Pilot observer programme in Irish pelagic trawl and gillnet fisheries: Implementing Council Regulation (EC) No 812/2004.

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by

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Introduction

In order to obtain reliable estimates of incidental take of cetaceans in fishing activities, dedicated independent observer programmes aboard vessels are necessary. EU Member States are required to design annual monitoring schemes for incidental catch of cetaceans on their vessels, in accordance with Council Regulation (EC) No 812/2004 of 26.4.2004*. According to the Directive, the sampling strategy for annual monitoring schemes should be designed so that the estimation of bycatch for the most frequently caught species in a fleet should not have a coefficient of variation greater than 0.30. If previous monitoring schemes have not been carried out, such a sampling strategy cannot be designed. In this case, Member States should establish pilot observer programmes for two consecutive years. Pilot programmes are then used to provide estimates of bycatch per unit effort for each species, and to inform the design of subsequent sampling strategies.

The required observer effort relating to Irish pelagic trawls is 10% of the fishing effort from December to March, in ICES subareas VI, VII and VIII, as indicated in Annex III of the Directive. For bottom-set gillnet and tangle-net fisheries, the required effort is 5%, from December to March.

A team from the Department of Zoology, Ecology and Plant Science (ZEPS) at University College Cork, carried out the first Irish independent cetacean observer programme, from December 2010 to March 2011, in line with the 812/2004 Directive. In addition to the requirements of the Directive, 10% coverage of the albacore tuna pair pelagic fishery, from August 2010 to October 2010, was requested by an Bord Iascaigh Mhara. This report describes the sampling effort and results from the pilot programme.

*Council Regulation (EC) No 812/2004 of 26.4.2004 laying down measures concerning incidental catches of cetaceans in fisheries and amending Regulation (EC) No 88/98.

Methodology

The principal task of observers was to monitor incidental catch of cetaceans onboard Irish fishing vessels, and to collect the data necessary to facilitate extrapolation of observed bycatch to the entire fleet. In order to maximise data collection onboard vessels, a number of additional tasks were also carried out. These additional data were collected to be of use to the fishing industry, in providing information for fisheries certification schemes.

Vessel details were acquired from BIM, and from fish producer's organisations (Irish South and West Fish Producers Organisation and Killybegs Fishermen's Organisation). Albacore tuna *Thunnus alalunga* (Bonnaterre, 1788) fishing vessels were targeted from August to October 2010. From December 2010 to March 2011, mackerel *Scomber scombrus* Linnaeus, 1758, herring *Clupea harengus* Linnaeus, 1758, horse mackerel *Trachurus trachurus* (Linnaeus, 1758), and blue whiting *Micromesistius poutassou* (Risso, 1827) were targeted. However, in most cases, observer trips were carried out according to where most fishing was taking place at the time, and the willingness of skippers to accommodate an observer. Gillnet fishing vessels were targeted in February and March 2011.

In accordance with the Directive, all personnel selected were experienced in cetacean identification and fishing practices, scientific observation and data recording, and held Sea Survival Certificates. Observers carried UCC insurance certificates aboard vessels. On each fishing trip, observers recorded skipper contact details, as well as vessel and net specifications. For pelagic fishing, observers recorded the latitude and longitude, depth, and time of net shooting and net hauling for each individual haul on the primary vessel. These details were also recorded for the partner vessel, but from the primary vessel's wheelhouse. Before, during and after the haul, observers were on deck at all times, observing and recording any cetacean bycatch or any 'dropouts' of cetaceans from the nets, or any cetacean activity around the vessel and around the fishing gear (and from the partner vessel when in view). In addition, any endangered, threatened or protected (ETP) species caught, such as seals, turtles and birds, were recorded, as well as fish slipped from the nets or released from the vessels, fish species retained, and fish species discarded. ID cards were developed for cetacean, turtles and fish species likely to be

encountered, as well as comprehensive sheets for data recording. An estimation of quantities of fish landed was also recorded. On each albacore tuna fishing trip, the lengths of a sub-sample of fish were measured.

For bottom-set gillnets, observers recorded the latitude and longitude, depth and time of the net setting and hauling, and soak time. Fish retained and fish discarded were recorded. In some instances the observer was only present for either the gillnet setting or hauling. Observers also recorded any damage to fish on gillnet fishing vessels, or any seabed interactions. Damage was assessed by fish species and divided into categories – relating to the area damaged/missing, e.g. abdominal area, abdomen and tail, head.

Observers spent a number of days being trained on how to perform post-mortem examinations on small cetaceans and seals. A number of individuals that stranded were frozen and then used to train observers. Observers were trained how to take measurements for morphometrics, and to take samples for genetics, ageing, reproductive status and diet analysis. Each observer had a sampling kit with them on each trip.

When fishing was not being carried out, observers carried out constant effort watches for cetaceans, to contribute to the mapping of their distribution and relative abundance in Irish waters. Constant effort watches were usually carried out for 30 or 60 mins, and in Beaufort Sea State conditions of 3 or less. Opportunistic, or 'off effort' sightings were also recorded.

Individual reports were produced following every fishing trip. The reports contained vessel details, observer details, trip dates, details of fishing gear, ICES sub-area in which fishing occurred, details of each individual haul, cetacean incidental take, ETP species incidental take, fish slipped or released, fish discarded, and details of constant effort watches. Vessel names were kept anonymous and were given a numeric code. Skippers and fish producer's organisations were provided with copies of reports when requested.

Results

Observers spent a total of 111 days at sea on Irish fishing vessels over the duration of the pilot observer programme, and fishing occurred on 57 of these days (Table 1). Thirty trips on 22 different vessels were observed. Five of the vessels were <15m in length. Most days at sea were spent on pelagic trawlers, with 8 days on bottom set gillnet vessels (Table 2). There were 25 pelagic trawl trips, of which 22 were pair pelagic trawls, and 3 were single pelagic trawls (Table 3). In addition, five bottom set gillnet trips were observed (Table 3). Most of the pelagic fishing occurred in ICES areas VI and VII, with four fishing days in VIIId for albacore tuna in October (Table 1). Gillnet fishing occurred in ICES sub-areas VIIj and VIIg only.

Table 1: The monthly break down of days at sea and days fishing from August 2010 to March 2011, and ICES sub-areas where fishing occurred.

Month	**Days at Sea**	**Fishing Days**	**ICES sub-areas**
August	1	0	-
September	12	9	VIIk
October	20	12	VIIj, VIIId, VIIg, VIIk
December	16	3	VIa
January	30	15	VIa
February	18	10	VIIa, VIIj, VIIb
March	14	8	VIa, VIb, VIIc
Total	**111**	**57**	

Table 2: Days at sea, days fishing and hauls observed for pelagic trawl fishing and bottom set gillnet fishing.

