

NEAFC request on discarding of mackerel in the NEAFC Regulatory Area

Advice summary

The advice presents available information on mackerel discarding since 2015. It is recognized that data are only provided for some fleets from scientific observer programmes and that the total discards are underestimated. With this caveat, estimated discards represent less than 1% of the total ICES catch of northeast Atlantic mackerel. ICES cannot quantify the discard rate of mackerel within the NEAFC Regulatory Area.

Request

NEAFC needs information concerning discards in the NEAFC regulatory area in order to address the calls and commitments set out on discards under the UNGA fisheries resolutions. Information regarding discards is included in the ICES single stock advice sheets; NEAFC would like to highlight which fisheries have high discarding issues and are interested in spatially relevant discarding info.

NEAFC requests ICES to compile and aggregate available data since 2015 on discards in the NEAFC regulatory area, i.e. spatially and temporally distributed, as well as per fishery, where conducted both in the regulatory area and in the EEZ (for instance herring, blue whiting and mackerel).

ICES should provide information on what precisely the issues are, i.e. where are there gaps, can ICES advise on the robustness of evidence in order to take management decisions.

Following consultation, NEAFC suggested that a suitable pelagic stock with robust data series, such as northeast Atlantic mackerel, should be used in the first instance for the "trial run" as an example of how discard data availability can be explored and any problems highlighted.

Elaboration on the advice

In order to provide NEAFC with advice on which fisheries have high levels of discarding, it is necessary to take a two-step approach. This involves determining which fisheries are active in the NEAFC Regulatory Area (Figure 1), and then, for each fishery separately, assessing the available data to inform discard estimates.

This advice contains preliminary work undertaken to this end. It presents a method to identify discrete fisheries and then an investigation of discarding data available for one of these: the fishery for mackerel (*Scomber scombrus*) in the NEAFC Regulatory Area.

A principal component analysis (PCA) was carried out on the daily catch report information by vessel to explore the composition of catches and identify discrete "fishery" units for which discards could be investigated.

Discard estimates presented here represent discards from scientific observer programmes from a subset of fleets catching mackerel. This implies that the mortality associated with the discards estimates is only part of the unaccounted mortality exerted on mackerel.

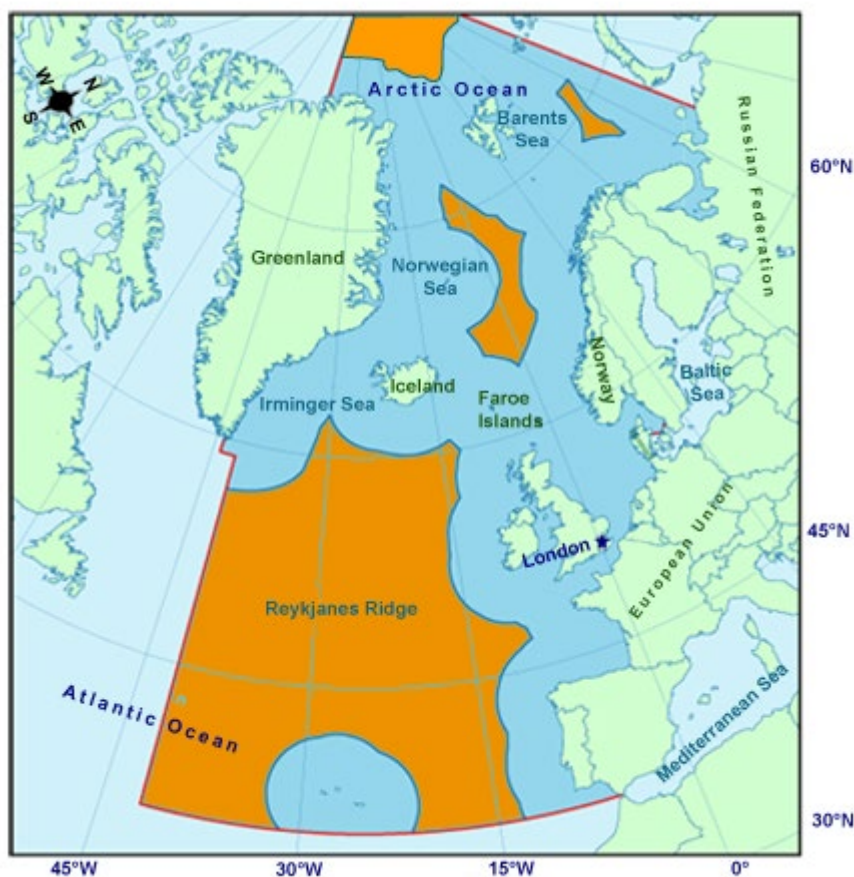


Figure 1 NEAFC Regulatory Area (orange).

