Online Behaviour and Attitudes Survey of Irish Sea Anglers

Irish Marine Recreational Angling Survey (IMREC)

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1. Summary

In July 2020 an online behaviour and attitudes (B & A) survey of sea angling in Ireland was carried by Inland Fisheries Ireland as one element of a larger project - the Irish Marine Recreational Angling Survey (IMREC) (<u>https://www.fisheriesireland.ie/what-we-do/research/marine-recreational-fishery-in-ireland-mrec</u>). The online questionnaire was developed to collect general information on angler demographics, behaviours and opinions and, specific information on the three major angling types in Ireland, namely shore, small boat and charter boat angling. For each of the three categories, respondents were asked a broad range of questions concerning their angling behaviour including angling effort, angling locations, tackle used and attitudes towards catch and release.

Over 1,200 sea anglers responded to the survey. The majority of respondents were shore anglers. The response level was unexpectedly high, possibly due to Ireland being in a COVID-19 related national lockdown in operation when the survey was initiated. Respondents were self-selecting and therefore likely to be from the cohort of more avid anglers in Ireland (Hyder et al., 2020; Lewin et al., 2021). A comparison between annual angling effort (fishing trips per year) from this survey and results from a random national omnibus phone survey confirmed that the online respondents were on average more avid anglers than a random sample of the general population. Nonetheless, the B&A survey provided previously lacking data relating to when, where and how anglers fish, specific to the three main angling types. Key data on percentage participation rates in each element of the angling fishery were also obtained. Not only did the survey provide a much clearer overview of sea angling in Ireland today, but the data were immediately integrated into the larger IMREC project sampling methodology to increase sampling efficiency for estimating recreational angler catch rates.

2. Introduction

The legal framework for the collection of recreational fisheries data by EU Member States was given by the EU Data Collection Framework (Council Regulation EU 1004/2017 and Commission Decision EU 1251/2016). This directs Ireland to report, for marine recreational fisheries, annual volume (numbers and weights or length) of catches and releases for sea bass, cod, pollack, elasmobranchs and highly migratory ICCAT species. 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. IFI initiated the Irish Marine Recreational Angling Survey (IMREC) programme in October 2019. For all Member States, including Ireland, this survey shall allow for the assessment of the share of catches from recreational fisheries in relation to commercial catches for all species in particular marine regions. IMREC comprises of several survey elements (**Fig. 1**), each of which contributes to the main goal of estimating angling effort and catch rates across

sea angling in Ireland. The online behaviour and attitudes (B&A) survey presented here comprises one survey element of IMREC.

Ireland has a wide range of sea angling opportunities around its 5,600 kilometre coastline. Various habitats including sandy beaches, steep-to shingle beaches, estuaries and rock outcrops offer mixed shore angling potential. Mixed coastal habitats including reefs, depositing banks and deeper troughs provide boat angling opportunities. Despite various socio-economic surveys being conducted across the entire angling sector limited data has been collected on actual numbers or catch success of sea anglers in Ireland. Although some studies have been carried out in the past to estimate participation rates in recreational angling among the Irish population and its contribution to the economy, these studies did not have the resolution to examine sea angling specifically (Curtis and Grilli, 2019). The information collected through IMREC aims to provide a specific estimate of sea angling participation rates, multi-species angling effort and catch success for the first time.

Three components make up the vast majority of sea angling in Ireland - shore, small boat and charter boat angling (hereafter referred to as angling type). However, little was known about how prevalent these angling types are. To investigate this, in mid-2020 the IMREC team developed and conducted an extensive national online survey to collect a range of information concerning the behaviour and attitudes of the sea angling community in Ireland. As well as facilitating sea anglers to express their opinions regarding the current state of sea angling in Ireland, it was designed to characterize sea angling activity across the three major angling types in Ireland. The questionnaire was created in consultation with a Steering Group made up of stakeholders from sea angling including anglers and charter skippers, Inland Fisheries Ireland, Marine Institute and a representative from the environmental pillar.



Fig. 1: Schematic illustrating how the survey components of the Irish Marine Recreational Angling Survey (IMREC) will meet the requirements of the DCF and how the B&A survey of Irish anglers will assist in this.

Marine recreational fishing (MRF) catch has been studied using a wide variety of methods worldwide. The most scientifically robust techniques depend on probability based surveys where total numbers of fish caught and released can be estimated (ICES, 2015). These methods can be costly, especially in countries such as Ireland where there is no register of active sea anglers. This means that at least two surveys must take place. Firstly, a survey to estimate the total number of sea anglers in the population and how often they fish and secondly, a survey to estimate how many fish these anglers catch, and how many they catch & release. The first typically requires a random sample of the whole population through a phone questionnaire survey (**Fig. 1**). Sample size must be adequate to reduce sampling error to an acceptable level. The second involves on-site data collection at randomly chosen sites which could be anywhere around the coast where sea angling can take place (**Fig. 1**).

Ultimately, the IMREC survey aims to estimate harvest rates of marine species through MRF. Similar studies from around Europe have found that release rates of highly sought after species like cod, under certain conditions, can be as high as 60% (Ferter et al., 2013).Therefore it is important to also assess species specific release rates of popular angling species in the Irish context.

