

Marine Institute Cetacean Monitoring

Cetacean Distribution and Relative Abundance Survey

During the Celtic Sea Herring Acoustic Survey

8th October – 28th October 2021

Lead Agency: Marine Institute

Lead Partners: National Parks and Wildlife Service,

Authors: Irish Whale and Dolphin Group

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Executive Summary

Irish waters represent one of the most important marine habitats for cetaceans in Europe and are utilized by a wide range of cetacean species. However, the abundance, distribution and conservation status of many of the species occurring in Irish waters remains poorly understood. Under the EU Habitats Directive, there is a requirement on member states to conduct surveillance of cetaceans occurring within their waters. The Irish Whale and Dolphin Group (IWDG), contracted by the Marine Institute Ireland, conducted a cetacean survey from the RV Celtic Explorer during the annual Celtic Sea Herring Acoustic Survey (CSH), running from 8 October to 28 October 2021.

A single Marine Mammal Observer (MMO) was aboard the Marine Institute's research vessel 'Celtic Explorer' for 20 days, compiling both legs of the research cruise. The role of the MMO was to record any sightings of cetaceans during daylight hours of the survey. A standard, single platform line transect survey methodology was employed by the MMO with additional visual point sampling at oceanographic sampling stations. Survey transects were undertaken at speeds of 5-11 knots, with fishing activity being conducted at speeds of 3-5 knots. The MMO's survey effort was maximized during periods of sea state ≤ 6 and with visibility of ≥ 1 km. A total of 17 days of surveying was possible, amounting to 65 hours of survey time. Sea state was relatively good during survey days (≤ 3 at 38.7% of effort recordings) and visibility was also favourable (> 5 km at 87% of effort recordings).

A total of 178 separate sightings of cetaceans were recorded. Recorded species were: harbour porpoise (*Phocoena phocoena*); short-beaked common dolphin (*Delphinus delphis*); bottlenose dolphin (*Tursiops truncatus*); minke whale (*Balaenoptera acutorostrata*); humpback whale (*Megaptera novaeangliae*); fin whale (*Balaenoptera physalus*); Other non-cetacean species recorded were Basking shark (*Cetorhinus maximus*) and blue shark (*Prionace glauca*).

Introduction

In the waters of Ireland's Exclusive Economic Zone (EEZ), 25 species of cetacean (whales, dolphins and porpoise) have been recorded to date. Eleven of these species are thought to calve in Irish waters. As such, the Irish government declared Irish waters within the EEZ as a cetacean sanctuary in 1991 (Rogan and Berrow, 1995). However, despite this designation there is limited knowledge on the distribution and relative abundance of cetaceans within the Irish EEZ (NPWS, 2013; Table 1). Under the EU Habitats Directive, there is a requirement on member states to conduct surveillance of cetaceans occurring within their waters. Marine mammals in Ireland are also protected under the EU Habitats Directive. All cetaceans are listed under Annex IV of the Directive as species requiring strict protection in their natural range (Article 12, EC Council Directive 92/43/EEC). The harbor porpoise (*Phocoena phocoena*) and bottlenose dolphin (*Delphinus delphis*), together with both seal species occurring in Irish waters, the grey seal (*Halichoerus grypus*) and the common seal (*Phoca vitulina*), are listed in Annex II and further protected under Article 3 of the Directive, as species whose conservation requires the designation of Special Areas of Conservation (SAC).

Since 1991, the Irish Whale and Dolphin Group (IWDG) have been monitoring cetacean distributions and abundances in Irish and Northern Irish waters. Surveys on board the Marine Institute's research vessel (Celtic Explorer) have been undertaken by IWDG since 2003 and these surveys have helped to provide vital data on cetacean density and distribution in Irish, UK and EU waters. These data will contribute to the identification of important habitats for European cetacean populations and to help devise programs for their long-term conservation and protection.

Studies on the presence, distribution and abundance of cetacean species have been conducted in Ireland since 1994 (e.g. Pollock et al. 1997; Ó Cadhla et al. 2004; Wall et al. 2013; O'Brien et al. 2016). Since 2003 the Marine Institute has facilitated the surveillance of cetaceans in Irish waters by accommodating marine mammal observers onboard national research vessels (RV Celtic Explorer and RV Celtic Voyager) during research surveys (Oudejans 2014). Fisheries acoustic surveys are particularly suited to the conduction of cetacean surveys as the vessel spends the majority of the survey travelling at a steady speed along pre-determined survey tracks (e.g. Figure 2).

