

Stock Annex: Undulate ray (*Raja undulata*) in divisions 7.d and 7.e (English Channel)

Stock specific documentation of standard assessment procedures used by ICES.

Stock: Undulate ray (*Raja undulata*) in divisions 7.d and 7.e (English Channel)

Working Group: Working Group on Elasmobranch Fishes (WGEF)

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A. General

A.1. Stock definition

Raja undulata is known to have a patchy and localized distribution (Ellis *et al.*, 2012). It seems to form a separate stock in the English Channel (divisions 7.de). Data from surveys (CGFS-Q4, IBTS-Q3 and UK(E&W)-BTS-Q3 in 7.d, Q1SWECOS and Eng-WEC-BTS-Q4 in 7.e) and from French observations aboard commercial vessels suggest a main area of abundance in the Normand-Breton Gulf (southeast of the western Channel including the Mont St Michel Bay, West Coast of Cotentin Peninsula and Channel Islands waters) connected to areas of lesser density to the west along the north coast of Brittany and to the East (Figures 2, 3 and 4). On the English side of the Channel, the species is mostly encountered east of Start Point (Silva *et al.*, 2018 WD). The species seems to occur at much lower abundance further east, in the southern North Sea (ICES Division 4.c), and West in the Celtic Sea (7.h), suggesting that the English Channel may form a stock unit.

A.2. Fishery

This species was historically mainly exploited by French and UK (including Channel Islands) fleets, as a bycatch by the trawlers, and as a target species by small, coastal netters and longliners. In 2009, it became illegal to retain this species onboard (CR 43/2009 of 16 January 2009), and in 2010, undulate ray was added to the EU list of prohibited species for EU waters in ICES Subareas 6–10 (CR 23/2010 of 14 January 2010). In 2014, *R. undulata* was removed from the list of prohibited species in Subareas 7, 8 but was subject to a 0 TAC. Therefore, no landings data are available between 2009 and 2014 (included). The quality

of landings data in previous years is considered poor as the species was often landed as miscellaneous rays. In 2016, dedicated TAC of 12 tonnes and 100 tonnes were decided for undulate ray in Divisions 7.d and 7.e respectively (CR 2016/72 of 22 January 2016, amended by CR 2016/458 of 30 March 2016). The TAC for the two ICES Divisions 7.d and 7.e have been merged into a combined TAC since 2019. This TAC is split between Belgium, France, and the UK. Today, it remains prohibited to target this species. For French vessels, a special fishing permit was first necessary to land undulate ray when a non-0 TAC was applied starting in 2016. The issuance of such a permit was conditioned upon the commitment to participate in a self-sampling programme. This obligation was lifted in 2019.

Otter trawls have contributed to most of the landings of undulate ray in the English Channel over the period 2015–2019 (62%), followed by nets (19%), beam trawls (10%) and hooks and lines (4%). The remainder is contributed by miscellaneous or unspecified gears.

The average discard rate over the period 2015–2019 is around 93%. Based on data provided in response to the 2020 data call, the proportion of undulate ray in Divisions 7.d-e over the minimum conservation reference size of 78 cm caught by British vessels in 2019 was 86% in weight in 2019, while it was 68% for French vessels. Within this marketable fraction, 73% (in weight) were discarded by British vessels, while 79% were discarded by French vessels. Current landings are determined by a constraining TAC and are therefore not considered reflecting stock abundance.

A.3. Ecosystem aspects

R. undulata is mostly a coastal species (Ellis *et al.*, 2012). Based on French onboard observation, a major nursery area was identified in shallow waters of the Normand-Breton Gulf (Figure 3). The species is also frequently encountered in this area during the Q1-SWECOS survey (Figure 4). The Normand-Breton Gulf is characterised by mixed and coarse sediments in coastal waters. The participatory science project of egg cases collection along the French coast by APECS (Association pour l'Etude et la Conservation des Sélaciens) also reflects the higher abundance of eggs in this area (http://www.asso-apecs.org/IMG/pdf/Rapport_capoera_bilan_des_actions_2012_vf.pdf). Adult fish also occur in coastal areas but have a larger habitat including occurrences in the central eastern Channel (Figure 2) where the seafloor is mostly coarse sediments. They tend to be found deeper and on coarser bottoms than juveniles (Elliot *et al.*, 2020).

