19 Skates in the Bay of Biscay and Iberian Waters (ICES Subarea 8 and Division 9.a)

ICES uses the generic term "skate" to refer to all members of the order Rajiformes. The generic term "ray", formerly used by ICES also to refer to Rajiformes, is now only used to refer to other batoid fish, including manta rays and sting rays (Myliobatiformes), and electric rays (Torpediniformes). ICES only provides routine advice for Rajiformes.

19.1 Ecoregion and stock boundaries

The Bay of Biscay and Iberian Waters ecoregion covers the Bay of Biscay (divisions 8.a-b and 8.d), including the Cantabrian Sea (Division 8.c), and the Spanish and Portuguese Atlantic coast (Division 9.a). This ecoregion broadly equates with the area covered by the South Western Waters Advisory Council (SWWAC). Commercially-exploited skates do not occur in the offshore Division 8.e to any significant extent.

The northern part of the Bay of Biscay has a wide continental shelf with flat and soft bottom more suitable for trawlers, whilst the Cantabrian Sea has a narrower continental shelf with some remarkable bathymetric features (canyons, marginal shelves, etc.). The Portuguese continental shelf (Division 9.a) is narrow, except for the area located between the Minho River and the Nazaré Canyon, and in the Gulf of Cadíz, where it is about 50 km wide, particularly to the east. The slope is mainly steep with a rough bottom including canyons and cliffs.

Rajidae are widespread throughout this ecoregion but there are regional differences in their distribution as described in earlier reports (ICES, 2010), and this is particularly evident for those species with patchier distributions and limited dispersal (Carrier *et al*., 2004).

Recent studies have provided information on ecologically important habitats for *R. clavata*, *R. brachyura*, *R. montagui*, *R. microocellata*, *R. undulata* and *L. naevus* in Portuguese continental waters (Serra-Pereira *et al*., 2014). Sites with similar geomorphology were associated with the occurrence of juveniles and/or adults of the same group of species. For example, adult *R. clavata* occurred mainly in sites deeper than 100 m with soft sediment. Those were also considered to be habitat for egg-laying of this species. *Raja undulata* and *R. microocellata* occurred preferentially on sand or gravel habitats. Potential nursery areas for *R. brachyura*, *R. montagui* and *R. clavata* were found in coastal areas with rock and sand substrates. Further details are given in the Stock Annexes.

Information from trawl surveys on catches of (viable) skate egg-cases is considered valuable to further identify ecologically important habitats. Further information could be collected in trawl surveys. Skates in this ecoregion include thornback ray *Raja clavata*, cuckoo ray *Leucoraja naevus*, the less frequent blonde ray *Raja brachyura*, small-eyed ray *R. microocellata*, brown ray *R. miraletus*, spotted ray *R. montagui*, undulate ray *R. undulata*, shagreen ray *Leucoraja fullonica*, common skate *Dipturus batis*-complex, (recently split into *D. batis* and *D. intermedius*), long-nosed skate *D. oxyrinchus*, sandy ray *Leucoraja circularis* and white skate *Rostroraja alba*.

Studies undertaken in the Portuguese Atlantic coast (Division 9.a; Serra-Pereira *et al*., 2014), and in the Cantabrian Sea (eastern parts of Division 8.c) indicate spatial overlap between *R. clavata* and *L. naevus* (e.g. Sánchez, 1993). In the Bay of Biscay, *L. naevus* is more abundant on the offshore trawling grounds (Sánchez *et al*., 2002). Along the Portuguese coast *R. clavata* and *L. naevus* co-occur in areas deeper than 100 m, on grounds composed of soft bottom, from mud to fine sand (Serra-Pereira *et al*., 2014). *Raja clavata* can also be found from rocky to coarse sandy bottoms.

Raja brachyura occurs primarily near the coast in shallower depths in areas of rocks surrounded by sand. Juvenile *R. brachyura*, *R. montagui* and *R. clavata* co-occur on grounds shallower than 100 m. In the Bay of Biscay and the Iberian Coast, *R. undulata* and *R. microocellata* occur at depths < 40 m over sandy bottoms. *R. undulata* is locally abundant in the shallow waters between the Loire and Gironde estuaries (eastern Bay of Biscay; divisions 8.a-b) and occurs along most of the French coast.

The geographical distributions of the main skate species in the ecoregion are known, but their stock structure still needs to be more accurately defined. Studies (e.g. tagging and/or genetic studies) to better understand stock structure are required.

A tagging survey of *R. undulata* carried out in the Bay of Biscay (2012–2013) showed that movements of this species were limited to *ca.* 30 km (Delamare *et al*., 2013 WD; Biais *et al*., 2014 WD). This result supports the hypothesis that several local stocks exist in European waters and corroborates the assumption of three distinct assessment units (divisions 8.a–b; 8.c and 9.a) in this ecoregion.

In 2022 the stock of thornback ray in the Bay of Biscay (rjc.27.8) was split between the eastern shelf (divisions 8.abd) and the Cantabrian Sea (Division 8.c) following the benchmark for the stock were the population connectivity was addressed (ICES, 2022b). A third stock unit of thornback ray was already considered separately in Division 9.a. Since 2015, cuckoo ray from ICES subareas 6 and 7 in the Celtic seas ecoregion and the Bay of Biscay is considered to form one single stock, cuckoo ray in subareas 6 and 7 and divisions 8.a-b,d.There are two other stocks of cuckoo ray in this ecoregion: in Division 8.c (Cantabrian Sea) and Division 9.a (Iberian waters). For the spotted ray two stock units are considered: Subarea 8 and Division 9.a. Lastly, for blonde ray the stock unit considered covers only Division 9.a. Landings of skates outside of the boundaries of ICES stocks units are considered together with landings not reported species-by-species in a multispecies unit referred to as "Other skates and rays in Subarea 8 and Division 9.a" this unit is not subject to assessment and advice for it was not requested in 2022.

19.2 The fishery

19.2.1 History of the fishery

In the Bay of Biscay and Iberian waters, skates are caught mainly as a bycatch in mixed demersal fisheries, which target various species: primarily hake, nephrops, anglerfish and megrim. The main fishing gears used are otter trawl, bottom-set gillnets and trammel nets. The countries involved in these fisheries are France, Spain and Portugal, as detailed below.

France

Skates are traditional food resources in France, where target fisheries were known to occur during the 1800s. In the 1960s, skates were taken primarily as a bycatch of bottom trawl fisheries operating in the northern parts of the Bay of Biscay, the southern Celtic Sea and English Channel. By this time, *R. clavata* was targeted seasonally by some fisheries, and was the dominant skate species landed. After the 1980s, *L. naevus* became the main species landed. However, landings of both *R. clavata* and *L. naevus* declined after 1986.

Other skates are also landed, including *L. circularis*, *L. fullonica*, *R. microocellata, D. batis* complex (mostly common blue skate), which is included in the prohibited species list by the EU regulation since 2010, and *D. oxyrinchus*. There have been no major annual landings of *Rostroraja alba* by French fleets in the past three decades.

The historical French catches of skates in coastal fisheries are poorly known. Most landings of skates and rays were not reported by species before 2009 where species-specific reporting of landings was required by the EU regulation. For *Raja undulata,* this implies that no species-specific landings were reported before its inclusion on the EU prohibited species list and past levels of catch are unknown.

Spain

Spanish demersal fisheries operating in Galicia and the Cantabrian Sea (Division 9a N and 8.c) and Bay of Biscay (divisions 8.a-b and 8.d) catch various skate species using different fishing gears. Most landings are a bycatch from trawl fisheries targeting demersal teleosts, (e.g. hake, anglerfish and megrim). Among the skate species landed, *R. clavata* and *L. naevus* are the most frequent. Historically, due to their low commercial value, most skate species, especially those derived from artisanal gillnetters, were reported as Rajidae. There are artisanal gillnet fisheries operating in bays, rias and shallow waters along the Cantabrian Sea and Galician coasts (divisions 8.c and 9.a). *R. undulata* is caught mainly in the coastal waters of Galicia (northern part of Division 9.a and western part of Division 8.c) where it was frequently landed and one of the most abundant species inside the rias. Other skate species caught in Galician waters include *R. brachyura*, *R. microocellata*, R. *montagui*, *R. clavata* and *L. naevus*. The characteristics of Spanish artisanal fleets catching skates are not fully known.

Mainland Portugal

Off mainland Portugal (Division 9.a), skates are caught mainly by the artisanal polyvalent fleet with a smaller contribution of trawlers to landings. The artisanal fleet operates mostly with trammel nets, but other fishing gears (e.g. longlines and gillnets) are also used. The skate species composition of landings varies along the Portuguese coast. *Raja clavata* is the main species landed, but *R. brachyura*, *L. naevus* and *R. montagui* are also caught. Before being prohibited, *R. undulata* was frequently landed. Other species, such as *R. microocellata*, *D. oxyrinchus*, *R. miraletus*, *R. alba* and *L. circularis,* are also caught, albeit less frequently (particularly the latter three species). Further details on fisheries in Division 9.a are given in Stock Annexes.

19.2.2 The fishery in 2020-2021

COVID-19 is expected to have affected fishing activity in 2020, although so far unquantified, with national or local restrictions on fishing activity as well as disruption of markets and the food chain reducing fishing effort for at least part of the year.

Apart from COVID-19, no other clear changes are noted in recent years.

France

Landings and on-board observation data confirm that skates are primarily a bycatch in numerous fisheries operating in the Bay of Biscay. French landings statistics from more than 100 métiers (defined at DCF level 6) report landings of *R. clavata* and *R. montagui* in the Bay of Biscay. Trammel nets are the main métier for *R. montagui*, while twin-trawl is the main métier for *R. clavata*.

Spain

The results from the DCF pilot study held from 2011–2013 and conducted in the Basque Country waters (Division 8.c) with the objective of describing and characterizing coastal artisanal fisheries (trammel nets targeting mainly hake, anglerfish and mackerel), showed that several skate species (*R. clavata*, *R. montagui*, *L. naevus*, *L. fullonica*, *L. circularis, R. brachyura* and *R. undulata*) are caught as bycatch. The Basque artisanal fleet consists of 55 small vessels that use gillnets and trammel nets during some periods of the year. Vessels have an average length of 12.7 m and an average

engine power of 82.4 kW. The proportions of skates in the total sampled trips were 30% (2011), 35% (2012) and 16% (2013). The estimated landings of skates by this fleet were 19.3 t in 2012 and 26.9 t in 2013 (Diez *et al.*, 2014 WD).

In the Cantabrian Sea (Division 8.c) most skate landings are also from bycatch from otter trawl (47%) and gillnet gears (43%). The remaining landings are derived from longlines and other fishing gears.

Mainland Portugal

Skates are mainly a bycatch in mixed fisheries, particularly from the artisanal polyvalent fleet (representing around 80% of landings). Set nets (mainly trammel nets), or a combination of set nets and traps, account for most skates' landings (*ca.* 56% in weight and 65% in number of trips in 2021), followed by longline (*ca.* 29% in weight and 24% in number of trips in 2021). Also, within the artisanal polyvalent fleet, small trawlers may account for 5% in weight and 6% in number of trips of the total landings of skates and rays, being only observed in certain landing ports. Methods to estimates landings by skate species were developed during the DCF-funded pilot study focused on skate catches in Portuguese continental fisheries carried out from 2011 to 2013 (Figueiredo *et al.*, 2020b).

The experimental quota of *R. undulata* assigned to Portugal since 2016 requires a special fishing license for this species. Vessels, with the license are mainly operating close to the coast. This fishery is TAC constrained and has as the main goal to provide fishery data for future scientific advice.

19.2.3 ICES Advice

Before 2012, ICES provided general advice on skates by ecoregions. This is not much adequate as skate species have different life-history traits and this does not fit with stocks straddling the boundaries of ecoregions. For instance, one stock of *L. naevus* straddles subareas 6 and 7 (excl. Division 7.d) and divisions 8.a-b and 8.d.

From 2012–2014, ICES has moved towards providing advice at single stock level, giving quantitative advice where possible.

Advice on skates is given biannually. The last advice was given in 2020 for 2021 and 2022 and new advice is requested in 2022. For most stocks a landings advice was given, a summary of these and details for stocks not subject to a landings advice or for which the advice was more complex is summarised in the table below.

Scientific name	ICES stock code	Distribution area	Advice for 2023 and 2024	ICES stock data category
Raja undulata	rju.27.8ab	8.a,b	Catches should be no more than 202 tonnes of which no more than 12 tonnes should be landed	6
Raja undulata	rju.27.8c	8.c	No targeted fisheries, manage bycatch	6
Raja clavata	rjc.27.8abd	8.abd	Not more than 255 t in 2023 and not more than 257t in 2024	2
Raja clavata	rjc.27.8c	8.c	Catches should be no more than 201 tonnes of which no more than 173 tonnes should be landed	3
Leucoraja naevus	rjn.27.8c	8.c	Catches should be no more than 38 tonnes of which no more than 33 tonnes should be landed	
Raja montagui	rjm.27.8	8	Landings should be no more than 99 tonnes	3
Raja montagui	rjm.27.9a	9.a	Landings should be no more than 98 tonnes	3
Leucoraja naevus	rjn.27.9a	9.a	Catches should be no more than 84 tonnes of which no more than 71 tonnes should be landed	3
Raja clavata	rjc.27.9a	9.a	Landings should be no more than 1452 tonnes	3
Raja undulata	rju.27.9a	9.a	Landings should be no more than 31 tonnes	6
Raja brachyura	rjh.27.9a	9.a	Landings should be no more than 231 tonnes	3
Dipturus batis complex *(Dipturus batis)* *(Dipturus intermedius)*	rjb.27.89a	8, 9.a	No advice requested	6
Other skates	raj.27.89a	8, 9.a	ICES cannot provide catch advice	5

19.2.4 Management applicable

An EU TAC for skates (Rajiformes) in subareas 8 and 9 was first established in 2009, and set at 6423 t. Since then, the TAC was reduced between 9 and 15% up to 2014, and increased between 8 and 15% since 2017.. The history of the EU regulations adopted for skates in this ecoregion and the ICES landings estimates for all Rajiformes (excluding *Raja undulata* from 2014 onwards, where a sub-TAC was set for this species from 2015 in Subarea 8 and from 2016 in Division 9.a) is summarized below:

Year	TAC for EC waters of subareas 8 and 9	TAC change (%)	ICES landing estimates	Regulation
2009	6423 t		4327 t	Council Regulation (EC) No 43/2009 of 16 January 2009 (1,2)
2010	5459 t	-15	4140 t	Council Regulation (EU) No 23/2010 of 14 January 2010 (1,2)
2011	4640 t	-15	4144 t	Council Regulation (EU) No 57/2011 of 18 January 2011 (1,2)
2012	4222 t	-9	3766 t	Council Regulation (EU) No 43/2012 of 17 January 2012 (1,2)
2013	3800 t	-9	3686 t	Council Regulation (EU) No 39/2013 of 21 January 2013 (3,2)
2014	3420 t	-10	3685 t	Council Regulation (EU) No 43/2014 of 20 January 2014 (3,2)
2015	3420 t	0	3508 t	Council Regulation (EU) No 104/2015 of 19 January 2015 amended by the Council Regulation (EU) No 523/2015 of 25 March 2015 (3,4)
2016	3420 t	0	3296 t	Council Regulation (EU) No 72/2016 of 22 January 2016 (3,4)
2017	3762 t	+9	3430 t	Council Regulation (EU) No 2017/127 of 20 January 2017 (3,4)
2018	4314 t	-15	3795 t	Council Regulation (EU) No 2018/120 of 23 January 2018 (3,4)
2019	4759 t	+10	3550 t	Council Regulation (EU) No 2019/124 of 30 January 2019 (3,4)
2020	4759 t	0	3393 t	Council Regulation (EU) No 2020/123 of 27 January 2020 (3,4)
2021	5129 t	+8	3425 t	Council Regulation (EU) No 2021/703 of 26 April 2021 (3,4)*

(1) Catches of cuckoo ray (*Leucoraja naevus*) (RJN/89-C), thornback ray (*Raja clavata*) (RJC/89-C) shall be reported separately.

(2) Does not apply to undulate ray (*Raja undulata*), common skate complex (*Dipturus batis* and *D. intermedius*) and white skate (*Rostroraja alba*). Catches of these species may not be retained on board and shall be promptly released unharmed to the extent practicable. Fishers shall be encouraged to develop and use techniques and equipment to facilitate the rapid and safe release of the species.

(3) Catches of cuckoo ray (*Leucoraja naevus*) (RJN/89-C), blonde ray (*Raja brachyura*) (RJH/89-C), and thornback ray (*Raja clavata*) (RJC/89-C) shall be reported separately.

(4) Shall not apply to undulate ray (*Raja undulata*). This species shall not be targeted in the areas covered by this TAC. By-catch of undulate ray in subarea 8 (since 2015) and 9 (since 2016) may only be landed whole or gutted, and provided that it does not comprise more than 20 kilograms live weight per fishing trip in subarea 8 (in 2015 and 2016) and 40 kilograms of live weight per fishing trip in subarea 9 (in 2016). This provision shall not apply for catches subject to the landing obligation. By-catches of undulate ray shall be reported separately under the codes RJU/8-C and RJU/9-C, respectively for each subarea.

*** UK quota not agreed at the time of publication.**

Regarding *R. undulata* no management measures had been adopted by European Commission (EC) until 2009, when EC regulations stated that "*Undulate ray … (in) … EC waters of VI, VII, VIII, IX and X … may not be retained on board. Catches of this species shall be promptly released unharmed to the extent practicable"* (CEC, 2009). In 2010, *R. undulata* was listed as a prohibited species on quota regulations (Section 6 of CEC, 2010). In 2017, EC stated that "*it shall be prohibited for third-country*

*vessels to fish for, to retain on board, to tranship or to land undulate ray (Raja undulata) in Union waters of ICES subareas VI, IX and X (*Council Regulation (EU) No 2017/127). A by-catch TAC was established for Subarea 8 since 2015 and for Subarea 9 since 2016, under the limits presented in the table below:

Year	TAC for EU waters of Subarea 8	TAC for EU waters of Subarea 9	ICES landing estimates in Subarea 8	ICES landing estimates in Subarea 9	Regulation
2015	25 t	-	16 t	-	Council Regulation (EU) No 523/2015 of 25 March 2015 [3,4]
2016	25 t	40 t	21 t	31 t	Council Regulation (EU) No 72/2016 of 22 January 2016 [3,4]
2017	30 t	48 t	30 t	46 t	Council Regulation (EU) No 2017/127 of 20 January 2017 [3,4]
2018	30 t	48 t	26 t	52 t	Council Regulation (EU) No 2018/120 of 23 January 2018
2019	33 t	50 t	31 t	38 t	Council Regulation (EU) No 2019/124 of 30 January 2019
2020	33 t	50 t	29 t	45 t	Council Regulation (EU) No 2020/123 of 27 January 2020
2021	33 t	50 t	30 t	35 t	Council Regulation (EU) No 2021/703 of 26 April 2021

Unwanted catches of skates and rays in subareas 8 and 9 for the period 2021–2023 are regulated by the Commission Delegated Regulation (EU) 2020/20153, , which establishes the details of the landing obligation in Southern-Western waters. According to this, based on scientific evidences of high survivability, most skates and rays are exempted from the landing obligation. This exemption implies that when discarding skates and rays in the cases referred above, those shall be released immediately, and that during the period 2021–2023, all Member States have to present before 1 May each year additional scientific information supporting the exemption. The Scientific, Technical and Economic Committee for Fisheries shall assess that scientific information by 31 July every year. The exemption applies to:

- All skates and rays (except *L. naevus*) caught by all fishing gears in subareas 8 and 9;
- *L. naevus* caught by trammel nets in subareas 8 and 9 (until 31 December 2022);
- *L. naevus* caught by trawls in Subarea 8 (until 31 December 2022).

19.2.4.1 Regional management measures

Portugal

The Portuguese Administration adopted, on 29 December 2011, national legislation (Portaria no 315/2011) that *prohibits the catch, the maintenance on board and the landing of any skate species belonging to the Rajidae family, during the month of May along the whole continental Portuguese EEZ*. This applies *to all fishing trips, except bycatch of less than 5% in weight*. The legislation was updated on 21 March 2016 (Portaria no 47/2016) by extending the fishing prohibition period to June.

By 22 August 2014, the Portuguese Administration adopted a national legislation (Portaria no 170/2014) that *establishes a minimum landing size of 52 cm total length (L_T) for all Raja spp. and Leucoraja spp*.

On 19 May 2016, Portugal adopted a legislative framework (Portaria no. 96/2016) regarding the 2016 quota of *Raja undulata* in Division 9.a assigned to Portugal. This framework includes a set of conditions for licensing specific fishing permits to vessels on the owner's request, provided

that each vessel fulfils the set of specific conditions which include fishing vessel type, fishing license and historical skate landings. Vessels having the specific fishing permit shall comply with a set of rules, which include obligation to transmit, to both the General Directorate of Natural Resources, Maritime Security and Services (DGRM) and to IPMA, specific fishing data using a form designed by DGRM and IPMA to register haul and catch data on a haul-by-haul basis; the obligation to accept scientific observers duly accredited by IPMA onboard, except in situations where, demonstrably, due to vessel's technical characteristics, it affects the normal activity of the vessel. In 2019, the DGRM introduced a landing control process according to which, in addition to licensed vessels, vessels not possessing the special fishing license were allowed to land a maximum of one specimen per trip and were also obliged to provide additional information on their fishing activity related to *R. undulata* captures (Portaria no. 4/2019).

On each fishing trip, vessels are prohibited from targeting undulate ray and are obliged to land the species under specific conditions: a maximum of 30 kg of undulate ray live weight (for licensed vessels) or one specimen per trip (for non-licensed vessels) is allowed; only whole or gutted specimens can be landed and a minimum (78 cm L_T) and a maximum (97 cm L_T) landing sizes are adopted. During the months of May, June and July of each year the capture, retention onboard and landing of undulate ray is prohibited, but data on catches should be recorded.

France

Based on feedback from scientific programs carried out since 2011 in close partnership with fishermen, it was decided in December 2013 to remove undulate ray from the list of prohibited species, without landings permitted (Total Allowable Catch of zero). In December 2014, thanks to measures proposed by Member States to ensure the sustainable management of local populations of undulate ray, a small TAC has been allowed for France in ICES divisions 7.de and 8.ab, with limited bycatch but no targeted fishing. Since then, the French authorities adopted different decrees to regulate bycatch and landings of undulate ray. Starting in 2016, a legislative framework similar to the one adopted by Portugal was implemented, with landing of undulate ray allowed for a limited number of vessels conditioned by the systematic reporting of catches of this species, a minimum landing size of 78 cm and landing limitations per trip and time period. The obligation of possessing a special permit to land *R. undulata*, which was in place since the dedicated TAC for this species in ICES divisions 8.a and 8.b was set over 0, was lifted in 2019. For more details on the different modalities of this bycatch by year, see Gadenne (2017 WD).

All skates are subject to a minimum landings size of 45 cm in France (JORF, 2017).

Spain

The Spanish Ministerio de Agricultura, Pesca y Alimentación published in the Resolution of 1 July 2019 the list of species for 2019 that have high survival and that can be released into the sea once captured that affected the stocks of *Raja microcellata* in 7.fg, Rajiformes in 6, 7, 8, 9 and *Raja undulata* in 8.c and 9.

In March 2020, the list of species with exemption of the landing obligation based on high survival was updated (Boletín Oficial Del Estado nº 66, sec. III), following the Commission Delegated Regulation (EU) 2019/2237. The updated list includes all skates and rays (except *L naevus)* caught by all fishing gears in Divisions 8 and 9, *L. naevus* caught with trawl in Division 9 and *L. naevus* caught with trammel nets in Divisions 8 and 9. The recommendation is to release immediately the unwanted catch of those species below the sea surface.

19.3 Catch data

19.3.1 Landings

Although historical data are incomplete with some national data missing in some years and some year to year variations suggesting changes in reporting practices rather than actual variations in landings, reported landings suggest a long-term decrease since the early 1970s (Figure 19.1). Landings data for all Rajiformes combined are considered reliable since 2005 (but species-specific landing are no reliable before 2009 for most stocks). Landings have decline since 2005. Detailed landings by area, species and stock are presented in Tables 19.1a-f and19.2a-d at the end of this chapter.Table 19.1f gives annual ICES landings by stock and country. Table 19.2a-c present the annual ICES landing estimates, by division for each skate and ray species and Table 19.2d landings of Dasyatidae, Myliobatidae, Rhinobatidae, Torpedinidae and Gimnuridae species

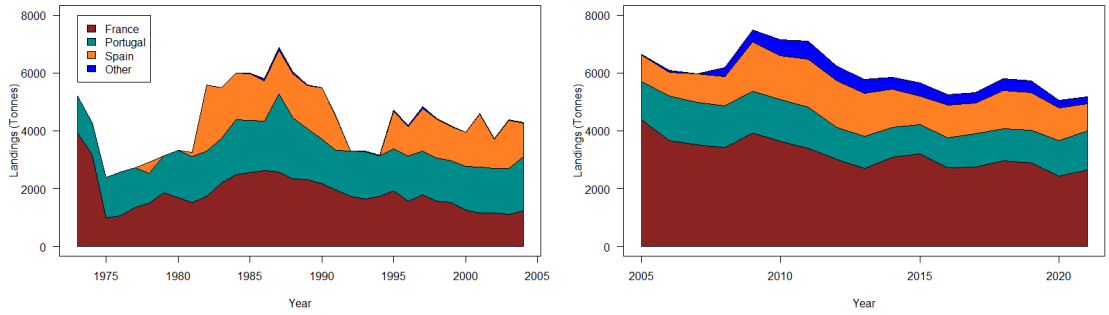

Figure 19.1. Skates in the Bay of Biscay and Iberian Waters.(Left): historical landings of Rajidae in subarea 8 and 9from 1973 to 2004 from STATLANT data (with WGEF corrections using national data provided by WGEF members for some countries and years), (right): landings in 2004-2021 from data submitted to ICES.

Skates in Bay of Biscay and Cantabrian Sea (Subarea 8)

Since 2005 approximately 68% of landings in Subarea 8 have been caught by France and 31% by Spain. Since 1973, skate landings show no clear trend, although at the earlier years of the time-series (1973–1974) and in the period from 1982–1991 remarkably high values were registered. Data before the 2000s are considered incomplete.

Since 2010, divisions with the highest landings had been 8.a–b (around 70%), and these were mostly from France). In Division 8.c, landings represented 16-30% of the total landing of Subarea 8 and were mainly from Spain. Landings from Division 8.d-e have been low and decreasing since 2005, around 50 tonnes or less in recent years.

Skates in Division 9.a

Portuguese and Spanish historical landings since 2005 account for *ca.* 78% and 22%, respectively of reported skate landings. Since 2005, total landings of skates remained relatively stable, in the range 1265–1863 tonnes.

19.3.2 Discards

Discard quantities available to ICES for Subarea 8 and Division 9.a and country are presented in Table 19.3a at the end of this chapter..

High survival rate of discarded skates have been estimated for several stock in subareas 8 and 9 and elsewhere so that discards do not correspond to dead catch. Discard survival is considered in more detail where discards are accounted for in stock assessments.

In the two last data years included in assessment carried out in 2022, on-board observation programme have been disrupted by the COVID-19 pandemic. The sampling was overall lesser than in previous years resulting in a general increase uncertainty and some gaps in discard data.

19.3.3 Discard survival

WKSHARK3 (ICES, 2017a) and WKSHARK 5 (ICES, 2020) reviewed available studies to identify where there are existing data on at-vessel mortality and post-release mortality of elasmobranch species by area, gear type and identify important data gaps.

Discard survival data available on skates caught in trammel net fisheries (mesh size ≥ 100 mm) in ICES Division 27.9.a, collected under the Portuguese DCF pilot study on skates (2011–2013), and presented in previous reports was re-analyzed and the results summarized in Serra-Pereira and Figueiredo (2019 WD). Experiments were conducted on categorical vitality assessment (CVA) after capture of *R. clavata, L. naevus, R. montagui, R. brachyura* and *R. undulata* and indicate that it is generally high for all species, as the percentage of skates in Excellent and Good vitality status was above 75% for all species, mesh size and soak time considered (Table 19.3.3.1).