Conducting marine mammal observations onboard the CSH survey presents a highly advantageous opportunity to record cetaceans in key areas of Ireland's EEZ (e.g. large areas of the continental shelf waters), and neighboring UK waters. The oceanic waters of Ireland's EEZ are highly productive due to the upwelling of nutrient-rich waters which in turn support an array of species assemblages (Mackey et al. 2004). This, coupled with the complex bathymetry and hydrology of the Atlantic margin create rich habitats for cetaceans (Wall et al. 2006).

Table 1: Marine mammal species occurring in Irish waters and their conservation status (Sources: Wall et al. 2013; Whooley 2016; Temple et al. 2007)

Common name	Scientific name	Occurrence	Conservation Status (IUCN Europe)
Baleen whales			
Humpback whale	<i>Megaptera novaeangliae</i>	May-Aug	Least concern
Blue whale	<i>Balaenoptera musculus</i>	July-March	Endangered
Fin whale	<i>Balaenoptera physalus</i>	All year	Near threatened
Sei whale	<i>Balaenoptera borealis</i>	All year	Endangered
Northern minke whale	<i>Balaenoptera acutorostrata</i>	All year	Least concern
Northern right whale	<i>Eubalaena glacialis</i>	Vagrant	Critical
Bowhead whale	<i>Balaena mysticetus</i>	Data deficient	Not assessed
Toothed whales and dolphins			
Sperm whale	<i>Physeter macrocephalus</i>	All year	Vulnerable
Pygmy sperm whale	<i>Kogia breviceps</i>	Vagrant	Not assessed
Killer whale	<i>Orcinus orca</i>	All year	Data deficient
False killer whale	<i>Pseudorca crassidens</i>	June-Nov	Not assessed
Long-finned pilot whale	<i>Globicephala melas</i>	All year	Data deficient
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	May-Aug	Least concern
Northern bottlenose whale	<i>Hyperoodon ampullatus</i>	May-Aug	Data deficient
Gervais' beaked whale	<i>Mesoplodon europaeus</i>	Vagrant	Data deficient
Sowerby's beaked whale	<i>Mesoplodon bidens</i>	All year	Data deficient
True's beaked whale	<i>Mesoplodon mirus</i>	All year	Data deficient
Beluga	<i>Delphinapterus leucas</i>	Vagrant	Not assessed
Risso's dolphin	<i>Grampus griseus</i>	March-July	Data deficient
Common bottlenose dolphin	<i>Tursiops truncatus</i>	All year	Data deficient
Short-beaked common dolphin	<i>Delphinus delphis</i>	All year	Data deficient
Striped dolphin	<i>Stenella coeruleoalba</i>	May-Sept	Data deficient
White-beaked dolphin	<i>Lagenorhynchus albirostris</i>	All year	Least concern
Atlantic white-sided dolphin	<i>Lagenorhynchus acutus</i>	All year	Least concern
Porpoises			
Harbour porpoise	<i>Phocoena</i>	All year	Vulnerable
Seals			
Grey seal	<i>Halichoerus grypus</i>	All year	Least concern
Common (harbour) seal	<i>Phoca vitulina</i>	All year	Least concern

Methodology

During this survey cetacean observations were conducted by a single Marine Mammal Observer (MMO) during daylight hours between 08:00 and 12:15, and from 13:00 to 18:00 (times adjusted on some days for environmental conditions and feasibility of surveying). On average (average taken over all surveyable days including those impacted by poor weather), 3 hours and 49 minutes were spent watching for cetaceans each day (Figure 1). The average of time spent surveying was reduced particularly by poor weather on leg two. The area scanned during observations was from the ship's bow and 90° to either side. This area was constantly scanned during watch hours with roughly 60% of scans conducted using binoculars (Swarovision EL 8.5x45) and the remainder by eye.

