
Cetacean monitoring during the Celtic Sea Herring Acoustic Survey (CSHAS) October 2014



Fastnet Rock, West Cork (C. Cronin, DAHG)

A report to the National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht
by Ciarán Cronin and Colin Barton, November 2014



Long Strand, Castlefreke, Clonakilty, County Cork
Telephone 00 353 2388 40665 or 00 353 87 904 2383
Website: www.corkecology.net E-mail: info@corkecology.net

Executive Summary

A dedicated visual survey for cetaceans was conducted in coastal waters off the west, south-west and south coasts of Ireland during the Celtic Sea Herring Acoustic Survey led by the Marine Institute. The survey took place aboard the RV Celtic Explorer between 6th and 26th October 2014. The target survey area focused on the inshore bays of Counties Kerry, Cork and Waterford, as well as offshore waters in the Celtic Sea off Counties Cork, Waterford and Wexford.

The work was undertaken on behalf of the National Parks & Wildlife Service of the Department of Arts, Heritage and the Gaeltacht (DAHG), as part of Ireland's ongoing programme for monitoring cetacean species. Ciarán Cronin, an experienced marine mammal observer, was the surveyor on board for DAHG. Also on board were William Hunt, cetacean surveyor for the Irish Whale and Dolphin Group (IWDG) and seabird observers from Birdwatch Ireland, as well as other scientists and crew. A rota for survey hours was agreed between DAHG and IWDG prior to the cruise commencing, which allowed for constant observer effort throughout daylight hours as well as periods of overlap with two observers on watch together. This report presents survey data collected by the DAHG observer only.

A total of 103 hours and 22 minutes of dedicated survey effort was achieved by the DAHG observer between 6th and 25th October 2014, with an average of 5 hours and 26 minutes of effort per day. Approximately 30.3% of survey effort was recorded in sea state 3 or less, with a further 26.0% of survey effort recorded in sea state 4. Observations during sea states of 5 to 6 accounted for 43.4% of the total survey effort, with a sea state > 6 recorded for 0.3% of the total survey effort.

There was a total of 106 sightings of positively identified cetaceans during the DAHG survey, involving seven cetacean species. The most frequently recorded cetacean species was Common Dolphin, with 76 sightings, involving an estimated 2,171 animals. Fin Whales were the most frequently encountered large whale species, with 13 sightings involving up to 24 animals, while there were also eight sightings of Humpback Whale involving up to 12 animals. In addition, there were four sightings of Minke Whale (4 animals), one sighting of Risso's Dolphin (two animals), one sighting of Bottlenose Dolphin (one animal) and three sightings of Harbour Porpoise (five animals). There were a further 10 cetacean sightings recorded where it was not possible to fully identify the species involved.

Three other species of marine megafauna were also recorded during the survey period: Grey Seal, Leatherback Turtle and Bluefin Tuna.

The current study formed the 11th dedicated cetacean survey carried out during the CSHAS in collaboration with the Marine Institute. Between 2004 and 2014 a total of 10 species of cetacean have been recorded on these surveys, with Common Dolphin, Minke Whale and Fin Whale being the most regular species encountered, although numbers are very variable. The 2014 survey recorded the highest number of Humpback Whale records during any CSHAS cruise to date.

The survey data acquired over the 11-year period so far (O'Donnell *et al.* 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012 & 2013) indicate the potential importance of certain waters in the northern Celtic Sea, and the food resources therein, for a number of cetacean species, particularly Common Dolphin, Fin Whale and Minke Whale. With greater survey effort in adjacent geographic regions during the autumn-winter seasons and continued effort aboard CSHAS cruises the full significance of such findings can perhaps be better understood.

Introduction

A total of 24 species of cetacean have been recorded in Irish waters, of which 18 species are either present year-round or occur seasonally. The remaining six species have only been recorded very rarely and are considered to be vagrant species (NPWS 2013).

All whale and dolphin species occurring in Irish waters are protected under the Irish Wildlife Acts 1976 to 2012. In 1991, the Irish government further recognised the importance of Irish waters for cetaceans and declared all waters within the Exclusive Economic Zone (EEZ) a whale and dolphin sanctuary (Rogan & Berrow 1995). In addition to the national legislation, the EU Habitats Directive obliges Ireland to implement protective and conservation measures for selected species and habitats considered to be at risk or in need of protection. As part of Ireland's obligations under the EU Habitats Directive there is a significant requirement for the surveillance of cetacean species' occurrence (e.g., range, distribution, abundance) in Irish waters.

The conservation status of many cetacean species occurring in Irish waters is currently not well known, and information on their population status, distribution and habitat use is limited (NPWS 2013). Since 1994 a number of intensive year-round visual surveys for cetaceans have been conducted in Irish waters, providing data on the presence, distribution and abundance of many species (e.g., Pollock *et al.* 1997, Ó Cadhla *et al.* 2004, and Wall *et al.* 2013).

In recent years access to research vessels such as the R.V. Celtic Explorer conducting oceanographic and fisheries surveys have provided opportunities to conduct cetacean surveys without the often prohibitive costs of chartering suitable vessels. The Marine Institute has conducted acoustic surveys for herring in the Celtic Sea for several years and has facilitated visual surveys for cetaceans by providing berths for dedicated observers on board research vessels (e.g., O'Donnell *et al.* 2013, O'Donnell *et al.* 2012 & O'Donnell *et al.* 2011).

This report documents the results of cetacean surveying carried out in the Celtic Sea in parallel with the annual Celtic Sea Herring Acoustic Survey (CSHAS) conducted by the Marine Institute aboard the R.V. Celtic Explorer in October 2014. The work was undertaken on behalf of the National Parks & Wildlife Service of the Department of Arts, Heritage and the Gaeltacht (DAHG), as part of Ireland's ongoing programme for monitoring cetacean species. The main objectives of the project were to conduct a high quality visual survey for cetaceans during the fisheries survey and to deliver detailed scientific information on the occurrence and distribution of cetaceans encountered during the survey.

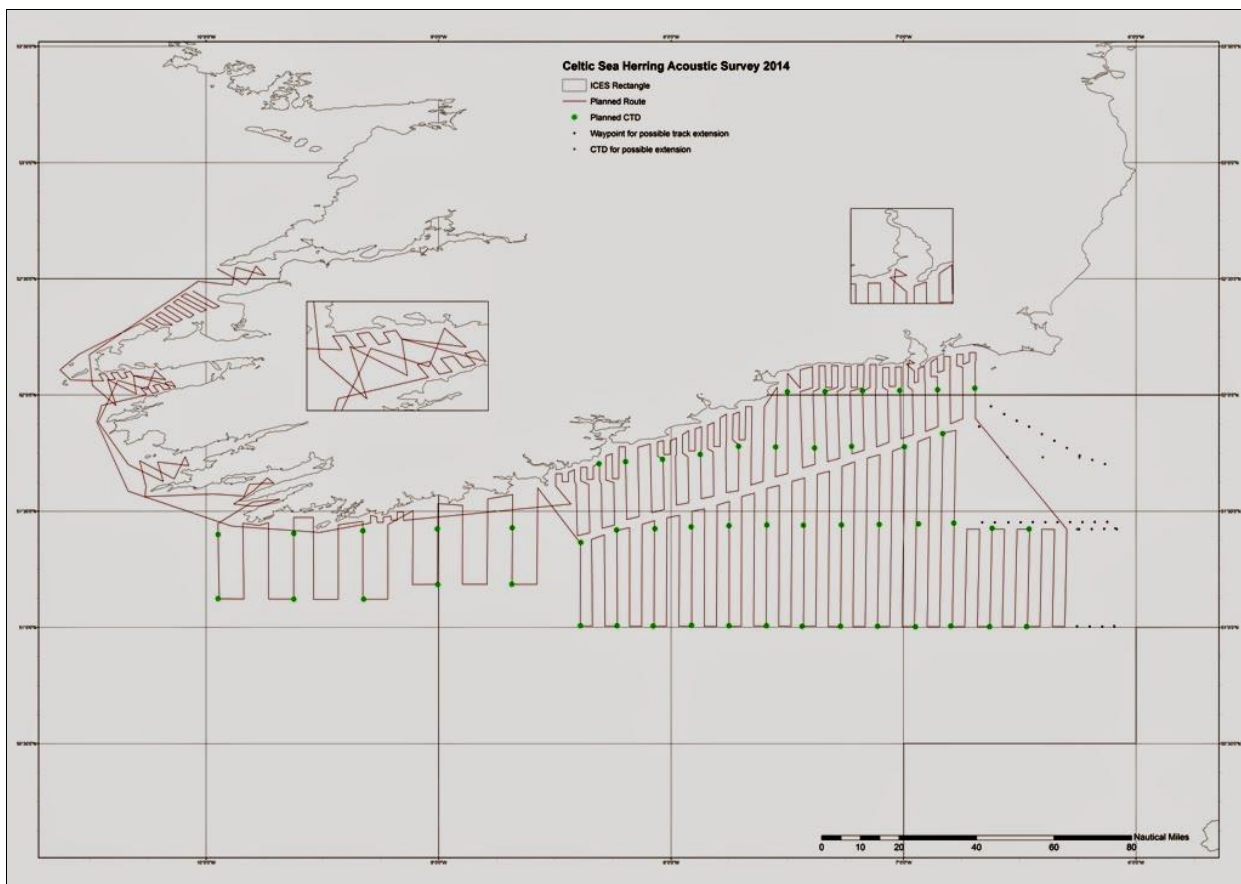
Methods

Ciarán Cronin, an experienced marine mammal observer, conducted a dedicated visual survey for cetaceans (and other marine fauna) during daylight hours from 6th to 25th October 2014 for DAHG. The CSHAS area focused on the inshore bays of Counties Kerry, Cork and Waterford, as well as offshore waters of Counties Cork and Waterford (Figure 1).

Surveys were conducted from the Crow's Nest (deck height of 17m) unless rough seas made for unsafe working conditions. When this occurred surveys were conducted from the Bridge (deck height of 10m).

Survey effort was focused in a 180° arc ahead of the ship, although observations outside this arc were also recorded.

Figure 1. Target survey plan for the Celtic Sea Herring Acoustic Survey 2014 showing planned survey tracklines off the south coast of Ireland and oceanographic CTD stations (green dots).