The aim of this B&A survey was to collect information on a wide range of angler behaviours and catch preferences at a regional level which can be incorporated into the random-stratified survey of marine recreational fisheries in Ireland. It will contribute to estimating angling effort and catch rates around the Irish coast. This report presents an overview of the key results and conclusions from the B&A survey. Responses by anglers to the 58 survey questions will be retained to support any further analysis.

3. Methods

The B&A survey, comprising 58 questions, mainly categorical, was designed using the online platform Survey Monkey[®] (www.surveymonkey.com) (Appendix 1). The survey opened with general questions to allow for grouping according to angling experience, age, gender, club membership and perception of change in angling quality. Respondents were also asked to identify the most important challenges facing sea angling today. Next, the angling type-specific behaviour questions were introduced. These were carefully designed to inform final sampling design for the onsite creel surveys (shore & private boat) and the charter skipper diary-based survey in order to increase sampling efficiency (Jones and Pollock, 2012; Pollock et al., 1997). The survey categorised respondents into angling type (shore, private boat or charter angling), before requesting information on their preferred angling location (at ICES sub-division spatial resolution) (**Fig. 2**), monthly effort, within week/within day angling preference, among others. If a respondent participated in more than one angling type, they were requested to answer a number of questions specific to each one. To develop an overview on relative harvest rates for specific species across the three angling types, all

respondents were asked which species they caught most often and how often they retain a selection of species. This will be compared to European data where possible. The survey finished with socio-economic questions relating to annual spend and travel.

The IMREC B&A survey was publicised to sea anglers through a dedicated web page (https://www.fisheriesireland.ie/what-we-do/research/marine-recreational-fishery-inireland-mrec). This contained information about survey rationale and goals and provided links to the online survey. It was also posted on the IFI angling website https://fishinginireland.info/ and its social media accounts on Facebook and Twitter and emailed to over 10,000 subscribers of the Irish Angling Update weekly e-zine. A press release was issued to regional newspapers and other local media outlets. An incentive was offered to potential survey respondents in the form of fishing tackle vouchers for three participants (1 x €200 and 2 x €100); the respondents were chosen as prize winners at random once data collection was complete. IMREC flyers were distributed at angling shows and at angling venues to publicise the goals of the overall survey.

All survey responses were reviewed in preparation for analysis. Incomplete responses were removed and any responses originating from the same IP address were interrogated to ensure that false data were not used. All remaining data were used to prepare simple summary statistics. Reported in sequence below are (a) respondent demographics (b) angling behaviour for each of the angling types and (c) socio-economic data.



Fig. 2: Ireland's location in a European and ICES subdivision context.

As respondents were self-selecting there was a risk of selection bias. Avidity bias was expected as it is enthusiastic anglers who tend engage with angling press and related social

media and were more likely to be aware of the survey than those who go fishing occasionally. These surveys are most informative when examining relative trends such as when and where anglers fish, rather than absolute numbers (Armstrong et al., 2013). For this reason, even though information on hours per day and days per month spent fishing are presented in this report, these data should be treated with caution.

Independently, as part of the IMREC project a random population-wide sea angling survey (**Fig. 1**), using a telephone omnibus approach (referred to as the phone survey hereafter), was undertaken, to estimate sea angling effort. The contracted survey service provider asked each respondent if they considered themselves to be a recreational sea angler, even if they only fish in the sea, either from the shore or in a boat in Ireland, on the odd occasion. If they responded 'Yes' they were asked if they participated in any of the three types of angling: Shore, small boat or charter angling and if so, how often during a typical year. Angling trip frequency by angling type was selected by respondents from a ranges of values. This output was compared with B&A online survey data to determine bias inherent in such online surveys. Simple comparisons between both surveys are made because it is not possible to confirm that they are independent of one another, which is a basic assumption of most statistical tests of significance.

4. Results

4.1. Demographics of sea anglers in Ireland

4.1.1. Characterisation of respondents to B&A online survey

A total of 1211 sea anglers completed the online B&A survey. 4% were female. This is consistent with the phone survey which found that 3% of respondents were female. There was a wide age distribution across the angling population according to the B&A survey. The largest group was in the 35-44 cohort in both the online and phone survey (Table 1). If the two youngest groups are combined (16-34), the respondents of the online and phone surveys make up 35% and 30% of all respondents respectively. However, the groups older are clearly age underrepresented in the online survey (Table 1).

Table 1: Breakdown of respondents to the online
B&A and the random omnibus surveys by age.

, , , ,				
	Online B&A Survey		Phone Survey*	
Age	Number	Percent	Number	Percent
Group	of	(%)	of	(%)
	anglers		anglers	
16-24	138	11	56	16
25-34	291	24	47	14
35-44	317	26	81	23
45-54	252	21	64	18
55-64	156	13	50	15
65plus	54	5	48	14
TOTALS	1208	100	346	100

*The data presented as the omnibus survey is from a representative sample (n=346) of the Irish population who responded yes when asked if they considered themselves to be a recreational sea angler.