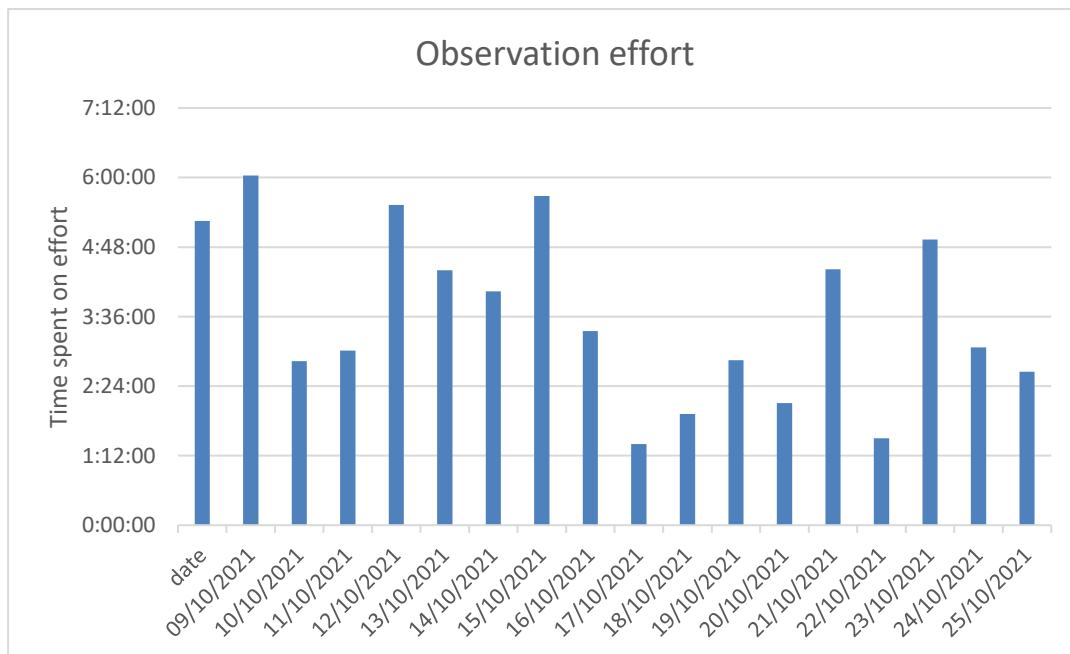


Figure 1. Daily observation effort during survey.

Observation platform.

Observations were conducted primarily from the ship's crow's nest located at a height of 18 meters above sea level and access to this platform was possible up to sea state 6, moderate swell conditions and Beaufort 7. Where environmental conditions exceeded those outlined, access to crow's nest was restricted and further observations were conducted from the monkey island (13 meters above sea level) when safe to do so. When unsafe to do so, observations continued inside from the ship's Bridge as have done on previous surveys.

Data collection and recording.

Bearings to sightings were measured using an angle board and distances were estimated with the aid of distance measuring stick. Environmental data were recorded every 30 minutes using Logger 2000 software (IFAW 2000). Sightings were also recorded using Logger 2000. Automated position data were obtained through a laptop computer linked to a GPS Receiver Unit.

Line transect survey methodology.

The vessel travelled at an average speed of 10 knots when steaming (except where restricted due to heavy weather). The vessel stopped on a regular basis to conduct CTDs or fishing trawl samples. During these times the vessel remained stationary for up to 1½ hours at a time (when in deep water) or reduced speed (3-5 knots) while trawling. As the focus of this vessel’s survey was to sample fish stocks, surveys of cetaceans were conducted in ‘passing mode’ and cetaceans sighted were not approached. Sightings were identified to species level where possible, with species identifications being graded as definite, probable or possible. Where species identification could not be confirmed, sightings were downgraded (e.g. unidentified dolphin / unidentified whale) according to criteria established for the IWDG’s cetacean sightings database (IWDG 2021).

