

Marine Recreational Fishing Catches in Ireland - 2023

Irish Marine Recreational Angling Survey (IMREC)

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Abstract

The Irish Marine Recreational Angling Survey (IMREC) 2023 report provides an overview Ireland's marine recreational fishing, estimating fish catches, the level of angler engagement, and socioeconomic impacts. IMREC, led by Inland Fisheries Ireland (IFI), aligns with EU directives to monitor and estimate catches of nominated species, including sea bass, cod, and pollack and elasmobranchs, thereby contributing to the goal of sustainable fisheries management. Annual catch estimates (both for retained and released fish) are reported through the Marine Institute, the National Correspondent, for the EU Data Collection Framework process.

The IMREC survey incorporates both on-site and off-site data collection methods, combining direct interviews, roving creel surveys, bus route access points for boat anglers, and onboard charter surveys. Additionally, a customised IMREC Angler Diary app enables voluntary, citizen-science participation.

Data collection in 2023 spanned Ireland's eastern and western coasts with seasonal stratification, focusing on high-activity areas. In 2023, shore surveys along the west coast recorded mackerel as the top retained species, followed by pollack. Onsite interviews with anglers during small boat surveys was limited, leading to limited data. Nonetheless, mackerel and pollack were also the most caught species. Charter vessel surveys, though more thorough, also faced regional sampling limitations. Across all methods, high catch-release rates were common, particularly for species like European sea bass and dogfish, indicating catch-and-release is a prevalent practice among Irish anglers.

Socioeconomic findings reveal that shore anglers primarily engage in the activity for leisure, with an estimated annual spend of €164 million on trips, complemented by €337 million on gear. Shore anglers typically spend €45 daily, while small boat anglers average €75. IMREC's findings underscore the need for increased sampling, especially for small boat anglers, to enhance data accuracy. Future plans include expanding the charter vessel sampling and addressing gaps in small boat data to refine data quality and ensure a more holistic understanding of Ireland's marine recreational fishing landscape.

1. Introduction

The legal framework for the collection of recreational fisheries data by EU Member States (MS) was given by the EU Data Collection Framework (Council Regulation EU 2017/1004 and Commission Decision EU 1251/2016). Like other MS, Ireland is required to report annual volumes (numbers and weights or lengths) of catches and releases of sea bass, cod, pollack, elasmobranchs and highly migratory ICCAT species in marine recreational fisheries within its waters. As Inland Fisheries Ireland (IFI) is the state agency responsible for the protection, management and conservation of the Republic of Ireland's recreational sea angling resources, it is tasked with collecting these data. To that end IFI initiated the Irish Marine Recreational Angling Survey (IMREC) programme in October 2019.

This report presents the data collected throughout 2023. It continues to apply the knowledge gained through the pilot study of marine recreational fishing (MRF) catches in Ireland (Ryan et al., 2022) and adds to the MRF catch data collected throughout 2022 and presented in Ryan et al. (2023). On-site random sampling methods continue to be central to the programme, albeit with considerable modifications to account for the constraints associated with a limited budget. Random sampling techniques remain the most reliable for estimating catch rates in diverse and complex fisheries as they reduce fisher selection biases (Lewin et al., 2021; Arlinghaus and Cooke, 2009; Pollock et al., 1994) and often allow direct measurement of retained fish (Jones and Pollock, 2012). Data from these surveys and estimates of total catches are presented in this report.

Marine recreational fishing is a popular activity in Ireland, attracting a substantial number of participants and contributing to tourism and to the economy in the country (Hynes & Graeven, 2016). In Ireland, leisure angling with rod & line is the primary activity in the marine recreational fishing sector. In that sense, recreational fishing goes beyond providing social benefits, it also brings substantial economic advantages. For this reason, The EU council also requires the collection of socio-economic data that are necessary for fisheries management, as referred to in Article 5(1)(a) of Regulation (EU) 2017/1004. The IMREC programme has been collecting socio-economic data from willing anglers during the onsite surveys since 2020. The information collected in the intervening years has been collated and presented in this report.

As on-site sampling methods are expensive to maintain in the long term in terms of staff time and resources, a citizen science based voluntary catch data collection method, the IMREC Angler Diary, was developed primarily to increase data returns and coastline coverage and to engage the angling community. This online angling diary was originally developed and tested during the pilot study. It is well documented that self-selecting survey data collection methods are susceptible to biases (Skov et al., 2021; Venturelli et al., 2017). However, these

tools are likely to play a central role in fisheries data collection (Lennox et al., 2021; Gundeland et al., 2020) due to advances in technology and because they are relatively inexpensive to operate. Anglers, as stakeholders, also benefit by being meaningful contributors to a citizen science-based process. This tool allowed anglers to record fishing trips with information regarding location, methods used, time spent fishing, species caught, fish length (cm) and if catches were released. This report presents a year of diary-based angling data which has been collected and analysed.

2. Methods

Ireland is in the Eastern North Atlantic. Its coastline encompasses ICES divisions (VIIa, VIIg, VIIj, VIIb and VIa) (Fig. 1). The IMREC survey is designed account for all MRF along the Irish coastline and within its inshore waters. Ryan et al., 2021 & 2022 characterised the different MRF sectors in Ireland considerable detail.

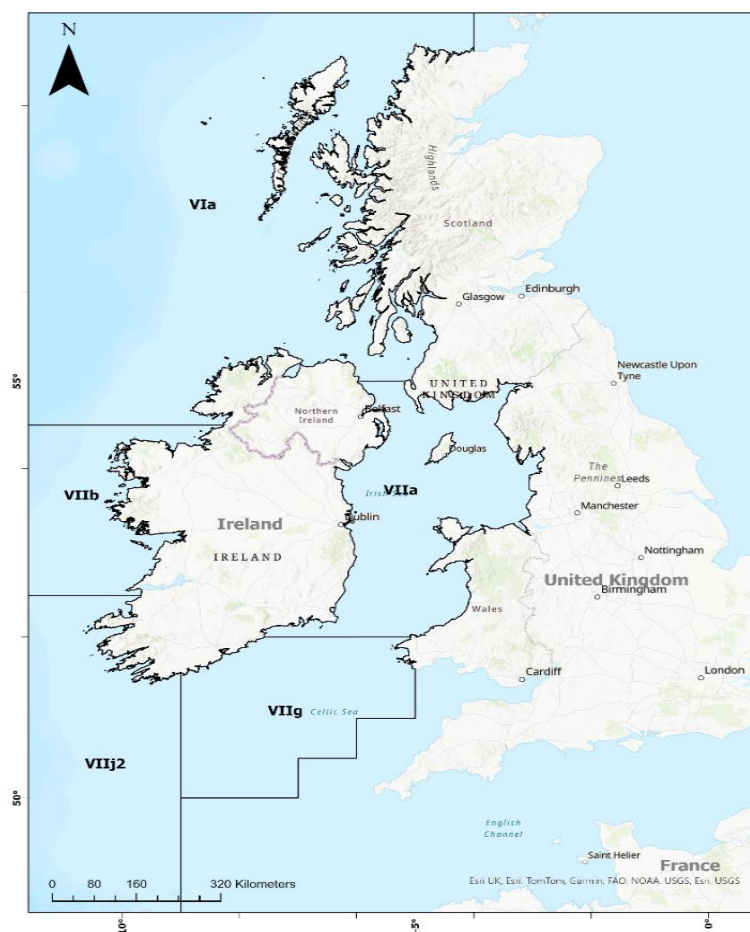


Fig. 1: Ireland's location in a European and ICES region context.

2.1 On-site angling surveys

2.1.1 Roving creel survey of shore anglers

Sampling strata

The IMREC survey of shore anglers utilises a spatio-temporal sampling method to collect catch per unit effort (CPUE) data of sea anglers around the Irish coast. The roving-creel survey approach was applied due to the disparate nature of shore angling around Ireland and the multiple potential access points to the sea (Armstrong et al., 2013; Lockwood, 2000; Pollock et al., 1997). The survey also incorporates spatial and temporal stratification into its final design to maximise sampling efficiency (Jones and Pollock, 2012; Pollock et al., 1997).

Increased sampling effort is allocated to the places and times with greater angling effort (unequal probability sampling) thus increasing the precision of the effort estimates (Hayne, 1991), as well as increasing sampling efficiency (Best and Boles, 1956).

Sampling strata choices for the surveys have been reviewed and amended during the lifetime of the sampling programme to strike a balance between calculating precise estimates and collecting sufficient angler interviews per sampling strata. The spatio-temporal sampling frame consists of two spatial strata: East (VIIa and VIIg) and West (VIIj2, VIIb and Via) (Fig. 1) and two temporal strata: Winter (November to March) and Summer, (April to October). More detail for this decision-making process is presented in Ryan et al. (2022) and Ryan et al. (2023). To increase the likelihood of encountering anglers during sampling, angling activity strata (high and low activity) were also written into the sampling programme (Ryan et al 2022).

Sampling protocol

All sampling took place within the Western spatial stratum in 2023 (Fig. 2). The Eastern stratum was sampled in 2022. Refer to Ryan et al. (2023) for reporting on the 2022 programme. Sampling was selected sequentially for each sampling week. Prior to each sampling season, a sampling programme for each consecutive week was developed, taking account of each stratum and cluster in the sampling design. Visits to PSUs were heavily weighted towards those designated as high activity (probability = 0.75). For further details on the sampling selection process refer to Ryan et al. (2023)

Data collection and analysis

To allow instantaneous data collection, all surveyors were supplied with a tablet containing the data collection software, Survey123 <https://survey123.arcgis.com> (ESRI 2020). All anglers are interviewed about their catch on site and all information is uploaded and a follow up

interview is requested to collect a complete picture of their angling trip. The mean catch-per-unit-effort (CPUE) of all MRF species caught during each shore angling trip is estimated where an angling trip is defined as one daily angler trip for shore angling. A ratio of the means estimator (Armstrong et al., 2013; Pollock et al., 1994; Vølstad et al., 2006) was used to calculate average species specific CPUE across all strata for shore and small boat angling, whereby a stratum was defined for each season and high/low activity combination. Retained or released fish of a particular species were considered as a separate catch. For detail on data collection and analysis protocol, refer to Ryan et al. (2023).

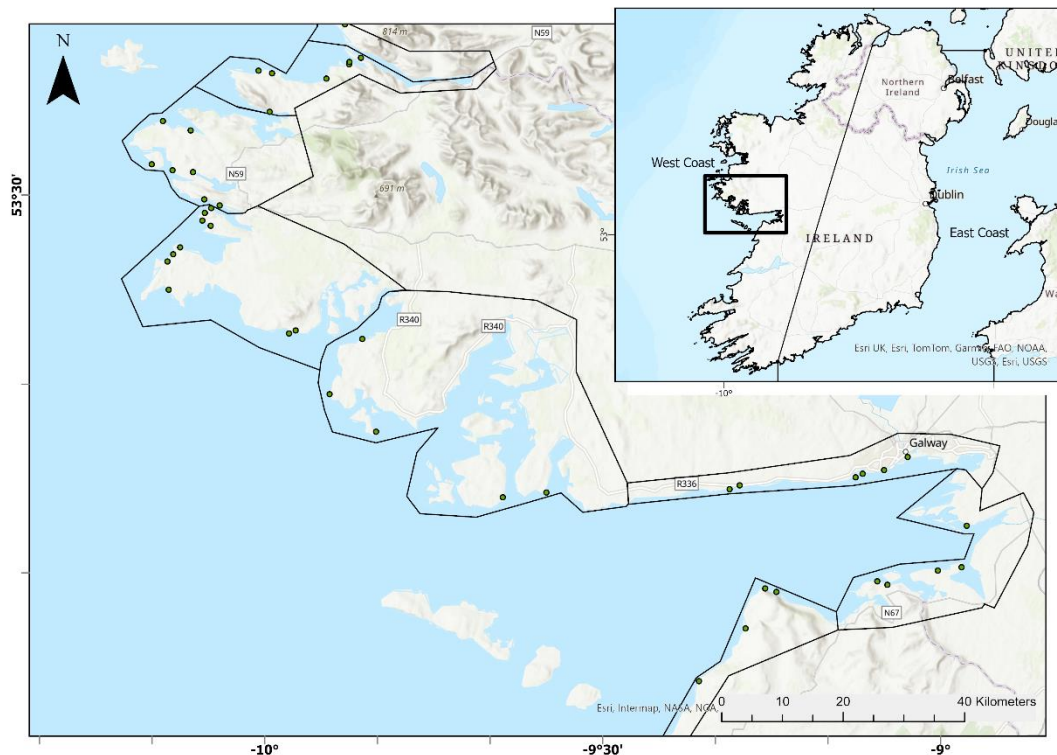


Fig. 2: Map of Ireland identifying PSUs (Black outline) and SSUs (green dots) within a section of the Western region stratum, for the roving creel survey of shore anglers. Inset identifies the East and West strata.