Fishing Gear Type	Days at Sea	Fishing Days	Hauls or strings observed
Pelagic Trawl	103	50	91 hauls
Bottom Set Gillnet	8	7	16 strings

In September and October, the target species was primarily albacore tuna, however some herring fishing also occurred in October. In December, horse mackerel was mainly targeted, with small amounts of mackerel and sprat (*Sprattus sprattus*) also caught. In January, most vessels were targeting mackerel, and the majority of the larger vessels caught their mackerel quotas by the end of the month. As a result, most fishing in February and March occurred on smaller vessels, targeting herring and horse mackerel. There was one pelagic trip targeting blue whiting in March. The five bottom set gillnet trips were carried out during February and March, and the target species were pollack *Pollachius pollachius* (Linnaeus, 1758), cod *Gadus morhua* Linnaeus, 1758, haddock *Melanogrammus aeglefinus* (Linnaeus, 1758) and whiting *Merlangius merlangus* (Linnaeus, 1758) (see Table 3 for full details). Four of the gillnet trips were single day trips, with one trip in February lasting 4 days.

Cetacean and ETP species incidental take

Details of cetacean incidental take, ETP species caught, and fish slipped or released are provided in Table 4. There was no cetacean incidental take observed during the programme. In addition, there were no cases of cetacean 'dropout' from the nets. The chance of observers noticing cetacean bycatch was extremely high as observers were on deck at all times before, during and after hauling, with full view of the nets. Observers were unable to get a clear view of the nets being hauled on partner vessels in many cases, so information was obtained from communication between the vessels' skippers. No cetacean bycatch was reported from the partner vessels. No seals were caught during the observed trips. There were 10 gannets (*Morus bassanus*) caught in pelagic gear, six of which were released alive, during pelagic fishing for mackerel, horse

mackerel and herring. One gannet was recovered for post-mortem examination and feathers for stable isotope analysis were taken from an additional two individuals. Results from the stable isotope analysis will be incorporated into food models being developed in the Beaufort Ecosystem Approach to Fisheries Management project.

One leatherback turtle *Dermochelys coriacea* was caught, and released alive, 10 swordfish *Xiphias gladius* (Linnaeus, 1758), eight bluefin tuna *Thunnus thynnus* (Linnaeus, 1758), one blue shark *Prionace glauca* (Linnaeus, 1758), and approximately 40 sunfish *Mola mola* (Linnaeus, 1758) were caught on albacore fishing trips.

Spurdog (*Squalus acanthias*), classified by IUCN as vulnerable, was caught on a number of occasions in gillnet fisheries and Stellate smooth hound (*Mustelus asterias*) was also recorded. In the gillnet fisheries observed, lesser spotted dogfish (*Scyliorhinus canicula*) were frequently discarded in relatively high numbers.

Fish slipped and fish released

Fish slippage occurs when all fish in the net are deliberately released back into the water instead of hauling the net onboard, and usually occurs if the fish are too small, or are mixed species, and cannot be landed, or if there are too few fish in the net to land. This occurred for six hauls during the programme. Fish release occurred when fish holds were filled, or quotas were caught, and the remaining fish were released back from onboard, in nine instances. On three occasions fish were accidentally released due to equipment malfunction.

Cetacean interactions with fishing vessels

While fishing was in progress, observers monitored cetacean activity around the vessel and the nets, and recorded any 'interactions' with the vessel. During albacore fishing, on two occasions common dolphins (*Delphinus delphis*) were observed at the bow of the boat at night, feeding on small fish, possibly garfish, which were attracted to the lights of the boat. In one instance the nets had been hauled and the fish were being stored, and in the other case, the nets were still in the water at the stern of the boat being sorted, after the fish had been stored. The dolphins did not approach the nets.

During mackerel fishing in ICES sub-area VIa in December and January, observers recorded numerous interactions between killer whales *Orcinus orca* Linnaeus 1758, and fishing vessels fishing for mackerel. Killer whales were recorded on 17 different occasions (see Figure 1 for locations). Group size ranged from 4 - 40 individuals. In some instances the killer whales remained at a distance from the vessel and slowly circled as the net was being hauled, or followed the net as it was being towed. In other cases, the killer whales appeared next to the vessel and displayed foraging behavior around the vessel (tail slapping, surface rushing, bubble netting and milling) as fish were being pumped from one vessel to another. Fishermen reported that this is a common occurrence during mackerel fishing. There were no instances of killer whale incidental catch.