Less than 2% of respondents were not resident in Ireland. Over 80% of respondents said that they were not currently a member of a sea angling club. Discussions with representatives of

sea angling clubs in Ireland confirmed that this proportion probably aligned with the Irish angling population. When asked about their angling experience, 20% of respondents classified



themselves as novices, while 53% and 26% classified themselves and somewhat or very

Angling quality has: 🗌 Improved 📱 Stayed the same 📱 Gotten worse

Fig. 3: Age specific response when respondents to the online B&A survey were asked how they felt angling quality has changed over their angling 'career'.

experienced, respectively. The remaining respondents preferred not to say. Not surprisingly, the perception that angling quality has declined over the years was correlated with the age of the respondent (**Fig. 3**), as it is likely that older anglers have been fishing for longer and so they have observed change over a longer timeframe.

Most respondents lived in the coastal counties, with the highest proportion from Dublin. Small numbers were scattered throughout the midland counties (**Fig. 4**). When respondents were asked to rank in order of importance the three most important issues facing Irish sea angling, they were most concerned with commercial fishing (**Fig. 5**). Nearly 45% of anglers felt that the lack of Marine Protected Areas (MPAs) around the Irish coast was also an important issue. When respondents were asked what types of sea angling they engage in, 85% classified themselves as shore anglers. Of this cohort 41% shore fished only (**Fig. 6**). 38% and 34% of respondents confirmed that they fish from a private boat and a charter boat, respectively. However, a very small percentage of these fished only from a private boat (7%) or charter boat (3%) (**Fig. 6**). In comparison, phone survey respondents comprised 75% shore anglers, and 55% and 28% private boat and charter boat and charter boat anglers.



Fig. 4: Spread of respondents to the online B&A survey by county.



Fig. 5: Responses when anglers (n=1211) were asked what they felt were most important issues facing angling today Issues affecting sea angling today.



Fig. 6: Venn diagram illustrating the breakdown of fishing types which respondents (n=1211) to the online survey purported to take part in.

4.1.2. Where Anglers Fish

Over 40% of respondents reported that they live in coastal counties along the east and south-east of the country (Louth to Waterford). As expected, this region (ICES subdivision VIIa) was reported as the most common area to fish for both shore (35%) and private boat (32%) fishing (**Fig. 7**). The west coast of the country (ICES subdivision VIIb/Clare to Sligo) was a slightly more common region for

charter boat angling activity than the Louth to Waterford coast (26% to 24%). This is likely because charter fishing opportunities are superior along the west coast and anglers will travel to a venue because charter angling trips are usually planned in advance.



Fig. 7: Percent response when all anglers were asked in what region of the country they usually fish.

4.2. Angler Behavior

4.2.1. Angling effort

Shore anglers who responded to the B&A online survey reported going fishing on average 53 times per year while private boat and charter anglers reported 29 and 11 sessions per year respectively. There was a large disparity between these values and average annual effort from the phone survey. Shore anglers who responded to the B&A survey went fishing more than four times more often per year than respondents to the phone survey (**Fig. 8**). The situation is similar for private boat angling (2.5 times as many) and charter angling (5 times as many).



Fig. 8: Average number of times respondents to the online B&A survey (self-selecting) and the phone omnibus survey (random) reported going fishing per year, for each angling type.

These results highlight a large bias within the B&A survey most likely due to avid anglers selfselecting to respond. Therefore, absolute angling effort values from the B&A survey must be treated with extreme caution. As angling effort data were recorded at a monthly resolution for the online survey, it is appropriate to examine relative trends in angling effort between quarters (Armstrong et al., 2013). B&A survey data showed that 65% of all shore angling trips took place between April and September. This was higher for private boat and charter anglers where 79% of all trips occurred (**Fig. 9**). This information can be integrated into the sampling frames of the onsite angler surveys to increase sampling efficiency and precision.



Fig. 9: Proportion of annual fishing trips across quarters for each angling type as reported by respondents to the online B&A survey of Irish sea angling.

4.2.2. Preferred angling days/times

To increase sampling efficiency and precision, it is also important to consider what times of the day and week are the most popular times for fishing among Irish sea anglers. The B&A survey found that weekends were particularly popular with charter anglers who reported that 70% of their fishing took place over the weekend. Likewise, shore and private boat anglers reported that 59% and 60% of their angling took place on the weekend (Friday evening to Sunday evening), respectively. (**Fig. 10**). The survey also asked respondents who fished from the shore or a small boat which time of day, if any, they preferred to fish. Anglers could select more than one option. Evening angling was the most popular time for shore fishing (45%). However, 32% said they had no preference which was the second most popular response. The afternoon was the least popular time by far for shore anglers (**Fig. 11**). On the other hand, most private boat anglers preferred fishing in the morning (43%). As observed for shore anglers, a large proportion (37%) of private boat anglers had no preference. Choices for charter angling times are usually limited to half day, full day or short evening sessions. The vast majority of charter anglers (87%) reported that they preferred to book a full day charter where possible.







Fig. 11: How anglers responded when they were asked their preferred times of day for angling. Respondents could select more than one option.

4.2.3. Preferred angling venues and techniques

Shore venue types

Shore anglers were asked from which type of venue they usually fish. Beach fishing is the most popular, with over 70% of respondents saying they usually fish from beach venues. In contrast 46% of respondents said that they usually fish from a pier (**Table 2**).

Table 2: Percentage response when shore anglers were asked if they usually fished at a particular venue type (n=1030).