The overall CPUE estimates of a selection of species were combined with effort estimates derived from CSO and IPSOS-MRBI surveys, described in Ryan et al. (2022), to calculate total catch of all released and retained species through shore angling (Table 1). Where applicable, CPUE estimates for some species were converted to CPUE biomass estimates using length/weight conversion equations derived during the pilot study (Ryan et al. 2022). As the current survey (2023) focused on the West coast, effort estimates were apportioned according to data obtained during the IFI Behaviour and Attitudes Sea Angling survey (Ryan et al. 2021) (Fig. 3).

Table 1: Total annual sea angling trip estimates per annum along the Western half of Ireland. For details refer to Ryan et al. (2022).

Angling type	Angling trips per year	RSE
Shore	786,000	0.31
Small boat	467,000	0.43

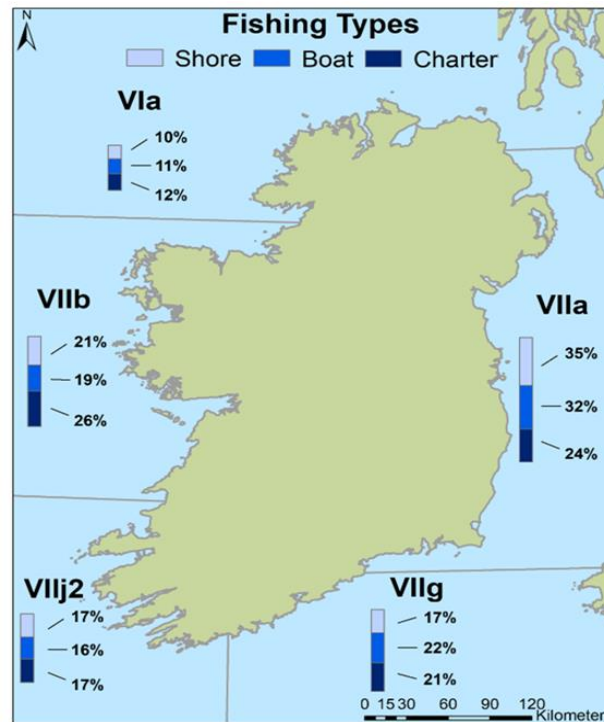


Fig. 3: Proportion of angling effort around Ireland according to the Inland Fisheries Ireland behaviour and attitudes survey of Irish sea anglers (n=1211) (Ryan et al. 2021).

2.1.2 Bus route access point survey of small boat anglers

The IMREC survey of private small boat anglers also uses a spatio-temporal sampling method to collect catch per unit effort data around the Irish coast. The most appropriate method of collection of catch data for this survey is through a random-access point survey. Unlike the roving-creel type approach, this method captures complete angling trip data as the interview occurs when the angler has completed their fishing trip. This survey also incorporated stratification into its final design to maximise sampling efficiency. Refer to Ryan et al. (2023) for details.

Sampling protocol

All sampling took place within the Western spatial stratum in 2023 (Fig. 4). The Eastern stratum was sampled in 2022. Refer to Ryan et al. (2023) for the reporting on the 2022 programme. Site selection procedures generally followed the steps described in the roving creel survey of shore anglers above. However, in the small boat bus route procedure, each access point/SSU is sub-sampled across the sampling day. The amount of time spent at each SSU depended on the number of SSU within a PSU. Time spent at each SSU was apportioned evenly across the sampling day.

Data collection and analysis

This generally followed the steps described in the roving creel survey of shore anglers above with some exceptions. Refer to Ryan et al. (2023) for details.

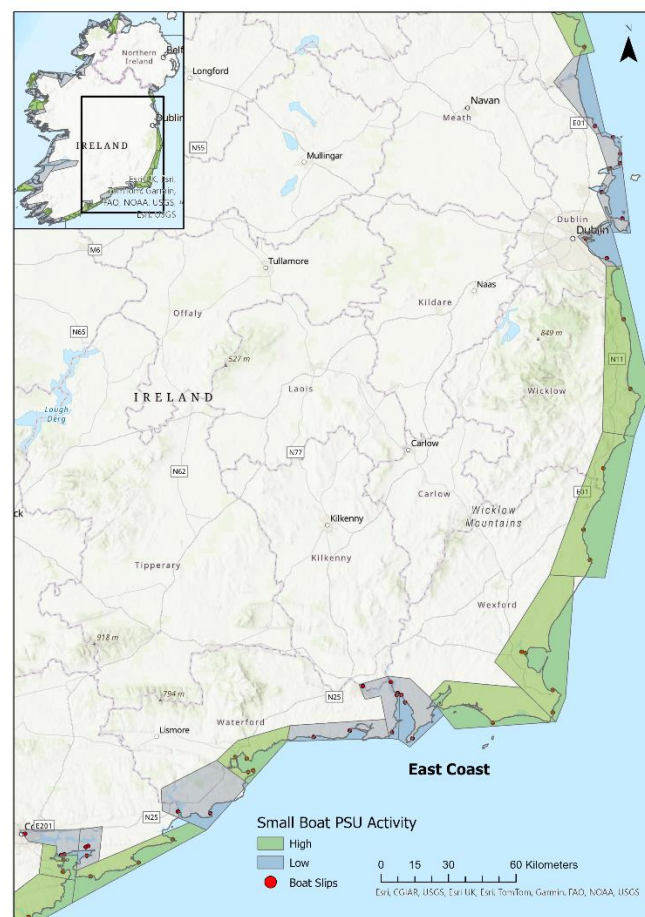


Fig. 4: Map of Ireland identifying PSUs and SSUs within a substantial portion of the Eastern region stratum, for the bus route access point survey of small boat anglers.

2.1.3 Onboard charter vessel catch survey

The charter vessel sampling programme developed by IFI, undertaken by IFI staff and Marine Institute (MI) contractors commenced in summer 2021, and was re-run in 2022. This programme sampled randomly designated chartered angling trips to record species numbers, and measure lengths and weights of all captured and released fish (Ryan et al. 2022).

A sampling frame was developed from a subset of charter skippers (Fig. 5) who agreed to participate in the programme (n=22). As per the surveys, the sampling frame was stratified spatially (east and west coasts) and temporally (summer and winter). Surveys were selected through a well-defined random sampling frame and, unlike the shore and small boat surveys, the sampling frame included the entire coast of Ireland in 2023. When possible, samplers were assigned to a vessel trip to survey to accurately measure and weigh captured fish. In total, 21 trips were sampled between June and December 2022. For reporting in 2022, the data collected in 2021 and 2022 were combined prior to analysis as the programme continued without modification over both sampling years (Ryan et al. 2023). Differences between catches during sampling years are compared.

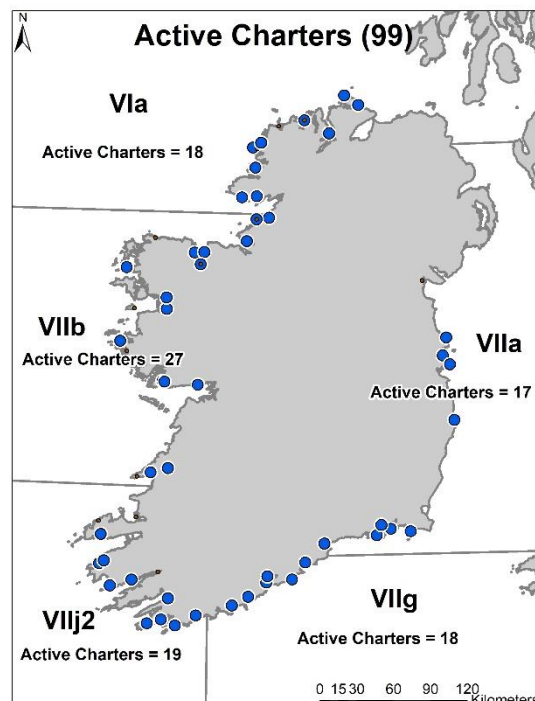


Fig. 5: Map of Ireland identifying the general location of active charter sea angling vessels (2023) by ICES division.

Data collection and analysis

An onboard sampler boards a randomly chosen charter vessel prior to the trip, as agreed with the charter skipper. They record relevant trip information and biometric catch data that allows for the estimation of angler Catch Per Unit Effort (CPUE), total retained biomass, and where possible length-weight relationships for individual species. Priority was given to seabass, cod, pollack, elasmobranchs and highly migratory ICCAT species (Council Regulation (EU) 2017/1004). For further detail refer to Ryan et al. (2021). For information on methods of data analysis. Refer to Ryan et al. (2023).

2.2 Off-site angling surveys

2.2.1 Online angling diary

To recruit diarists for the IMREC Angler Diary, several approaches were used. A call to action for all sea anglers subscribed to a weekly IFI issued 'Irish Angling Update' was released along with recruitment during Face-to-Face angler surveys. Further media pushes of the IMREC Diary from the IFI marketing department occurred during 2023, leading to an increase in diarist recruitment.

Each diarist receives an email with their own login details, user manual and a fish ID guide, giving them the information needed to start recording their fishing trips through the online diary. The requested information for each session included the general fishing location, time spent fishing, type of fishing, methods used and any catch data (species, total caught, retained/released, length (cm)). Each angler can access their own catch data through an online dashboard which provides an overview of all angling trips the angler has recorded. All data submitted is uploaded to an ArcGIS Online Feature Layer. This is stored on Inland Fisheries Ireland's ArcGIS Enterprise cloud storage. Data can be downloaded for analysis as required. All personal data was removed from the database before data analysis. All data are aggregated and are presented in the results coming from trips in 2023. For comparison, results are also presented for the different strata used in the roving creel approach.

Data collection and analysis

The diary allows for one of 4 types of fishing activity to be selected per session, Shore, Small boat, Kayak and Charter. The fishing type for each session is recorded and allows for catch percentages to be calculated based on catch and effort levels. As with the on-site surveys, data are collated into two regional strata (East and West) and two temporal strata (summer and winter).

Catch Per Unit effort was based on total fish caught and total trips by sector (shore, small boat etc) recorded. All CPUE figures are calculated at species level with further separations to identify seasonal and spatial differences. Due to the broad variety and number of different species recorded in the diary, only the overall top 10 species were included in CPUE calculations. Region/Season strata are based on the total angling trips per Region/Season and number of fish caught per species in each. An example of this would be whiting CPUE in the East coast during Summer = 0.438. This is based on 109 whiting caught in 249 angling trips along the East coast during the summer months. Total diary CPUE figures for whiting is 0.489 based on 314 whiting caught across 642 angling trips across all regions/seasons.

$$CPUE_n = \frac{\sum FISH_n}{\sum TRIPS_n}$$

Where: $CPUE_n$ is the number of captured fish (retained or released) for a particular species ($FISH_n$) divided by the total number of angling trips recorded ($TRIPS_n$).

Analysis at species level was confined to the top 10 species based on overall total catch (shore and small boat catches combined) and total catch per fishing type.

2.3 Highly Migratory ICCAT Species

In a separate programme, authorised by EU/ICCAT, Ireland operates a limited Atlantic Bluefin Tuna scientific data collection programme (Tuna CHART <https://www.fisheriesireland.ie/Fisheries-Research/tuna-chart.html>). This programme commenced in 2019. In Q3 and Q4, in each year, a limited number of authorised and trained charter skippers operated a highly controlled catch, tag and release programme. All fish were captured by angling, measured and tagged in the water, and released. The programme is ongoing. Catch data are reported to ICCAT <https://www.iccat.int/GBYP/en/overview.asp>.

A small-scale Albacore (*Thunnus alalunga*) angling fishery operates off the southwest coast for a limited number of weeks during the summer months, typically in settled weather.

2.4 Socio-economic angling data

Socio-economic data collection followed the same probability-based sampling programme as described for the roving creel surveys of shore anglers and the access point surveys of small boat anglers. When surveyors had completed the part of the interview relating to catch data, they were asked if they would like to answer some questions on their spend on activities relating to their fishing trip, as well as annual expenditure on fishing tackle. This information was combined with demographic data collected earlier in the survey.

Data analysis

To estimate average angler expenditure related to MRF activities, all anglers interviewed on site were asked questions relating to two categories: “Daily Expenditure” and “Annual Gear Expenditure”. To determine “Daily Expenditure” of anglers engaged in fishing, anglers interviewed were asked questions about their costs for the specific day of fishing. These included: transportation costs to and from venue, purchase of food and snacks and purchase of fishing bait. They were also asked to record any spend on accommodation and/or angling guides for the day. All responses were combined for each angler prior to the assessment. For “Daily Expenditure” the survey allowed the daily expenditure data to be divided across categories: “Season” and “Region” where appropriate. As above, the variable “Season” was categorized into summer and winter. The variable “Region” consisted of East and West coast of Ireland (Fig. 2). For the assessment of “Annual Gear Expenditure”, respondents were asked about their cumulative spending on fishing equipment over the preceding 12 months. This category includes items such as fishing rods and reels.