Source: Marine Institute

William Hunt, a cetacean observer for the Irish Whale and Dolphin Group (IWDG), was also on board the vessel. A rota for survey hours within the available daylight was agreed between DAHG and IWDG prior to the cruise commencing, which allowed for constant observer effort throughout daylight hours as well as periods of overlap with two observers on watch together. Watch start times rotated between the observers every day. This report presents survey data and results collected by the DAHG observer only, although all data recorded during the cruise will be shared between DAHG and IWDG in due course.

Cetaceans were searched for with the naked eye, using Swarovski 10 x 42 EL binoculars only to confirm species identification and the estimated numbers of animals detected. Where the exact species detected could not be confirmed, sighting records were downgraded as appropriate (i.e., probable, possible, unidentified whale, unidentified dolphin, etc.) according to guidelines set out by DAHG. The radial distance of each cetacean (or group of cetaceans) seen from the ship was estimated using a range stick calibrated to the observer and vessel (Heinemann 1981). In addition, the angle/bearing to each sighting was recorded using an angle-board. The radial distance to the sighting, together with the recorded angle from the ship's track, were used to calculate the position of the sighted animal(s).

Other information such as the time of the sighting (hour, minutes and seconds), species, group size, behaviour, animal heading, sighting cue and vessel position at the time of the sighting were also recorded on paper recording forms. Environmental information including sea state, wind strength, wind direction, swell height, cloud cover, visibility and sun glare was recorded at least every 15 minutes or when conditions changed. Vessel position was recorded every minute using a hand-held GPS unit.

Additional sightings of cetaceans seen by seabird surveyors, other scientists on board the ship and the vessel's crew were also recorded. Records of any other marine megafauna (e.g., seals, Bluefin Tuna, Leatherback Turtles) were also noted.

Data Validation

At the end of each survey day, paper data sheets were collated by the observer and the data entered onto the Excel spreadsheet provided by DAHG. To calculate the original position of each sighting record, an online conversion programme (<http://www.movable-type.co.uk/scripts/latlong.html>) was used, which calculated the latitude and longitude of each sighting in relation to the true bearing from the vessel, the estimated radial distance from the vessel and the vessel's position.

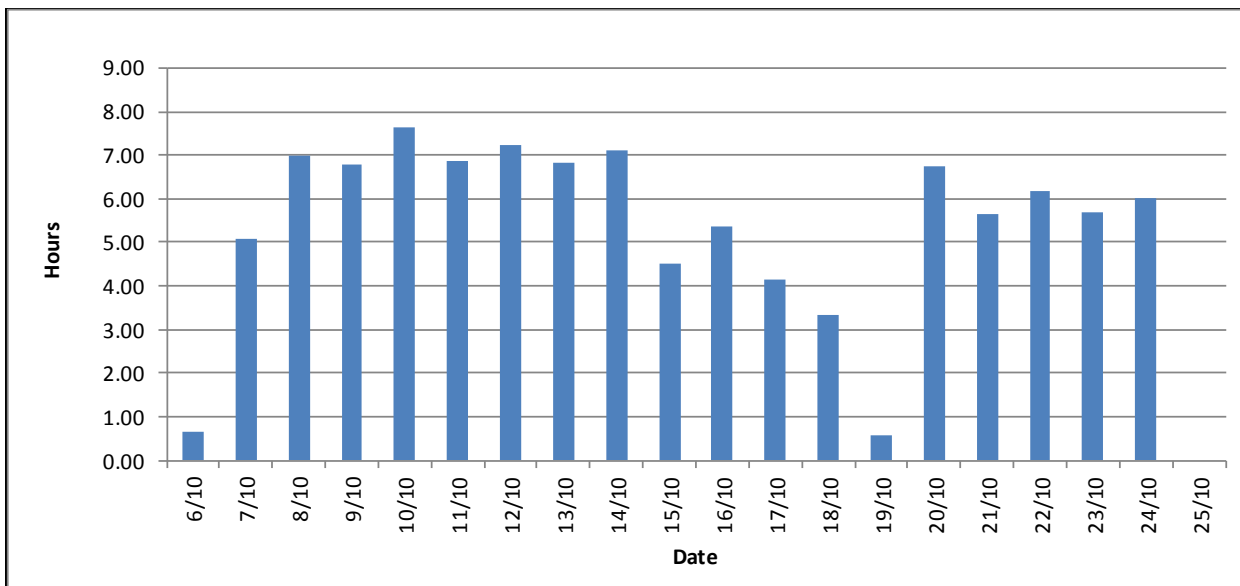
On completion of the survey, paper data sheets were cross-checked against the Excel spreadsheet to confirm that the data entered on the spreadsheet corresponded to the data sheets, and any errors were corrected. In addition, all sighting positions were also double-checked as part of the verification process.

Results

Survey effort and sighting conditions

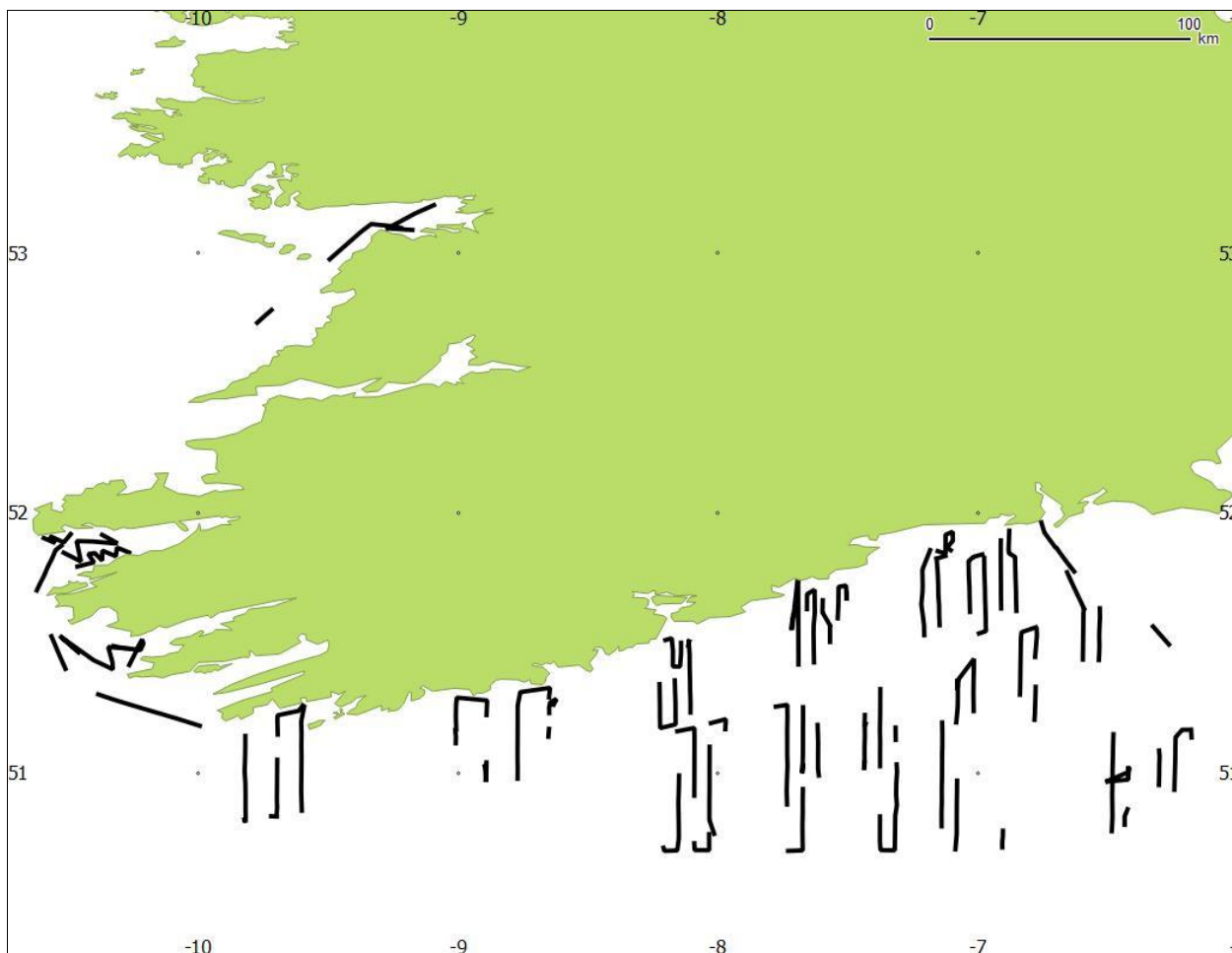
A total of 103 hours and 22 minutes of dedicated survey effort was recorded by the DAHG observer between 6th and 25th October 2014, with an average of 5 hours and 26 minutes of effort per day. Survey effort was recorded on each of the 19 active survey days, although there was no effort on the last day (25th Oct) while the vessel waited in Galway Bay to berth. There were two days where less than one hour of survey was possible due to unsuitable weather conditions (Figure 2); however, on the remaining 17 days survey effort ranged from 3 hours and 21 minutes to 7 hours and 38 minutes (Figure 2). A total of 101 hours and 12 minutes of survey effort was recorded from the Crow’s Nest, with a further 2 hours and 10 minutes conducted from the Bridge.

Figure 2. Hours of survey effort for cetaceans logged per day during the CSHAS 2014.



The DAHG cetacean survey effort tracks for the 2014 CSHAS cruise are shown in Figure 3. Gaps shown in survey coverage are due to the hours of darkness, sea conditions being too poor to maintain effort, or when the DAHG observer was on a break.

Figure 3. Spatial distribution of survey effort for cetaceans during DAHG surveys on the CSHAS 2014.



