTATUS update
Key threats	Fisheries mortality: By-catch in commercial fisheries Target fishing (if occurring – primarily sport angling and possibly obtaining specimens for aquaria)	White skate has been listed as a prohibited species in EU waters of ICES subareas 6–10 on annual EU fisheries regulations from 2009. - White skate is currently listed as a prohibited species on Regulation (EU) 2019/1241 for ICES subareas 6–10. - Regulation (EU) 2015/812 requires that all white skate caught and discarded should be reported. - White skate is listed on the UK Wildlife and Countryside Act (WCA), which gives legal protection against deliberate killing, taking or injuring. This would apply to recreational fisheries in UK coastal waters.
	Habitat deterioration (secondary threat)	While habitat degradation (and prey availability) may have an effect on populations, their impacts are considered minor (and negligible) in comparison to that caused by fishing mortality.
Other responsible authorities	EC and Council of Fisheries Ministers (Common Fisheries Policy, TACs) OSPAR Contracting Parties ICES (e.g. provision of advice on trends, assessment criteria and triggers) and other RFOs Council of Europe?	No change

Already protected? Measures adequate?	EU: Zero TAC and mandatory release (2009)	- Too recent to be able to assess impact. Must be extended into future years. Should not prohibit the participation of anglers in genuine tag and release research programmes;	Given the rarity of white skate, tag-and-release programmes (which may inadvertently result in recaptured specimens being retained by fishers) are not considered either practical or appropriate at the present time.
		- Supplement with national and EC species conservation measures	White skate has been listed as a prohibited species since 2009 (EU, 2019) in EU waters of ICES subareas 6–10. One range state (UK) has included white skate on national wildlife legislation (WCA) giving additional protection.
Recommended Actions and Measures	OSPAR Commission	- Communicate to the Commission the status of *R. alba* and its need for conservation under biodiversity instruments and the Community Plan of Action for Sharks; - Communicate to ICES and other scientific bodies the need for research and advice on distribution and habitat requirements.	Not for WKSTATUS to comment on
	Contracting Parties	- Consider how national and regional fisheries conservation and management measures, marine protected areas, and species/ biodiversity protection legislation may be used to improve the status of *R. alba* and take action to apply these, as appropriate	White skate is protected on the UK's Wildlife and Countryside Act. The species is still listed as Critically Endangered on the IUCN Red List (Gibson *et al.*, 2008; Nieto *et al.,* 2015).
		- Disseminate to commercial and sports fishers information on the threatened status of *R. alba* and the legal and voluntary measures that protect it and require captures to be released alive	No change but given the depleted nature of the stock, many fishers and seagoing staff are unfamiliar with this species. Improved identification and educational material should be developed and circulated to fishers, in order to aid in data collection and highlight the need for releasing prohibited species.
		- License tag and release programmes	Given the rarity of white skate, tag-and-release programmes in the OSPAR area (which may inadvertently result in recaptured specimens being retained by fishers) are not considered appropriate at the present time.
		- Assist industry to develop techniques and equipment to facilitate safe release of *R. alba* from commercial fishing gear.	No change
	Research needs	- Life history information;	Whilst there are only limited life-data available for white skate (e.g. Kadri *et al.*, 2014), the collection of contemporary life-history information is of lower priority than non-destructive surveys of refuge populations and former habitat to better evaluate current stock status and population trends (see below).

		- Location of surviving populations (including surveys of areas formerly supporting target fisheries) and critical mating and spawning habitats	Some former and recent sites of occurrence have been identified (e.g. Sousa *et al.*, 2019). Non-destructive surveys of such sites could usefully be conducted, including consideration of eDNA sampling of former sites in the first instance. This would inform on options for future monitoring. -Improved at-sea observer coverage of those fleets operating in areas with perceived greater potential of encountering white skate could be considered under national discard observer programmes.

*** Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.**

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Annex 1: List of participants

Name	Institute	Country (of institute)	Email
Thomas Barreau	Museum National d'Histoire Naturelle (MNHN), Station marine de Dinard	France	Thomas.barreau@mnhm.fr
Jurgen Batsleer	WMR Wageningen Marine Research	Netherlands	jurgen.batsleer@wur.nl
Gérard Biais	IFREMER L'Houmeau Station	France	gerard.biais@ifremer.fr
Cristina Cabello	IEO Instituto Español de Oceanografía, Centro Oceanográfico de Santander	Spain	cristina.cabello@ieo.es
Jim Ellis	CEFAS Centre for Environment, Fisheries and Aquaculture Science	UK	jim.ellis@cefas.co.uk
Graham Johnston	Marine Institute	Ireland	graham.johnston@marine.ie
Armelle Jung	Des Requins et des Hommes	France	armelle@desrequinsetdeshommes.org
Claudia Junge	IMR Institute of Marine Research	Norway	claudia.junge@hi.no
Pascal Lorance	IFREMER Nantes Centre	France	pascal.lorance@ifremer,fr
Inigo Martinez	ICES Secretariat	Denmark	inigo.martinez@ices.dk
Teresa Moura	IPMA Portuguese Institute for the Sea and the Atmosphere	Portugal	tmoura@ipma.pt
Joana Silva	CEFAS Centre for Environment, Fisheries and Aquaculture Science	UK	joana.silva@cefas.co.uk
James Thorburn	University of St Andrews	UK	jat21@st-andrews.ac.uk
Paddy Walker	Dutch Elasmobranch Society	Netherlands	walker@elasmobranch.nl

Annex 2: Species Background Information / audit trail

Background information/audit trail per species, supplementary to the status assessments in the main body of the report.

Angel shark

Audit trail	Extra information
Assessment methods	In 2008, ICES advised that angel shark should be given the strongest possible protection (ICES, 2008). ICES carries out an assessment and provides advice on angel shark *Squatina squatina* every four years (ICES, 2019a). Considering the depleted status of the stock, the 2019 advice stated "*ICES advises that when the precautionary approach is applied, there should be zero catches in each of the years 2020–2023"* (ICES 2019b). The status of angel shark is gauged primarily in relation to historical accounts (e.g. ICES, 2019a). There have been no data published since the 2008 Case Report (OSPAR Commission, 2008) and 2010 Background report (OSPAR Commission, 2010) to indicate that there have been further declines in either distribution or population size since then, although there is no direct evidence of population recovery either. There have, however, been several further reports highlighting the longer-term decline in the species in various parts of the species' geographic range, including sites both inside (e.g. Hiddink *et al.,* 2019; Shepherd *et al.,* 2019; Bom *et al.,* 2020) and outside of the OSPAR Convention Area. The paucity of records of angel sharks would indicates that angel shark is severely depleted and has not re-populated areas of former habitat in the OSPAR Area (ICES, 2019a). It is still considered to be severely depleted, and is listed as Critically Endangered by the IUCN (Morey *et al.*, 2019). However, there is no evidence to indicate further declines have occurred since protective measures in fisheries legislation were first introduced. There continue to be occasional authenticated records in the north-eastern Atlantic, including from around the coasts of the British Isles, indicating the species is still present in the OSPAR Area. The angel shark was first nominated in 2001, and the ICES Study Group on Elasmobranch Fishes reviewed the original nomination in 2002, noting "*SGEF felt that there is strong anecdotal evidence that this sensitive species has severely declined in the shelf waters of the OSPAR area*" (ICES, 2002). It was subsequently added to the 'Initial List of Threatened and/or Declining Species and Habitats in the OSPAR Maritime Area from 2008. The original evaluation against the Texel-Faial criteria listed rarity, sensitivity and decline, with the possibility of global and regional importance, as reasons for listing. The last assessment was in 2010 (OSPAR 2010).
Geographical range and distribution	Angel shark was historically distributed from the British Isles and southern Scandinavia southwards to North-west Africa, including the Mediterranean Sea (ICES, 2019a; Lawson *et al.,* 2020). As such the species distribution covers parts of ICES subareas 4 and 6–9, and OSPAR Regions II-IV. Stock structure is not known, but available data for this and other species of angel shark indicate high site specificity and possibly localized stocks. Mark–recapture data for *S. squatina* have shown that a high proportion of fish were recaptured from the original release location (Quigley, 2006), although occasional individuals can undertake longer-distance movements. The failure of former populations in the southern North Sea and parts of the English Channel to re-establish is also suggestive of limited mixing. Studies on other species of angel shark elsewhere in the world have also indicated that angel sharks show limited movements and limited mixing (e.g. Gaida, 1997; Garcia *et al.*, 2015). STECF (2003) noted that angel sharks "*should be managed on smallest possible spatial scale*".
Population / abundance	Given the longer-term decline of angel shark, there are insufficient contemporary data with which to determine either the population level, or recent trends in population size. Catches of angel shark are now rare, both in surveys and commercially. It is encountered rarely in trawl surveys, which may relate to the rarity of the species, as well as issues of gear selectivity and the limited overlap between surveys with the coastal distribution of the species (Shephard *et al.* 2019). Localised refuge populations do exist, including in OSPAR Region III (Cardigan Bay in Division 7.a and Tralee Bay in Division 7.j; Shephard *et al*., 2019)) and further south, although numbers are considered to have declined.

Angel shark is considered to be extirpated from the North Sea, although it may still occur in the English Channel part of OSPAR Region II.

The Irish angler tagging and specimen catch data have recently been combined with effort data from charter angling vessels to explore the apparent extirpation of this species from two former hotspots: Clew Bay and Tralee Bay. This study showed a decline close to zero, despite apparent stable or increasing angler effort (Shephard *et al*., 2019).

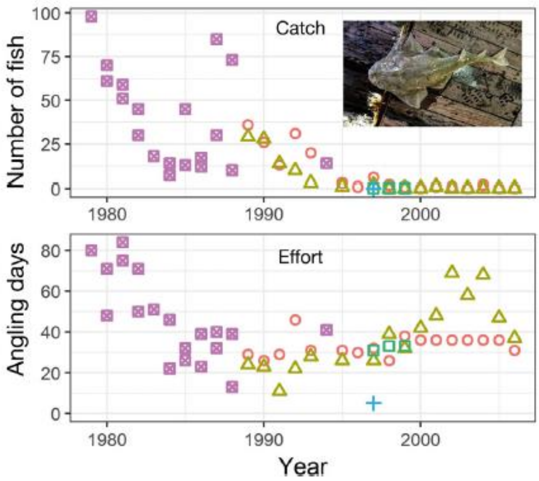

Fig. S1. Annual angling catch and effort data for angel shark being caught by charter vessels operating in Tralee Bay (Ireland). Colours of the data points refer to different charter vessels. Source: Shephard *et al.* (2019).

Condition

Angel shark is a large-bodied (>200 cm) demersal elasmobranch which produces few (<25) young over a biennial reproductive cycle. It favours inshore grounds, with females migrating inshore to give birth and having coastal nursery grounds. Their populations are thought to have limited connectivity. Hence, it is considered very sensitive to overfishing and localised depletion.

Whilst some life-history parameters are known for angel shark (e.g. Capapé *et al.*, 1990), the lack of recent records in the OSPAR Area means than changes in the condition of the stock (e.g. length/age composition; sex ratio) cannot be evaluated.

Threats and impacts

The key threats and impacts identified for angel shark were excessive mortality, habitat damage and prey availability (OSPAR Commission, 2010).

Excessive mortality is considered to be the main impact affecting angel shark. Excessive mortality may come from both commercial and recreational fisheries.

The current EU legislation, in which angel sharks are prohibited, means that targeted commercial fisheries for angel shark cannot be undertaken. Angel sharks are still an (occasional) bycatch in some trawl and setnet fisheries, and whilst such individuals should be released, discard survival is thought to be variable (Ellis *et al.,* 2017; ICES, 2019a). The prohibited listing on EU fishing regulations should reduce mortality in commercial fisheries in the OSPAR Area, as the distribution of angel shark in the OSPAR Area is mostly within EU waters. However, the full efficacy of the listing is uncertain, as it depends on the numbers of angel shark that are caught and the subsequent discard survival.

Regulation (EU) 2015/812 of the European Parliament and of the Council of 20 May 2015 (Article 7, 2 (c)) states that "*Masters of Union fishing vessels shall also record in their fishing logbook all estimated discards in volume for any species not subject to the landing obligation pursuant to Article 15(4) and (5) of Regulation (EU) No 1380/2013 of the European Parliament and of the Council*". The corresponding text in Regulation (EU) No. 1380/2013 of the European Parliament and of the Council of 11 December 2013 (Article 15(4)) states that "*The landing obligation referred to in paragraph 1 shall not apply to: (a) species in respect of which fishing is prohibited and which are identified as such in a Union legal act adopted in the area of the CFP*". Consequently, all catches and discards of angel shark should be reported.

Recreational fisheries (angling and spearfishing) can also result in mortality of angel sharks, depending on fisher behaviour and whether or not the species is protected under national legislation. Some Contracting Parties to OSPAR have protected angel shark, which should then confer legal protection from retention in recreational fisheries.

Habitat damage is a potential impact in some coastal areas, but has not been fully evaluated.

The current distribution of angel shark is severely diminished compared to the historical situation (Meyers *et al*., 2017; Shephard *et al*., 2019). The main known 'hot spot' for the species is around the

Canary Islands, and thus outside the OSPAR Convention Area (Meyers *et al*., 2017), although there are anecdotal reports that Tralee and Clew Bays and Cardigan Bay (Wales) are still potentially important to the species (Shephard *et al*., 2019).

Prey availability is likely a minor or negligible impact, as angel sharks predate on a range of flatfish and other demersal fish (e.g. Ellis *et al.,* 1996).

Table 2: Summary of key threats and impacts to Angel shark (*Squatina squatina*)

Type of impact	Cause of threat	Comment
Excessive mortality	Removal of all life stages through bycatch in fisheries	Fisheries mortality affects all life stages, from newborn to adult, and exceeds the natural rate of population increase for the species.
Habitat damage	Mobile fishing gears, pollution, eutrophication	Likely a minor impact compared with excessive mortality rates in fisheries.
Prey availability	Fisheries harvesting prey species	A minor impact compared with fisheries mortality.

Measures

There are several legal instruments to protect angel shark, the primary existing measure being that is a prohibited species under EU fisheries legislation.

Angel shark was also listed on the UK Wildlife and Countryside Act in 2008, which confers additional protection (e.g. in relation to recreational fisheries).

The distribution of angel shark extends to the Mediterranean Sea, Canary Islands and North-west Africa. It is a prohibited species in Mediterranean Sea, under recommendations from the GFCM.

Angel shark was listed on Appendices I and II of CMS on 2017. Contracting parties to CMS "*shall endeavour to provide immediate protection*" for species on Appendix I. Additionally, it was listed on Annex I of the CMS Sharks-MoU in 2018.

In recent years, the Angel Shark Conservation Network has been established, with regional Action Plans written or being developed, such as the Angel Shark Action Plan Canary Islands (Barker *et* al., 2016) and the Mediterranean Regional Action Plan (Gordon *et al.,* 2019). There is an ongoing project on angel sharks in Welsh waters.

There is an international network on angel shark conservation: www.angelsharkproject.com which is an umbrella for three initiatives: Angel Shark Project Wales; Angel Shark Project Canary Islands; and the Angel Shark Conservation Network

The Angel Shark Action Plan for the Canary Islands with the following goals:

Source Barker *et al*., 2016.

The Welsh project is aimed at public awareness, reporting sightings and encouraging anglers to return any catches of angel sharks unharmed, as well as highlighting the historical importance of the area for the species.

Knowledge gaps

For further information, please see the status assessment.

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Basking shark

Audit trail	Extra information
Assessment methods	For further information, please see the status assessment.
Geographical range and distribution	WGEF considers that the basking shark in the ICES area exists as a single stock and management unit. However, the WGEF is aware of recent tagging studies showing both transatlantic and transequatorial migrations, as well as migrations into tropical areas and mesopelagic depths (Braun *et al*., 2018; Gore *et al*., 2008; Skomal *et al*., 2009). Marked interannual and intra-annual variability of basking shark sightings have been reported, with significant correlation between the duration of the sightings season in each year and environmental/climatic factors like the North Atlantic Oscillation (Couto *et al*., 2017; Witt *et al*., 2012). A genetic study by Hoelzel *et al*. (2006) indicates no differentiation between ocean basins, whereas Noble *et al*. (2006) suggested little gene flow between the northern and southern hemisphere. The Irish and Celtic Seas are important areas and studies show important migration corridors for size sharks moving between NW Scotland, Isle of Man, SW England and western France (Berrow and Johnston, 2010 WGEF WD; Stéphan *et al.,* 2011, Lieber *et al*., 2019).

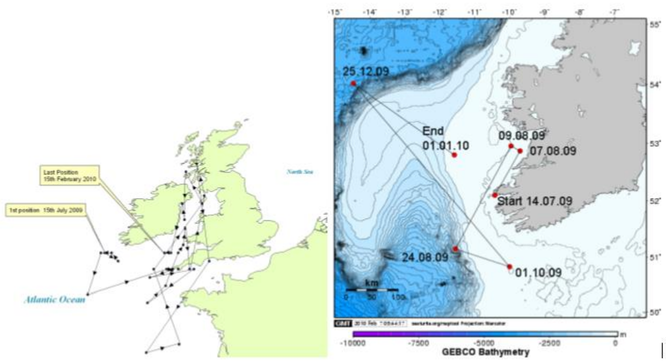

Figure 3/4 : Figure 7.6 Geo-locations from basking shark A (left, sex = male) and B (sex = unknown). Source: Berrow and Johnston (2010 WD).