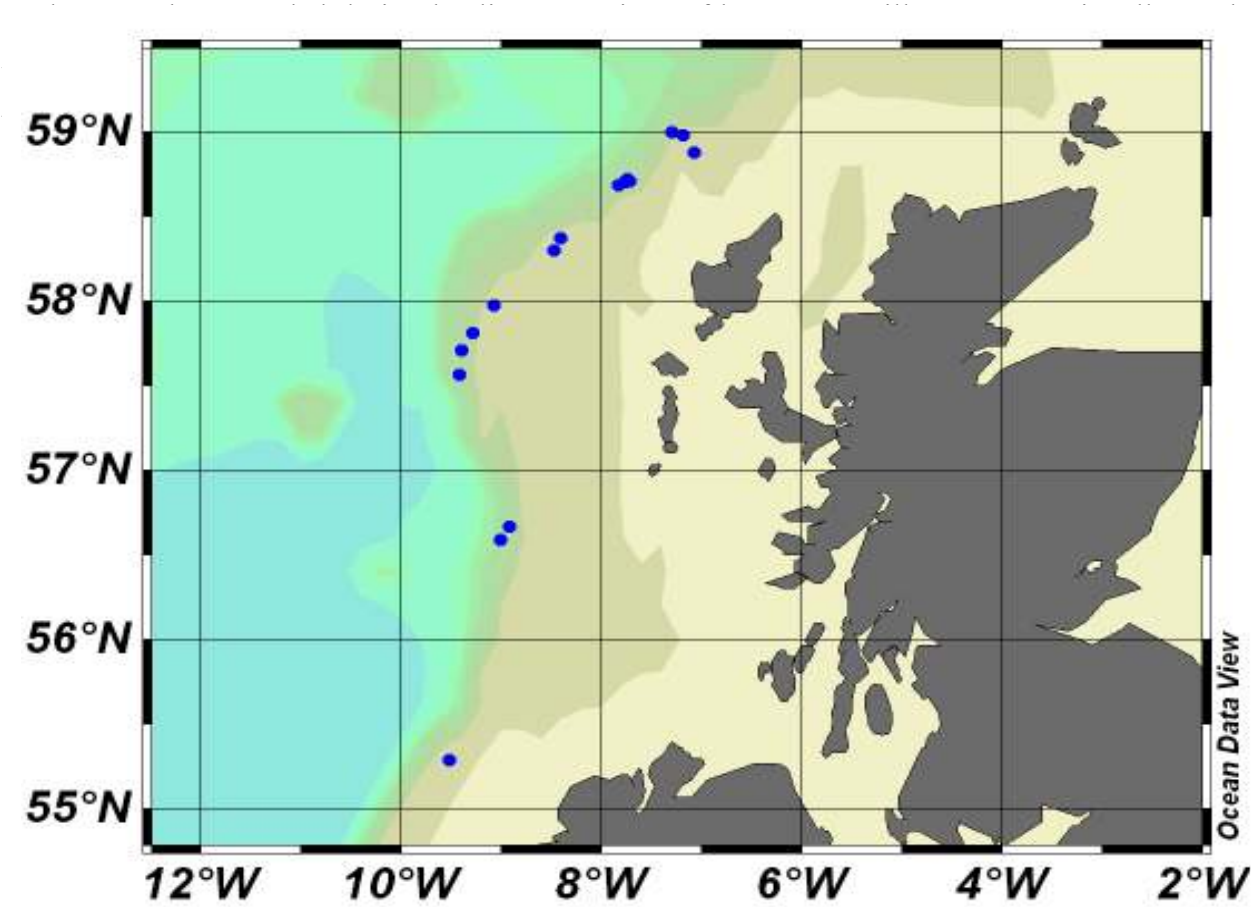

Figure 1: Locations of individual Killer whale sightings.

Table 3: Details of all 30 trips during the pilot observer programme, from August 2010 to March 2011. PT=Pelagic trawling and includes pair and single pelagic fishing vessels. GN=Bottom-set gillnet fishing.

Trip Number	Date	Year	Primary Vessel No.	Partner Vessel No.	Days at Sea	Days Fishing	No. of Hauls from Primary Vessel	No. of Hauls from Partner Vessel	Target Species	ICES sub-area	Fishing gear used	Cetacean bycatch
1	Aug 31st to Sept 05th	2010	Vessel 1	Vessel 2	6	4	3	2	Albacore tuna	VIIk	PT	0
2	Sept 16th to Sept 22nd	2010	Vessel 4	Vessel 3	7	5	2	3	Albacore tuna	VIIk	PT	0
3	Oct 11th to Oct 22nd	2010	Vessel 3	Vessel 4	12	7	8	5	Albacore tuna & herring	VIIj, VIIId & VIIg	PT	0
4	Oct 13th to Oct 17th	2010	Vessel 5	Vessel 6	5	3	3	2	Albacore tuna	VIIk	PT	0
5	Oct 18th to Oct 20th	2010	Vessel 7	Vessel 8	3	2	4	1	Herring	VIIg	PT	0
6	Dec 03rd to Dec 11th	2010	Vessel 11	-	9	2	3	-	Horse Mackerel &	VIa	PT	0
7	Dec 10th to Dec 14th	2010	Vessel 9	Vessel 10	5	1	2	1	Horse Mackerel	VIa	PT	0
8	Dec 17th to Dec 18th	2010	Vessel 4	Vessel 3	2	0	0	0	Mackerel & Sprat	VIIj	PT	0
9	Jan 11th to Jan 15th	2011	Vessel 20	Vessel 21	5	1	2	1	Mackerel	VIa	PT	0
10	Jan 12th to Jan 14th	2011	Vessel 12	Vessel 13	3	2	2	1	Herring	VIa	PT	0
11	Jan 14th to Jan 17th	2011	Vessel 14	Vessel 15	4	2	1	2	Mackerel	VIa	PT	0
12	Jan 16th to Jan 21st	2011	Vessel 21	Vessel 20	6	4	5	4	Mackerel	VIa	PT	0
13	Jan 17th to Jan 20th	2011	Vessel 7	Vessel 8	4	2	1	2	Mackerel	VIa	PT	0
14	Jan 21st to Jan 23rd	2011	Vessel 16	Vessel 17	3	2	2	3	Mackerel	VIa	PT	0

15	Jan 26th to Jan 28th	2011	Vessel 18	Vessel 19	3	1	1	2	Mackerel	VIa	PT	0
16	Jan 28th to Jan 29th	2011	Vessel 22	-	2	1	3	-	Mackerel	VIa	PT	0
17	Feb 07th to Feb 08th	2011	Vessel 23	Vessel 24	2	1	2	0	Herring	VIIa	PT	0
18	Feb 07th to Feb 08th	2011	Vessel 24	Vessel 23 Vessel 30	2	1	1	2 1	Herring	VIIa	PT	0
19	Feb 10th	2011	Vessel 25	Vessel 24	1	1	1	0	Herring	VIIa	PT	0
20	Feb 10th	2011	Vessel 24	Vessel 25	1	1	0	1	Herring	VIIa	PT	0
21	Feb 13th to Feb 15th	2011	Vessel 1	Vessel 2	3	1	1	1	Mackerel	VIIj	PT	0
22	Feb 15th to Feb 18th	2011	Vessel 31	-	4	3	2 strings, 8 nets	-	Pollack	VIIj	GN	0
23	Feb 20th to Feb 22nd	2011	Vessel 26	Vessel 27	3	1	2	0	Mackerel & Horse mackerel	VIIb	PT	0
24	Feb 27th to March 01st	2011	Vessel 9	Vessel 28 Vessel 10	3	1	1	1 1	Mackerel & Horse mackerel	VIIb	PT	0
25	Mar 02nd to Mar 05th	2011	Vessel 9	Vessel 10	4	1	1	0	Horse mackerel	VIa	PT	0
26	Mar 14th	2011	Vessel 30	-	1	1	1 string, 2 nets	-	Cod	VIIg	GN	0
27	Mar 15th	2011	Vessel 30	-	1	1	1 string, 2 nets	-	Cod	VIIg	GN	0
28	Mar 16th	2011	Vessel 29	-	1	1	2 nets	-	Pollack, Haddock & Whiting	VIIj	GN	0
29	Mar 18th to Mar 22nd	2011	Vessel 32	-	5	3	4	-	Blue Whiting	VIb, VIIc	PT	0

30	Mar 28th	2011	Vessel 29	-	1	1	2 nets	-	Pollack, Haddock &	VIIj	GN	0

Table 4: Incidental catch of birds and selected fish species (smaller fish such as pilchard, whiting, not included), any fish slipped or released from nets, and any cetacean interactions with the fishing vessel, during the fishing activity. There were no seals or cetaceans caught during this programme. PT=Pair trawl, GN=Bottom-set gillnet.