	71 1	,
Angling	Usually	Response
Venue	fished?	(%)
Peach	No	28.7
Deach	Yes	71.3
Pock	No	35.0
ROCK	Yes	65.0
Diar	No	54.4
Pier	Yes	45.6

Travel to venue – Shore

A minority of shore anglers said that they either "always" or "most of the time", travel over 50Km to fish (33%), whereas 42% said that they rarely or never travel this distance to fish (**Table 3**).

Table 3: Percentage response when shoreanglers were asked if they travelled to fish(n=1030).

· · · ·	
Do you travel over 50Km to	Response
fish	(%)
Always	12.3
Most of the time	20.3
About half of the time	25.2
Rarely	31.3
Never	10.9

Distances travelled from port- Private Boat and Charter angling

More than half (52%) of private boat angler respondents (n=459) normally travel less than 5 km from their launch site to fish. In contrast, 80% of charter anglers (n=415) reported travelling more than 5 km to fish (**Table 6**).

launch sile to fish.		
Private Boat Anglers (%)	Charter Anglers (%)	
8.1	0.2	
21.8	1.2	
22.2	10.1	
24.6	32.0	
20.9	48.2	
2.4	8.2	
	Private Boat Anglers (%) 8.1 21.8 22.2 24.6 20.9 2.4	

Table 6: Percent response when anglers wereasked how far on average they travelled from theirlaunch site to fish.

4.2.4. Favourite tackle – All angling types

All anglers were asked which was their favourite fishing tackle. Bait fishing was clearly the favoured technique for both shore and charter fishing (63% and 67% respectively), whereas 55% of private boat anglers responded that lure fishing was their favoured technique with bait fishing slightly less popular at 47%. For all anglers, fly fishing can still be considered a niche technique. Only 5% on shore anglers considered fly fishing their favourite (**Fig. 12**). Respondents were also given the option to confirm if they did not use a particular technique. The survey found that 66% of shore anglers do not fly fish. Unsurprisingly, this figure is considerably higher for private boat and charter angling (80% and 90%) respectively.



Fig. 12: Percent response when anglers were asked what their favourite angling technique was.

4.2.5. Private boat angling

Type of Private Boat

Respondents who considered themselves private boats anglers were asked what kind of boats they fished from. Nealy half of all respondents confirmed that they fish from their own boat. Less than one in three fish from a kayak or other small vessels (**Table 4**).

Table 4: Percentage of private boat anglers who					
responded	responded yes when asked if they fished from a				
particular t	ype of boat (n=459)				
Type of	Confirmed (%)				
boat					
Your boat	48.1				
A friend's	30.9				
boat					
A hired	5.2				
boat					
A kayak	29.6				
(incl.					
pontoon					
boat,					
inflatable,					
etc)					

Access to angling water - Private boat

Although nearly half of all private boat anglers launch from a slipway, a significant proportion access the water from various points. This includes 17% of respondents who confirmed that they usually launch from the beach (**Fig. 13**).



Fig. 13: Pie chart illustrating the percentage response when private boat anglers were asked how they usually launched their boat.

4.2.6. Angling session length, and group size

Average session length - All angling types

The average length of time respondents spent fishing per session was highly dependent on angling type (**Fig. 14**). Less than one fifth (18%) spent more than 6 hours angling in a single session, on average, whereas, over half (54%) of charter angling trips are greater than 6 hours. More than one quarter (28%) of private boat angling trips last more than 6 hours. The highest proportion of both shore and private boat anglers reported average session lengths of 4 to 6 hours (43% and 39% respectively). Overall, average session lengths for, charter anglers, private boat anglers are 5.6 hours, 4.7 hours, and 4.4 hours respectively.

Fig. 14: Response when anglers were asked how long they spend fishing during an average session.

Average Group Size - All angling types

Most shore and private boat anglers fished with one or two companions (64% and 66% respectively). Unsurprisingly, A large majority of charter anglers (80%) fished with a party of more than four (**Table 5**).

Table 5: Percent response whenanglers were asked how many peopleon average they fished with.			
Average Group Size	Shore anglers (%)	Private boat anglers (%)	Charter anglers (%)
Alone	23.9	15.9	NA
1 or 2	64.1	65.6	4.1
3 or 4	9.0	16.3	16.1
more than 4	3.0	2.2	79.8

4.2.7. Catch rates – Private Boat and Charter angling

Mackerel and pollack are the most commonly caught fish aboard both private boats and charters (**Fig. 15**). Over 90% of private boat anglers and 87% of charter anglers catch mackerel in particular. Pollack are nearly as common with 86% of charter anglers and 87% of private boat anglers reporting that they catch them often. Surprisingly perhaps, cod are the third

Fig. 15: Percentage of anglers who responded positively when asked if they often encountered a specific fish species/family during their charter or private boat angling.

most encountered species for anglers reporting on private boat (58%) and charter angling (71%). Ling and conger eel are encountered at a relatively common rate among charter anglers (67% and 45% respectively) compared to private boat anglers (34% and 24% respectively). This is probably as a result of the ability of charter boats to target particular marks which may be too distant or exposed for smaller boats. In contrast, 40% of private boat anglers report catching bass during angling sessions, whereas only 16% of charter anglers report the same (**Fig. 15**). This is probably because smaller private boat anglers are more likely to access and fish inshore reefs and target bass in these areas.