- ***R. clavata*** - specimens caught in both mesh size groups with soak time < 24h were mainly found in "excellent" condition (100% and 92%, respectively), while those from hauls with > 24h, although most specimens were caught in "excellent" condition (72% and 52%), the percentage of "poor/dead" vitality status was comparatively higher (16% and 24%, respectively for each mesh size);
- ***R. brachyura*** - most specimens were caught in "excellent" conditions, representing 67% of the observations from mesh size < 180 mm and soaking time < 24h, 92% for the same mesh and soaking time > 24h, 57% and 70% for mesh size > 180 mm for each soaking time period, respectively. The highest percentage of specimens in "poor/dead" status for that species was observed for mesh size > 180 mm and soaking time < 24h (24%);
- ***R. montagui*** - specimens caught with mesh size < 180 mm and in "excellent" vitality represented 100% and 67% depending on the soaking time; specimens caught with mesh size > 180 mm and in in "excellent" vitality represented 40% and 37%. The percentage of specimens in "poor/dead" conditions was higher for the larger mesh size group (30%) than for the smaller one (0% and 12%);
- ***L. naevus*** - representative data was only obtained for mesh size > 180 mm and soaking time > 24h. Under this situation 58% was the percentage of specimens in "excellent" condition while 21% and 21% corresponded to specimens in "good" and 21% "poor/dead" condition respectively;
- ***R. undulata*** - the percentage of specimens in "excellent" conditions was higher than 79% for all mesh sizes and soak times; highest values observed for mesh size > 180 mm and soaking time > 24h (96%). The percentage of specimens in "poor/dead" conditions was 2% and 5% for mesh size < 180 mm and 3% and 14% for mesh size > 180 mm, respectively for each of the two soaking times considered.

Results suggest that the vitality after capture of a specimen is not related to its size, as for all the species, and regardless of specimens' size (TL < 52 cm and > 52 cm), the majority was found in "excellent" vitality condition (60–92%). This indicate that fish below the currently established minimum landing size of 52 cm for all Rajiformes (except *R. undulata*) and 78 cm for *R. undulata* and below the maximum landing size 97 cm for the latter, if released immediately to the water after capture have a potentially high survival capacity.

Table 19.3.3.1. Skates in the Bay of Biscay and Iberian Waters. Percentage of individuals by vitality status after capture (1 = Good; 2 = Moderate; 3 = Poor) in relation to mesh size and soak time in the Portuguese polyvalent fleet operating with trammel nets for *Raja clavata*, *Raja montagui*, *Raja brachyura*, *Leucoraja naevus* and *Raja undulata.* The total length range is also given.

			Vitality status				
Species	**Mesh size (mm)**	**Soak time (h)**	**1**	**2**	**3**	**n**	**TL range (cm)**
Raja clavata	< 180	< 24	100%	0%	0%	17	23-72
		> 24	72%	12%	16%	25	39-80
	> 180	< 24	92%	4%	4%	26	48-88
		> 24	52%	23%	24%	103	40-96
Raja brachyura	< 180	< 24	67%	22%	11%	9	39-66
		> 24	92%	4%	4%	24	27-75
	> 180	< 24	57%	19%	24%	21	49-95
		> 24	70%	20%	10%	143	18-106
Raja montagui	< 180	< 24	100%	0%	0%	18	21-64
		> 24	67%	21%	12%	42	10-60
	> 180	< 24	40%	30%	30%	20	46-62
		> 24	37%	33%	30%	43	37-68
Leucoraja naevus	< 180	< 24	1	-	-	1	53
	> 180	< 24	1	-	-	1	61
		> 24	58%	21%	21%	24	46-62
Raja undulata	< 180	< 24	82%	16%	2%	44	40-89
		> 24	90%	5%	5%	58	43-92
	> 180	< 24	79%	7%	14%	71	32-92
		> 24	96%	1%	3%	174	44-92

Additionally, a mark-recapture study (UNDULATA project, 2014–2015) of *R. undulata* caught by trammel nets obtained a return rate of 11% and the mean observed time-at-liberty was of 54 days and maximum of 313 days. These results are a good indication that the species has a potential high long-term survival.

In 2017, an experiment was carried out in the Bay of Bourgneuf (Division 8.a) during which 163 undulate rays were caught using a bottom otter trawl (Morfin *et al.*, 2019). 144 individuals in a good-enough physical condition were equipped with acoustic transmitters and fixed receivers were deployed in the semi-enclosed bay, in addition to occasional tracking with a mobile antenna. The study concluded that a minimum of 49% of the skates survived at least 2 weeks after tagging (with a maximum estimated survival of 97.5% considering at deck mortality). The 49% estimate is a minimal survival rate because it could not be established whether individuals that were not detected after 2 weeks were dead or had wandered outside the detection range of the receivers during the time of the experimentation.

In 2018, new experiments were conducted onboard PTGFS-WIBTS-Q4 and PT-CTS (UWTV (FU 28–29)) surveys to collect CVA and short-term survival estimates (only in the former) for *R. clavata* caught by otter trawl. Overall, most of the specimens were found in "excellent" or "good" conditions (60–72%), with an at-vessel-mortality of 6–7% (Table 19.3.3.2). All specimens in "excellent" vitality status showed tail grab, spiracles and body flex reflexes. The percentage of body flex and tail grab reflexes decreased with vitality status, 71% to 29% and 48% to 29%, respectively.

The preliminary estimated survival, based on captivity observations of *R. clavata* during a maximum of 4 days, was 64%.

Table 19.3.3.2. Skates in the Bay of Biscay and Iberian Waters. Percentage of individuals by vitality status (1 = Excellent; 2 = Good; 3 = Poor; 4 = Dead) of each species assessed onboard IPMA's otter trawl surveys, for different deck times. For n ≤ 5, observed numbers by vitality are shown instead of percentages.

Species	Survey	Deck time	Length class	1	2	3	4	n	TL range (cm)
Raja clavata	PT-CTS	< 108 min	< 52 cm	47%	13%	33%	7%	30	
		< 108 min	> 52 cm	4	-	1	-	5	
		> 108 min	< 52 cm	0%	0%	0%	100%	25	
		> 108 min	> 52 cm	-	1	-	3	4	
	PTGFS-WIBTS-Q4	< 108 min	< 52 cm			1	1	2	
		< 108 min	> 52 cm	26%	46%	23%	6%	35	

In 2018, the Project DESCARSEL, conducted by IEO (Spain), performed survivability experiments to evaluate and estimate the survival of the rays usually discarded in the bottom trawl and trammel fisheries (Valeiras and Alvarez-Blazquez, 2018). A proportion of 93.46% and 100% of discarded rays assessed for vitality in bottom trawling and trammel nets survive to fishing operations and handling onboard. *Raja clavata* scored the lower survivability (58%-100%), *Raja montagui* intermediate (100%) and all specimens of *Raja undulata* survived the 36 hours first phase trial without mortality events (100% survivability). In bottom trawler the estimated survival for R. clavata at 36h was 58% (47.7-69.9) while in trammel net the estimated survival at 48h was 95.5% (87.1-100). Long-term survivability in *Raja clavata* was 17% (10.1-27.4) at the end of the observed period (one month). Stress and conditions at captivity should be a factor to take into account in this study and to analyze in future works. Most of the thornback rays did not feed till 3 weeks at captivity. Many factors influence survival and some of them are poorly understood and difficult to control across species, such as characteristics of the fishing haul (time, depth, speed, gear…), composition and volume of fish in the cod-end, time of hauling onboard, etc. (Valeiras and Alvarez-Blazquez, 2018).

In 2019, the Project DESCARSEL,performed survivability experiments focused on cuckoo ray (*L. naevus*) in trawl fisheries operating in northern Portugal fishing grounds (Division 9.a) (Valeiras *et al*., 2019). The study was conducted in April–May 2019 onboard a Spanish commercial trawler and included vitality and captivity observations. From a total of 503 individuals captured, 141 were placed in tanks for survival monitoring. The vitality results showed that 7.6% of the skates (n = 38) were assessed as Excellent condition, 24.1% (n = 121) as Good and 35.2% (n = 177) as Poor, and 33.2% (n = 167) were Dead. Estimated survival at 36h was 27% (21–36%). Maximum survivability at tank captivity was 7 days. Estimated 50% survivability was different for each vitality status. Skates assessed as Poor vitality died in 12 hours after hauling, while those with Excellent vitality lasted 41 hours (1.7 days) and those with Good vitality lasted 24 hours. The low survival estimates obtained from this study resulted on the removal of *L. naevus* caught by trawl in Division 9.a. from the exemption of the landing obligation (BOE, 2020, Nº 66, sec. III).

In 2020, the project SURF (Baulier *et al.* 2021) studied the survivability of cuckoo ray (*L. naevus*) discarded by French trawlers targeting demersal fish and operating in the Celtic Sea (Division 7h) and northern Bay of Biscay (Division 8a). The sampling, realised on a French commercial trawler, was stratified by vitality class and sampled individuals were landed and their state was monitored during up to three weeks in aquarium facilities in September 2020. Beside this, the vitality status of other discarded individuals was reported by an onboard observer during fishing trips carried out during winter, spring and summer aboard four different trawlers. The final

survival rate ranged from 12% to 22% and was mainly influenced by haul duration and weather conditions (wave height).

Experiments described here followed the procedures described in previous studies on the survival of this group of species and the recommendations made by the STECF and the ICES Working Group on Methods to Estimate Discard Survival.

In early 2021, ICES conducted a workshop on the inclusion of discard survival in stock assessments (WKSURVIVE; ICES, 2021a). It was recognized that this continues to be an active research, particularly in what regards discard survival of skates and rays, due to its link to the EU conditional survivability exemption and associated evidence roadmap. Due to the complexity and specifications across stocks, it was recommended that the task of including discard survival into stock assessments should be driven by stock assessment groups. To avoid the long benchmark process, this group recommended an inter-benchmark meeting to address the inclusion of discard survival across multiple stocks within the same meeting, to accelerate the process.

19.3.4 Quality of the catch composition data

Species composition of landings in Subarea 8 and Division 9.a, corrected according to the WKSHARK2 reporting guidelines (ICES, 2016) are presented (Tables 19.1a-f and 19.2a-d at the end of the chapter). In the past decade, official landings reported as Rajiformes (indet.) have declined because of the EU mandatory species-specific reporting. In the case of the Portuguese official landings statistics, eight commercial designations were reported in 2017: "raia lenga" (*R. clavata*), "raia pontuada" (*R. brachyura*), "raia manchada" (*R. montagui*), "raia-de-dois-olhos" (*L. naevus*), "raia de S. Pedro" (*L. circularis*), "raia-zimbreira" (*R. microocellata*), "raia-de-quatro-olhos" (*R. miraletus*) and "raia bicuda" (*D. oxyrinchus*).

Landings misidentifications and/or coding errors still occur in Subarea 8 and Division 9.a. In Division 9.a, statistical procedures were developed to better estimate species-specific landings during the DCF skate pilot study (2011–2013) (for details see Stock Annexes of Division 9a stocks and Figueiredo *et al.*, 2020b). Since 2017, a dedicated sampling programme on skate and ray species composition, incorporated in the DCF, was implemented in the main landing ports (Matosinhos, Póvoa do Varzim, Peniche, Sesimbra and Setubal). In France, sampling in auction market is carried out in a dedicated project "Elasmobranch on Shore" since 2012 (Mayot and Barreau, 2021).

19.4 Commercial catch composition and length frequency distribution

Length distribution of landings and discards are collected for all stocks in national programmes carried out in application of EU data collection regulations. However reliable length distributions are seldom available for the smaller stocks in relation to small number of individuals caught. In 2022, length distributions have been used for assessment and advice of a larger number of stocks following the implementation of the new WKLIFE methods (rfb rule) instead of the previous 2/5 rule.

19.5 Commercial catch–effort data

19.5.1 Portuguese data for Division 9a.

19.5.1.1 Effort data

In the Portuguese continental coast, Rajidae species are mainly landed by the polyvalent segment followed by trawl. In 2021, the landed weight of Rajidae derived from the polyvalent segment represented 82% of the total landings. This fishing segment is characterized by multi-species and mixed fisheries and includes vessels with length overall (LOA) ranging from 5 to 27 m, which generally operate between 10 to 150 m deep (occasionally down to 600 m). The analysis of DCF sampling data indicates that Rajidae are mainly caught by trammel nets, which is considered to be the most appropriated gear to catch these species.

Annual landings by species are calculated using the official daily landings data set and market sampling data collected under DCF according to the procedure described in Figueiredo *et al.* (2020b).

Fishing effort time series (2008–2021) for each fleet segment, polyvalent and trawl, were analysed. Consistently increasing or decreasing trends (monotonic) on the fishing effort data collected over time were investigated and the non-parametric Mann-Kendall trend test was applied (https://cran.r-project.org/web/packages/Kendall/Kendall.pdf). For each fishing segment, the test was applied to the last 10 years of the fishing effort series, considering the number of fishing trips with landings of Rajidae species as sampling unit (Table 19.5.1.1.1). Fishing effort time series (in number of trips) suggests a downward trend and the autocorrelation in data series does not appear significant for both fleets, polyvalent (Mann-Kendall trend test: tau = -0.24, p-value = 0.37) and trawl (Mann-Kendall trend test: tau = -0.02, p-value = 1). Additionally, fishing effort for bottom otter trawls targeting demersal fish in kW*days based on logbook data (DGRM data base) combined with vessel's technical characteristics (EU Fleet Register) for the period 2010-2021 is also presented in Table 19.5.1.1.1. The overall decrease in fishing effort observed for both fleets may be related to several factors including the inclusion of *R. undulata* in the prohibited species list in 2009, the implementation of seasonal closures since 2012, and changes in the target species in some polyvalent fleets.

Table 19.5.1.1.1. Skates in Division 9.a. Fishing effort (number of trips) from the Portuguese polyvalent and trawl fleets for all species of skates and rays in the period 2008–2021. Fishing effort for demersal fish bottom otter trawl in kW*days for the period 2010–2021 is also presented.

Year	No Fishing trips		kW*days
	Polyvalent	Trawl	Demersal fish otter trawl
2008	36149	6513	
2009	36239	5683	
2010	34767	5461	3783454
2011	36761	5139	3436491
2012	32565	5158	3867366
2013	28007	4658	3860658
2014	25779	4471	3983152
2015	25723	4325	4301238
2016	24476	4593	4533480
2017	25296	4237	3170657
2018	24761	4566	3389243
2019	24561	4492	3396599
2020	27464	4650	3046189
2021	29470	5021	3459537

19.5.1.2 CPUE and Effort data

In 2022, standardized LPUE was updated for *R. brachyura* (see Section 19.9.12 for more details) *R. montagui* (see Section 19.9.8 for more details), *R. clavata* (see Section 19.9.3 for more details), *R. undulata* (see Section 19.9.11 for more details) and *L. naevus* (see Section 19.9.6 for more details) in Division 9.a.

19.6 Fishery-independent surveys

Groundfish surveys provide data on the spatial and temporal patterns in species composition, size composition, relative abundance and biomass for various skates. The fishery-independent surveys operating in the Bay of Biscay and Iberian Waters are discussed briefly below (see Stock Annexes for further details).

Due to the patchy (mainly coastal) distribution and habitat specificity of some skate species (e.g. *R. undulata, R. brachyura* and *R. microocellata*), existing surveys do not provide reliable information on abundance and biomass. In order to gather information on the distribution and spatio-temporal dynamics, and on abundance and biomass for those species, WGEF recommends dedicated surveys using an appropriate fishing gear be developed in this ecoregion.

19.6.1 French EVHOE survey (Subarea 8)

The EVHOE-WIBTS-Q4 (G9527) survey has been conducted annually in the Bay of Biscay since 1987 (excluding 1993, 1996 and 2017). Data are used to calculate biomass indices of two stocks (rjc.27.8abd and rjn.27.678abd, see the corresponding stock annexes for method.

19.6.2 Spanish survey data (divisions 8.c and 9.a)

The Spanish North Coast Bottom Trawl Survey (SP-NORTH, G2784) annual survey in the Cantabrian Sea and Galician waters (divisions 8.c and 9.a) has covered this area since 1983 (except in 1987), More information on this survey is given in the Stock Annex of the stocks corresponding to Div. 8c (rjn-27-8c and rjc.27.8c) and WKSKATE report (ICES, 2021c).

The Spanish bottom trawl survey IBTS-GC-Q1-Q4 (ARSA, G4309) in the Gulf of Cadiz (Division 9.a) has been carried out in spring since 1993 and in autumn since 1997 up to 2021. Despite COVID-19 issues both surveys were conducted in 2020. The surveyed area corresponds to the continental shelf and upper-middle slope (depths of 15–800 m) and from longitude 6º20'W to 7º20'W, covering an area of 7224 km^2.

In the ARSA time series survey (1993–2020), the most abundant skates are *L. naevus* and *R. clavata*. In 2020, the biomass of *R. clavata* decreased compared to 2019, particularly in the autumn survey however it remains amongst the high values of the time series. In the case of *L. naevus* the biomass index sharply decreased in the last two years 2019 and 2020 in both surveys (Figure 19.6.2.1).

Both species showed an increasing trend in biomass since 1997, with the highest values reached in 2013, 2015, 2018 and 2019, although since 2013 the biomass shows large year-to-year variations. The values in 2020 decreased slightly for *R. clavata* remaining close to 2.0 kg haul whereas *L. naevus* shows a decreasing trend since 2018 remaining at very low values of the time series (0.34 kg haul) (Figure 19.6.2.2).

Despite being variable, abundance indices (nº ind per haul) of *R. clavata* and *L. naevus* show an increasing trend over the time series since 1997. The highest abundance value of *R. clavata* were recorded in the autumn 2013 and 2015 but has slightly decreased in the last 3 years (2018–2020). The abundance of *L. naevus* after the peak in 2017 has strongly decreased in 2019–2020 to the lowest values of the time series (Figure 19.6.2.2).

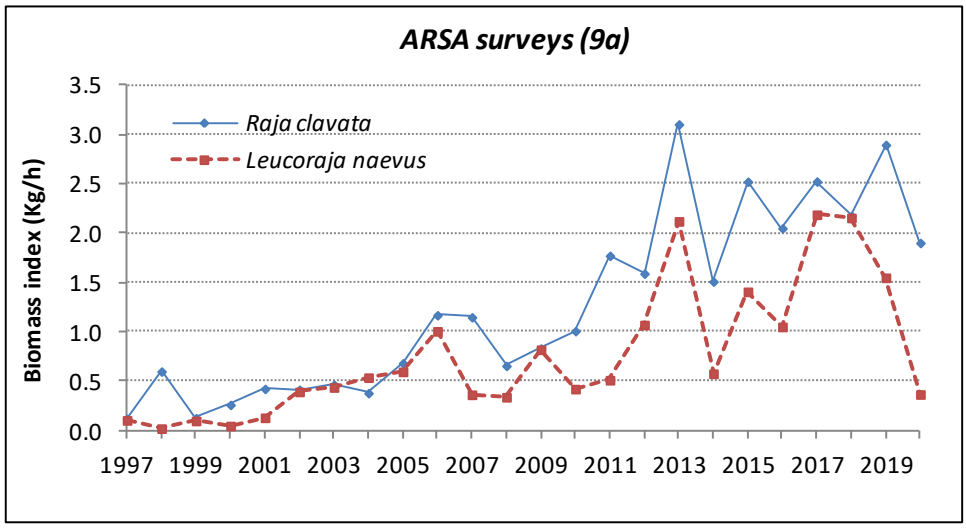

Figure 19.6.2.1. Skates in the Bay of Biscay and Iberian Waters. Trend of the yield of *R. clavata* and *L. naevus* expressed as kg per haul from the Spanish bottom trawl survey ARSA carried out in spring and autumn in the Gulf of Cadiz (9.a South) from 1997 to 2020. The average of both surveys Q1 and Q4 has been represented.

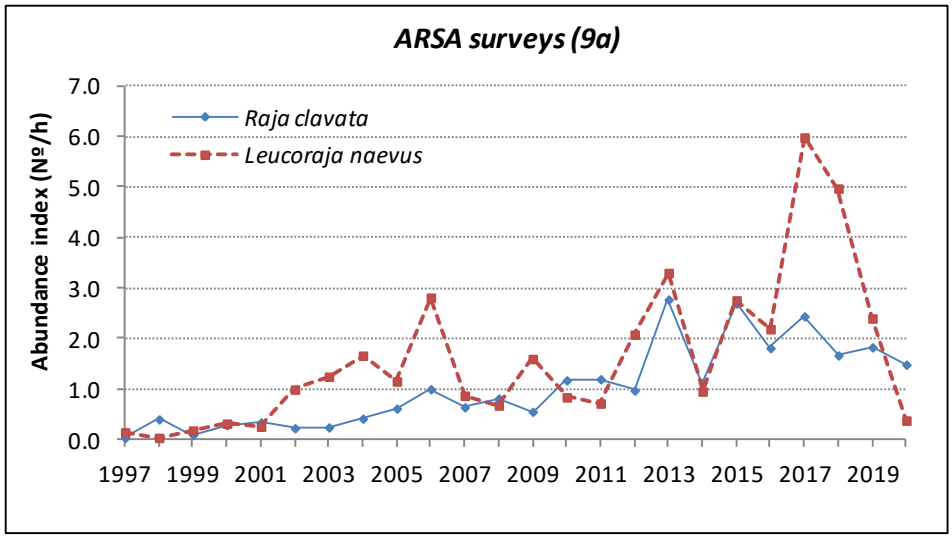

Figure 19.6.2.2. Skates in the Bay of Biscay and Iberian Waters. Trend of the yield of *R. clavata* and *L. naevus* expressed as number per haul from the Spanish bottom trawl survey ARSA carried out in spring (Q1) and autumn (Q4) in the Gulf of Cadiz (9.a South) from 1997 to 2020. The average of both surveys Q1 and Q4 has been represented.

19.6.3 Portuguese survey data (Division 9.a)

The Portuguese Autumn Groundfish Survey (PtGFS-WIBTS-Q4) has been conducted by the Portuguese Institute for the Sea and Atmosphere (IPMA, ex-IPIMAR) and has the main objective to monitor the abundance and distribution of hake (*Merluccius merluccius*) and horse mackerel (*Trachurus trachurus*) recruitment (Cardador *et al.*, 1997). PtGFS-WIBTS-Q4 is performed along the Portuguese continental coast, extending from latitude 41°20'N to 36°30'N (ICES Division 9.a) from 20 to 500 m deep. For details on vessels characteristics, survey stratification and technical characteristics of fishing operations see ICES (2017b). The survey was not conducted in 2012 and 2019. In 2018, the survey had technical problems, and part of the stations were sampled using a commercial trawler and a different fishing net (using FGAV019 instead of NCT). In 2021, the survey was conducted with a new vessel and the effect of vessel (or gear) could not be evaluated as more years of survey data are needed. The vessel (or gear) effect can be further included in the model used to estimate the skates and rays biomass indexes from this survey.

The Portuguese crustacean surveys/Nephrops TV Surveys (PT-CTS (UWTV (FU 28-29)) has been conducted by the Portuguese Institute for the Sea and Atmosphere (IPMA) and the main objective is to monitor the abundance and distribution of the main crustaceans species, namely Norway lobster (*Nephrops norvegicus*), rose shrimp (*Parapenaeus longirostris*) and red shrimp (*Aristeus antennatus*). The PT-CTS (UWTV (FU 28-29) have been carried out during the 2nd quarter (May–July) of the year and covers the southwest coast (Alentejo, FU 28) and south coast (Algarve, FU 29) from 200– 750 m. For details on vessels characteristics, survey stratification and technical characteristics of fishing operations see ICES (2018). No vessel was available to conduct this survey in 2004, 2010, 2012, 2019 and 2020 (ICES, 2012). In 2021, the survey was conducted with a new vessel and although the gear used is the same, the trawling speed and the doors characteristics may affect the net geometry and the performance of the fishing operation so, more years of survey data are needed.

Leucoraja naevus (14–65 cm L_T) is the main skate species caught in both Portuguese surveys. It is found along the whole Portuguese coast, from 55 to 728 m deep, but is more common south of Cabo Espichel and in waters shallower than 500 m (Figure 19.6.3.1). Biomass and abundance indices have been variable in the last seven years, with 2014–2015 showing a slight increasing

trend within the average values for the time-series (Figure 19.6.3.2). No *L. naevus* were caught in the 2016. In 2017, the species was only caught in one station. The observed lower catches of *L. naevus* do not follow the increasing trend observed in the Spanish IBTS-GC-Q1 ()G7511) IBTS-GC-Q1-Q4 (G4309) bottom trawl survey in the Gulf of Cadiz. No technical reason was found for the low catchability observed for the species in the last two years, apart from the later timing of the survey conducted in 2017, July/August instead of May/June (C. Chaves *pers. com.*). Mean annual biomass index for 2017–2018 (0.08 kg h^{-1}) was 12% smaller than observed in the preceding five years (2012–2016; 0.09 kg h^{-1}). Mean annual abundance index for 2017–2018 (0.44 ind h^{-1}) was 46% higher than observed in the preceding five years (2012–2016; 0.30 ind h^{-1}). The length-distribution has been variable during the time series, mainly due to higher catches of juveniles in certain years (Figure 19.6.3.3).

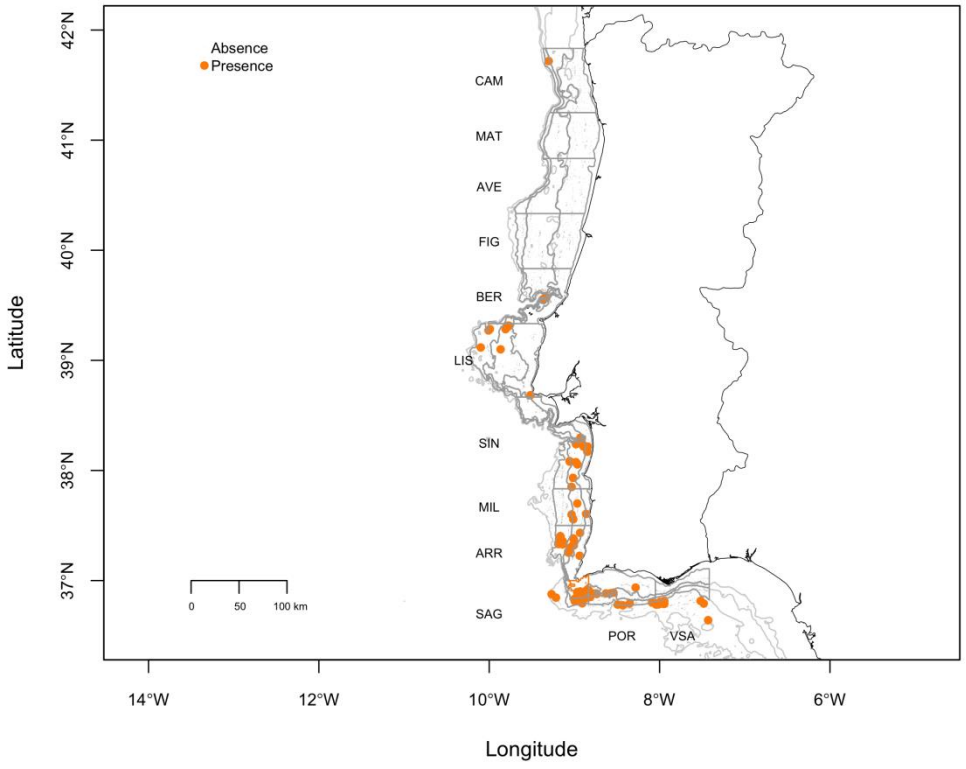

Figure 19.6.3.1. Skates in the Bay of Biscay and Iberian Waters. *Leucoraja naevus* distribution from 1981 to 2018 in the Portuguese Autumn Groundfish Surveys (PtGFS-WIBTS-Q4), and Portuguese crustacean surveys/*Nephrops* TV surveys (PT-CTS (UWTV (FU 28-29).