B. Data

B.1. Commercial catch

Before the ban commercial landings of undulate ray were reported separately by UK in 2008 only and were never reported separately by France and other countries. Between 2009 and 2015, this species was completely discarded and no longer occurred in the commercial landings (Leblanc, 2013). Discards in French fisheries in 2011–2013 were estimated to more

than 1500 tonnes per year from the French on-board observation program, mostly from 7.e. Discards still dominate the catch today.

B.2. Biology

Data are historically poor. The ban has triggered biological studies and more results have become available (distribution, size at maturity, length/weight relation, length/width relation).

Movement patterns: results from tagging in the Normand-Breton Gulf (1488 individuals released, 77 recaptured up to 2014 corresponding to 5.2 %) seem to confirm high site fidelity. 58.4% in the western English Channel of the recaptured skates were taken at the release location (less than 5 km between release and recapture positions) and 75.3% at less than 20 km (Stéphan *et al.*, 2014). Ellis *et al.* (2011), who carried out a mark-recapture experiment around the Island of Jersey, similarly concluded in limited movement of this species.

Preliminary results on population genetic structure: genetic polymorphism of the mitochondrial control region (MCR) was studied. The total absence of polymorphism in the test samples of 19 French individuals prompted to hypothesize that an extension of this analysis to the complete sampling would not be more informative.

Table 1. Maturity data of Undulate ray from the Normand-Breton Gulf (Stéphan *et al.*, 2014)

SEX	NUMBER OF FISH (NO. OF FEMALES BETWEEN 70–93 CM)	NO. MATURE	LENGTH OF THE SMALLEST MATURE (CM)	LENGTH OF THE LARGEST IMMATURE (CM)	LENGTH AT 50 % MATURITY (L50, CM)
Male	889	594	74	91	78.2
Female	289 (79)	119	78	86	(82.8)

Table 2.-Relationship between total length (TL) and disc width (DW) where $DW = a TL + b$ and correlation coefficient r^2 (Stéphan *et al.*, 2014). Samples are from the Normand-Breton Gulf.

SEX	NUMBER OF FISH	TL RANGE (CM)	A	B	R ²
Combined	1739	18-103	0.59	2.58	0.97
Male	972	18-99	0.57	3.64	0.97
Female	767	18-103	0.61	1.94	0.98

B.3. Surveys

Survey data used include the French CGFS-Q4 in 7.d (and 7.e since 2018), UK (E&W)-BTS-Q4 and IBTS-Q3 in 7.d and 4.c, and the Eng-WEC-BTS-Q4 in 7.e. There are also French small-scale surveys in 7.d catching skates.

The French CGFS-Q4 provides indices of abundance and biomass for the species in Division 7.d (Figure 1). Indices are raised to the total area of 7.d (swept area method), they must however be considered relative because they do not account for catchability and the species is abundant in waters shallower than those sampled. The survey indices should be considered representative of the relative abundance of large undulate rays in offshore waters (Figure 2).

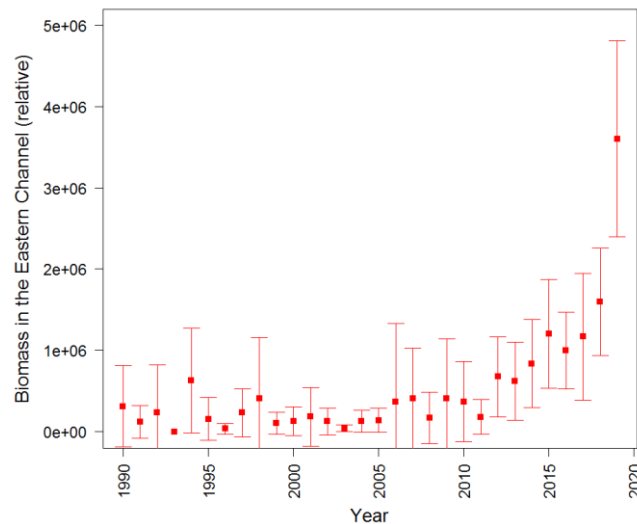


Figure 1. Relative biomass index (in kg) of undulate ray from CGFS-Q4.

The geographical distribution of the species seems to have been relatively stable from 1988 to 2013. It is more abundant to the west of the area surveyed (Figure 2).