Basis of the advice

Results

A statistical analysis was carried out to identify the main fisheries in the NEAFC Regulatory Area, and the methods are described below. Results of the clustering based on main species in the catch, as might be expected, revealed a strong separation in catch composition between the main pelagic species caught in the area (mackerel, herring, and blue whiting) from the other stocks (Figure 2). Excluding these species and repeating the exercise provided more contrast between the other groups, with catch reports that were dominated by beaked redfish and *Pandalus* being strongly separated from each other as well as from other demersal species. Within the mixed demersal clade, there was some separation visible between cod/redfish, capelin, and flatfish (Greenland halibut and long rough dab), deep-water species and haddock. However, the lack of contrast between these groupings suggests an overlap in catch compositions.

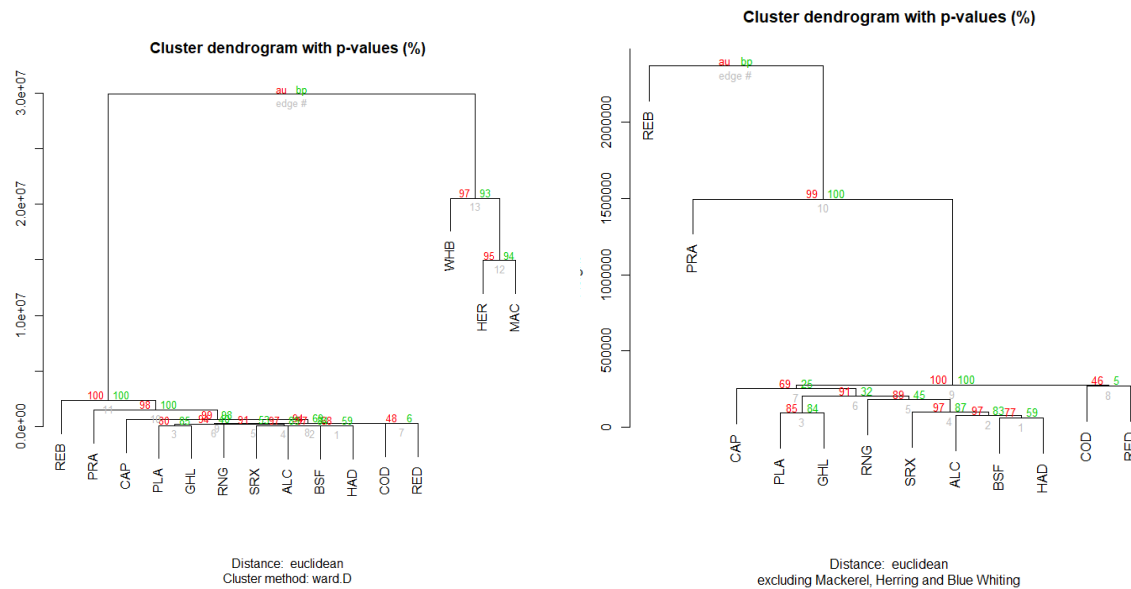


Figure 2 Dendrograms showing euclidean distances between composition of catch reports in the NEAFC Regulatory Area, based on the main species reported in the catch, including (left) and excluding (right) mackerel, herring, and blue whiting.

The PCA results identified which species were most likely to be reported as being caught on the same day by the same vessel. The top five components accounted for nearly 90% of the variance. Figure 3 shows the results of the first three principal components, together with a co-plot showing the dimensional association of each species.