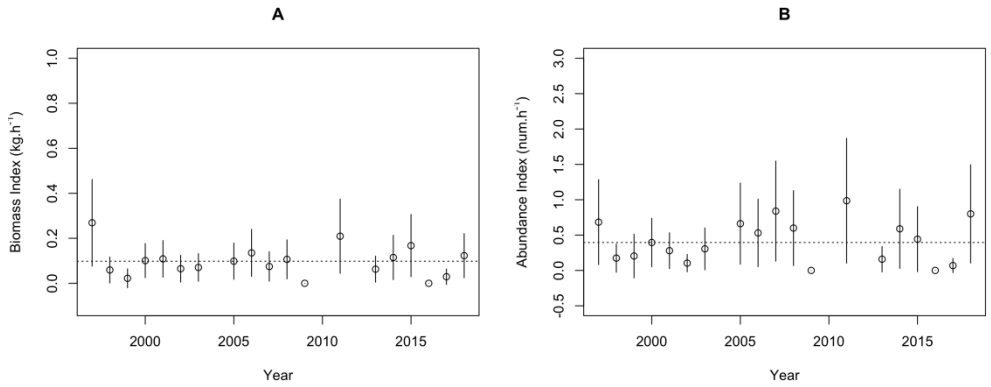

Figure 19.6.3.2. Skates in the Bay of Biscay and Iberian Waters. *Leucoraja naevus* A) biomass index (kg hour^{-1}) and B) abundance (ind.hour^{-1}) on PT-CTS (UWTV (FU 28-29) from 1997 to 2018. Dashed line represents the mean annual abundance for the considered period.

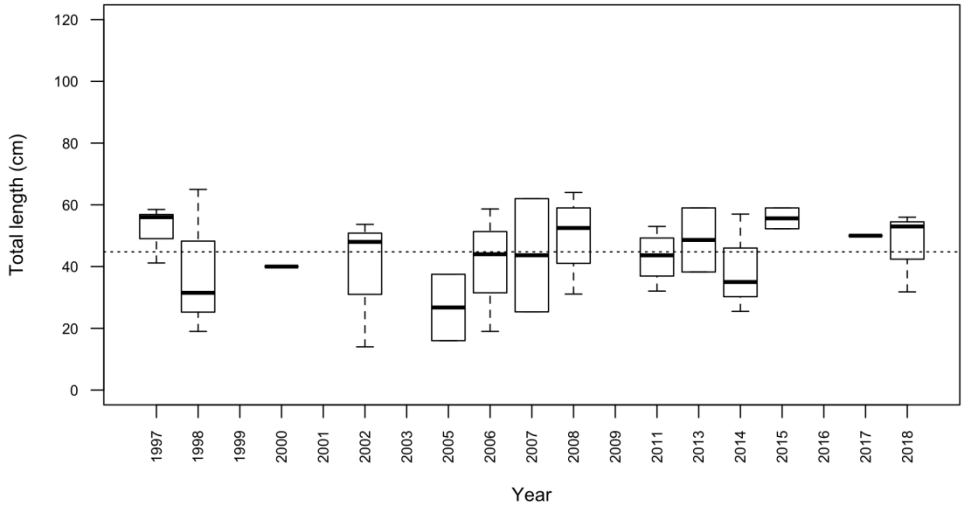

Figure 19.6.3.3. Skates in the Bay of Biscay and Iberian Waters. Total length variation of *Leucoraja naevus*, by year on PT-CTS (UWTV (FU 28-29) (dashed line represents the mean annual length for 1997–2018).

19.7 Life history information

Available biological parameters of the main species from Portuguese Iberian waters are shown in table 19.7. In 2022, a new WD on the reproductive biology of *Raja brachyura* is available (Maia *et al.*, 2022a).

Data on the life-history traits of *R. undulata* in the Bay of Biscay are also available (Stéphan *et al.*, 2014). The length of first maturity was estimated to be 81.2 cm for males (n = 832) and 83.8 cm for females (n = 94). Exploratory growth analyses based on increase in size between tagging and recapture of a small number of tagged *R. undulata* for which size-at-recapture was recorded were consistent with growth estimates for the species in Portuguese waters. More information including diet and a trophodynamic model for the northern part of Division 9.a is available in the Stock Annex.

Table 19.7. Skates in the Bay of Biscay and Iberian Waters. Life-history information. Biological parameter estimates available for skate species inhabiting Portuguese Iberian waters. Growth models: VBR – von Bertalanffy Growth Model; GG – Gompertz Growth Model.

Species	TL range (cm)	L50 (cm) F	L50 (cm) M	l50 (years) F	l50 (years) M	Fecundity	Reproductive period	Growth model	Growth parameters estimates						Period	Region	Source
									L∞ (cm)	k (y–1)	t0 (years)	Lmax (cm)	lmax (years)	l∞ longevity (years)			
R. undulata	19.4–88.2	76.2	73.6	8.98	7.66	-	-	VBG	110.2	0.11	–1.58	88.2	13	-	1999–2001	Algarve	[1,2]
	23.7–90.5	83.8	78.1	9	8	-	Feb–May	VBG	113.7	0.15	–0.01	90.5	12	23.6	2003–2006	Centre	[3]
	32.0–83.2	-	-	-	-	-	-	VBG	119.3	0.12	–0.41	83.2	9	28.9	1999–2001	Algarve	[3]
	23.5–95.9	86.2 ±2.6	76.8 ±2.4	8.7 ±0.3	7.6 ±0.4	69.8 ±3.4	Dec–May	-	-	-	-	-	-	-	2003–2013	North /Centre	[4]
R. clavata	14.3–91.3	-	-	-	-		-	VBG	128.0	0.112	–0.62	91.3	10	-	2003–2007	All	[5]
	12.5–105.0	78.4	67.6	7.5	5.8	136	May–Jan		-	-	-	-	-	-	2003–2008	All	[6]
R. brachyura	37.4–106.1	97.9	88.8	-	-	-	Mar–Jul	VBG	110.51	0.12	0.26	106.1	-	-	2003–2004	All	[7]
	37.6–108.8	96.6	88.6	-	-		Mar–Jul		-	-	-	-	-	-	2003–2012	North /Centre	[10]
	37-111	95.2	90.0				Apr-Sep								2003-2020	All	[11]
R. montagui	25.2–76.1	59.4	50.4	-	-	-	Apr–Jun	VBG	75.9	0.23	0.16	76.1	7	-	2003–2004	All	[8]
	36.8–70.2	56.7	48.0	-	-		Apr-Jul	-	-	-	-	-	-	-	2003–2012	All	[10]
L. naevus	12.7–71.8	55.6	56.5	-	-		-	VBG	79.2	0.24	0.12	71.8	-	-	2003–2004	All	[7]
	13.3–71.8	56.5	56.0	-	-	63	Jan-May		-	-	-	-	-	-	2003–2010	All	[9]

[1] Coelho and Erzini, 2002; [2] Coelho and Erzini, 2006; [3] Moura *et al.*, 2008; [4] Serra-Pereira et al., 2015; [5] Serra-Pereira *et al.*, 2008; [6] Serra-Pereira *et al.*, 2011; [7] Farias, 2005; [8] Serra-Pereira, 2005; [9] Maia *et al.*, 2012; [10] Pina Rodrigues, 2012; [11] Maia *et al.*, 2022a.

19.8 Exploratory assessments

Previous analyses of the skates in this ecoregion were based on commercial LPUE data and on survey data. Updated analyses were conducted (see below).

19.8.1 *Raja undulata* in Divisions 8.a-b

An exploratory assessment based on a mark-recapture approach using data from two project (RAIEBECA and RECOAM) collected from 2011 to mid-2014 in the Bay of Biscay contributed greatly to knowledge of the spatial distribution, movements and biology of *R. undulata* (see ICES (2020) for a full account). An explanatory assessment using length-based indicators was performed for years 2016–2017 and 2018–2019 based on data collected by the onboard observation programme (DCF programme) on French fishing vessels in divisions 8.a-b (Baulier, 2020 WD). The assessment used the eight indicator ratios recommended by WKLIFE (ICES, 2015) and combined catch data from bottom trawls and trammel nets raised to the corresponding fleets. The reference indicator ratio $L_{mean}/L_{F=M}$ (mean length of individuals larger than the length at first capture over the theoretical average length resulting from exploitation with a fishing mortality equal to natural mortality, which is a proxy for F_{MSY}) suggested that the stock was exploited with a fishing mortality lower than F_{MSY}. However, due to deviations from assumptions necessary to the derivation of reference points (especially steady state and knife-edge selectivity), the actual difference between current fishing mortality and F_{MSY} could not be estimated. Nevertheless, this diagnosis appeared to be robust to the values survival rate of discards applied, the degree of smoothing of the length distribution and the time period considered (2016–2017 or 2018–2019).

19.8.2 *Raja brachyura* in Division 9.a

The stock rjh.27.9a has been assessed under category 3 (trend-based assessment) with input from standardized LPUE time-series as stock indicator. Considering data issues and best knowledge on species biology and distribution, trials with the stochastic production model in continuous-time (SPiCT) (Pedersen and Berg, 2017) were run in line with ICES WKLIFE X guidelines for category 3 stocks (ICES, 2021b). No significant bias or autocorrelation were found and both QQ-plot and the Shapiro test show normality in the residuals. Regarding the retrospective pattern, Mohn's rho is <0.2 for both B/BMSY and F/F_{MSY} (of 0.029 for B/B_{MSY} and of -0.025 for F/F_{MSY}). However, only three peels were included in the analysis due to the small time series. The checklist for the acceptance of a SPiCT model (Mildenberger *et al*., 2020) was followed and no issues were found. Despite the large confidence intervals for B/B_{MSY} and F/F_{MSY} those do not span more than 1 order of magnitude. More tests and sensitivity analyses, particularly concerning the data to be used and the choice of priori distributions, may be considered in the future. Methodological procedures and results can be found in Maia *et al*. (2022d).

19.8.3 *Raja montagui* in Division 9.a

The stock rjm.27.9a has been assessed under category 3 (trend-based assessment) with input from standardized LPUE time-series as stock indicator. Considering data issues and best knowledge on species biology and distribution, trials with the stochastic production model in continuous-time (SPiCT) (Pedersen and Berg, 2017) were run in line with ICES WKLIFE X guidelines for category 3 stocks (ICES, 2021b). Preliminary essays were conducted and no significant bias or autocorrelation were found and both QQ-plot and the Shapiro test show normality in the residuals. Regarding the retrospective pattern, Mohn's rho is <0.2 for both B/BMSY and F/F_{MSY}

(of -0.022 for B/B_{MSY} and of 0.122 for F/F_{MSY}). More tests and sensitivity analyses, particularly concerning the data to be used and the choice of priori distributions, may be considered in the future. Methodological procedures and results can be found in Maia *et al*. (2022c).

19.8.4 *Raja clavata* in Division 9.a

The stock rjc.27.9a has been assessed under category 3 (trend-based assessment) with input from standardized LPUE time-series as stock indicator. Considering data issues and best knowledge on species biology and distribution, trials with the stochastic production model in continuous-time (SPiCT) (Pedersen and Berg, 2017) were run in line with ICES WKLIFE X guidelines for category 3 stocks (ICES, 2021b). Preliminary essays were conducted and no significant bias or autocorrelation were found and both QQ-plot and the Shapiro test show normality in the residuals. Regarding the retrospective pattern, Mohn's rho is <0.2 for both B/BMSY and F/F_{MSY} (of -0.045 for B/B_{MSY} and of -0.085 for F/F_{MSY}). Despite the large confidence intervals for B/B_{MSY} and F/F_{MSY} those do not span more than 1 order of magnitude. More tests and sensitivity analyses, particularly concerning the data to be used and the choice of priori distributions, may be considered in the future. Methodological procedures and results can be found in Maia *et al*. (2022b).

19.9 Stock assessment

Given the limited time range of species-specific landing data, and that commercial and biological data are often limited, the status of most skate stocks in this ecoregion is based primarily on survey data and length distribution, following the Category 3 of the ICES approach to data-limited stocks. Further analyses of survey data (see Section 19.6) and catch rates were undertaken. Due to the absence of survey data for some of the species in this ecoregion (e.g. rjh.27.9a, rju.27.9a, rjm.27.9a), other approaches were adopted for the advice (e.g. LPUE or self-sampling data).

In this section, data and analyses are summarized by stock units for which ICES provides advice.

Assessments are carried biennially and were updated in 2022.

19.9.1 Thornback ray (*Raja clavata*) in divisions 8abd (Bay of Biscay)

The stock identity of thornback ray in the Bay of Biscay was considered by the Benchmark WKELASMO (ICES 2022b). Results of a genetic-study where more than 7000 individuals were genotyped to carry out a close-kin mark-recapture (CKMR) together with data on the geographical distribution of landings, location of catches from on-board observations and surveys and length distribution from surveys allowed to conclude that there was limited flow of individuals between thornback ray from Divisions 8.abd and thornback ray from Division 8.c (see ICES 2022b for details). The genetic clearly showed further meta-population structure within divisions 8.abd. There was no or limited flow between individuals from the Gironde estuary and individuals from the offshore continental shelf and probably other local coastal populations. Nevertheless, quantitative assessment of every small populations is not feasible and the only way forward is to assess larger units comprising meta-populations, some of which being possibly disconnected such as the Gironde and offshore shelf. Assessing two stock units for 8.abd and 8.c (see section 19.9.2) separately is achievable because there is a survey index for each.

Following WKELASMO, this stock is assessed in the ICES stock data category 2 using a tailored Bayesian Surplus Production Model (BSPM). The model is described in the new stock annex for rjc.27.8abd. The assessment used landings only data because dead discards were estimated to be 0.2-3% depending on the year.

The description of the index calculation is included in the stock annex.

The biomass index was derived from the EVHOE-WIBTS-Q4 survey [G9527] using DATRAS data for the period 2009 to 2021 (no data in 2017 due to vessel break down). Sampling strata were used to delineate the area where the bulk of catch was made in the commercial fisheries and in the survey. Sampling strata where the species was not caught in the survey or with only occasional catches were excluded. Hence only the two largest survey strata (GN4 and GN3) were retained for index calculation (Figure 19.9.1.1).

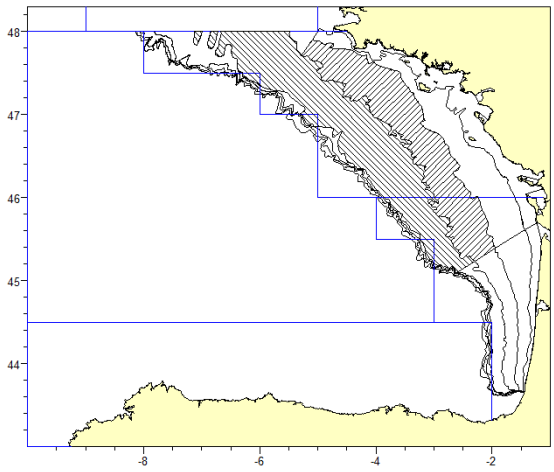

Figure 19.9.1.1. Strata used in the calculation of the survey index from EVHOE-WIBTS-Q4 [G9527].

The biomass index was calculated using a swept area approach where the biomass caught in the area swept by the sampling trawl was raised to the survey area for the two selected strata. Confidence intervals and the variance of the biomass index were obtained using a non-parametric data bootstrap conditioning on the total number of hauls in a given year and assigning resamples to the appropriate strata. Note that confidence intervals were rather symmetrical, justifying the use of a normal distribution for the observation error in the production model. Indices of total and exploited (individuals >= 50 cm TL) biomass and an index of abundances of juveniles (individuals > 50 cm TL) were calculated (Figure 19.9.1.2). Only the index of total biomass was used in the assessment.

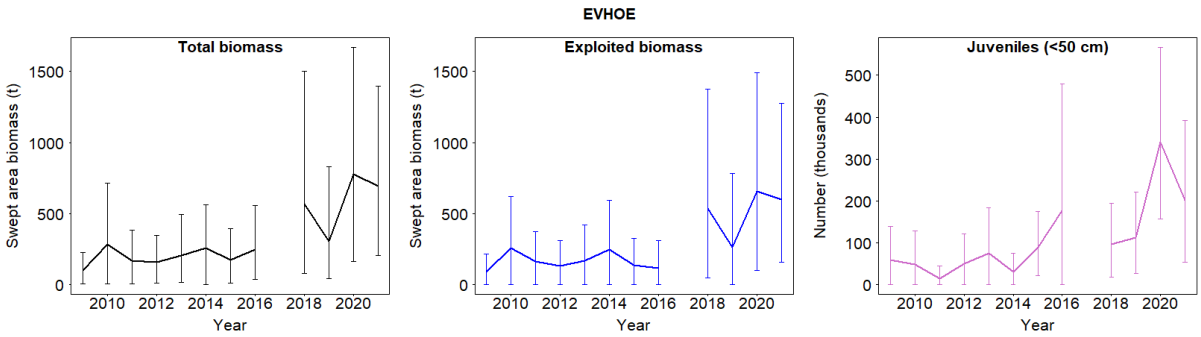

Figure 19.9.1.2. Estimates of total biomass (tonnes), exploited biomass (tonnes) and juveniles (thousands) from EVHOE-WIBTS-Q4 [G9527], 95% CI from bootstrap.

The indices of total and exploitable biomass were very similar (Figure 19.9.1.2), so that using one or the other is not expected to have a significant impact on the assessment results. Note that the

recent increase in biomass seems to have been preceded by an increase in the abundance of juveniles in 2015-2016. Abundance of juveniles is higher in 2015-2021 than in preceding years.

Table 19.9.1.1. Thornback ray in divisions 8.a-b and 8.d. Time-series of biomass index used for the advice, with 95% confidence intervals. The biomass per km² is also presented.

Year	Biomass	Low 95% CI	High 95% CI	kg.km^{-2}
2009	102	8	230	2.42
2010	284	12	705	6.73
2011	166	6	382	3.94
2012	156	11	348	3.69
2013	205	15	492	4.86
2014	257	0	608	6.11
2015	173	8	407	4.11
2016	247	38	530	5.87
2017				
2018	566	89	1439	13.43
2019	304	40	849	7.21
2020	776	188	1668	18.41
2021	692	236	1416	16.41

Close-kin mark-recapture estimate

A close-kin mark-recapture (CKMR) estimate of abundance was available for this stock (see stock annex, Trenkel and Lorance, 2022 WD, Trenkel *et al.*, 2022). Total biomass was derived from estimated abundance for years 2012–2015 (Table 19.9.1.2).

Table 19.9.1.2. Thornback ray in divisions 8.a-b and 8.d. CKMR derived estimate of total abundance.

Year	Lower CI	Biomass	Higher CI
2012	558.84	1257.93	1957.02
2013	885.59	1271.99	1658.4
2014	921.45	1452.14	1982.84
2015	626.47	1781.2	2935.94

The model description, priors applied and the forecast method can be found in the stock annex.

In the 2022 assessment, convergence was achieved for all parameters and state variables. All posterior parameter distributions differed markedly from their prior distributions, indicating the important contribution made by the data (Figure 19.9.1.3).

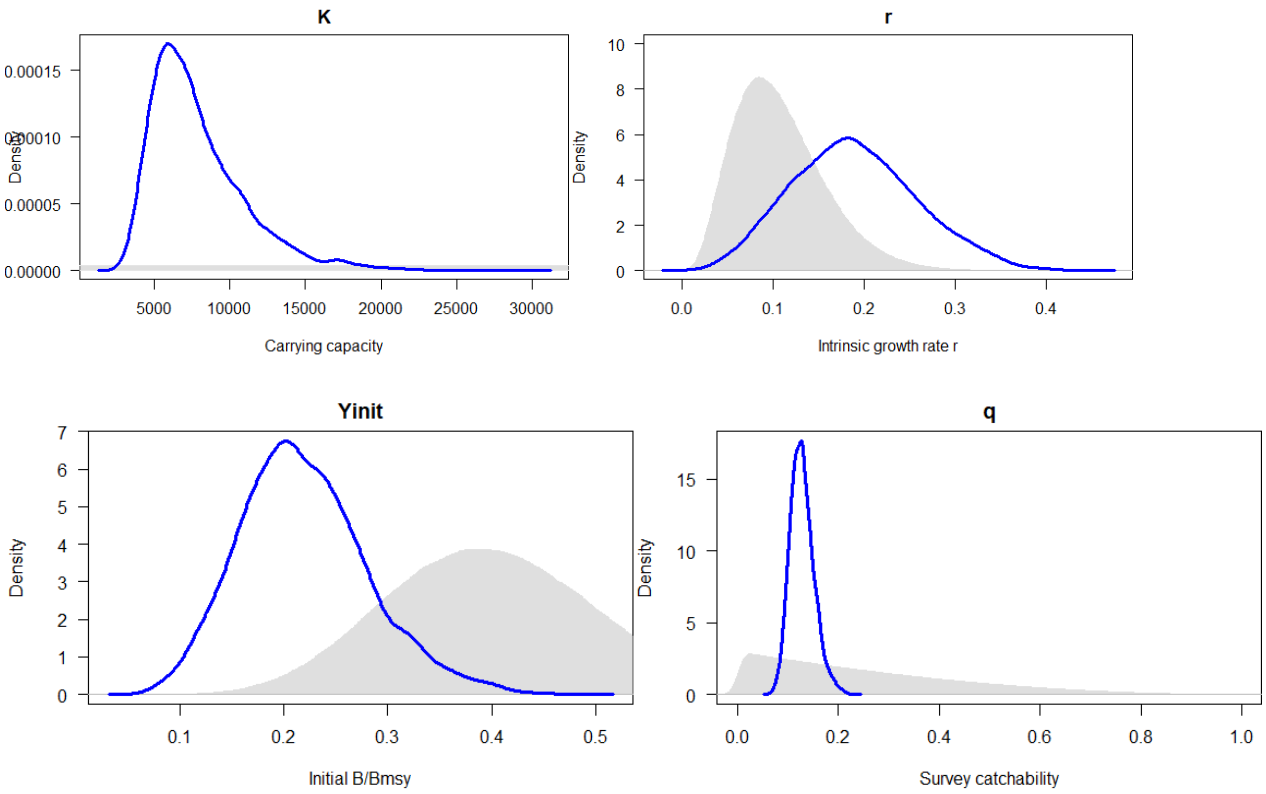

Figure 19.9.1.3. Prior (grey surfaces) and posterior (blue lines) distributions for parameter estimates for production model.

Model parameter estimates are given in table 19.9.1.3. Reference points were directly derived from two estimated model parameters, intrinsic population growth rate r and carrying capacity K, using the median of the posterior distribution (Table 19.9.1.4).

Table 19.9.1.3. Bayesian production model posterior parameter estimates and credible interval points.

Parameter	Description	Posterior median	Lower 5 percentile	Upper 95 percentile
R	intrinsic population growth rate	0.19	0.08	0.31
K	carrying capacity (tonnes)	7932	4245	14043
Q	EVHOE survey catchability	0.13	0.09	0.17
Yinit	depletion rate in 2009 (B_{2009}/K)	0.22	0.13	0.33

Table 19.9.1.4. Thornback ray in divisions 8abd. Reference points, values and their technical basis.

Framework	Reference points	Value	Technical basis
MSY approach	MSY $B_{trigger}$	0.5 B_{MSY} = 0.25 K	Relative value. B_{MSY} is estimated directly from the assessment model and changes when the assessment is updated.
	F_{MSY}	r/2	Relative value. F_{MSY} is estimated directly from the assessment model and changes when the assessment is updated
Precautionary approach	B_{lim}	0.3 x B_{MSY}	Relative value. (equilibrium yield at this biomass is 50% of MSY)
	F_{lim}	1.7 F_{MSY}	Relative value (the F that drives the stock to B_{lim})

Harvest rate estimates as well as total biomass estimates are presented relative to their maximums sustainable yield values, i.e. F/F_{MSY} and B/B_{MSY} respectively. The estimated biomass increased over time, while the harvest rate decreased, though neither were above respectively below the MSY value by 2020 (Figure 19.9.1.4 top). Note that the uncertainty of both biomass and harvest rate estimates is rather large but still possibly somewhat underestimated. As the length of the data time series increases, precision of estimates can be expected to improve.

The retrospective analysis which consisted of sequentially removing data corresponding to the three final years showed that estimates were sensitive to this, though median posterior estimates remained within the 80% credible of the full data time series (2009–2020) (Figure 19.9.1.4 bottom). This result is not surprising given the time trend in survey index that appeared at the end of the time series. Mohn's rho was 0.19 for biomass B and 0.09 for harvest rate F. Further, in this retrospective pattern, harvest rate F tends to be overestimated and the biomass in the last years to be underestimated when years are removed, suggesting that the model tends to underestimate the increasing trend of the stock.

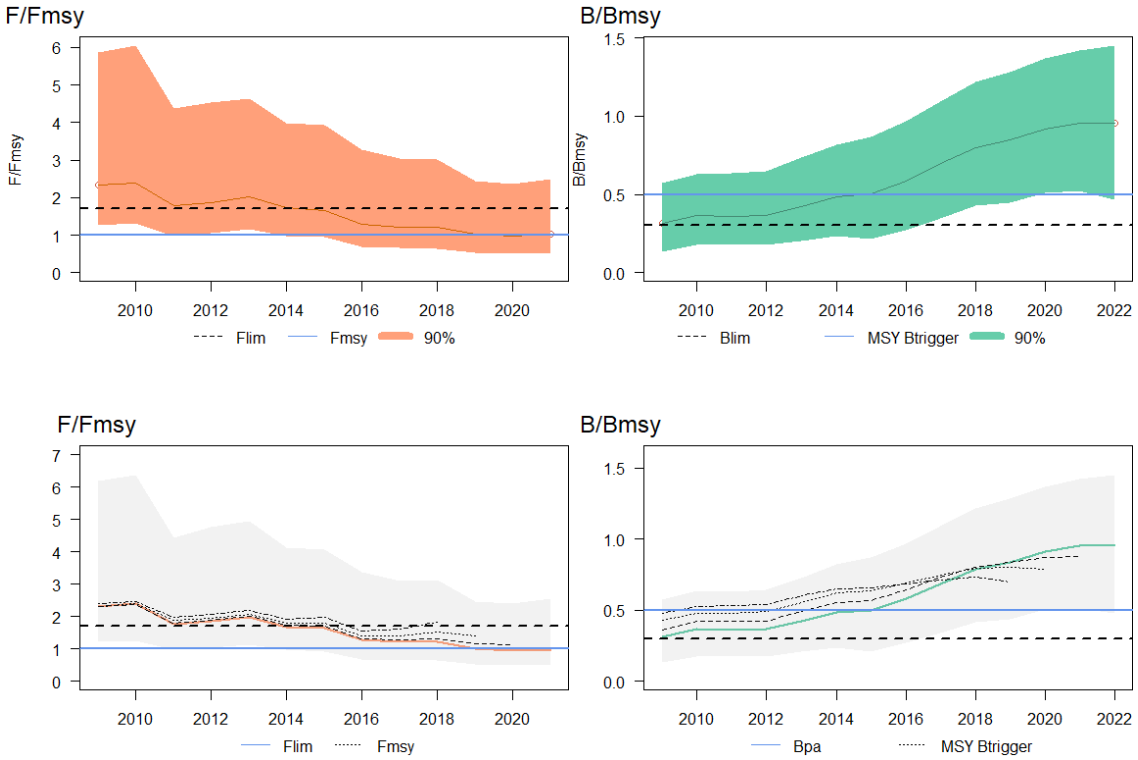

Figure 19.9.1.4. Top row: Relative estimates for harvest rate as a proxy for fishing mortality (left) and total biomass (right) as well as precautionary (pa) and MSY reference points. Median estimates (solid lines) and 80% credible intervals. Bottom row: Retrospective analysis of harvest rate (left) and total biomass (right) removing final years in model fitting. Grey surface and coloured continuous line correspond to full assessment results in top row.

The results for the interim year projection under status quo harvest rate are given in table 19.9.1.5 and two-year ahead forecasts for status quo and F_{MSY} exploitation in tables 19.9.1.6 and 19.9.1.7. Applying the precautionary approach, the 35th percentile of projected catches was used for the two years of forecasts. The uncertainty impacting projected catch distributions differs between the two presented catch scenarios. For the status quo harvest rate scenario, the uncertainty comes solely from uncertainty in projected biomass (harvest rate=catch/biomass). In contrast, the distribution of catches in the F_{MSY} scenario is impacted both by the uncertainty in projected biomass as well as the uncertainty in growth rate r (F_{MSY} = r/2). Hence the uncertainty is wider in the second scenario leading to a substantial lower 35% catch percentile value despite the fact that the median harvest rate for this stock was close to F_{MSY} in recent years.