For both expenditure categories, Angler responses were also separated by “Age” and “Level of Experience”, to assess variation of expenditure. Participants were queried about their age, and classified into one of the following age intervals: 16-24, 25-34, 35-44, 45-54, 55-64, and 65+. To facilitate the data analysis, groups 16-24 and 25-34 were aggregated into the 16-34, groups 35-44 and 45-54 into 35-54, and groups 55-64 and 65+ into the 55+ age group. Participants were also asked to describe their level of fishing experience. response options included "novice", "somewhat experienced" and "very experienced." For this analysis, respondents indicating "somewhat experienced" were classified as "intermediate" group, while those stating, "very experienced" were classified as "experienced". The number of people interviewed is different between categories because not all anglers interviewed provided information about age or level of experience.

All averages were calculated using the following formula:

Average = (Sum of all values for the group being analyzed) / (Total number of responses).

The standard error (SE) was calculated using the formula:

$$(\sqrt{\sum(x_i - \bar{x})^2 / (n - 1)}) / \sqrt{n}$$

and the relative standard error (RSE) was calculated dividing the SE by the corresponding average.

To estimate the total recreational fishing expenditure in Ireland, prior information regarding angler participation rates and the annual number of angling trips (Ryan et al., 2022) was combined with average annual and daily spending estimates. The initial step involved

estimating the value based on daily expenses, achieved by multiplying the daily average expenditure by the overall count of annual angling trips taken in Ireland. To estimate the total annual gear expenditure among Irish anglers, the mean expenditure was multiplied by the number of individuals engaged in fishing in Ireland per year (according to the participation rate). The final calculation of the overall fishing expenditure in Ireland was obtained by summing the results of both estimations.

3. Results

3.1 On-site angling surveys

3.1.1 Roving creel survey of shore anglers

During 2023, IFI surveyors conducted 76 shore surveys (PSU visits) which consisted of 561 SSU visits. During the surveys, 114 shore angler interviews were completed and 340 catches of 12 different species were recorded (Table 2).

Table 2: Primary sampling unit (PSU) survey details during IMREC roving creel shore surveys along the West Region stratum in 2023.

Season	number PSU visits	number SSU visits	number PSU visits (with ≥ 1 angler interviewed)	number angler Interviews	Average catch count ($\pm$ s.d)	Average angling time mins ($\pm$ s.d)
Winter	23	147	9	16	0.7 (1.6)	396 (204)
Summer	53	414	36	98	6.7 (15.5)	380 (267)

Catch per unit effort (CPUE) estimates

CPUE estimates for all shore caught species recorded during the survey have been weighted using the survey design approach and calculated across all survey strata. Mackerel were the most retained species (CPUE 1.3, 0.03 RSE), followed by pollack (CPUE 0.26, 0.03 RSE). Five other retained species were recorded during the survey in 2023 (coalfish, flounder, conger eel and European seabass and gilthead bream) (Table 3). In total 12 species were recorded as caught and released during the onsite shore surveys (Table 3). The most caught and released species were pollack (CPUE 0.16, 0.04 RSE), and ballan wrasse (CPUE 0.07, 0.17 RSE), followed by flounder and lesser spotted dogfish (Fig. 6).

Fish lengths

Pollack released by anglers interviewed during the survey were on average smaller (23 ± 0.4 se) than retained fish (28 cm). Similarly released catches of flounder and European sea bass tended to be smaller than kept catches of these species (Table 3).

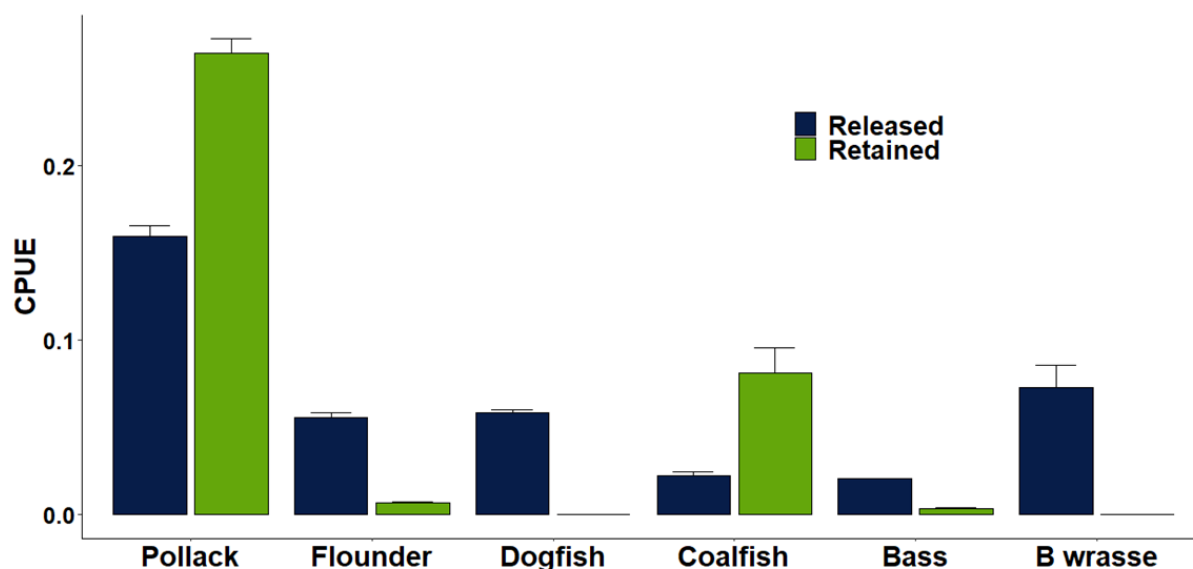


Fig 6. Mean weighted CPUE (catch per angler day) estimates of the six most commonly shore caught species (besides mackerel) recorded during on-site surveys along the Western Region stratum of Ireland (Jan-Dec 2023).

Annual shore catch estimates – Western Regional stratum

No catches of cod were recorded during the on-site shore sampling surveys. Mackerel made up the largest proportion of retained fish by shore anglers (Table 4) with an estimated 228 (0.31 RSE) tonnes retained along the western half of Ireland. Besides mackerel, pollack were the most retained species by number and weight (Table 4). European sea bass were retained, albeit in small numbers. Total retention was estimated to be around 3,000 (0.43 RSE) individuals, whereas around 16,000 (0.32 RSE) individuals were caught and released, according to estimates.

Table 3: Weighted CPUE (catch per angler day) estimates and average lengths/weights of **all** fish captures recorded during IMREC on-site shore surveys along the Western Region stratum of Ireland (Jan – Dec 2023).

Species	Number of catch records	CPUE(RSE)	CPUE biomass (RSE)	Length (±se) cm	Ave weight (±se) g
Released Catches					
Pollack	16	0.16 (0.04)	17 (0.04)	22.9 (0.45)	128.5 (9.2)
Lesser spotted dogfish	10	0.06 (0.03)	NA	56.5 (0.75)	NA
Mackerel	8	0.04 (0.05)	6 (0.05)	28.5 (0.18)	192.7 (4.1)
Flounder	14	0.06 (0.05)	NA	23 (0.42)	NA
Ballan wrasse	7	0.07 (0.17)	NA	31 (0.72)	NA
European seabass	6	0.02 (0.02)	20 (0.01)	44.3 (0.75)	995.3 (59.9)
Turbot	5	0.02 (0)	NA	14.2 (0.1)	NA
Weever (Lesser)	4	0.01 (0.09)	NA	10 (0)	NA
Thornback ray	3	0.03 (0.01)	NA	60 (0)	NA
Coalfish	2	0.02 (0.09)	NA	NA	NA
Conger eel	2	0.02 (0.02)	NA	94 (3.84)	NA
Sea trout	2	0.04 (0.06)	NA	NA	NA
Retained Catches					
Mackerel	225	1.3 (0.03)	290 (0.02)	26.1 (0.57)	174.8 (8.7)
Pollack	25	0.26 (0.03)	126 (0.01)	35.2 (0.98)	507.3 (53.6)
Coalfish	7	0.08 (0.18)	NA	40.6 (0.18)	NA
Flounder	2	0.01 (0.09)	NA	30 (0.66)	NA
Conger eel	1	0 (0.03)	NA	NA	NA
European seabass	1	0 (0.12)	5 (0.03)	52(0)	1475(0)

Table 4: Shore angling estimates of total catch and weight for **selected** species along the Western Region stratum of Ireland (Jan - Dec 2023).

Species	Total Annual catch (000's) (RSE)	Total Catch Biomass (t) (RSE)
Released		
Pollack	125 (0.34)	14 (0.31)
Ballan wrasse	57 (0.48)	NA
Lesser spotted dogfish	46 (0.34)	NA
Flounder	44 (0.35)	NA
Thornback ray	27 (0.32)	NA
European seabass	16 (0.32)	16 (0.31)
Retained		
Mackerel	1021 (0.34)	228 (0.31)
Pollack	208 (0.34)	99 (0.31)
Coalfish	64 (0.49)	NA
Flounder	5 (0.39)	NA
European seabass	3 (0.43)	4 (0.31)

3.1.2 Bus route access point survey of small boat anglers

During 2023, IFI surveyors conducted 22 small boat surveys (PSU visits) which consisted of 71 SSU (boat access points) visits. Despite this extensive sampling effort, only six small boat interviews were completed and 71 catches of three different species were recorded (Table 5). Small boat fishing is generally limited in Winter (Oct – March) due to weather conditions but sampling is required during this period to ensure consistency.

Table 5: Primary sampling unit (PSU) survey details during IMREC roving creel small boat surveys along the Western Region stratum of Ireland (Jan-Dec 2023).

Season	number PSU visits	number SSU visits	number PSU visits (with ≥1 angler interviewed)	number angler Interviews	Average catch count (±s.d)	Average angling time mins (±s.d)
Winter	6	18	0	0	NA	NA
Summer	16	53	5	6	22.2 (20.9)	458 (71)

Catch per unit effort (CPUE) estimates

CPUE estimates for all small boat caught species recorded during the survey have been weighted using the survey design approach and calculated across all survey strata. Both species recorded during this survey, namely mackerel and pollack, were caught at a high catch rate. However, as interview rates were extremely low, the small boat fisheries is likely to be far more varied than presented here. Mackerel were retained at a higher rate than pollack, with CPUEs of 3.85 (0.01 RSE) and 0.2 (0.08 RSE) respectively. Pollack catches as reported by the small boat interviewees were released (CPUE 1.35 ,0.01 RSE) at a higher rate than they were retained (Fig. 7).

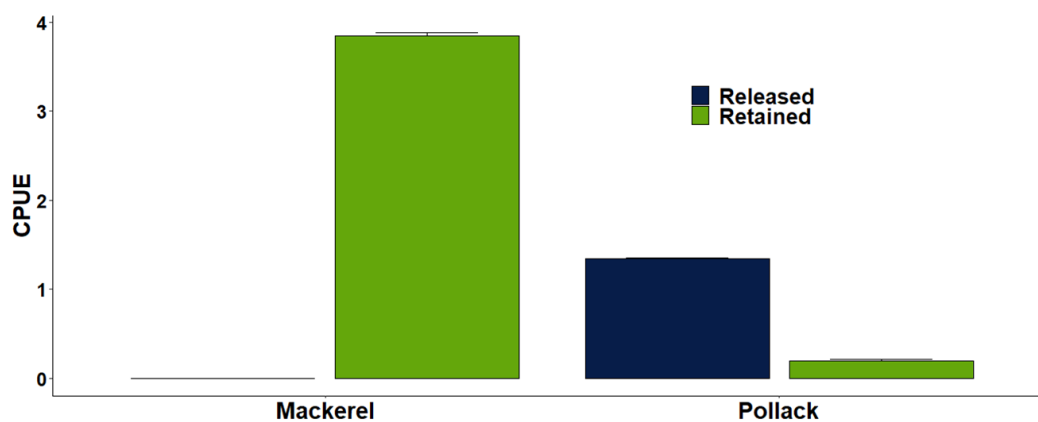


Fig 7. Mean weighted CPUE (catch per angler day) estimates of small boat caught mackerel and pollack recorded during on-site surveys along the Western Region stratum of Ireland (Jan-Dec 2023).

Fish lengths

Retained small boat caught pollack were smaller ($40\text{cm} \pm 7\text{se}$, $n=7$) on average, than released fish ($53\text{m} \pm 7\text{se}$, $n=34$). All reported mackerel were retained. Average reported length was $30\text{cm} \pm 0.2\text{se}$, $n=30$.

Annual small boat catch estimates – Western Region stratum

The data collected during the pilot study estimated that small boat anglers retain 83 (0.44 RSE) tonnes of pollack and 388 (0.44 RSE) tonnes of mackerel over the course of a year along the Western Region stratum (Table 6). Overall small boat catch records were low due to the considerable difficulties in encountering these anglers at sampling points, so estimates are imprecise.

Table 6: Small boat angling estimates of total catch and weight for selected species along the Western Region stratum of Ireland (Jan - Dec 2023).