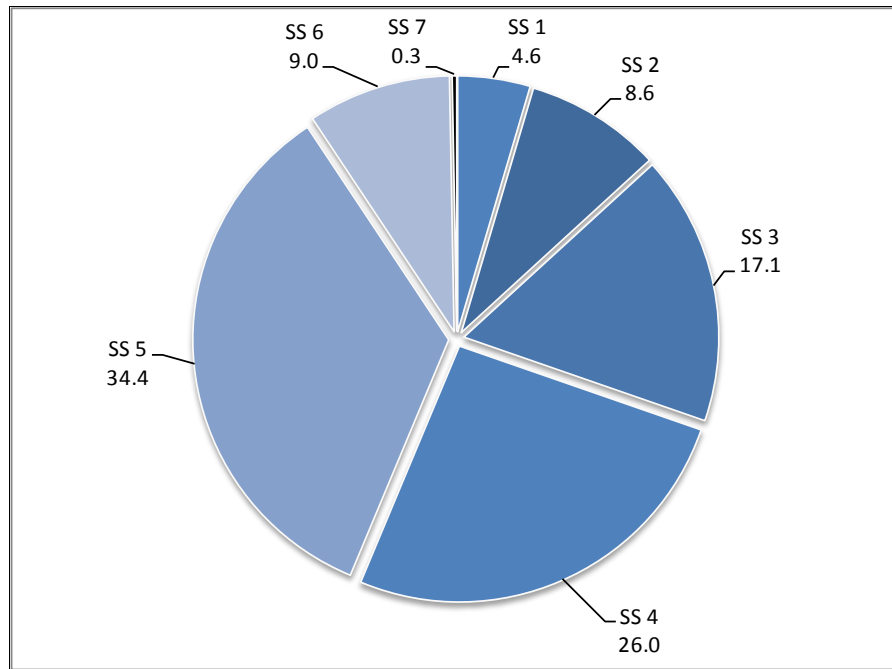
Key: Black lines = DAHG survey transects

Sea State

Environmental data were collected at least every 15 minutes along the survey track, or when conditions changed. Conditions during the first 10 days were reasonably good for surveying, with relatively calm seas and low winds. The weather worsened during the middle of the survey period before improving again particularly for the final three days. Although a sea state of 6 was considered to be the cut-off for observations, a small amount of survey effort was conducted in sea state 7 for comparative purposes.

During the CSHAS cruise, approximately 30.3% of DAHG survey effort for cetaceans was conducted in sea state 3 or less (Figure 4). This percentage increased to 56.3% when DAHG survey effort in sea state 4 was included. Observation during sea states of 5 to 6 accounted for 43.4% of the total DAHG survey effort, with a sea state > 6 recorded for 0.3% of the total DAHG survey effort.

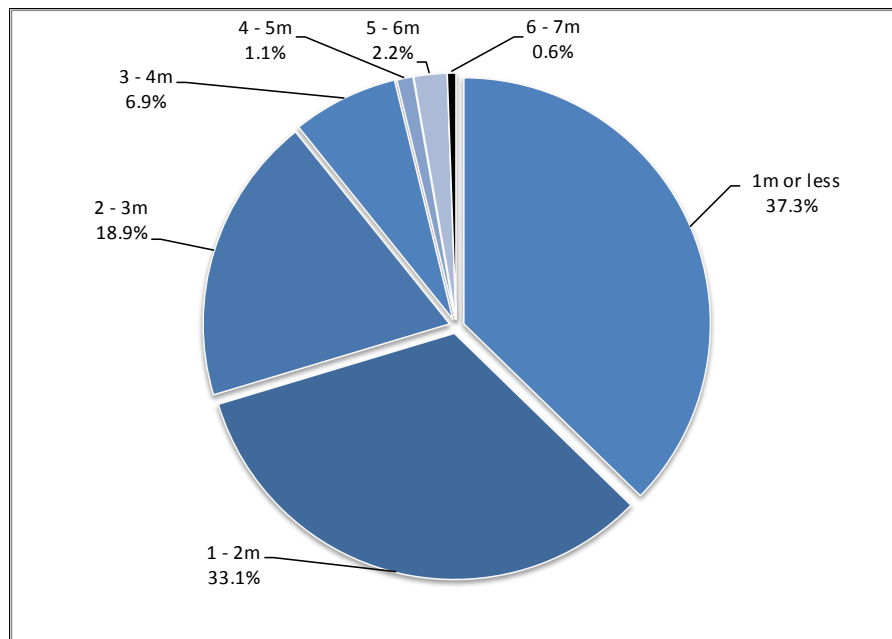
Figure 4. Proportions of DAHG survey effort for cetaceans recorded in relation to sea state.



Swell height

Over two thirds of all DAHG survey effort for cetaceans (70.4%) was conducted at swell heights of 2m or less (Figure 5). A further 18.9% of survey effort was conducted at swell heights of between 2m and 3m, with the remainder of survey effort (10.8%) recorded when swell heights were between 3m and 7m.

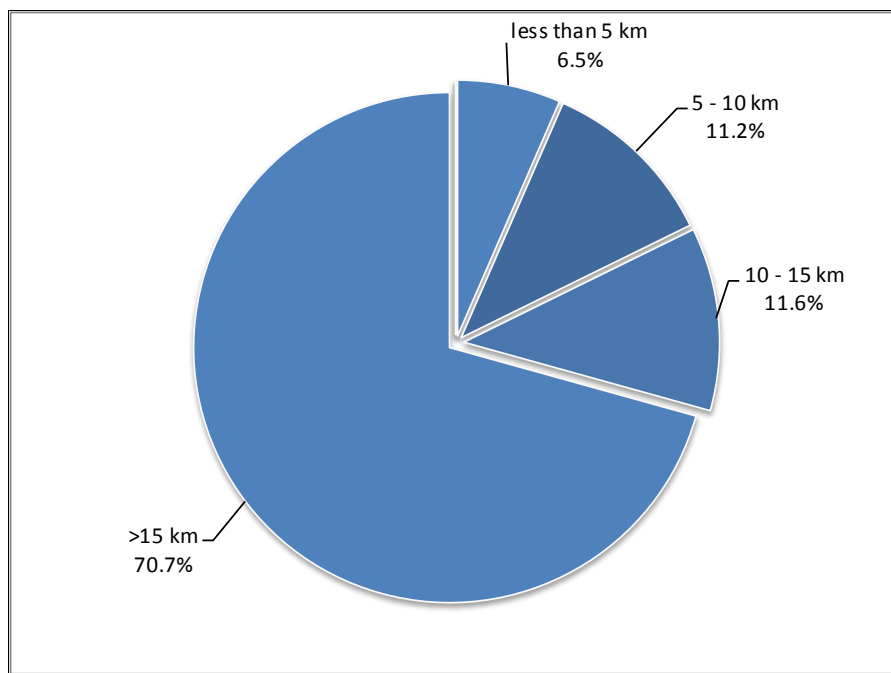
Figure 5. Proportions of DAHG survey effort for cetaceans recorded in relation to swell height.



Visibility

Visibility was generally good to excellent during the CSHAS cruise, with the majority of all DAHG survey effort (82.3%) conducted when visibility was greater than 10 km (Figure 6). A further 11.2% of survey effort for cetaceans was recorded when visibility was between 5 and 10 km. Conditions where visibility was reduced to less than 5km accounted for just 6.5% of the DAHG survey effort.

Figure 6. Proportions of DAHG survey effort for cetaceans recorded in relation to visibility.



Cetacean sightings

A total of 106 sightings of seven cetacean species occurred during DAHG surveys on the CSHAS cruise (Table 1). The most frequently recorded cetacean species was Common Dolphin, with 76 sightings involving an estimated 2,171 animals. Fin Whales were the most frequently encountered of the large whales, with 13 sightings involving up to 24 animals, while there were also eight sightings of Humpback Whale involving up to 12 animals. Further details are given in the species account section below.

In addition, there were four sightings of Minke Whale (4 animals), one sighting of Risso’s Dolphin (two animals), one sighting of Bottlenose Dolphin (one animal) and three sightings of Harbour Porpoise (five animals) recorded during the survey period. There were a further 10 cetacean sightings where it was not possible to precisely identify the species involved.

Table 1. Species, sighting totals, counts and group sizes of all cetaceans recorded during the Celtic Sea Herring Acoustic Survey 2014.

Species	No. of sightings	No. of individuals	Group size range
Fin Whale (<i>Balaenoptera physalus</i>)	13	24	1 - 5
Humpback Whale (<i>Megaptera novaeangliae</i>)	8	12	1 - 3
Minke Whale (<i>Balaenoptera acutorostrata</i>)	4	4	1
Risso's Dolphin (<i>Grampus griseus</i>)	1	2	2
Bottlenose Dolphin (<i>Tursiops truncatus</i>)	1	1	1
Common Dolphin (<i>Delphinus delphis</i>)	76	2,171	1 – 1,000
Harbour Porpoise (<i>Phocoena phocoena</i>)	3	5	1 - 2
Unidentified Large Whale	2	2	1
Unidentified Whale	4	4	1
Unidentified Dolphin	3	60	5 - 50
Unidentified Cetacean	1	1	1
Total	116	2,286	n/a

Other species of marine megafauna

Three other species of marine megafauna were also recorded on surveys undertaken during the cruise: Grey Seal (*Halichoerus grypus*), Leatherback Turtle (*Dermochelys coriacea*) and Bluefin Tuna (*Thunnus thynnus*).

Table 2. Species, sightings, count totals and group sizes of other marine megafauna recorded during the Celtic Sea Herring Acoustic Survey 2014.