Table 19.9.1.5. Thornback ray in division 8abd. The basis for the catch scenarios.

Basis	Value	Notes
Median F2022/F_{MSY}	1.02	harvest rate in 2022
Median B2023/MSY $B_{trigger}$	1.91	B2023 is at the beginning of the year 2023
Median B2023/B_{MSY}	0.95	B2023 is at the beginning of the year 2023
Catch (2022)	314	Assumed catch data for 2022 HRstatusquo

Table 19.9.1.6 Thornback ray in division 8abd. Annual catch scenarios for 2023.

Basis	Status quo harvest rate	F_{MSY} Harvest rate
Catch (t)	309	254
Stock size (B2024/MSY $B_{trigger}$), median	1.92	1.96
Fishing mortality (F2023/F_{MSY}), median	0.97	0.79
Probability of B2024 falling below B_{lim}	0	0
Probability of B2024 falling below $B_{trigger}$	0	0
Probability of F2023 exceeding F_{lim}	0.17	0.11
Probability of F2023 exceeding F_{MSY}	0.48	0.35
% Advice change*	3	-16

Table 19.9.1.7 Thornback ray in divisions 8abd. Annual catch scenarios for 2024.

Basis	Status quo harvest rate	F_{MSY} harvest rate
Catch (t)	304	257
Stock size (B2025/MSY $B_{trigger}$), median	1.93	1.99
Fishing mortality (F2024/F_{MSY}), median	0.94	0.79
Probability of B2025 falling below B_{lim}	0	0
Probability of B2025 falling below $B_{trigger}$	0	0
Probability of F2024 exceeding F_{lim}	0.18	0.12
Probability of F2024 exceeding F_{MSY}	0.46	0.35
% Advice change*	1	-15

***Advice value relative to catch in 2021.**

The stock is estimated to have creased over years 2009-2021 and the current biomass (at the start of year 2022) is estimated to be close to MSY level with $B_{2022} = 0.96*B_{MSY}$ (Table 10).

Catches

Landings were derived from InterCatch data and treated in the WGEF file for landings. Corrections of reported landings for this stock were minor or no-existent.

Dead discards were estimated to represent less than 5% of total catch and were therefore considered negligible for assessment purpose and ignored. Landings varied from 200 to 300 tonnes in 2009–2021. Landings before 2009 were considered unreliable.

Table 19.9.1.8 Thornback ray in divisions 8.a-b and 8.d. Landings (tonnes).

Year	Landings
2009	239
2010	246
2011	217
2012	227
2013	244
2014	241
2015	266
2016	211
2017	232
2018	273
2019	266
2020	266
2021	305

Table 19.9.1.9. Thornback ray (Raja clavata) in divisions 8abd. Assessment summary. Biomass is relative to Bmsy at the end of the year and fishing mortality relative to Fmsy. High and low values are 90% probability intervals of the posterior distribution

Year	Low_BB_{MSY}	Value_BB_{MSY}	High_BB_{MSY}	Catch (tonnes)	Low_FF_{MSY}	Value_FF_{MSY}	High_FF_{MSY}
2009	0.14	0.31	0.57	239	1.27	2.32	5.87
2010	0.18	0.37	0.63	246	1.3	2.39	6.04
2011	0.18	0.36	0.63	217	0.98	1.79	4.37
2012	0.17	0.37	0.65	227	1.06	1.88	4.54
2013	0.2	0.42	0.73	244	1.15	2.02	4.63
2014	0.24	0.48	0.82	241	0.98	1.72	3.97
2015	0.22	0.5	0.87	266	0.94	1.65	3.93
2016	0.27	0.58	0.97	211	0.7	1.29	3.28
2017	0.35	0.7	1.09	232	0.65	1.21	3.05
2018	0.43	0.8	1.22	273	0.64	1.21	3.01
2019	0.45	0.85	1.28	266	0.54	1.03	2.43
2020	0.51	0.92	1.37	266	0.51	0.97	2.37
2021	0.52	0.95	1.42	305	0.51	1.02	2.5
2022	0.47	0.96	1.45	NA	NA	NA	NA

19.9.2 Thornback ray (*Raja clavata*) in Division 8.c (Cantabrian Sea) (rjc.27.8c)

As commented in previous section 19.9.1 the stock identity of thornback ray in the Bay of Biscay was considered by the Benchmark WKELASMO (ICES 2022b). According to the information presented and discussed at WKELASMO (Lorance, 2022; Rodriguez-Cabello and Sánchez, 2022 two

stock units were split from rjc.27.8 stock. The last assessment was conducted in 2020 on rjc.27.8 stock therefore this is the first assessment on rjc.27.8c.

A proposal for assessing the status of the stock using the ICES rfb rule (ICES, 2021a) was presented at WGEF 2022. Following the ICES guidance on the parameter determination for the rfb rule (ICES, 2021a; ICES, 2022a), the input values for applying rfb rule are presented in Table 19.9.2.1. Following the rfb rule, the advised catches for this stock (rjc.27.8c) in 2023 and 2024 should not be more than 201 tonnes If discard rates do not change from the average of the last 3 years (2019–2021), this implies landings of no more than 173 tonnes. The stability clause was considered and applied to limit the reduction in the catch advice to 30%. The discard rate (average 2019-2021) was 14%.

Table 19.9.2.1. *Raja clavata* in ICES Division 8c (rjc. 27.8c). Estimates used in the rfb rule, with comments.

Variable	Estimate	Input data	Comment
r: Stock biomass trend	0.71	Stock-size indicator: Biomass survey index from North Spanish survey (SpNGFS-WIBTS-Q4)	Index A (2020*) = 3.28 kg.haul^{-1} Index B (2017, 2018, 2019)= 4.62 kg.haul^{-1}
b: Biomass safeguard $= \mathbf{min}(\mathbf{1}.\ \boldsymbol{I_{y-1}} / \boldsymbol{I_{\mathbf{trigger}}})$ $I_{\mathrm{trigger}} = I_{\mathrm{loss}}\ \omega$ Considering $\omega = 1.4$	1	Stock indicator; I_{loss}, minimum estimate (1995) = $I_{trigger}$ = 0.36 $(\frac{I_{y-1}}{I_{\mathrm{trigger}}} = 9.10)$	The biomass index has been fluctuating inter-annually since the beginning of the time series with an increasing trend.
m linked to von Bertalanffy k	0.95	k estimated from the Von Bertalanffy model adopted for the species	Growth rate estimates for this species in div. 9a is k=0.117
f: Fishing proxy	1.00	Length data collected under the sampling program raised to the overall landings. See Table 19.9.2.4	To overcome deficiencies in sampling in 2020 due to covid disruption, data from 2019-2021 was combined.
Stability clause	30%	Applied	Due to a decreased in 32.6%
Ay × r × f × b × m	201 t		Decrease of 30% in relation to the average catch of the last 3 years. Limited by the stability clause applied.

Stock indicator (for the definition of r and b)

The biomass index used for this stock corresponds to the standardized biomass index obtained from the annual bottom trawl survey carried out in autumn in the north of Spain (SpNGFS-WIBTS-Q4). Index values are presented in Table 19.9.2.2.

During the time series standardized since 1991, the biomass of R. clavata, has an increasing trend from the beginning of the time series with inter-annual fluctuations (Figure 19.9.2.1). In 2021 a severe breakage of the ship used to conduct the survey, forced to change the vessel (Blanco et al., 2022). Although the gear used was the same standard gear used on previous surveys (SPNGFS-WIBTS-Q4) during the WGEF was decided for precautionary not to use the index of 2021 in the analysis.

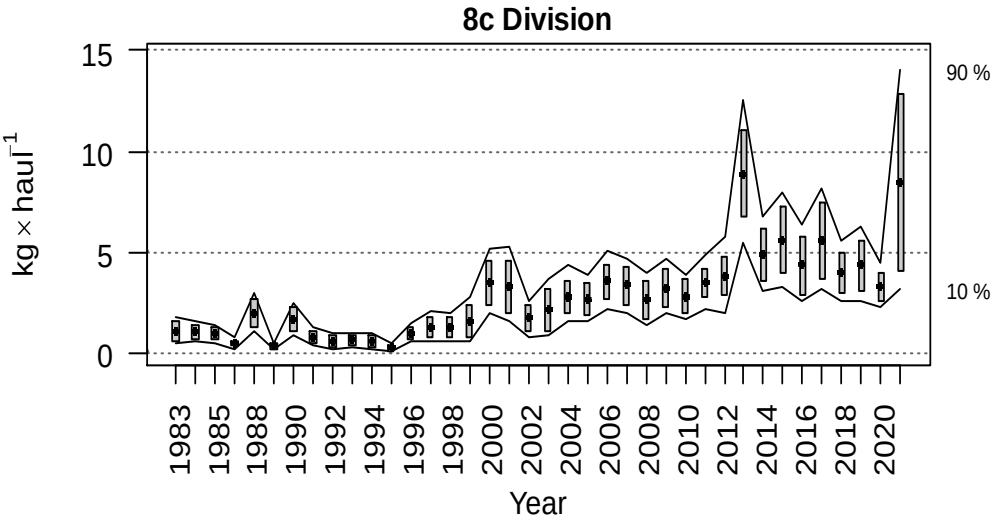

Figure 19.9.2.1. Skates in the Bay of Biscay and Iberian waters. Time-series of *Raja clavata* biomass indices, in ICES division 8.c, during the North Spanish bottom trawl survey (1983–2021). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α = 0.80, bootstrap iterations = 1000).

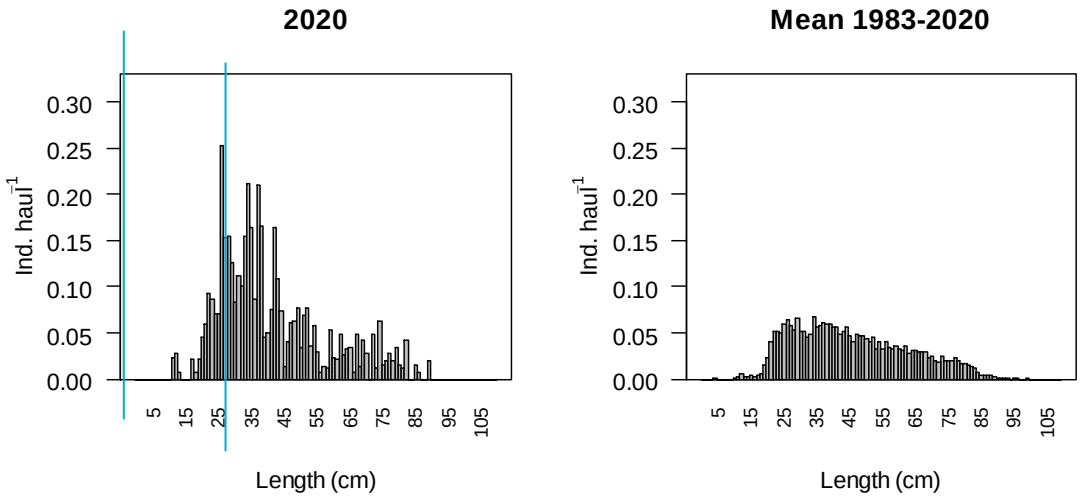

Figure 19.2.2.2. *Raja clavata* in ICES Division 27.8c. Landings, discards and yearly values of the stock indicator for the period 1997-2021. It corresponds to the biomass index from Spanish groundfish surveys (SpN-GFS-WIBTS-Q4).

Table 19.9.2.3. Stock assessment summary: biomas index and catches

Year	Biomass index	Landings	Discards	Catch
1988	2.02			
1989	0.35			
1990	1.67			
1991	0.78			
1992	0.60			
1993	0.65			
1994	0.62			
1995	0.26			
1996	1.02			
1997	1.28			
1998	1.25			
1999	1.59			
2000	3.48			
2001	3.28			
2002	1.75			
2003	2.17			
2004	2.81			
2005	2.64			
2006	3.55			
2007	3.36			
2008	2.64			
2009	3.22	94.1	27.9	122.0
2010	2.81	186.1	30.7	216.7
2011	3.47	207.2	29.1	236.3
2012	3.82	223.7	21.1	244.9
2013	8.86	238.5	36.6	275.1
2014	4.86	248.0	72.8	320.8
2015	5.62	149.9	86.6	236.5
2016	4.33	161.2	61.2	222.4
2017	5.57	136.4	13.0	149.4
2018	3.97	256.0	27.6	283.6
2019	4.33	247.4	31.4	278.8
2020	3.28	257.1	61.4	318.4
2021*		233.0	33.0	266.0

***Biomass index in 2021 not used due to vessel change during the survey.**

Estimation of length–based indicators (F proxy)

Assessment was done using landings length distribution of *Raja clavata* in ICES division 8c for the Spanish fleet (mainly trawl fleet). Alternative analysis were done using discard length data (Rodriguez-Cabello and Velasco, 2022). Due to Covid 19 and other issues discard length data for 2019 was constrained and no length data was recorded in 2020 (Figure 19.9.2.3). Following WGEF 2022 discussions f proxy was determined using length frequency distributions of landings raised from combined sampling data from 2019 to 2021 (Figure 19.9.2.2).

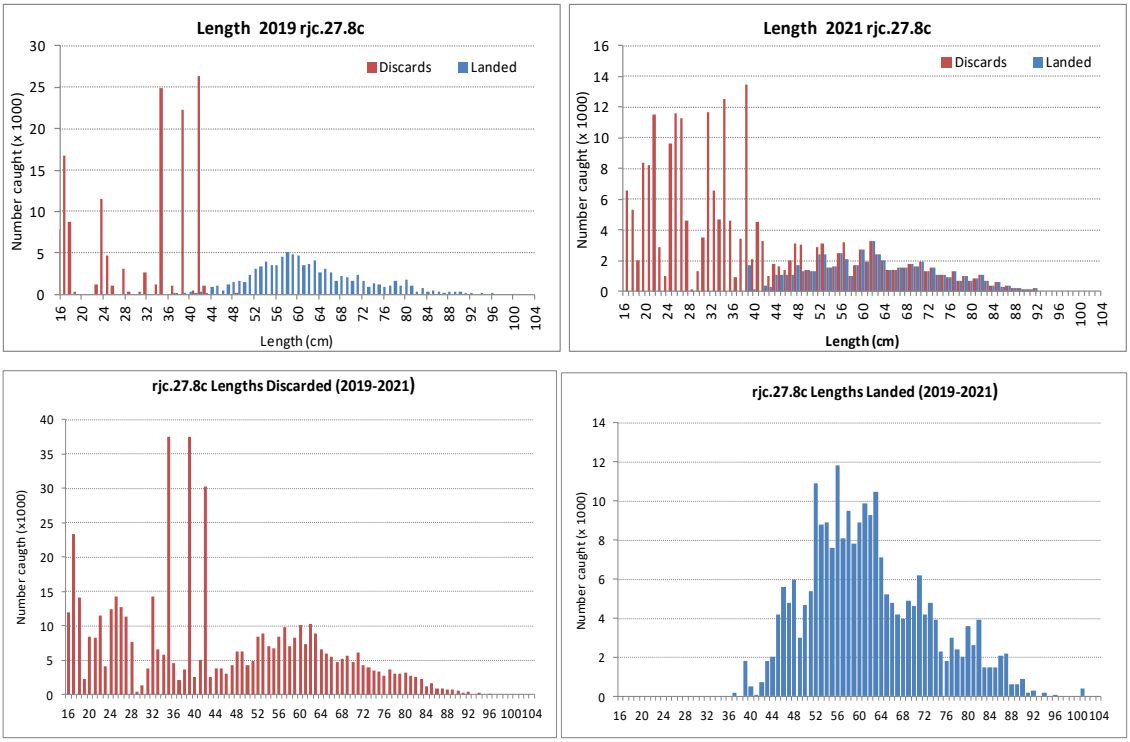

Figure 19.9.2.3. Skates in the Bay of Biscay and Iberian waters. Length frequency distributions of *Raja clavata* landed and discarded in 2021 and combined sampling data from 2019 to 2021.

To determine F proxy, estimates of Linf, L50 and parameters of the weight-length relationship were used. These parameters are defined for this stock (Table 19.9.2.3). Length classes of 2 cm were adopted.

The length distributions obtained from surveys (Figure 19.9.2.3) ranged from 12 to 102 cm along the time series (Blanco et al., 2022). Maximum recorded length from commercial fishing sampling in division 8c is 104 cm and in general the length distributions ranged from 30 to 90 cm for all gears combined. According to this the relation Lobs= L∞* 0.95 (Froese& Binohlan, 2000; Froese, 2004) has been applied to estimate asymptotic length.

Length at first captured (Lc), mean length (Lmean), and F proxy (LF=M) differ if considering catch length or only landings length frequency (Table 19.9.2.4). However, in both cases, data combined (2019-2021) provided a f proxy equal or above 1.

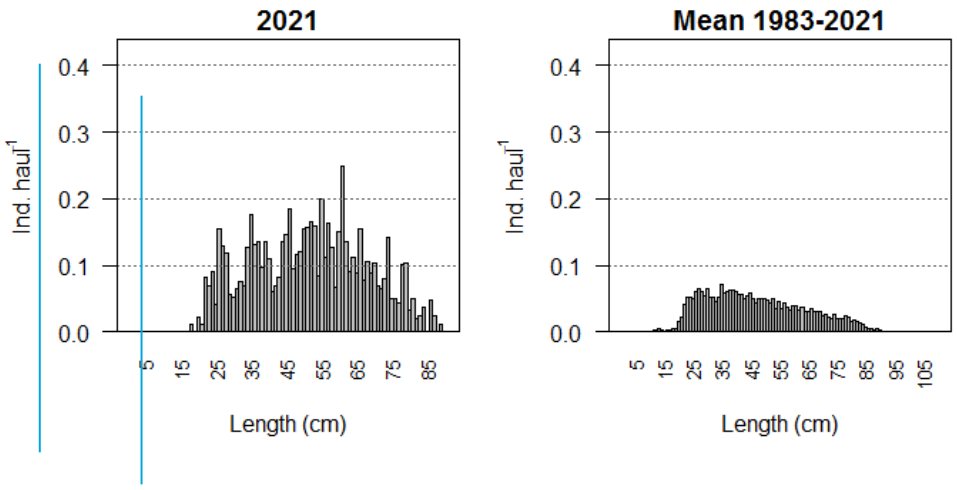

Figure 19.9.2.3. Skates in the Bay of Biscay and Iberian waters. Stratified length distribution of *R. clavata* obtained from Spanish bottom trawl surveys time-series in the last survey (left) and in the period 1983–2021 (right) in Division 8.c of the North Spanish Shelf.

Table 19.9.2.3. Biological parameters used for calculating the LBI parameters (rjc.27.8c).

Parameter	Value	Definition	Source
L∞ (cm)	110	Asymptotic average maximum length	Linf=Lobs / 0.95 (Froese, 2004)
Lmat	73.2	Length at 50% maturity	Serra-Pereira et al., 2011
K	0.117	growth coefficient (year^{-1})	Serra-Pereira et al., 2008
a	0.0018	Condition factor parameter of length-weight relationship	IEO Data base (DELASS)
b	3.33	Slope parameter of length-weight relationship	IEO Data base (DELASS)
M/K	1.5	ratio of natural mortality to von Bertalanffy growth rate	Jensen, 1996

Table 19.2.2.4. *Raja clavata* in ICES Division 8c stock (rjc.27.8c). Results summary of length based indicators obtained using the length distribution of catch (landings + discards) or landings only from the Spanish fleet for 2021 and for the period 2019-2021 combined.

Catch used	Year	Lc	Lmean	LFeM	Lmean_LFeM
Landings and discards	2021	17.0	43.85	40.25	1.09
Landings and discards	2019-2021	17.0	49.45	40.25	1.23
Landings	2021	47.0	63.50	62.75	1.01
Lanings	2019-2021	45.0	61.71	61.25	1.01

Fishery data

No previous catch advice was given as this stock resulted from the split of rjc.27.8 into rjc.27.8abd and rjc.27.8c following the WKELASMO benchmark (ICES, 2022), therefore following ICES guidelines the catch average of the last three years was considered (Table 19.2.2.2). This value accounts for 288 tonnes.

Data used correspond to landings (t) of *Raja clavata* by the Spanish fleet operating in this area ICES Div. 8c (Cantabrian Sea). Species-specific landings are available only from 2009. Discard estimates are also available from that period and are variable ranging from 8 % to 37% (Figure 19.9.2.4).

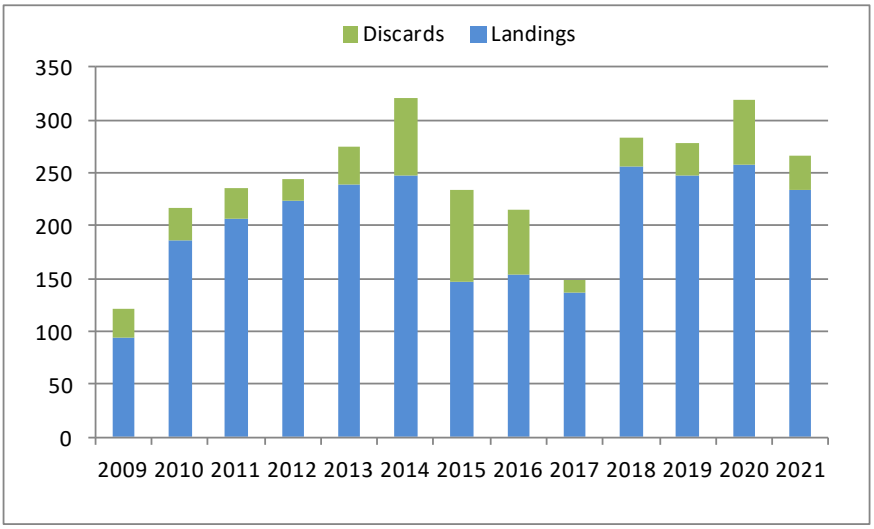

Figure 19.9.2.4. Landings and discards (tonnes) of *Raja clavata* by the Spanish fleet in Division 8.c for the period 2009–2021.

19.9.3 Thornback ray (*Raja clavata*) in Division 9.a (west of Galicia, Portugal, and Gulf of Cadiz) (rjc.27.9a)

19.9.3.1 Assessment carried out in 2022

For the period 2008-2021, *Raja clavata* landings are mainly derived from Portugal (Table 19.9.3.1), in particular from the polyvalent fleet which represents around 80% of the total annual landed weight of the species (Maia et al., 2022b). Spain landings only represent up to 29% for the period 2009-2021.

Discards information on skates and rays from the Portuguese polyvalent and bottom otter trawl segments operating in the ICES Division 9.a has been collected by the Data Collection Framework (EU DCR). The routine estimator used to estimate total discards in the Portuguese crustacean and demersal fish bottom otter trawl does not apply to species with occurrence lower than 30% of the trips sampled under the DCF Portuguese on-board sampling program, which is the case of all skate and ray species (Serra-Pereira *et al.*, 2017). The low frequency of occurrence registered for the species in bottom otter trawl fisheries indicates that discards can be considered negligible (Fernandes, 2021). Regarding the polyvalent fleet, discards are known to take place but are not fully quantified and information available is insufficient to estimate discards of the species. Discard survival studies suggest that *R. clavata* has relatively high survivorship after capture (for details see Section 19.3.3.).

Table 19.9.3.1. *Raja clavata* in ICES Division 27.9a. ICES estimates of landings by country (in tonnes) for the period 2009-2021. In 2003–2008 species-specific landings data are only presented for Portugal, as Spanish species-specific landings are not available in this period.

Year	Spain	Portugal	Total
2003		351	351
2004		516	516
2005		480	480
2006		569	569
2007		472	472
2008		745	745
2009	29	739	768
2010	115	611	725
2011	139	811	950
2012	194	570	764
2013	166	643	809
2014	215	585	800
2015	120	578	697
2016	123	559	682
2017	124	620	744
2018	152	654	806
2019	181	621	802
2020	178	670	848
2021	174	768	942

A proposal for assessing the status of the stock using the ICES rfb rule (ICES, 2021a) was presented at WGEF 2022. Following the ICES guidance on the parameter determination for the rfb rule (ICES, 2021a; ICES, 2022a), the input values for applying rfb rule are presented in Table 19.9.3.2. Following rfb rule, the advised landings in 2023 and 2024 should not exceed 1296 t. Since the advice for 2023 and 2024 corresponds to a decrease of 24% in relation to the previous advice (Ay of 1717 t), the stability clause was not applied.

Table 19.9.3.2. *Raja clavata* in ICES Division 27.9a. Estimates used in the rfb rule, with details and comments.

Variable	Esti-mate	Input data	Comment
r: Stock biomass trend	0.82	Stock indicator (Commercial LPUE from Portuguese polyvalent fleet and ARSA surveys in Q2 and Q4, previously scaled by the respective long-term mean).	Index A (2020, 2021) = 1.31 Index B (2017, 2018, 2019) = 1.60
b: Biomass safe-guard $= \mathbf{min}(\mathbf{1}.\ \boldsymbol{I_{y-1}}\ /\boldsymbol{I_{\mathbf{trigger}}})$ $I_{\text{trigger}} = I_{\text{loss}}\ \omega$ (considering $\omega = 1.4$)	1	Stock indicator; I_{loss}, minimum estimate (1997) = 0.07 $I_{trigger}$ = 0.102 $(\frac{I_{y-1}}{I_{\text{trigger}}} = 12.83)$	The stock shows a continuous increasing trend since the beginning of the series.
m linked to von Bertalanffy k	0.95	k= 0.117 year^{-1}; estimated from the Von Bertalanffy growth model (Serra-Pereira et al., 2008)	*k* estimated for males and females since no significant differences in growth parameters were observed between sexes (Serra-Pereira et al., 2008).
f: Fishing proxy	0.97	Length data collected under the sampling program from 2019 to 2021, raised to the overall landings. L_{mean}=70.37 cm $L_{F=M}$= 72.5 cm	F proxy was estimated from length-based indicators. To overcome deficiencies in sampling in 2020 due to covid disruption, data from 2019-2012 was combined. See more information below.
Ay × r × f × b × m	1296 t		Decrease of 24% in relation to the previous advice (A_y of 1717 t). The stability clause was thus not applied.

Up to 2018, this stock was assessed using data derived from the Spanish ARSA survey in Gulf of Cadiz (SpGFS-GC-WIBTS-Q1 and SpGFS-GC-WIBTS-Q4, Figure 19.9.3.1) and the Portuguese Autumn Groundfish Surveys (PtGFS-WIBTS-Q4). However, because of the problems with the PtGFS-WIBTS-Q4 survey data availability for the period 2018–2020 (see details in Section 19.6.3) and uncertain future, an alternative assessment approach using a standardized commercial LPUE series was reviewed and accepted at WKSKATE (ICES, 2021b).

Data used as stock indicator corresponds to the mean normalized biomass index from Spanish groundfish surveys in the Gulf of Cadiz (SpGFS-GC-WIBTS-Q1&Q4, Figure 19.9.3.1), averaged with the normalized LPUE standardized index from the Portuguese polyvalent fleet and the MSY related indicator ($L_{mean}/L_{F=M}$) as F proxy (see details above).

In the ARSA survey time series (1993–2020), *R. clavata* is one of the most abundant skate species. In 2021, the survey was not performed. In 2020, the biomass of *R. clavata* decreased compared to 2019, particularly in the autumn survey, however it remains amongst the high values of the time series. The species shows an increasing trend in biomass since 1997, with the highest values reached in 2013, 2015, 2018 and 2019, although since 2013 the biomass shows large year-to-year variations. The values in 2020 decreased slightly for *R. clavata* remaining close to 2.0 kg haul (Figure 19.9.3.1).