Source: Basking Shark Stock Annex (ICES, 2019c)

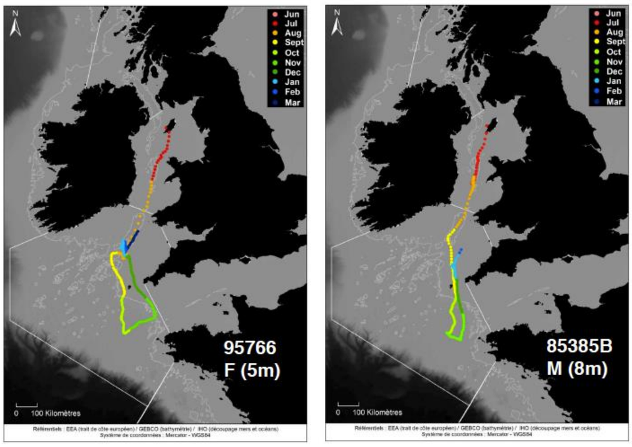

Figure 4/5 : Most probable track of basking sharks tagged off Isle of Man. Source: Stéphan *et al.*, 2011)

Population / abundance	There are two rough estimates of effective population size using genetics, one global, to take with caution, by Hoelzel *et al*. (2006) of 8200 and one for the Irish Sea of 382, which would suggest over 800 individuals frequenting Isle of Man waters at some point (Lieber *et al*. 2019). A recent study west of the UK, using photo identification (Gore *et al.,* 2016), showed very few re-sightings after one year (0.5%), and satellite tracking showed that basking shark show behavioural plasticity and that most individuals use only a small fraction of the time feeding in the surface (Gore *et al.,* 2016; Doherty *et al.*, 2017). These results are not conclusive for estimating population size as they could either point to a relatively large stock, and/or that the stock size may not be adequately traced by surface sightings.
Condition	For further information, please see the status assessment.
Threats and impacts	From OSPAR (2009) The main threat to basking sharks is accidental by-catch. Currently in the OSPAR maritime area, targeted fisheries are forbidden, but by-catches sometimes occur in set nets, trawls and through entanglement in pot lines. The magnitude of this threat is unknown due to lack of reporting. Considering its vertical movement, basking shark could be bycatch by a large range of fishing gear type. Accidental boat collisions are being increasingly reported and evident from scars on sharks. The increase of recreational boat traffic and wildlife watching may constitute indirect threats for basking sharks which may affect their behaviour in traditional feeding, pupping and breeding grounds. Anthropogenic pollution from land/riverine runoff and changing seawater temperature may induce a degradation in the basking shark's habitat by altering the composition and distribution of its primary food source, copepod zooplankton. Clearly there has been a shift in the timing and distribution of *Calanus* copepod community in the North Atlantic which may be affecting basking shark populations or distribution (Beaugrand *et al*., 2002). Basking sharks are also particularly in danger of ingesting plastics, especially macroplastics, similar to whales. There are recent records of small amounts of basking shark fins on Asian markets (Fields *et al*. 2017), but these may not be from OSPAR Regions.
Measures	International: ICES advice has been for a zero TAC since 2006 (ICES, 2019) Article 14 of Council Regulation (EU) 2019/124 prohibits Union fishing vessels from fishing for, retaining on board, transhipping, or landing basking shark in all waters. Article 50 of Council Regulation (EU) 2019/124 prohibits third-country vessels fishing for, retaining on board, transhipping, or landing basking shark from EU waters. Basking shark is listed as "Endangered" on the Red List of European marine fish (Nieto *et al.*, 2015) and on the Norwegian Red List (Sjøtun *et al.,* 2010). Basking shark was listed on Appendix II of the Convention on International Trade in Endangered Species (CITES) in 2002. Basking shark was listed on Appendices I and II of the Convention on the Conservation of Migratory Species (CMS) in 2005. Basking shark is listed on Annex I, Highly Migratory Species, of the UN Convention on the Law of the Sea (UNCLOS).

	In 2005, the North-East Atlantic Fisheries Commission (NEAFC) adopted its first ban on directed Basking Shark fisheries in the Convention Area. This measure has since been regularly renewed; the current ban, adopted in 2015, expires at the end of 2019 and will be reconsidered based on scientific advice (ICES 2019). The Basking Shark is listed on Appendix II of the Bern Convention for the Conservation of European Wildlife and Habitats. In 2012, the General Fisheries Commission for the Mediterranean (GFCM) banned retention and mandated careful release for the Basking Shark and 23 other elasmobranch species listed on the Barcelona Convention Annex II. Implementation by GFCM Parties, however, has been very slow. The practice of shark finning was forbidden in EU waters for all vessels fishing there and in all waters for vessels operating under the flag of an EU Member State in 2007. To close loopholes in the legislation and to facilitate monitoring and control of the ban, it was been reinforced in 2013 by a strict "fins-naturally-attached" policy (FNAP) through Regulation (EU) No 605/20134 (STECF, 2019). National: Based on ICES advice, Norway banned all directed fisheries and landing of basking shark in 2006 in the Norwegian Economical Zone and in ICES subareas 1–14. The ban has continued since. During this period, live specimens caught as bycatch had to be released immediately, although dead or dying specimens could be landed. Since 2012, bycatch that is not landed should also be reported, and landings of basking sharks are not remunerated. Bycatch should be reported both in number of individuals and weight (since 2009). Basking shark has been protected from killing, taking, disturbance, possession and sale in UK territorial (twelve nautical miles) waters since 1998. They are also protected in two UK Crown Dependencies: Isle of Man and Guernsey (Anon., 2002). Furthermore, in the UK Basking Sharks are protected under: Schedule 5 of the Wildlife and Countryside Act 1981; Countryside Rights of Way Act 2000; Wildlife (Northern Ireland) Order 1985; and Nature Conservation (Scotland) Act 2004 (https://www.sharktrust.org/basking-shark-conservation) Sweden has forbidden fishing for or landing basking shark since 2004. In recent years, a designated site for flapper skate (*Dipturus intermedius*) and one for basking shark (*Cetorhinus maximus*) have been established in waters off the West coast of Scotland (STECF 2019).
Knowledge gaps	For further information, please see the status assessment.
References	Anon. 2002. Convention on International Trade in Endangered Species (CITES), 2002. Inclusion of Basking Shark *Cetorhinus maximus* in Appendix II. Proponent: United Kingdom (on behalf of the Member States of the European Community). 12th Meeting of the Conference of Parties Proposal 36. Beaugrand, G., Reid, P. C., Ibanez, F., Lindley, J. A., and Edwards, M. 2002. Reorganisation of North Atlantic Marine Copepod Biodiversity and Climate. Science 296. 1692-1694. Berrow, S. D., and Johnston, E. 2010. Basking shark telemetry and tracking in Ireland. .Working Document for the ICES Elasmobranch Working Group (WGEF) 2010. Braun, C., Skomal, G., and Thorrold, S. 2018. Integrating archival tag data and a high-resolution oceanographic model to estimate basking shark (*Cetorhinus maximus*) movements in the western Atlantic. Frontiers in Marine Science, 5, p.25. Couto, A., Queiroz, N., Relvas, P., Baptista, M., Furtado, M., Castro, J., Nunes, M., Morikawa, H., and Rosa, R. 2017. Occurrence of basking shark *Cetorhinus maximus* in southern Portuguese waters: a two-decade survey. Marine Ecology Progress Series, 564, pp.77-86. Doherty, P. D., Baxter, J. M., Godley, B. J., Graham, R. T., Hall, G., Hall, J., Hawkes, L. A., Henderson, S. M., Johnson, L., Speedie, C., and Witt, M.J. 2019. Seasonal changes in basking shark vertical space use in the north-east Atlantic. Marine Biology, 166(10), p.129.Fields, A. T., Fischer, G. A., Shea, S. K. H., Zhang, H., Abercrombie, D. L., Feldheim, K.A., Babcock, E.A., and Chapman, D.D. (2017). Species composition of the international shark fin trade assessed through a retail-market survey in Hong Kong. *Conserv. Biol*. 32, 376–389. Henderson, S. M., Johnson, L., and Speedie, C. 2017. Long-term satellite tracking reveals variable seasonal migration strategies of basking sharks in the north-east Atlantic. Sci. Rep. 7, 42837; doi: 10.1038/srep42837 Gore, M., Rowat, D., Hall, J., Gell, F. R., and Ormond, R. F. 2008. Trans-Atlantic migration and deep midocean diving by basking shark. Biology Letters, 4: 395–398. Hoelzel, A. R., Shivji, M. S., Magnussen, J., and Francis, M. P. 2006. Low worldwide genetic diversity in the basking shark (*Cetorhinus maximus*). Biol. Lett. 2, 639–642 ICES. 2016. Report of the Workshop to compile and refine catch and landings of elasmobranchs (WKSHARK2), 19–22 January 2016, Lisbon, Portugal. ICES CM 2016/ACOM:40. 69 pp. https://doi.org/10.17895/ices.pub.5590.

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Scientific, Technical and Economic Committee for Fisheries (STECF). 2019. Review of the implementation of the shark finning regulation and assessment of the impact of the 2009 European Community Action Plan for the Conservation and Management of Sharks (STECF-19-17), Walker, P. and Pinto, C. editor(s), EUR 28359 EN, Publications Office of the European Union, Luxembourg, ISBN 978-92-76-11287-7 (online), doi:10.2760/487997 (online), JRC119051

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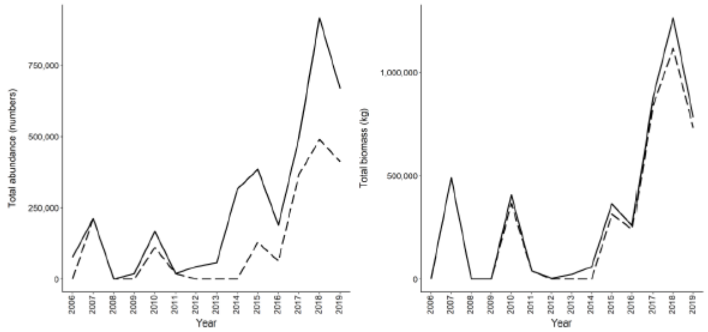
Common skate complex

Audit trail	Extra information
Assessment methods	A taxonomic revision of the common skate complex (Iglésias *et al*., 2010) highlighted that it was comprised of two species, provisionally renamed *D.* cf. *flossada* and *D.* cf. *intermedius*. This was confirmed in subsequent studies (Griffiths *et al.*, 2010). The current, accepted taxonomic names (Last *et al.*, 2016) are common blue skate *Dipturus batis* and flapper skate *Dipturus intermedius.* Earlier data ascribed to *D. batis* refers to the 'common skate complex', thus compromising the estimation of species-specific trends in abundance and distribution from earlier data. The earlier perceptions of both the stock complex (Dulvy *et* al., 2006; OSPAR Commission, 2010) and the two species (Nieto *et al.*, 2015) have been based largely on the documented contraction in geographical range (see below). Current fishery-independent trawl surveys provide the longest time-series of species-specific information (ICES, 2019a), although the inclusion of earlier data from longer-term surveys may require analyses to be undertaken for the complex, and taxonomic identification in some surveys can be variable. Whilst catch rates in the surveys are too low to provide a robust stock-size indicator (ICES, 2019b), the consistent occurrence of this species in North Sea trawl surveys (IBTS–Q1 and IBTS–Q3) in recent years, and catch rates of increasing from 0.005 n h^{-1} (1991–1998) to 0.054 n h^{-1} (2011–2018) are suggestive of the early stages of an improving stock status (ICES, 2019a). Similarly, there have also been recent increases in the *Dipturus batis* stock observed in the western Channel (Silva *et al.*, 2020). The approach in this study assumed that catchability would be 1 and selectivity would be consistent across size categories, and so these preliminary swept-area estimates should be regarded as indicative values rather than absolute values. Data from this study suggest that increasing numbers of common skate-complex have been caught in that part of the survey area covering ICES Division 7.e since 2014, although it is noted that the overall numbers

	caught in this part of the study area (which has the longest time-series) are generally low, and lower than encountered further offshore in the Celtic Sea (which has a more restricted time-series).  Figure 2: Preliminary swept-area estimates of abundance (numbers, left) and biomass (kg, right) for the common skate complex (mostly relating to *Dipturus batis*) in the south-west beam trawl survey (for those strata occurring in ICES Division 7.e only). The continuous line relates to all specimens and the dashed line relates to individuals ≥50 cm total length. Source: Silva *et al.* (2020). Whilst catch rates are low, the recent assessments by ICES (2019a; Silva *et al.,* 2020) indicate positive signs, although the increasing catch rates in some areas need to be viewed in the context of the longer-term declines in geographical extent over the wider area.
Geographical range and distribution	Historical data largely refer to the species-complex, with these data indicative of a longer-term decline in the distribution of the species complex, which was largely lost from large parts of the Irish Sea (Brander, 1981) and North Sea (Walker & Heessen, 1996; Walker & Hislop, 1998). The historical decline in geographical extent is one of the main factors informing on the perceived stock status (Dulvy *et al.*, 2006; OSPAR Commission, 2010). Given the updated taxonomic status, the distributions and stock boundaries of both species are uncertain (ICES, 2019a), particularly for those areas with limited recent survey coverage. Common blue skate appear to have the broader distribution, occurring in the Celtic Sea (where it is locally common and the dominant of the two species), with a distribution that extends northwards to the Rockall Bank and Iceland, and eastwards into the Channel (Griffiths *et al.*, 2010; Bendall *et al.,* 2018; Silva *et al.,* 2020). There have been some reported juvenile *D. batis* from the south-western North Sea and northern Bay of Biscay in recent years (Ellis, pers. comm., Barreau, pers. Comm.). As such, the distribution of *D. batis* includes OSPAR Regions I-V. Flapper skate is found primarily around the west coast of Ireland, Northern Ireland and Scotland (Griffiths *et al.*, 2018), where they are often found closer to land than in more offshore areas (Pinto *et al*., 2016), though the distribution extends southwards to at least the Celtic Sea (Bendall *et al.*, 2018). As such, the main distribution of *D. intermedius* is found in OSPAR Regions II-III. The distribution may also extend into parts of OSPAR Regions I, IV and V, but further studies to examine the distribution of this species are required. Indeed, the species-complex has been recorded at ca. 900 m depth (Hareide & Garnes, 2001). Some individual of flapper skate appear to undertake seasonal migrations from coastal waters to offshore areas of the shelf (Pinto *et al.*, 2016). Connectivity between coastal regions has also been shown for *D. intermedius* between southern and western Scotland, travelling a minimum of 100 miles over 10 days (Scottish Shark Tagging programme, unpublished data). Both species exhibit regional movements. *D. intermedius* tagged off the west coast of Scotland exhibited pronounced site fidelity to highly localised areas, suggesting that spatial management of such sea loch habitats may be effective (Wearmouth & Sims, 2009; Neat *et al.*, 2014; Thorburn *et al.,* 2018). *Dipturus batis* tagged in the Celtic Sea were observed to remain in the Celtic Sea and northernmost part of the Bay of Biscay (Bendall *et al.*, 2018).
Population / abundance	Both species are sampled in scientific trawl surveys. However, the survey designs (and gears) were not developed to inform on large-bodied skates, and so catch rates in many surveys can be low. Furthermore, although many of the on-going surveys now provide separate data for *D. intermedius* and *D. batis,* earlier data were reported (as "*D. batis"*) for what must be assumed to be the species-complex. There are, however, some positive signs in the catch rates of both species in various trawl surveys, as indicated in the assessment (see above).
Condition	There are currently insufficient data to assess longer-term changes in the condition (length composition or age structure) of the populations of either species.

Threats and impacts	The key threats identified for the common skate complex are fisheries mortality (including by-catch in commercial fisheries, and target fishing (e.g. recreational angling) and, secondarily, habitat deterioration (OSPAR Commission, 2010). The larger-bodied *D. intermedius* is regarded as more vulnerable to overfishing than common blue skate *D. batis,* given its larger body size. This larger body size could also imply a higher mortality rate to bycatch.
Measures	Both species of the common skate complex have been prohibited on EU Fisheries Regulations since 2009. Regulation (EU) 2015/812 of the European Parliament and of the Council of 20 May 2015 (Article 7, 2 (c)) states that "*Masters of Union fishing vessels shall also record in their fishing logbook all estimated discards in volume for any species not subject to the landing obligation pursuant to Article 15(4) and (5) of Regulation (EU) No 1380/2013 of the European Parliament and of the Council*". The corresponding text in Regulation (EU) No. 1380/2013 of the European Parliament and of the Council of 11 December 2013 (Article 15(4)) states that "*The landing obligation referred to in paragraph 1 shall not apply to: (a) species in respect of which fishing is prohibited and which are identified as such in a Union legal act adopted in the area of the CFP*". Consequently, EU fishing vessels should report all catches and discards of common skate complex in EU waters. There can be misidentifications between both listed species, Norwegian skate *D. nidarosiensis* and long-nosed skate *D. oxyrinchus.* All but the latter are listed as prohibited species over large parts of their distribution in EU waters. The recent increase in reported landings of long-nosed skate (ICES, 2019b), which occurred after the prohibition on landings the common skate complex, requires further study. It should also be noted that current regulations prohibit commercial landings from EU waters, and both species may have distributions that extend into international waters. Both species may also be taken in recreational fisheries, but these are not regulated throughout the species ranges. It is noted that Scotland's "The Sharks, Skates and Rays (Prohibition of Fishing, Trans-shipment and Landing) (Scotland) Order 2012" prohibits the landing of "Common skate *Dipturus batis*" when caught by rod-and-line.
Knowledge gaps	For further information, please see the status assessment.
References	Bendall, V. A., Nicholson, R., Hetherington, S., Wright, S., and Burt, G. 2018. Common skate survey of the Celtic Sea. Working Document to the ICES Working Group on Elasmobranch Fishes, Lisbon, June 19–28 2018; 26 pp. Brander, K. 1981. Disappearance of common skate *Raia batis* from the Irish Sea. Nature 290: 48-49. Dulvy, N. K., Notarbartolo di Sciara, G., Serena, F., Tinti, F. & Ungaro, N., Mancusi, C., and Ellis, J. 2006. *Dipturus batis*. The IUCN Red List of Threatened Species 2006: e.T39397A10198950. https://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T39397A10198950.en. Downloaded on 26 June 2020. EU. 2013. Regulation (EU) No. 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC. *Official Journal of the European Union*, L 354/22-61. EU. 2015. Regulation (EU) 2015/812 of the European Parliament and of the Council of 20 May 2015 amending Council Regulations (EC) No 850/98, (EC) No 2187/2005, (EC) No 1967/2006, (EC) No 1098/2007, (EC) No 254/2002, (EC) No 2347/2002 and (EC) No 1224/2009, and Regulations (EU) No 1379/2013 and (EU) No 1380/2013 of the European Parliament and of the Council, as regards the landing obligation, and repealing Council Regulation (EC) No 1434/98. *Official Journal of the European Union*, L 133/1-20. Griffiths, A. M., Sims, D. W., Cotterell, S. P., El Nagar, A., Ellis, J. R., Lynghammar, A., McHugh, M., Neat, F. C., Pade, N. G., Queiroz, N., Serra-Pereira, B., Rapp, T., Wearmouth, V. J., and Genner, M. J. 2010. Molecular markers reveal spatially segregated cryptic species in a critically endangered fish, the common skate (*Dipturus batis*). *Proceedings of the Royal Society B*, 277: 1497–1503. Hareide, N. R., and Garnes, G. 2001. The distribution and catch rates of deep water fish along the Mid-Atlantic Ridge from 43 to 61 N. *Fisheries Research*, 51: 297-310. ICES. 2019a. Working Group on Elasmobranch Fishes (WGEF). ICES Scientific Reports. 1:25. 964 pp. http://doi.org/10.17895/ices.pub.5594 ICES. 2019b Common skate complex (blue skate (*Dipturus batis*) and flapper skate (*Dipturus intermedius*) in Subarea 4 and Division 3.a (North Sea, Skagerrak and Kattegat). In Report of the ICES Advisory Committee, 2019. ICES Advice 2019, rjb.27.3a4, https://doi.org/10.17895/ices.advice.4835 Iglésias, S. P., Toulhoat, L., and Sellos, D. Y. 2010. Taxonomic confusion and market mislabelling of threatened skates: important consequences for their conservation status. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 20: 319–333. Last, P. R., White, W. T., de Carvalho, M. R., Séret, B., Stehmann, M. F. W., and Naylor, G. J. P. 2016. Rays of the world. CSIRO Publishing & Cornell University Press, Comstock Publishing Associates, vii + 790 pp.