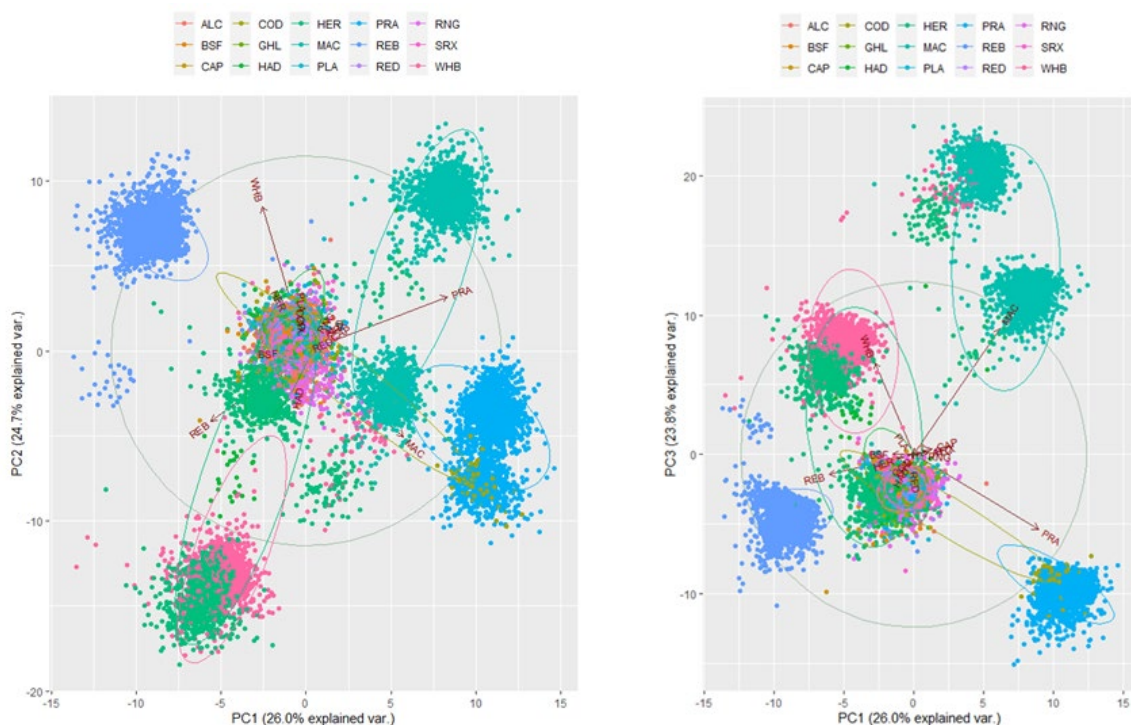


Figure 3 Results of PCA showing showing significance of first versus second (left) and first versus third (right) components. Points are coloured according to the main species in the catch report (by weight).

This analysis has identified a number of fisheries, which can broadly be described in terms of their catch composition as:

- Pelagic stocks (mackerel/herring and blue whiting, either alone or in some combination)
- *Pandalus*
- Pelagic redfish
- Demersal species
 - cod/redfish
 - flatfish (Greenland halibut and long rough dab)
 - capelin
 - deep-water species (grenadiers, smoothheads, skate, and black scabbardfish)
 - haddock

This analysis has not taken into account spatial information on the location of the catches, nor indicated gear type associated with each vessel, where available. It may be possible to provide more definitive definitions of the fisheries if this information is incorporated.

Retained catches in 2020

Reported retained catches of Northeast Atlantic mackerel in the NEAFC Regulatory Area (RA) in 2020 are shown in Figure 4.