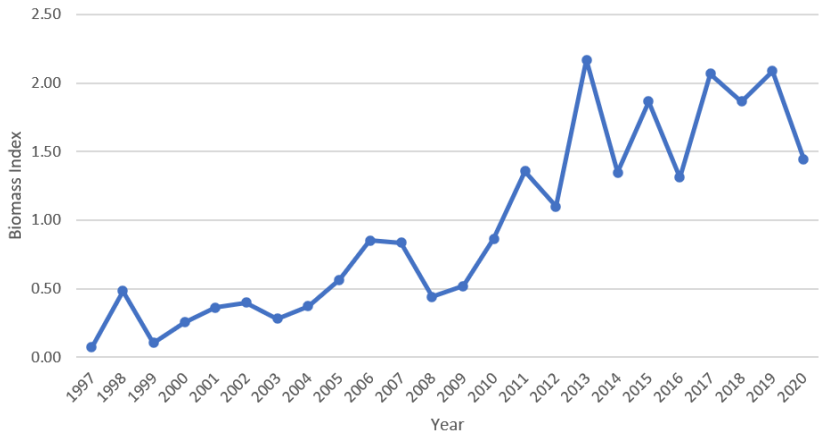

Figure 19.9.3.1. *Raja clavata* in ICES Division 27.9a. Mean normalized biomass index from Spanish groundfish surveys (SpGFS-GC-WIBTS-Q1&Q4) for the period from 1997 to 2020.

Details on the LPUE estimation methodology can be found in Serra-Pereira *et al.* (2020) and ICES (2021, report). In 2022, the model was updated (explained variance = 0.81, AIC = 762514). The best model selected with the updated dataset included the variables years, quarter, landing port, vessel size, fishing seasonality on skates and fishing gear (trammel nets or gillnets). More details and results can be found in Maia *et al.*, 2022b WD. The mean annual biomass index (kg/trip) scaled by the overall mean for 2020–2021 (1.24) was 4% greater than the observed in the preceding three years (2017-2019: 1.19) (Figure 19.9.3.2).

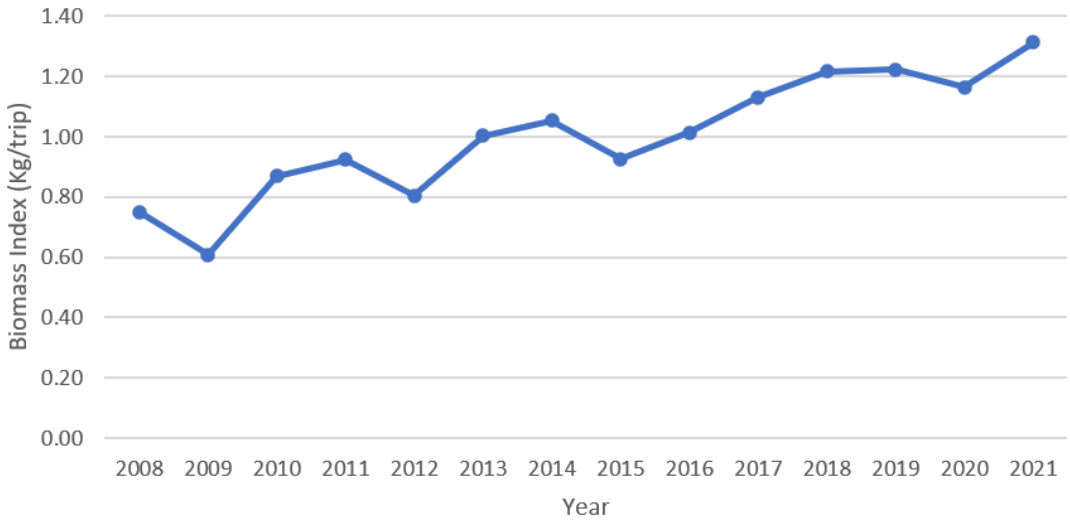

Figure 19.9.3.1. *Raja clavata* in ICES Division 27.9a. Standardized LPUE from the polyvalent segment for the period 2008-2021.

Annual length frequency distributions for the Portuguese combined trawl and polyvalent landings are presented in Figure 19.9.3.3. Spanish landings length data were not used once is only available for trawlers, as well as discards length data that only represents ~1% of the stock catches in weight. Due to Covid related data collection constrains, data for the period 2019-2021 was combined, according to WGEF decision.

To determine F proxy based on length-based indicators, estimates of L_{inf} (128 cm; Serra-Pereira et al., 2008), L_{50} (78.4 cm; Serra-Pereira *et al.*, 2011) and parameters from the weight-length relationship a=0.0052 and b=3.05 (Serra-Pereira *et al.*, 2010) were used. Length classes of 4 cm were adopted as creates a smooth and unimodal distribution. LBI analysis resulted in a L_c= 54.0 cm, L_{mean}=70.36 cm and $L_{F=M}$= 72.5 cm for the period 2019-2021.

The L_c estimated value of the exploited length frequency population is constrained by the Portuguese technical measures adopted, in particular the minimum landing size (MLS). Therefore, the L_c estimate is high and is likely to be biased against the L_c of the fishing gears capturing the species. The adoption of a MLS leads to the increase of smaller specimens discarding. Survivorship of *R. montagui* after capture with trammel nets in 9a is estimated as 54% (Castelo, 2021).

F_{MSY} proxy ($L_{mean}/L_{F=M}$) suggests that the stock is exploited at sustainable levels, with values above or very close to 1 (for details see Maia *et al.*, 2022c).

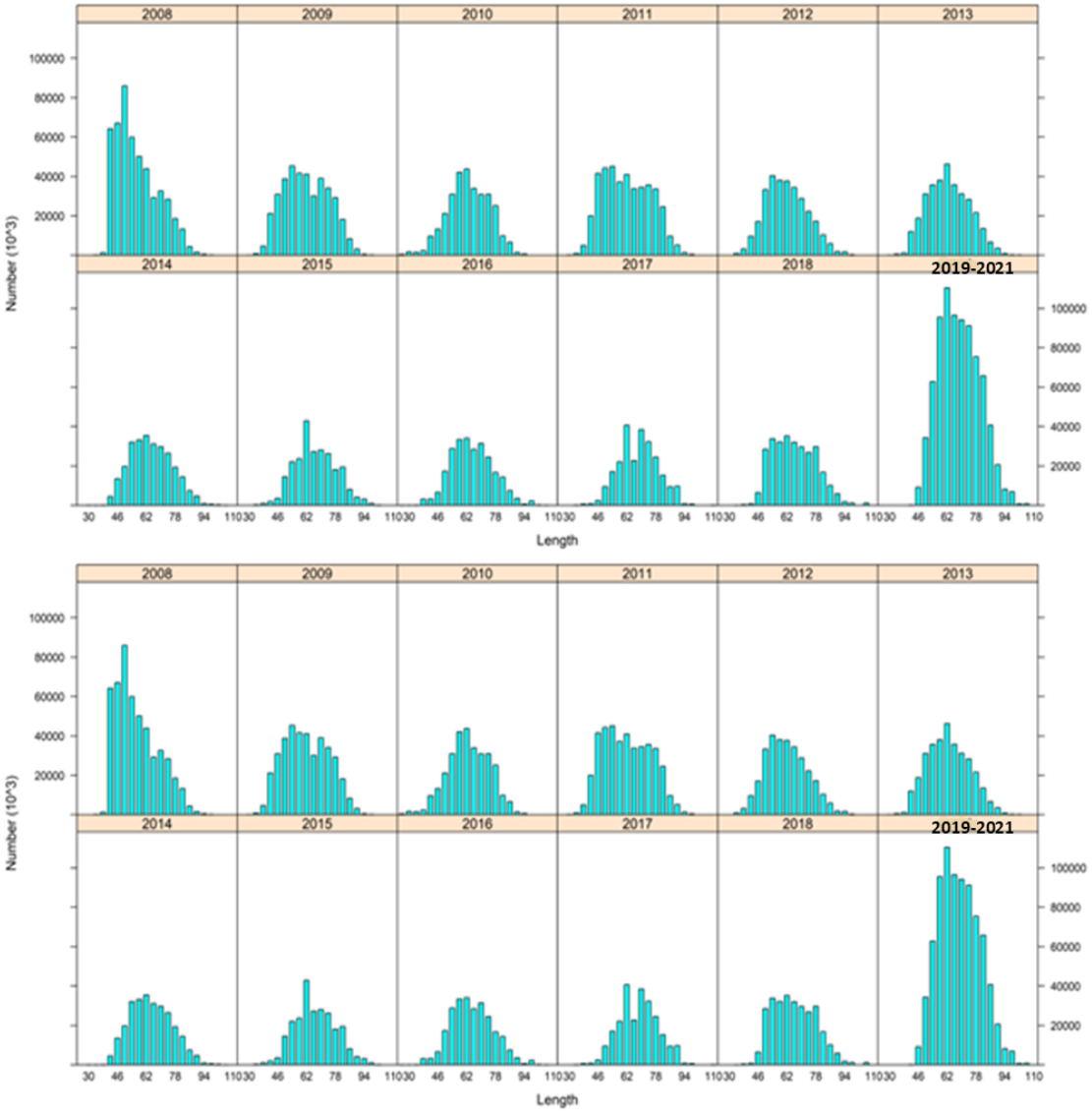

Figure 19.9.3.3. *Raja clavata* in ICES Division 27.9a. Length–frequency distribution (4 cm length classes) for the period for 2008-2021 with polyvalent and trawl fleets combined. Data for the period 2019-2021 is combined. Numbers of individuals correspond to raised numbers.

19.9.4 Cuckoo ray (*Leucoraja naevus*) in subareas 6-7 (Celtic Sea and West of Scotland) and divisions 8.a-b,d (Bay of Biscay) (rjn.27.678abd)

This stock is addressed in Section 18, Skates and rays in the Celtic Seas

19.9.5 Cuckoo ray (*Leucoraja naevus*) in Division 8.c (Cantabrian sea) (rjn.27.8.c)

A proposal for assessing the status of the stock (rjn.27.8c) using the ICES rfb rule (ICES, 2021a) was presented at WGEF 2022. Following the ICES guidance on the parameter determination for the rfb rule (ICES, 2021a; ICES, 2022a), the input values for applying rfb rule are presented in Table 19.9.5.1. According to the assessment, the advised catches for this stock (rjn.27.8c) in 2023 and 2024 should not be more than 38 tonnes If discard rates do not change from the average of the last 5 years (2017–2021), this implies landings of no more than 36 tonnes. The stability clause was not applied since catch advised have decreased by less than 20%.. The discard rate (average 2017-2021) was 14%.

Table 19.9.5.1. *Leucoraja naevus* in ICES Division 8c (rjn. 27.8c). Estimates used in the rfb rule, with comments.

Variable	Estimate	Input data	Comment
r: Stock biomass trend	0.94	Stock-size indicator: Biomass survey index from North Spanish survey (SpNGFS-WIBTS-Q4)	Index A (2020*) = 0.60 kg.haul^{-1} Index B (2017, 2018, 2019)= 0,64 kg.haul^{-1}
b: Biomass safeguard $= \min(1.\ I_{y-1}\ /I_{\text{trigger}})$ $I_{\text{trigger}} = I_{\text{loss}}\ \omega$ Considering $\omega = 1.4$	1	Stock indicator; I_{loss}, minimum estimate (1991) = $I_{trigger}$ = 0.07 $(\frac{I_{y-1}}{I_{\text{trigger}}} = 8.60)$	The biomass index has been fluctuating inter-annually since the beginning of the time series with an increasing trend reaching the top of the time series in 2017.
m linked to von Bertalanffy k	0.95	k estimated from the Von Bertalanffy model adopted for the species.	
f: Fishing proxy	1.00	Length data collected under the sampling program raised to the overall landings. No length data was available in 2020 Length data 2019-2021 combined. L_{mean}=53.8 cm $L_{F=M}$= 53.6 cm	To overcome deficiencies in sampling in 2020 due to covid disruption, data from 2019-2021 was combined.
Ay × r × f × b × m	38 t		Decrease of 10% in relation to the previous advice (A_y of 42 t). The stability clause was thus not applied.

Stock indicator (for the definition of r and b)

The status of this stock in Division 8.c is evaluated based on survey data from the Spanish (IEO) survey. The biomass index used for this stock corresponds to the standardized biomass index obtained from the annual bottom trawl survey carried out in autumn in the north of Spain (SpNGFS-WIBTS-Q4).

During the time series standardized since 1991 the biomass of *L naevu*s, has been fluctuating between 0.2 to 0.6 (kg.haul-1) with an increasing trend reaching the top of the time series in 2017 (Figure 19.9.5.1). More information on survey data, species distribution, etc. (Blanco *et al*., 2022; ICES, 2021b) In 2021 the survey was carried out with two different vessels, due to technical problems with the ordinary vessel for that reason the index of 2021 has not been used in the analysis.

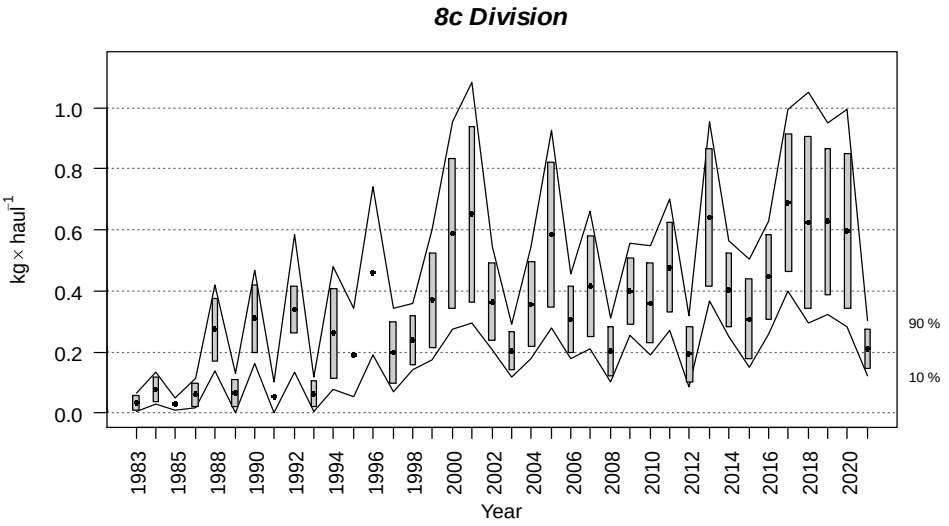

Figure 19.9.5.1. Evolution of *Leucoraja naevus* biomass index (kg.haul^{-1}) during the north Spanish bottom trawl survey (ICES Division 8c). Boxes mark parametric standard error of the stratified biomass index and black lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000).

Since the last assessment conducted in 2020, the advice for this stock is given as catch advice instead of landings advice which was done in previous assessments (issue 2018). This is due to the ADG recommendation of including discard data when this information is available and reliable. Data on discards were available for this stock since 2015 and although variable, it is considered reliable and thus has been included in the assessments (see section below, Figure 19.9.5.3).

Estimation of length–based indicators (F proxy)

Following WGEF 2022 discussions and to consolidate length frequency data due to Covid-19 data collection constraints, f proxy was determined using length frequency distribution based on combined sampling landing data from 2019 to 2021 (Figure 19.9.5.2). Not landings length frequency distribution was available in 2020.

To determine F proxy based on length-based indicators estimates of Linf, L50 and a and b parameters from the weight-length relationship were used. These parameters are defined for this stock (Table 19.9.5.2). Length classes of 2 cm were adopted. LBI analysis resulted in a Lc= 46.5 cm, Lmean=53.79 cm and LF=M= 53.63 cm for the period 2019-2021 (Table 19.9.5.3).

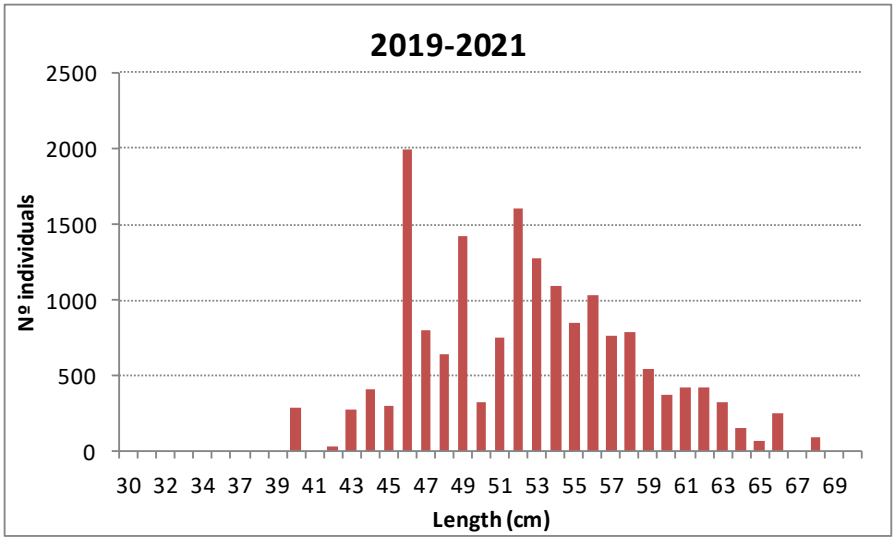

Figure 19.9.5.2. *Leucoraja naevus* in ICES Division 27.8c. Length–frequency distribution (2 cm classes) for the period 2019-2021 (combined).

Table 19.9.5.2. Biological parameters used for calculating the LBI parameters (rjn.27.8c).

Parameter	Value	Definition	Source
L∞ (cm)	75	Asymptotic average maximum length	Linf=Lobs / 0.95 (Froese, 2004)
Lmat	56.2	Length at 50% maturity	Maia et al., 2012
a	0.0027	Condition factor parameter of length-weight relationship	IEO Data base (DELASS)
b	3.204	Slope parameter of length-weight relationship	IEO Data base (DELASS)

Table 19.9.5.3. Leucoraja naevus stock in ICES Division 8c (rjn.27.8c). Results of length-based indicators obtained from landings length frequency of the Spanish fleet (2019-2021 combined). No length data available for 2020.

Year	Lc/Lmat	L25/Lmat	Lmax/Linf	Pmega	Lmean/Lopt		Lmean/LFeM		
2019-2021	>1	>1	>0.8	>30%	~1	≥1	Lc	Lmean	LFeM
	0.83	0.86	0.87	0.35	1.08	1	46.5	53.8	53.6

Fishery Data

Data used correspond to landings (t) of Leucoraja naevus mainly from Spanish fleet which majority operates in this area ICES Div. 8c. Some landings are also reported by the French fleet usually fluctuating from 0 to 0.2 tonnes. Species-specific landings are available only since 2009 (Figure 19.9.5.3). Discard data for the Spanish fleet is available since 2015, discards are relatively low but highly variable (Figure 3).

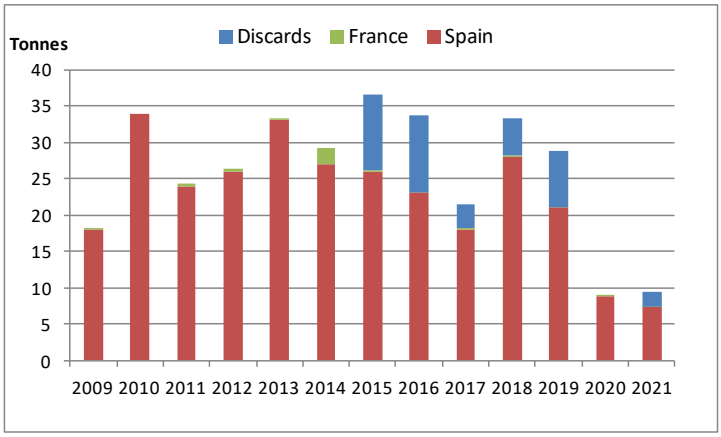

Figure 19.9.5.3. Landings (tones) of cuckoo ray *(Leucoraja naevus*) in Div.8c (rjn.27.8c) and discards of the Spanish fleet.

19.9.6 Cuckoo ray (*Leucoraja naevus*) in Division 9.a (west of Galicia, Portugal, and Gulf of Cadiz) (rjn.27.9a)

The rfb rule (ICES, 2021a) was applied for the first time during the WGEF 2022 to assess the status of cuckoo ray (Leucoraja naevus) in Iberian waters ICES Division 9.a (stock rjn.27.9a).

Following the ICES guidance on the parameter determination for the rfb rule (ICES, 2021a; ICES, 2022), the input values for applying rfb rule on rjn.27.9a are presented in Table 19.9.6.1.

Previous catch advice (Ay) was 120 tns catches corresponding to 84 tns landings. According to the rfb guidelines the catch advice for 2023 and 2024 should not exceed 84 tns which implies landings no more than 71 tns. This corresponds to a decrease of 30 % compared to previous advice since the stability clause was considered and applied to limit the reduction in landings advice to 30%.

Table 19.9.6.1. *Leucoraja naevus* in ICES Division 9a (rjn.27.9a). Estimates used in the rfb rule, with comments.

Variable	Estimate	Input data	Comment
r: Stock biomass trend	0.57	Stock-size indicator: Biomass survey index and standardized commercial LPUE from Portuguese polyvalent fleet.	Index A (2020, 2021) = 0.82 Index B (2017, 2018, 2019) = 1.433
b: Biomass safeguard $= \min(1.\ I_{y-1} / I_{\text{trigger}})$ $I_{\text{trigger}} = I_{\text{loss}}\ \omega$ Considering $\omega = 1.4$	1	Stock indicator; I_{loss}, minimum estimate (1998) = $I_{trigger}$ = 0.035 $(\frac{I_{y-1}}{I_{\text{trigger}}} = 13.57)$	The series shows an increasing trend since its beginning but in the last 2 years index values decreased.
m linked to von Bertalanffy k	0.95	k estimated from the Von Bertalanffy model adopted for the species.	
f: Fishing proxy	1.14	Length data collected under the sampling program raised to the overall landings. Length data were from 2019 to 2021. L_{mean}=56.4 cm $L_{F=M}$= 49.5 cm	To overcome deficiencies in sampling in 2020 due to covid disruption, data from 2019-2021 was combined. See more information below.
Ay × r × f × b × m	84 t		The stability clause was applied to limit the reduction in landings advice to 30%. in relation to the previous catch advice (A_y of 120 t).

Stock indicator (for the definition of r and b)

The stock indicator is given by the average of the normalized biomass index from Spanish groundfish surveys in Gulf of Cadiz (SpGC-GFS-WIBTS-Q1-Q3) and the standardized LPUE series from the Portuguese polyvalent fleet (presented, reviewed and accepted at WKSKATE; ICES, 2021b). The index is presented in Table 19.9.6.2 and Figure 19.9.6.1. In 2021 only data from LPUE was available since the Spanish survey was not conducted due to a vessel breakdown (Rodriguez-Cabello *et al.*, 2022b).

Table 19.9.6.2. *Leucoraja naevus* in ICES Division 27.9a. Landings and yearly values of the stock indicator, it corresponds to the average of the normalized biomass index from Spanish groundfish surveys in Gulf of Cadiz (SpGC-GFS-WIBTS-Q1-Q3) and the Portuguese LPUE series.

Year	Landings	Stock Indicator	Survey index	LPUE index
1998		0.025	0.025	
1999		0.114	0.114	
2000		0.060	0.060	
2001		0.172	0.172	
2002	12.7	0.548	0.548	
2003	18.0	0.494	0.494	
2004	113.0	0.640	0.640	
2005	42.8	0.816	0.816	
2006	50.8	1.262	1.262	
2007	78.8	0.481	0.481	
2008	49.8	0.423	0.418	0.429
2009	53.1	0.920	0.988	0.853
2010	59.4	0.686	0.551	0.821
2011	68.0	1.772	0.656	2.887
2012	52.6	1.290	1.309	1.272
2013	28.6	1.948	2.586	1.309
2014	34.4	1.345	0.782	1.908
2015	19.7	1.252	1.750	0.755
2016	58.6	1.093	1.278	0.909
2017	40.7	1.423	2.769	0.077
2018	24.8	1.552	2.816	0.287
2019	38.4	1.324	2.026	0.622
2020	23.0	0.687	0.459	0.914
2021	22.7	0.956		0.956

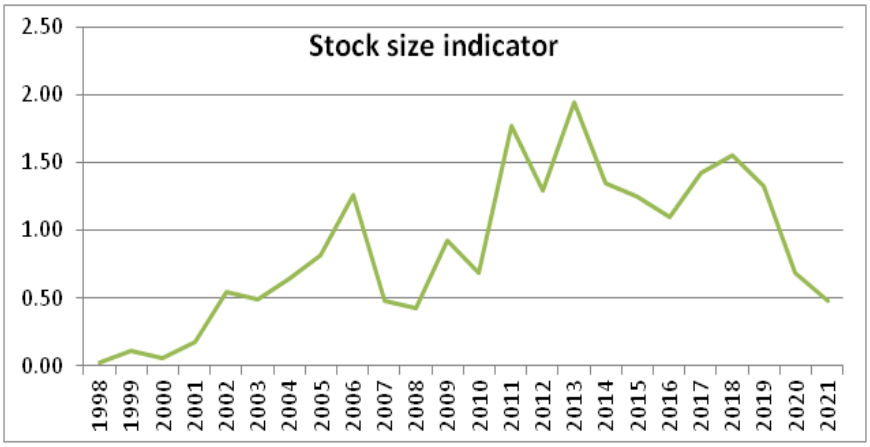

Figure 19.9.6.1. Leucoraja naevus in ICES Division 27.9a. Biomass indicator for the period 1998-2021. It corresponds to the standardized average of biomass index from Spanish groundfish surveys in Gulf of Cadiz (SpGC-GFS-WIBTS-Q1-Q3) and the LPUE index from the Portuguese polyvalent fleet.

Estimation of length–based indicators (fF proxy)

Landing length frequency distributions for the combined trawl and polyvalent Portuguese fleet were used to determine f proxy (Figure 19.9.6.2). Due to Covid related data collection constrains, data for the period 2019-2021 was combined, according to WGEF decision. Only Portuguese length data was available. It should be remarked that the Portuguese landings represented ~85% of the total landings of the stock in 2019-2021 and that trawl and polyvalent fleets combined correspond to ~100% of the Portuguese landings. Discard data are only available from the Spanish trawl fleet for the period 2015-2019 but length information is deficient.

To determine F proxy based on length-based indicators estimates of Linf, L50 and a and b parameters from the weight-length relationship were used. These parameters are defined for this stock (Table 19.9.6.3). Length classes of 2 cm were adopted. LBI analysis resulted in Lc= 41.0 cm, Lmean=56.36 cm and LF=M= 49.50 cm for the period 2019-2021.

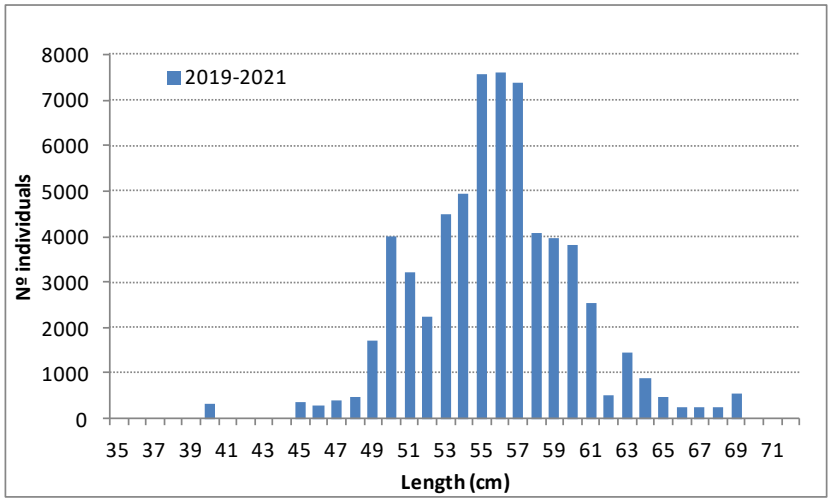

Figure 19.9.6.2. *Leucoraja naevus* in ICES Division 27.9a. Length–frequency distribution of landings for the Portuguese fleet, polyvalent and trawl fleets combined, and for the period for 2019-2021 (combined).

Table 19.9.6.3. Biological parameters used for calculating the LBI parameters (rjn.27.9a).