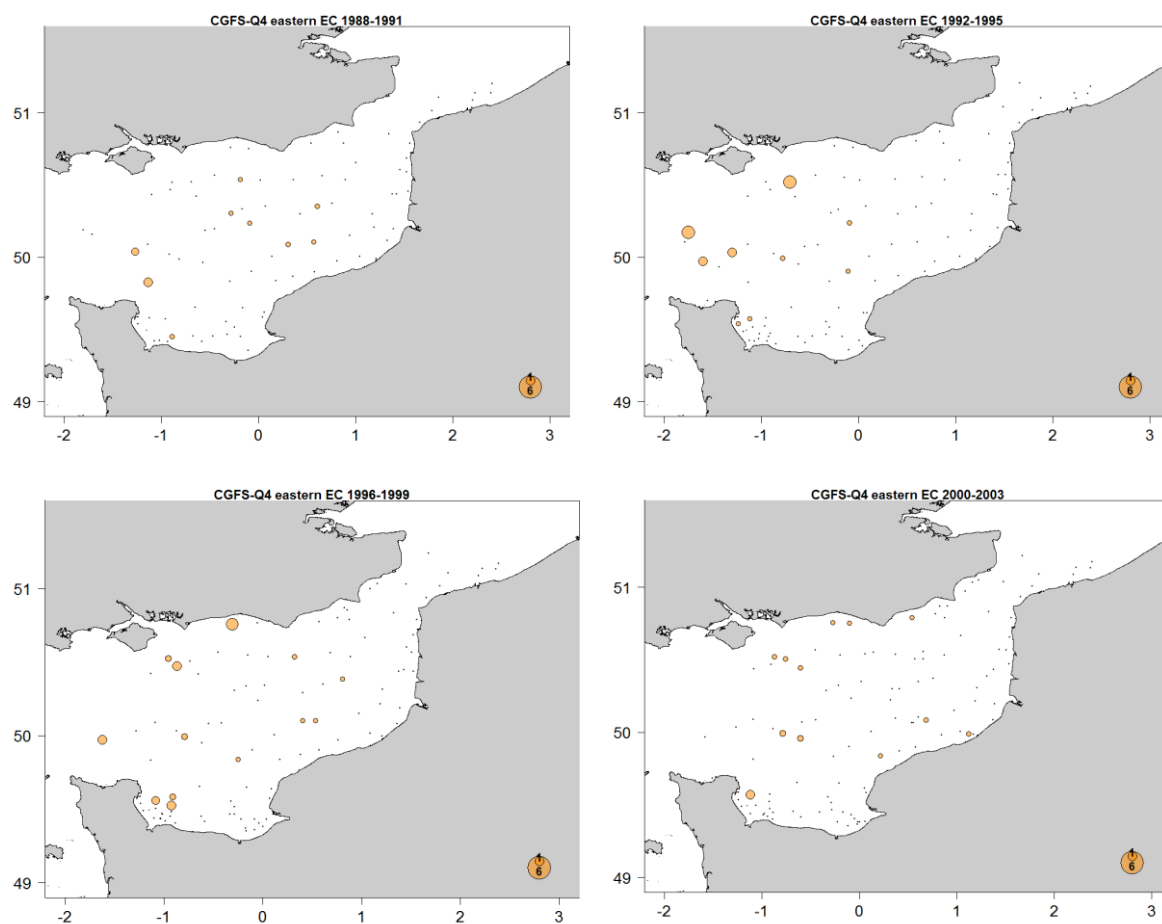


Figure 2. Spatial distribution of undulate ray (*Raja Undulata*) catches in Division 7.d from CGFS-Q4. The number of fish caught per haul (orange circles) is averaged over groups of four years. Hauls with no catch of the species are represented by a black dot. Note that there was a vessel and a gear change starting in 2015.