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Gulper shark

Audit trail	**Extra information**
Assessment methods	*C. granulosus*, like other gulper shark species, are vulnerable to fisheries. Exploitation has resulted in rapid depletion of its population in the OSPAR Maritime Area. The conservation objective for this species should be to protect remaining portions of the stock in order to allow population recovery (OSPAR 2010).
Geographical range and distribution	For further information, please see the status assessment.
Population / abundance	For further information, please see the status assessment.
Condition	A relatively common, sometimes very abundant, deep-water dogfish with a widespread global range, although actual knowledge of its range still depends on definite resolution of taxonomy of the genus (Guallart *et al.*, 2015). It inhabits the upper continental slopes and outer continental shelf area. The gulper Shark is believed to have the lowest reproductive potential of all elasmobranch species (Guallart *et al.*, 2015) Biology is characterized by a late onset of maturity (12 to 16 years in females). Females can attain 166 cm and maturity is reached at 147 cm (Bañon *et al*., 2008). The species produce 1-6 pups per litter (Bañon *et al.*, 2008). This makes it extremely sensitive to overexploitation and population depletion.
Threats and impacts	The gulper shark was included in the OSPAR list due to the steep declines (80-95%) in CPUE based on data from the Portuguese target long line fishery within the main distribution range of this species (OSPAR 2010). The fishery has stopped in 2006 (ICES, 2006).
Measures	Since 2013 under NEAFC Recommendation 7 it was required that Contracting Parties prohibit vessels flying their flag in the Regulatory Area from directed fishing for 16 species and one genus of deep-sea sharks. The list includes the gulper shark. There has been a by-catch TAC for deep-water sharks in ICES Areas 5-9 and 10 since 2017. This corresponds to OSPAR Region V and most of Region III The species is in NEAFC Category 2. **Measures stipulating that directed fisheries are not authorised and that bycatches should be minimised.** This should apply to stocks for which the ICES advice statement is “no directed fishery, minimize bycatch” or similar, but for which no specific catch limit is advised (NEAFC, 2016).

Action/measures that OSPAR could take, subject to OSPAR agreement

It is proposed that OSPAR should encourage relevant Contracting Parties to OSPAR and NEAFC (those whose flag vessels are engaged in the deep-water fisheries that take *C. granulosus* and other threatened deep-water shark species) to adopt or support the adoption of ICES advice for deep-water sharks through:

• national, European and regional (NEAFC) fisheries conservation and management measures, including provisions within the Community Plan of Action on Sharks and prohibitions on target fishing, retention, landing and sale;

• the designation of offshore marine protected areas;

• national, European and international protected species legislation (including the Bern Convention on the Conservation of European Wildlife and Natural Habitats and Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora); and

• marine species and fisheries research.

These have been addressed in Chapter 5.4 of this report.

Management applicable for deep-water sharks (ICES, 2019).

The EU TACs that have been adopted for deep-sea sharks in European Community waters and international waters at different ICES subareas are summarized below.

Year	ICES subareas		
	5–9	10	12 (includes also *Deania histricosa* and *Deania profondorum*)
2005 and 2006	6763	14	243
2007	2472(1)	20	99
2008	1646(1)	20	49
2009	824(1)	10(1)	25(1)
2010	0(2)	0(2)	0(2)
2011	0(3)	0(3)	0(3)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	10(4)	10(4)	0
2018	10(4)	10(4)	0
2019	7(4)	7(4)	0
2020	7(4)	7(4)	0

(1) Bycatch only. No directed fisheries for deep-sea sharks are permitted.

(2) Bycatch of up to 10% of 2009 quotas is permitted.

(3) Bycatch of up to 3% of 2009 quotas is permitted.

(4) Exclusively for bycatch in longline fishery targeting black scabbardfish. No directed fishery shall be permitted.

The ICES Workshop on deep-water species (WKSHARK6) has an overview of management measures as follows: "All the deep-water sharks are subject to 0-TAC advice under the deep-water TAC and quota regulation (EU2019/124) or are prohibited from being fished by NEAFC. That effectively is a license to discard these species and being caught at such depths the likelihood of survival is very low. The existing legislation is not designed to mitigate by-catch. There is also an allowed limited by-catch in target fisheries for black scabbardfish fishery, for scientific purposes." (ICES, 2020).

WKSHARK6 notes that deep-water sharks may be taken in five broad gear types:

True deep-water fisheries in waters greater than 400 m depth, and/or targeting deep species

Bottom trawls

Longlines

Gillnets and tangle nets

True deep-water fisheries

Most of these deep-water sharks are only present in waters deeper than 500 m (Figure 1). Hence mitigation of bycatch is a concern only in dedicated deep-water fisheries or those operating in deep waters (e.g. some pelagic trawling).

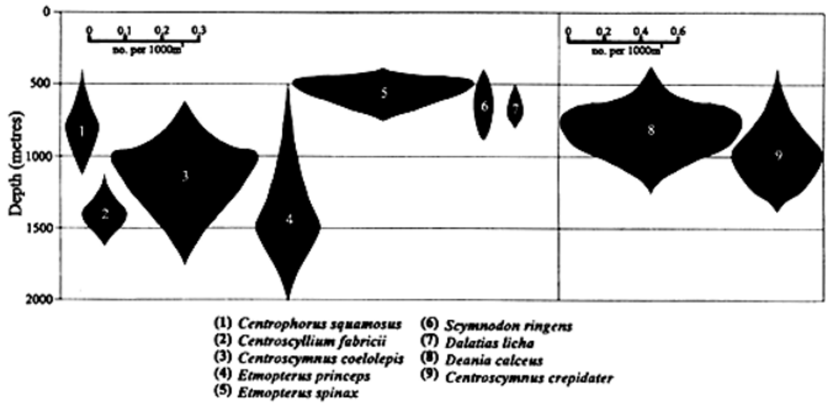

Figure 1. Distribution, by depth, of deepwater sharks in ICES Sub-area 6. This illustrates that for most species, waters shallower than 500 m are not of importance. The exception is *Etmopterus spinax*. Reproduced from Gordon (1999).

Various regulations restrict the use of the first 3 gear types above. Bottom trawling by EU vessels and in EU waters is banned in waters deeper than 800 m (Regulation 2016/2336), while gillnet and tangle net fisheries (by EU vessels and in EU waters) are banned in waters deeper than 600 m (Regulation 41/2007). A gillnet ban in waters deeper than 200 m is also in operation in the NEAFC regulatory Area (all international waters of the ICES Area). NEAFC also ordered the removal of all such nets from NEAFC waters by 1 February 2006.

Given these bans, the following gear types represent the main risk of by-catch:

Longlines in all areas

Bottom trawls in waters shallower than 800 m

Bottom trawls in all depths in the NEAFC Regulatory Area (NEAFC-West only because deep-water sharks are not widely distributed in NEAFC– Banana Hole and -Doughnut Hole)

Pelagic trawls operating in waters deeper than 600 m, especially when contacting the bottom.

Bycatch mitigation measures are difficult to implement for chondrichthyans since many species occur in a similar size range as the target species in mixed fisheries (exemptions include the greenland shark *Somniosus microcephalus*). Possible yet to be evaluated mitigation measures may be deterrent measures “triggering” electromagnetic senses of elasmobranchs (hook material, net material etc.), as well as acoustics and light-based technologies. Gear-based technical measures can be applied to improve the selectivity for sharks. For example, use of hooks at different depths, alternative hooks which and/or deployment of magnets on hooks, alternative mesh sizes and shapes, new materials, grids and escape windows to reduce bycatch. Novel grid panels designed to facilitate flatfishes (e.g. ‘Freshwind’ https://vimeo.com/channels/801304) may have potential to reduce some skates bycatches with similar body morphology. These measures should always be subjected to proper scientific evaluation, before they could be considered.

For deep-water sharks, spatial management could be considered to minimise bycatch. It might be necessary to trial new methodologies or to improve knowledge on where to best deploy fishing gears. The avoidance of some fishing grounds or time of the year where the spatial overlap between the target species of the fisheries and deep-water shark species could be also considered. However there is not adequate information on any deep-water shark to frame such measures at present.

Knowledge gaps — For further information, please see the status assessment.

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Bañón, R., Piñeiro, C., and Casas, M. (2008). Biological observations on the gulper shark *Centrophorus granulosus* (Chondrichthyes: Centrophoridae) off the coast of Galicia (north-western Spain, eastern Atlantic). Journal of the Marine Biological Association of the United Kingdom, 88(2), 411-414.

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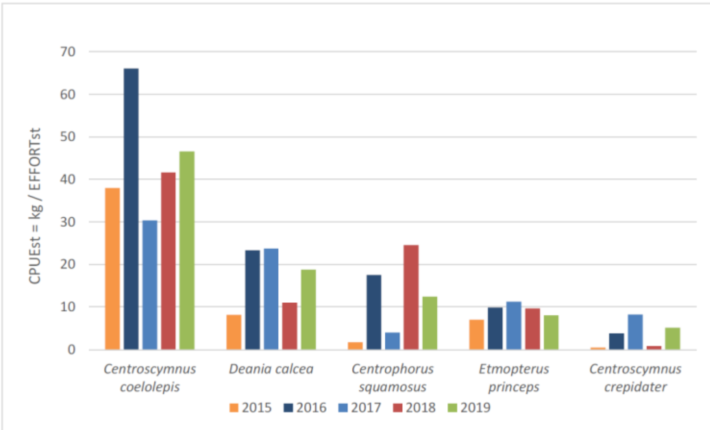
	ICES. 2020. Workshop on the distribution and bycatch management options of listed deep-sea shark species (WKSHARK6). ICES Scientific Reports. 2:76. 85 pp. http://doi.org/10.17895/ices.pub.7469 OSPAR. 2010. Background Document for Gulper shark *Centrophorus granulosus.* OSPAR Commission. 18 pp. NEAFC. 2016. The NEAFC approach to conservation and management of deep-sea species and categorization of deep-sea species/stocks. Adopted at the 35th Annual Meeting, November 2016. https://www.neafc.org/basictexts.OSPAR 2010

Leafscale gulper shark

Audit trail	Extra information
Assessment methods	For further information, please see the status assessment.
Geographical range and distribution	The species can be demersal on the continental slopes (at depths of 230–2400 m) or have a more pelagic behaviour, occurring in the upper 1250 m of oceanic areas with seafloor around 4000 m (Compagno and Niem, 1998). In the Rockall Trough they are found at low relative abundance at depths of 500 and 1800m, peaking in abundance around 800 m (Neat *et al.*, 2015).
Population / abundance	 Figure 1. Deep-water sharks – CPUE (kghook^{-1}min^{-1}) estimates of the each main deep-water shark species caught by year on PALPROF survey (2015-2019; from Diez *et al*., 2020). A recent longline survey in the Bay of Biscay – PALPROF- has been conducted annually (2015 -2019) with the main objective of estimating and assessing the inter-annual variation of the abundance and biomass indices of the deep-water sharks and other ichthyofauna. The CPUE values for *C. squamosus* were variable, but close to 20 kg hook^{-1} min^{-1} in 2016 and 2018 (Figure 1). Deep-water sharks were more frequent in the bottom sections of the gear (Diez *et al.*, 2020 WD). ICES, following the precautionary approach, has advised zero catches in each of the years 2020–2023, this advice did not change from previous 2015 advice. This stock is assessed under ICES framework for category 6 (ICES, 2012). According to this category and since no information on abundance or exploitation is available, ICES considers that a precautionary reduction of catches should be implemented unless there is ancillary information clearly indicating that the current level of exploitation is appropriate for the stock. Discarding is known to take place, but ICES cannot quantify the corresponding catch. Discard survival, which may occur, has also not been estimated (ICES, 2019a). Total landings have been reduced to low levels compared to the historical landings (ICES, 2019). Given the management measures currently in place for deep-water fisheries, it is likely that fishing effort has reduced. The only available survey data, from the Scottish deep-water survey, are currently not considered to be informative given the limited spatial and temporal coverage. A recently initiated longline survey in the Bay of Biscay will increase spatial survey coverage. The stock likely extends into the CECAF (Fishery Committee for the Eastern Central Atlantic) area, and data for this part of the stock are not available.

Condition

Available information suggests that this species is highly migratory (Clarke *et al*., 2001; 2002; Moura *et al*., 2014). In the NE Atlantic, the distribution pattern formerly assumed considered the existence of a large-scale migration, where females would give birth off the Madeira Archipelago, as there were reports of pregnant females (Severino *et al*., 2009) in that region. Geo-referenced data show that pregnant females also occur off Iceland, indicating another potentially important reproductive area in the northern part of the NE Atlantic (Moura *et al*., 2014). Juveniles are only caught rarely, which may be a consequence of their concentration in nurseries outside the sampling areas, movement to/occurrence in pelagic or deeper waters and/or due to gear selectivity (Moura *et al*., 2014). Segregation by sex, size and maturity seems to occur, likely linked to factors such as depth and temperature. Post-natal and mature females tend to occur in relatively shallower sites. Pregnant females are distributed in warmer waters compared to the remaining maturity stages, particularly immature females, which are usually found at greater depths and lower temperatures (Moura *et al*., 2014). Although based on a small sample size, tagging studies have observed movements from the Cantabrian Sea to the Porcupine Bank (Rodríguez-Cabello and Sánchez, 2014; Rodríguez-Cabello *et al*., 2016).

A total of nine leafscale gulper sharks were tagged with pop-up, satellite, archival, transmitting tags (PSAT) in the Marine Protected Area (MPA) of El Cachucho (LeDanois Bank) located in waters to the north of Spain (NE Atlantic) (Rodriguez-Cabello *et al.* 2016). Results suggest that the species moved both to the west (Galician waters) and to the north (Porcupine Bank). The inferred trajectories indicated that sharks alternate periods constrained to specific geographical regions with quick and prompt movements covering large distances. Two sharks made conspicuous diurnal vertical migrations being at shallower depths around midnight and at maximum depths at midday, while other sharks did not make vertical migrations. Vertical movements were done smoothly and independently of the fish swimming long-distances or resting in the area. Overall results confirm that this species is highly migratory, supporting speeds of 20 nautical miles/day and well capable to swim and make vertical migrations well above the abyssal plain.

Results from a molecular study, using six nuclear loci, did not reject the null hypothesis of genetic homogeneity among NE Atlantic collections (Verissimo *et al*., 2012). The same study showed that females are less dispersive than males and possibly philopatric. In fact, mature males of leafscale gulper shark were found to be more broadly distributed than mature females, also supporting the possibility of sex-biased dispersal in these species (Moura *et al*., 2014). In the absence of more clear information on stock identity, a single assessment unit of the Northeast Atlantic has been adopted.

Biological parameters of the species are presented in Table 1 for different geographical areas within the OSPAR area and Madeira Archipelago.

Table 1. Reproductive parameters of *C. squamosus* caught in different geographic areas in the NE ATlantic. The values presented in parentheses stands for the mean value. M, males; F, females; Geograph. Area, Geographical area; Max TL, Maximum total length sampled; Ov.Fec., ovarian fecundity; Ut.Fec., Uterine fecundity; Length mat., estimated length-at-maturity.

Geograph. Area	Sex	Max TL	Ov. Fec.	Ut. Fec.	Length mat.	Length-at-birth	Reference
West of British Isles	M	120			98		Girard and Du Buit (1999)
	F	140	7-11	---	124		
West of British Isles	M	---			102	---	Clarke et al. (2001),
	F	---	6-11 (8.1)	---	128		Clarke et al. (2003)
Galicia	M	121			101	38-40	Bañon et al. (2006)
	F	144	7-12 (9)	---	125		
Madeira Archipelago	M	118			---		
	F	146	2-10 (5.4)		95-100		
Portuguese cont. slope	M	122			99	440	Figueiredo et al. (2008)
	F	144	5-15	---	126		

Threats and impacts

By-catch mortality, whether discarded or utilised, poses a particular challenge for the management of deep-water sharks; these species cannot be returned alive following capture in many commercial fisheries. In 2010, the primary threats identified were target and utilised bycatch fisheries and ghost fishing from discarded nets. Given the management measures currently in place for deep-water fisheries, fishing effort has likely reduced.

Results from a study conducted with the Portuguese longline fishery targeting the black scabbardfish, indicated that in fishing grounds where black scabbardfish is more abundant and where fishing takes place, the relative occurrence of leafscale gulper shark is reduced, extending to deeper grounds where the fishery does not operate. These differences on the relative occurrence have implications for alternative management measures to be adopted in the deep-water longline black scabbardfish fishery, particularly in what concerns the minimization of deep-water shark bycatch (ICES, 2019).

Measures

Management applicable for deep-water sharks (ICES, 2019).

The EU TACs that have been adopted for deep-sea sharks in European Community waters and international waters at different ICES subareas are summarized below.

Year	ICES subareas		
	5–9	10	12 (includes also *Deania histricosa* and *Deania profondorum*)
2005 and 2006	6763	14	243
2007	2472(1)	20	99
2008	1646(1)	20	49
2009	824(1)	10(1)	25(1)
2010	0(2)	0(2)	0(2)
2011	0(3)	0(3)	0(3)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	10(4)	10(4)	0
2018	10(4)	10(4)	0
2019	7(4)	7(4)	0
2020	7(4)	7(4)	0

(1) Bycatch only. No directed fisheries for deep-sea sharks are permitted.

(2) Bycatch of up to 10% of 2009 quotas is permitted.

(3) Bycatch of up to 3% of 2009 quotas is permitted.

(4) Exclusively for bycatch in longline fishery targeting black scabbardfish. No directed fishery shall be permitted.