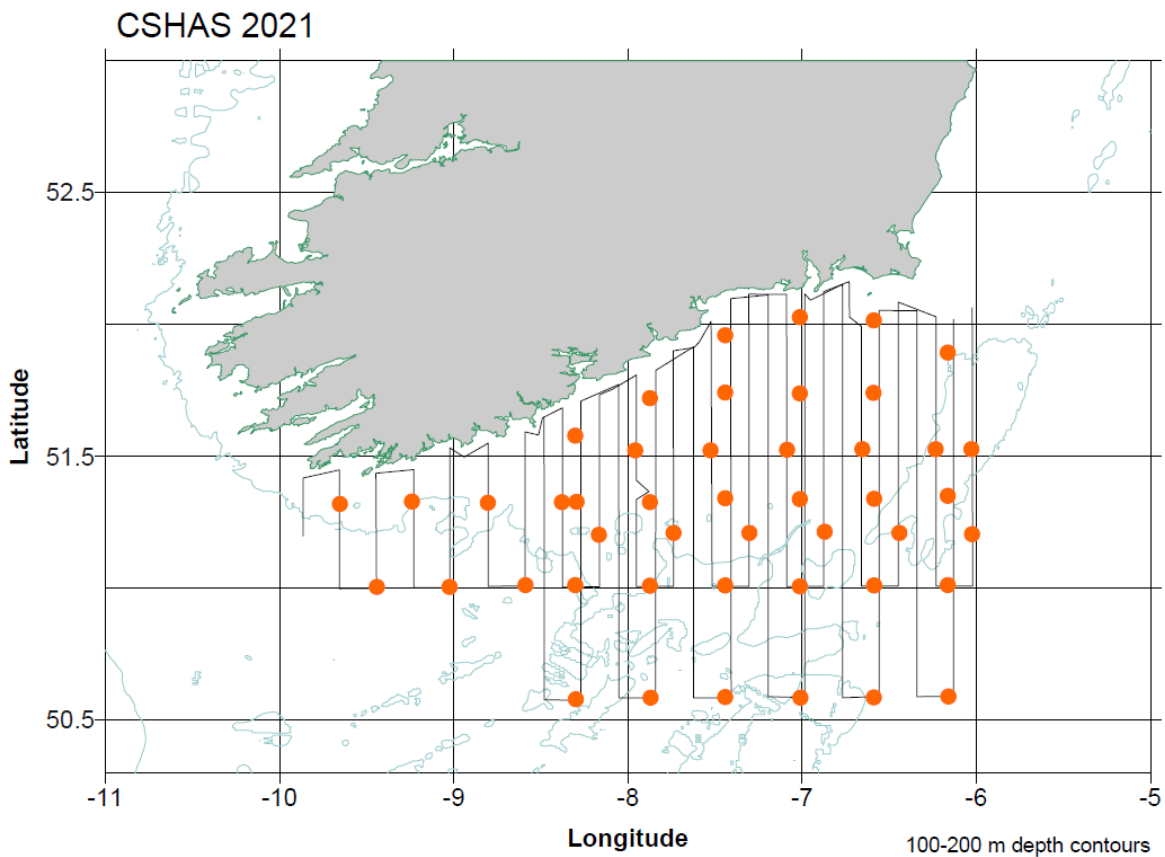


Figure 2. CSH 2021 proposed survey track with CTD stations.

Results

Environmental data were collected at 124 stations. On the second leg of the survey time spent observing was severely reduced due to persistent bad weather.

Mean wind speed during survey effort was 15 km/h. Sea state was ≤ 3 at 38.7% of environmental stations and occurred between the 9th and 16th of October. Visibility was good ($>5\text{km}$) at 87% of stations, moderate (1–5km) at 11% of stations and poor ($<1\text{km}$) at 5% of stations. A heavy swell (2m+) was recorded at 41.1% of stations. Precipitation was recorded at 12.9% of stations (Figures 3-5).

