EMFF Operational Programme 2014-2020

Marine Biodiversity

Underwater Television Surveys

Marine Mammal Observer Reports

R.V. *Tom Crean*

2023

EMFF 2014-2020

Marine Institute Report Series

Ireland's EU Structural and Investment Funds Programmes 2014 - 2020
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Underwater Television Survey

Marine Mammal Observer Report

R.V. *Tom Crean*

30 May – 10 June 2023

EMFF 2014-2020

Marine Institute Report Series

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1 Executive summary

The first leg of the Underwater Television Survey (UWTV) 2023 was carried out over the course of 12 days, from May 30 to June 10, 2023, onboard the Marine Institute's R.V. Tom Crean. This survey aimed to assess the *Nephrops* stock in Irish waters and covered all stations of two functional units – Galway Bay, Aran Islands, and the Porcupine Bank grounds – and a few stations of a third functional unit – southwest of Ireland grounds.

A cetacean-dedicated survey was conducted by a marine mammal observer (MMO) onboard, following a standard singe platform line-transect methodology when travelling and a point survey when the UWTV sedge was being deployed or retrieved. Effort was carried out during daylight hours, mostly from 7am to 8pm every day. The MMO effort summed up to a total of 89 hours 36 minutes and 55 seconds.

A total of 21 sightings were recorded, of which the common dolphin was the most frequently and abundant species observed, accounting for 80,9% of the total sightings and 76,9% of all animals recorded.

Environmental conditions were favourable in general. Throughout the survey, the most common conditions were sea state 2, visibility 6 (more than 20 km), swell height between 1 and 2 m and no precipitation.

2 Introduction

The Marine Institute has carried out the Underwater Television Survey every year since 2002, on board the R.V. Celtic Voyager. Since 2022, the survey has been conducted on board the R.V. Tom Crean.

The main objective of this survey is to assess the abundance, distribution, and stock size of *Nephrops norvegicus*, also known as Norway prawns or Dublin Bay prawns. The survey is managed in Functional Units (FUs), which include the Irish Sea *Nephrops* Grounds (FU 14 and 15), Porcupine Bank *Nephrops* Grounds (FU16), Aran, Galway Bay, and Slyne Head *Nephrops* Grounds (FU17), South and South west Ireland *Nephrops* Grounds (FU19), Labadie, Jones, and Cockburn *Nephrops* Grounds (FU20 and 21) and finally, "Smalls" *Nephrops* Grounds (FU22).

This report refers to the first leg of the UWTV survey of 2023, which was conducted from May 30th to June 10th, on the FUs of Porcupine Bank (FU16), Galway Bay and Aran Islands grounds (FU17) and a few stations on the south and south west of Ireland (FU19).

The methodology used was based on burrow density estimation at each sampling station, using a UWTV sledge equipped with a HD camera system (Aristegui et al., 2021). Travelling at circa 200m at 0.8 knots, the sledge is towed for 10 minutes in every sampling station and the burrows are counted by trained scientists. Sandy and/or muddy areas are the natural habitat of the Norway prawn, where the sediment allows them to construct burrows. The prawns spend a large amount of their lives in the burrows, therefore counting burrows represents a very effective method to estimate the stock. The Irish prawn fishery is the second most valuable commercial fisheries in Irish waters and is evaluated at around 80 million euros at first sale (Lordan et al., 2013).

Ireland has one of the largest maritime Exclusive Economic Zones (EEZ) in Europe and has been recognised as of great importance for marine mammal distribution and abundance. To date, 25 different cetacean species have been recorded in Irish waters (Whooley & Berrow, 2019). Given the strong prevalence of cetacean species in Irish waters, since 2022 the UWTV survey added a Marine Mammal Observer (MMO) to the scientist team, providing an important opportunity to collect data on cetacean abundance and distribution within the surveyed area.

3 Materials and methods

3.1 Data collection

The cetacean-dedicated survey was conducted by an MMO during the UWTV survey 2023 on board the R.V. Tom Crean, from Galway port on May 30th to Cork on June 10th, 2023.

The methodology used followed a standard single platform line-transect survey when travelling and a point survey when the UWTV sedge was being deployed or retrieved. The visual survey effort was carried out from the monkey island, located at 13.5 m above the sea level, during daylight time approximately from 7am to 8pm. To decrease fatigue and ensure high quality data, the MMO took breaks throughout the day. Effort was focused at a 90º angle on each side of the vessel and up to 1 km in distance. Sightings spotted outside of this area or further than 1 km were still logged. Watches were mostly conducted with the naked eye. However, when needed, to confirm sighting information, such as species identification, group composition and size or behaviour, the watches were aided using Nikon Monarch 7 binoculars. No photographs were taken during this survey.