Species	Total Annual catch (000's) (RSE)	Total Catch Biomass (t) (RSE)
Released		
Pollack	629 (0.44)	960 (0.44)
Retained		
Mackerel	1799 (0.44)	388 (0.44)
Pollack	94 (0.51)	83 (0.44)

3.1.3 Onboard charter vessel catch survey

The 2023 onboard charter catch survey (149 anglers aboard 21 charter trips) around the coast collected data on 26 species (2411 fish). Only two sampling trips took place in the eastern regional stratum, the remainder were within the western regional stratum (Fig. 8).



Fig 8. Sampling trip locations during the IMREC onboard charter vessel angling *Catu* survey (Jan -Dec 2023).

Across the charter boat fishery in 2023, mackerel had the highest rate of retention by catch count (CPUE 9, RSE 0.14) (fig. 9), and pollack had the highest retention rate by biomass (CPUE biomass (Kg), 2.7, RSE 0.12 (Table 7). Other relatively commonly caught and retained species were retained at a far lower rate than mackerel or pollack. For example, coalfish and cod retained CPUE was 0.35 (0.61 RSE) and 0.14 (0.26) respectively (Table 7, Fig. 9). Retained pollack were on average longer than released fish. This was the same for the majority of species (Fig. 10).

Table 7: Weighted CPUE (catch per angler day) **ranked** estimates and average lengths/weights of **all** fish captures recorded during national IMREC on-board charter surveys throughout Ireland (Jan – Dec 2023).

Species	Total Caught	CPUE (RSE)	CPUE Biomass (kg) (RSE)	Average length (cm) (±s.d)	Average weight (Kg) (±s.d)
Released					
Pollack	325	2.34 (0.21)	1.4 (0.25)	41.7 (7)	0.6 (0.25)
Coalfish	227	1.63 (0.65)	0.72 (0.63)	37.2 (3)	0.44 (0.08)
Pouting	33	0.24 (0.31)	0.1 (0.34)	29.8 (4.1)	0.41 (0.14)
Whiting	32	0.44 (0.22)	0.01 (0.36)	28.1 (23.7)	0.14 (0.05)
Cuckoo Wrasse	25	0.18 (0.38)	0.05 (0.19)	26.4 (3.2)	0.29 (0.08)
Red Gurnard	19	0.14 (0.61)	0.03 (0.63)	29.2 (1.9)	0.21 (0.08)
Ballan Wrasse	18	0.12 (0.35)	0.07 (0.19)	31.4 (5)	0.45 (0.34)
Spurdog	17	0.12 (1.1)	NA	100.9 (8.6)	NA
Scad	14	0.1 (0.83)	NA	34.3 (1.7)	NA
Mackerel	12	0.29 (0.09)	0.04 (0.08)	24.5 (6.1)	0.15 (0.01)
Tub Gurnard	12	0.09 (0.51)	0.06 (0.58)	38.3 (8.2)	0.73 (0.49)
Lesser Spotted Dogfish	11	0.08 (0.69)	0.05 (0.68)	55 (7.9)	0.6 (0.12)
Thornback Ray	11	0.08 (0.7)	0.12 (0.75)	57.4 (7.5)	1.5 (0.54)
Grey Gurnard	8	0.06 (0.51)	0 (0.52)	21.6 (0.9)	0.08 (0.02)
Ling	7	0.05 (0.36)	0.02 (0.38)	44.4 (6.2)	0.42 (0.19)
Dab	6	0.04 (0.7)	0.01 (0.76)	23.7 (1.2)	0.12 (0.03)
Tope	4	0.03 (0.66)	NA	1450 (108)	NA
Blue Shark	2	0.01 (1.32)	NA	142.5 (88.4)	NA
Cod	2	0.01 (0.61)	0.01 (0.47)	44 (1.4)	NA
Poor Cod	2	0.01 (0.52)	0 (0.55)	19 (0)	0.13 (0.04)
Homelyn Ray	1	0.01 (0.66)	0.01 (0.66)	NA	NA
Megrim	1	0.01 (0.66)	0 (0.66)	NA	NA
Porbeagle Shark	1	0.01 (1.32)	0.72 (1.32)	NA	NA
Smooth Hound	1	0.1 (0.1)	0.28 (0.1)	NA	NA
Retained					
Mackerel	1095	8.96 (0.14)	2.25 (0.02)	28 (3.7)	0.2 (0.02)
Pollack	264	1.9 (0.27)	2.65 (0.12)	48.3 (8.7)	1.4 (0.61)
Scad	102	0.73 (0.5)	0.17 (0.02)	28.5 (3.2)	0.24 (0.01)
Whiting	53	0.38 (1.17)	0.1 (0.07)	33.8 (2.6)	0.26 (0.04)
Coalfish	49	0.35 (0.61)	0.22 (0.42)	39.9 (4.3)	0.62 (0.13)
Cod	19	0.14 (0.26)	0.14 (0.25)	48.8 (9.2)	1.03 (0.6)
Ling	12	0.09 (0.29)	0.14 (0.32)	67.5 (8.9)	1.61 (0.7)
Greater sandeel	8	0.06 (0.95)	0 (0.95)	29.9 (0.6)	0.08 (0)
Pouting	6	0.04 (0.57)	0.02 (0.55)	32.7 (2.3)	0.57 (0.04)
Ballan Wrasse	5	0.04 (0.66)	0.03 (0.66)	35.6 (2.1)	0.77 (0.11)
Pilchard	4	0.03 (1.32)	NA	21 (0.8)	NA
Red Gurnard	2	0.01 (0.66)	0.01 (0.66)	35 (0)	0.4 (0.01)
Dab	1	0.01 (0.66)	0 (0.66)	NA	NA

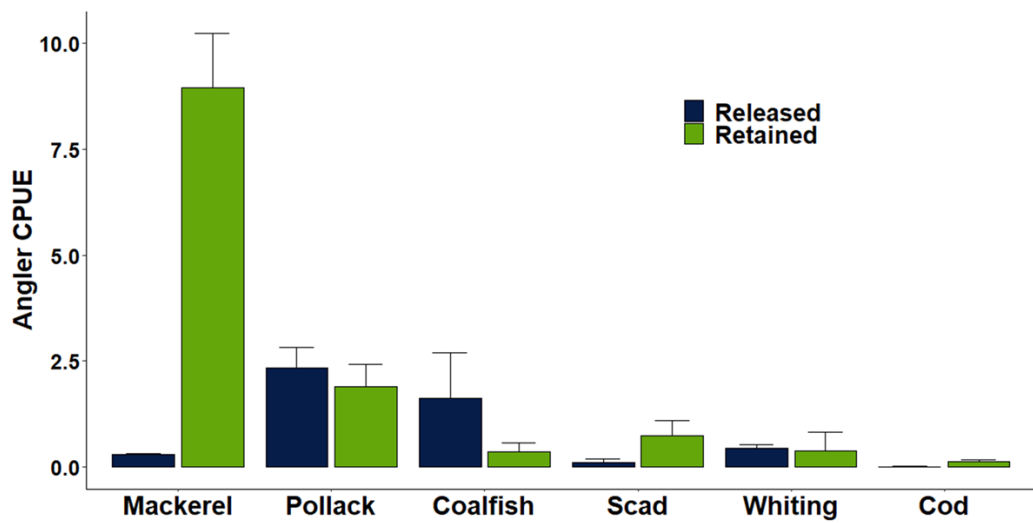


Fig 9. Mean weighted CPUE (catch per angler day) estimates of the six most commonly charter caught species recorded during the national IMREC onboard charter survey (Jan-Dec 2023).

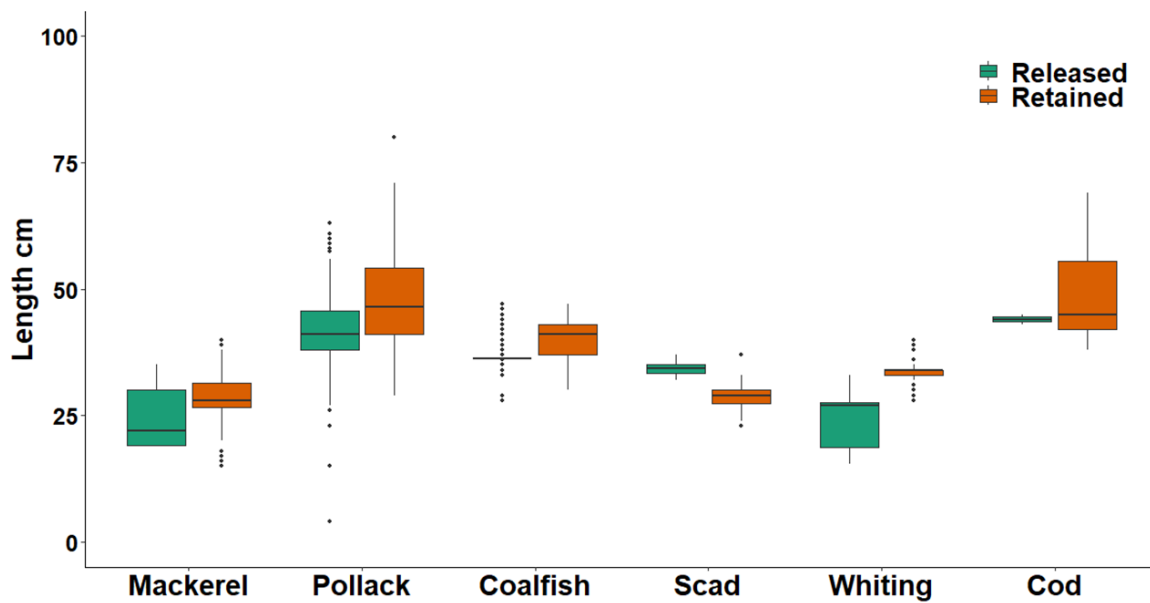


Fig 10. Box plots of the lengths of the six most commonly charter caught species recorded during the national IMREC onboard charter survey (Jan -Dec 2023).

Spurdog were the most commonly caught elasmobranch species by charter boats in 2023, followed by smoothhound (Fig. 11). All 48 recorded elasmobranch catches were released.

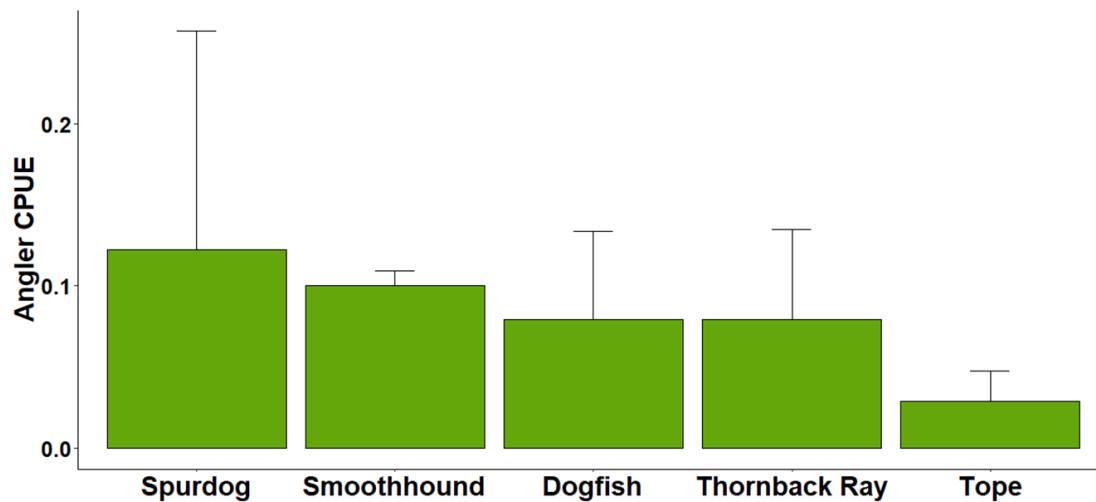


Fig 11. CPUE (catch per angler day) of charter caught elasmobranch species recorded during the IMREC onboard charter survey (Jan-Dec 2023).

Annual charter catch estimates

The collated IFI historical charter effort data (1976-2008) determined that, on average, charter vessels undertook 62 (± 0.9 s.e) angling trips per year (Ryan et al., 2023). The current survey found that 7.1 anglers were aboard for the average charter trip. According to most recent data, the highest possible size of the active charter fleet in Ireland is 99. This equals 43,339 (± 781 se) charter angler days in Ireland, per year.

It is estimated that 123 tonnes of pollack and 104 tonnes of mackerel were retained by charter anglers in Ireland in 2023 (Table 8). Otherwise, overall harvest is low and most catches are returned alive.

Table 8: Charter vessel angling estimates of total annual catch and weight for **selected** species throughout the coast of Ireland in 2023.