Parameter	Value	Definition	Source
L∞ (cm)	75	Asymptotic average maximum length	Linf=Lobs / 0.95 (Froese, 2004)
Lmat	56.2	Length at 50% maturity	Maia et al., 2012
a	0.0027	Condition factor parameter of length-weight relationship	IEO Data base (DELASS)
b	3.204	Slope parameter of length-weight relationship	IEO Data base (DELASS)

Management measures

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. Portuguese regulations (Portaria no. 315/2011, updated by Portaria no. 47/2016) also prohibits the catch, retention onboard, and landing of any skate species belonging to Rajiformes during the months of May and June, which covers the spawning period of the species. During these two months, vessels are permitted to retain on board and to land a maximum of 5% bycatch, in weight, of the Rajiformes species per trip.

Further information

Exploratory assessments using SPiCT model were also conducted with this stock. Data and more information on rjn.27.9a can be found in Rodríguez‐Cabello et al., (2022 WD).

19.9.6.4. Exploratory LPUE

As the PtGFS-WIBTS-Q4, the NepS (FU 28–29) survey was not conducted in recent years (2019–2020) and the continuity of the series is uncertain. And although not used to provide advice for rjn.27.9a, due to the irregularity in the series, it is used as auxiliary information. Considering this, and the fact that the ARSA surveys used currently as basis to provide advice only covers a small part of the stock area, an alternative assessment approach using a standardized commercial LPUE series was explored and presented in the WKSKATE meeting (Serra-Pereira *et al.*, 2020 WD; ICES, 2021b). The method is the same as that used for rjh.27.9a and is described in the stock annex for rjh.27.9a (see also LPUE in Section 19.9.3, rjc.27.9a). In brief, it considers the estimated landed weight of the species per trip (fishing effort unit) from the Portuguese polyvalent fleet using nets. Portuguese landings represented, on average, 92% of the total reported landings and the polyvalent fleet represented 67–81% in the last three years for the overall stock. The landed weight per trip is obtained by applying the stepwise statistical methodology described in Figueiredo *et al.* (2020b), in which the vessels are stratified by size and fishing seasonality. Vessels classified in the same *strata* are known to operate similarly in terms of fishing time, size of gear and fishing areas. As for rjc.27.9a, no changes in the fishing areas explored or in the distributional area for this stock were observed over the years. Therefore, it is considered unlikely that LPUE are not reflecting the biomass in the exploited areas. The fishing trip was adopted as the effort unit because most of the vessels from the polyvalent fleet do not have log-book. The inclusion of variables in the model that inform on the stratification of the fleet allows to have homogenous vessel strata with similar fishing operations. Also, from information collected through inquiries to the Portuguese fleet, the duration of fishing trips from most vessels is around 24h which is equivalent to using the "trip" as fishing effort unit.

Several explanatory variables were investigated as potential candidates and the selection of the best model was done through residual graphical analysis and AIC comparison. Those included in the best GLM model (explained variance = 0.58) were: year, quarter, vessel size, fishing seasonality on skates and rays and fishing gear (Figure 19.9.6.3). Two fishing gears are used: trammel nets and gillnets. Annual standardized estimates of CPUE and the corresponding standard error were determined for a reference condition of the variables included in the model apart from the year level (Figure 19.9.6.4).

So, in order to include the new LPUE series as basis to provide advice for rjn.27.9a in 2022, the method was presented (Serra-Pereira *et al*., 2020 WD) and evaluated during WKSKATE and peer-reviewed by an external review group, as a recommendation from ICES ACOM (ICES, 2021b). In brief, WKSKATE acknowledged the adequacy of the Portuguese commercial LPUE series to assess the status of this stock and accepted its use for the next advice, due in 2022; the reviewers also recognized the choice made by the group to look at the use of LPUEs as an alternative to surveys and made suggestions for further improvement (see Section 19.9.2 and ICES (2021b) for more details). The main concern from the reviewers about the methodology proposed was the non-inclusion of the zeroes in the analysis. The rationale for choosing this approach is described in detail in ICES (2021b) and in Section 19.9.3 of this report. Additional analysis to justify the choice of not including the zeroes in the model will be presented in 2022.

In 2021, the model was updated (explained variance = 0.56, AIC = 23 589) (Figure 19.9.6.4). The best model selected with the updated dataset included all the variables mentioned for the previous model. The mean annual biomass index (kg/trip) scaled by the overall mean for 2019–2020 was 11% smaller than the observed in the preceding five years. For comparison purposes with the current assessment methodology, the LPUE data series was normalized to the long-term mean and compared with the normalized biomass Index obtained from the NepS (FU 28–29) survey (Figure 19.9.6.4). In general, followed similar trends, although the survey series has gaps in 2010, 2012, 2019 and 2020. Also, to note that the survey index is a screenshot in time during a specific time of the year (Q2) whilst the LPUE series is based on information collected throughout the year, so a lag between the two is to be expected. Also, as cuckoo ray is not very abundant in the surveys, the uncertainty of the estimates is larger than those for the thornback ray; considering that, most of the LPUE estimates are within the range of the CI.

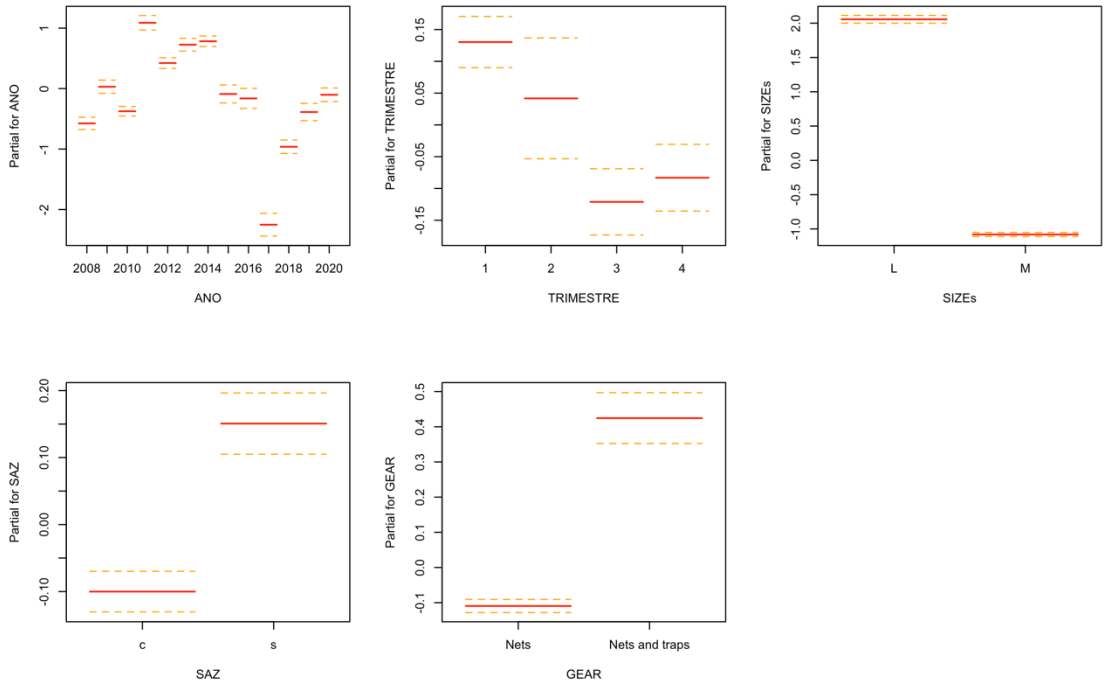

Figure 19.9.6.3. Skates in the Bay of Biscay and Iberian Waters. Effect of each explanatory variable included in the standardization of the LPUE for *L. naevus* caught by the polyvalent segment in mainland Portugal (Division 9.a): year, quarter, landing port, vessel size ("SIZEs"), fishing seasonality ("SAZ") and fishing gear (trammel nets or gillnets).

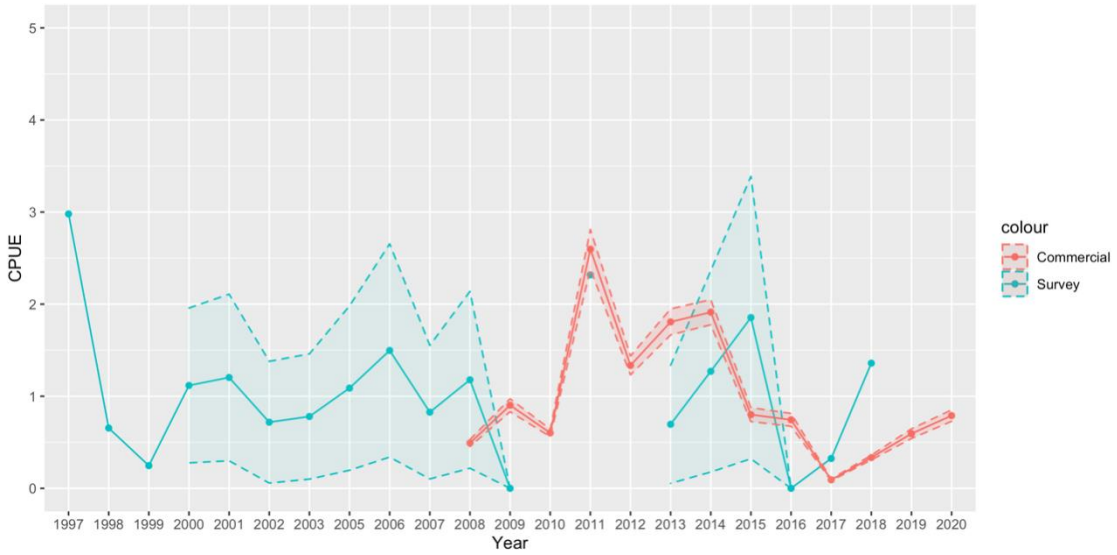

Figure 19.9.6.4. Skates in the Bay of Biscay and Iberian Waters. Standardized LPUE from the polyvalent segment in mainland Portugal vs standardized NepS (FU 28–29) Survey biomass Index for *L. naevus* (Division 9.a). Both series are normalized to the long-term mean and present the standard errors in shade.

19.9.7 Spotted ray (*Raja montagui*) in Subarea 8 (Bay of Biscay and Cantabrian Sea) (rjm.27.8)

In 2022, the assessment was carried out applied the rfb rule (Table 19.9.7.1). Data used were the Spanish SpGFS-WIBTS-Q4 [G2784] survey and the length distribution from French and Spanish landings. Spotted ray is caught sporadically in divisions 8abd during the EVHOE survey so that this survey does not provide a reliable index. Therefore, the biomass index used for assessment comes from Division 8.c only (Figure 19.9.7.1). In Division 8.c, the species has been frequent, especially in the central area Sea during the time-series of the Spanish survey.

In 2021, following a breakdown, the survey was carried out from a different vessel, using the same gear. As the biomass indices of some skate species showed unexpected variations between 2020 and 2021, it was decided to excluded year 2021 for all species until the possible difference in catchability resulting from the vessel change is clarified. Therefore, the change in the biomass index to calculate the *r* of the *rfb* rule was the ratio of the biomass index in 2020 to the average of the biomass index in the three preceding years (2017-2019).

Table 19.9.7.1. *Raja montagui* in ICES Subarea 27.8. Estimates used in the rfb rule, with details and comments.

Variable	Estimate	Input data	Comment
r : Stock biomass trend	0.85	Biomass index from SpGFS-WIBTS-Q4 [G2784] excluding year 2021 for vessel breakdown	After an increase from 2011, the stock trend shows a rather stable pattern since 2013
b : Biomass safeguard $= \min(1.\ I_{y-1} / I_{\text{trigger}})$ $I_{\text{trigger}} = I_{\text{loss}}\ \omega$ Considering $\omega = 1.4$	1	I_{loss} minimum estimate (2011) = 0.46 (last smallest value between 1999 and 2020) $I_{trigger}$ = 0.644 $(\frac{I_{y-1}}{I_{trigger}} = 2.06)$	After an increase from 2011, the stock trend shows a rather stable pattern since 2013
f : fishing proxy	1.04	Length data were collected on French and Spanish landings then raised to the fleet. Length data were collected from 2019 to 2021.	Data above 80 cm have been removed because they are considered to be misreporting. Data on discard were considered unreliable.
m linked to Von Bertalanffy k	0.95	k estimated from Von Bertalanffy model adopted for the species which is also considered in the assessment model adopted for the species	k (= 0.24) for this stock is based on the $\boldsymbol{L}_{\infty}$(=$\boldsymbol{L_{max}}/0.95$ with $\boldsymbol{L_{max}}$ = 78 cm)
Ay × r × f × b × m	103		Decrease of 20% in relation to the previous advice (A_{y-1} of 129 t). The stability clause was thus not applied.

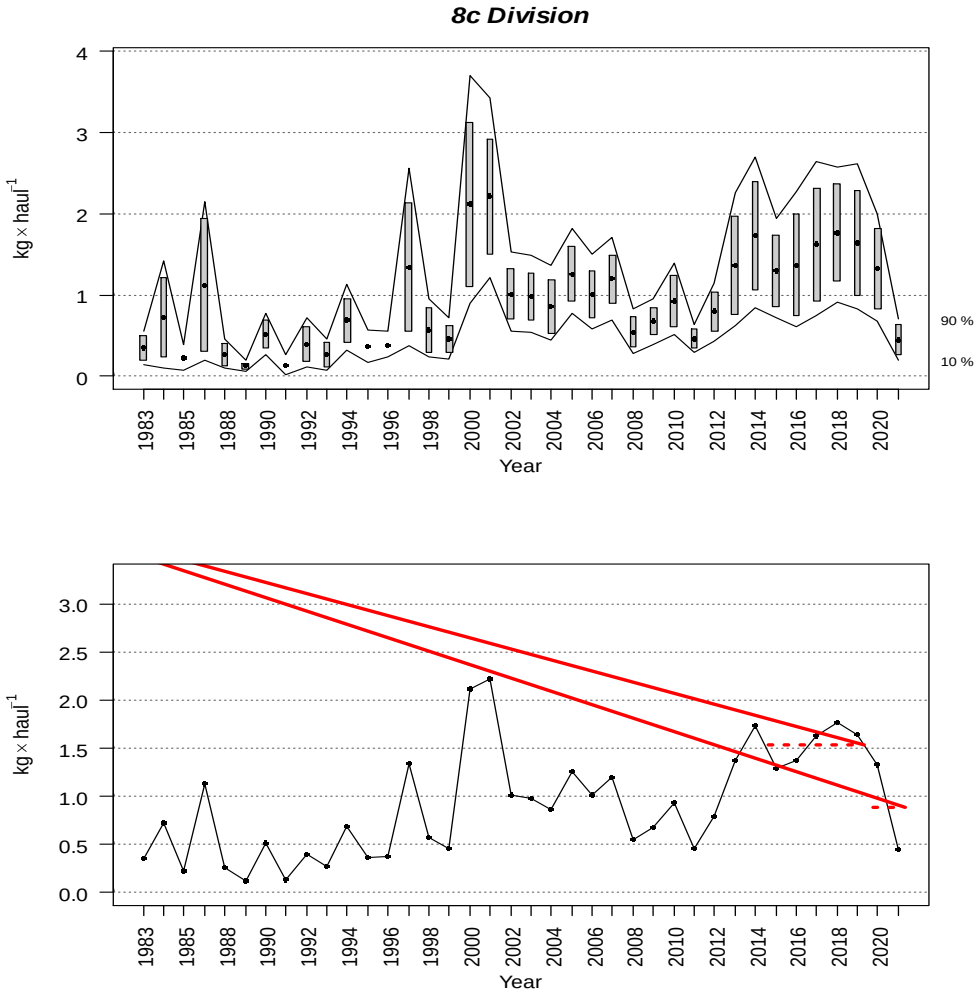

Figure 19.9.7.1. Skates in the Bay of Biscay and Iberian Waters. Time-series of *Raja montagui* biomass index during North Spanish shelf bottom trawl survey (1983–2021) in Division 8.c covered by the survey. Top: boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (a = 0.80, bootstrap iterations = 1000). Bottom: red lines show the average index in the two last years and in the five previous.

19.9.8 Spotted ray (*Raja montagui*) in Division 9.a (west of Galicia, Portugal, and Gulf of Cadiz) (rjm.27.9a)

For the period 2008-2021, *Raja montagui* landings are mainly derived from Portugal (Table 19.9.8.1), in particular from the polyvalent fleet which represents between 67 and 90% of the total annual landed weight of the species (Maia et al., 2022c). Spain landings only represent up to 17%.

Discards information on skates and rays from the Portuguese polyvalent and bottom otter trawl segments operating in the ICES Division 9.a has been collected by the Data Collection Framework (EU DCR). The routine estimator used to estimate total discards in the Portuguese crustacean and demersal fish bottom otter trawl does not apply to species with occurrence lower than 30% of the trips sampled under the DCF Portuguese on-board sampling program, which is the case of all skate and ray species (Serra-Pereira *et al*., 2017). The low frequency of occurrence registered for the species in bottom otter trawl fisheries indicates that discards can be considered negligible (Fernandes, 2021). Regarding the polyvalent fleet, discards are known to take place but are not fully quantified and information available is insufficient to estimate discards of the

species. Discard survival studies suggest that *R. montagui* has relatively high survivorship after capture (for details see Section 19.3.3.).

Table 19.9.8.1. *Raja montagui* in ICES Division 27.9a. ICES estimates of landings by country (in tonnes). In 2003–2008 species-specific landings data are only presented for Portugal, as Spanish species-specific landings are not available in this period.

Year	Spain	Portugal	Total Landings
2003		56	56
2004		82	82
2005		76	76
2006		90	90
2007		119	119
2008		144	144
2009	7	184	191
2010	10	275	284
2011	3	121	124
2012	2	108	110
2013	4	111	115
2014	2	91	93
2015	1	67	68
2016	5	68	73
2017	5	94	99
2018	5	57	62
2019	9	82	90
2020	12	58	69
2021	9	104	113

A proposal for assessing the status of the stock using the ICES rfb rule (ICES, 2021a) was presented at WGEF 2022. Following the ICES guidance on the parameter determination for the rfb rule (ICES, 2021a; ICES, 2022a), the input values for applying rfb rule are presented in Table 19.9.8.2. Following rfb rule, the advised landings in 2023 and 2024 should not exceed 98 t. Since the advice for 2023 and 2024 corresponds to a decrease of 9% in relation to the previous advice (Ay of 108 t), the stability clause was not applied.

Table 19.9.8.2. ***Raja montagui*** **in ICES Division 27.9a. Estimates used in the rfb rule, with details and comments.**

Variable	Estimate	Input data	Comment
r: Stock biomass trend	0.99	Stock-size indicator: standardized commercial LPUE from the Portuguese polyvalent fleet.	Index A (2020, 2021) = 6.65 kg.trip^{-1} Index B (2017, 2018, 2019) = 6.69 kg.trip^{-1}
b: Biomass safeguard $= \mathbf{min}(\mathbf{1}.\ \boldsymbol{I_{y-1}}/\boldsymbol{I_{\mathbf{trigger}}})$ $I_{\mathrm{trigger}} = I_{\mathrm{loss}}\ \omega$ Considering $\omega = 1.4$	1	Stock indicator; I_{loss}, minimum estimate (2013) = 4.25 $I_{trigger}$ = 5.95 $(\frac{I_{y-1}}{I_{\mathrm{trigger}}} = 1.09)$	The series is relatively stable but short.
m linked to von Bertalanffy k	0.90	k>0.2 (See comments)	There are no reliable growth studies for this species in ICES division 9a. *K* estimates from studies in other areas of the northeast Atlantic vary from values less than 0.2 year^{-1} (Holden, 1972; Ryland and Ajayi, 1984) to higher than 0.2 year^{-1} (Gallagher et al., 2005). Given the uncertainty on this parameter estimate, the *m* adopted for the calculation of rfb rule was 0.90, following the decisions for other spotted ray stocks. However, stock specific studies are needed.
f: Fishing proxy	1.02	Length data collected under the sampling program raised to the overall landings. Length data were from 2019 to 2021. L_{mean}=59.64 cm $L_{F=M}$= 58.55 cm	To overcome deficiencies in sampling in 2020 due to covid disruption, data from 2019-2021 was combined. See more information below.
Ay × r × f × b × m	98 t		Decrease of 9% in relation to the previous advice (A_y of 108 t). The stability clause was thus not applied.

Data used included a standardized LPUE time-series as stock indicator and the MSY related indicator ($L_{mean}/L_{F=M}$) as F proxy (see details above).

Up to 2018, this stock was assessed using data from the Portuguese Autumn Groundfish Survey (PtGFS-WIBTS-Q4). However, because of the problems with the PtGFS-WIBTS-Q4 survey data availability for the period 2018–2020 (see datils in Section 19.6.3) and uncertain future, an alternative assessment approach using a standardized commercial LPUE series was reviewed and accepted at WKSKATE (ICES, 2021b).

The time-series for *R. montagui* in the ARSA surveys is irregular and with very low catches although a high peak in the biomass and abundance values was observed in 2015 and 2016. There are no records of this species in the Spanish IEO Q4-IBTS survey in Division 9.a over the whole time-series. For these reasons the Spanish surveys are not used in the assessment.

Details on the LPUE estimation methodology can be found in Serra-Pereira *et al.* (2020 WD) and ICES (2021, report). In 2022, the model was updated (explained variance = 0.75, AIC = 130875).

The best model selected with the updated dataset included the variables years, quarter, landing port, vessel size and fishing seasonality on skates. More details and results can be found in Maia *et al*., 2022c WD. The mean annual biomass index (kg/trip) scaled by the overall mean for 2020–2021 (6.65) was 1% smaller than the observed in the preceding five years (2017-2019: 6.69) (Figure 19.9.8.1).

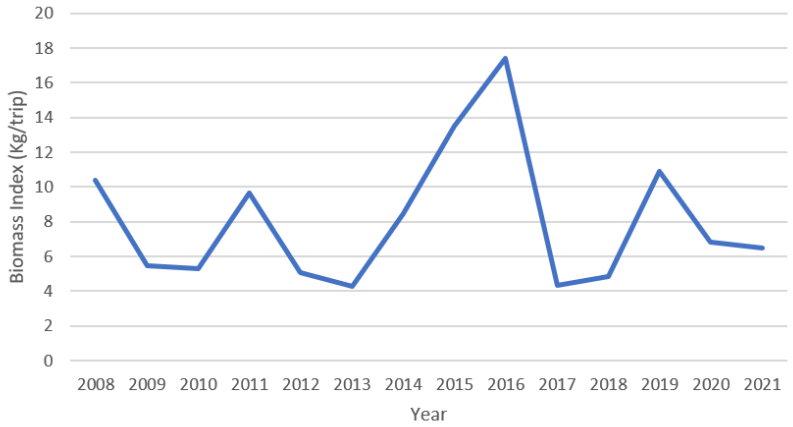

Figure 19.9.8.1. *Raja montagui* in ICES Division 27.9a. Standardized LPUE from the polyvalent segment for the period 2008-2021.

Annual length frequency distributions for the Portuguese combined trawl and polyvalent landings are presented in Figure 19.9.8.b. Spanish landings data were not used once is only available for trawlers, as well as discards data that are only available for 2019. Due to Covid related data collection constrains, data for the period 2019-2021 was combined, according to WGEF decision.

To determine F proxy based on length-based indicators, estimates of L_{inf} (Lmax/0.95; Lmax=80 cm; based on Pauly, 1984), L_{50} (56.7 cm; Pina-Rodrigues, 2012) and parameters from the weight-length relationship a=0.000000344 and b=3.47 (Serra-Pereira *et al*., 2010) were used. Length classes of 4 cm were adopted as creates a smooth and unimodal distribution. LBI analysis resulted in a L_c= 50.0 cm, L_{mean}=59.64 cm and $L_{F=M}$= 58.55 cm for the period 2019-2021.

The L_c estimated value of the exploited length frequency population is constrained by the Portuguese technical measures adopted, in particular the minimum landing size (MLS). Therefore, the L_c estimate is high and is likely to be biased against the L_c of the fishing gears capturing the species. The adoption of a MLS leads to the increase of smaller specimens discarding. Survivorship of *R. montagui* after capture with trammel nets in 9a is estimated as 54% (Castelo, 2021).

F_{MSY} proxy ($L_{mean}/L_{F=M}$) suggest that the stock is exploited at sustainable levels, with values since 2014 above 1 (for details see Maia *et al*., 2022d).

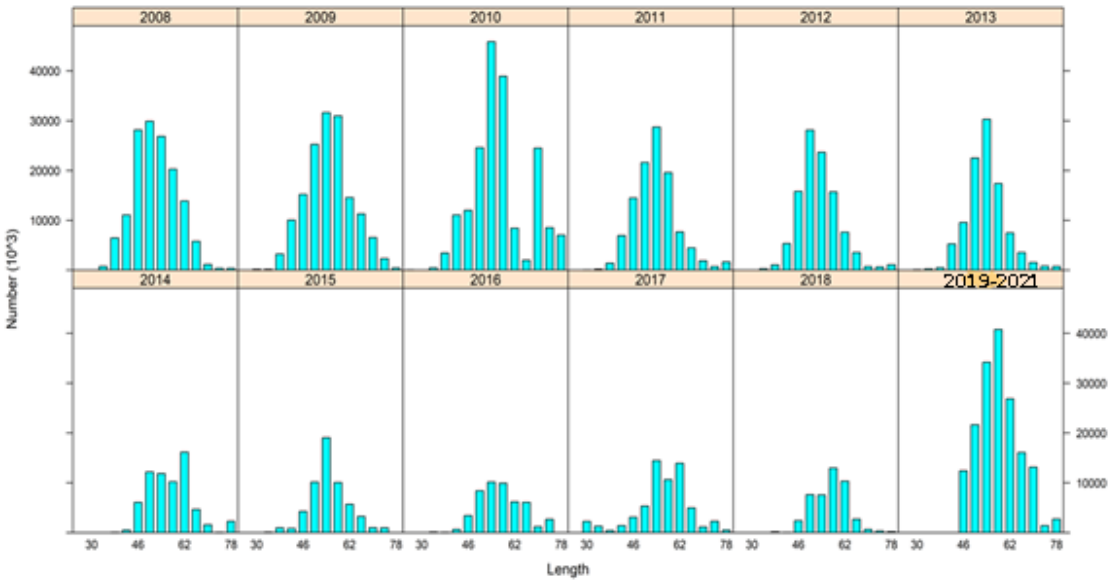

Figure 19.9.8.1. *Raja montagui* in ICES Division 27.9a. Length–frequency distribution (4 cm length classes) for the period for 2019-2021 (combined) with polyvalent and trawl fleets combined. The number of individuals correspond to raised numbers.

19.9.9 Undulate ray (*Raja undulata*) in divisions 8.a-b (Bay of Biscay) (rju.27.8ab)

The EVHOE survey is uninformative for this stock because the distribution of *R. undulata* is more coastal than the area surveyed. Exploratory assessments were presented by Biais *et al*. (2014 WD) and summarized in Section 19.8.2.

As the discard rate for this stock is very high (0.94) in the period 2017–2021 and the advised catches issued in 2020 were 202 tonnes, the latest assessment advised that no more than 12 tonnes should be landed in years 2023–2024. The advised catches have remained constant since 2018.

The reduction of the corresponding landings relative to the previous advice (13 tonnes to 12 tonnes) is due to a slight increase in the average discard rate. Despite the fact that it was last applied in 2018, the PA buffer was not applied in 2022 due to a significant reduction of the fishing effort in métiers likely to catch significant amounts of undulate ray over the period 2012-2021 (Figure 19.9.9.1). The selected gears are: GNS, GTR, LLS, LHM, OTB, OTM, OTT, SSC and TBB. The target species are: DEF and CRU. In order to exclude offshore-operating vessels not fishing in the coastal habitat of undulate ray, only vessels shorter than 24 m where considered.