Trip Number	Vessel	Target Species	ICES sub-area	Fishing gear	Sea-birds	Sharks	Turtles	Other	Fish slipped or fish released	Cetacean interactions
1	1	Albacore	VIIk	PT			1 leatherback turtle caught & released alive from partner vessel	2 swordfish ~14 sunfish		Once net was taken in after 1st haul, and tuna were stored, 4–5 common dolphins were feeding at bow of boat on small fish attracted to boat lights.
3	4	Albacore	VIIk	PT		1 blue shark		5 bluefin tuna 5 Sunfish 1 swordfish		Mother & calf common dolphin feeding on garfish attracted to boat lights at bow. Nets in water at stern of boat, dolphins didn't approach nets.
3	3	Albacore	VIIg, VIIj & VIIId	PT				7 swordfish 19 sunfish 1 bluefin tuna	2nd and 3rd herring hauls fully slipped, due to small and mixed catch	
5	7	Herring	VIIg	PT					1st and 2nd herring hauls fully slipped due to mixed catch of pilchard, herring and mackerel Relatively small amounts of fish released due to holds filling during 3rd haul	
6	11	Horse mackerel & mackerel	VIa	PT						4 killer whales following net as it was being hauled in, remained for 5 mins. Large group (~40) of killer whales

										following net, feeding on escaped fish.
7	9	Horse mackerel & mackerel	VIa	PT					Fish released due to hold overflow on last haul	Killer whales feeding near partner vessel
9	20	Mackerel	VIa	PT						12 killer whales, between 2 boats while towing +30 killer whales around vessels while hauling
10	12	Herring	VIa	PT						3 grey seals foraging at stern during fish pumping between vessels 8–10 grey seals
11	14	Mackerel	VIa	PT					Relatively small quantities of fish released due to fish pump breaking during fish transfer between vessels on last haul	20–30 killer whales foraging near vessels during fish pumping 5–15 killer whales near vessel during fish pumping
12	21	Mackerel	VIa	PT					Small quantities of fish slipped from 1st haul due to mixed catch, and very little fish in net Relatively small quantities of fish released due to hold overflow on last haul.	5–6 killer whales 100 m from vessel
13	7	Mackerel	VIa	PT					Haul 1 accidentally released due to net damage	10–12 killer whales approached vessel during net hauling ~ 8 killer whales around vessel during fish pumping
14	16	Mackerel	VIa	PT					Fish released due to hold overflow on last haul.	10–15 killer whales travelling behind vessel as net was hauled 19–23 killer whales around vessel during hauling and fish pumping, foraging behaviour
15	18	Mackerel	VIa	PT					Fish released due to hold overflow on last haul.	At least 10 killer whales around vessel as fish were brought onboard, and following vessel as

										fish were released.
16	22	Mackerel	VIa	PT					Fish released due to hold overflow on last haul.	
17	23	Herring	VIIa	PT					Relatively small quantities of fish released due to equipment failure.	
19	25	Herring	VIIg	PT	3 gannets (2 released alive, 1 dead)				Relatively small quantities of fish released as quota was caught.	
21	1	Mackerel	VIIj	PT	2 gannets				~20 tonnes fish released on last haul, as quota was caught	
22	31	Pollack	VIIj	GN						Grey seals around boat, and taking fish from nets.
23	26	Mackerel & horse mackerel	VIIb	PT	1 gannet				~20 tonnes mackerel and horse mackerel released on last haul as quota was caught	
24	9	Horse mackerel & mackerel	VIIb	PT	2 gannets (released alive)					
25	9	Horse mackerel	VIa	PT	2 gannets (released alive)				All fish from 1st haul slipped due to small size of fish	

Albacore tuna sampling

Table 5: Number of hauls observed by month in the albacore fishery

Month	*No. hauls observed*
August	0
September	10
October	13

The numbers of tuna caught varied considerably between observed hauls (from only a few fish to 15 tonnes) and because of the "spread out"/dispersed nature of the fish this year, fishers often spent hours to days searching for fish aggregations. For example, on the first observer trip at the end of August, two nights were spent searching for fish, before fishing commenced on the third night (2nd Sept). Tow duration varied from 1 hr 32 mins to 7 hrs 20 mins. Length measurements were taken from a random sample of tuna from each vessel (Figure 2). It is interesting to note that the larger fish were recorded on the last observed trip in October, and that the boat was operating at the most southern location observed.

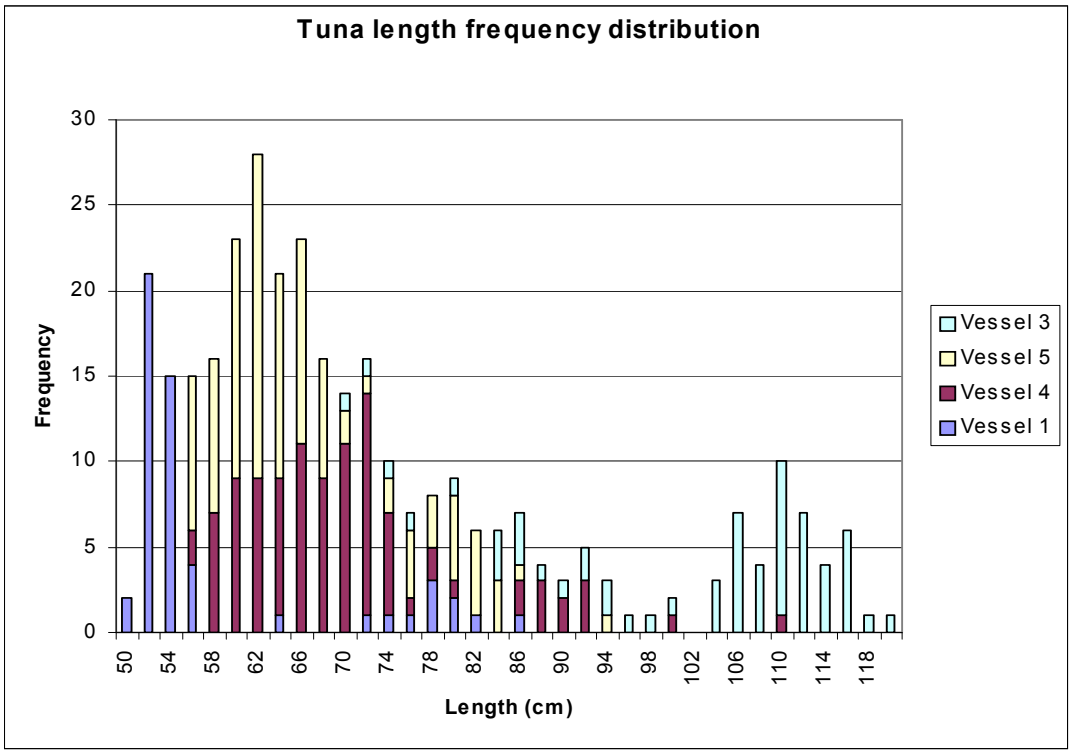

Figure 2: Length-frequency distribution of Albacore tuna (n = 324), sampled from four vessels.