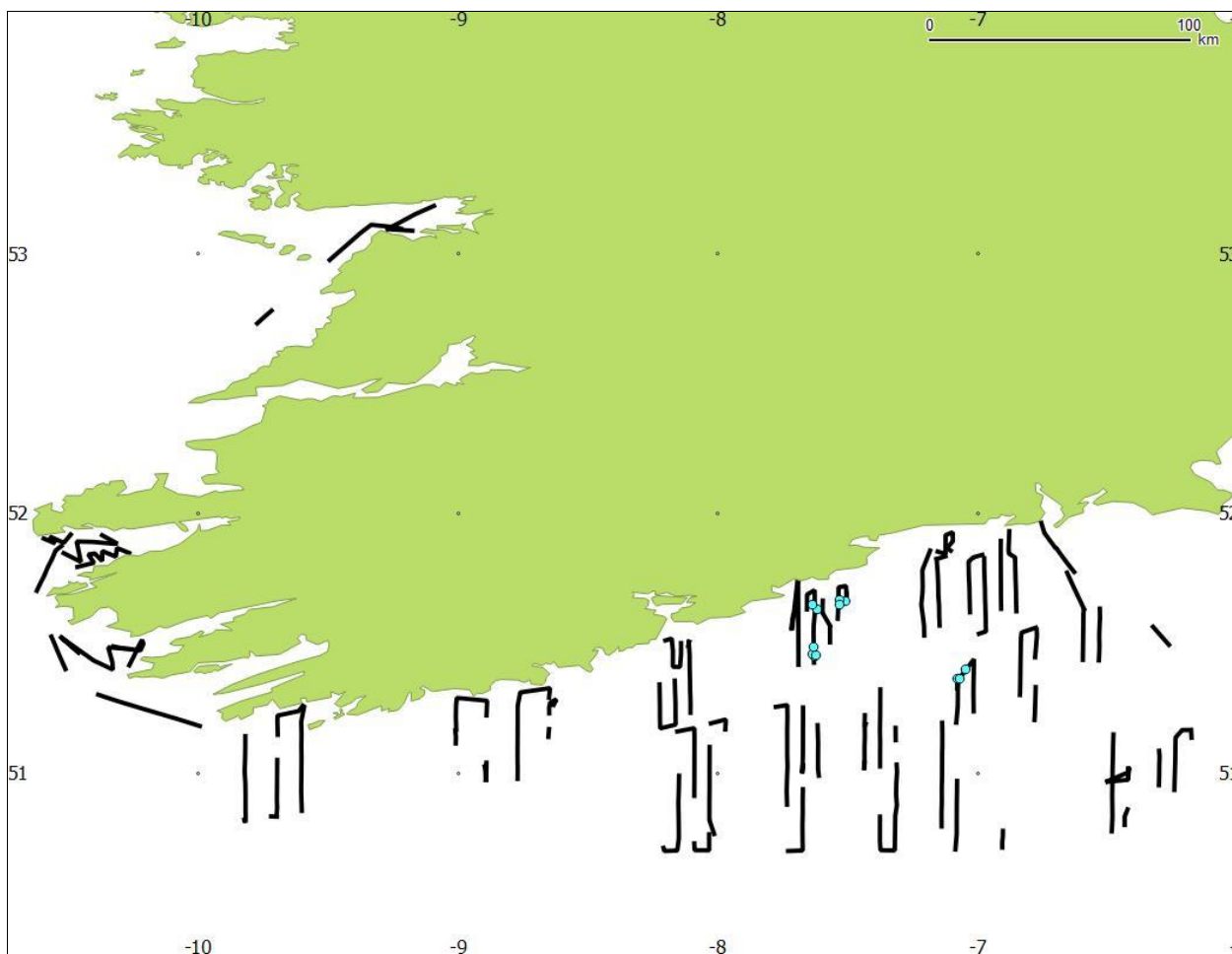
Species	No. of sightings	No. of individuals	Group size range
Grey Seal (<i>Halichoerus grypus</i>)	1	1	1
Leatherback Turtle (<i>Dermochelys coriacea</i>)	4	4	1
Bluefin Tuna (<i>Thunnus thynnus</i>)	5	195	5 - 300

Cetacean species accounts

Fin Whale (*Balaenoptera physalus*)

There were a total of 12 sightings of Fin Whale recorded by the DAHG surveyor with one additional sighting by a seabird surveyor on the CSHAS cruise, collectively involving up to 24 animals. Three sightings involving eight animals were made on 14th October, approximately 50 km south-east of Ram Head, Co. Waterford (Figure 7). On 22nd October there were 10 sightings involving 16 animals between three and 18 km south of Ram Head. Photographs later indicated that at least one identifiable animal (i.e., likely FWIRL50 in the current IWDG catalogue) was seen in both groups and as such it seems likely that at least some of the animals seen on 14th October were the same as those seen on 22nd, in areas that were approximately 35 km apart. Several Fin Whales were observed to be feeding during the survey period, with sightings appearing to correlate with the presence of Sprat (*Sprattus sprattus*) rather than Herring (*Clupea harengus*).

Figure 7. The distribution of Fin Whale sightings recorded on DAHG surveys during the CSHAS Cruise 2014.



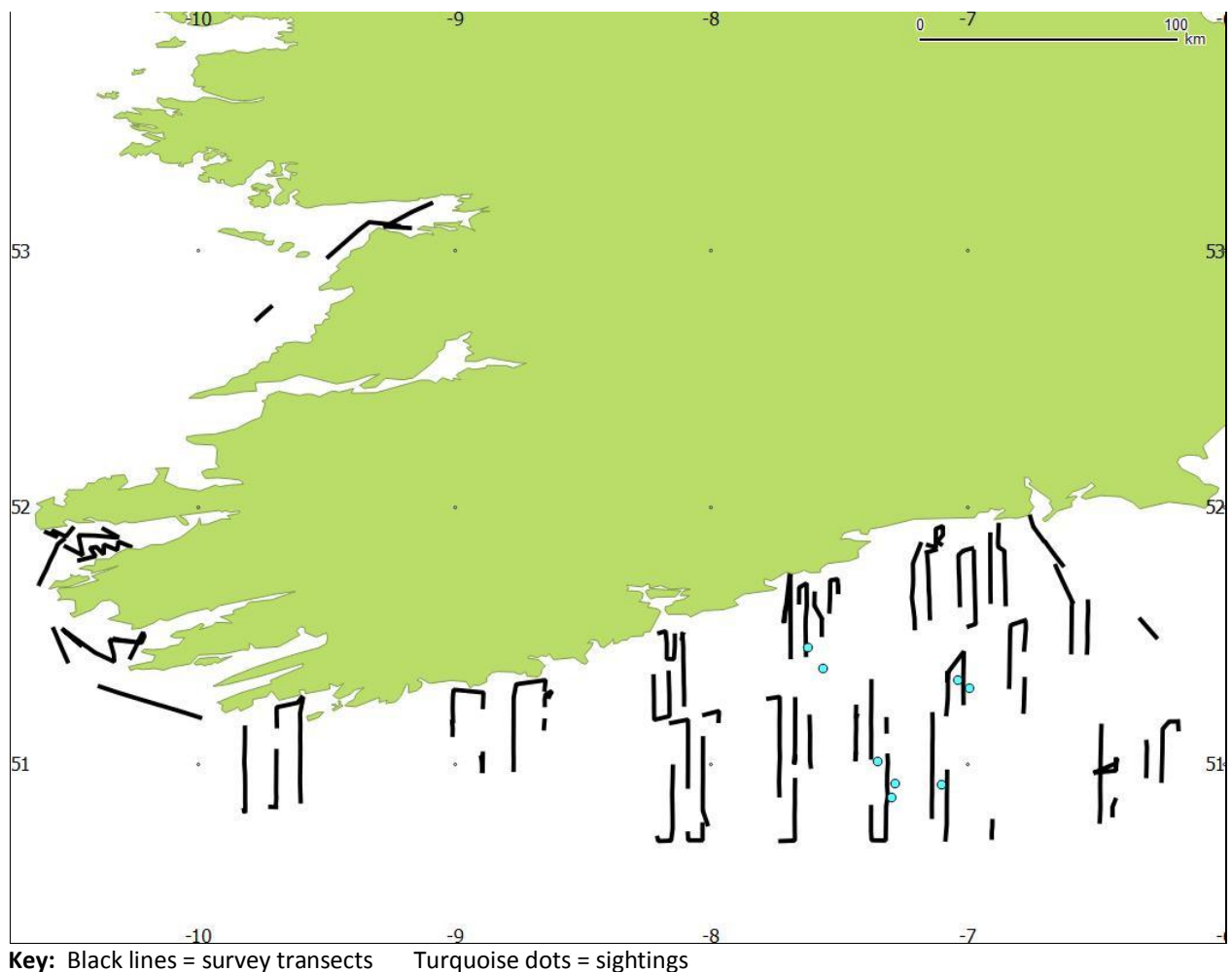
Key: Black lines = survey transects Turquoise dots = sightings

Humpback Whale (*Megaptera novaeangliae*)

There were six sightings of Humpback Whale recorded by the DAHG surveyor on the CSHAS cruise, with two additional sightings by a seabird surveyor and the IWDG surveyor respectively. Sightings involved up to 12 animals, mostly in association with records of Fin Whales south of Co. Waterford (Figure 8).

The easily identifiable individual HBIRL3 (in the current IWDG catalogue, aka 'Boomerang') was encountered on 22nd October, south of Ram Head Co. Waterford. As observed with Fin Whales most sightings were correlated with the presence of Sprat in the area.

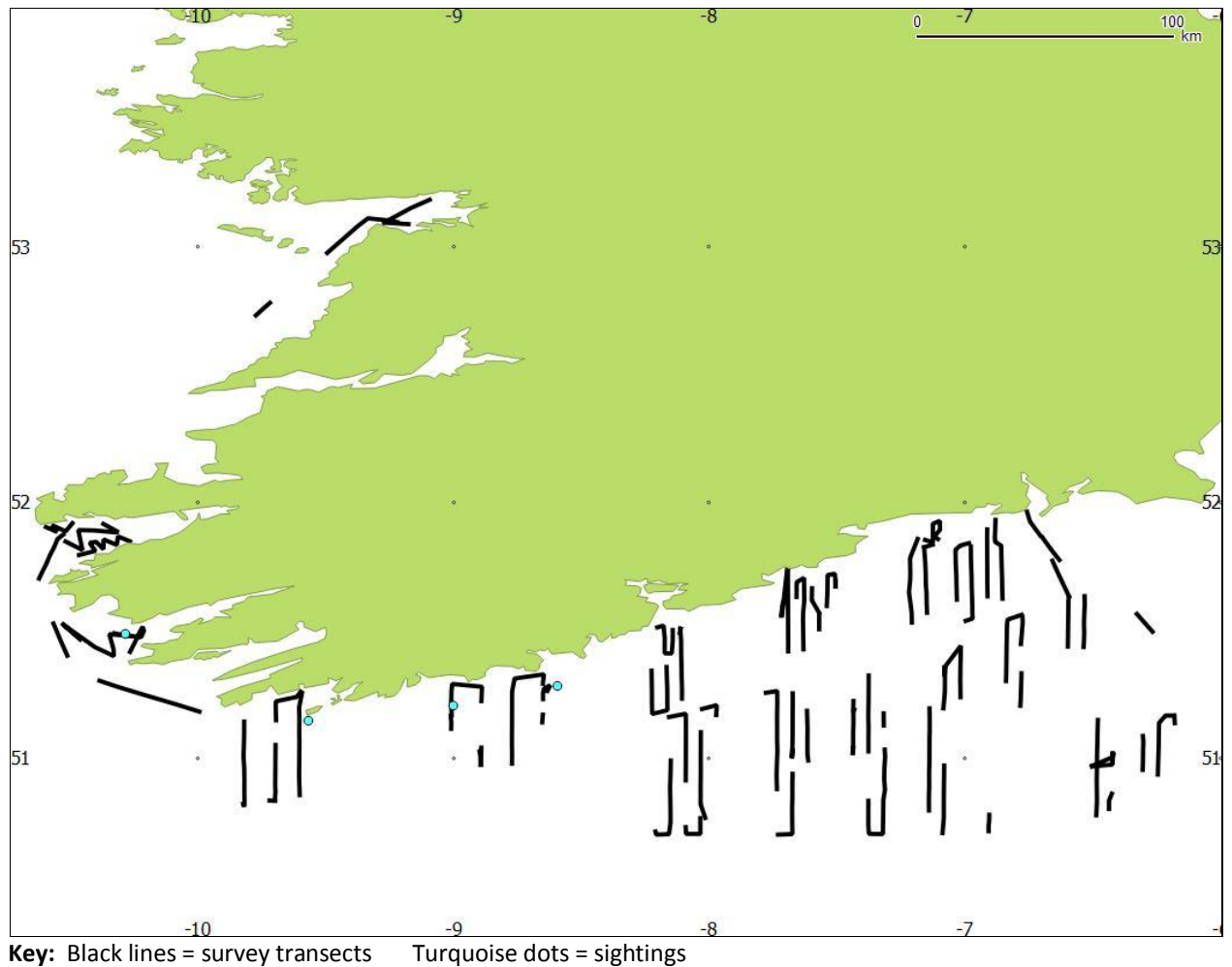
Figure 8. The distribution of Humpback Whale sightings recorded on DAHG surveys during the CSHAS Cruise 2014.