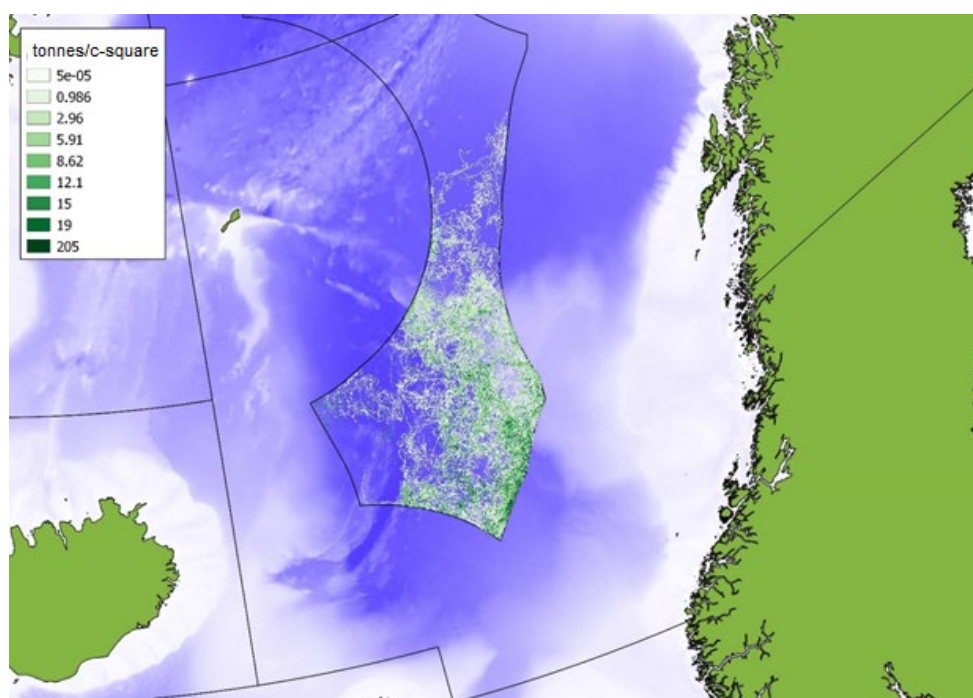


Figure 4 Mackerel retained catches in the NEAFC RA 2 in 2020.

Analysis of VMS and retained catches shows that the mackerel fishery in the NEAFC Regulatory Area during 2020 was mainly within Regulatory Area 2 ("the Banana Hole"), with a wide distribution in waters over the Norwegian Deeps and Voring Plateau (Figure 4). The fishery appears to be mostly concentrated along the boundary with the Norwegian EEZ.

Mackerel discard data 2015–2020

Discard data for Northeast Atlantic mackerel are requested annually in the data call for ICES Working Group on Widely Distributed Stocks (WGWIDE). The discard figures provided to the working group for the years 2015–2020 are presented in Table 1.

It is recognized that data is only provided for some fleets and that the total will be an underestimate. For example, for several countries, the observer comes from demersal fleets, which are not expected to catch large amounts of mackerel. With this caveat, estimated discards represent less than 1% of the total ICES catch.

Table 1 Mackerel total reported catch, estimated discards, and % discards 2015–2020. All weights are in tonnes.

Year	2015	2016	2017	2018	2019	2020
Total ICES catch	1215827	1100135	1159641	1023144	839727	1039513
Discards	10431	5971	2832	2890	7807	9280
% Discards	0.86	0.54	0.24	0.28	0.93	0.89

An additional request to provide the total catch inside and outside the NEAFC Regulatory Area is included in the annual data call, and figures are available for 2018–2020 (Table 2). In 2018, 21% of the catch was taken inside the NEAFC area. In 2019, 25% and in 2020, 24% of the catch was taken inside the NEAFC area. The total catch inside the NEAFC area reported by Iceland, Russian Federation, Faroes, and Greenland accounts for 98% in 2018 and 99.9% in 2019 and 2020 of the total catch in this area. Small quantities of discards are reported by Greenland but Russian Federation, Iceland, and Faroes currently do not supply discard data to WGWIDE.

Table 2 Mackerel reported catch inside/outside the NEAFC RA. All weights are in tonnes.

Year	Catches inside NEAFC RA	Catches outside NEAFC RA	Total catches	Proportion inside the NEAFC RA (%)
2018	213 608	809 536	1 023 144	21
2019	207 200	632 527	839 727	25
2020	247 901	791 612	1039513	24

The discard data supplied to WGWIDE is available from observer programmes and is presented by country in Table 3.

Table 3 Mackerel discards reported to WGWIDE by country 2015–2020. All weights are in tonnes.