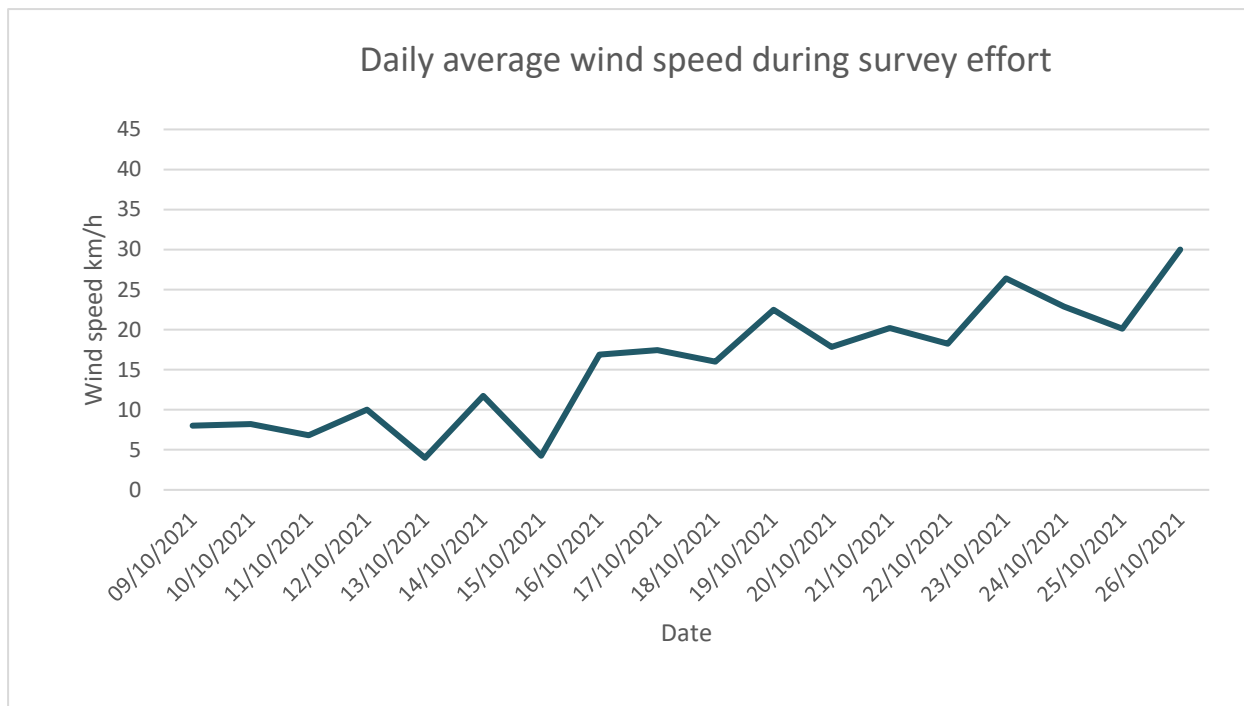


Figure 3. Average and maximum daily wind speed recorded during survey hours.

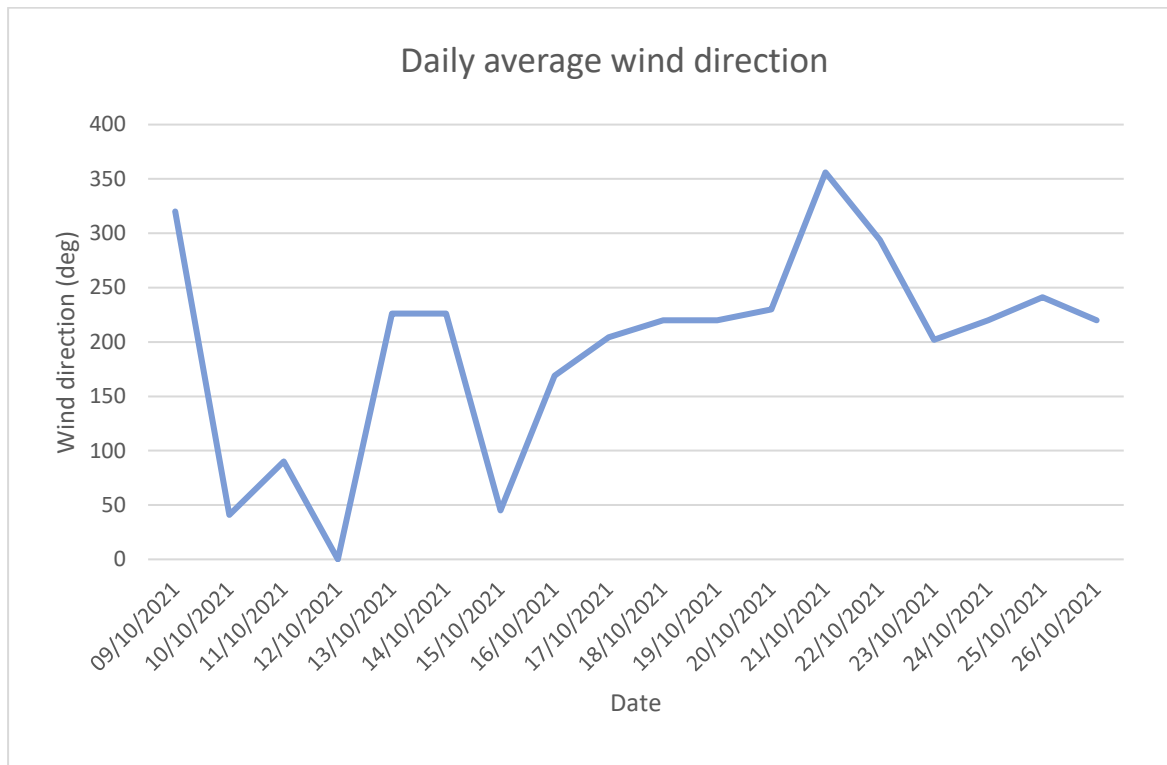


Figure 4. Average daily wind speed direction recorded during survey hours.