Cetacean sightings

During the constant effort watches, five species of cetacean were positively identified over the course of this study, with a total of 165 individuals recorded. In addition, there were three sightings of seals. Thirty-three sightings were made during 83 hours of dedicated watches. These sightings comprised mostly common dolphins, with varying group sizes. Off effort, an additional 87 sightings were made, comprising mostly common dolphins, followed by killer whales, fin whales (*Balaenoptera physalus*), grey seals (*Halichoerus grypus*), striped dolphins (*Stenella coeruleoalba*), pilot whales (*Globicephala melas*) and Atlantic white-side dolphins (*Lagenorhynchus acutus*). In the case of common dolphins, in many instances individuals approached the vessel and commenced bow riding. On other occasions, the animals were seen in close proximity to the boat during hauling (e.g. killer whales and grey seals).

The locations of all sightings recorded are indicated on Fig. 3. The most northerly sighting was a group of approximately 20 grey seals, in the harbour at Lerwick, in the Shetland Islands. The two other northerly sightings are to the south of Shetland, two common dolphins and three possible Risso's dolphins (*Grampus griseus*). The killer whale sightings are mostly to the west of the Hebrides, with one further south, off the coast of Donegal (see Figure 1). Grey seals were sighted frequently, mostly in harbours and near coastlines. The fin whales sightings (n = 5) were seen on one fishing trip on the south coast. These data provide additional information on the distribution of cetaceans, especially in winter-time, and will be lodged at the Biodiversity Centre, Waterford and to the European Seabirds at Sea (ESAS) database (JNCC Aberdeen). They will also be used in analysis currently being undertaken by the Beaufort Ecosystem Approach to Fisheries Management, to examine the spatial "risk" of cetacean entanglement with fisheries.

Table 6 Sighting records of marine mammals recorded by observers on dedicated watches.

Species	***Number of sightings***	***Number of animals***
Common dolphin (*Delphinus delphis*)	15	95
Risso's dolphin (*Grampus griseus*)	3	10
Killer whale (*Orcinus orca*)	2	18
Pilot whale (*Globicephalea melas*)	2	12
Unidentified baleen whale	2	2
Unidentified dolphin	4	25
Unidentified cetacean	2	3
Unidentified seal	2	2
Grey seal (*Halichoerus grypus*)	1	1

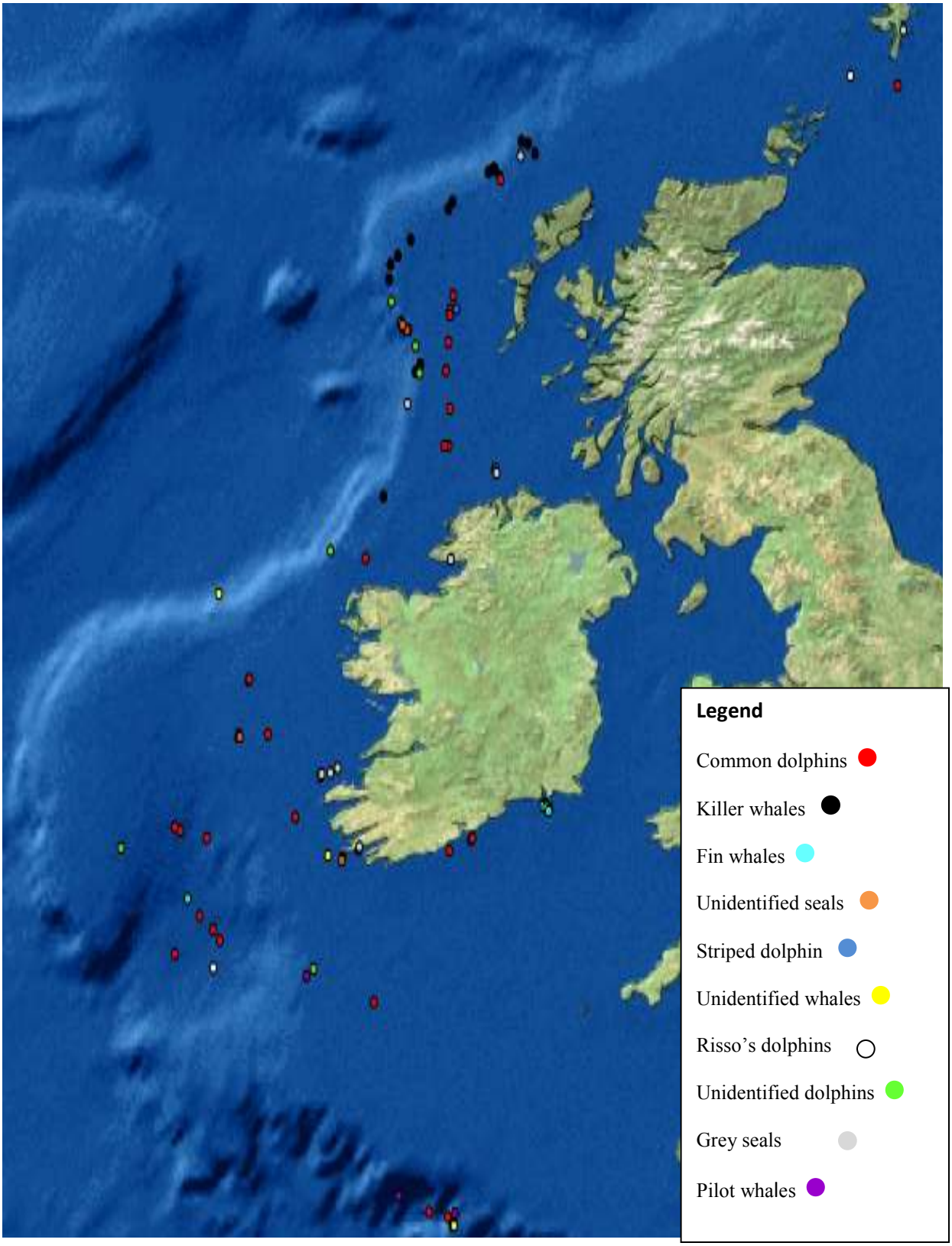

Figure 3: All cetacean and seal sightings from 'on' effort watches and 'off' effort sightings.