The ICES Workshop on deep-water species (WKSHARK6) has an overview of management measures as follows: "All the deep-water sharks are subject to 0-TAC advice under the deep-water TAC and quota regulation (EU2019/124) or are prohibited from being fished by NEAFC. That effectively is a license to discard these species and being caught at such depths the likelihood of survival is very low. The existing legislation is not designed to mitigate by-catch. There is also an allowed limited by-catch in target fisheries for black scabbardfish fishery, for scientific purposes." (ICES, 2020)

WKSHARK6 notes that deep-water sharks may be taken in five broad gear types:

True deep-water fisheries in waters greater than 400 m depth, and/or targeting deep species

Bottom trawls

Longlines

Gillnets and tangle nets

Non-deep-water fisheries with some interactions with deepsea species

Pelagic trawls when deployed at or near the bottom

Outer –shelf bottom fisheries for various species

True deep-water fisheries

Most of these deep-water sharks are only present in waters deeper than 500 m, and the Portuguese dogfish, in particular, is more frequent at depths >900 m. (Figure 1). Hence mitigation of bycatch is a concern only in dedicated deep-water fisheries operating in such deep waters.

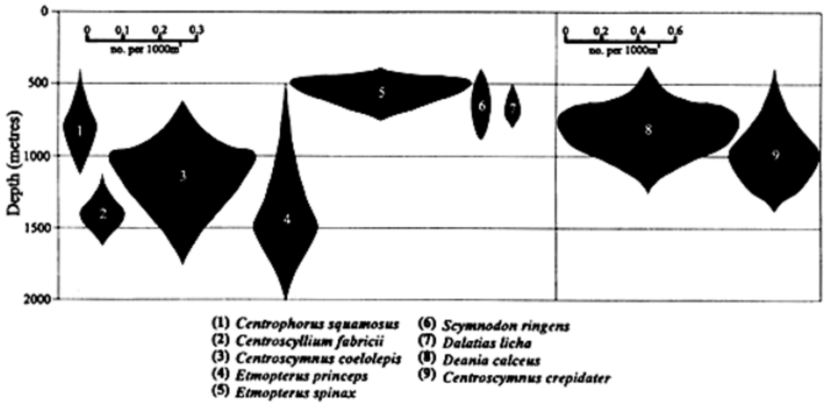


Figure 2. Distribution, by depth, of deep-water sharks in ICES Sub-area 6. This illustrates that for most species, waters shallower that 500 m are not of importance. The exception is *Etmopterus spinax*. In ICES 2020, reproduced from Gordon (1999).

Various regulations restrict the use of the first 3 gear types above. Bottom trawling by EU vessels and in EU waters is banned in waters deeper than 800 m (Regulation 2016/2336), while gillnet and tangle net fisheries (by EU vessels and in EU waters) are banned in waters deeper than 600 m (Regulation 41/2007). A gillnet ban in waters deeper than 200 m is also in operation in the NEAFC regulatory Area (all international waters of the ICES Area). NEAFC also ordered the removal of all such nets from NEAFC waters by 1 February 2006.

Given these bans, the following gear types represent the main risk of by-catch:

Longlines in all areas

Bottom trawls in waters shallower than 800 m

Bottom trawls in all depths in the NEAFC Regulatory Area (NEAFC-West only because deep-water sharks are not widely distributed in NEAFC– Banana Hole and -Doughnut Hole)

Pelagic trawls operating in waters deeper than 600 m, especially when contacting the bottom.

Bycatch mitigation measures are difficult to implement for chondrichthyans since many species occur in a similar size range as the target species in mixed fisheries (exemptions include the greenland shark *Somniosus microcephalus*). Possible yet to be evaluated mitigation measures may be deterrent measures “triggering” electromagnetic senses of elasmobranchs (hook material, net material etc.), as well as acoustics and light-based technologies. Gear-based technical measures can be applied to improve the selectivity for sharks. For example, use of hooks at different depths, alternative hooks which and/or deployment of magnets on hooks, alternative mesh sizes and shapes, new materials, grids and escape windows to reduce bycatch. Novel grid panels designed to facilitate flatfishes (e.g. ‘Freshwind’ https://vimeo.com/channels/801304) may have potential to reduce some skates bycatches with similar body morphology. These measures should always be subjected to proper scientific evaluation, before they could be considered.

For deep-water sharks, spatial management could be considered to minimise bycatch. It might be necessary to trial new methodologies or to improve knowledge on where to best deploy fishing gears. The avoidance of some fishing grounds or time of the year where the spatial overlap between the target species of the fisheries and deep-water shark species could be also considered. However there is not adequate information on any deep-water shark to frame such measures at present.

Knowledge gaps	For further information, please see the status assessment.
References	Diez, G., Arregi, L., Basterretxea, M., Cuende, E., and Oyarzabal, I. 2020. Abundance, biomass and CPUE of deep-water sharks through a five-year deep-water longline survey in the Bay of Biscay (ICES 8c). Working Document presented to the Working Group on Elasmobranch Fishes. 16th – 25th, June 2020. 9 p. Clarke, M. W., Connolly, P. L., and Bracken, J.J. 2001. Aspects of reproduction of the deep water sharks *Centroscymnus coelolepis and Centrophorus squamosus* from west of Ireland and Scotland. Journal of the Marine Biological Association of the United Kingdom, 81, 1019-1029.

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Rodríguez-Cabello, C., and Sánchez, F. 2014. Is *Centrophorus squamosus* a highly migratory deep-water shark?. Deep Sea Research Part I: Oceanographic Research Papers, 92, 1-10.Rodríguez-Cabello, C., González-Pola, C., and Sánchez, F. 2016. Migration and diving behavior of *Centrophorus squamosus* in the NE Atlantic. Combining electronic tagging and Argo hydrography to infer deep ocean trajectories. Deep Sea Research Part I: Oceanographic Research Papers, 115, 48-62.

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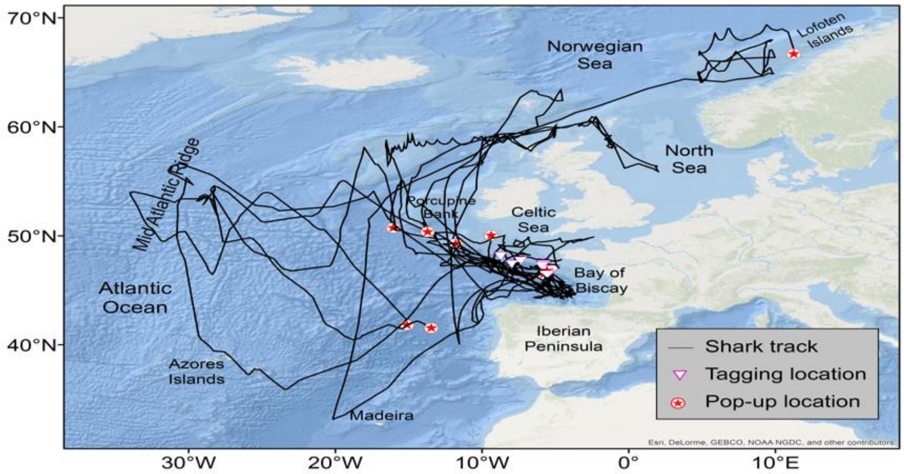
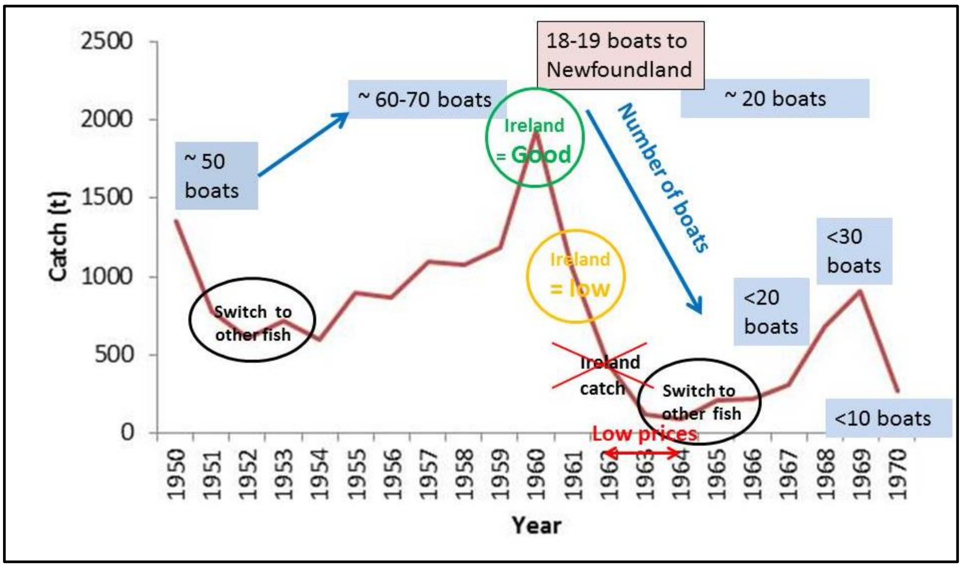
Porbeagle

<table>
<tr><th>Audit trail</th><th>Extra information</th></tr>
<tr><td>Assessment methods</td><td></td></tr>
<tr><td>Geographical range and distribution</td><td>


Porbeagle in the Northeast Atlantic. Movement of porbeagle tagged in French porbeagle archival tagging programme (Biais *et al.*, 2017).</td></tr>
<tr><td>Population / abundance</td><td>In the most recent WGEF report (ICES, 2019) the following information is available:

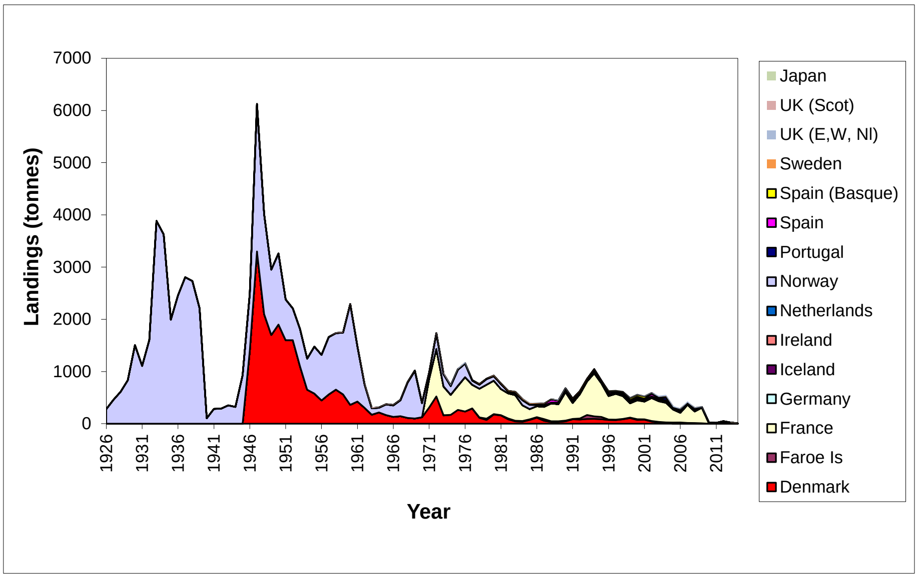
"*The first assessment of the Northeast Atlantic stock was carried out in 2009 by the joint ICCAT/ ICES meeting (ICCAT, 2009; ICES, 2009) using a Bayesian Surplus Production (BSP) model (Babcock and Cortes, 2009) and an age-structured production (ASP) model (Porch et al., 2006). The 2009 assessments have not been updated since. Since the closure of the fishery and the designation of porbeagle as a prohibited species, there are insufficient commercial data (and no fishery-independent data) with which to ascertain the current status of the stock. In order to close data gaps and identify important areas for life-history stages (e.g. mating, pupping and nursery grounds), ICCAT has encouraged research and monitoring projects at stock level to start in 2017.*"

In the ICES Stock Annex:

"*No reference points have been proposed for this stock. ICCAT uses F/F_{MSY} and B/B_{MSY} as reference points for stock status of pelagic shark stocks. These reference points are relative metrics rather than absolute values. The absolute values of B_{MSY} and F_{MSY} depend on model assumptions and results and are not presented by ICCAT for advisory purposes.*"</td></tr>
<tr><td>Condition</td><td>


Porbeagle in the Northeast Atlantic. Trend in Norwegian catch and information on the fishery (Source: Biais *et al.*, 2015).</td></tr>
</table>

Threats and impacts



Porbeagle in the Northeast Atlantic. Working Group estimates of longer term trend in landings of porbeagle in the Northeast Atlantic (Source: ICES, 2019).

There are recent records of small amounts of porbeagle fins on Asian markets (Fields *et al*. 2017), but these may not be from the OSPAR Regions.

Measures

For further information, please see the status assessment.

Knowledge gaps

For further information, please see the status assessment.

References

Biais, G., Helle, K., and Hareide, N. 2015. Trends in the Northern European porbeagle fishery from 1950 to 1970. Working Document to ICES Working Group on Elasmobranch Fishes (WGEF), Lisbon, 2015; WD2015-11, 5 pp.

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ICES. 2019. Working Group on Elasmobranch Fishes (WGEF). ICES Scientific Reports. 1:25. http://doi.org/10.17895/ices.pub.5594

Portuguese dogfish

Audit trail	Extra information
Assessment methods	For further information, please see the status assessment.
Geographical range and distribution	For further information, please see the status assessment.
Population / abundance	Population structure studies developed so far using microsatellites and mitochondrial DNA show no evidence of genetic population structure among collections in the NE Atlantic (Moura *et al*., 2008 WD; Verissimo *et al*., 2011; Catarino *et al.,* 2015). In the absence of more clear information on stock identity, a single assessment unit of the Northeast Atlantic has been adopted. (ICES, 2019) Data from the Scottish survey showed no clear trend between relative abundance and latitude and no trend in numbers h−1 over the period 1998–2013, although an unusually large catch (35 individuals in 30 min) was recorded in 2013 (Neat *et al*., 2015).
Condition	The productivity of this species is likely to be low. Low mean fecundities of 10–14 pups per litter and a gestation period of 2 years or more (Girard and DuBuit, 1999; Clarke *et al*., 2001; Verıssimo *et al*., 2003; Figueiredo *et al.,* 2008). Moreover, females undergo a resting stage between consecutive gestation periods (Verissimo *et al*., 2003). Life history characteristics are poorly known. Size at birth is close to 30 cm (TL), litter size aprox 12 (8-19). Length at maturity for males 80-85 cm and for females 84-101 cm according to some studies conducted in different areas (Girard and DuBuit, 1999; Clarke *et al*., 2001; Verıssimo *et al*., 2003; Figueiredo *et al*., 2008). (A summary of the biological parameters available for the OSPAR area is presented in Table 1. All the adult reproductive stages occur within the same geographical area and, in many cases in similar proportions, which suggests that this species is able to complete its life cycle within these areas (Moura *et al.*, 2014).

Table 1. Reproductive parameters of *C. coelolepis* caught in different geographic areas in the NE Atlantic. The values presented in parentheses stands for the mean value. M, males; F, females; Geograph. Area, Geographical area; Max TL, Maximum total length sampled; Ov.Fec., ovarian fecundity; Ut.Fec., Uterine fecundity; Length mat., estimated length-at-maturity.

Geograph. Area	Sex	Max TL	Ov. Fec.	Ut. Fec.	Length mat.	Length-at-birth	Reference
West of British Isles	M	108			86		Girard and Du Buit (1999)
	F	122	8-22	8-19 (14)	102	300	
West of British Isles	M	---			---		Clarke *et al*. (2001)
	F	---	10-21 (12.7)	8-21 (13.8)	---	---	
Portugal	M	100			~90		Verissimo *et al.* (2003)
	F	122	5-30 (13.2)	1-25 (9.9)	98.5	233-300	
Galicia	M	100			---		Bañon *et al.* (2006)
	F	122	23	5-22 (14)	---	270-290	
Portugal	M	100			85.1		Figueiredo *et al.* (2008)
	F	122	(13.7)	(11.3)	101.2	310	

In the Scottish research survey most individuals were large and mature and there was a notable lack of individuals in the size range 40–60 cm *L*T (Neat *et al.,* 2015). In fact, individuals in those size ranges were rarely caught in the NE Atlantic and the existence of undiscovered concentration areas of juveniles outside the sampling areas in the NE Atlantic may also be hypothesized (Moura *et al*., 2014). This

	seems likely given that post-natal and pregnant females with near-term embryos are relatively common in a number of areas of the NE Atlantic (Girard and Du Buit, 1999; Clarke *et al*., 2001; Bañon *et al*., 2006; Figueiredo *et al*., 2008). Other possible explanations for the absence of these small fish in the NE Atlantic may be their movement to/occurrence in pelagic or deeper waters and/or by gear selectivity (Moura *et al*., 2014).
Threats and impacts	Given the management measures currently in place for deep-water fisheries, fishing effort has reduced. Results from a study conducted with the Portuguese longline fishery targeting the black scabbardfish, indicated that in fishing grounds where black scabbardfish is more abundant and where fishing takes place, the relative occurrence of Portuguese dogfish is reduced and that the species distribution extends to deeper grounds, where the fishery does not operate. These differences on the relative occurrence have implications for alternative management measures to be adopted in the deep-water longline black scabbardfish fishery, particularly in what concerns the minimization of deep-water shark bycatch (ICES, 2019).
Measures	Management applicable for deep-water sharks (ICES, 2019).

The EU TACs that have been adopted for deep-sea sharks in European Community waters and international waters at different ICES subareas are summarized below.

Year	ICES subareas		
	5–9	10	12 (includes also *Deania histricosa* and *Deania profondorum*)
2005 and 2006	6763	14	243
2007	2472(1)	20	99
2008	1646(1)	20	49
2009	824(1)	10(1)	25(1)
2010	0(2)	0(2)	0(2)
2011	0(3)	0(3)	0(3)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	10(4)	10(4)	0
2018	10(4)	10(4)	0
2019	7(4)	7(4)	0
2020	7(4)	7(4)	0

(1) Bycatch only. No directed fisheries for deep-sea sharks are permitted.

(2) Bycatch of up to 10% of 2009 quotas is permitted.

(3) Bycatch of up to 3% of 2009 quotas is permitted.

(4) Exclusively for bycatch in longline fishery targeting black scabbardfish. No directed fishery shall be permitted.

The ICES Workshop on deep-water species (WKSHARK6) has an overview of management measures as follows: "All the deep-water sharks are subject to 0-TAC advice under the deep-water TAC and quota regulation (EU2019/124) or are prohibited from being fished by NEAFC. That effectively is a license to discard these species and being caught at such depths the likelihood of survival is very low. The existing legislation is not designed to mitigate by-catch. There is also an allowed limited by-catch in target fisheries for black scabbardfish fishery, for scientific purposes." (ICES, 2020)

WKSHARK6 notes that deep-water sharks may be taken in five broad gear types:

True deep-water fisheries in waters greater than 400 m depth, and/or targeting deep species

Bottom trawls

Longlines

Gillnets and tangle nets

Non-deep-water fisheries with some interactions with deepsea species

Pelagic trawls when deployed at or near the bottom

Outer –shelf bottom fisheries for various species

True deep-water fisheries

Most of these deep-water sharks are only present in waters deeper than 500 m, and the Portuguese dogfish, in particular, is more frequent at depths >900 m. (Figure 1). Hence mitigation of bycatch is a concern only in dedicated deep-water fisheries operating in such deep waters.