Minke Whale (*Balaenoptera acutorostrata*)

There were three sightings of Minke Whale recorded by the DAHG surveyor, with one additional sighting by a seabird surveyor on the CSHAS cruise. Sightings involved four individual animals (Figure 7). All four sightings occurred in inshore waters off the coast of Counties Cork and Kerry, with no sightings off the Waterford coast where the majority of other baleen whale sightings were made together with large recorded concentrations of Sprat and Herring.

Figure 9. The distribution of Minke Whale sightings recorded on DAHG surveys during the CSHAS Cruise 2014.



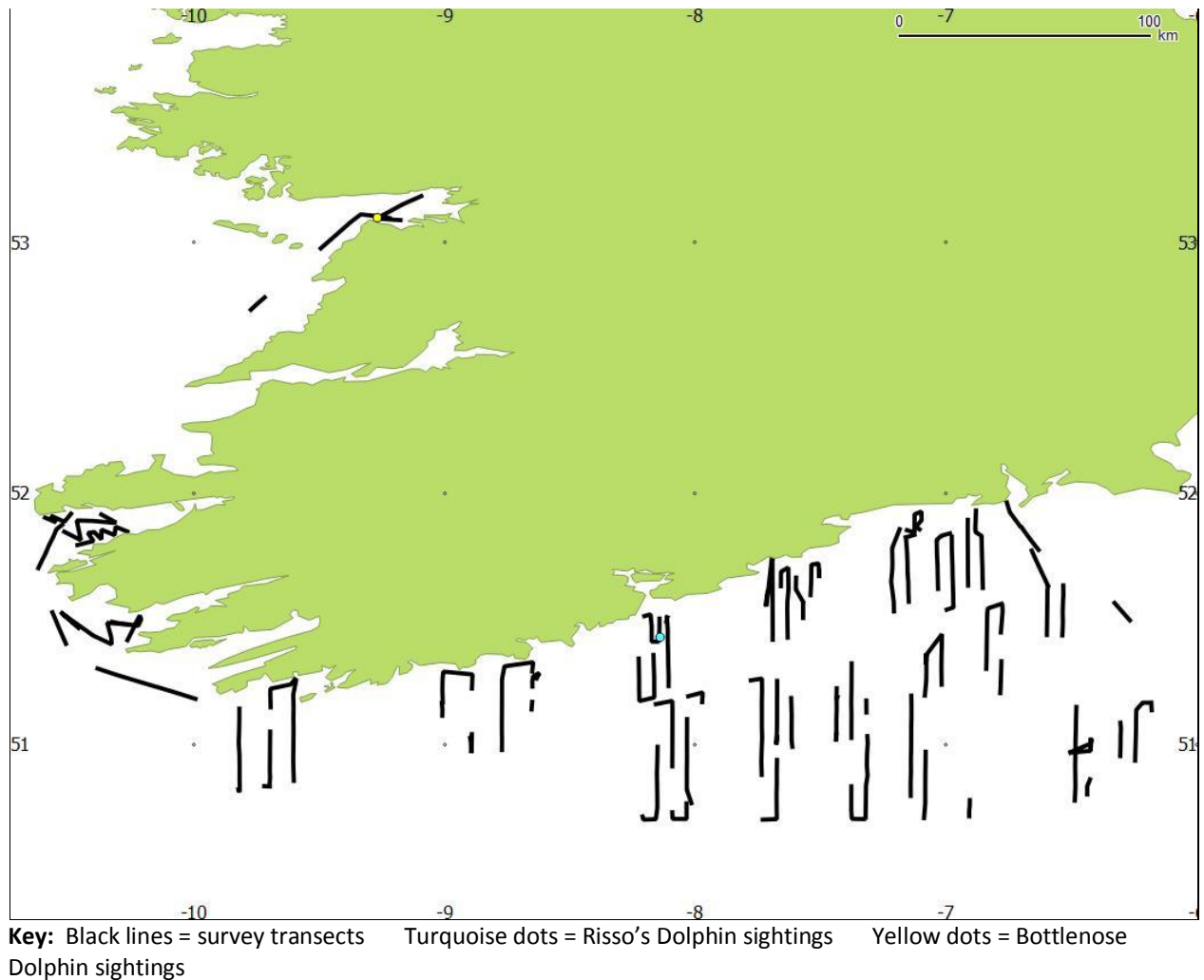
Risso's Dolphin (*Grampus griseus*)

There was one sighting of two Risso's Dolphins recorded by the DAHG surveyor, approximately 15 km south of Roche's Point, Co. Cork on 23rd October (Figure 10).

Bottlenose dolphin (*Tursiops truncatus*)

A single animal of this species was recorded when it briefly investigated the vessel whilst at anchor off Black Head, Co. Clare on 7th October (Figure 10).

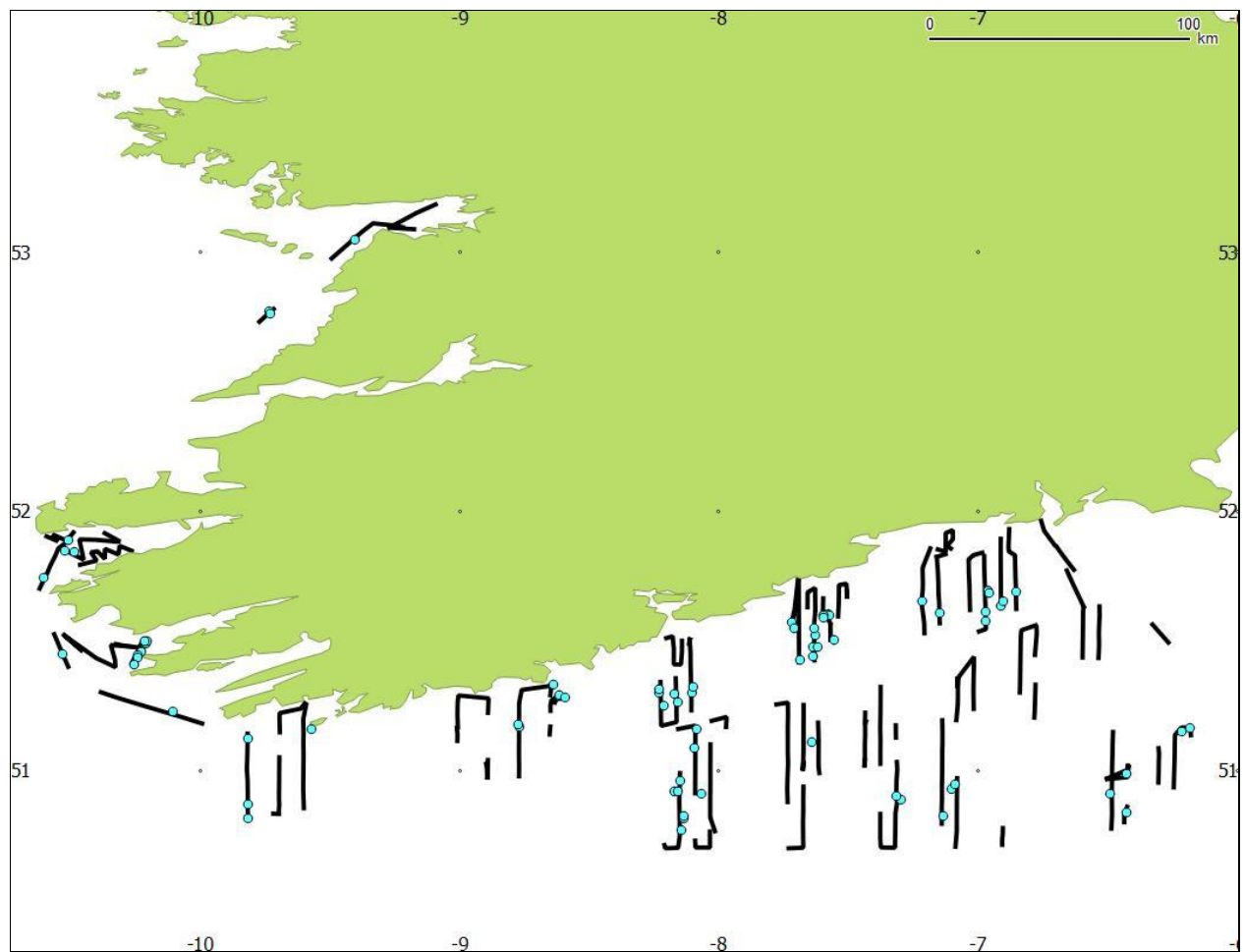
Figure 10. The distribution of Risso's Dolphin and Bottlenose Dolphin sightings recorded on DAHG surveys during the CSHAS Cruise 2014.