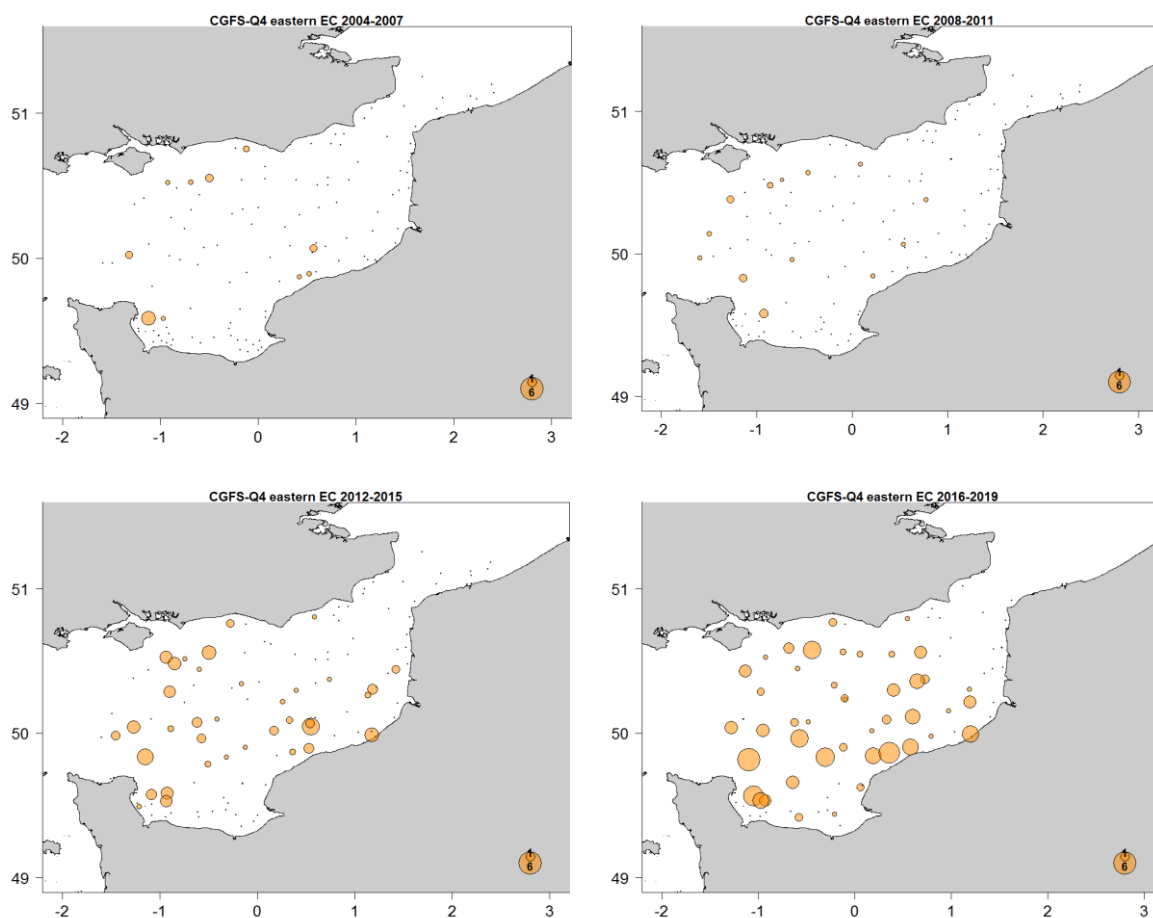


Figure 2 continued. Spatial distribution of undulate ray (*Raja Undulata*) catches in Division 7.d from CGFS-Q4. The number of fish caught per haul (orange circles) is averaged over groups of four years. Hauls with no catch of the species are represented by a black dot. Note that there was a vessel and a gear change starting in 2015.

B.4. Commercial CPUE

Due to the prohibition of landings and the poor data quality before the prohibition, the only data susceptible to provide CPUEs from commercial fleets are on-board observations. These are carried out in application of the DCF and have been strongly supplemented by national projects since the landings prohibition. One on these projects, the French RAIMOUEST project, also included interviews of skippers which included some questions on the area of higher catch rates.