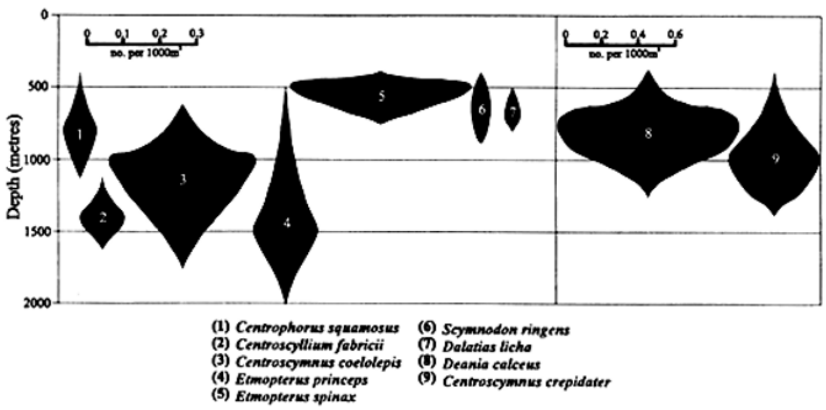

Figure 1. Distribution, by depth, of deepwater sharks in ICES Sub-area 6. This illustrates that for most species, waters shallower than 500 m are not of importance. The exception is *Etmopterus spinax*. Reproduced from Gordon (1999).

Various regulations restrict the use of the first 3 gear types above. Bottom trawling by EU vessels and in EU waters is banned in waters deeper than 800 m (Regulation 2016/2336), while gillnet and tangle net fisheries (by EU vessels and in EU waters) are banned in waters deeper than 600 m (Regulation 41/2007). A gillnet ban in waters deeper than 200 m is also in operation in the NEAFC regulatory Area (all international waters of the ICES Area). NEAFC also ordered the removal of all such nets from NEAFC waters by 1 February 2006.

Given these bans, the following gear types represent the main risk of by-catch:

Longlines in all areas

Bottom trawls in waters shallower than 800 m

Bottom trawls in all depths in the NEAFC Regulatory Area (NEAFC-West only because deep-water sharks are not widely distributed in NEAFC– Banana Hole and -Doughnut Hole)

Pelagic trawls operating in waters deeper than 600 m, especially when contacting the bottom.

Bycatch mitigation measures are difficult to implement for chondrichthyans since many species occur in a similar size range as the target species in mixed fisheries (exemptions include the greenland shark *Somniosus microcephalus*). Possible yet to be evaluated mitigation measures may be deterrent measures “triggering” electromagnetic senses of elasmobranchs (hook material, net material etc.), as well as acoustics and light-based technologies. Gear-based technical measures can be applied to improve the selectivity for sharks. For example, use of hooks at different depths, alternative hooks which and/or deployment of magnets on hooks, alternative mesh sizes and shapes, new materials, grids and escape windows to reduce bycatch. Novel grid panels designed to facilitate flatfishes (e.g. ‘Freshwind’ https://vimeo.com/channels/801304) may have potential to reduce some skates bycatches with similar body morphology. These measures should always be subjected to proper scientific evaluation, before they could be considered.

For deep-water sharks, spatial management could be considered to minimise bycatch. It might be necessary to trial new methodologies or to improve knowledge on where to best deploy fishing gears. The avoidance of some fishing grounds or time of the year where the spatial overlap between the target species of the fisheries and deep-water shark species could be also considered. However there is not adequate information on any deep-water shark to frame such measures at present.

Knowledge gaps	For further information, please see the status assessment.
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Spotted ray

Audit trail	Extra information
Assessment methods	ICES provides advice on fishing opportunities for five stocks of spotted ray: (1) ICES Subarea 4 and Divisions 3.a and 7.d (Region II); (2) Divisions 7.a,e-h, and (3) Subarea 6 and Divisions 7.b and 7.j (Region III); and (4)Subarea 8 and (5) Division 9.a (Region IV). Fisheries-independent trawl survey provide the basis of the assessment within the five stock units above identified. The current assessment has revised the Regions in which this species occurs to Regions II, III and IV. OSPAR (2010) previously considered Region V (coastal areas), but these are excluded here as the species has not been reported from the waters of the Azores and wider area (Santos *et al.,* 1997)
Geographical range and distribution	For further information on spatial distribution and geographical range, please see the status assessment.
Population / abundance	Region II (North Sea) Spotted ray *Raja montagui* was included in the OSPAR List of threatened and/or declining species and habitats on the basis of a decline, sensitivity and rarity within Belgian waters (Region II), however, ICES (2002) have noted that the data used for the original proposal were not sufficiently reliable. Also noting that, although spotted ray may have declined within Belgian waters, this species is frequently caught in western areas of the southern North Sea, with survey indices suggesting an increase in abundance in recent years (ICES, 2019a-b).

The nature of the earlier perceived decline of spotted ray in OSPAR Region II is unclear. Whilst Poll (1947) was used as the main information source in both the case study and previous assessment, Poll (1947) only stated that "*cette raie est à considérer comme commune près de notre littoral , mais moins commune que la raie bouclée … Un assez numbreux matérial de cette espèce figure dans les collections du Musée Royal d'Histoire naturelle, en provenance des eaux Belge ou des parage de celle-ci"* [*this ray is considered as common near our coast, but less common than the thornback ray ... Quite a number of specimens of this species appear in the collections of the Musée Royal d'Histoire naturelle, coming from Belgian waters or around it*]. This would indicate that the perception of the status was informed from the wider parts of the southern North Sea, rather than just Belgian waters, given that specimens in the national collection were also from surrounding waters.

WKSTATUS also considered additional scientific literature relating to the southern North Sea. Rijnsdorp *et al.* (1996) examined changes in the catch rates of demersal fish in the southern North Sea from trawl surveys conducted in 1906–1909 and 1990–1995. This study reported that the standardised catch rates (numbers per hour standardised to the estimated swept area) of spotted ray in Roundfish Area 6 (which includes Belgian waters) from the RV *Wodan* (OT20, 1906–1909) were zero, whilst contemporary data from GOV trawl surveys were <0.5. Whilst this study did indicate a decline in thornback ray between the two time periods, there was no evidence that spotted ray was frequent in the south-eastern North Sea in either time period. A comparable study by Rogers & Ellis (2000) compared data from beam trawl surveys conducted in the southern North Sea in 1903 with the period 1989–1997, and this study reported a longer-term increase in the catch rates of spotted ray.

Given that these scientific studies on longer-term changes in demersal fish assemblage of the southern North Sea have not observed a decline in spotted ray, that available survey data indicate that spotted ray in the North Sea occur primarily in the northern and western parts of the North Sea (Ellis *et al.*, 2015), and that fishery-independent trawl surveys are showing increasing catch rates of spotted ray, WKSTATUS consider that spotted ray do not meet the criterion for 'decline'.

Figure 1: Abundance index (n. hr-1), biomass index (kg.hr-1) and exploitable biomass (kg.hr-1), including their three year running means, during the North Sea IBTS (in roundfish areas 1-7), BTS, and CGFS surveys in the years 1977–2018). Data extracted from the DATRAS database (selected for CPUE per length per haul) on 12 June 2019. Source: ICES, 2019b.

Region III (Celtic Seas)

ICES stock assessment advice for two stocks within OSPAR Region III (Divisions 7.a,e-h and Subarea 6, and Divisions 7b and 7j) (ICES, 2018a-b).

For Divisions 7a,e-h, ICES advice is based on the UK (E&W) beam trawl survey in Divisions 7afg (UK (E&W)-BTS-Q3), which covers a representative proportion of the stock area. Other surveys in the area, currently not used for advice, the Irish groundfish survey (IGFS-IBTS-Q4) and the UK Q1 Southwest Ecosystem Survey (UK-Q1SWBeam) may also suggest similar trend (ICES, 2018a; ICES, 2019b; Silva *et al.*, 2020). Although the latter also covers part of Division 7.e which straddles both OSPAR Regions II and III.

For Subarea 6, Divisions 7b and 7j, ICES advice is based on the Irish groundfish survey (IGFS-WIBTS-Q4), which appropriately covers the stock area (ICES, 2018b).

Region IV (Subarea 8 – Bay of Biscay)

ICES advice in Subarea 8 is based on the Spanish groundfish survey in Division 8.c (SpGFS-WIBTS-Q4), though it only covers part of the stock area. Whilst there is another survey within the Bay of Biscay (Divisions 8.a and 8.b, EVHOE-WIBTS-Q4), the catches are considered to be low and variable and, therefore, not used for stock advice (ICES, 2018c).

Recent study by Marandel *et al.* (2019) on multispecies modelling of the skate assemblage in the Bay of Biscay, estimated for *R. montagui* an increase above 50% of carrying capacity based on current harvest rates. Although it should be noted that the survey used to estimate biomass index, may have a limited coverage of coastal areas where this species would be expected to be more frequently encountered.

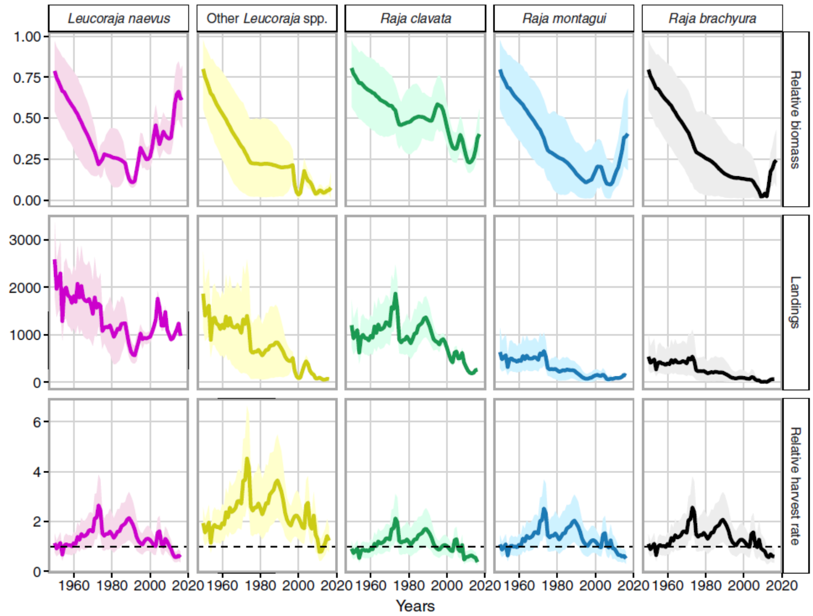

Figure 2: Estimated relative biomass between 1950 and 2017 (top row), landings (tonnes) between 1950 and 2016 (middle row) and relative harvest rates between 1950 and 2016 (bottom row) for the studied ray species (mean values with 95% percentile bands). Dashed horizontal lines for relative harvest rates correspond to maximum sustainable yield (hMSY). Source: Marandel *et al*, 2019.

Region IV (Division 9a – Atlantic Iberian waters)

ICES advice in Division 9a is based on the Portuguese groundfish survey (PtGFS-WIBTS-Q4) (ICES, 2018d). Although surveys from the south of Spain (SpGFS-GC-WIBTS-Q1&Q4) are currently not being used for advice, due to low and variable catches, they also suggest a similar recent decrease as the Portuguese groundfish survey.

Condition	For further information, please see the status assessment.
Threats and impacts	Region II and III (North Sea and Celtic Seas) Recent study from Gascuel *et al.* (2016) investigated the fishing impact and environmental status in European seas, with results showing a decrease in fishing pressure OSPAR Regions II and III.

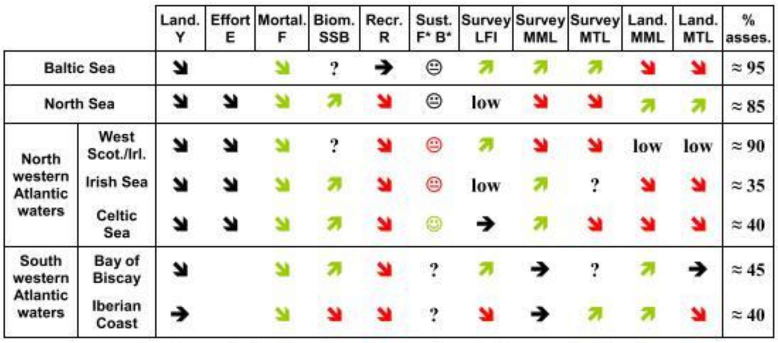

Figure 3 - Summary of trends over the last 10 years in the main indicators of ecosystem health in the even ecosystems considered: total landings Y, fishing effort E, mean fishing mortality rate F, total stock spawning biomass SSB, mean recruitment index R, index of mean sustainable fishing mortality F*, survey large fish indicator LFI, mean maximum length MML from surveys or from landings, mean trophic level MTL from surveys or from landings, % of landings due to assessed stocks. Green and red symbols refer to positive and negative trends, respectively (i.e. improving or deteriorating stocks status), while black arrows refer to uninterpretable changes in trend (landings might for instance decrease either because F or B decreases). Source: Gascuel *et al.*, 2016.

Region II (North Sea)

Recent study from Couce *et al.*, (2020) reconstructed total international trawling effort in the North Sea (1985–2015), with results consistent with Gascuel *et al.* (2016) where a decline in fishing effort is observed in the North Sea.

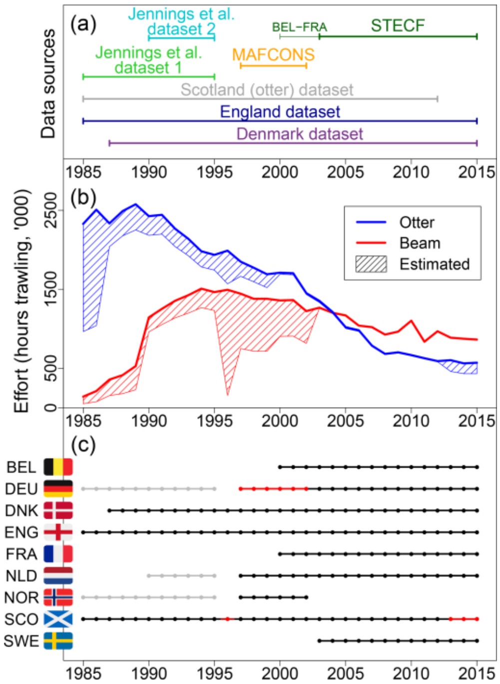

Figure 4. (a) The timelines for seven sources of compiled (nominal) fishing effort data, included in the present study; see methods section for full details of each dataset. (b) Reconstructed total fishing hours in the North Sea by beam (red) and otter trawlers (blue), from 1985 to 2015. White-shaded areas show the proportions of the reconstructed total based on compiled (nominal) fishing effort data,

and dashed areas show the proportions based on estimated (modelled) data. (c) The timelines, by country, for which nominal effort data were available and compiled for this study. The periods shown in grey indicate years for which country data were available but only as part of a compiled set, and the individual country contribution to the total was unknown (this is data which therefore could not be used to estimate missing periods). The periods shown in red indicate years for which only part of the data were available, or there was an issue with the compiled data. Source: Couce *et al.*, 2020.

Region IV (Iberian waters)

Estimates of fishing effort on rays in Iberian waters (Region IV) also show a steady decrease between 2008 and 2014 and have been relatively stable since (ICES, 2020).

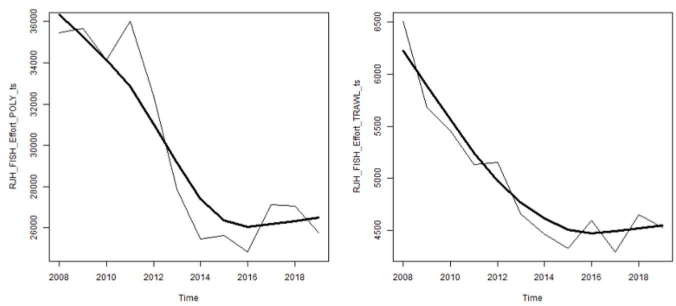

Figure 5. Estimates of fishing effort on rays in Iberian waters (Region IV). Source: ICES, 2020.

Discards

A relatively high proportion of spotted ray catch may be discarded, given their small size (e.g. Silva *et al.*, 2012). Discard survival has not been fully evaluated for all fleets but is likely to be variable and preliminary studies have shown the discard survival probabilities to range from 21% to 67% in pulse-trawl fisheries (Schram and Molenaar, 2018). Other studies suggest variable at-vessel mortality depending on several factors (e.g. gear type, soaking time, fish size) (e.g. Ellis *et al.*, 2018; Serra-Pereira & Figueiredo, 2019).

Measures

As set out in Article 4 of Annex V of the Convention, OSPAR has agreed that no programme or measure concerning a question relating to the management of fisheries shall be adopted under this Annex. However, where the Commission considers that action is desirable in relation to such a question, it shall draw that question to the attention of the authority or international body competent for that question. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.

Additional measures in continental Portuguese EEZ that will be applicable to *Raja* species:

On 22 August 2014 the Portuguese government adopted national legislation (Portaria no. 170/2014) that established a minimum landing size of 520 mm (total length) for specimens of the genus *Leucoraja* or *Raja*, covering all of the continental Portuguese EEZ.

The national legislation adopted on 29 December 2011 (Portaria no. 315/2011) was updated by the Portuguese government on 21 March 2016 (Portaria no. 47/2016). The new legislation prohibits, throughout the whole of the continental Portuguese EEZ, the catch, retention on board, and landing of any skate species belonging to Rajiformes during the months of May and June. For each fishing trip during these two months a maximum of 5% bycatch, in weight, of *Raja* species is allowed to be retained on board and landed.

Knowledge gaps

There have been initial studies of potential nursery grounds for spotted ray around the British Isles (e.g. Ellis *et al*., 2005, 2012; AFBI, 2009), but spawning and nursery grounds are yet to be fully delineated.

Similar studies on ecologically important habitats for spotted ray in Portuguese continental waters are described in Serra-Pereira *et al.* (2014).

Although tagging programmes (conventional and electronic) may have been conducted for spotted ray (e.g. Bird *et al.*, 2020; Humphries *et al.*, 2016; Simpson *et al.*, 2020), these could be extended to cover the entire spatial distribution of this species.

Also existing survey data could provide information on the locations of nursery grounds and other juvenile habitats, which should be further investigated to identify sites where there are large numbers of 0-groups and where these life-history stages are found on a regular basis (ICES, 2019b).