Country	2015	2016	2017	2018	2019	2020
Germany	1					
Denmark	13	59	52	18	42	104
Spain	8890	4626	1390	1844	2740	306
France	1039	513	850		2831	57
Greenland	78	54	62	51	18	
Ireland					70	118
Sweden		4	6	21	7	1
UK England and Wales	410	35	39	290	1317	7736
UK Scotland		679	432	667	784	958
Total	10431	5971	2832	2890	7807	9280

Discard data by ICES division is shown in Table 4 with discards mainly reported from the southern area.

Table 4 Mackerel discard data reported by ICES division 2015–2020. All weights are in tonnes.

ICES division	2015	2016	2017	2018	2019	2020
27.2.a			4	5	5	
27.3.a	2.6	7.3	40.1	22.2	35.1	34
27.3.b				0.4	1.0	2
27.3.c				0.04	0.02	0.4
27.3.d		0.2	0.3	0.4	0.3	0.05
27.4.a	22	517	351	591	708	644
27.4.b	10	35	8	6	60	52
27.4.c		11.62	0.49		7.23	
27.5.b1		0.16				0.05
27.5.b			0.39			
27.6.a	6	168	99	39	119	325
27.6.b	24	14	52	51	25	15
27.6.b2		18				
27.7.a	0	1			17	

ICES division	2015	2016	2017	2018	2019	2020
27.7.b	72	15	9	2	18	0.7
27.7.c	61	147	7	34	94	1
27.7.d	84	81	72	0.5	380	5
27.7.e	970	119	140	52	2040	7736
27.7.f		2	2		151	
27.7.g		2	20	132	38	3
27.7.h	140	61	20	16	48	0.3
27.7.j	829	322	98	326	695	108
27.7.k			0.1	2		
27.8.a	268	348	535	2	1477	52
27.8.b	732	822	1086	1034	940	157
27.8.c	4725		84	278	760	28
27.8.cE		2469		46		
27.8.d		5	4	11	4	
27.9.a	2409		143			
27.9.aN		751		194	172	115
27.14.b	78	54	58	46	13	
Total	10431	5971	2832	2890	7807	9280

Methods

Vessels fishing in the NEAFC Regulatory Area are required to carry vessel monitoring systems (VMS), which report hourly speed, heading, and positional information back to the NEAFC Secretariat via national fisheries monitoring centres. Vessels are also required to submit daily catch reports (or weekly, in the case of EU vessels), detailing quantities and species of fish caught. Data supplied by NEAFC to ICES under the data sharing agreement was analysed in conjunction with daily catch reports received from vessels operating in the NEAFC area during 2020.

The catch report information was explored using cluster analysis to identify discrete “fishery” units for which discarding could be investigated and explore the composition of catches in terms of likely target and bycatch species. Catch reports were extracted from the NEAFC data, providing retained catch information for each species and for each vessel on a specific date. It was not possible to correct the data to account for the difference between daily and weekly catch reports. Fifteen species were reported in the catch reports; this figure is likely an underestimate as catches of species below 50 kg can be pooled together and reported under the species code “MZZ” – mixed demersal fishes. A matrix of catch reports for the fifteen identified species was created with a small random value added to each value to allow matrix inversion. Successively, a principal component analysis (PCA) was carried out using the *pcaPP* library in R, and a dendrogram of the euclidian distances in catch composition between reported catches grouped by main species was created using the *pvclust* library. This exercise serves to identify the number of “fishery units” active in the NEAFC Regulatory Aea for which this exercise could be carried out and the species which are likely to co-occur in catches of particular fisheries.

By linking the daily catch reports to the associated fishing activity it was possible to map the distribution of mackerel catch. Fishing activity was determined using a speed range of 1–6 knots. Quantities of mackerel in daily catch reports were linked to vessels and distributed evenly amongst VMS pings at fishing speeds in the corresponding time period. These were then summed in a raster and plotted in Figure 4. It was not possible to correct the data to account for the difference between daily and weekly catch reports.

Mackerel catch and discard data were compiled by WGWIDE based on data submissions to ICES as part of the annual data call.

Sources and references

ICES. 2021. Working Group on Widely Distributed Stocks (WGWIDE). ICES Scientific Reports. 3:95. 874 pp.
<http://doi.org/10.17895/ices.pub.8298>

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