Gillnets and damaged fish

Observers recorded the number of fish damaged/set. Seventeen sets were observed, targeting mostly pollack, whiting and haddock. Soaktime ranged from 9 hours to 26 hours. The length of the gear set was also variable, with strings of gear ranging from 1.2km to 9.6km. The positions of the sets are shown in Figure 4. Of the 17 sets observed, damaged fish were reported from 16 sets. The number of individuals damaged varied between sets and ranged from 1 individual to 42 (Figure 5). One set recorded no damage, and on one occasion, a plastic ring was found behind the pectoral fins, causing epidermal and muscular abrasion (see Plate 4).

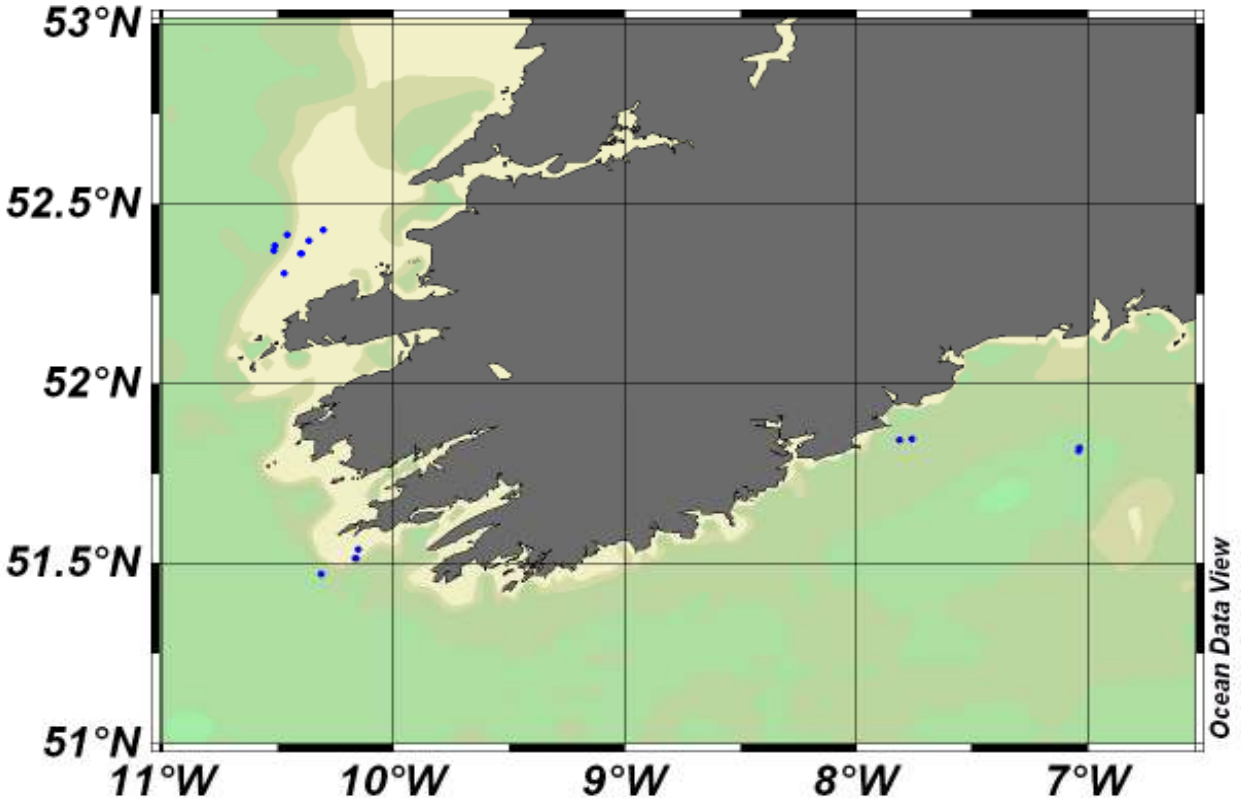

Figure 4: Locations where damaged fish recorded

There was no overall linear relationship between the number of fish damaged and the fishing effort (net km hours) (Figure 5). Damage appears to be regional, with fewer fish recorded as damaged from the south coast than the west coast, and more damaged fish were recorded north of Dingle than off Castletownbere**.** Comparing the number of fish damaged with the number of boxes of fish landed (Figure 6) no clear relationship can be seen, although the area fished

appears to be a factor accounting for higher damage levels, and irrespective of the number of fish caught. In some cases, the number of damaged fish comprised a high percentage of fish caught.

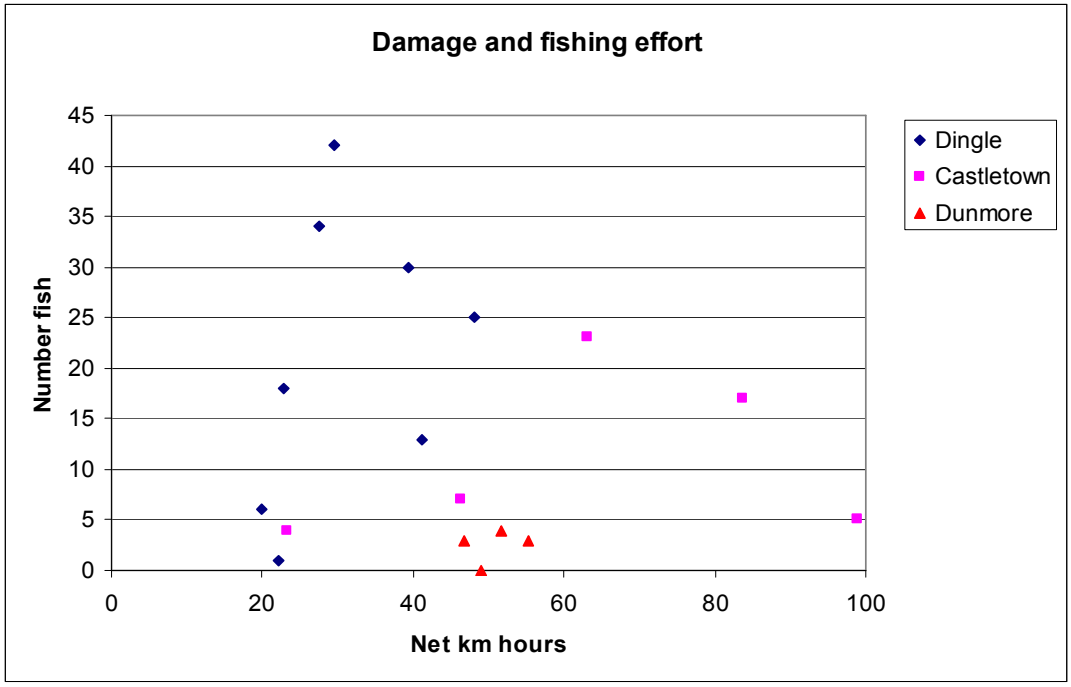

Figure 5: Relationship between observed fish damaged/set and fishing effort by area fished.