Common Dolphin (*Delphinus delphis*)

Common dolphin was the most frequently encountered cetacean species during the CSHAS cruise, with sightings recorded on 15 of the 19 survey days across a wide geographic distribution (Figure 11). There were a total of 76 sightings of Common Dolphin recorded by the DAHG surveyor with one additional sighting by a seabird surveyor. A total of 2,171 animals were estimated, and group size ranged from one to 600 animals, with the median group size comprising 16 animals. The estimated group of 600 common dolphins was recorded on 14th October, approximately 90 km south of Co. Waterford. A total of 39 Common Dolphin calves were recorded during the CSHAS survey period.

Figure 11. The distribution of Common Dolphin sightings recorded on DAHG surveys during the CSHAS Cruise 2014.

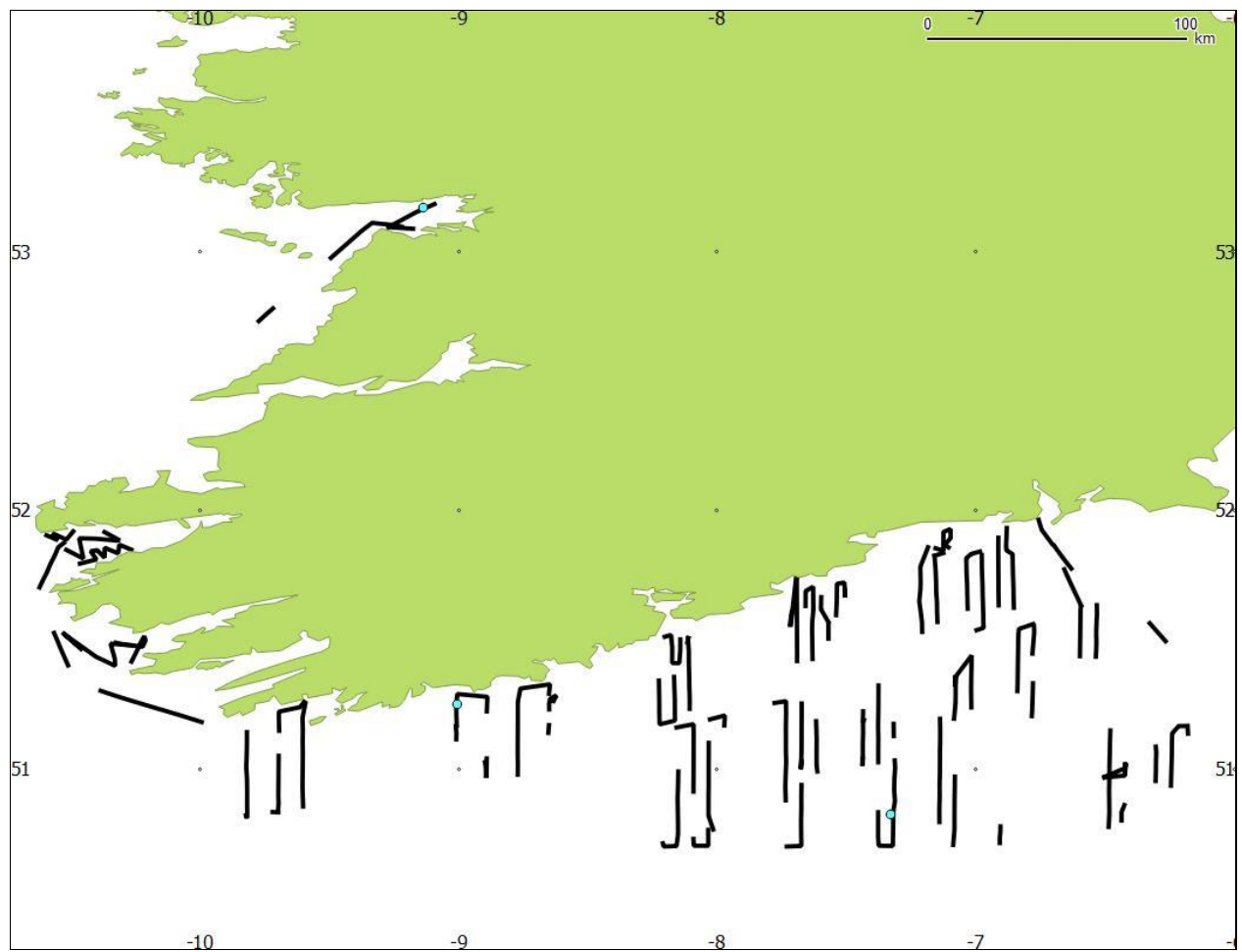


Key: Black lines = survey transects Turquoise dots = sightings

Harbour Porpoise (*Phocoena phocoena*)

There were three sightings of Harbour Porpoise recorded by the DAHG surveyor during the CSHAS cruise (Figure 12), involving five animals. Sightings occurred on 6th, 10th & 13th October in the Shannon Estuary, and off the south coast of Ireland. Despite sea conditions of sea state 2 or less for periods on 6th and 7th October and again on 11th, 12th and 14th October the number of sightings of this small and inconspicuous species was low. Weather conditions for much of the rest of the survey were too severe to reliably detect this very unobtrusive species which is also known to avoid motorised vessels.

Figure 12. The distribution of Harbour Porpoise sightings recorded on DAHG surveys during the CSHAS Cruise 2014.

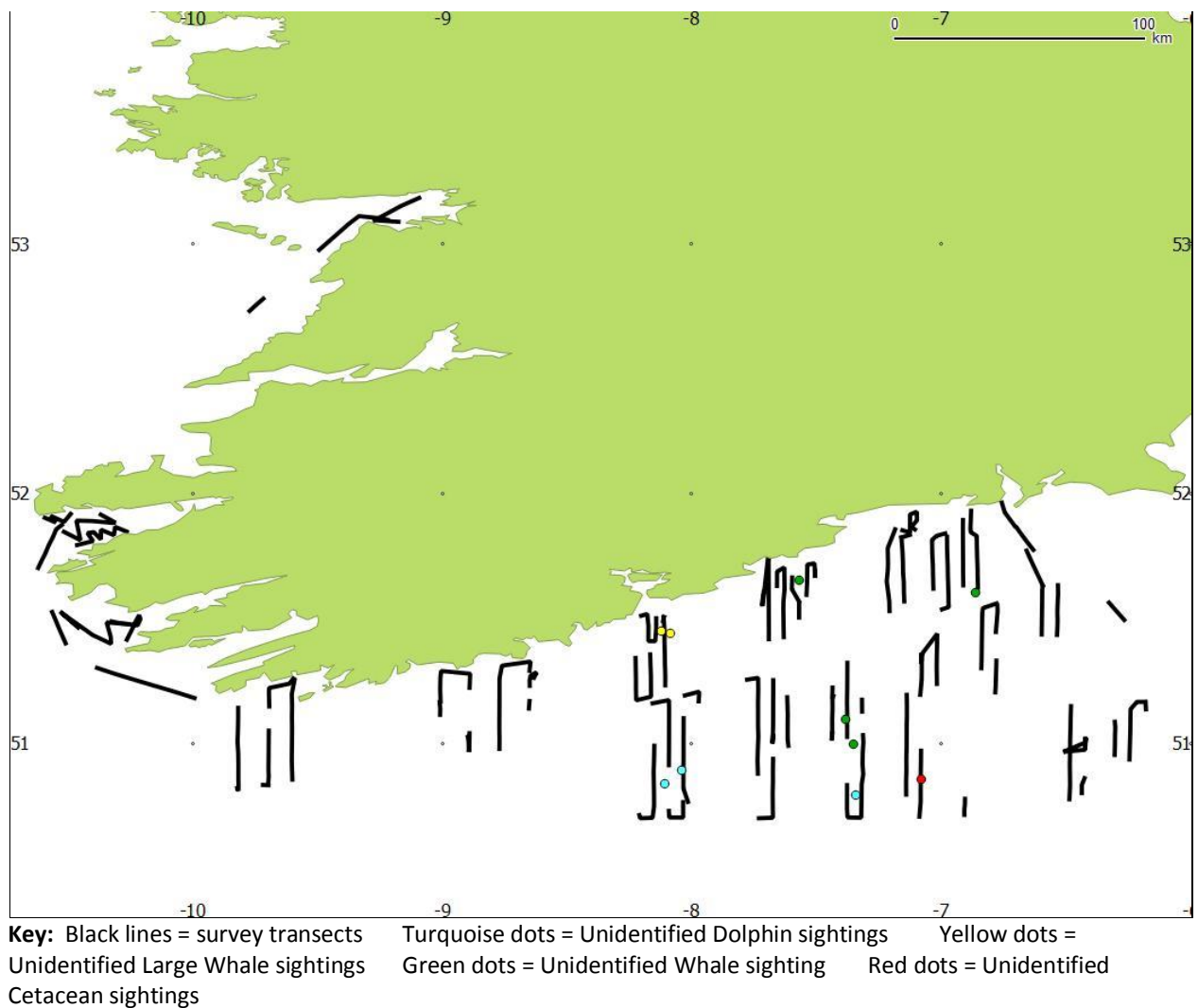


Key: Black lines = survey transects Turquoise dots = sightings

Unidentified cetaceans – various categories

There were three sightings of Unidentified Dolphins involving an estimated 60 animals during surveys on 11th and 13th October, although all three sightings were thought likely to be Common Dolphins (Figure 13). A further two large whales were not identified to species level, with just distant blows observed south of Cork Harbour on 23rd October. In addition, there were four sightings of Unidentified Whales on 13th, 20th and 22nd October, again with inconclusive blows observed (Figure 13). One Unidentified Cetacean with a “small weak blow” was also recorded on 14th October by one of the seabird observers.

Figure 13. The distribution of all unidentified cetacean sightings recorded on DAHG surveys during the CSHAS Cruise 2014.