Recent studies and analysis have been conducted in recent years around the British Isles (Region II and III) on life-history parameters (McCully *et al.,* 2012) with conversion factors for length-weight and length-disc width and, estimations of length at first maturity and length at 50% maturity. Further biological studies estimated von Bertalanffy growth model parameters in Portuguese Iberian waters (Region IV) (Pina-Rodrigues, 2012; Serra-Pereira, 2005).

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Spurdog

Audit trail	Extra information
Assessment methods	For further information, please see the status assessment
Geographical range and distribution	Primarily epibenthic, they are not known to associate with any particular habitat (Fordham *et al.* 2016 and references therein). Vertical utilization suggests distinct diel patterns and that this species may not use the benthos as previously thought (Carlson *et al.* 2014).
Population / abundance	For further information, please see the status assessment
Condition	Research in the UK has recently been carried out to better understand the implications of elasmobranch bycatch in the southwest fisheries around the British Isles (Silva and Ellis, 2015 WD and references therein). Preliminary results suggested there may be no changes of length-at-maturity of females in comparison to earlier estimates from the 1960s, despite recent spurdog stock overexploitation.. However, the maximum fecundity observed (n = 19 pups) reported in this recent study is higher than reported in earlier studies (e.g. Ford, 1921; Holden and Meadows, 1964; Gauld, 1979), thus, providing further support to the hypothesis of a density-dependent increase in fecundity (see Ellis and Keable, 2008 and references therein). Norway has collected information to improve the geographical coverage of input data. These data will be used to improve the next ICES stock assessment. All size groups, both sexes, and all maturity stages were present in the analysed samples from Norway, showing that spurdog is using Norwegian coastal waters year-round and for their whole life cycle (Albert and Knutsen, 2017, Albert *et al*., 2019). The spurdog reproductive cycle takes almost two years (Burgess, 2002, NEFSC, 2006). Discarding is known to take place, but dead discards have not been quantified. It is assumed that EU catches have been discarded since 2010 (ICES, 2018). The annual discards in the period 2010-2017 in the assessment are assumed as the difference between the assumed catches (average of 2007-2009 catches (2468 t)) and reported landings (ICES, 2018).
Threats and impacts	For further information, please see the status assessment
Measures	Information from background document (OSPAR 2010) As set out in Article 4 of Annex V of the Convention, OSPAR has agreed that no programme or measure concerning a question relating to the management of fisheries shall be adopted under this Annex. However, where the Commission considers that action is desirable in relation to such a question, it shall draw that question to the attention of the authority or international body competent for that question. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them. Scientific advice on the management of this species is available from ICES. This is being implemented, at least in part, by NEAFC, Norway and the European Union. OSPAR should endeavour to

	support the adoption of these management measures by its Contracting Parties and consider whether it may also contribute to the conservation of critical habitats for this species. The TAC was reduced by 90% in 2010, and set to zero from 2011 onwards. There have been no targeted fisheries in EU or Norwegian waters since 2011. Spurdog remains a bycatch in the mixed demersal and gillnet fisheries, and an unquantified amount of discarding now takes place in these fisheries. The proportion of dead spurdog when taken aboard is low in longline fisheries, but higher in trawl and gillnet fisheries. Levels of discard survival are unknown but likely variable. In the absence of reliable catch data since 2010, ICES assumes the average landings for 2007–2009 to be a representative level of dead catch for 2010 onwards. Following the 2010 OSPAR assessment, the target fishery for spurdog has been closed since 2011 in the EU and Norway. Some of the research needs identified by OSPAR (Life history, discard, bycatch survival, and growth parameters) are taking place in some countries at a national level, with data feeding into ICES stock assessments The current IUCN listing for European waters is endangered (Nieto *et al.*, 2015).
Knowledge gaps	There are concerns over the quality of the data used for the assessment (ICES, 2018) as a consequence of (a) uncertainty in the historical level of catches because of misreporting and generic landings categories, (b) lack of commercial length–frequency information for countries other than the UK, (c) lack of data on dead discards, and (d) the survey data examined do not cover the entire stock area (ICES, 2018) (which is however planned to be addressed in the benchmark 2021). Reliable catch data since 2010 are not available. Future assessments require updated and validated growth parameters and better estimates of natural mortality (ICES, 2018). There is also a lack of accurate data on the location of pupping and nursery grounds, and their importance to the stock, which precludes spatial management for this species at the present time.
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Thornback ray

Audit trail	Extra information
Assessment methods	ICES assess and provide advice on fishing opportunities for seven stocks of *Raja clavata* in the ICES Area, namely (i) Subarea 4 and Divisions 3.a and 7.d (Region II); (ii) Subarea 6, (iii) Divisions 7.afg, and (iv) Division 7.e (Region III); (v) Subarea 8 and (vi) Division 9.a (Region IV); and (vii) Azores (Region V). Fisheries-independent trawl surveys provide the basis of the assessment within the stock units above identified. The current assessment has revised the Regions in which this species occurs to Regions II, III, IV and V.
Geographical range and distribution	For further information on spatial distribution and geographical range, please see the status assessment
Population / abundance	Stock assessments on this species are based on research survey data.

Region II (North Sea)

Thornback ray is probably the most important skate for the commercial fisheries. Survey indices for thornback ray in Region II show an increasing trend in the past 8 to 10 years, with one outlier in 1991 owing to a single exceptionally large catch (confirmed record) (ICES, 2019).

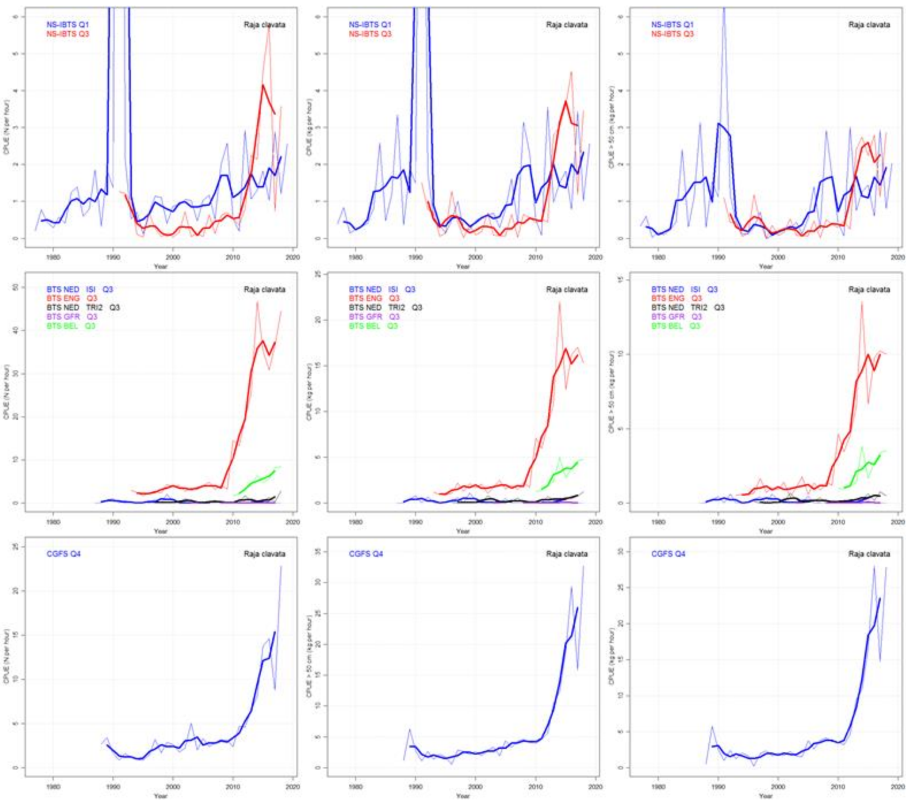


Figure 1. CPUE estimates for *Raja clavata*. Abundance index (n. hr-1), biomass index (kg hr-1) and exploitable biomass (kg hr-1), including their three year running means, during the North Sea IBTS (in roundfish areas 1–7), BTS, and CGFS surveys in the years 1977–2018 (ICES, 2019). The CPUE has shown an increasing trend since 2008/10.

Region III (Celtic Seas)

Thornback ray in Division 6 shows a recent increase in abundance, following a decline two years ago. The index of the IGFS (IGFS-WIBTS-Q4) is used in the assessment.

Thornback ray in Divisions 7.a and 7.f-g is assessed using the UK (England and Wales) beam trawl survey in divisions 7.a and 7.f. This survey covers the main part of the stock range and is showing a continuous increasing trend in biomass.

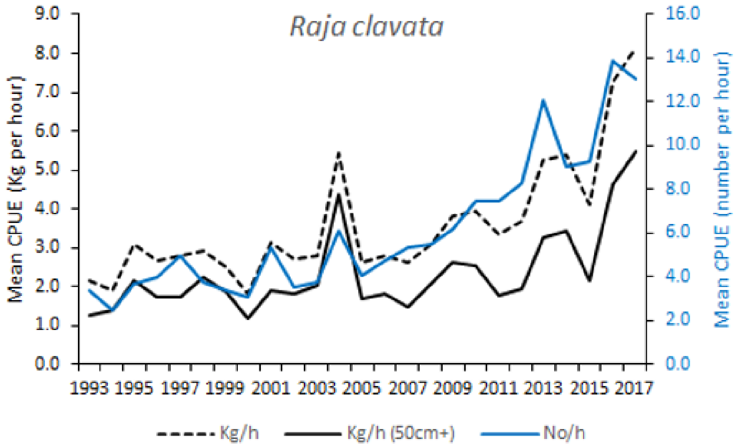


Figure 2: Temporal trends (1993–2017) in the CPUE by individuals

(n h^{-1}), biomass (kg h–1), and biomass for individuals ≥ 50 cm total length (kg h^{-1}) of skates in the 7.a.f–g beam trawl survey (EngW-BTS-Q3). Source: ICES, 2019

Region IV (Bay of Biscay and Atlantic Iberian waters)

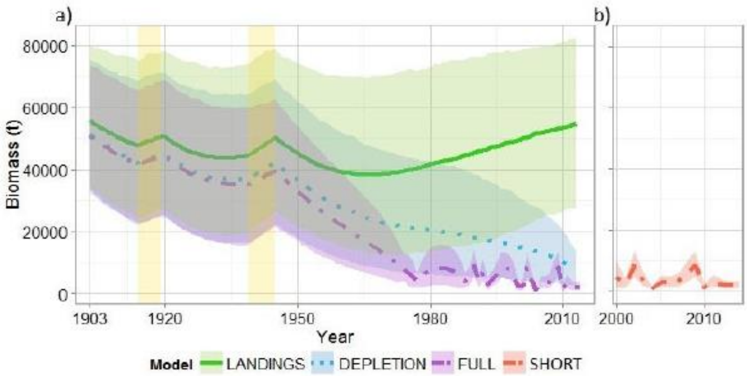


Figure 19.15. Skates in the Bay of Biscay and Iberian Waters. a) Estimated biomasses trajectories for *R. clavata* in the Bay of Biscay for model runs using different data series. LANDINGS: landings only; DEPLETION: landings and final year depletion rate; FULL: landings and biomass index for the years 1973–2013. Coloured areas: credible intervals between 2.5 and 97.5 percentiles. Vertical rectangles: World War I and II periods. b) Estimated biomasses trajectories for *R. clavata* in the Bay of Biscay by using only catches and biomass index time series from 2000 to 2013 (SHORT run).

Figure 3. Skates in the Bay of Biscary and Iberian waters.

This decline is borne out by Marandel *et al.* (2016) who estimated a severe long-term decline of thornback ray in the French part of the Bay of Biscay. However, the signal is not completely clear when looking at the CPUE of the species in the Bay of Biscay – ICES Area 8 (ICES 2019)

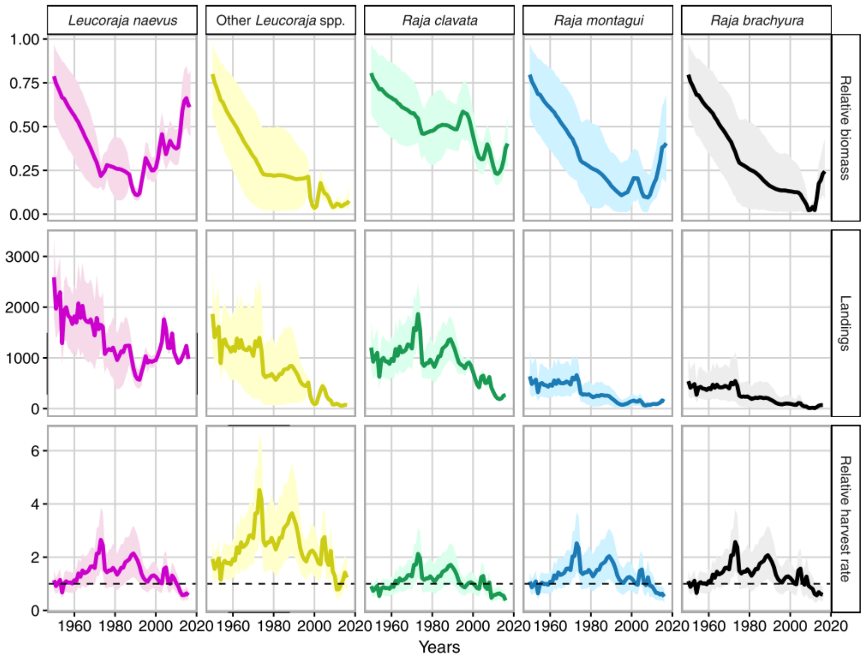


Figure 4: Estimated relative biomass between 1950 and 2017 (top row), landings (tonnes) between 1950 and 2016 (bottom row) for the studied ray species (mean values with 95% percentile bands). Dashed horizontal lines for relative harvest rates correspond to maximum sustainable yield (h_{msy}). Source: Marandel *et al*., 2019

Based on a multispecies modelling of the skate assemblage in the Bay of Biscay, The current level of the stock way estimated to 40% of the carrying capacity, i.e. 80 of the biomass corresponding to Fmsy and to be on the recovery after having felt at 25% of the carrying capacity in the 2000s (Marandel *et al.*, 2019). Recent harvest rate were lower than MSY harvest rates. The study concluded that the biomass of *Leucoraja naevus* was over 60% of its carrying capacity while the other species considered (*Raja brachyura*, *Raja montagui* as well as *Leucoraja fullonica* and *L. circularis* (combined as "Other *Leucoraja* spp.) were at much lower levels (down to 8% carrying capacity for Other *Leucoraja* spp.). Under current (2017) estimate of fishing mortality, the thornback ray was projection to reach 50% carrying capacity within 5 years.

Region (V) (Azores)

Thornback ray is the most abundant ray species in Subarea 10. In the Azores EEZ, this species is the most commercially important species caught by the fisheries being a multispecies demersal fishery, using handlines and bottom longlines, and by the black scabbardfish fishery using bottom longlines (ICES, 2019). Thornback ray landings have increased in the Azores since 2009 until 2014, with 2014 and 2015 having the highest records in the time series, decreasing thereafter.

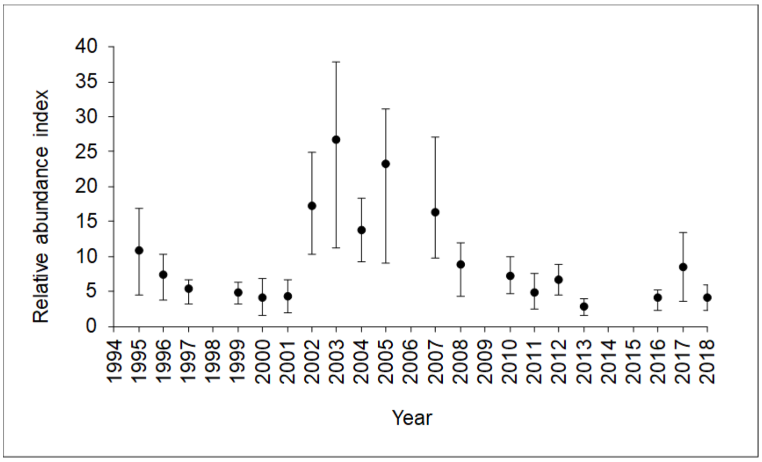


Figure 5. Annual abundance, in numbers, of thornback ray from the Azores (ICES subarea 10) from the Azorean demersal spring bottom longline survey (1995–2018). Source: ICES, 2019

Condition	A large sample (n=7180) of thornback ray from the Bay of Biscay was measured for the French Geno-PopTaille project which aims at estimating the population abundance by close-kin mark-recapture. Individuals were mostly sampled from commercial catches with a small contribution from surveys. The length distribution shows a mode at 72 cm for male and 79 cm for females, with a few individuals larger than 100 cm (Figure 6)

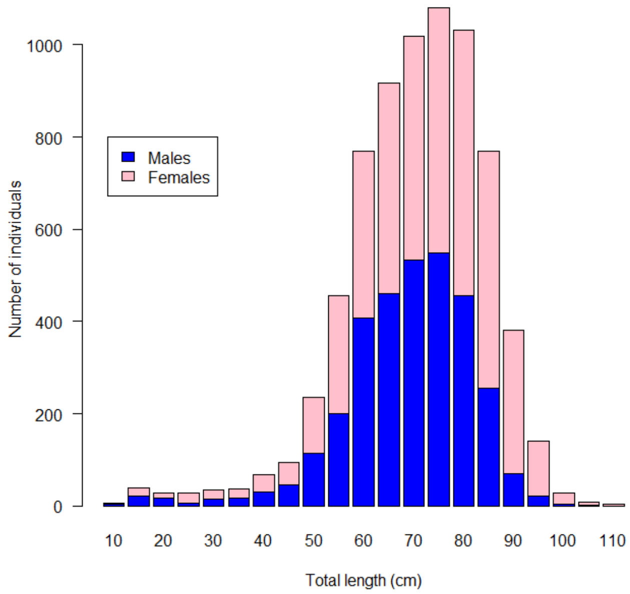
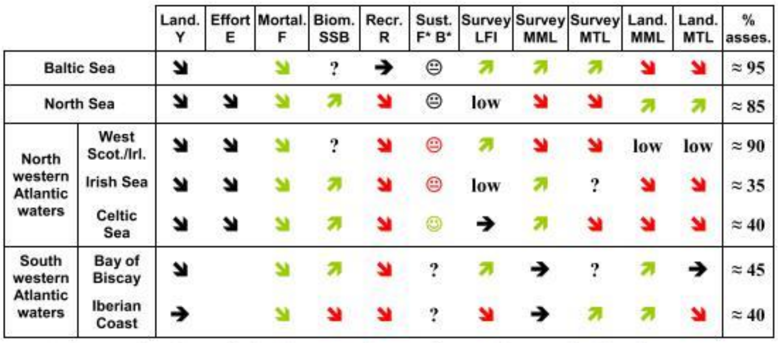


Figure 6. Length distribution of thornback ray from the Bay of Biscay sampled in the genoPopTaille project (n=7180).