When a sighting was logged, species identification, distance, bearing, heading, group size, age composition and behaviour of the animals were recorded. Distance of the individuals from the vessel was estimated using a range-finding stick (Heinemann, 1981) and bearing was estimated using an angle board. An effort was made to identify all sightings to the level of species. Whenever a sighting could not be identified to the level of species (i.e., whenever species could not be confirmed), appropriate taxonomic levels and associated confidence levels were assigned.

Additionally, environmental variables were also recorded approximately every 15 minutes or whenever one of the parameters changed. For this survey, the environmental variables included sea state (from 0 to 6), visibility (with 1 = <1km, 2 = 1-5 km, 3 = 6-10 km, 4 = 11-15 km, 5 = 16-20 km, 6 = >20 km), cloud cover (from 1 to 8, 1 being no clouds and 8 being full cloud coverage), swell height (with 0 = no swell, 1 = light 0-1 m, 2 = moderate 1-2 m, 3 = heavy >2 m), precipitation type (fog or rain) and precipitation intensity (continuous light, continuous intense, intermittent light or intermittent intense). Generally, the MMO was off effort under unfavourable environmental conditions, such as sea state ≥ 6, swell > 2 m and/or visibility < 1km. Nonetheless, in cases where the MMO considered appropriate, effort was still conducted even under the above-mentioned conditions. All sightings that occurred off effort or that were spotted by another scientist or crew member on board were recorded as auxiliary sightings and analysed separately from the main sightings.

Vessel position, sightings and environmental data were recorded using the software IFAW Logger 2000 TM (IFAW 2000), which logged the data into a Microsoft Access database. GPS position of the vessel was recorded every 10 seconds into the database using an external GPS receiver with USB connection. All records were time-stamped and assigned a unique GPS index. The time recorded by the software corresponds to the Greenwich Mean Time (GMT), which was one hour behind local time during the entire survey.

3.2 Data treatment

The GPS data recorded into the database was examined and the GPS index of all the sightings, as well as of the environmental stations recorded, were verified prior to mapping.

Cetacean survey effort and the sightings recorded were mapped using ArcGIS Pro, version 2.5.0 (ESRI 2020). Microsoft Excel was used to run analysis and evaluate data patterns.