Species	Total Annual catch (000's) (RSE)	Total Catch Biomass (t) (RSE)
Released		
Pollack	109 (0.21)	65 (0.25)
Coalfish	76 (0.65)	33 (0.63)
Pouting	11 (0.31)	5 (0.34)
Whiting	21 (0.22)	1 (0.36)
Cuckoo Wrasse	8 (0.38)	2 (0.19)
Red Gurnard	6 (0.61)	1 (0.63)
Ballan Wrasse	5 (0.35)	3 (0.19)
Spurdog	6 (1.1)	NA
Scad	5 (0.83)	NA
Mackerel	14 (0.09)	2 (0.08)
Tub Gurnard	4 (0.51)	3 (0.58)
Lesser Spotted Dogfish	4 (0.69)	2 (0.68)
Thornback Ray	4 (0.7)	6 (0.75)
Grey Gurnard	3 (0.51)	0 (0.52)
Ling	2 (0.36)	1 (0.38)
Dab	2 (0.7)	0 (0.76)
Retained		
Mackerel	416 (0.14)	104 (0.02)
Pollack	88 (0.27)	123 (0.12)
Scad	34 (0.5)	8 (0.02)
Whiting	18 (1.17)	5 (0.07)
Coalfish	16 (0.61)	10 (0.42)
Cod	6 (0.26)	7 (0.25)
Ling	4 (0.29)	6 (0.32)
Sandeel	3 (0.95)	0 (0.95)
Pouting	2 (0.57)	1 (0.55)
Ballan Wrasse	2 (0.66)	1 (0.66)
Pilchard	1 (1.32)	NA
Red Gurnard	1 (0.66)	0 (0.66)

3.2 Off-site angling surveys

3.2.1 Online angling diary

The voluntary angler diary allows for reporting of catch at national level as users are distributed around the coast.

Angling type

Shore angling represented 80% of all recorded angling trips, accounting for 45.1% of all fish caught. Kayak angling saw 34.8% of all catches while only representing 13.1% of total reports. Kayak angling displayed a much higher catch rate when compared to shore angling. Small boat and charter vessel angling represented a smaller portion of recorded angling trips with 5% and 1.8% respectively. Small boat angling accounted for 12.6% of all catches with charter angling representing less than 10% of catches (7.5%) (Fig. 12). The number of hours spent fishing based on the type of angling mirrors the number of angling trips recorded.

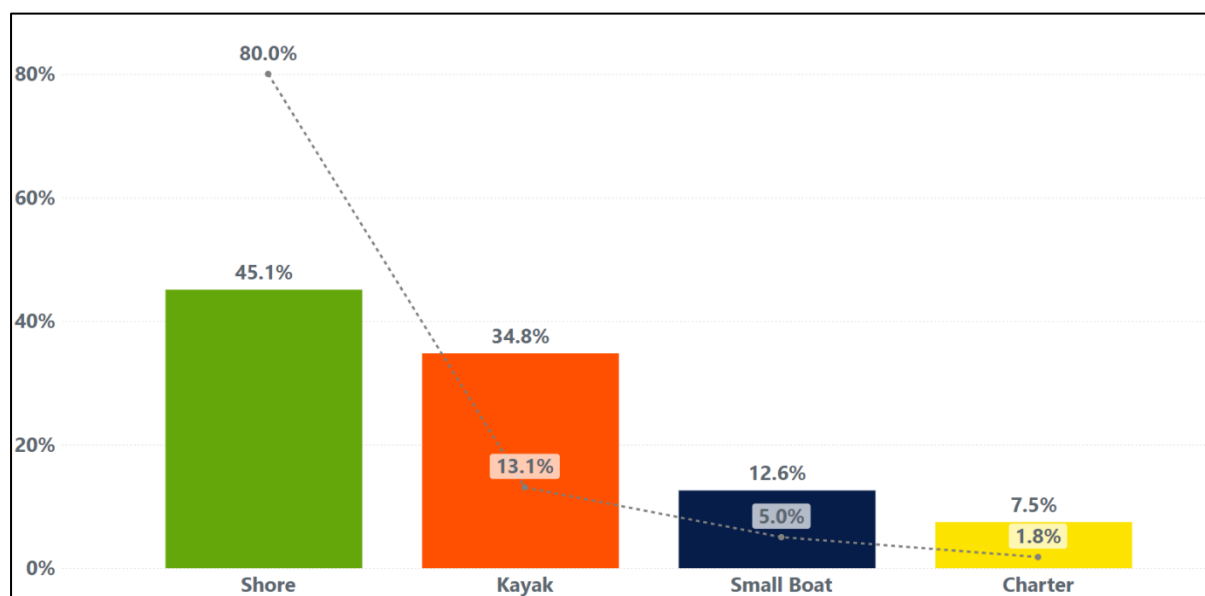


Fig. 12: All angling records (dotted line) and catch rates per fishing type (Bars), recorded on the IMREC angling diary, 2023.

Number of angling trips by strata

Contributing anglers recorded 247 trips on the East Region stratum and 249 on the West Region stratum showing an almost even divide between both East and West strata (Fig. 13). A greater proportion of trips were recorded during the summer period in both strata. The East saw an even spread across both seasonal strata with 49% of all trips recorded in the winter months and 51% during the summer. The West saw a higher rate of summer fishing with 68% of angling trips taking place during this period and 32% during winter months.

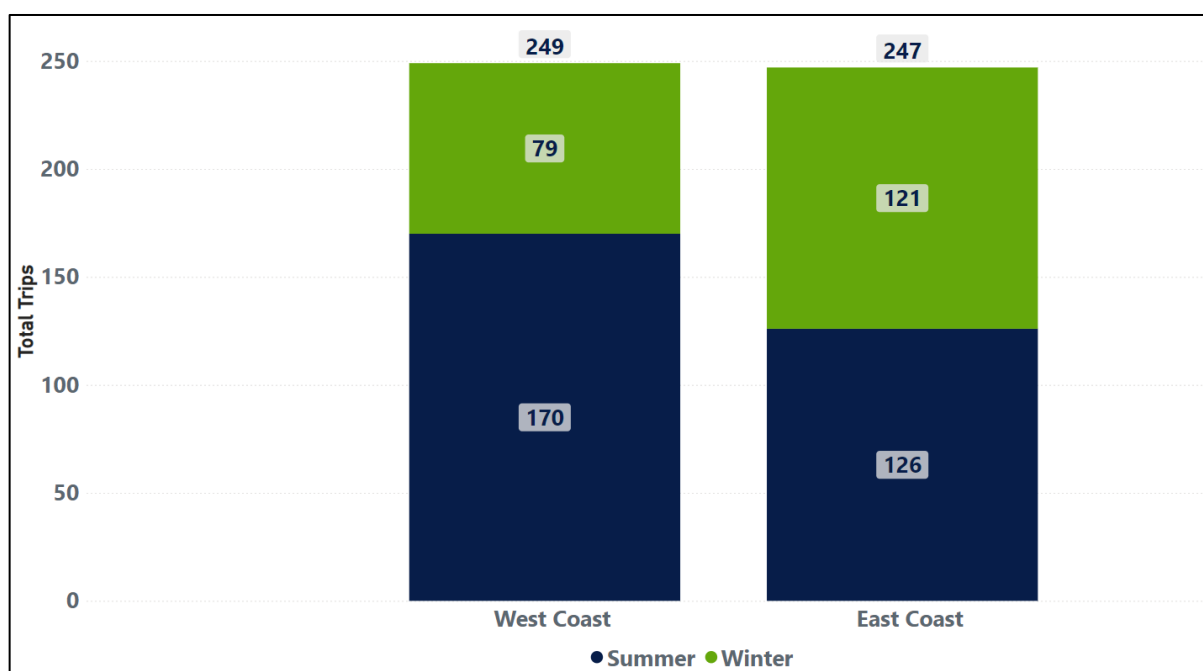


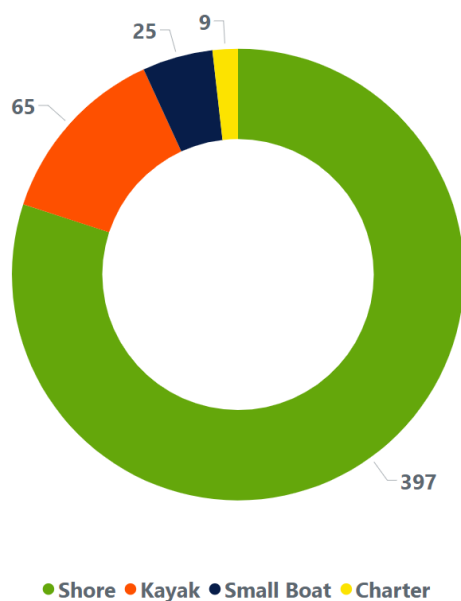
Fig. 13: All angling trips recorded by sampling strata on the IMREC angling diary 2023.

Number of angling trips by angling type

A total of 496 trips were recorded in 2023. 397 shore angling trips were recorded (Fig. 14). Of these, 66% logged at least one fish capture (Table 9). Of the 65 kayak trips, 95% of all trips resulted in fish being caught. Fish were caught in 96% of small boat trips and all charter trips.

Table 9: Percentage of successful angling trips by angling type

	Total	Fish Caught	No Fish Caught
Shore	397	66%	34%
Kayak	65	95%	5%
Small Boat	25	96%	4%
Charter	9	100%	-



Seasonal variations were noted for each fishing type by spatial strata: 24% of trips occurred in the East and 16% in the West during winter (Oct 1 - Mar 31). Shore angling dominated both regions. The East saw 21 kayak trips (4%) and the West 16 (3%). Only 6 charter trips and 4 small boat trips were recorded in the East, with none in the West (Fig. 15). Most small boat angling trips were recorded in the summer (1st April-31st Sept). Over 3% of all summer trips recorded were from small boats, with the East coast seeing 2.8% and the West coast 1.4% (Fig. 15).

Fig. 14: All angling trips recorded by angling type on the IMREC angling diary 2021-2022.

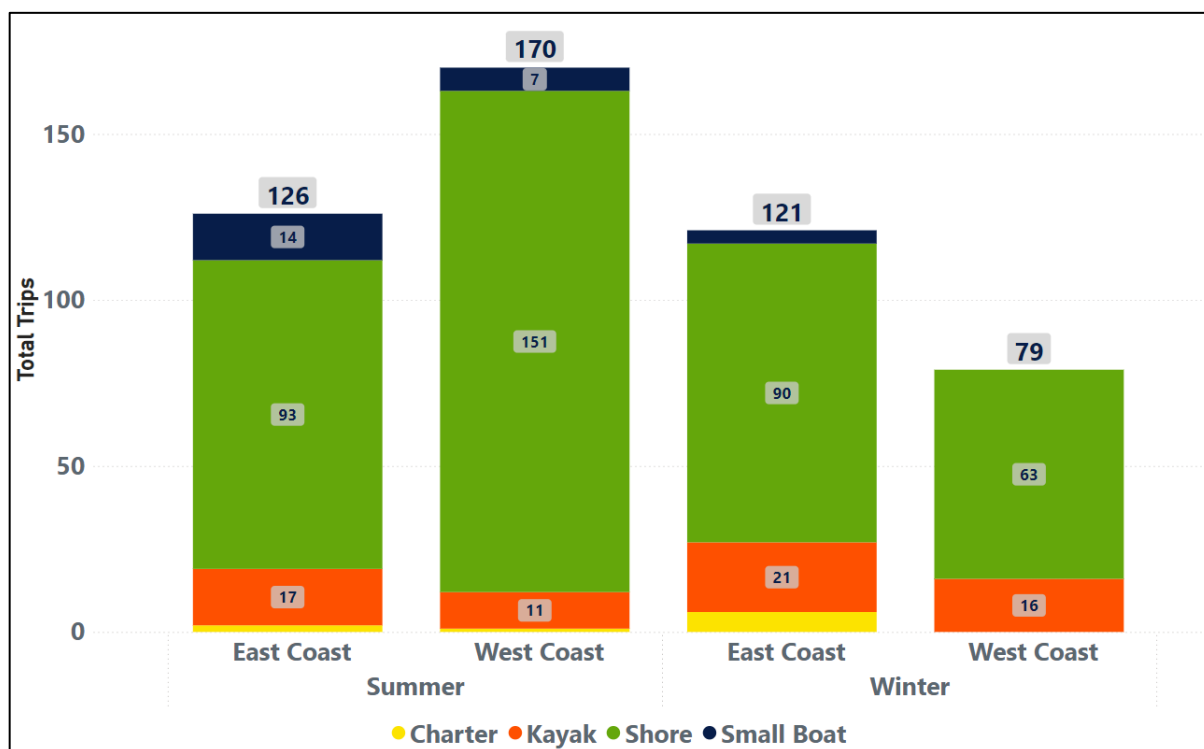


Fig 15: All angling trips recorded by angling type across regional and temporal strata on the IMREC angling diary 2023.

Species catch records (all angling types)

A total of 3,493 fish were caught across 57 species in 2023. Mackerel were the most commonly caught species, comprising 12.3% of all catches, closely followed by whiting and pollack with 12% and 11% of all catches respectively (Fig. 16). A high release rate (89%) was observed across all captures. Mackerel release rates were the lowest with 30% release rate. When mackerel catches are excluded, the release rate was 98%. All whiting, lesser spotted dogfish and 98% of pollack were caught and released. Although cod catches had a relatively low release rate (74%), overall catches were low (20 catch records). With the exception of European sea bass, (release rate 91%), all other species catches recorded in the diary had a release rate of greater than 99%.