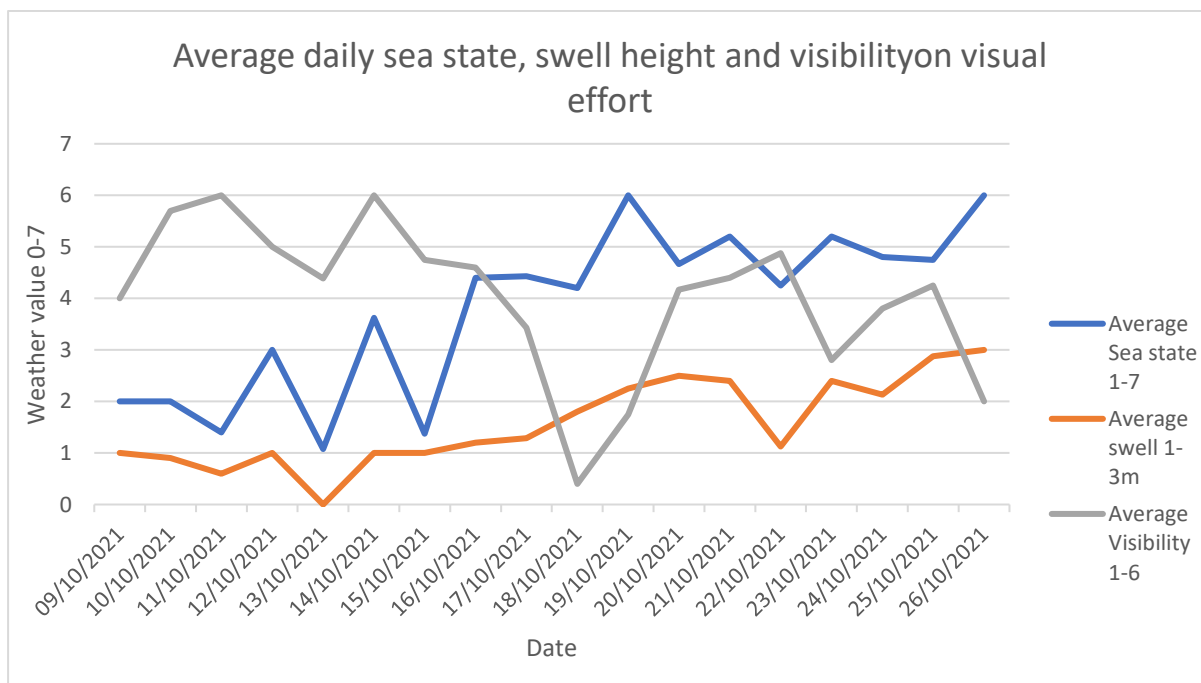


Figure 5. Average daily visibility, swell height and sea state recorded during survey hours.

Cetacean Survey Results

In total, 17 days were spent surveying with 65 hours of survey time logged. Six cetacean species were encountered during the survey i.e. harbour porpoise (*Phocoena phocoena*); short-beaked common dolphin (*Delphinus delphis*); bottlenose dolphin (*Tursiops truncatus*); minke whale (*Balaenoptera acutorostrata*); humpback whale (*Megaptera novaeangliae*); fin whale (*Balaenoptera physalus*). Other non-cetacean species recorded were Basking shark (*Cetorhinus maximus*); and blue shark (*Prionace glauca*) (Table 2).

Additional sightings of unidentified whales occurred (likely either Fin or Humpback whales) at various locations in the Celtic Sea.