Threats and impacts

Region II and III (North Sea and Celtic Seas)

Recent study from Gascuel *et al.* (2016) investigated the fishing impact and environmental status in European seas, with results showing a decrease in fishing pressure OSPAR Regions II and III.



		Land. Y	Effort E	Mortal. F	Biom. SSB	Recr. R	Sust. F* B*	Survey LFI	Survey MML	Survey MTL	Land. MML	Land. MTL	% asses.
Baltic Sea		↘		↘	?	→	😐	↗	↗	↗	↘	↘	≈ 95
North Sea		↘	↘	↘	↗	↘	😐	low	↘	↘	↗	↗	≈ 85
North western Atlantic waters	West Scot./Irl.	↘	↘	↘	?	↘	😐	↗	↘	↘	low	low	≈ 90
	Irish Sea	↘	↘	↘	↗	↘	😐	low	↗	?	↘	↘	≈ 35
	Celtic Sea	↘	↘	↘	↗	↘	🙂	→	↗	↘	↘	↘	≈ 40
South western Atlantic waters	Bay of Biscay	↘		↘	↗	↘	?	↗	→	?	↗	→	≈ 45
	Iberian Coast	→		↘	↘	↘	?	↘	→	↗	↗	↘	≈ 40

Figure 7 - Summary of trends over the last 10 years in the main indicators of ecosystem health in the even ecosystems considered: total landings Y, fishing effort E, mean fishing mortality rate F, total stock spawning biomass SSB, mean recruitment index R, index of mean sustainable fishing mortality F*, survey large fish indicator LFI, mean maximum length MML from surveys or from landings, mean trophic level MTL from surveys or from landings, % of landings due to assessed stocks. Green and red symbols refer to positive and negative trends, respectively (i.e. improving or deteriorating stocks status), while black arrows refer to uninterpretable changes in trend (landings might for instance decrease either because F or B decreases). Source: Gascuel *et al.*, 2016.

Region II (North Sea)

Recent study from Couce *et al.*, (2020) reconstructed total international trawling effort in the North Sea (1985–2015), with results consistent with Gascuel *et al.* (2016) where a decline in fishing effort is observed in the North Sea.

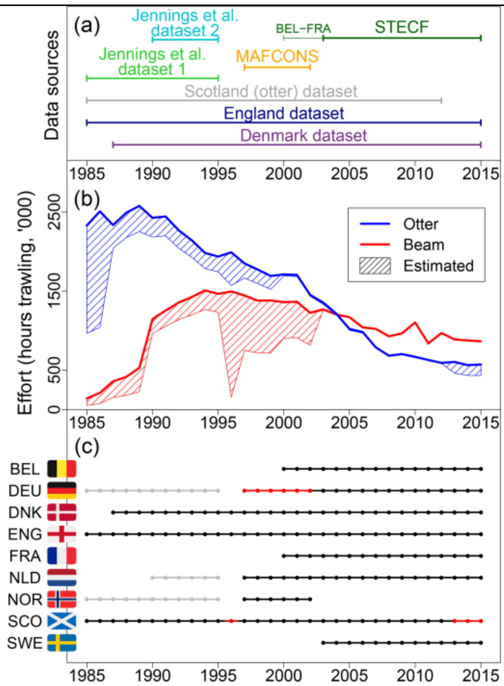


Figure 8. (a) The timelines for seven sources of compiled (nominal) fishing effort data, included in the present study; see methods section for full details of each dataset. (b) Reconstructed total fishing hours in the North Sea by beam (red) and otter trawlers (blue), from 1985 to 2015. White-shaded areas show the proportions of the reconstructed total based on compiled (nominal) fishing effort data, and dashed areas show the proportions based on estimated (modelled) data. (c) The timelines, by country, for which nominal effort data were available and compiled for this study. The periods shown in grey indicate years for which country data were available but only as part of a compiled set, and the individual country contribution to the total was unknown (this is data which therefore could not be used to estimate missing periods). The periods shown in red indicate years for which only part of the data were available, or there was an issue with the compiled data. Source: Couce *et al.*, 2020.

Region IV (Bay of Biscay and Atlantic Iberian waters)

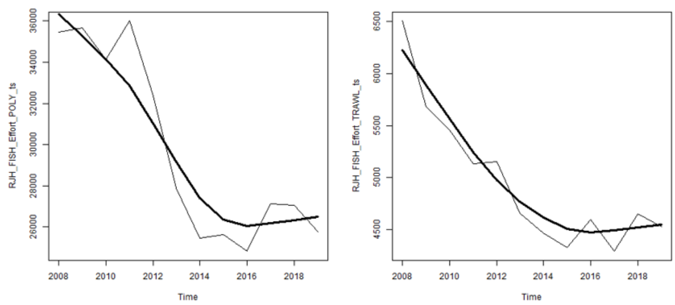


Figure 9. Estimates of fishing effort on rays in Iberian waters (Region IV) also show a steady decrease between 2008 and 2014 and have been relatively stable since (ICES, 2020).

Discards

Thornback ray is commercially the most relevant ray species. Due to constraining quota Producer organisations in the Netherlands and Belgium have implemented landings restrictions, e.g. introducing a minimum landing size and capping weekly landings (ICES, 2019). Such restrictions may increase the proportion of discards for thornback ray. Discard survival has not been fully evaluated for all fleets but is likely to be variable and preliminary study in the Dutch pulse trawl fishery has shown a discard survival probability of >50% (Schram and Molenaar, 2018) and > 90% in gillnets (Enever *et al.*, 2009; Catchpole *et al.*, 2017).

Measures

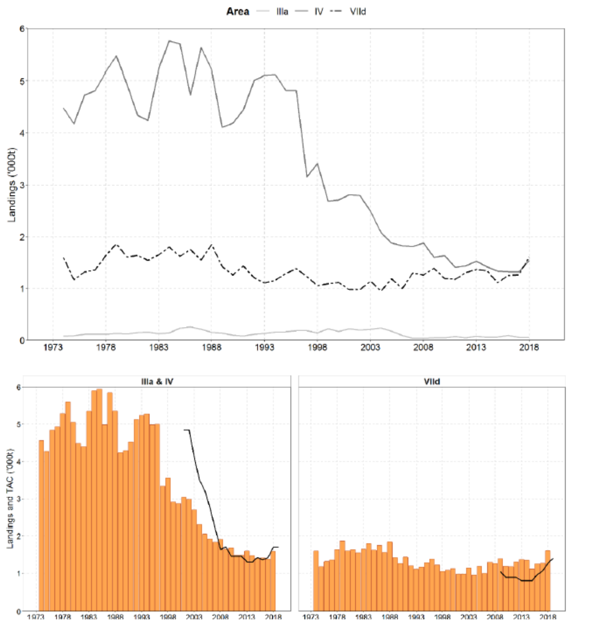


Figure 15.3.1. Top: Demersal elasmobranchs in the North Sea, Skagerrak, Kattegat and eastern Channel: total international landings of rays and skates in Division 3.a and Subarea 4 and Division 7.d since 1973, based on WG estimates. Bottom: Landings of area 3.a and 4 (combined) and 7.d, including the TACs for both areas (black lines).

Figure 10. Following the introduction of a Group-TAC for skates and rays, the corresponding catches match the TAC well as can be seen in the figure below (ICES, 2019).

As set out in Article 4 of Annex V of the Convention, OSPAR has agreed that no programme or measure concerning a question relating to the management of fisheries shall be adopted under this Annex. However where the Commission considers that action is desirable in relation to such a question, it shall draw that question to the attention of the authority or international body competent for that question. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.

Additional measures in continental Portuguese EEZ that will be applicable to *Raja* species:

On 22 August 2014 the Portuguese government adopted national legislation (Portaria no. 170/2014) that established a minimum landing size of 520 mm (total length) for specimens of the genus *Leucoraja* or *Raja*, covering all of the continental Portuguese EEZ.

The national legislation adopted on 29 December 2011 (Portaria no. 315/2011) was updated by the Portuguese government on 21 March 2016 (Portaria no. 47/2016). The new legislation prohibits, throughout the whole of the continental Portuguese EEZ, the catch, retention on board, and landing of any skate species belonging to Rajiformes during the months of May and June. For each fishing trip during these two months a maximum of 5% bycatch, in weight, of *Raja* species is allowed to be retained on board and landed.

Knowledge gaps

Existing survey data could provide information on the locations of nursery grounds and other juvenile habitats, which should be further investigated to identify sites where there are large numbers of 0-groups and where these life-history stages are found on a regular basis (ICES, 2019).

The population structure may be more complex than currently considered. There is an increasing scientific interest for the species with the number of articles in Web of Science with *Raja clavata* in the title or keywords increasing from 2 in 1990-2004 to 7 in 2005-2019.

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Couce, E., Schratzberger, M., and Engelhard, G. H. 2020. Reconstructing three decades of total international trawling effort in the North Sea. Earth System Science Data, 12, 373–386. https://doi.org/10.5194/essd-12-373-2020.

Enever, R., Catchpole, T. L., Ellis, J. R., and Grant, A. 2009. The survival of skates (Rajidae) caught by demersal trawlers fishing in UK waters. Fish Res 97: 72-76

ICES. 2019. Working Group on Elasmobranch Fishes (WGEF). ICES Scientific Reports. 1:25. 964 pp. http://doi.org/10.17895/ices.pub.5594.

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White skate

Audit trail	**Extra information**
Assessment methods	For further information, please see the status assessment
Geographical range and distribution	For further information, please see the status assessment
Population / abundance	ICES 2019b (WGEF) No formal stock assessment has been undertaken. The perceived stock status is based on the comparison between recent and historical trawl survey catch data. Historically, trawl surveys around the British Isles reported *Rostroraja alba* (Rogers and Ellis, 2000), whereas it has now disappeared from parts of their former range. Similar longer-term declines have also been reported for the Bay of Biscay (Quéro and Cendrero, 1996). WGEF considers that the comparison of historical data with the near-absence in recent data sources (historical landings, surveys, observer programmes) is sufficient to consider the species severely depleted and near-extirpated from various parts of the Celtic Seas and Biscay- Iberian ecoregions. Given the rarity of the species, fishery-independent trawl surveys encounter this species only very occasionally, and so there are insufficient data to inform on any changes to the state of the stock since the last assessment. However, there have been some authenticated records since the last assessment, indicating that white skate still occurs in OSPAR Regions II-IV. The species is still considered to be severely depleted.
Condition	ICES advice 2020-2023 The perception of the stock is based on the lack of recent records of this species in comparison with historical accounts, which documented a more widespread occurrence and localized abundance in parts of the Northeast Atlantic. Historical information indicates that white skate has formerly been targeted in fisheries in the English Channel and around Brittany (Ellis *et al*., 2010), but present records show only a few isolated instances in scientific surveys. Whilst listed in some official landings data, these include records from outside the biogeographical range and are assumed to reflect coding errors or misidentifications.
Threats and impacts	Threats from background document

Excessive mortality	Removal of all life stages through fisheries (primarily commercial by-catch, possibly target sports fishing)	Fisheries mortality affects all life stages, from egg cases on nursery grounds to newly hatched, juveniles and adult fish. It has greatly exceeded the natural rate of population increase for this species, but may be mitigated under the current EC management regime.
Habitat damage	Mobile fishing gears, pollution	Minor impact compared with excessive mortality rates in fisheries.
Prey availability	Depletion of prey species	Potential, but minor impact compared with fisheries mortality.

Measures

Regulation (EU) 2015/812 of the European Parliament and of the Council of 20 May 2015 (Article 7, 2 (c)) states that "Masters of Union fishing vessels shall also record in their fishing logbook all estimated discards in volume for any species not subject to the landing obligation pursuant to Article 15(4) and (5) of Regulation (EU) No 1380/2013 of the European Parliament and of the Council". The corresponding text in Regulation (EU) No. 1380/2013 of the European Parliament and of the Council of 11 December 2013 (Article 15(4)) states that "The landing obligation referred to in paragraph 1 shall not apply to: (a) species in respect of which fishing is prohibited and which are identified as such in a Union legal act adopted in the area of the CFP". Consequently, EU fishing vessels should report all catches and discards of white skate.

3. Programmes and measures FROM OSPAR (10-06 recommendations)

3.1 Each Contracting Party should:

a. consider the introduction of national legislation to protect the common skate species complex, the white skate, the angel shark and the basking shark in all their life stages;

b. take relevant conservation measures in key areas where significant numbers of these species still occur;

c. consider, and where appropriate, set up information campaigns about the identification, conservation and legal status of these threatened species, particularly targeting commercial and recreational fishermen and fisheries observers. These campaigns should include requests and incentives for reporting observations and incidental catches of these species, including information about size and condition of the fish, location and date, in order to reveal areas where these species and critical habitats for different life stages still occur;

d. consider whether any sites within its jurisdiction justify selection as Marine Protected Areas for the protection of relict populations of, and critical habitats for, common skate species complex, the white skate, the angel shark and the basking shark, and;

e. in accordance with OSPAR Recommendation 2003/3 as amended by OSPAR Recommendation 2010/2, report to the OSPAR Commission on sites selected for inclusion as components of the OSPAR Network of Marine Protected Areas and develop appropriate management plans and measures;

f. follow Shark Plans adopted within the framework of the FAO International Plan of Action for the Conservation and Management of Sharks;

g. where relevant, promote monitoring of basking sharks within whale observation programmes.

3.2 Acting collectively within the framework of the OSPAR Commission, Contracting Parties should:

a. request ICES to provide regular advice on the distribution, biology, conservation and management measures and research needs for these species;

b. promote the inclusion of the common skate, the white skate, the angel shark and the basking shark as protected species in European and international biodiversity conventions, taking into account the OSPAR Regions for which threats and/or decline have been indicated in the OSPAR List of threatened and/or declining species and habitats (OSPAR Agreement 2008-6);

c. in accordance with Annex V of the OSPAR Convention, encourage authorities competent for fisheries management:

(i) to assist industry with the development of techniques and equipment to facilitate the safe release of these species from commercial fishing gears and monitor their condition at the time of their release and discard survival;

(ii) to promote studies of the distribution and spatial dynamics of these species, for example through electronic tagging studies, and the use of fishery-independent studies to monitor population trends;

(iii) to take relevant conservation measures in key areas where significant numbers of these species would still occur.

Threats and measures are addressed in Chapter 12.4

Knowledge gaps

Management considerations from OSPAR recommendations 10-06 which could still be addressed:

	(i) assist industry with the development of techniques and equipment to facilitate the safe release of these species from commercial fishing gears and monitor their condition at the time of their release and discard survival; (ii) promote studies of the distribution and spatial dynamics of these species, for example through electronic tagging studies, and the use of fishery-independent studies to monitor population trends; (iii) take relevant conservation measures in key areas where significant numbers of these species would still occur.
References	EU. 2013. Regulation (EU) No. 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC. Official Journal of the European Union, L 354/22-61. Regulation (EU) 2015/812 of the European Parliament and of the Council of 20 May 2015 amending Council Regulations (EC) No 850/98, (EC) No 2187/2005, (EC) No 1967/2006, (EC) No 1098/2007, (EC) No 254/2002, (EC) No 2347/2002 and (EC) No 1224/2009, and Regulations (EU) No 1379/2013 and (EU) No 1380/2013 of the European Parliament and of the Council, as regards the landing obligation, and repealing Council Regulation (EC) No 1434/98. Official Journal of the European Union, L 133/1-20.

Annex 3: Reviewers' comments

Consolidated referee report

OSPAR special request to review and update OSPAR status assessments for stocks of listed shark, skates, and rays

Authors: Walker *et al.* August 10, 2020

1) Background

This is the consolidated review of the report developed by the WKSTATUS group in response to a special request from OSPAR to provide the scientific knowledge basis for preparing the OSPAR Quality Status Report 2023 (QSR2023). This is in regards to the list of threatened and/or declining species, in particular for the following elasmobranch species of concern: angel shark, basking shark, common skate complex, gulper shark, leafscale gulper shark, porbeagle, Portuguese dogfish, spotted ray, spurdog, thornback ray, and white skate.

The main purpose of status assessments is to inform OSPAR about the effectiveness of any measures and actions that were adopted and implemented by contracting parties. WKSTATUS provides 2-page status assessments for the above list of species. These assessments will be used to frame OSPAR's future decision-making relating to the OSPAR list of threatened species. Status assessments should make specific reference to relevant human activities that can have an effect on the status of the species and current measures to regulate such activities should be considered.

The Texel-Faial criteria for the identification of species in need of protection include the following categorisations: global importance, regional importance, rarity, sensitivity, keystone species and decline. Each assessment was asked to revisit the previous assessment of a species of concern against these criteria and to update this given any new evidence. The status assessment criteria included: distribution, population size/abundance, condition, key pressures and effectiveness of management.

2) General comments

WKSTATUS concluded that of the 11 assessed species, all should remain listed on the OSPAR list of threatened/declining species, except for thornback and spotted ray. Texel-Faial criteria were updated for angelshark, basking shark, common skate, spotted and thornback rays.

All reviewers concluded that the WKSTATUS provided a comprehensive, well-written, structured and informative document that delivers the knowledge base that was requested. The template as specified in the "Guidance on the development of Status assessments" has been followed. The species-information sections are generally well-supported by relevant, peer-reviewed literature.

However, there are areas in the assessment and proposed updates that would benefit from a few changes to improve the justification, clarity and transparency for a broad range of readers. In addition, the text in sections on Texel-Faial criteria in some instances is not as well supported; this was the case with angel shark, basking shark, common skate and others (see further detail in the specific comments).

The ToRs of the special request were all addressed using the OSPAR assessment template and audit trail in providing most up-to-date information about the species' spatio-temporal distributions and localised abundances. For a complete assessment, however, an assessment of the level of adoption, implementation and enforcement of existing measures is needed. As stated in the guidelines, the focus of the assessment should be to evaluate whether existing measures are effective in inducing a change in human pressure (the proxy approach). It was noted that although changes in key pressures were evaluated, WKSTATUS was quite reserved when commenting on the efficacy of any existing measure. This could be because reports about the level of adoption, implementation and enforcement of a contracting party for any of the existing measures were not available or not part of this assessment process. If so, this should be made clearer.