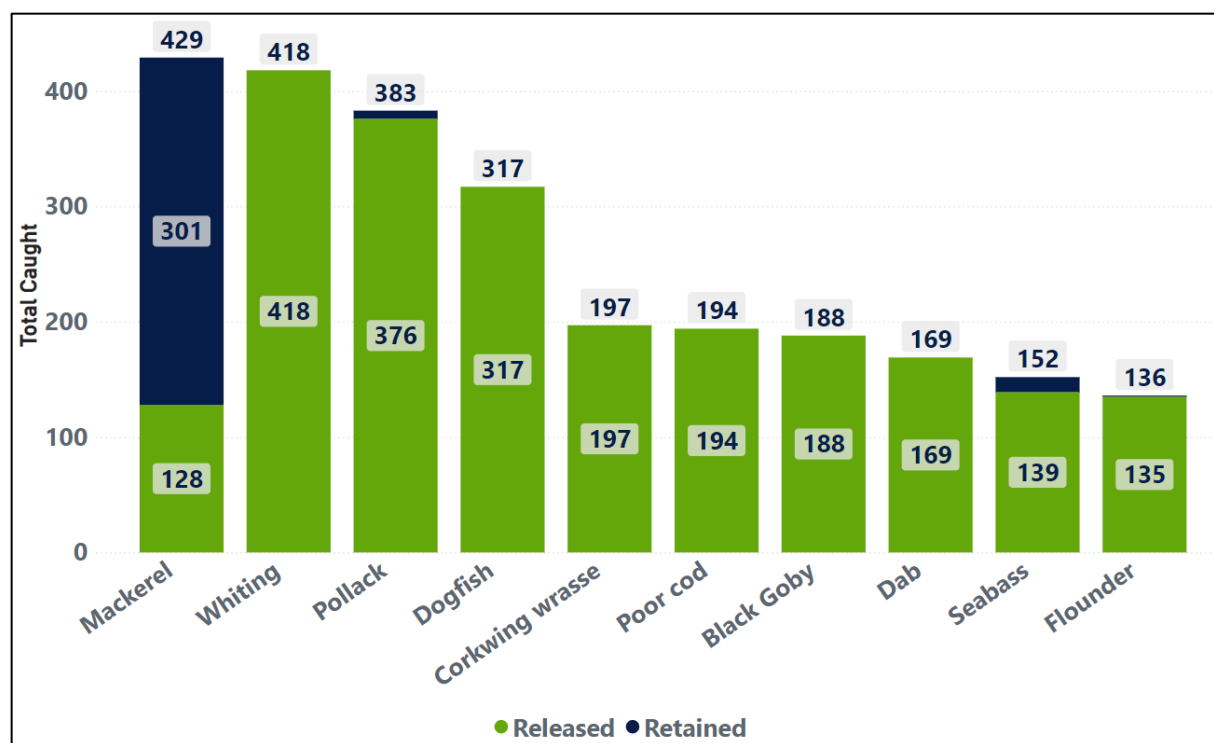


Fig 16: Top ten species catches (retained/released) recorded on the IMREC angling diary 2023.

Top 10 species by fishing type

Over 42% of mackerel catches were from small boats. Charter trips accounted 32.5% of whiting catches with kayak (31.3%), shore (21.8%) and small boat (14.4%) trips recording lower catch figures. Over 50% pollack catch records were from shore anglers (Fig. 17) Seabass

and flounder catch records were dominated by shore captures with 92.1% and 97.1% respectively. (>95%). (Fig. 17).

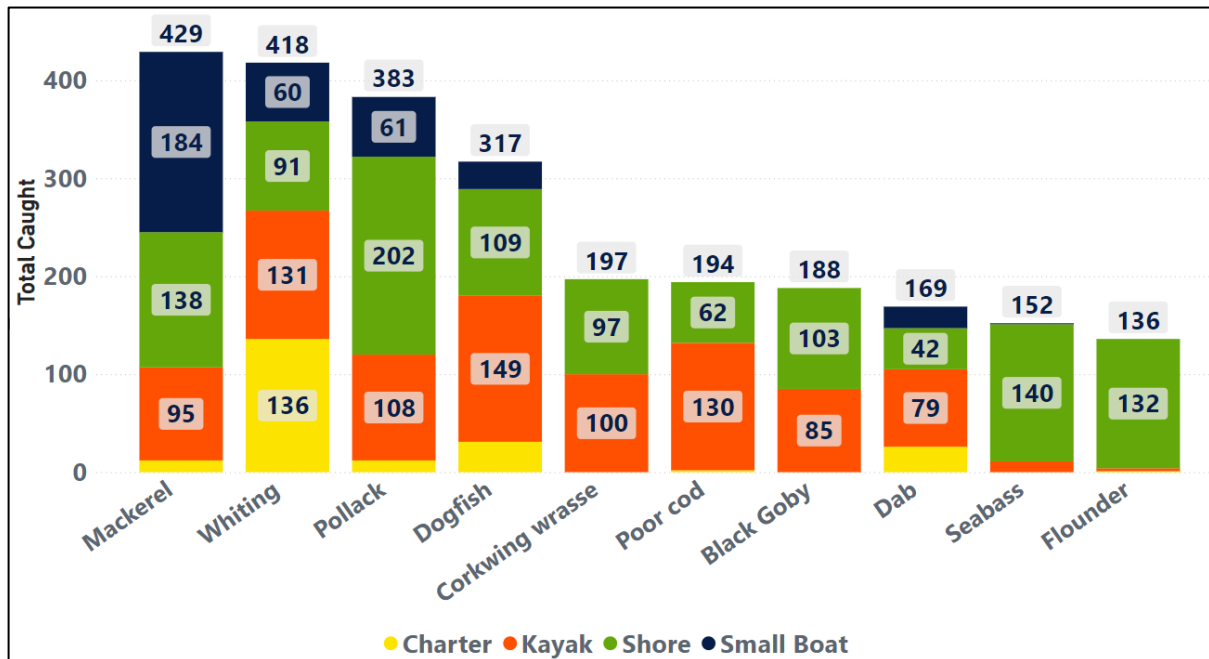


Fig 17: Top ten species catches by fishing type recorded on the IMREC angling diary 2023.

Species catch by strata

In total, 1,899 catches were recorded by anglers fishing on the east coast and 1,594 by those fishing on the west coast in 2023. Regarding the top 10 caught species only, 1,471 were caught along the east coast and 1,234 along the west coast (Table 1). Whiting catches were predominantly along the east coast with 351 captures (84%) compared to 67 (16%) for the West coast. 45% of Pollack catches were recorded along the east coast. A higher percentage of dogfish, poor cod, dab and sea bass catch records were along the east coast. The west coast anglers recorded more catches of corkwing wrasse (179, 91%), black goby (229, 63%) and flounder (81, 60%) (Table 10).

Angling trips were slightly more common in summer on the east coast (51%) and a lot more so on the west coast (68%). Mackerel catches were much higher in summer on both coasts (East, 89%; West, 95%). Seabass also saw predominantly summer catches (East, 76%; West, 97%). Conversely, species like Whiting and Poor Cod were more frequently caught in winter. Overall, 58% of fish catches on the east coast occurred in winter, while 58% of catches on the west coast occurred in summer (Table 10).

Table 10: Top ten species catches (no. of individual fish) by regional and temporal strata recorded on the IMREC angling diary in 2023.

	East		West		Total
	Summer	Winter	Summer	Winter	
Mackerel	211	26	183	9	429
Whiting	62	289	27	40	418
Pollack	58	114	118	93	383
Dogfish	110	87	67	53	317
Corkwing wrasse	3	15	92	87	197
Poor cod	4	115	19	56	194
Black Goby	12	57	49	70	188
Dab	68	58	24	19	169
Seabass	69	22	59	2	152
Flounder	18	37	30	51	136
Total	615	820	668	480	2583

Top 10 species per region and seasonal strata show the dominance of mackerel catches during the summer with whiting dominating winter East coast catches. Pollack and corkwing wrasse saw high catch rates in the west during winter months with coalfish and turbot also making top 10 species for this region/season. Other regional/seasonal differences between catches compared to the general top 10 species list in table 1 showed tope making an

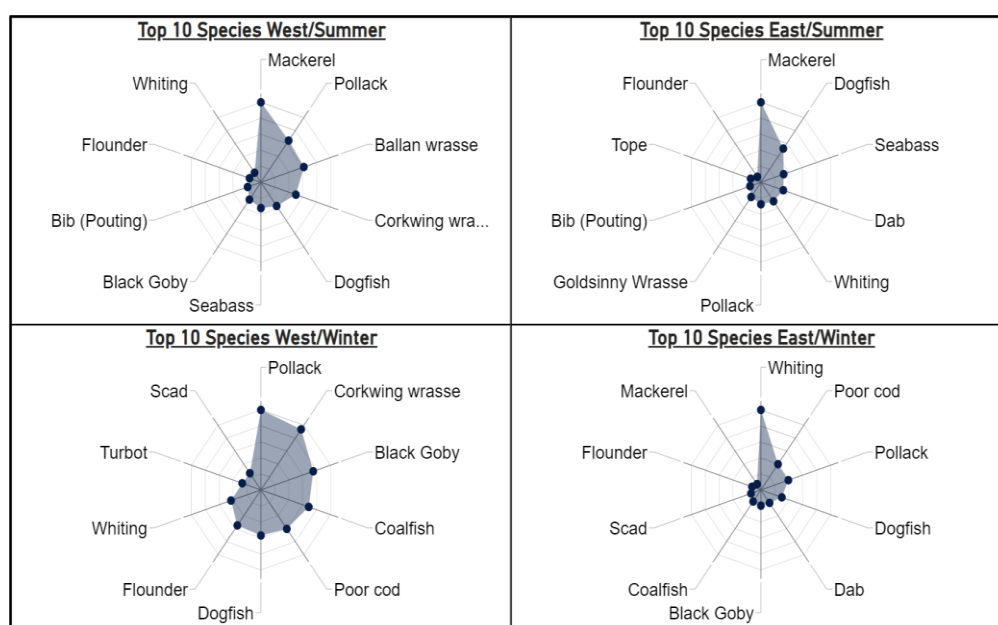


Fig. 18: Top 10 species across regional and temporal strata. Each point represents the total catch per species recorded on the IMREC angling diary in 2023. A point located near the outer edge indicates a high catch

appearance along the east coast in the summer months along with pouting and goldsinny wrasse. Coalfish and scad were other species that had relatively high catches along the east coast in the winter months. The west coast saw coalfish, turbot and scad make the top 10 for winter month catches (Fig. 18).

Catch per unit effort – shore angling

Overall CPUE for shore caught Pollack was 0.51 (Table 13) with a slightly lower CPUE along the east coast (0.43) than the west (0.57). The east coast saw a 97% release rate for pollack, leading to a higher CPUE figure of 0.42 compared to a retained CPUE of 0.01. This was also the case for the west coast with no pollack being retained (100% release rate) and a 0.57 CPUE figure for released pollack.

Seabass CPUE figures showed an overall CPUE of 0.45 with an east coast CPUE of 0.43 and a west coast CPUE of 0.29. Seabass also saw high release rates for east and west with 96% and 87% respectively.

Overall Mackerel CPUE was 0.35 with the west coast showing a higher CPUE (0.42) than the east (0.27). Release rates for mackerel showed a high release rate along the west coast (78%) compared to a much lower release rate along the east coast (35%).

Overall flounder CPUE was 0.33 with over 98% release rate for both east and west coasts. The west saw slightly higher CPUE for flounder (0.38) compared to the east (0.28). Ballan wrasse had an overall CPUE of 0.28 with a much higher CPUE along the west coast (0.50) than the east (0.02) with both coasts recording 100% release rates.

The remaining top 10 shore caught species saw 100% release rates on both coasts. Dogfish saw higher CPUE figures along the east coast with 0.37 compared to 0.19 in the west. Another species that had higher CPUE figures along the east coast was whiting with 0.38 compared to 0.10 in the west. Black goby (0.36) and corkwing wrasse (0.45) had higher CPUE along the west coast compared to the east coast and coalfish saw similar figures for both coasts (East, 0.19; West, 0.21).

Table 11: IMREC angling diary 2023: Retained/Released and combined CPUE of the 10 most commonly caught shore angling species along East/West coasts.

Species	Overall CPUE	East Coast CPUE			West Coast CPUE		
		Released	Retained	Combined	Released	Retained	Combined
Pollack	0.51	0.42	0.01	0.43	0.57	0	0.57
Seabass	0.35	0.42	0.02	0.43	0.25	0.04	0.29
Mackerel	0.35	0.09	0.17	0.27	0.32	0.05	0.42
Flounder	0.33	0.28	0	0.28	0.37	0.00	0.38
Ballan wrasse	0.28	0.02	0	0.02	0.50	0	0.50
Dogfish	0.27	0.37	0	0.37	0.19	0	0.19
Black Goby	0.26	0.14	0	0.14	0.36	0	0.36
Corkwing wrasse	0.24	0.01	0	0.01	0.45	0	0.45
Whiting	0.23	0.38	0	0.38	0.10	0	0.10
Coalfish	0.20	0.19	0	0.19	0.21	0	0.21

Catch release rates – shore angling

All top 5 shore-caught species had high release rates, with mackerel at the lowest (68%) and seabass next (93%), while the rest were 99% or above. (Fig.19).