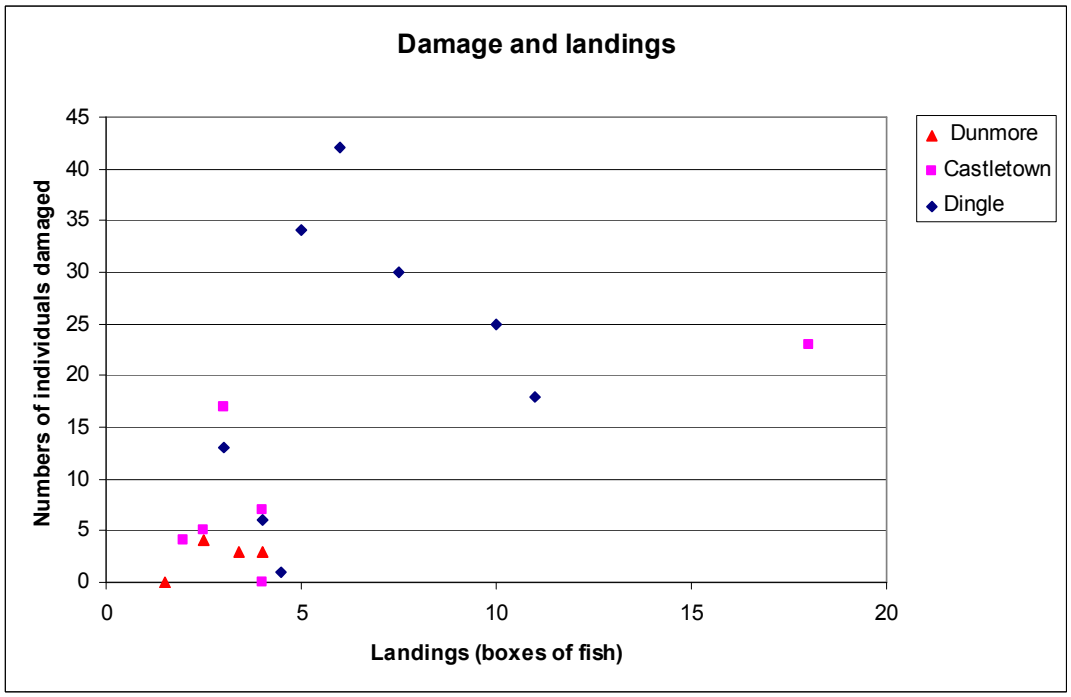

Figure 6: Relationship between observed fish damage/set and landings by area fished.

Of the 242 damaged fish examined, the majority (67%) were pollack, followed by smaller proportions of cod (n = 24), ling (n = 24), hake (n = 18), haddock (n = 11) and whiting (n = 8). Damage to one pouting and one mackerel was also recorded (Figure 7). Interestingly, no other species were observed damaged, even though other species, including lesser spotted dogfish, spurdog, monkfish, saithe, plaice, and sole were caught, albeit in small numbers.

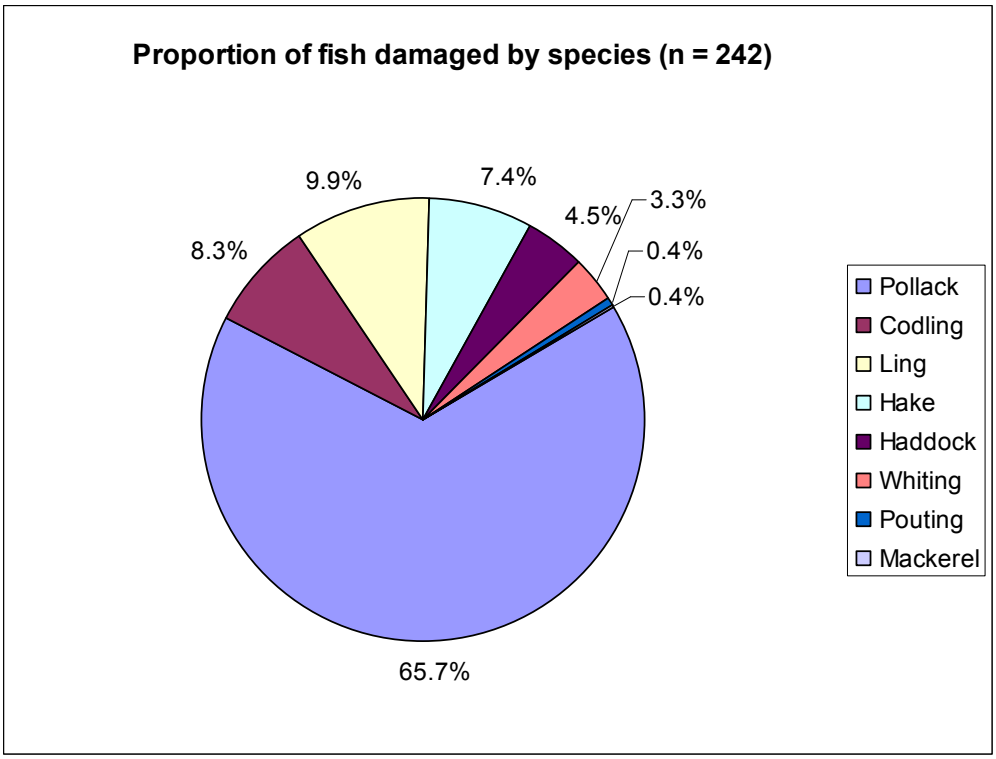

Figure 7: Proportion of recorded damage by species

Of the types of damage recorded, the most prevalent damage was damage to the abdominal area only, where a portion of the abdominal area is missing (plate 1). This represented 60% of the damage recorded. The next most frequently described damage (33%) was where the abdomen and tail were missing (plate 2). Occasionally, the head, or the head and abdomen combined, were damaged and in some instances, only the head and backbone remained (plate 3).