4.2.8. Catch rates – Shore angling

Similarly for boat anglers, mackerel and pollack are the most commonly encountered species amongst shore anglers (65% and 63% report catching these species) (**Fig. 16**). However, the proportion of shore anglers who report this observation is lower overall than the boat anglers. This is attributed to the difference between the cohort of those shore anglers who usually fish with lures from easily accessed platforms (pier or rocks) and those who fish from a beach with bait. The position of bass as the third most commonly encountered species by shore anglers

Fig. 16: Percentage of anglers who responded positively when asked if they often encountered a specific fish species/family during their shore angling sessions.

(60% report catching bass) highlights its popularity as a sport fish and its expanded distribution around the Irish coast, and improved bass angling techniques, including lure fishing (**Fig. 16**). Although mullet fishing is becoming more popular among sea anglers, the B&A survey indicates that relatively few anglers (14 %) have success catching mullet species around the Irish coast (**Fig. 16**). Only 5% of shore anglers reported commonly catching gilthead bream, which indicates that this relatively new migrant to Irish shores is still very localised.

4.2.9. Release rates – all angling types

Shore anglers retained less, on average, of every species listed in the survey except for bass (**Fig. 17**). However, bass retention rates were relatively low for all angling types (shore, 14%; private boat, 16%; charter 12%). Bass catch in the charter angling sector is low. Elasmobranchs are rarely retained by Irish sea anglers, irrespective of angling type (**Fig. 17**).

On average, both charter and private boat anglers reported that they retain 41% of their cod catch. Retention rates of pollack was slightly lower at 31% and 32% for private boat and charter angling respectively. In contrast, pollack and cod caught by shore anglers were retained at 22% and 28% respectively (**Fig. 17**).

Fig. 17: Retention rates of selected fish species as reported by respondents to the online B&A angling survey.

4.3. Socio-economic information

To gain insight into spend by sea anglers a limited number of spend related questions were included in the B&A survey.

Anglers reported spending an average of €100 per fishing trip on trip specific items such as food & drink, transport and bait, while spending a further €970 a year on capital items (**Table 6**). The average angler goes on three overnight fishing trips per year. The budget for each trip includes, €56 on accommodation per night and €52 on food and beverages.

Rods & reels	€279.23
Clothing	€115.30
Other fishing	€126.40
equipment	
Terminal	€101.59
tackle (capital)	
Boats & boating equipment (inc boat maintenance, slip fees, marine electronics and safety gear)	€186.07
Engines	€92.33
Other major spend	€68.14

Table 6: Average annual spend on major items. This does not include bait and smaller items.

4.4. Why do anglers go sea fishing?

To understand what motivates sea anglers to go fishing a single question was included in the survey. Over 90% said that they fished to relax and unwind with 87% saying they fished to be outdoors. Spending time with family and friends was the third most popular response (47%). Interestingly, responses related to actually catching fish were less prominent in responses (**Fig. 18**).

Fig. 18: The percentage of respondent anglers (n=1211) who selected the phrases when they were asked why they go sea fishing.

5. Discussion

This survey used online methods to collect information on the behaviour and attitudes of sea anglers in Ireland. It has allowed the IMREC survey team to collate data on the temporal and spatial rates of angling activity around the coast. It has also provided angler lead data on species specific catch and release rates across the three major angling types. This all can aid in the management of marine fish stock in Ireland. A potential shortcoming of collecting data in this way is the likelihood of large biases in the dataset due to self-selection of respondents (Gundelund et al., 2020; ICES, 2015; Venturelli et al., 2017) which may lead to avid anglers responding to the survey at a greater rate than their true representation in the sea angling trips reported by respondents to the online survey (self-selecting) against respondents to the phone survey (random) when online respondents reported around 4 times as many angling trips over a year. Therefore, using such effort values to estimate overall catch in Ireland is not feasible. However, trends in effort and release rates around the country and between seasons are likely to be more robust (Armstrong et al., 2013; Jones and Pollock, 2012).

The relative distribution of angling effort within a calendar year and between coastlines provided by respondents to this survey have allowed the designers of the larger IMREC programme make evidence-based decisions on where and when to focus sampling effort. For example, the proportion of shore angling in the first quarter of the year is around 15% of total

angling effort for the year. Therefore, only 15% of total shore angling sampling resources should be spent over this timeframe to increase sampling precision (Best and Boles, 1956; Pollock et al., 1994). This information can be used to evaluate quarterly weighting factors which can then be applied to CPUE estimates for shore angling in Ireland. Similar techniques can be used to focus sampling effort on a regional basis.

Anglers were also asked what time of day they prefer to fish. These preferences are important for refining the onsite roving creel survey of shore anglers. Due to budget constraints and health and safety considerations, the onsite shore angling survey is not conducted during hours of darkness. However, 25% of respondents to this survey reported that they prefer to shore fish during the hours of darkness. This is a large portion of the shore angling cohort. If they are not included in the roving creel sampling frame, it may lead to a bias in catch rates, particularly if night fishing is related a change in catch success. However, the current sampling design of the roving creel survey means that any anglers encountered at the end of an evening shift are surveyed and reports of their session are collected via a call-back. It is also reasonable to conclude that avid anglers are more likely to fish during darkness as they are more likely to have the knowledge and the equipment required to fish at night. Occasional anglers are not expected to night fish to the same degree.