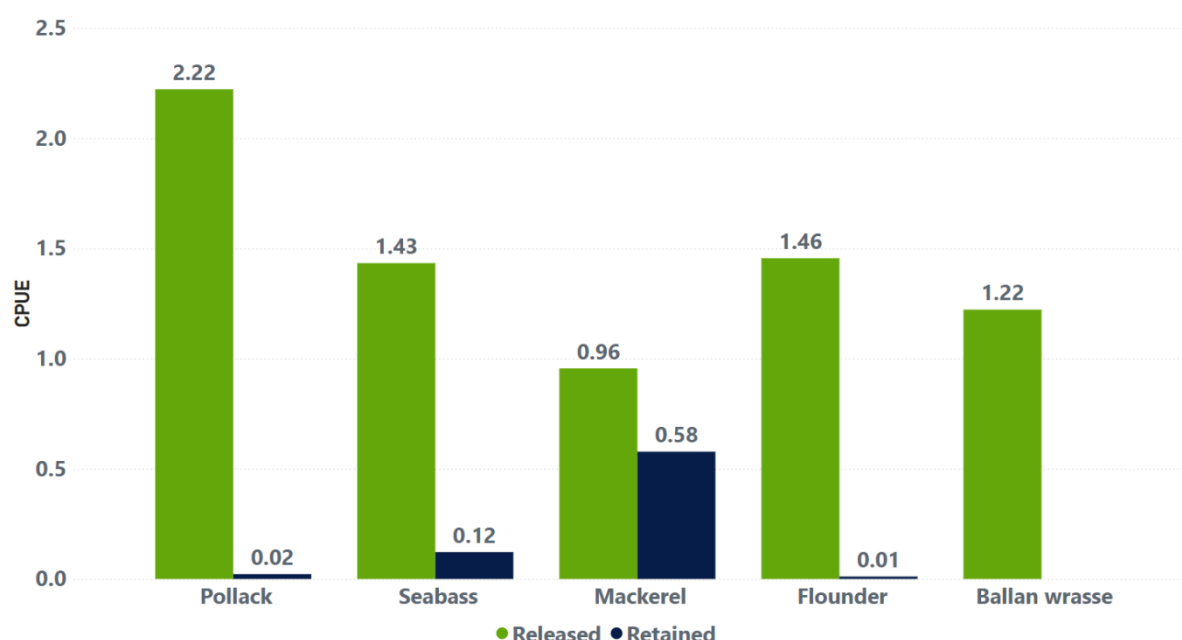


Fig. 19: Catch per unit effort (CPUE)) of the top 5 shore caught species recorded on the IMREC angling diary in 2023. Captures across strata combined.

Catch per unit effort across strata – small boat angling

Small boat CPUE focused on the top 10 species based on total caught during small boat fishing including catches recorded from kayaks, hereafter referred to as small boat catches (Table 12).

Small boat angling from the IMREC Diary saw high release rates (>98%) for 9 of the top 10 species with the exception of mackerel (Release rates: East, 13%; West, 19%). Similar CPUE figures could be seen along both coasts for mackerel with the east coast seeing CPUE figures of 3.14 and the west with 3.03. Overall whiting CPUE for small boats was 2.12 with the east coast (2.61) having a higher CPUE than the west (1.32). Dogfish had similar CPUE figures for both coasts (East, 1.91; West, 2.06). Overall Pollack CPUE was 1.88 with higher figures in the west (2.35) compared to the east (1.59). Poor cod also had similar CPUE figures for both coasts (East, 1.38; West, 1.56) with an overall CPUE of 1.44. Dab and goldsinny wrasse had overall CPUE figures of 1.12 and 0.58 respectively with CPUE for dab on the east coast being 1.61 and

goldsinny wrasse east coast figures being 0.86. Corkwing wrasse (2.44), black goby (1.24) and coalfish (0.68) all had higher CPUE figures along the west coast compared to the east, recording 0.30, 0.77 and 0.36 respectively.

Table 12: IMREC angling diary 2023: Release/Retained CPUE of the 10 most caught small boat & kayak angling species along East/West coasts.

Species	Overall CPUE	East Coast CPUE			West Coast CPUE		
		Released	Retained	Combined	Released	Retained	Combined
Mackerel	3.10	0.39	2.75	3.14	0.59	2.44	3.03
Whiting	2.12	2.61	0	2.61	1.32	0	1.32
Dogfish	1.97	1.91	0	1.91	2.06	0	2.06
Pollack	1.88	1.57	0.02	1.59	2.35	0	2.35
Poor cod	1.44	1.38	0	1.38	1.56	0	1.56
Dab	1.12	1.61	0	1.61	0.32	0	0.32
Corkwing wrasse	1.11	0.30	0	0.30	2.44	0	2.44
Black Goby	0.94	0.77	0	0.77	1.24	0	1.24
Goldsinny Wrasse	0.58	0.86	0	0.86	0.12	0	0.12
Coalfish	0.48	0.36	0	0.36	0.68	0	0.68

Catch per unit effort release rates – small boat angling

Like shore catch records, release rates were high across top 5 species with the exception of mackerel with a low release rate of 15%. All other species saw a 99% or above release rate. (Fig. 20).

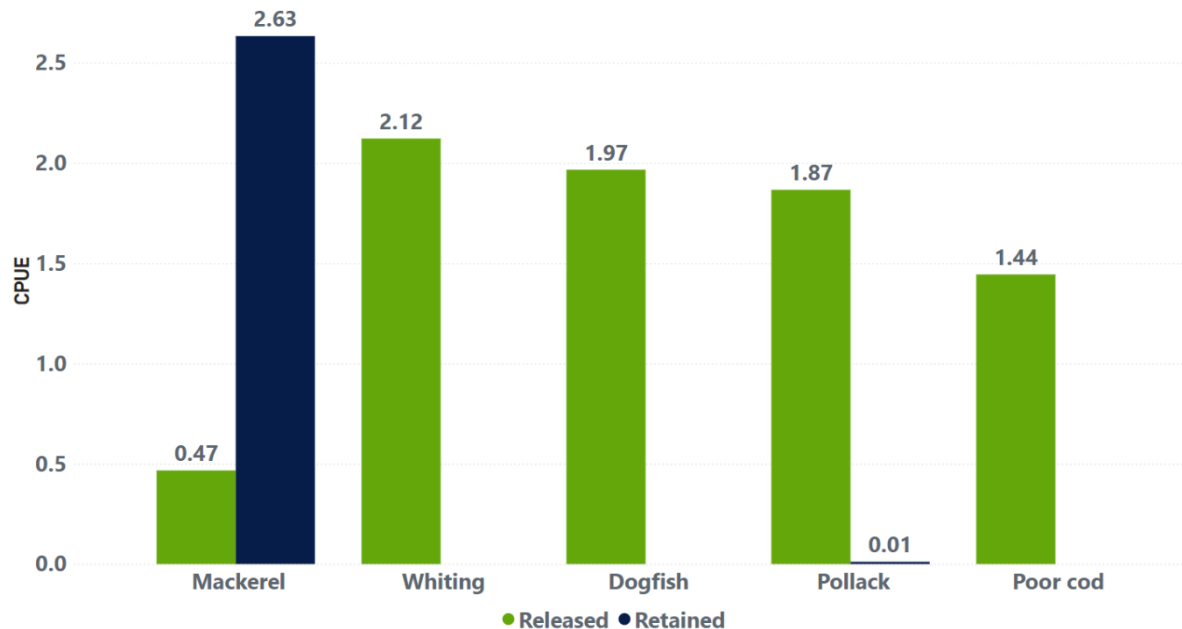


Fig. 20: Catch per unit effort (CPUE) of the top 5 small boat & kayak caught species recorded on the IMREC angling diary 2023. Captures across seasonal and regional strata combined.

3.3 Highly Migratory ICCAT Species

Under the Tuna CHART catch, tag and release programme, 390 Atlantic bluefin tuna (ABFT) (*Thunnus thynnus*) were caught on rod and line, measured (in the water) and released in 2023 (MacLeod et al., 2024). All measured Atlantic bluefin tuna were released alive. Of these 381 ABFT were tagged. The total estimated tonnage of ABFT based on measured fish was 45.9 tonnes. The weight of each individual ABFT was estimated based on a calculation by Lombardo et al. (2019) and summed.

No records of catches of Albacore Tuna were recorded over the course of this pilot study. However, there is some evidence of a limited fishery where a small number of charter vessels (<5) in the southwest occasionally target Albacore Tuna when weather conditions are calm. Exploitation levels are limited. Overall, harvest rates are assumed to be insignificant.

3.4 Socio-economic angling data

A total of 597 people were interviewed for the IMREC sea angler socio-economic survey, over a period of four years (2020-2023). Over 85% of interviews were with shore anglers (n=515) and the remainder were with small boat anglers (n=82). Most anglers interviewed self-identified as somewhat experienced (46%). The remainder identified themselves as either novices (24%) or very experienced (29%) (Fig. 21). Most interviews (505 (85%)) were conducted during the summer and the remaining 92 were during the winter season. Interviews were also collated regionally and 388 (65%) of the interviews were in the conducted Eastern region, while 209 interviews (35%) were in the Western region.

Anglers interviewed during the onsite surveys over the sampling years 2020 to 2023 spent an average of €45(±3s.e) per day related to their fishing trip (Table 13). The average daily spend was quite consistent between years, rising a small amount from €38 in 2020 to €49 in 2023 (Table 13). There was a greater variation in estimated annual spend on fishing gear between

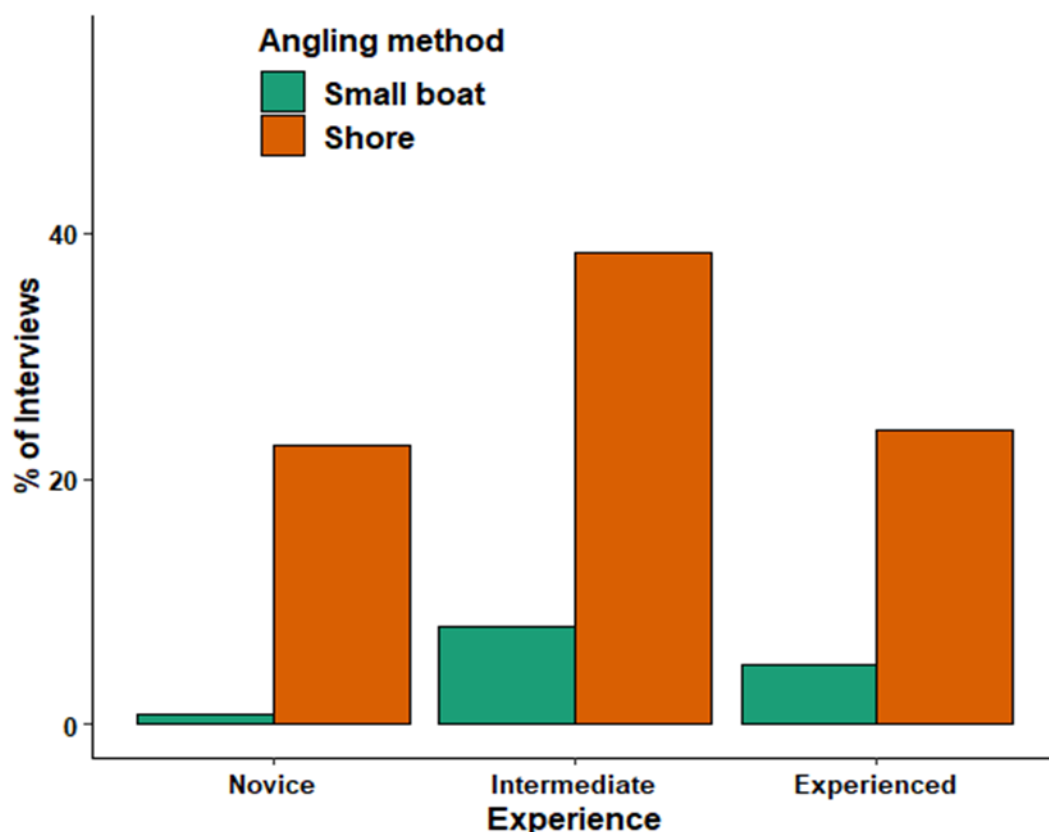


Fig. 21: Proportion of shore and small boat anglers by experience level interviewed during the IMREC on-site survey programme (2020-2023).

Table 13: Average spend of sea anglers interviewed during the onsite survey programme of Irish marine recreational anglers.