Sightings of other marine megafauna

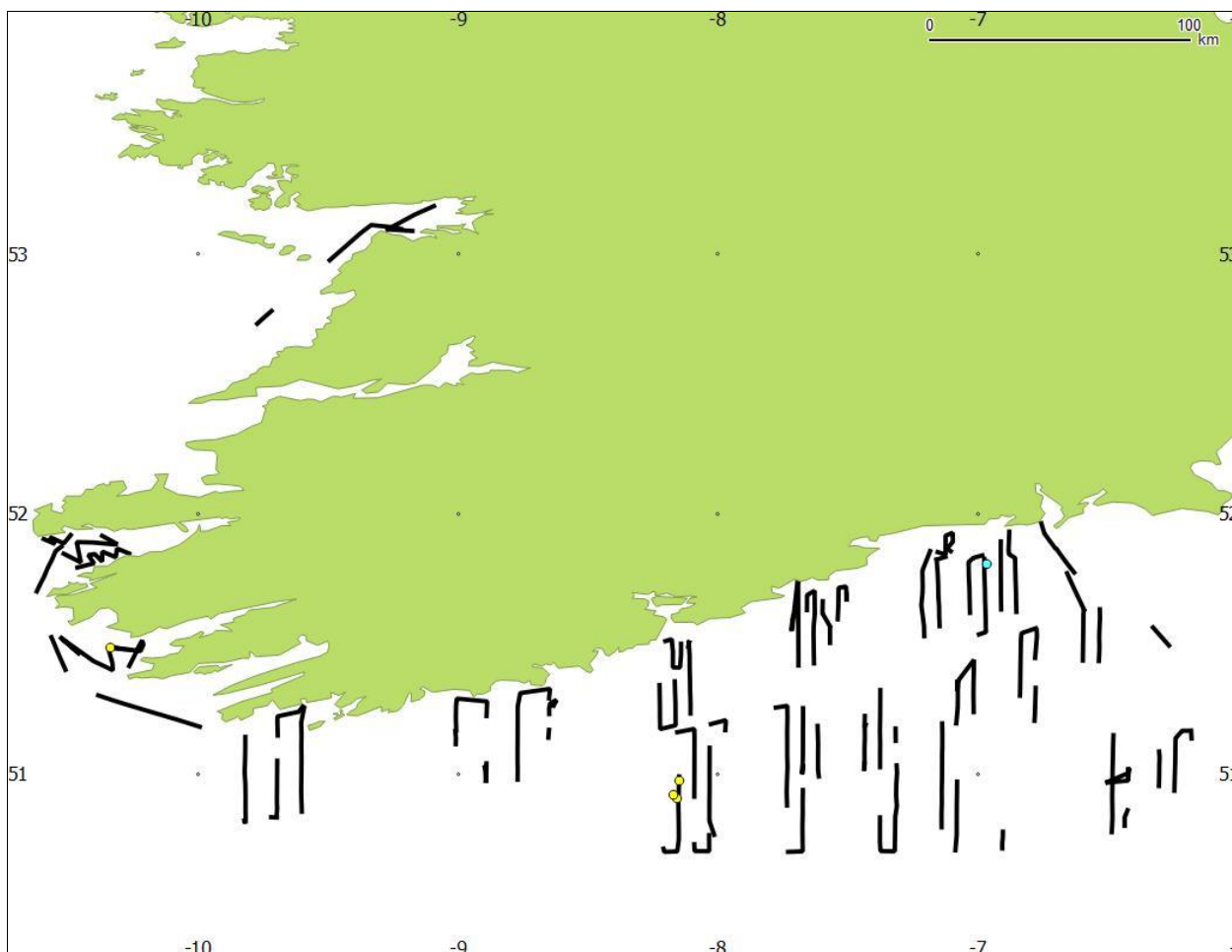
Grey Seal (*Halichoerus grypus*)

There was one sighting of a single Grey Seal during the CSHAS cruise (Figure 14). The animal was seen approximately 15 km south of Tramore, Co. Waterford on 20th October.

Leatherback Turtle (*Dermochelys coriacea*)

Notably, there were four sightings of Leatherback Turtle during the CSHAS cruise. The first sighting was off Deenish Island, Co. Kerry (Figure 14) on 8th October. There were a further three sightings on 11th October, due south of Cork Harbour. These sightings were recorded over a distance of approximately seven kilometres, over a 30 minute period when the vessel was steaming north at around 10 knots, and they were therefore likely to involve different individuals.

Figure 14. The distribution of Grey Seal & Leatherback Turtle sightings recorded on DAHG surveys during the CSHAS Cruise 2014.

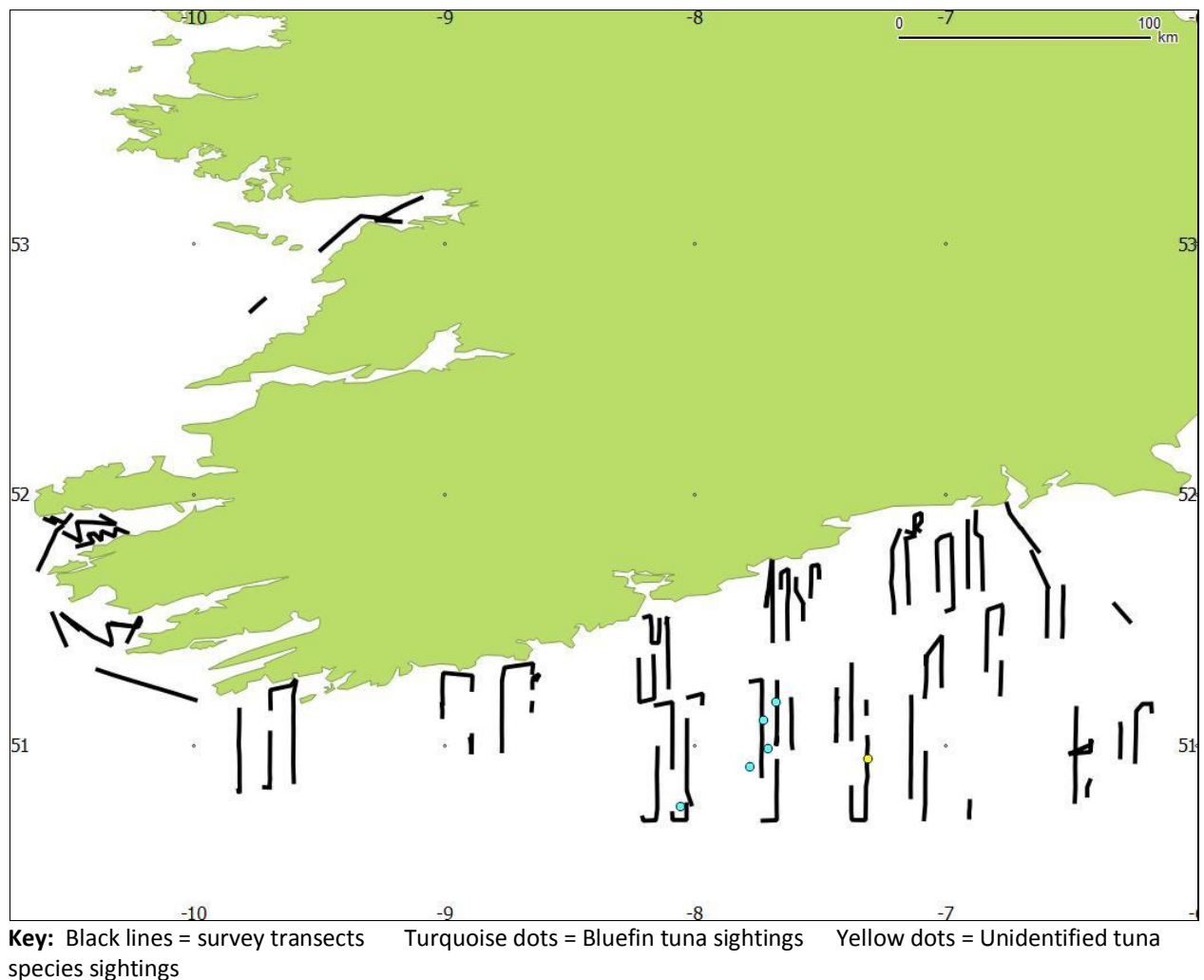


Key: Black lines = survey transects Turquoise dots = Grey Seal sightings Yellow dots = Leatherback Turtle sightings

Bluefin Tuna (*Thunnus thynnus*)

There were also five sightings of Bluefin tuna during the CSHAS cruise, involving up to 195 individuals (Figure 15). A large feeding group estimated to be in excess of 100 individuals was recorded 11th October, approximately 65 km south of Ballycotton, Co. Cork. Tuna were identified by their distinctive splashes at the surface, with spray directed almost horizontally in energetic bursts while feeding. There were a further four sightings of Bluefin Tuna on 12th October in the same general area. A single Unidentified Tuna species was also recorded on 13th October, and although views were too poor to enable full species identification it was considered most likely to be another Bluefin Tuna.

Figure 15. The distribution of Bluefin Tuna and Unidentified Tuna sightings recorded on DAHG surveys during the CSHAS Cruise 2014.



Discussion

Comparison of 2014 survey with previous years

The current study formed the 11th dedicated cetacean survey carried out during the CSHAS in collaboration with the Marine Institute. Between 2004 and 2014 a total of 10 species of cetacean have been recorded via the CSHAS, with Common Dolphin recorded on all 11 surveys and Minke Whale and Fin Whale recorded on 10 surveys. Harbour Porpoise and Bottlenose Dolphin have both been recorded on six surveys, while Humpback Whale and Risso’s Dolphin were recorded on four surveys. The remaining three species: Long-finned Pilot Whale (*Globicephala melas*), White-beaked Dolphin (*Lagenorhynchus albirostris*) and Atlantic White-sided Dolphin (*Lagenorhynchus acutus*) were all only recorded on one survey (Table 3).

Table 3. Comparison of sighting totals and the corresponding estimated number of animals (in brackets) recorded during CSHAS cruises between 2004 and 2014 inclusive.

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Fin Whale	x	-	5 (5)	3 (5)	9 (28)	4 (7)	3 (6)	25 (49)	20 (7-12)	1 (3+)	13 (24)
Humpback Whale	x	-	-	1 (1)	-	-	1 (2)	-	-	-	8 (12)
Minke Whale	x	-	7 (7)	13 (15)	7 (7)	13 (14)	4 (4)	6 (6)	6 (6)	5 (5)	4 (4)
Long-finned Pilot Whale	-	-	-	1 (16)	-	-	-	-	-	-	-
Risso’s dolphin	-	-	-	2 (30)	-	2 (5)	1 (3)	-	-	-	1 (2)
Bottlenose Dolphin	x	x	-	1 (4)	-	-	-	-	2 (6)	2 (13)	1 (1)
Common Dolphin	x	x	X	65 (2,126)	78 (1,849)	40 (814)	73 (774)	83 (814)	52 (411)	57 (305)	76 (2,171)
White-beaked Dolphin	x	-	-	-	-	-	-	-	-	-	-
White-sided Dolphin	-	-	-	1 (70)	-	-	-	-	-	-	-
Harbour Porpoise	x	-	-	3 (9)	3 (7)	-	2 (13)	-	5 (17)	-	3 (5)

X = Present but no counts given.