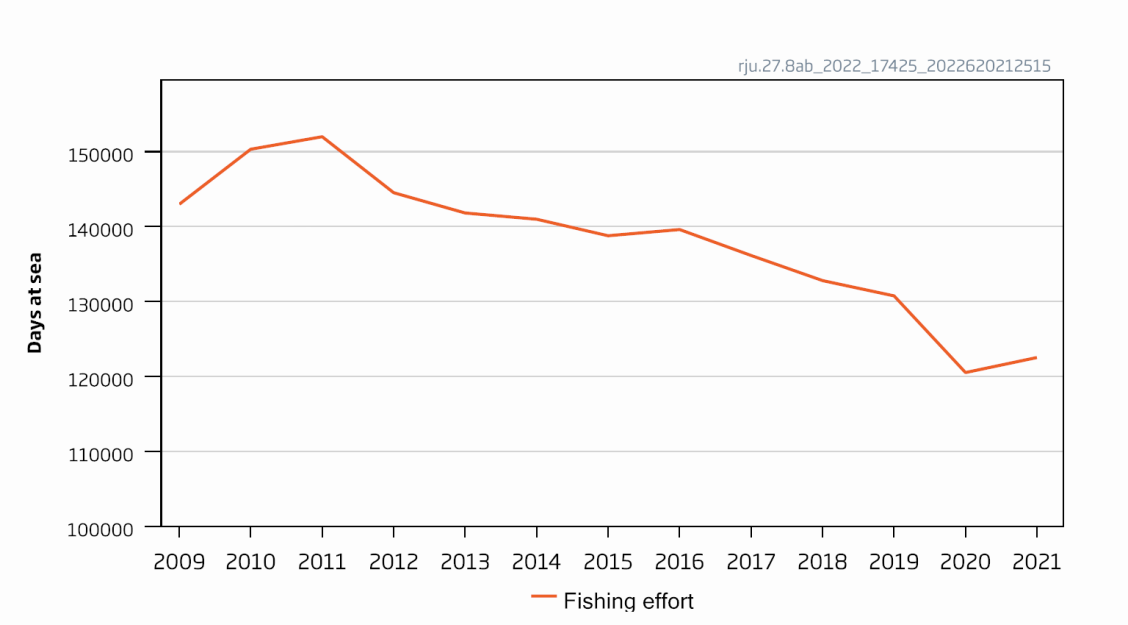

Figure 19.9.9.1. Time series of fishing effort of vessels likely to catch undulate ray in ICES divisions 8a and 8b, expressed in days at sea.

19.9.10 Undulate ray (*Raja undulata*) in Division 8.c (Cantabrian Sea) (rju.27.8c)

There are no longer-term survey data to assess temporal trends in this stock.

Scientific studies carried out in the eastern parts of Division 8.c have been conducted to characterize the specific composition of the landed skates, the species-specific CPUE and the geographical distribution of the catches (Diez *et al.*, 2014). During the period, 2011–2013, up to 118 trips/hauls of 21 vessels of the trammel net fleet from the nine main ports of the Basque Country were sampled. *Raja undulata* was the fifth species in quantity caught and made up only 5% of the total skates catches.

Whilst the total estimated ICES landings from 2005–2014 were 0 t, this period covers several years for which species-specific data were not required and then a period for which *R. undulata* could not be landed legally. Following relaxation of the prohibited status in 2015, and allowance for small quantities of bycatch, landings between 5–9 tonnes were reported (Figure 19.9.10.1).

The historical landings data is uninformative and unrepresentative of population levels Partial discards are available in two years since 2015 therefore it is considered very incomplete. According to fishing interviews, this species is locally frequent and distributed in the coastal waters of Division 8.c, although not very abundant in catches. This situation may not have changed over the years.

R. undulata is very scarce in the Spanish IEO Q4-IBTS survey in Division 8.c and usually lower than 0.1 kg haul^{-1} in any year of the series. In 2019, nine individuals of this species, ranging from 38 to 93 cm, were captured between 40 and 84 m deep in the Central and Eastern Cantabrian Sea. This due to the fact this species is distributed mainly out of the surveyed ground, in shallower areas not covered because they are not accessible to the vessel and the gear used.

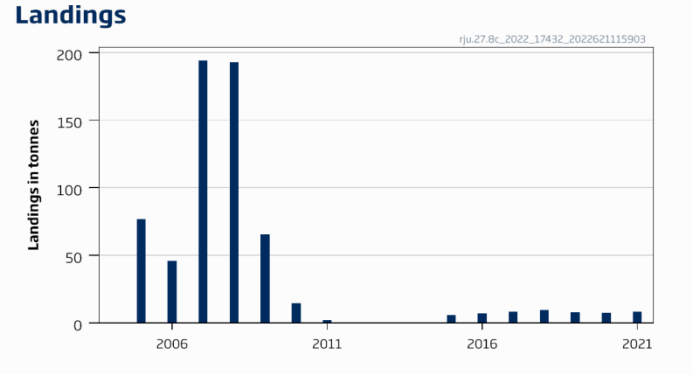

Figure 19.9.10.1. Landings (tonnes) of *Raja undulata* in ICES Div. 8.c.

19.9.11 Undulate ray (*Raja undulata*) in Division 9.a (west of Galicia, Portugal, and Gulf of Cadiz) (rju.27.9a)

Fishery Overview

Historically and prior the inclusion of *R. undulata* in the European list of prohibited species in 2009, official landings on the species were not informative once landings were not discriminated by species. Portuguese historical landings of *R. undulata* were estimated from aggregated Rajidae multispecies landings following the procedure proposed by Shelton et al. (2012) and using a multinomial–Poisson transformation (Baker 1994). Landings estimates ranged from 157 and 271 tonnes for the period 2003-2008 (Maia *et al*., 2015).

Portuguese management measures under the experimental quota

In Portugal, the use of *R. undulata* small experimental quota assigned since 2016 has been guided by scientific protocols and national regulations adopted, which were in turn conditioned by the EU quota assigned.

The legislative framework includes a set of conditions for licensing specific fishing permits to around 60 vessels operating along the Portuguese coast, following a set of criteria which include fishing vessel type, fishing license already assigned to the vessel and historical skate landings. Vessels possessing the specific fishing permit shall comply with a set of rules, which include obligation to transmit, to both the General Directorate of Natural Resources, Maritime Security and Services (DGRM) and to IPMA, fishery data using a form designed by DGRM and IPMA to register haul and catch data on a haul-by-haul basis (including hauls performed with trammel nets with no catch of the species). Furthermore, vessels are prohibited from targeting the species and are constrained to land a maximum of 30 kg per trip and the total length of landed specimens should be in the range 78-97 cm. As additional management measure adopted is prohibition of retaining the species onboard and of landing during the months of May, June and July. Additionally, in 2019, the DGRM introduced a landing control process under which, vessels not possessing the special fishing license are also allowed to land a maximum of one specimen per trip and are also required to provide additional information on their fishing activity related to *R. undulata* catches. Since in this new data collection scenario the forms with information on the species catches are delivered when the fish enters the auction. Because of this new data collection scenario, fishery data on trammel nets hauls with null catches of *R. undulata* were no longer mandatory.

Portuguese Fishery data after the moratorium period

Data collected under the quota management scenario and comments on its quality/application are summarized in Maia *et al*. (2022e).

Species biology and population parameters

Main biological information available for *R. undulata* in Portuguese waters is summarized in Table 19.7.

Species distribution, abundance and behaviour

Along the Portuguese continental coast, *R. undulata* bathymetric distribution varies from 4 to 128 m deep, being more abundant at depths ranging from 30 to 40 m which hinders the collection of adequate data from both Spanish IEO Q4-IBTS survey or the Portuguese demersal survey (PtGFS-WIBTS-Q4). The inadequacy of surveys is related with its design which has few fishing stations in shallow areas, where the species is known to occurs predominantly.

A mark-recapture study in Portuguese waters - UNDULATA project- showed that *R. undulata* perform short distance movements confirming the species high degree of site fidelity (For details on the results see Maia *et al.* (2022e).

Under the self-sampling program adopted for vessels with specific license for *R. undulata,* a methodology was adopted to estimate the density and abundance of the species. Geo-referenced fishery data collected in 2017 were used. A binomial mixture model (Kery, Royle, & Schimid, 2005) was the adequate statistical approach to be used as it accommodates the temporally and spatially replicated count data available. For details on species abundance and main conclusions see Figueiredo *et al.* (2020a).

Survivorship – health status after capture

The assessment of the health status after capture is considered a good indication of the survivorship index of skates. A qualitative assessment of the health status of the captured specimens of *R. undulata* in Portuguese continental waters was performed using the scale from Enever *et al*. (2009). The size of the specimens is the variable with more influence in the survivorship of the species. However irrespective of specimen size, the percentage individuals in "good" health status was always higher than 80%. In conclusion the species in subarea 27.9a is mainly caught by nets and have a high survivorship after capture (see Section 19.3.3).

Fishing effort and harvest rate

The harvest rate for 2017 was calculated using *R. undulata* biomass estimate for Portuguese continental coast (Figueiredo *et al*., 2020a) and catches of the year (official data). The resulting harvest rate is 0.003 (see details in Maia *et al*., 2022e), that corresponds to a fishing mortality of 0.00129, which is well below the FMSY estimated for *R. undulata* stock in ICES Division 27.7d-e (0.131) and the empirical estimate determined using the method proposed by Zhou *et al*. (2012) (0.1107) for Chondrichthyes (FMSY=0.41M).

Temporal evolution of abundance index for licensed vessels

Data used for abundance index standardization process comprised the fishery data collected from vessels with a special license for *R. undulata* for the period 2017-2021, which was adjusted to a zero-truncated Poisson regression model (for details on the methodology see Maia *et al*., 2022e). The standardized abundance index show stability along the 5 years period (Figure 19.9.11.11).

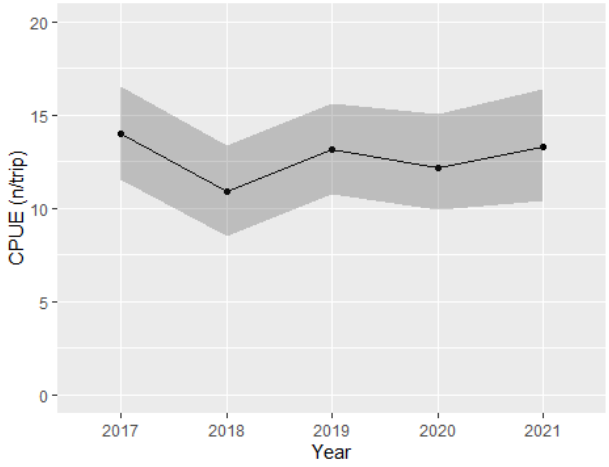

Figure 19.9.11.1. *Raja undulata* in ICES Division 27.9a. Standardized CPUE index (n/trip) and respective standard error from 2017 to 2021.

Final considerations to be considered in the advice

The standardized abundance index for the studied period shows a stability on abundance indicating that the harvest rates throughout the period had have no impact on the stock status. Given the high constrains on fishing opportunities for the species, fishery data derived from it do not enable the definition of sustainable exploitation levels particularly in accordance to the FMSY approach. The main deficiencies on the data collected under the quota assigned to ICES Division 27.9.a are:

- the spatial and temporal coverage of fishing is limited as the number of licenses is dependent on the quota available (Figure 19.9.11.2) shows the self-sampling data available by year enlightening the deficient spatial coverage along the coast);
- data from areas where the species is known to concentrate are not available to the fishing as only by-catch is allowed and because fishermen highly avoid those areas;
- length data from landings are limited and considered not representative of the exploitable population mainly because minimum and maximum landing sizes adopted and the total number of specimens allowed to be landed per trip (making it impossible to construct length frequencies for LBI estimation)

In conclusion, the small quota assigned to Portugal since 2016, is considered not to have a negative impact on the stock, but on other hand has had a great impact on the self-sampling program as fishermen´s motivation and collaboration has been continuously decreasing. Fishermen considered that despite their effort to collect data, results are not reflected in the scientific advice provided by ICES; following the guidelines for category 6 stocks, advice on fishing opportunities maintains or reduces in 20% the latest advice.

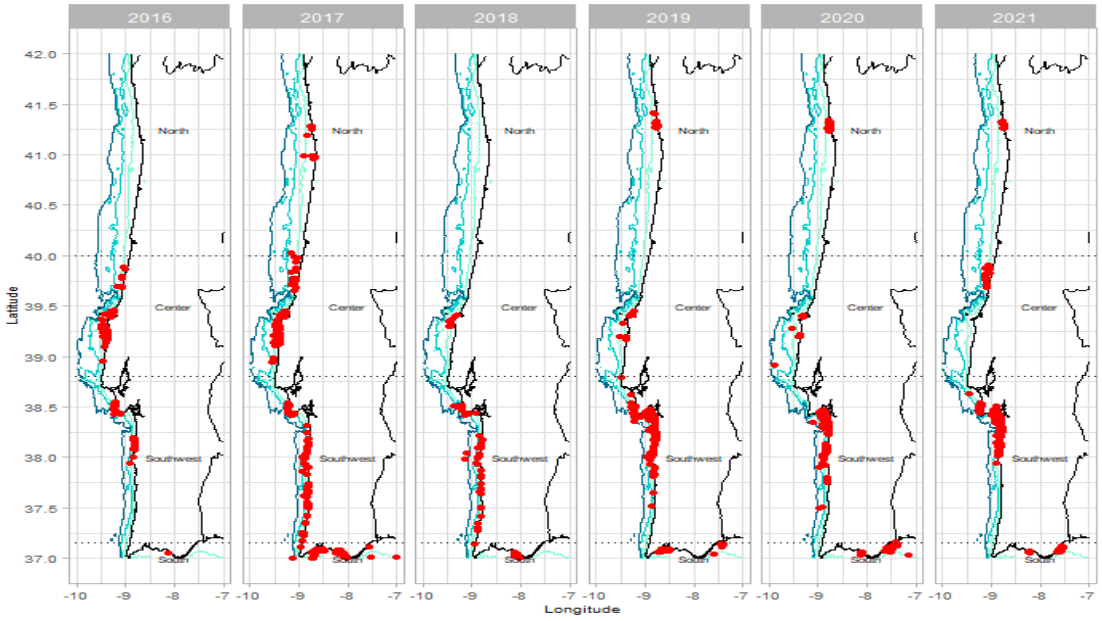

Figure 19.9.11.2. *Raja undulata* in ICES Division 27.9a. Spatial coverage of self-sampling data for the period 2016-2021.

19.9.12 Blonde ray (*Raja brachyura*) in Division 9.a (west of Galicia, Portugal, and Gulf of Cadiz) (rjh.27.9a)

For the period 2008-2021, *Raja brachyura* landings are mainly derived from Portugal (Table 19.9.12.1), in particular from the polyvalent fleet which represents between 71 and 94% of the total annual landed weight of the species (Maia *et al*., 2022d). Spain landings only represent up to 4%.

Discards information on skates and rays from the Portuguese polyvalent and bottom otter trawl segments operating in the ICES Division 9.a has been collected by the Data Collection Framework (EU DCR). The routine estimator used to estimate total discards in the Portuguese crustacean and demersal fish bottom otter trawl does not apply to species with occurrence lower than 30% of the trips sampled under the DCF Portuguese on-board sampling program, which is the case of all skate and ray species (Serra-Pereira *et al*., 2017). The low frequency of occurrence registered for the species in bottom otter trawl fisheries indicates that discards can be considered negligible (Fernandes, 2021). Regarding the polyvalent fleet, discards are known to take place but are not fully quantified and information available is insufficient to estimate discards of the species. *Raja brachura* has commercial interest and large individuals are not discarded. Discard survival studies suggest that *R. brachyura* has relatively high survivorship after capture (for details see Section 19.3.3.).

Table 19.9.12.1. *Raja brachyura* in ICES Division 27.9a. ICES estimates of landings by country (in tonnes). In 2005–2008 species-specific landings data are only presented for Portugal, as Spanish species-specific landings are not available in this period.

Year	Spain	Portugal	Total
2005		495	495
2006		586	586
2007		459	459

2008		193	193
2009	1	163	164
2010	2	221	223
2011	1	161	162
2012	1	165	165
2013	3	179	182
2014	0	174	174
2015	1	236	236
2016	1	221	222
2017	1	235	236
2018	3.7	191	195
2019	8.3	255	263
2020	12	335	347
2021	11	267	278

A proposal for assessing the status of the stock using the ICES rfb rule (ICES, 2021a) was presented at WGEF 2022. Following the ICES guidance on the parameter determination for the rfb rule (ICES, 2021a; ICES, 2022a), the input values for applying rfb rule are presented in Table 19.9.12.2. Following rfb rule, the advised landings in 2023 and 2024 should not exceed 231 t. Since the advice for 2023 and 2024 corresponds to a decrease of 9% in relation to the previous advice (Ay of 254 t), the stability clause was not applied.

Table 19.9.12.2. *Raja brachyura* in ICES Division 27.9a. Estimates used in the rfb rule, with details and comments.

Variable	Estimate	Input data	Comment
r: Stock biomass trend	0.96	Stock-size indicator: standardized commercial LPUE from Portuguese polyvalent fleet.	Index A (2020, 2021) = 29.92 kg.trip−1 Index B (2017, 2018, 2019) = 31.28 kg.trip−1
b: Biomass safeguard = $\mathbf{min}(\mathbf{1}.\boldsymbol{Iy}-\mathbf{1}/\boldsymbol{I}\mathbf{trigger})$ Itrigger=Iloss ω Considering ω=1.4	1	Stock indicator; Iloss, minimum estimate (2009) = Itrigger = 18.53 ($Iy-1I$trigger=1.67)	The series shows an increasing trend since its beginning.
m linked to von Bertalanffy k	0.95	k=0.13 year-1; estimated from the Von Bertalanffy growth model (Pina-Rodrigues, 2012)	*k* estimated for females (Pina-Rodrigues, 2012).
f: Fishing proxy	1.00	Length data collected under the sampling program raised to the overall landings. Length data were from 2019 to 2021. Lmean=74.54 cm LF=M= 74.63	To overcome deficiencies in sampling in 2020 due to covid disruption, data from 2019-2021 was combined. See more information below.
Ay × r × f × b × m	231 t		Decrease of 9% in relation to the previous advice (Ay of 254 t). The stability clause was thus not applied.

Data used included a standardized LPUE time-series as stock indicator and the MSY related indicator ($L_{mean}/L_{F=M}$) as F proxy (see details above).

This is a coastal species with a patchy distribution that is caught infrequently by both Spanish and in Portuguese surveys in Division 9.a (usually lower than 0.1 kg haul^{-1} in any year of the series). Consequently, abundance indices derived from these surveys are not considered indicative of stock status. In this case, the biomass index used for assessement is based on a standardized commercial LPUE time-series

Details on the LPUE standardization methodology are described in the stock annex for the species. In 2022, the model was updated with new data. The selected best model included the variables years, quarter, vessel size, fishing seasonality on skates and rays and fishing gear (trammel nets or gillnets) (AIC = 221905). In previous analysis a standardized LPUE was given for to a reference situation: quarter = 1, SIZEs = M (medium), SAZ = c (constant) and fishing gear = nets. However, WGEF considered the high value estimated for 2019 unreliable and exploratory analyses were performed. More details can be found in Maia *et al*., 2022d WD. As there were no evident reason for 2019 estimate, a new CPUE series was constructed based on the model´s estimated values for the input data set (Figure 19.9.12.1). Mean annual biomass index (stock indicator) for 2020-2021 (29.92) was 4% smaller than observed in the preceding five years (2017–2019; 31.28).

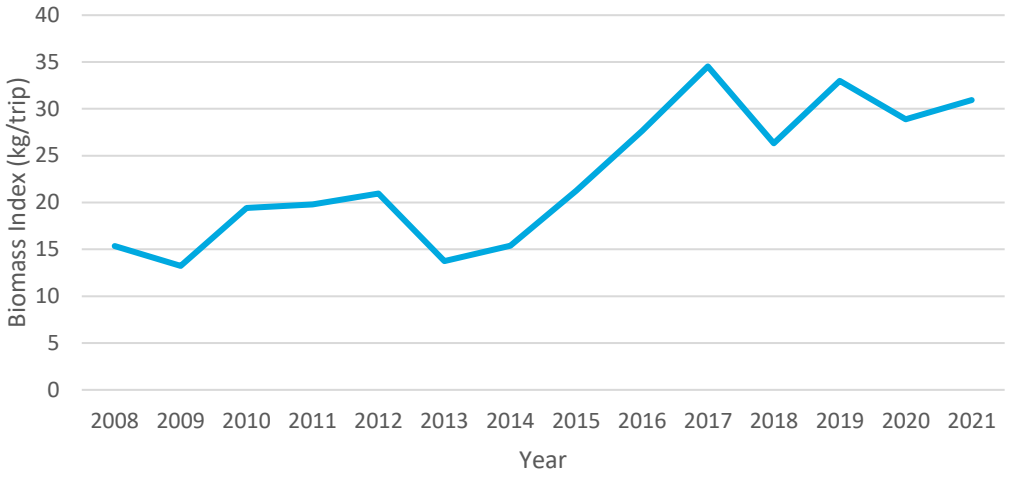

Figure 19.9.12.1. *Raja brachyura* in ICES Division 27.9a. Polyvalent fleet annual standardized CPUE estimates (kg trip^{-1}) in the Division 9.a for the period 2008–2021.

Annual length frequency distributions for the Portuguese combined trawl and polyvalent catches are presented in Figure 19.9.12.2. Due to Covid related data collection constrains, data for the period 2019-2021 was combined, according to WGEF decision. Discard data are only available from the Spanish trawl fleet but length information is deficient. In the early years of the time series the sampling effort was reduced and the corresponding length frequency distributions for the exploited population reflect that and should be analyzed with caution.

To determine F proxy based on length-based indicators, estimates of L_{inf} (126.0 cm; Pina-Rodrigues, 2012), L_{50} (95.2 cm; Maia *et al*., 2022a) and parameters from the weight-length relationship *a*0.00000198; and *b*=3.2 (Serra-Pereira *et al*., 2010) were used. Length classes of 5 cm were adopted as creates a smooth and unimodal distribution. LBI analysis resulted in a L_c= 57.5 cm, L_{mean}=74.54 cm and $L_{F=M}$= 74.63 cm for the period 2019-2021. The L_c estimated value of the exploited length frequency population is constrained by the Portuguese technical measures adopted, in particular the minimum landing size (MLS). Therefore, the L_c estimate is high and is likely to be biased against the L_c of the fishing gears capturing the species. The adoption of a MLS leads to the increase of smaller specimens discarding which, however, are thought to have a high survivorship after capture, as proven by studies on *R. brachyura* in the area (ICES, 2021b; Castelo, 2021).

F_{MSY} proxy ($L_{mean}/L_{F=M}$) suggest that the stock is exploited at sustainable levels, with values above or very close to 1 along the time-series (for details see Maia *et al*., 2022d).

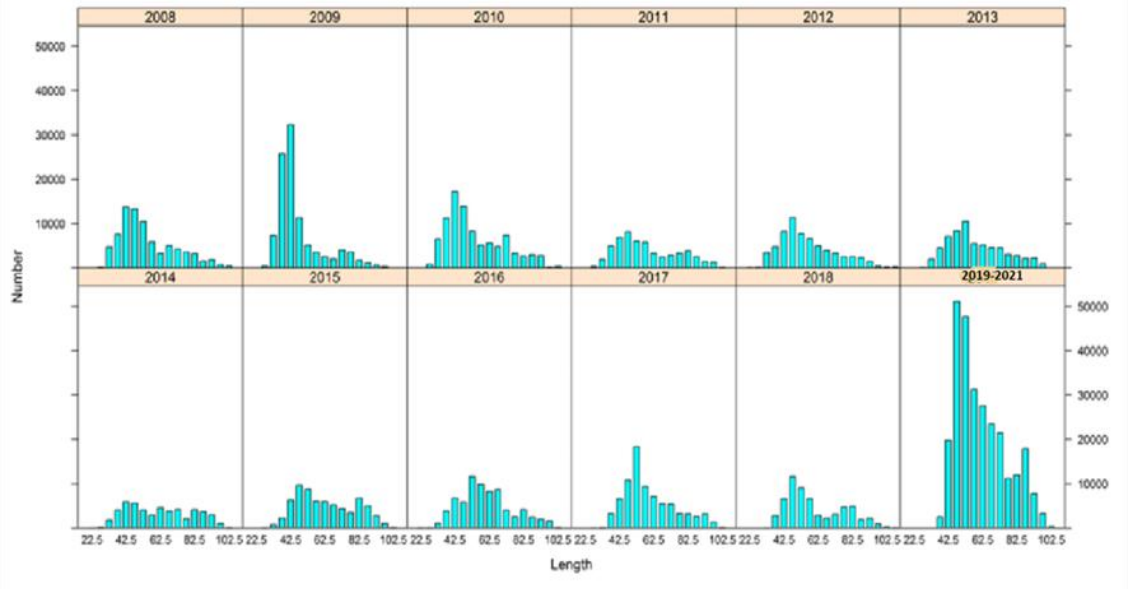

Figure 19.9.12.2b. Raja brachyura in ICES Division 27.9a. Length–frequency distribution (5 cm length classes) for the period for 2008-2021 with polyvalent and trawl fleets combined. Data for the period 2019-2021 is combined. Number of individuals correspond to raised numbers.

19.9.13 Common skate *Dipturus batis*-complex (blue skate *Dipturus batis* and flapper skate *Dipturus intermedius*) in Subarea 8 and Division 9.a (Bay of Biscay and Atlantic Iberian waters) (rjb.27.89a)

Dipturus batis-complex has been confirmed to comprise two species, the nomenclature has been stabilized in Last *et al.* (2016) the smaller species (the form described as *D. cf. flossada* by Iglésias *et al.*, 2010) is named common blue skate, *Dipturus batis* and the larger species flapper skate, *D. intermedius*.

These species are only caught occasionally in Subarea 8 and might not occur to any degree in Division 9.a.

There are no stock size indicators for either species. Reported landings are low due to restrictive management measures and do not provide information on stock dynamics. Despite the *Dipturus batis*-complex being prohibited in EU regulations, some individuals were landed occasionally in French and Spanish fish markets in Subarea 8. In France, sampled specimens in fish markets included an adult female *Dipturus intermedius* (200 cm L_T) - a southerly record of the species in recent years; and small individuals of *Dipturus batis* caught at the Glénan archipelago (southern Brittany). As these species are now extirpated from inner shelf areas of their former range, fishermen are not always able to identify them accurately. Available information does not change the perception of the stock status of these species that occur at low levels in this ecoregion.

Differing to other areas, *D. oxyrinchus* was included since 2016 and in the advice for the raj.27.89a and not for rjb.27.89a. It is important to highlight that all landings of the genus *Dipturus* from Portugal in Division 9.a refer to *D. oxyrinchus*, for Spain and France official landings of *D. oxyrinchus* were considered to be correctly identified and all the remaining official landings of the genus *Dipturus* from this ecoregion were allocated to *Dipturus* spp., as species identification problems persist among species of the genus *Dipturus*.

In 2021, information about *Dipturus* species were compiled for this ecoregion and discussed under the Tor *"Evaluate available data at species-specific level within the common skate-complex (Dipturus spp.) stock units in order to further increase our understanding of each individual species and their current status"*. See section 26 of this report for further details.

19.9.14 Other skates in Subarea 8 and Division 9.a (Bay of Biscay and Atlantic Iberian waters) (raj.27.89a)

Sandy ray *Leucoraja circularis* occurs on the deeper shelf and along the slope of the Bay of Biscay and in minor abundance in Portuguese landings. Minor occurrences of the shagreen ray *Leucoraja fullonica* are also observed to the North of Division 8.a, but this species is largely absent from Division 9.a. Owing to the higher abundance of these two species in the Celtic Seas, the Bay of Biscay may comprise the southern limits of the Celtic Sea stocks.

In divisions 8.a-b, occasional catches of *Raja brachyura* and *Raja microocellata* are found at the coast by artisanal fisheries. These two species are scarce in the historical time-series of the Spanish IEO Q4-IBTS survey in divisions 8.c and 9.a.

All four of these species are caught in too small numbers in the EVHOE survey to calculate reliable population indices.

In Division 9.a, *Raja microocellata*, *Raja miraletus* and *D. oxyrinchus* appear occasionally in landings (Table 19.2a at the end of this chapter). *R. microocellata* length–frequency distribution is only presented for the Portuguese commercial polyvalent fleet, due to the low occurrence of this species in landings from the trawl fleet, for the period 2008–2021 (Figure 19.9.14). *Raja miraletus* and *D. oxyrinchus* are caught in low numbers in Portuguese surveys.