Although cod remain a highly prized species for consumption, release rates among Irish anglers are generally in line with other countries with a longer tradition of catch and release fishing where between 60% and 70% are released (Brownscombe et al., 2017; Ferter et al., 2013; Vølstad et al., 2011). In other countries where angler culture is different, release rates of cod are as low as 1% (Ferter et al., 2013). According to estimates collected during this survey, Irish anglers release a higher proportion of their bass catch than all other European countries with available data (Ferter et al., 2013). This is probably because of Ireland's bag limit and minimum landing size rules (Grilli et al., 2018). Pollack retention rates in Ireland according to this survey are higher than England, where a retention rate of 18% has been reported (Armstrong et al., 2013) but lower than Norway (44% retained) (Vølstad et al., 2011). Pollack is not traditionally a fish which is commonly consumed in Ireland. This survey provides some evidence that things could be changing. Besides mackerel, pollack is the most commonly caught fish by Irish anglers. As retention rates are relatively high, it may be pertinent to closely monitor inshore pollack populations into the future. The survey also found that more fish, regardless of the species, are retained when caught on a boat rather than from the shore. This is likely because fish caught abord boats tend to be larger. The main reasons that anglers report for releasing fish relate to small size (Ferter et al., 2013)

The age distribution of sea anglers is broadly in line with the latest census figures for the Irish population (CSO, 2016). which indicates that the proportion of anglers within the population is consistent across age groups. However, there was a disparity detected between respondents to the online survey from older age groups and those from the phone survey. It

is likely that the older age groups are underrepresented in the online survey because they are less likely to use the internet regularly. This could have implications for use of online catch diaries, as they may omit a cohort of experienced anglers and as a result estimates of cate rate may not be accurate (Venturelli et al., 2017). However, this survey and the phone survey has provided information which can allow researchers estimate the magnitude of this bias and thus account for it at analysis through evidence based weighting (ICES, 2017).

Small boat and charter anglers generally fish in ICES subdivisions at the same rate as shore anglers with one notable exception. The west coast (ICES VIIb) is the most popular destination for charter anglers, with 26% reporting that they usually fish there, while 24% fish the east coast. It is unclear why this is but is likely due to a combination of access to the pristine angling waters off the west coast and the relatively high concentration of charter operators working here.

The response that more than half of private boat anglers do not launch from a slip and 17% of these launch from a beach is highly relevant in the context of the larger IMREC survey. The on-site sampling programme of private boat anglers is based around awaiting anglers returning from their trips at previously characterised launching/recovery sites. One anticipated issue was the difficulty in interviewing anglers who complete their trip behind private jetties and/or moorings. Although it was also anticipated that some private boat anglers launch from the beach, 17% is a very high proportion of anglers that fall outside the characterised sampling frame. As it is a large cohort, this result must be carefully considered during the revision of a sampling programme for private boat angler CPUE.

The output of this survey highlights the heterogenous nature of the sea angling resource in Ireland. It has illustrated the clear regional variation in both species encountered and angling effort across space and time. In order to properly understand the impact or otherwise of MRF in Ireland, well characterised sampling programmes with stratification are required to reduce error to an acceptable level (Dedeu et al., 2019). It is also appropriate to examine the three major angling types separately. Not only are species caught clearly different between boat and shore fishing, session lengths can vary substantially impacting CPUE. Even though MRF is one of the world's most popular coastal leisure activities (Dedeu et al., 2019), historically it's impact on coastal fish populations has gone unstudied (Hyder et al., 2018). There is evidence to suggest that MRF is impacting fish populations in some regions (Brownscombe et al., 2019; Holder et al., 2020; Lewin et al., 2006). Still, if MRF in Ireland is found to have no discernable impact on fish stocks, it is important that fisheries managers have objective evidence to confirm this. Otherwise, it may lead to inter-sectoral conflicts between the commercial and the recreational fishing sectors over the allocation of fishing areas and fish stocks (Brown, 2016; Voyer et al., 2017).

The survey identified the value of sea angling to the Irish economy where anglers spend upwards of ≤ 1000 on tackle and bait and around ≤ 300 per year on accommodation and food while taking part in their pastime. The latest data suggests that 180,00-250,000 people consider themselves sea anglers. This equates to a lot of money going to rural coastal economies. More importantly perhaps, sea angling is important to the health and wellbeing of a significant proportion of the Irish population. That in itself justifies everyone's efforts to protect and improve this important natural resource.