Source: Marine Institute Cruise Reports (O’Donnell *et al.* 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012 & 2013)

It is noteworthy that the estimated numbers of Fin Whale and Common Dolphin seen during the CSHAS cruises have been highly variable between survey years, while 2014 saw the highest number of Humpback Whale records during any CSHAS cruise to date. In addition to natural ecological variability, the role of prevailing sea and weather conditions in influencing the sighting datasets obtained at sea are unknown at present. The data acquired over the 11-year period so far (O'Donnell *et al.* 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012 & 2013) do indicate however the potential importance of certain waters in the northern Celtic Sea, and the food resources therein, for a number of cetacean species not least Common Dolphin, Fin Whale and Minke Whale. With greater survey effort in adjacent geographic regions during the autumn-winter seasons and continued effort aboard CSHAS cruises the full significance of such findings can perhaps be better understood.

Long term monitoring

Cetacean surveys conducted to date during Marine Institute Herring Acoustic Surveys in the Celtic Sea continue to provide a very good overview of the cetacean species present in waters off the south coast of Ireland in October, along with information on their relative abundance and distribution.

Long-term standardised survey and monitoring programmes such as the CSHAS can provide invaluable information on the relative abundance and distribution of cetacean species. Furthermore long-term datasets can through effective sampling reflect or capture changes in occurrence and distribution in relation to time. The interdisciplinary ecosystem-level elements of such collaboration should also not be underestimated since it is likely in this case at least that fish prey resources and oceanographic/physical conditions in the Celtic Sea play a key role in the occurrence of some key cetacean species that are observed in significant numbers year after year.

Frequently recorded species

Three cetacean species have been encountered frequently during the Celtic Sea Herring Acoustic Surveys: Common Dolphin, Fin Whale and Minke Whale. Common Dolphins are the most widespread and abundant dolphin species in Irish waters, with highest relative abundances between 2005 and 2011 recorded off the south and south-west coasts of Ireland (Wall *et al.* 2013). Estimated numbers recorded in October 2014 were higher than in previous surveys, with the number of distinct sightings recorded similar to previous years.

Fin whales are the most common large baleen whale in Irish waters, with highest relative abundances between 2005 and 2011 recorded off the south coast of Ireland in autumn, in both inshore waters and further offshore (Wall *et al.* 2013). Numbers of sightings and animals vary between years, however, the number of sightings in October 2014 were relatively high, with more sightings recorded in only two CSHAS cruises in 2011 and 2012 (O'Donnell *et al.* 2011 & 2012).

Minke whales are the most likely whale species to be seen in inshore waters around the Irish coast (Berrow *et al.* 2010). Between 2005 and 2011, highest relative abundances of Minke Whales were recorded off the south and south-west coasts in the autumn (Wall *et al.* 2013). Minke Whales were recorded in nine out of the previous 10 CSHAS surveys autumn surveys in low numbers, and the low number of sightings recorded in October 2014 in coastal waters fits into this pattern.

Less frequently recorded species

The number of sightings and estimated number of animals of species such as Risso's Dolphin and Bottlenose Dolphin recorded in October 2014 were reasonably typical, when compared to numbers recorded on previous CSHAS surveys (Table 3).

A similar pattern was recorded for Harbour Porpoise, although numbers recorded on CSHAS cruises appear to be lower than suggested by the recent "Atlas of Distribution and Relative Abundance" which indicates that Harbour Porpoises are common off the south coast of Ireland throughout the year (Wall *et al.* 2013). The apparent low frequency of encounters during CSHAS surveys may be a result of higher sea states prevailing during these surveys, resulting in animals not being detected. Sea state 2 is considered the upper limit for reliably recording this species (SCANS-II 2008).

The majority of inshore and offshore sightings of Humpback Whales in Irish waters between 2005 and 2011 were recorded in what appear to be annual/seasonal foraging grounds off the south and southwest coasts, that are used by individual whales primarily between the months of July and February (Wall *et al.* 2013). Sightings of Humpback Whales on the 2014 CSHAS cruise fit into this pattern, although numbers of sightings were higher in October 2014 than in previous years. Although the actual number of animals present is likely to be lower than the maximum number of animals recorded in 2014 (12 animals), due to the likelihood of double counting the same individuals on different days, there were still more animals present than the previous peak of two animals in 2010 (O'Donnell *et al.* 2010).

Acknowledgements

Ciarán Cronin (Surveyor for DAHG) and the Department of Arts, Heritage and the Gaeltacht would like to thank Dr Ciaran O'Donnell of the Marine Institute for providing the berth on the R.V. Celtic Explorer. The Chief Scientist Dr Cormac Nolan was immensely helpful and he and all the Marine Institute staff on board cannot be thanked enough for making the trip such a success. The captain Denis Rowan and bridge team of Basil and John were also of great help and many thanks to them for all their assistance. Thanks also to the Birdwatch Ireland team of seabird surveyors (Niall Keogh, Stephen McAvoy and Katherine Keoghan) for their incidental cetacean sightings.

Thanks are also due to William Hunt, the IWDG cetacean surveyor on board for the duration of the cruise and to Dave Wall of IWDG for assisting with survey logistics and collaboration.

Dr Ferdia Marnell and Dr Oliver Ó Cadhla (DAHG) provided assistance and advice at the start of the cruise and also commented on the final draft of this report.

References

- Berrow, S.D., Whooley, P., O'Connell, M. and Wall, D. (2010) *Irish Cetacean Review (2000-2009)*. Irish Whale and Dolphin Group, 60pp.
- SCANS-II. 2008. Small Cetaceans in the European Atlantic and North Sea (SCANS-II). Final Report to the EU Life Project Number LIFE04NAT/GB/000245.
- NPWS. 2013. The Status of EU Protected Habitats and Species in Ireland. Species Assessments Volume 3. Version 1.0. National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- O'Donnell, C., Griffin, K., Clarke, M., Lynch, D., Ulgren, J., Goddijn, L., Wall, D. & Mackey, M. 2004. Celtic Sea Herring Acoustic Survey Cruise Report 2004. Acoustic Survey Cruise Report, ICES Divisions VIIb, j & g and VIIaS.
- O'Donnell, C., Doonan, I., Johnston, G., Lynch, D., Dransfeld, D. & Wall, D. 2005. Celtic Sea Herring Acoustic Survey Cruise Report 2005. Acoustic Survey Cruise Report, ICES Divisions VIIb, j & g and VIIaS.
- O'Donnell, C., Doonan, I., Lynch, D., Egan, A., Boyd, J., Wall, D. & Ulgren, J. 2006. Celtic Sea Herring Acoustic Survey Cruise Report 2006. Acoustic Survey Cruise Report, ICES Divisions VIIb, j & g and VIIaS.
- O'Donnell, C., Egan, A., Lynch, D., Dransfeld, L., Boyd, J., Lyons, K. & Wall, D. 2007. Celtic Sea Herring Acoustic Survey Cruise Report and Biomass Estimate, 2007.
- O'Donnell, C., Saunders, R., Lynch, D., Lyons, K. & Wall, D. 2008. Celtic Sea Herring Acoustic Survey Cruise Report 2008. FSS Survey Series: 2008/03.
- O'Donnell, C., Lynch, D., Lyons, K., McKeogh, Ni Riogain, P. & Volkenandt, M. 2011. Celtic Sea Herring Acoustic Survey Cruise Report 2011. FSS Survey Series: 2011/03.
- O'Donnell, C., Nolan, C., Sullivan, M., Lyons, K., McKeogh, E., McAvoy, S., Ingham, S. & O'Sullivan, E. 2012. Celtic Sea Herring Acoustic Survey Cruise Report 2012. FSS Survey Series: 2012/05.
- O'Donnell, C., Nolan, C., Mullins, E., Lyons, K., Volkenandt, M., Keogh, N., McAvoy, S. & Williams, D. 2013. Celtic Sea Herring Acoustic Survey Cruise Report 2013. FSS Survey Series: 2013/04.
- Ó Cadhla, O., Mackey, M., Aguilar de Soto, N., Rogan, E. & Connolly, N. 2004. Cetaceans and Seabirds of Ireland's Atlantic Margin. *Volume II – Cetacean distribution and abundance. Report on research carried out under the Irish Infrastructure Programme (PIP):* Rockall Studies Group (RSG) projects 98/6 and 00/13, Porcupine Studies Group project P00/15 and Offshore Support Group (OSG) project 99/38.
- Pollock, C.M., Reid, J.R., Webb, A. & Tasker, M.L. 1997. The distribution of seabirds and cetaceans in the waters around Ireland. JNCC Report No. 267. Joint Nature Conservation Committee, Peterborough.
- Rogan, E. & Berrow, S.D. 1995. The management of Irish waters as a whale and dolphin sanctuary. *In* A.S. Blix, L. Walløe & Ø. Ulltang. (eds.) *Whales, seals, fish and man*. Elsevier Science. Amsterdam. pp. 671-681.

Saunders, R., O'Donnell, C., Campbell, A., Lynch, D., Lyons, K. & Wall, D. 2009. Celtic Sea Herring Acoustic Survey Cruise Report 2009. FSS Survey Series: 2009/03.

Saunders, R., O'Donnell, C., Campbell, A., Lynch, D., Egan, A., Lyons, K. & Wall, D. 2010. Celtic Sea Herring Acoustic Survey Cruise Report 2010. FSS Survey Series: 2010/03.

Wall D., Murray C., O'Brien J., Kavanagh L., Wilson C., Ryan C., Glanville B., Williams D., Enlander I., O'Connor I., McGrath D., Whooley P. and Berrow S. 2013. Atlas of the distribution and relative abundance of marine mammals in Irish offshore waters 2005 - 2011. Irish Whale and Dolphin Group, Merchants Quay, Kilrush, Co Clare.