Nevertheless it was noted that, in some species assessments, a comment was made that it was not up to WKSTATUS to comment upon the efficacy of measures, whereas for another species, a comment was included. An example is the lack of evaluation and validation of uptake of improved training material for species identification purposes (see common skate complex vs gulper shark – under recommended actions and measures; or P. 14 for angelshark). A consistent approach should be taken by WKSTATUS or detail provided about whether or not an evaluation of the efficacy of a management measure was done, and if not, what is lacking.

Almost all of the assessed species are under pressure from incidental bycatch, given that directed fisheries have ceased and were banned. The efficacy of listing species as prohibited has, in many cases, not been assessed, let alone documented due to inadequate data on discarding. There are doubts about whether bycatch events are being reported at all and if so, they lack validation. For almost all of the species, there is no knowledge about the order of magnitude of discarding (despite EU regulations to document and report incidental catches, and at-sea observations as part of the Data Collection Framework), let alone discard mortality (which would be essential to justify prohibited species listings). In some cases, a new measure has been suggested to incorporate vitality assessments of any captured individuals during DCF campaigns (see ICES WGMEDS 2020 report, section 2.3, P. 28), for example for angel sharks. The potential effects of IUU, which is likely to occur given the large OSPAR region, has rarely been mentioned as a potential human threat and pressure. Recreational fisheries are a human pressure, especially for those species that are found in coastal areas. It is therefore advisable to describe any interactions with such fisheries and link more closely with WGRFS and WGBYC to check and coordinate whether all available data sources have been shared. If so, these links and data extracts should be made explicit and their input acknowledged (e.g., as part of the audit trail).

Assessments for almost all species were data deficient. Except for the common skate complex, porbeagle shark, spurdog, spotted ray, thornback ray, the status of the population was unknown and could not be assessed based on direct monitoring observations. Abundance and biomass index estimates are either highly variable or not known.

Assessments often rely on expert opinion and it should therefore be specified in the audit trail how experts were solicited. Nowhere in the report is there any indication of the significance, the depth or extent of expert opinion used for assessments. In chapter 5.3.4 'Expert judgment' in the OSPAR Agreement 2019-05 (P. 12-13), key points are listed that should be addressed to ensure a robust assessment. The audit trail should be used to elucidate that. Such indications could help the 'estimation' of the bias this generates and provide a 'confidence' of the conclusion's statements as the OSPAR Agreement 2019-05 (P.21, 37) requires.

Generally, the condition of the stock, threats and impacts sections of individual species often lacks an outlook for the next 6-12 years for likely changes in condition or main pressures (as asked for according to the guidelines, P. 33, 36). The effect of climate change has rarely been mentioned (other than for basking shark), whereby it could have an effect for species whose distribution is knowingly affected by temperature.

An overview species table that tabulates OSPAR status, and vulnerability to fishing based on life-history traits would be valuable, if not available elsewhere already.

3) Specific comments

a) Is the executive summary clear and succinct and meets the ICES guideline criteria?

Yes, the executive summary conforms to ICES guidelines. Nevertheless, any scientific highlights in addressing the objectives could be elaborated on. Implications of the findings were described, together with any associated uncertainties and some recommendations were made. The summary provided a brief but concise description of the analyses made and presented the main conclusions. Some more attention could be paid towards also summarizing the limitations of the available data, and their significance in contributing to uncertainty.

b) Are the deliverables in their scope, robustness, and presentation appropriate in response to the terms of references of the special request?

Yes, the report provided the knowledge basis that was requested and addressed all ToR's of the special request. As noted as a general comment above, almost all assessments suffer from a lack of data, often undermining the robustness of the assessment and increasing uncertainty.

c) Is the methodology appropriate, and described in sufficient detail to be both understandable and reproducible?

For all assessed species, the ToRs of the special request were addressed by detailing:

- Recent changes in species distribution, including seasonal aspects and habitats, changes in abundance or relative abundance;
- Most relevant human activities that have an effect on the status of the species;
- Changes in human activities and pressures that are threats to the species; and
- Current measures with regards to human activities affecting the status of the species, including fisheries.

None of the assessments provide details about the time period assessed. If available, figures should provide (stacked) bar graphs of landings and discards, and provide estimates of uncertainty around abundance indices. In some cases, as outlined below, legends and/or axes labels are too small to be read, and some images need better quality images. In some cases, the visuals do not correspond with, nor support the assertions made in the text, or agree well with captions. The authors should check that any studies cited in the 2-page assessment summary reports were included in the references there and not in the audit trail (e.g. Lawson et al. 2020 is cited on P. 10 global importance for angelshark, but listed in reference section of the audit trail, P. 136).

More detailed comments are provided on a species-by-species basis drawing in all reviewers' suggestions:

Angelshark (*Squatina squatina*)

Habitat damage and threats to prey availability are not documented by appropriate references. There are limited data of only landings, although the EU Regulation 2015/812 requires all angel shark bycatch must be reported for countries. Current status and population trends are unknown. Regarding the change of global/regional criteria, it is not easy to understand the discussion that the species is extinct yet there are 2 articles that indicate the presence of the species in UK waters (Wales) during last 10 years. It seems a contradiction that this is then used to assert that the species meets the Texel-Faial criteria 1 and 2 (Global/Regional importance). This should be explained better.

P. 6 – key message: What are the indirect data that was cited as the source to indicate a reduction of pressure for excessive mortality? Could this not be misinterpreted that its status is likely to improve, when changes in pressures are considered as a proxy for status? Was an analysis of bycatch events registered during DCF commercial trips not provided? - but perhaps should be made available via WGBYC?

P. 7 – population/abundance: Figure 2 shows only commercial landings. However, to evaluate the actual impact on the species, the figure should include data on discards as well, especially noting that the report states that EU Regulation 2015/812 requires all angel shark discards to be recorded. Presenting discard information with landings would provide a more accurate representation of recent removals (even though discard mortality is largely unknown).

P. 8 – threats and impacts / conclusions: Discard survival probability is unknown (see conclusion, P. 8) or variable (see Threats and impacts, P. 8). Specify which statement is more correct – unquantified or variable?

P. 10 – global/regional abundance: The WKSTATUS proposes a change of the Texel-Faial Criteria on global and regional importance because new information on presence and distribution of local populations has become available. It would be very useful to present both the old and updated maps of species distribution to help justify this change. Otherwise, it is difficult to evaluate whether current knowledge indeed supports the change proposed.

P. 10 – global importance: The report states that this is based on 'new information on biogeographic distribution' citing two studies. The first one is Morey et al. (2019) - the source of Figure 1 in the report - where the species is considered extant in the largest part of OSPAR area III (a sighting since 1987). However, the report presents Figure 2, P.7, with reported landings that show that the species is firmly and continuously present in this area until 2017 (30 years after 1987). That fact alone challenges the validity of the former source. The second reference (Lawson et al., 2020 P.19, Figure 1) presents the species as extinct in the Celtic-Biscay Shelf (based on studies last published in 2017). At the same time, Shephard et al. (2019) reported records from Wales in 2017.

Based on the above two studies, it is therefore very difficult to assume that the species is extant from OSPAR area III and that 'the Baltic Sea is no longer considered to be within the species' geographic range' (P.10 of the report). This is particularly the case given that, according to OSPAR Agreement 2019-03, P.3, a species is considered extinct 'if surveys in the area have repeatedly failed to record a living individual in its former range and/or known or expected habitats at appropriate times (taking into account diurnal, seasonal, annual patterns of behavior) for at least 10 years'. Clearly, this is not the case with angel shark.

On the contrary, in the 2010 report it was stated that 'the possibility cannot be excluded that the remaining stocks here may now represent 75% of the global population'. Since then, severe protective measures have been taken and European fisheries regulations are prohibiting the retention of angel shark, thus reducing fishing mortality (including from recreational fisheries) which is the main pressure on the species.

Although for several reasons, landings data are not necessarily informative of population size, an overall decline in landings (Figure 2) might be the result of the severely decreased fishing pressure which in turn has likely had a positive effect on the stock. Furthermore, given the rarity of the species, scientific surveys encounter this animal only very occasionally, meaning that sufficient data to evaluate the state of the stock are lacking.

Therefore the possibility that the aforementioned percentage of 75% of the global population remains (or the population has even increased) cannot be excluded. This also increases the global importance of the OSPAR area for this species.

For these reasons it is not clear which criteria were used by WKSTATUS to conclude that the species does not qualify for the criterion of global importance and so perhaps it is premature to reach this absolute conclusion.

Basking shark (*Cetorhinus maximus*)

The WKSTATUS assessment revised the Texel-Faial criteria taking into account seasonal aggregations in localised, coastal regions. The key message should also refer to your observation that the survival of discards and their frequency of occurrence remain unknown. Also, comment on the effectiveness of existing measures (see general comment above). For example, listing a species as prohibited may still invite unregistered discarding, and a bias in reporting incidents.

P. 21 – regional importance: WKSTATUS proposes that basking sharks qualify for the regional importance Texel-Faial criterion, and bases the recommendation on recent genetic studies. The reference to that genetic study (i.e., Lieber et al. 2019) is necessary. It is mentioned on P. 18, but then not included in the "references" tab of the status assessment, only in the audit trail (P. 141).

Common skate (*Dipturis batis*)

This species complex should be listed separately. Incidental bycatch from fishing is the main threat. It is listed as prohibited species. The impact from recreational angling is unknown.

P. 32 – population/abundance: Figure 2 appears to be of very poor quality and it is difficult to read the content, due to extremely small font size, lack of clarity, and coded labels which are not translated. It should be replaced with a better quality version. Also, abundance index estimates need to be presented with corresponding uncertainty intervals to enable readers to judge the value of the estimates for informing abundance or changes therein. Fisheries-dependent information and even fisheries-independent information acquired from scientific sampling programmes have difficulties to distinguish these species. Also landings and discards of the common skate complex-*Dipturus batis* can be misidentified with other *Dipturus* species (D. *nidarosiensis* and *D. oxyrinchus*). ICES detected a possible misreporting of *D. batis* and higher reporting of *D. oxyrhinchus*. Thus, any data about indices of fishing abundance must be taken with caution when deciding the status of each species.

P. 35: As is the case with other species, references are needed in the Texel-Faial criteria assessment description for which a change in status is proposed (those criteria include global and regional importance as well as keystone species). Currently, the text simply describes new information, but does not cite the references where this new information came from. Such references are necessary.

Gulper shark (*Centrophorus granulosus*)

Given the many unknowns relating to the gulper shark's biology, lack of data and species identification issues, an assessment is difficult. The assessment against Texel-Faial criteria suggested no changes. This is a zero-TAC species, but some bycatch quota is allowed on a trial basis from a longline fishery for black scabbardfish. Is an analysis of any catch records from this fishery available yet?

P. 41 – species information: delete the second sentence that begins with "Information about this species is very limited". Reword instead as: "Information about the species is deficient and uncertain given the misidentification issues identified with similar species of the *Centrophorus* genus."

P. 43 – condition: Better use "bycatch" instead of "accessory" species?

P. 43 – threats and impacts: check with and cite WGSHARK6 for the correct listing of fishing restrictions.

P. 44: Cite in the conclusion the WKSHARK6 report also when mentioning the possibility of improved selective measures.

Leafscale gulper shark (*Centrophorus squamosus*)

As the gulper shark, members of the *Centrophorus* genus are sensitive to depletion by fisheries due to their life history traits (low productivity, high longevity, slow growth rates). Fishing pressure was reduced over the last years. No outlook was provided in the condition, threats and impacts section of the assessment sheet (P. 58). The species qualifies for listing as threatened OSPAR species based on decline criteria while steep declines have been reported based on CPUE data. But how certain are these declines as on P. 58 there is an indication of uncertainty in the conclusion - and considering that this species is rarely captured in scientific research surveys and belongs to a group of deep-water shark species that are difficult to identify by fishers.

P. 55 – Background information: write "declining" instead of "cecling".

P. 65: What are unobserved fisheries – unobserved by DCF observers?

The assessment of these deep-water sharks is influenced by the poor data and by misidentification in fisheries-dependent data.

Porbeagle shark (*Lamna nasus*)

There seem to be contradictory opinions about the effectiveness of prohibiting directed fisheries on this species and its listing as a prohibited species. That is, for leafscale gulper shark, it is stated as an equivalent to a license to discard, whereas for porbeagle, it is hailed as a successful measure to reduce fishing pressure. Texel-Faial decline criteria may still qualify for this species to be listed as threatened or rather classified as unknown. The reduction in pressure from fisheries as stated in the key message is not reflected in the table by a downward pointing arrow. The outlook for condition and threats and measures was not provided - for example, whether tagging programmes in recreational fisheries could shed some light on population condition.

Portuguese dogfish (*Centroscymnus coelolepis*)

P. 79-80 – geographical range: the legends of Figure 2 (updated distributional maps from the WKSHARK6 report) are difficult to read.

Spotted ray (*Raja montagui*)

The WKSTATUS concludes that the spotted ray does not justify inclusion in the OSPAR List, since the spotted ray population has increased in Regions II, III and IV, with recent years above the long-term average.

P. 92 – population/abundance: Figure 2 presents stock size indications, but should be improved. The figure includes several panels with indicators for different areas. Areas should be clearly marked, as two of the panels correspond to OSPAR Area II, and two are from OSPAR Area IV, which is not clear. It is also not clear what the red lines are meant to represent – if they are important, the description should be included in the caption. If not – they should be removed. The first two panels are lacking uncertainty intervals about index estimates. As already mentioned, it is important to provide them for accurate interpretations.

The text above the Figure 2 states that "An increasing stock trend is observed for OSPAR Region II, whereby the stock size indicator is above the long-term average". However, Figure 2a does not show any long-term average, nor is a trendline depicted or quantified. The text also says that "Stock size indicators are also increasing in OSPAR Regions III and IV." However, Figure 2b and 2d that show that a relative increase is only observed in a few recent years, and not over a long term.

P. 98 – recommended actions and measures: Is an increase in Minimum Conservation Reference Size (MCRS) a potential new management measure? Also, for other species? It has rarely been mentioned.

Spurdog (*Squalus acanthias*)

P. 101: Latin name (*Squalus acanthias*) is missing from 10.1 Species information. Fishbase lists it as picked dogfish.

P. 103: While describing the species' geographic range, it is worth mentioning that spiny dogfish in the North Pacific Ocean is a different species, *Squalus suckleyi*, since the official taxonomical separation of the two species occurred after the initial OSPAR assessment.

P. 105: include discard survival estimation also in recommended actions and measures (P. 110).

P. 104 – population/abundance: In Figure 2, the landings and discards on the top left panel should be stacked to more transparently represent year-specific removals.

P. 105 – condition: Do the different lines in Figure 3 represent different estimates, from different assessments? If so, this should be clearly noted on the figure itself or in the caption. As in other cases, it is important to add uncertainty intervals to at least the most current assessment trajectories, to illustrate whether estimates from the past assessments fall within the current uncertainty intervals.

Thornback ray (*Raja clavata*)

WKSTATUS concludes the species does not continue to justify for inclusion in the OSPAR List of threatened and/or declining species, because the stock has shown an increase in the stock-size indicator.

P. 114 – population/abundance: Figure 2 – as in case with spotted ray, it is not clear what the red lines are meant to illustrate. If they are important, the description should be included in the caption. If not – they should be removed. Several panels are lacking uncertainty intervals about index estimates. The text above Figure 2 says that in Region V, catch rates are stable at a low level, however Figure 2f shows a declining trend in the relative abundance index since 2004. The caption and legend of Figure 2 should be improved.

P. 115 – measures that address key pressures: refer to the comment in recommended actions (p. 120). Studies on discard survival are ongoing in several countries: Belgium, France, Portugal, and results will be forthcoming.

P. 115 – condition: Figure 3 – yes, there were specific trends in length composition data presented, but it is debatable to call them stable, as they are quite dynamic especially on the first two panels. Figure 3 needs a better quality image with a higher resolution.

P.118 – TF criteria – keystone species: The group assessment concludes that spotted rays and Thornback rays did not qualify as keystone species. Although the previous OSPAR assessment highlighted the non-existence of information to decide (so the status was unknown), in this assessment, WKSTATUS decided that both rays did not qualify as Keystone species although it was stated that there is no evidence that the species have a controlling influence on the marine community. If there is no such evidence, on what basis this assessment was made? Bearing in mind that in Chapter 9.1, paragraph 2 (P. 90) for Spotted ray, the report stated 'Whilst there have been improvements to our biological understanding, knowledge of their life-cycle and population structure is incomplete.' and Chapter 11.1 paragraph 3 (P. 112) for Thornback ray 'there is still an incomplete understanding of the life-cycle'.

White skate (*Rostroraja alba*)

P. 125: With which species and at which of their life stages can it be confused with?

P. 130: Are there any considerations for DCF sampling programmes to take routine photo records to build a reference image library to facilitate species identification with an image processing software?

d) Have the limitations of the available data been sufficiently described?

Yes. The assessments are mainly based on expert opinion but how it has been solicited could be detailed in the audit trail, together with how data sources were integrated (see comment above).

Maybe also refer to limitations of the data that went into generating the distributional maps of WKSHARK6, seeing that some of these maps were re-printed in the WKSTATUS report. Correct species identification remains an issue for common skate and several other species. Although training material has been developed, their uptake and application has rarely been evaluated. Discard survival is virtually unknown for most species, and for some, experts judged it to be variable. This should be included in the recommended actions and measures section, wherever feasible and with priority. Surprisingly, the issue of age determination and any advancement in knowledge in that field of study was not mentioned at all in relation to any of the species, even though elasmobranchs (being cartilaginous fish) often present a challenge in that regard. For example, stock assessments of the spiny dogfish in the North Pacific continue to be a major challenge due to the lack of reliable age data.

e) ***Are there any more data sources, reports or peer-reviewed literature available to your knowledge, but which were not used or cited as part of the deliverable?***

Some more training material for correct species identification has recently been made available: https://www.youtube.com/watch?v=IJqx4nSKy8Y

Estimates about discard survival of thornback rays, blonde rays and spotted rays are also forthcoming from (ongoing) research. A study of genetic kinship of blonde and thornback rays is ongoing in The Netherlands.

f) ***Is the standard nomenclature consistently applied?***

The standard nomenclature is successfully and consistently applied throughout the report. A spell check of scientific names may be a convenient way to cross-check. One additional minor comment is that the titles of the 2-page status assessment reports should follow a consistent nomenclature. As OSPAR noted, there are several assessments of this kind that sometimes overlap with respect to the assessment criteria applied. The IUCN redlist assessment was noted by WKSTATUS to be useful to consult, and several data sources such as distributional maps were shared and acknowledged as input to the WKSTATUS assessments.

g) ***Are the conclusions supported by the data?***

In general, the conclusions summarized the key issues arising from the entire process done during the individual species assessments, condensing all available information and relating them back to the initial purpose of assessing status.