Plate 1 Damage to abdomen

Plate 2 Abdomen and tail missing

Plate 3 Head and backbone remaining

Plate 4 Fish damaged by plastic ring

Discussion

The pelagic trawl and gillnet fisheries monitored during this programme, in accordance with the 812/2004 Directive, resulted in zero cetacean bycatch being observed. Based on this result, it is therefore not possible to design a sampling strategy aimed at achieving a co-efficient of variation no higher than 0.30 for the most frequently caught species, and pilot observer programmes should continue. This result does not imply that there is no cetacean bycatch in the Irish fleet. The total number of days on which fishing was observed was 57 days, out of 111 days at sea. It is not clear whether an increase in observation effort in pelagic trawls would result in cetacean bycatch being detected. While cetacean bycatch has been noted in some pelagic trawl fisheries in the NE Atlantic at varying rates and in different years (e.g. Morizur *et al*., 1999, Fernándes-Contresas *et al*., 2010, Northridge & Kingston, 2010), in other pelagic fisheries the number of individuals caught is zero (e.g. no cetacean bycatch has been observed in the UK herring and mackerel pair trawls operating in areas IVa and VIa since 2005; Northridge & Kingston, 2010). In contrast, by-catch in gillnets has regularly been recorded from many studies and an increase in observer effort in gillnets is warranted. For example, 10 harbour porpoises (*Phocoena phocoena*) and three common dolphins were observed bycaught in gillnet and tangle net fisheries in the UK in 2009, raising the total bycatch to the UK fleet level to 791 (CV 0.31) and 237 (CV 0.58), respectively (Northridge & Kingston, 2010).

The total of 111 days at sea achieved during this programme, fell short of the requirements set out of 190 days. There are a number of reasons why this target was not reached, which are mostly logistic and relate to the dynamic nature of fish and fisheries. The target for Albacore tuna sampling was 40 fishing days, from August to October 2010. We achieved 30 days at sea on albacore fishing trips (although one of these trips targeted herring for two days). From discussions with fishermen, the quantity of tuna caught this year was much lower than previous years. Skippers reported that tuna were widely dispersed and not present in areas where they were caught last year. Many vessels were just about covering the fuel costs on individual trips and for this reason, many vessels opted out of tuna fishing this year, or finished fishing for tuna earlier in the season than usual. We encountered difficulties in finding vessels fishing in both September and October. We also encountered difficulties with obtaining vessel contact details

from fish producer's organizations' in August and early September. Furthermore, one observer was taken ill (and had to be air lifted off a vessel) on a fifth fishing trip, thus reducing our fishing days further.

The target for the pelagic trawl fishery was 120 days at sea from December 2010 to March 2011. Seventy-three days were achieved (including a 3 day trip for herring in October). Just over half of our target pelagic trawl days at sea in December were reached (16 out of 30 days). Most vessels had caught their allocated quotas early in December and were not fishing again until January. Some vessels were demersal fishing for whitefish in December, and not pelagic trawling until January. Two mackerel trips organised to take place before Christmas, were cancelled by the skippers as the mackerel quota allocated to them was too small to make it worth their while fishing. One further trip on a vessel departing from Killybegs in early December had to be cancelled by the observer due to hazardous road conditions at the time.

The pelagic trawl target for January of 30 days at sea was reached, as most vessels were fishing for mackerel in area VIa during January. A meeting with the KFO in November was very useful, and many skippers were aware that it was supported by the KFO. The targets of 40 pelagic trawl days for February and 20 days in March were not reached (18 days in February and 10 days in March were achieved). Again, many of the larger vessels had caught their quotas for the year and were no longer fishing beyond January. Other vessels had switched to demersal fishing. Shorter trips on smaller vessels fishing for herring in Dunmore East, as well as some mackerel and horse mackerel on vessels that had not caught their quotas were carried out.

The total days at sea on bottom set gillnet trips was 8 days, falling far short of the target of 25 days from December to March. This was largely due to a lack of contact details for gillnet vessels, particularly for area VIIa, the Irish Sea. In addition, one of the larger gillnet vessels did not have any room for an observer.

As this was the first year of such a dedicated observer programme, delays were encountered in the first phase of the project, with compiling lists of skippers and vessels. It is expected that if this project were to run again, more days at sea could be achieved as many contacts have now been established, skippers are now aware of the project and good relationships have been established between observers and skippers. Increased resources could also facilitate an increase

in the days at sea, with more observers, particularly in January when most fishing is taking place. Another possible way of increasing marine mammal bycatch observer effort would be to use the existing fisheries observers, whose main work involves recording and measuring fish and discards. These observers have different work regimes and different priorities, but it may be possible for these observers to do randomly assigned marine mammal trips or specific hauls within a trip, where they would focus on marine mammals, observe the entire hauls, look for drop outs, look for other interactions with the gear and then continue with the remainder of the fish focused trip. This approach is similar to the one used in New Zealand and could be used alongside a dedicated cetacean observer programme to increase cover in specific fisheries.

The dedicated cetacean programme also allowed auxiliary data to be collected, including effort related marine mammal sightings data, occasional marine mammal sightings data, killer whale interactions with the mackerel fishery and in the case of gillnets, damage to fish. The sightings information is important and will contribute to our knowledge about the distribution and relative abundance of cetaceans, particularly in wintertime. At least 24 species of cetacean have been recorded in the waters around Ireland and this information has been obtained during dedicated surveys (such as SCANS, SIAR, SCANS 2 and CODA), and using observers on research vessels and other platforms of opportunity (e.g. O'Cadhla et al., 2004, Wall et al., 2006). The coverage still remains patchy, but this information is crucial for spatial management and examining areas where there is likely to be overlap with the oil and gas industry, offshore renewables and with the fishing industry. While the weather and light conditions often excluded effort related watches, the pilot programme shows that it is possible for observers to carry out dedicated watches, especially during transit to fishing grounds, providing added value to the programme and increasing our information on distribution and habitat use. Occasional sightings (non-effort related) can also provide information on seasonal distribution of different species.

The behavioral observations of the killer whales and the mackerel trawlers are of note. This interaction has been observed previously in a similar area (see Luque *et al*., 2006). Killer whales in the NE Atlantic are poorly studied, but recent information shows that there are likely a number of feeding specializations, underpinned by genetic differentiation (Foote et al., 2009, 2011). We are currently looking at relatively poor quality photo-identification images in an attempt to identify the killer whale individuals involved and are collaborating with Dr A. Foote (University

of Aberdeen/Copenhagen) in an attempt to match the images to known individuals in the NE Atlantic killer whale catalogue, with a view to preparing the information for publication and also developing a dedicated research project.

The records of damage to fish caught in gillnets was additional "value added" work carried out by the observers while on board. While in this current study, the sample size is low, there does appear to be some variation in the level of damage, with possible regional differences, as other factors, such as soak time or numbers of fish caught/landed did not appear to show any consistent patterns. The quantification of damage to fish is important, along with possible factors influencing the level of damage, such as species composition, distance to shore, season and location. Additional observer programmes could relatively easily incorporate this element into the work programme, along with collecting data on some additional data/co-variates which might better explain variability in damage.

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