Scientific name	No. sightings	No. of individuals	Group size
<i>Delphinus delphis</i>	114	2723	1-300
<i>Balaenoptera physalus</i>	31	48	1-8
<i>Megaptera novaeangliae</i>	4	6	1-2
<i>Phocoena phocoena</i>	2	4	1-3
<i>Balaenoptera acutorostrata</i>	3	3	1
<i>Tursiops truncatus</i>	1	14	14
<i>Cetorhinus maximus</i>	3	8	1-4
<i>Prionace glauca</i>	5	6	1-2
Unidentified Whale	2	2	1
	178	2814	

Table 2: Sightings of Cetaceans and elasmobranchs during CSH 2021

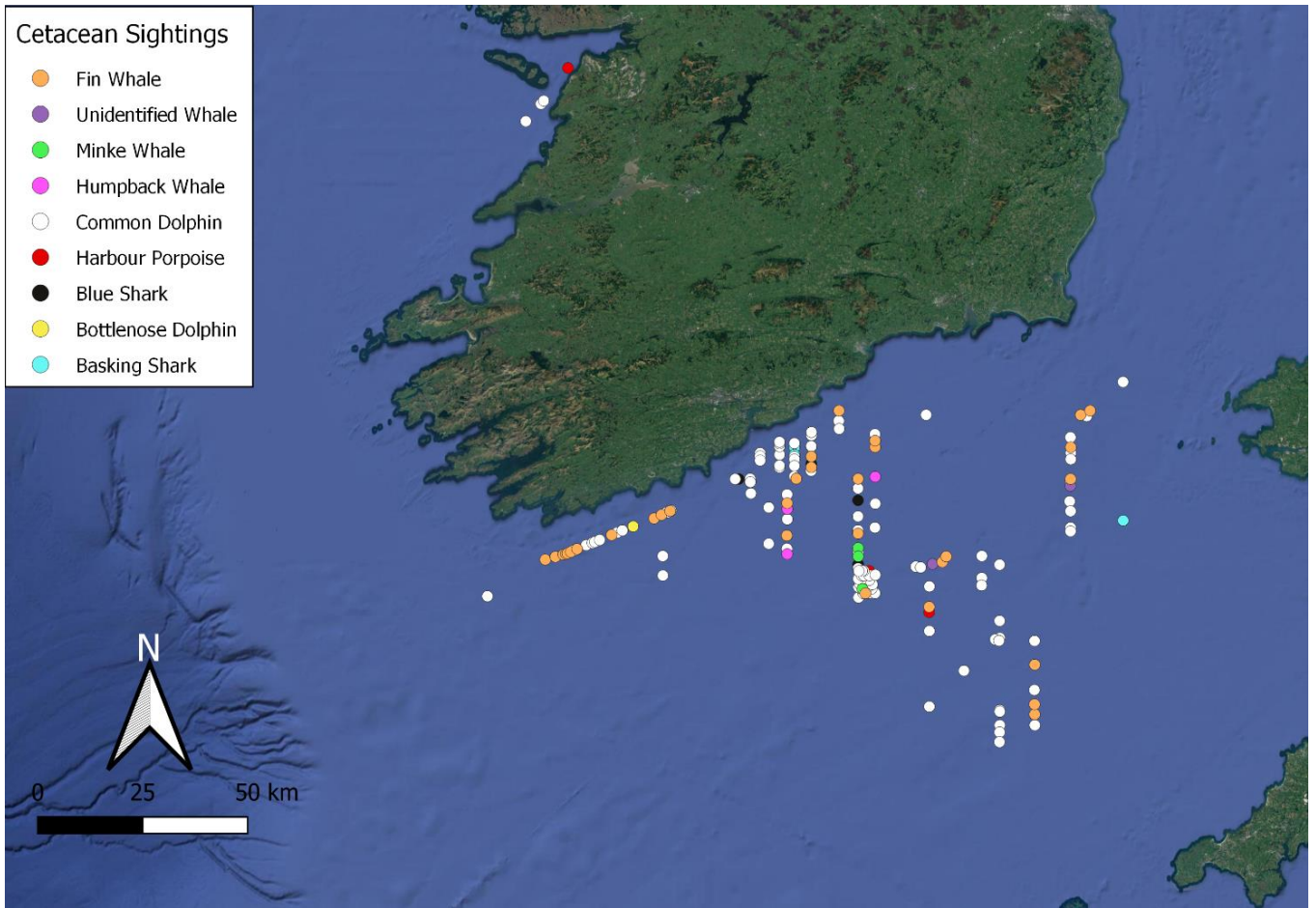


Figure 6. Locations of cetacean and shark sightings during WESPAS survey leg 2.