As mentioned in the previous section, landings allocated to *D. oxyrinchus* were included in this stock.

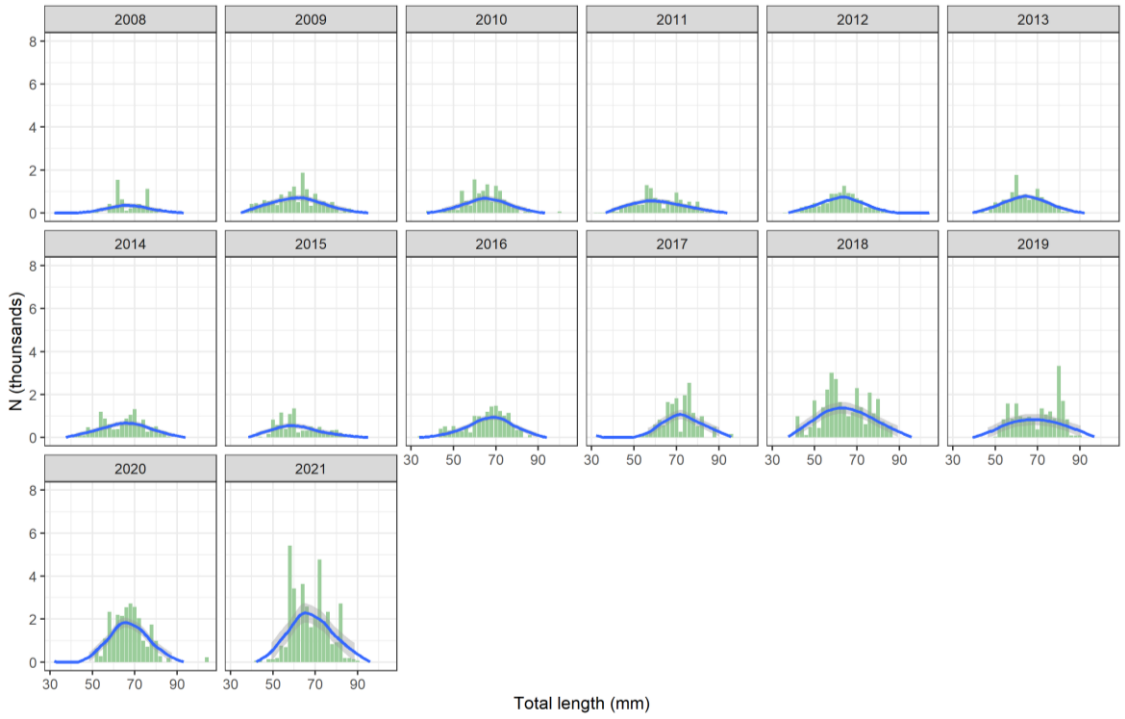

Figure 19.9.14. *Raja microocellata* in ICES Division 27.9a. Length–frequency distribution from the Portuguese commercial polyvalent fleet for the period from 2008–2021. Total number of sampled trips was n = 799. Length–frequency distributions were extrapolated to the total estimated landed weight of each species.

19.9.15 Summary of the status of skate stocks in the Bay of Biscay and Atlantic Iberian waters

The following table provides a summary of stock status for the main species evaluated in 2022 and using ICES MSY and DLS approaches.

Species	ICES stock code	ICES DLS Category	Perceived status
Thornback ray *Raja clavata*	rjc.27.8ab,d	2	The current stock biomass (2022) is considered just below B_{MSY} ($0.96*B_{MSY}$)
	rjc.27.8c	3	Declining in the stock size indicator since a peak level in 2013
	rjc.27.9a	3	The stock size indicator increased from 2008 to 2017 and levelled off thereafter
Cuckoo ray *Leucoraja naevus*	rjn.27.9a	3	The stock size indicator increased from 1998 to 2018 and declining strongly in 2020
	rjn .27.8c	3	The stock size indicator shows a long-term increasing trend since 1988, with strong fluctuations
Spotted ray *Raja montagui*	rjm.27.8	3	The stock size indicator is highly uncertain and shows no trend during the past two decades.
	rjm.27.9a	3	The stock size indicator fluctuated without trend since 2008.
Undulate ray *Raja undulata*	rju.27.8ab	6	No assessment, ancillary information suggest increase in the stock biomass
	rju.27.8c	6	No assessment, fisheries data may not be informative of trends in stock biomass.
	rju.27.9a	6	No assessment, the current levels of exploitation are not thought to have a negative impact on stock status
Blonde ray *Raja brachyura*	rjh.27.9a	3	The stock size indicator increased from 2008 to 2017 and levelled off thereafter.
Common skate *Dipturus batis* complex	rjb.27.89a	6	No assessment, available data do not inform on stock dynamics, species composition, catch, or landings. There are currently no robust stock size indicators.
Other skates	raj.27.89a	6	No assessment. The decline in landings is due primarily to the increase in the proportion of landings of rajidae that are reported by species.

19.10 Quality of assessments

LPUE data for *L. naevus and R. clavata* are available for divisions 8.abd since 2001. Since 2008 LPUE were made available for *R. clavata*, *R. microocellata*, *R. montagui*, *R. undulata* and *R. brachyura* in Division 9.a. The inclusion of the standardized LPUE series in the assessment of *R. clavata, R. montagui* and *L. naevus* in Division 9.a were reviewed by WKSKATE and peer-reviewed by an external review group (ICES; 2021b).

As in other ecoregions, surveys in Subarea 8 and Division 9.a were not specifically designed for elasmobranchs, producing a high frequency of zero-catch data. The fishing gear used and the survey design are not the most appropriate to sample elasmobranchs, especially for species with patchy distributions. Surveys do not cover coastal and estuarine areas, and therefore do not provide indicators for stocks distributed in shallow waters, e.g. those of undulate ray. Nevertheless, for some stocks, surveys provide reliable biomass indices.

Efforts have been made to overcome data limitations in order to standardize the fishery-independent abundance indexes, using as an example the estimates for *R. clavata* data from the

autumn survey (PtGFS-WIBTS-Q4) in Division 9.a (Figueiredo and Serra-Pereira, 2013 WD). To deal with the large amount of zero-catches a generalized linear mixed model (GLMM) was fitted to the data, assuming a Tweedie distribution for the observations. One of the main purposes of applying a GLMM was to incorporate in the model variables that could account for differences between years, namely the difference between stations, depths, survey methodology, etc. Some decisions/assumptions had to be taken in order to proceed with the analysis of the data, including the determination of a subset of the available data, which better represent the geographical distribution of the species.

Tagging studies of *R. undulata* have shown that the distribution of this species is discontinuous, confirming the 2013 tagging results and the need to assess the state of the stocks of this species for areas that fit with the limited movements that this species may make. This behaviour may be a benefit for obtaining mark–recapture stock estimate as the one provided for the central part of the Bay of Biscay. Results allow an exploratory analysis including a lot of assumptions. Consequently, it must be regarded as only indicative of the biomass trend.

19.11 Management considerations

A TAC for skates in this region was only introduced in 2009, along with requirements to provide species-specific data for the main commercial species (initially *L. naevus* and *R. clavata* and, since 2013, *R. brachyura*). Consequently, there is only a relatively short time-series of species-specific landings. In the case of Portugal, estimates of species-specific landings based on DCF sampling data are available since 2008.

Landings of *Raja undulata* were not allowed from 2009 and 2014, with a bycatch allowance only established for Subarea 8 since 2015, which was then extended to Division 9.a. in 2016. Consequently, landings data for *Raja undulata* are not indicative of stock status. However, landings and discards data could be indicative of stock status for this species along with several monitoring years according to self-sampling programs (French and Portuguese) in these areas.

Currently, fishery-independent trawl survey data provide the longest time-series of species-specific information. These surveys do not sample all skate species effectively, with more coastal species (e.g. *R. brachyura, R. microocellata* and *R. undulata*) not sampled representatively.

The status of more offshore species, such as *L. circularis* and *L. fullonica*, are poorly understood, but these two species may be more common in the adjacent Celtic Seas ecoregion (see Section 18).

Some of the larger-bodied species in this ecoregion are from the genus *Dipturus*, but data are limited for all these species, with some potentially more common further north.

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Table 19.1a. Skates in the Bay of Biscay and Iberian Waters. ICES estimates of landings (tonnes) of Rajidae in divisions 8.a-b (the figures in the table are rounded to the nearest tonne. Calculations were done with unrounded inputs, and computed values may not match exactly when calculated using the rounded figures in the table).

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Belgium	12	15	9	9	12	4	9	4	6	8	5	4	3	1	2	2	1
France	2405	1960	1884	1799	1693	1461	1294	1202	1179	1349	1541	1220	1322	1463	1200	1043	1146
Ireland											35	28					
Netherlands					0												
Norway		15	4														
Spain	423	334	408	428	295	190	247	235	242	243	212	262	210	256	213	170	133
UK	10	40	7	4	0	0	1	2	0		19	0	0	0			
Total	**2850**	**2364**	**2312**	**2239**	**2000**	**1656**	**1551**	**1443**	**1427**	**1601**	**1811**	**1514**	**1534**	**1720**	**1415**	**1216**	**1280**

Table 19.1b. Skates in the Bay of Biscay and Iberian Waters. ICES estimates of landings (tonnes) of Rajidae in Division 8.d.

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
France	110	63	71	94	72	68	71	76	57	66	61	44	32	46	41	49	30
Ireland				0				0			0						
Spain	16	12	17	9	0	1	4	2	8	6	6		0	1	0	2	0
UK	0	3	1	0	0	0	1	0	0	0							
Total	**127**	**77**	**89**	**103**	**72**	**69**	**75**	**78**	**66**	**72**	**66**	**44**	**32**	**48**	**41**	**51**	**30**

Table 19.1c. Skates in the Bay of Biscay and Iberian Waters. ICES estimates of landings (tonnes) of Rajidae in Division 8.c.

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
France	2	0	1	0	0	0	2	1	0	3	1	0	0	0	0	0	0
Spain	177	194	420	434	533	551	662	654	608	528	364	407	377	541	525	450	408
Total	**179**	**194**	**421**	**434**	**534**	**552**	**664**	**656**	**609**	**530**	**364**	**408**	**377**	**542**	**525**	**450**	**408**

Table 19.1d. Skates in the Bay of Biscay and Iberian Waters. ICES estimates of landings (tonnes) of Rajidae in Division 9.a.

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
France					1						0		0	0			
Ireland					0												
Portugal	1303	1544	1444	1439	1444	1454	1425	1122	1104	1026	1012	1026	1138	1105	1133	1247	1353
Spain	301	283	139	134	276	409	429	468	481	455	253	304	348	381	436	430	353
Total	**1604**	**1827**	**1583**	**1573**	**1722**	**1863**	**1853**	**1590**	**1585**	**1481**	**1266**	**1330**	**1487**	**1485**	**1569**	**1677**	**1706**

Table 19.1e. Skates in the Bay of Biscay and Iberian Waters. Combined Landings (tonnes) of Rajidae in Biscay and Iberian Waters.

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Belgium	12	15	9	9	12	4	9	4	6	8	5	4	3	1	2	2	1
France	2517	2023	1955	1893	1766	1529	1367	1279	1236	1418	1602	1264	1354	1510	1242	1092	1177
Ireland				0	0			0			35	28					
Netherlands					0												
Norway		15	4														
Portugal	1303	1544	1444	1439	1444	1454	1425	1122	1104	1026	1012	1026	1138	1105	1133	1247	1353
Spain	918	823	985	1005	1104	1152	1342	1359	1340	1233	835	973	935	1179	1173	1052	894
UK	10	43	8	4	1	0	1	2	0	0	19	0	0	0			
Total	**4760**	**4462**	**4405**	**4350**	**4327**	**4140**	**4144**	**3766**	**3686**	**3685**	**3508**	**3296**	**3430**	**3795**	**3550**	**3393**	**3425**

Table 19.1f. Skates in the Bay of Biscay and Iberian Waters. Landings (tonnes) by ICES stock unit and country since 2005. Totals by stock are presented in bold (the figures in the table are rounded to the nearest tonne. Calculations were done with unrounded inputs, and computed values may not match exactly when calculated using the rounded figures in the table).

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
raj.27.89a	Belgium	12	15	9	1	2	1	2	0	1	0	1	0	0	0	0	0	
	France	783	662	610	613	391	244	175	151	179	238	202	181	243	255	16	20	21
	Ireland				0	0						4	5					
	Netherlands					0												
	Portugal	104	123	38	307	308	293	276	240	144	132	113	99	116	142	120	121	161
	Spain	918	823	985	1000	707	627	840	762	616	461	299	367	396	422	433	346	286
	UK	10	43	8	2	0	0		0	0		1						
	Total	**1827**	**1665**	**1651**	**1924**	**1408**	**1166**	**1293**	**1153**	**940**	**831**	**620**	**653**	**755**	**819**	**570**	**487**	**467**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rja.27.nea	France	1		2	1	59	11	29	12	15	11	7	4	4	7			
	Ireland										0	0	0		0	0		
	Portugal	5	6															
	UK				1	0	0		0	0	0			0			0	0
	Total	**6**	**6**	**2**	**2**	**59**	**11**	**29**	**12**	**15**	**12**	**7**	**4**	**4**	**7**	**0**	**0**	**0**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjb.27.89a	France	11	5	3	5	0	0	0	0	0	0	0	0	0	0			
	Ireland											13	15					
	Spain	0		0	1													
	UK										0							
	Total	**11**	**5**	**4**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**15**	**0**	**0**	**0**	**0**	**0**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjc.27.8abd	Belgium				2	2	1	2	2	3	3	1	2	1	1	1	1	1
	France	276	300	215	187	195	217	177	179	194	202	211	166	191	229	223	226	262
	Ireland								0			4	7					
	Spain				0	42	28	37	45	47	36	33	37	40	44	42	38	42
	UK							1	2			17	0	0	0			
	Total	**276**	**300**	**215**	**190**	**239**	**246**	**217**	**227**	**244**	**241**	**266**	**211**	**232**	**273**	**266**	**266**	**305**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjc.27.8c	France	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Spain		0	0	4	94	186	206	223	238	248	150	161	136	256	247	257	233
	Total	**0**	**0**	**0**	**4**	**94**	**186**	**207**	**224**	**238**	**248**	**150**	**161**	**136**	**256**	**247**	**257**	**233**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjc.27.9a	France													0	0			
	Portugal	480	569	472	745	739	611	811	570	643	585	578	559	620	654	621	670	768
	Spain					29	115	139	194	166	215	120	123	124	152	181	178	174
	Total	**480**	**569**	**472**	**745**	**768**	**725**	**950**	**764**	**809**	**800**	**697**	**682**	**744**	**806**	**802**	**848**	**942**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjh.27.9a	Belgium													0				
	France													0	0			
	Portugal	495	586	459	193	163	221	161	165	179	174	236	221	235	191	255	335	267
	Spain					1	2	1	0	3	0	0	1	0	4	8	12	11
	Total	**495**	**586**	**459**	**193**	**164**	**223**	**162**	**165**	**182**	**174**	**236**	**222**	**236**	**195**	**263**	**347**	**278**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjm.27.8	**Belgium**				**0**	**0**	**0**	**0**	**0**					**0**	**0**			**0**
	France	155	130	124	106	64	86	91	86	109	121	149	132	153	172	222	188	184
	Ireland											12	1					
	Spain					11	26	22	19	28	40	28	26	27	44	45	42	36
	UK				1	1	0	0				1	0					
	Total	**155**	**130**	**124**	**107**	**77**	**112**	**114**	**105**	**137**	**161**	**190**	**159**	**180**	**215**	**267**	**231**	**220**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjm.27.9a	France													0	0			
	Portugal	76	90	119	144	184	275	121	108	111	101	67	68	94	57	82	58	104
	Spain			0		7	10	3	2	4	2	1	5	5	5	9	12	9
	Total	**76**	**90**	**119**	**144**	**191**	**284**	**124**	**110**	**115**	**103**	**68**	**73**	**99**	**62**	**90**	**69**	**113**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjn.27.678abd	Belgium			0	86	81	70	112	93	97	48	51	27	26	28	25	18	0
	France	3164	2565	2575	2507	3217	3069	2909	2571	2195	2515	2621	2233	2144	2288	2398	1984	2151
	Ireland					12	55	106	108	93	83	79	69	69	115	103	73	55
	Netherlands						0			0	0			0				
	Spain				1	778	480	387	311	373	300	343	372	305	335	295	192	145
	UK				225	321	421	402	306	269	262	266	254	260	272	289	186	166
	Total	**3164**	**2565**	**2575**	**2819**	**4408**	**4096**	**3916**	**3388**	**3028**	**3209**	**3360**	**2955**	**2804**	**3037**	**3111**	**2453**	**2517**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjn.27.8c	France	0	0		0	0	0	0	0	0	2	0	0	0	0		0	0
	Spain					18	34	24	26	33	27	15	13	15	23	13	9	7
	Total	**0**	**0**	**0**	**0**	**18**	**34**	**24**	**27**	**33**	**29**	**16**	**13**	**15**	**23**	**13**	**9**	**7**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjn.27.9a	France											0		0	0			
	Portugal	43	51	79	50	50	55	56	39	27	34	20	57	39	23	31	19	22
	Spain					3	4	12	13	2	0	0	1	2	2	8	4	1
	Total	**43**	**51**	**79**	**50**	**53**	**59**	**68**	**53**	**29**	**34**	**20**	**59**	**41**	**25**	**38**	**23**	**23**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rju.27.8ab	France	1	0		0	3	2	2	3	0	7	11	14	22	17	23	22	22
	Spain															0	0	
	Total	**1**	**0**	**0**	**0**	**3**	**2**	**2**	**3**	**0**	**7**	**11**	**14**	**22**	**17**	**23**	**22**	**22**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rju.27.8c	**France**													**0**	**0**			**0**
	Spain											5	7	8	9	8	7	8
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**7**	**8**	**9**	**8**	**7**	**8**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rju.27.9a	France													0	0			
	Portugal	100	119	277									23	35	38	25	24	32
	Spain												8	12	15	13	21	3
	Total	**100**	**119**	**277**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**31**	**46**	**52**	**38**	**45**	**35**

Table 19.2a. Skates in the Bay of Biscay and Iberian Waters. Species-specific landings (tonnes) in divisions 8.abde since 2005 (the figures in the table are rounded to the nearest tonne. Calculations were done with unrounded inputs, and computed values may not match exactly when calculated using the rounded figures in the table).

Species	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Dipturus oxyrinchus	12	10	2	3	1	6	6	0	0	0	0	0	0				
Dipturus spp	11	5	3	5	0	0	0	0	0	0	13	15	0	0			
Leucoraja circularis	84	53	58	69	20	28	16	20	20	25	24	22	0		1	1	0
Leucoraja fullonica	14	8	7	7	45	37	36	30	30	38	47	40	27				
Leucoraja naevus	1290	927	1002	987	1310	1102	982	935	959	1057	1214	996	915	1043	923	761	773
Raja brachyura				0	11	11	18	7	27	67	65	76	144		5	7	4
Raja clavata	276	300	215	190	239	246	217	227	244	241	266	211	232	273	266	266	305
Raja microocellata	0	0	0	1	3	2	4	13	20	38	21	30	54				
Raja montagui	155	130	124	107	65	86	92	86	109	121	162	133	153	172	222	188	184
Raja undulata	1	0		0	3	2	2	3	0	7	11	14	22	17	23	22	22
Rajella fyllae									0								
Rajiformes	1133	1008	990	974	373	206	252	199	83	79	52	19	18	263	17	20	22
Rostroraja alba	1		0	0	3	0	1	1	0	1	3	1	0	0			
Total	**2977**	**2441**	**2401**	**2343**	**2072**	**1725**	**1626**	**1520**	**1493**	**1673**	**1878**	**1558**	**1566**	**1768**	**1456**	**1267**	**1310**

Table 19.2a. Skates in the Bay of Biscay and Iberian Waters. Species-specific landings (tonnes) in divisions 8.abde since 2005 (the figures in the table are rounded to the nearest tonne. Calculations were done with unrounded inputs, and computed values may not match exactly when calculated using the rounded figures in the table).

Species	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Dipturus oxyrinchus	12	10	2	3	1	6	6	0	0	0	0	0	0				
Dipturus spp	11	5	3	5	0	0	0	0	0	0	13	15	0	0			
Leucoraja circularis	84	53	58	69	20	28	16	20	20	25	24	22	0		1	1	0
Leucoraja fullonica	14	8	7	7	45	37	36	30	30	38	47	40	27				
Leucoraja naevus	1290	927	1002	987	1310	1102	982	935	959	1057	1214	996	915	1043	923	761	773
Raja brachyura				0	11	11	18	7	27	67	65	76	144		5	7	4
Raja clavata	276	300	215	190	239	246	217	227	244	241	266	211	232	273	266	266	305
Raja microocellata	0	0	0	1	3	2	4	13	20	38	21	30	54				
Raja montagui	155	130	124	107	65	86	92	86	109	121	162	133	153	172	222	188	184
Raja undulata	1	0		0	3	2	2	3	0	7	11	14	22	17	23	22	22
Rajella fyllae									0								
Rajiformes	1133	1008	990	974	373	206	252	199	83	79	52	19	18	263	17	20	22
Rostroraja alba	1		0	0	3	0	1	1	0	1	3	1	0	0			
Total	**2977**	**2441**	**2401**	**2343**	**2072**	**1725**	**1626**	**1520**	**1493**	**1673**	**1878**	**1558**	**1566**	**1768**	**1456**	**1267**	**1310**

Table 19.2b. Skates in the Bay of Biscay and Iberian Waters. Species-specific landings of Rajidae (tonnes) in divisions 8.c since 2005.

Species	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Dipturus oxyrinchus								0	0	0	3	0					
Dipturus spp	0	0	0	1									0				
Leucoraja circularis	0	0		4	1	2	1	1	1	0	0	0				0	0
Leucoraja fullonica		0		0	0					0			0			0	0
Leucoraja naevus	0	0		0	18	34	24	27	33	29	16	13	15	23	13	9	7
Raja brachyura					0	5	1	0	0	0	1	1	0		2	2	5
Raja clavata	0	0	0	4	94	186	207	224	238	248	150	161	136	256	247	257	233
Raja microocellata													0		1	0	
Raja montagui				0	11	25	22	19	28	40	28	26	27	44	45	42	36
Raja undulata											5	7	8	9	8	7	8
Rajiformes	179	194	421	426	409	299	409	385	308	213	162	199	190	210	209	132	119
Total	**179**	**194**	**421**	**434**	**534**	**552**	**664**	**656**	**609**	**530**	**364**	**408**	**377**	**542**	**525**	**450**	**408**

Table 19.2c. Skates in the Bay of Biscay and Iberian Waters. Species-specific landings (tonnes) of rajidae in divisions 9.a since 2005.

Species	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Dipturus oxyrinchus				72	75	20	68	24	64	33	74	26	41	56	36	16	35
Dipturus spp													0				
Leucoraja circularis	0	0	0	1	2	11	1	0	0	0	0	2	1	0	5	5	0
Leucoraja fullonica								0			0				0	0	
Leucoraja naevus	43	51	79	50	53	59	68	53	29	34	20	59	41	25	38	23	23
Raja brachyura	495	586	459	193	164	223	162	165	182	174	236	222	236	195	263	347	278
Raja clavata	480	569	472	745	768	725	950	764	809	800	697	682	744	806	802	848	942
Raja microocellata	88	105	35	19	45	43	29	36	41	45	32	63	68	82	77	91	124
Raja miraletus	16	19		4	2	6	5	5	1	2	0	2	0	0	0	0	0
Raja montagui	76	90	119	144	191	284	124	110	115	103	68	73	99	62	90	69	113
Raja undulata	100	119	277									31	46	52	38	45	35
Rajiformes	301	283	142	345	421	491	447	432	345	289	139	171	210	207	218	212	156
Rostroraja alba	5	6															
Total	**1604**	**1827**	**1583**	**1573**	**1722**	**1863**	**1853**	**1590**	**1585**	**1481**	**1266**	**1330**	**1487**	**1485**	**1569**	**1535**	**1706**

Table 19.2d. Skates in the Bay of Biscay and Iberian Waters. Species-specific landings (tonnes) of Myliobatiformes, Pristiformes, Rhinopristiformes and Torpediniformes in subareas 8 and 9 since 2005.

Species	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Dasyatidae	1	2	0	0	0	0	0	0	0	0		0	0	0	0	2	0
Dasyatis centroura	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	
Dasyatis pastinaca	4	3	6	5	3	3	2	2	3	5	6	4					
Gymnura altavela	5	9	12	7	7	7	10	8	12	7	9	10	12	6	4		1
Myliobatidae														43	6	7	
Myliobatis aquila	2	2	1	2	1	1	2	1	1	2	2	2	23	15	11	7	4
Pteroplatytrygon violacea					0			1									
Rhinobatos spp.	0	0	0	0	0		0	0	0	0	0	0		0	0	0	
Torpedinidae	39	49	45	46	39	50	54	39	43	46	43	49	63	50	46	34	34
Torpedo marmorata	27	24	25	28	25	22	20	20	23	14	18	16				22	22
Total	**79**	**89**	**89**	**87**	**76**	**84**	**90**	**72**	**83**	**75**	**78**	**81**	**98**	**114**	**67**	**72**	**61**

Table 19.3a. Skates in the Bay of Biscay and Iberian. Discards reported to ICES[^1] (tonnes) by ICES stock unit and country.

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
raj.27.89a	France												713	882				
	Portugal					0	0	0	0	0	0	0	0	0	0	0	0	
	Spain															1		
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**713**	**882**	**0**	**1**	**0**	**0**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rja.27.nea	Portugal															0	0	
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjb.27.89a	France														19			
	Portugal					0	0	0	0	0	0	0	0	0	0	0	0	
	Spain											3				0		
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**19**	**0**	**0**	**0**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjc.27.8abd	Belgium													1			2	
	France												27	24	22	10	50	2
	Spain											4	30	14	5	5	9	4
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**58**	**40**	**27**	**15**	**61**	**7**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjc.27.8c	Spain											73	79	12	28	31	61	33
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**73**	**79**	**12**	**28**	**31**	**61**	**33**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjc.27.9a	Portugal					0	0	0	0	0	0	0	0	0	0	0	0	
	Spain											31	43	7	13	21		13
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**31**	**43**	**7**	**13**	**21**	**0**	**13**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjh.27.9a	Portugal					0	0	0	0	0	0	0	0	0	0	0		
	Spain											0	2	0	0	3		1
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**3**	**0**	**1**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjm.27.8	France												71	85	0	63	0	32
	Spain											1	34	2	5	12		6
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**104**	**87**	**6**	**75**	**0**	**38**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjm.27.9a	Portugal					0	0	0	0	0	0	0	0	0	0	0	0	
	Spain											1	41	12	2	3		2
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**41**	**12**	**2**	**3**	**0**	**2**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjn.27.678abd	Belgium									67	42	48	169	859	34	131	116	14
	France												820	1030	667	855	428	25
	Ireland					857	1886	746	866	469	719	673	562	597	732	975	322	849
	Spain											315	315	128	139	241	105	144
	UK					59	177	52	52	102	198	50	196	101	207	41	359	655
	Total	**0**	**0**	**0**	**0**	**916**	**2063**	**798**	**918**	**638**	**959**	**1086**	**2063**	**2715**	**1778**	**2244**	**1329**	**1687**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjn.27.8c	Spain											11	11	3	5	8		2
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**11**	**3**	**5**	**8**	**0**	**2**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rjn.27.9a	Portugal					0	0	0	0	0	0	0	0	0	0	0		
	Spain											4	41	22	16	7		
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**41**	**22**	**16**	**7**	**0**	**0**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rju.27.8ab	France												416	230	271	122		368
	Spain																	1
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**416**	**230**	**271**	**122**	**0**	**369**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rju.27.8c	Spain											1		0	0	0		
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**

Stock	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
rju.27.9a	Portugal					0	0	0	0	0	0	0	0	0	0	0		
	Spain											0	7	14	0	1		4
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**14**	**0**	**1**	**0**	**4**

[^1] This table includes estimated discards from fleets (e.g. a DCF levels 6 fleet for one country), for which there was enough (quality controlled) samples for the raising at national level. Unsampled fleets not included.