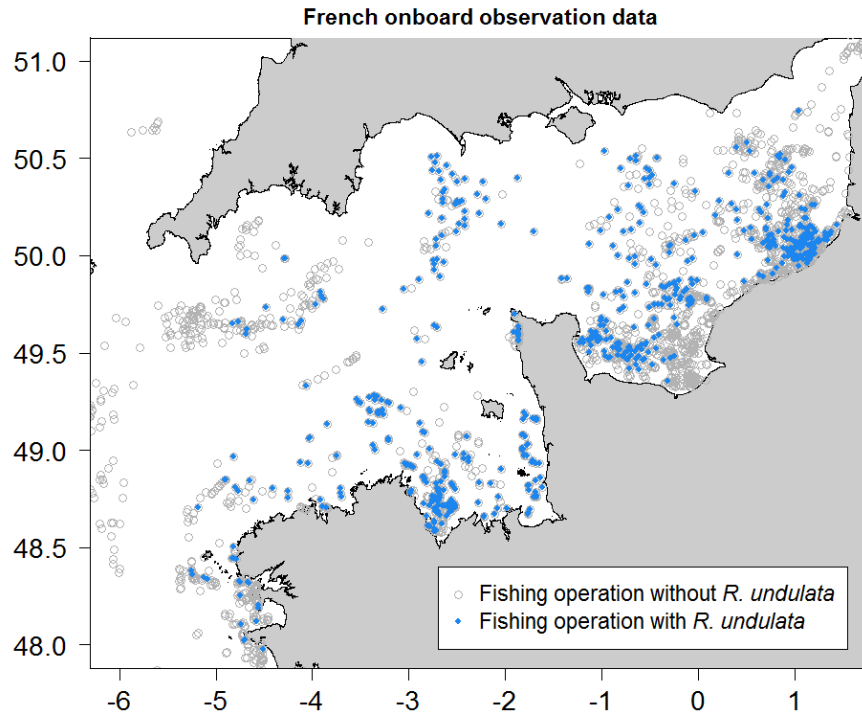


Figure 3. French fisheries observer program: fishing operations with and without *Raja undulata* in the English Channel and adjacent areas from 2017 to 2019. Only data from vessels with a report of at least one observation of undulate ray in the entire data series are represented. Each circle corresponds to one sampled fishing operation.

In 2015–2018, a self-sampling programme was conducted on French vessels. When a non-zero TAC was decided in 2016, the issuance of a special permit allowing the landing of undulate ray was conditioned upon the participation in this self-sampling programme. Fishers were asked to report the landed and discarded weights of undulate ray for each fishing operation. In addition, numbers of fish as well as their body length were reported for year 2015. Results from this self-sampling programme are described in more detail in a working document (Gadenne, 2017 WD). The collection of these catch data led to the estimation of total catches and discards of undulate ray in Divisions 7.d-e for 2016 and 2017.

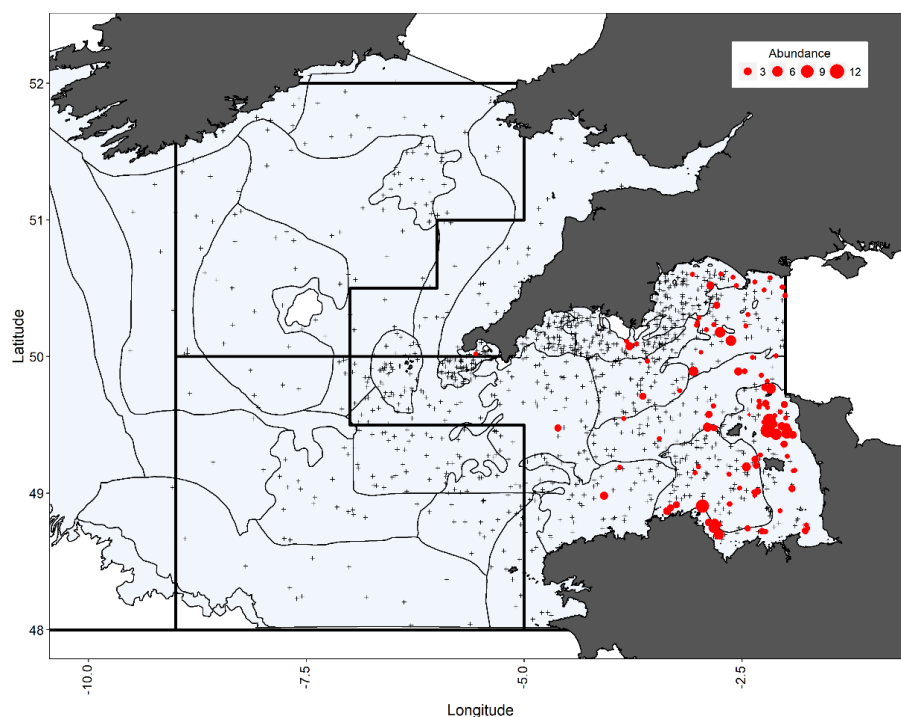


Figure 4. Distribution and relative abundance of undulate ray *Raja undulata* caught during Q1SWECOS surveys between 2006 and 2018 (from Silva *et al.*, 2018 WD)

B.5. Other relevant data

C. Assessment: data and method

Rju.27.7de is a category 3.2 stock.

The relative biomass index derived from CGFS-Q4 is the reference index for this stock. Despite covering only a portion of the area of distribution of the stock (Division 7.d), the index is considered representative of the whole stock by the group.

Undulate ray landings are provided by Belgium, France, and the United Kingdom.

Discard estimates are provided by gear type. For French vessels, the raising is based on total landings of all species. This is different from the derivation of discards for other stocks (except undulate ray in divisions 8.a-b), with a raising based on the landings of the considered species. This singularity is due to the small contribution of landings in the catch of the species.