Common dolphins (*Delphinus delphis*) (Figure 9) and Fin whales (*Balaenoptera Physalus*) (Figure 10) were the most frequently recorded species accounting for 64% and 17.4% of recordings respectively (114 and 31 sightings respectively). Common dolphins were also the most abundant species recorded on the survey (2723 Common dolphins recorded accounting for 64% of all animals counted across all species). The observed group size for common dolphins ranged from 1 to 300 individuals. The observed group size for Fin whales ranged from 1 to 8 individuals.



Figure 7. Common dolphin with cut dorsal fin consistent with a fisheries interaction injury.

The third most frequently observed species were Humpback whale *Megaptera novaeangliae* which accounted for 2.2% of sightings. Subsequently Minke whale *Balaenoptera acutorostrata* and Basking shark *Cetorhinus maximus* accounted for 1.7% of sightings respectively, Harbour porpoise *Phocoena* and Blue shark *Prion glauca* accounted for 1.1% of sightings each and bottlenose dolphin *Tursiops truncatus* for 0.6% of sightings (Table 2).



Figure 8. Bottlenose dolphin mother calf pair.



Figure 9. Two Basking shark exhibiting circling courtship behaviour.



Figure 10. Bluefin tuna feeding in association with common dolphin



Figure 11. Fin Whale blow in rough weather, A typical feeding aggregation of Fin whales and Common dolphins in the Celtic Sea in October.



Figure 12. Fin Whale lunge feeding showing mandible.



Figure 13. Fin whale lunge feeding and showing pectoral and caudal fin

Discussion

The cetacean distribution survey carried out on board the R.V. Celtic Explorer for the 2021 CSH yielded 178 sightings of cetaceans. 2814 individual animals of identifiable species were recorded. During days of high sea states and heavy swells of the survey, this may have negatively affected the detection rate of cetaceans by the MMO, particularly those species with inconspicuous surfacing behaviors (Ryan et al. 2012; Cominelli et al. 2016). Periods of high winds and swell also hindered the MMO's ability to identify some animals to species level.

The CSH survey provides a unique opportunity for data collection of cetaceans in the Celtic Sea in October, which can be difficult to cover by other means. The majority of species recorded on this survey were done so in nearshore areas and on the shelf where migrating fish populations congregate. Therefore, these dynamic areas are likely important habitats for these higher trophic species (Wall et al. 2006). Feeding aggregations of cetaceans occurred in areas with extensive activity on the multibeam sonar.

Basking sharks *Cetorhinus maximus* were recorded on three occasions with 8 individuals observed at the surface. Two of these sightings of 6 individuals occurred in an area with feeding common dolphins *Delphinus delphis* and fin whales *Balaenoptera physalus*, two individuals exhibited circling behavior which may be indicative of courtship behavior. Excellent weather conditions for the first leg of the survey improved detectability for Basking sharks.

The Celtic Sea is known as an important site for large whales particularly Humpback and Fin whales and common dolphins (IWDG. 2021). This survey recorded significant numbers of Common dolphins and Fin whales including a significant sized group of 8 Fin whales feeding offshore of Carnsore point in the Celtic Sea. One Humpback Whale HBIRL3 was photo identified off the Cork coast. This whale also known as Boomerang has been frequently recorded on Irelands south coast over the past two decades. Interestingly HBIRL3 is regularly seen associated with fin whales unlike most Humpback whales which associate with their own species (Wall et al. 2013).

The CSH survey provides an excellent opportunity for the collection of data on the abundance, distribution and behaviour of cetaceans in Irish waters. However, the amount and quality of data collected is confounded by factors such as environmental conditions and cetacean survey design. Poor weather reduced the total number of cetacean survey hours undertaken but also affected the detection probability of many species, particularly those with inconspicuous surfacing behaviors (Cominelli et al. 2016). To remedy this issue, the additional use of PAM could have a positive effect on the detection rate and could help over-come some of the issues surrounding the visual detection of some cetaceans in poor sea states (MCR 2011; Ryan et al. 2012). During busy periods of cetacean activity, a second observer would assist greatly in recording accurate data as one observer cannot simultaneously record data and identify sightings to species level.

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I would also like to thank Seabird Observer Niall Keogh and Larry Manning for assisting with sightings and communications particularly during busy periods. This assisted greatly with accurate data collection.

Finally, I wish the ship's crew and the Marine Institute staff all the best for future surveys. Both, the Celtic Sea Herring Acoustic Survey (CSH) survey

MMO Report

Explorer crew and the Marine Institute staff have been a pleasure to work with I look forward to working with them again.

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Further details available on www.emff.marine.ie

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