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APPENDIX – Survey questions

Online behaviour and attitudes survey of Irish Anglers

General Questions to categorise ALL anglers

Angling Experience : d, Very experienced)	(Novice, Somewhat experience	Sex (M or F)	
Club Membership	(0,1 or more than 1)	Member of ESRI panel	(Y or N)
Age Group		Angling quality change:	(Worse, Same, Better)
Irish resident	(Y or N)	Closest town/ County	

Please rank in order of importance the three most important issues facing Irish Sea angling today

Lack of protection from	Lack of protection for a	Lack of Marine Protected
commercial interests for	broader range of angling	Areas/Protected nursery areas
angling species	species via length and bag	
	limits	
Lack of "no net" zones in	Commercial overfishing at sea	Lack of angler representation
estuaries		at government fishing decision
		making
Increased pollution	Lack of funding for angling	Lack of funding for
	clubs	International angling teams

Shore angling specific behaviour questions

1. Where do you usually fish? Select all that apply

Options:

VIIa - East coast	VIIg - SE coast
VIIj - SW coast	VIIb - West Coast
Via - NW coast	West NI coast
East NI Coast	

2. How many times, how often on average per month would you go shore fishing? A seperate response provided for each month of the year:

1-2	3-4	5-6	7-8
9-10	11-14	15 or more	

3. Would you say that a weekend (anytime between Friday evening and Sunday evening) incl udes:

All of my fishing 3 quarters A half 1 quarter None of

4. On a fishing trip, from where do you usually go shore fishing?

Usually beach fish Usually rock fish Usually pier fish
--

5. What kind of shore fishing do you prefer to do?

	Select your preference for angling method			
a): Bait	Favourite	2 nd Favourite	3 rd Favourite	Do not Fish this way
b): Lure	Favourite	2 nd Favourite	3 rd Favourite	Do not Fish this way
c): Fly	Favourite	2 nd Favourite	3 rd Favourite	Do not Fish this way

6. Thinking about a typical shore angling session, which of the options below best suits your preferred conditions?

Prefer Morning (YorN)	Prefer Afternoon (YorN)	Anytime (YorN)
Prefer Evening (YorN)	Prefer Night (YorN)	

7. How many people on average do you fish with while shore fishing?

Alone	1-2
3-4	More than 4

8. On a day shore fishing trip, do you travel more than 50 kms / 30 miles from your home or accommodation to your chosen venue?

Never	Rarely	About half of the time
Most of the time	Always	

9. For how long (hrs) on average do you spend angling during a shore fishing session?

•	• • •		
0-2	2-4	4-6	Greater than 6

10. What species in particular do you catch when fishing from the shore?

(Answer Y or N)

NOTE: This can be related to where an angler says they usually go fishing

a): Bass	b): Cod	c): Dogfish	d): Flatfish	e): Gilthead	f): Mackerel	g): Mullet
h): Pollack	i): Sea trout	j): Large shark	k): Small shark	l): Whiting	m): Wrasse	
		/skate				

Species	Options for selection %				
a): Bass	Release all	0to25	26to49	50 or greater	I keep all of these
b): Cod	Release all	0to25	26to49	50 or greater	I keep all of these
c): Pollack	Release all	0to25	26to49	50 or greater	I keep all of these
d): Mackerel	Release all	0to25	26to49	50 or greater	I keep all of these
e): Large sharks	Release all	0to25	26to49	50 or greater	I keep all of these
/skates					

11. Thinking about the species listed below, how often do you retain these fish to eat when fishing from the shore?

Private boat specific behaviour questions

1. Where do you usually fish. Select all that apply

Options:

VIIa - East coast	VIIg - SE coast
VIIj - SW coast	VIIb - West Coast
Via - NW coast	West NI coast
East NI Coast	

2. What kind of small boat do you fish from? You can choose more than one

I fish from my boat	I fish from a friends boat	I fish from a hired	I fish from a kayak etc
		boat	

3. How many times, how often on average per month would you go small boat fishing? Response for each month of the year:

1-2	3-4	5-6	7-8
9-10	11-14	15 or more	

4. Would you say that a weekend (anytime between Friday evening and Sunday evening) includes:

All of my fishing 3 quarters A half 1 quarter None of

5. How do you usually launch for your small boat angling session?

	-	-	-		 		
Beach Launch		Mooring		Slip	Jetty	Other	

6. Thinking about a typical small boat angling session, which of the options below best suits your preferred conditions?

Prefer Morning (YorN)	Prefer Afternoon (YorN)	Anytime (YorN)
Prefer Evening (YorN)	Prefer Night (YorN)	

7. How many people on average do you fish with while small boat fishing?

Alone	1-2
3-4	More than 4

8. When small boat fishing, how far on average do you travel from your launch site?

0-1 kms	1-3 kms	3-5 kms
5-10kms	More than 10kms	

9. When small boat fishing, for how long on average do you spend angling?

0-2	2-4	4-6	Greater than 6 hrs

10. What kind of method when small fishing do you prefer to use?

		Select your preference for angling method			
a): Bait	Favourite	2 nd Favourite	3 rd Favourite	Do not Fish this way	
b): Lure	Favourite	2 nd Favourite	3 rd Favourite	Do not Fish this way	
c): Fly	Favourite	2 nd Favourite	3 rd Favourite	Do not Fish this way	

11. When fishing from a small boat, what species in particular do you catch? (Answer Y or N)

NOTE: This can be related to where an angler says they usually go fishing

a): Bass	b): Coalfish	c): Cod	d): Conger	e): Flatfish	f): Gurnards	g): Ling	h): Mackerel
i): Pollack	j): Ray	k): Skate	l): Small	m): Medium	n): Large sharks	o): Tuna	p): Whiting
			shark	sharks			
q):Wrasse							