In 2018, in response to a request from the French Department of Agriculture and Fisheries, the advice was modified from a landing-based advice to a catch-based advice.

The basis for the advice was the average estimated catch over the previous seven years (2011–2017). The discard rate estimated for the most recent year (2017 then) was 95%. This discard rate is rather stable in time and its average over 2015–2019 is around 93%.

Because the survey index ratio was over 1.2 (1.52), the uncertainty cap was applied in 2018 and the advised catch for the next two years was derived as

$$\overline{Catch} \times UncertaintyCap \quad (Eq. 1),$$

where \overline{Catch} is the average catch between 2011 and 2017. The recommended removals corresponding to this advised catch is the sum of landings and dead discards, calculated as

$$RecomRemovals = Landings + AdvisedCatch \times DiscardRate \times (1 - SurvRate) \quad (Eq. 2)$$

Because precise information on the rate of survival of discards was not available at the time and following a precautionary approach it was decided to assume a complete survival of discarded undulate ray (i.e. $SurvRate=1$). Eq. 2 then becomes:

$$Removals = Landings$$

The recommended landings corresponding to the advice were derived as

$$Landings = DiscardRate \times AdvisedCatch$$

Biseau (2020 WD) explored the consequences of applying an advice based on removals instead of total catch for the 2018 assessment. He applied estimates of survival rate of discards obtained by Morfin et al. (2019) for undulate ray in the Bay of Bourgneuf (France, semi-enclosed bay within the Bay of Biscay) and a range of discard rate (based on a gradient of constraint on landings imposed by the TAC).

In 2020, the advice was based on the reference catch advice produced in 2018.

The analysis of temporal trends in fishing effort was first performed in 2020, when the application of the precautionary buffer was considered. The fluctuations of fishing effort applied to the stock were considered proportional to variations of the fishing effort by French vessels (which account for 70% of catches in 2017-2019). This effort was expressed in days at sea of French fishing vessels using bottom trawls (including beam trawl), nets, and hooks and lines in Divisions 7.d-e. A Mann-Kendall trend test concluded in a significant decrease of the effort over the period 2010-2019 ($\tau = -0.644$, $p.value = 0.012$, Figure 5).

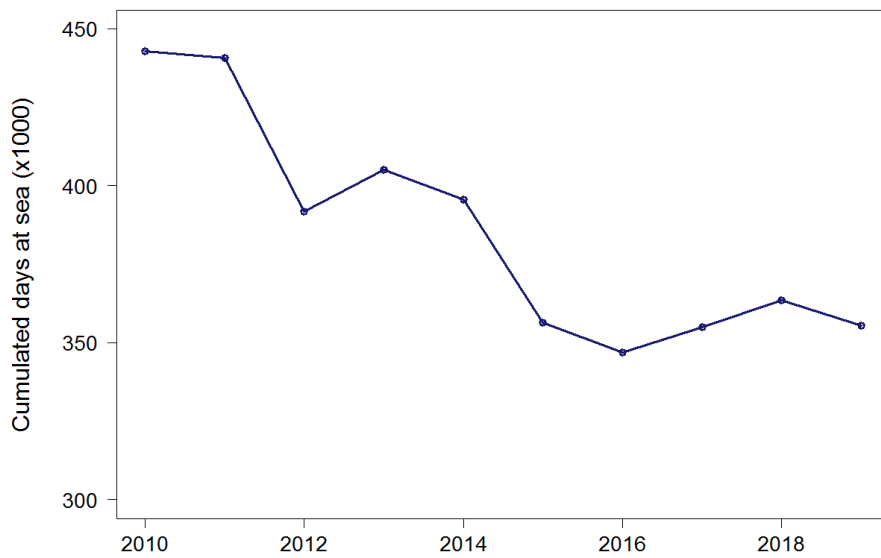


Figure 5. Time series of French fishing effort for undulate ray in Divisions 7.de between 2010 and 2019. Fishing effort of trawlers, netters, and vessels using hooks and lines is expressed in cumulated annual days at sea.

D. Short-Term Projection

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E. Medium-Term Projections

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F. Long-Term Projections

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G. Biological Reference Points

No reference points are defined for this stock.

H. Other Issues

H.1. Historical overview of previous assessment methods

2012: first advice for rju-ech/rju.27.7de, years 2013 and 2014.

2018: first advice based on catch.

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