Sampling year	Number of interviews	Mean daily spend € ($\pm$ s.e)	Mean annual angling gear spend € ($\pm$ s.e)
2020	168	38 (5)	441 (50)
2021	143	46 (7)	747 (184)
2022	166	49 (7)	938 (187)
2023	120	49 (8)	806 (155)
Years combined	597	45 (3)	719 (76)

sampling years. The average spend over the four sampling years was €719 ($\pm$ 76) per annum. Spending by year ranged from €441 ($\pm$ 50s.e) in 2020 to €938 ($\pm$ 187s.e) in 2023 (Table 13). Unsurprisingly, small boat anglers spent more on average than shore anglers, for both daily spend (€75 compared to €40 respectively) and annual spend (€1200 compared to €649 respectively). However, small boat spend data was highly variable and the number of interviews was low compared to the shore spend data.

Although experienced anglers spent more (€49, s.e $\pm$ 6), on average during a fishing trip day than self-proclaimed novice (€39, s.e $\pm$ 8) and intermediate anglers (€45, s.e $\pm$ 4), differences between the groups were small (Fig. 22). On the other hand, experienced anglers spent a lot more annually (€1340, s.e $\pm$ 212) on average than less experienced anglers (intermediate annual spend; €597, s.e $\pm$ 87, novice annual spend; €155, s.e $\pm$ 18). This result was highly variable and was driven by a small number of experienced anglers who had recently purchased large, expensive items, such as boats (Fig. 23).

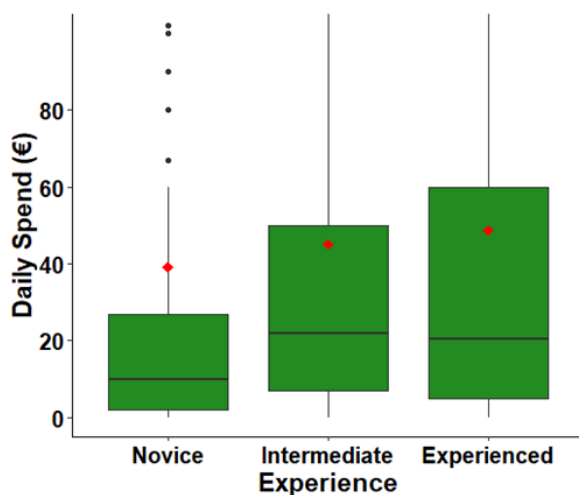


Fig 22: Daily fishing trip spend by experience level among anglers interviewed during the IMREC fishing survey programme. The box plots show the median (horizontal line in boxes), the mean (red dot), the interquartile range, the 5th and 95th percentiles and outliers.

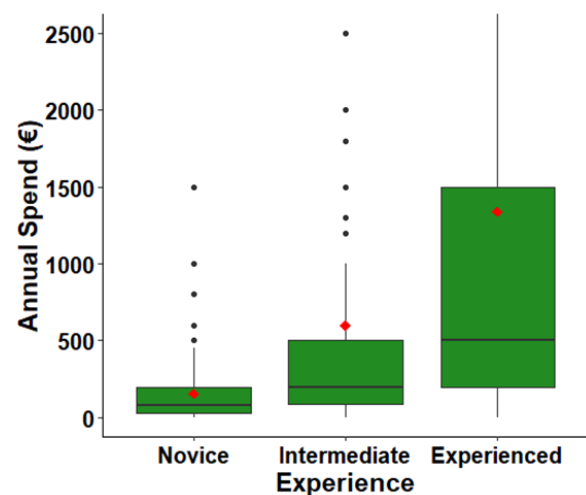


Fig 23: Annual spend by experience level among anglers interviewed during the IMREC fishing survey programme. The box plots show the median (horizontal line in boxes), the mean (red dot), the interquartile range, the 5th and 95th percentiles and outliers.

Total annual spend

According to the onsite survey data and previously collated angling effort data (Ryan et al. 2022) combined, it is estimated that recreational sea anglers in Ireland spend a total of €164 million on their daily angling trips, per annum. This includes travel to and from venue, bait and terminal tackle, food and snacks and slip access fees.

It was estimated that small boat anglers (€124 million $\pm$ se 59) spend more overall than shore anglers (€41 million $\pm$ se 21), although these estimates are imprecise (Fig. 24), mainly due to the uncertainty, around Irish angling effort estimates. Total annual spend on angling, for items such as, rod and reels or boats and engines, was estimated to be 337 million euros. Those anglers participating in small boat angling (€243 million $\pm$ se 93) spent more in total per annum than shore anglers (€95 million $\pm$ se 25). These estimates were also imprecise (Fig. 25).

The data presented is a summary of some key results. Additional analyses and reporting will be undertaken in due course.

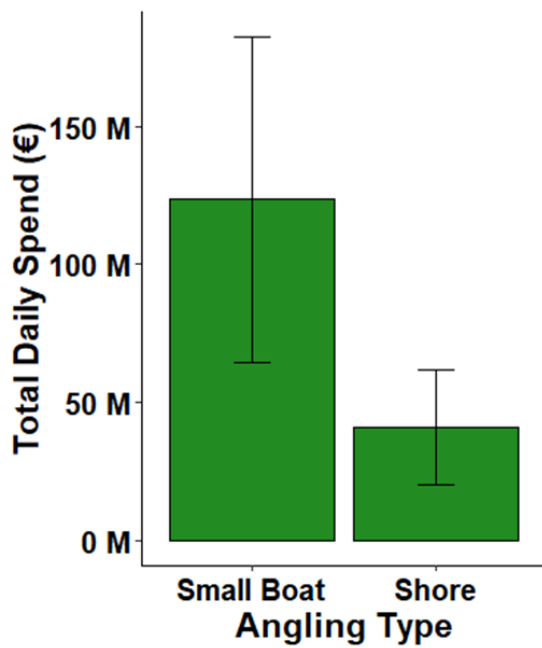


Fig 24: Total Daily fishing trip spend per year by shore and small boat anglers interviewed during the IMREC fishing survey programme. Error bars denote standard error.

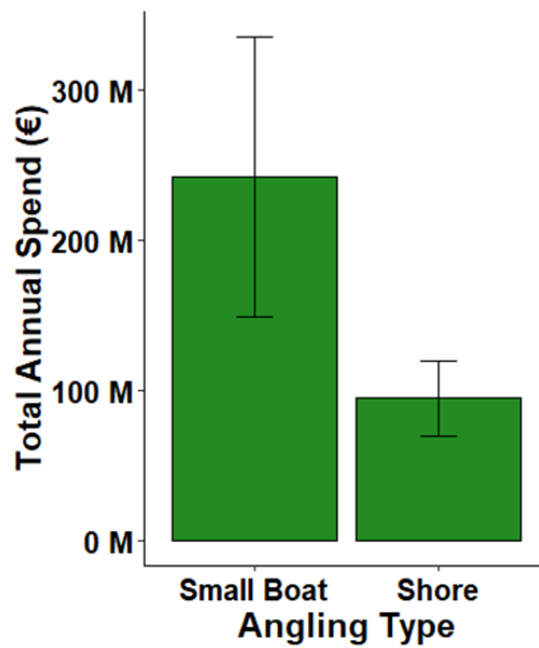


Fig 25: Total average annual spend on sea angling by shore and small boat anglers interviewed during the IMREC fishing survey programme. Error bars denote standard error.

4. Discussion

This report provides MRF catch estimates around Ireland in 2023, using sampling programmes developed and refined during a pilot study which ran from 2019-2021 (Ryan et al. 2022). It complements the survey work carried out in 2022, which focused on small boat and shore angling recreational fisheries along the eastern half of the country (Ryan et al. 2023). Achievements and some limitations of the sampling programmes (largely due to lack of resources) are discussed below.

On-site surveys 2023 overview

Shore angling catches

All on-site creel surveys took place along the western region. Surveyors conducted 114 interviews with shore anglers during their sea angling trips. Interview refusals were low, indicating that anglers are willing to engage with survey programmes. Like the east coast, mackerel and pollack were the most caught and retained species (Ryan et al. 2023). However, catch rates for both were noticeably higher, where CPUE for retained mackerel was 0.17 on the east coast and 1.3 on the west coast. Similarly, retained pollack CPUE was 0.06 on the east coast and 0.26 on the west coast. This indicates both increased abundance of these popular angling species and that more anglers target these species on the west coast. It is noteworthy that whiting was a common caught and released species on the east coast (Ryan et al. 2023) but no whiting catches were recorded during the 2023 shore surveys along the west coast. Lesser spotted dogfish were caught and released at the same rate, regardless of angling region (CPUE 0.06), indicating that this species is present at similar densities throughout the Irish coast. Like the east coast, most European sea bass caught by shore anglers along the west coast are released (>80%), even though catch rates are lower (0.02 CUPE compared to 0.08 CPUE on the east coast) (Ryan et al. 2023).

Small boat angling catches

Despite intensive sampling, interview records during the small boat surveys along the west coast were extremely low, as observed in previous years, and remain too low to make confident catch estimates. Only 6 anglers were intercepted as they completed their small boat fishing trips. Only two species (mackerel and pollack) were reported. As catches for these anglers were high, estimated CPUEs for these species were equally high. A much larger sample size is likely to provide a more realistic picture of the variability of the small boat recreational angling fishery on the west coast. Capturing accurate small boat angler participation and angling effort data remain a priority for the IMREC programme and surveys to determine same will be undertaken when the opportunities arise.

Although results are likely inaccurate for small boat angling, the high number of released pollack is noteworthy. Currently, knowledge of the level of post release mortality of pollack is limited. To best assess pollack removal through recreational angling, it would be important to quantify the probability of survival of released pollack as identified by a recent ICES workshop on recreational fisheries (ICES 2024).

Charter vessel catches

The rate of onboard charter sampling effort was once again low for the east coast region compared to the west coast. Currently the east coast catches are heavily weighted to account for small sample sizes. This is likely to bias the estimates as the relatively small sample size is unlikely to be a true reflection of the variability of charter angling along the east coast. A new cohort of charter skippers has been recruited to take part in the onboard charter sampling programme in 2024. Sampling on additional boats in the East Region should account for this potential bias in the future.

As with 2021 and 2022, pollack were by far the most common harvest, by weight in the charter fishery in Ireland in 2023. Total removals were similar between sampling years (102 t in 2022 compared to 123 tonnes in 2023), indicating that charter pollack catches may be quite consistent between years. Ongoing sampling will monitor trends over time.

Current estimates of total charter catch assume the charter fleet comprises 99 active vessels. Expert opinions from within the sector suggest this number may be overestimated. However, until further data are gathered, it is prudent to include the maximum potential effort (i.e., all probable vessel activity) in estimating recreational catches. Ongoing consultations with stakeholders by IFI are positive and should result in a more precise sampling frame.

Diary reported catches versus creel survey data

Anglers who contribute to citizen science programmes (for this report, IMREC angler catch diaries), are more likely to be experienced anglers who tend to have different preferences to the general angling population (Fisher, 1997), which includes targeting more specialist species such as European sea bass (Grilli et al., 2018). For example, a far larger proportion of non-zero catch diary reports include European sea bass catches than creel surveys. Likewise, mackerel, a generalist angler species, was included in many more non-zero catch creel angler catch records than diarists. Also, release rates of pollack catches are far higher among diarists compared to creel survey interviewees and the rate of zero catch trips is far higher among the creel survey interviewees. These observations suggest a distinction in angling preferences between diarists and creel anglers. Although the diary programme has proven to be a good tool to collect data, as highlighted by the number of trips records, it is likely that some bias is present which must be characterised before it is used to assess MRF harvest in Ireland. These

discrepancies between the data collection methods must be understood. If CPUE estimates depend on self-selecting diarist anglers, who do not report all zero-catch shore angling trips, there is a risk that total harvests will be overestimated, and unnecessary legislation will be implemented. Although advocates of the precautionary principle may view this positively, trust between fisheries managers and their main stakeholders is vital to ensure an effectively administered fishery (Turner et al., 2016).

Concluding remarks

Since the initiation of the IMREC program in 2019, considerable insights have been gained about Ireland's MRF sector. From a low baseline, in terms of catch statistics, considerable advances in data and data quality have been made and continue to be made annually. While the shore and charter angling catch data are relatively refined, accurate small boat catch estimates remain elusive due to the considerable challenges posed in relation to sampling this sector. Continual refinements of data streams in this sector are being pursued and it is likely that these will aid in reducing the error in small boat catch estimates within the recreational angling sector.

The IMREC programme's diary collects extensive catch data across various times and regions, supplementing the on-site survey program. Despite potential sampling biases, the diary promotes angler engagement and education, with ongoing refinements and increased participation expected to enhance data quality. Combining diary data with probability-based on-site surveys, which capture information from occasional anglers, helps fill knowledge gaps and assess biases. Addressing these biases can demonstrate the IMREC diary's value in collecting year-round data efficiently, while on-site surveys continue validating diary data and engaging stakeholders.

Recreational catch data from the programme is beginning to be considered for incorporation into species-specific stock assessments at customer level (e.g. ICES) and all IMREC refinements will assist in improving understanding of overall exploitation and contextualise recreational angling vis-à-vis commercial fishing for the relevant species.

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