12. Thinking about the species listed below, how often do you retain these fish to eat when fishing from a small boat?

Species	Options for selection %				
a): Bass	Release all	0to25	26to49	50 or greater	I keep all of these
b): Cod	Release all	0to25	26to49	50 or greater	I keep all of these
c): Pollack	Release all	0to25	26to49	50 or greater	I keep all of these
d): Mackerel	Release all	0to25	26to49	50 or greater	I keep all of these
e): Large sharks	Release all	0to25	26to49	50 or greater	I keep all of these
/skates					

Charter boat specific behaviour questions

1. Where do you usually charter fish. Select all that apply

Options:

VIIa - East coast	VIIg - SE coast
VIIj - SW coast	VIIb - West Coast
Via - NW coast	West NI coast
East NI Coast	

2. How many times, how often on average per month would you go shore fishing? Response for each month of the year:

1-2	3-4	5-6	7-8
9-10	11-14	15 or more	

3. Would you say that a weekend (anytime between Friday evening and Sunday evening) includes:

All of my fishing 3 quarters	A half	1 quarter	None of
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4. How do you usually enter the sea for your charter boat angling session?

	Marine	Mooring	Jetty	Other
--	--------	---------	-------	-------

5. Thinking about a typical charter boat angling session, which of the options below best suit your preferences

	Prefer Fullday (YorN)	Prefer Halfday (YorN)	Evening (YorN)
--	-----------------------	-----------------------	----------------

6. When charter boat fishing, how many people on average do you fish with?

1-2	3-4
5-6	7 or more

7. When charter boat fishing, how far on average do you travel from your launch site?

0-1 kms	1-3 kms	3-5 kms
5-10kms	More than 10kms	

8. When charter boat fishing, for how long on average do you spend angling?

2-4	4-6	Greater than 6 hrs	

		Select your preference for angling method					
a): Bait	Favourite	2 nd Favourite	3 rd Favourite	Do not Fish this way			
b): Lure	Favourite	2 nd Favourite	3 rd Favourite	Do not Fish this way			
c): Fly	Favourite	2 nd Favourite	3 rd Favourite	Do not Fish this way			

9. What kind fishing method do you prefer to use?

10. When charter fishing, what species in particular do you catch? (Answer Y or N)

NOTE: This can be related to where an angler says they usually go fishing

a): Bass	b): Coalfish	c): Cod	d): Conger	e): Flatfish	f): Gurnards	g): Ling	h): Mackerel
i): Pollack	j): Ray	k): Skate	l): Small	m): Medium	n): Large sharks	o): Tuna	p): Whiting
			shark	sharks			
q):Wrasse							

11. Thinking about the species listed below, how often do you retain these fish to eat when charter fishing?

Species	Options for selection %				
a): Bass	Release all	0to25	26to49	50 or greater	I keep all of these
b): Cod	Release all	0to25	26to49	50 or greater	I keep all of these
c): Pollack	Release all	0to25	26to49	50 or greater	I keep all of these
d): Mackerel	Release all	0to25	26to49	50 or greater	I keep all of these
e): Large sharks	Release all	0to25	26to49	50 or greater	I keep all of these
/skates					

ALL Anglers Socio Economic Questions

Thinking about overnight sea fishing trips in Ireland, please answer the questions below

How many overnight sea fishing trips	How many nights do these sea fishing trips
would you take in an average year?	usually last?

When staying on an overnight sea fishing trip in Ireland, how much IN EUROS do you typically spend per night on the following items? If you do not take overnight trips you can skip to the day trip expenditures in the next section.

• Firstly, if you	Accommodation	 Food and drink 	Entertainment	Other items
also paid for	(per person)	(per person)	(e.g. cinema,	(per person)
other people,			music gigs etc -	
such as family			per person)	
members, how				
many others did				
you pay for? If				
you only paid for				
yourself, then				

leave the box		
empty		

During a typical day's sea fishing in Ireland, how much IN EUROS would you normally spend on the following items, please only answer those relevant to you, answers are PER DAY

 Road transportation 	• Bait	 Tackle (per day trip) 	 Other items for a
to/from a venue			day's fishing
including hire cars,			
fuel and tolls			
 Meals/snacks (per 	 Car parking 	 Pier/slip fees 	 Boat hire / charter
day not including			fees
evening meals)			
Boat fuel	 Public transport 	 Professional fishing 	Boat fuel
		guide fees	

Anglers will often buy items of tackle not specific to a certain trip, such as a new rod or reel, fishing clothing or waders, marine electronics, lifejackets etc. These are not expendable items like bait, hooks, traces, weights which might be purchased for each trip. IN EUROS, how much do you estimate that you have you spent in Ireland in the last 12 months on this type of long term sea fishing hardware not specific to a fishing trip?

Rods & reels	Clothing	Other fishing	Terminal tackle
		equipment	(capital)
Boats & boating	• Engines	 Other major spend 	
equipment (inc boat			
maintenance, slip			
fees, marine			
electronics and safety			
gear)			

Why do you go sea fishing? Choose all that apply

	To relax and	To be with	For health	To catch big
To be outdoors	unwind	family/friends	reasons	fish/lots of fish
	To self-supply	To participate in	To get to know	Other (please
To enjoy solitude	with fresh fish	competitions	other people.	specify)