4 Results

4.1 Marine mammal survey effort

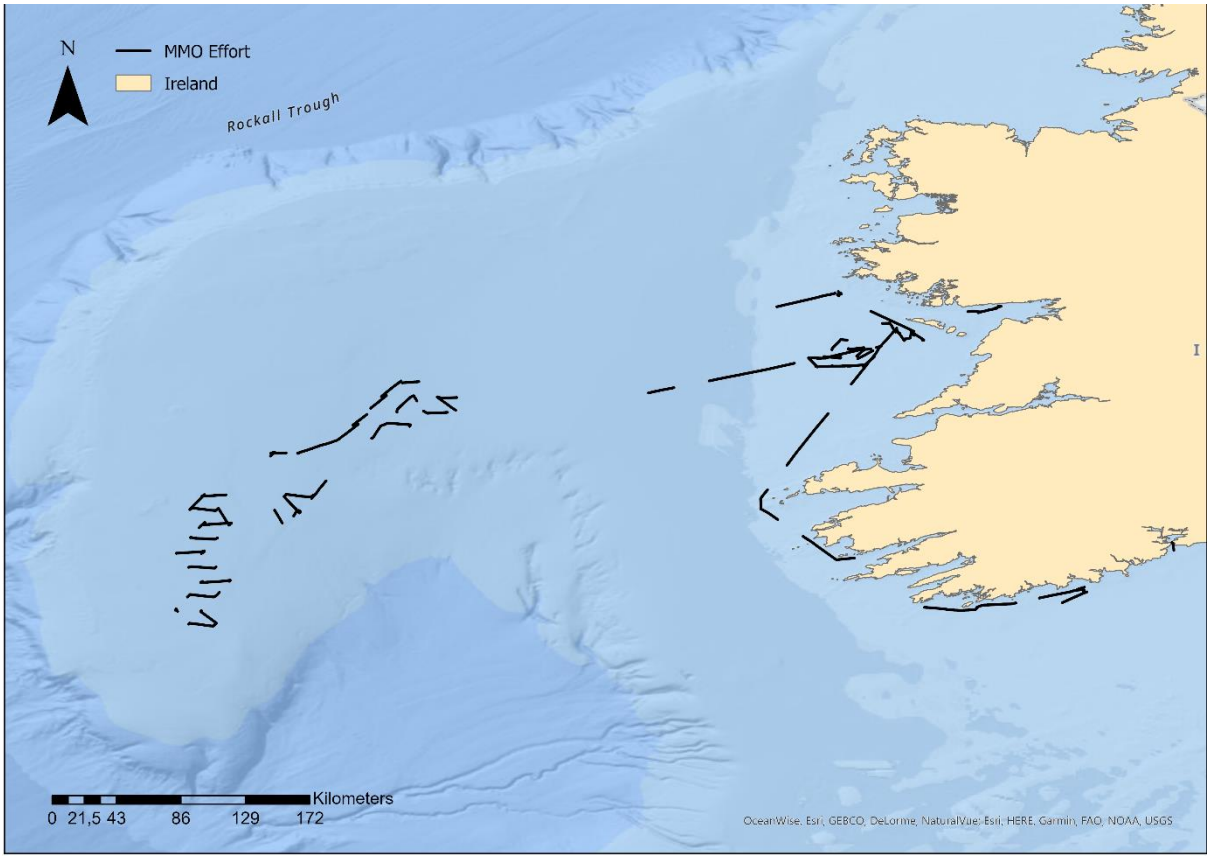

Figure 1. Marine mammal survey effort during the 1st Leg of the UWTV 2023 survey.

The R.V. Tom Crean departed on 30/05/2023 at 2pm, local time, from Galway port. The MMO effort started that afternoon at 3pm, while travelling through Galway Bay (FU17). In the first few hours of the survey, the R.V. Tom Crean remained in the same place, due to complications deploying the UWTV sledge, but the MMO effort was not interrupted. The next 2 days, travelling towards and around the Aran Islands (FU17), the watches continued from 7am to 8pm. Arriving at the Porcupine bank, due to heavy fog throughout all morning on 02/06/2023, with visibility less than 1 km, effort was officially stopped, but the MMO kept monitoring. Effort resumed around 11.30am, when the fog lifted, until the end of the day. From 03/06/2023 to 07/06/2023, the survey covered the all the Porcupine Bank *Nephrops* Grounds (FU16) stations, with bad weather conditions decreasing watch time due to bad visibility throughout the entire day on 05/06/2023. On 08/06/2023, the R.V. Tom Crean returned to the Aran Islands area to complete stations that were left unsurveyed. For the last remaining days, the survey was directed to Cork, covering some of the stations of FU19, South and South West Ireland *Nephrops* Grounds. The UWTV *Nephrops* Survey 2023 finished on 10/06/2023, arriving in Cork port at 10 am. On that day, the MMO held watches from 7am to 7.30am, until the R.V. Tom Crean entered Cork harbour. The total duration of the cetacean-dedicated survey was 134 hours 45 minutes and 51 seconds, however MMO effort amounted a total of 89 hours 36 minutes and 55 seconds. The cetacean survey is summarised in Table 1.

Table 1. Daily details of MMO survey effort including start and end times, duration, on effort time and platform from which watches were carried out. Times correspond to those entered via the software IFAW Logger 2000 in GMT. (MI = Monkey Island).

Date	Start time	End time	Duration	On effort	Platform
30/MAI	15:04:32	20:01:56	04:57:24	04:07:16	MI
31/MAI	06:40:21	19:07:03	12:26:42	09:11:15	MI
01/JUN	06:09:08	19:02:03	12:52:55	09:22:38	MI
02/JUN	06:11:13	19:03:11	12:51:58	05:00:07	MI
03/JUN	06:07:54	19:07:23	12:59:29	09:00:48	MI
04/JUN	06:15:05	19:26:40	13:11:35	08:41:11	MI
05/JUN	06:07:59	19:03:02	12:55:03	05:54:37	MI
06/JUN	06:07:11	19:30:38	13:23:27	09:36:16	MI
07/JUN	06:04:42	19:01:18	12:56:36	09:32:15	MI
08/JUN	07:00:00	19:16:44	12:16:44	09:01:09	MI
09/JUN	06:10:15	19:36:19	13:26:04	09:41:29	MI
10/JUN	06:06:44	06:34:38	00:27:54	00:27:54	MI
TOTAL			134:45:51	89:36:55	

Overall, MMO effort was conducted from the monkey island from 7am to 8pm, excepted when interrupted due to adverse weather conditions (i.e., sea state > 6, visibility < 1 km and/or swell > 2m) or for resting breaks. Vessel speed was kept at an average of 4,7 knots – lowest during each station for deployment, towing and retrieving of the UWTV sledge (usually ≥ 1 knot), and highest when steaming between stations (around 8 knots).

4.2 Environmental conditions

Environmental conditions encountered during the cetacean-dedicated survey effort were logged at 406 stations.

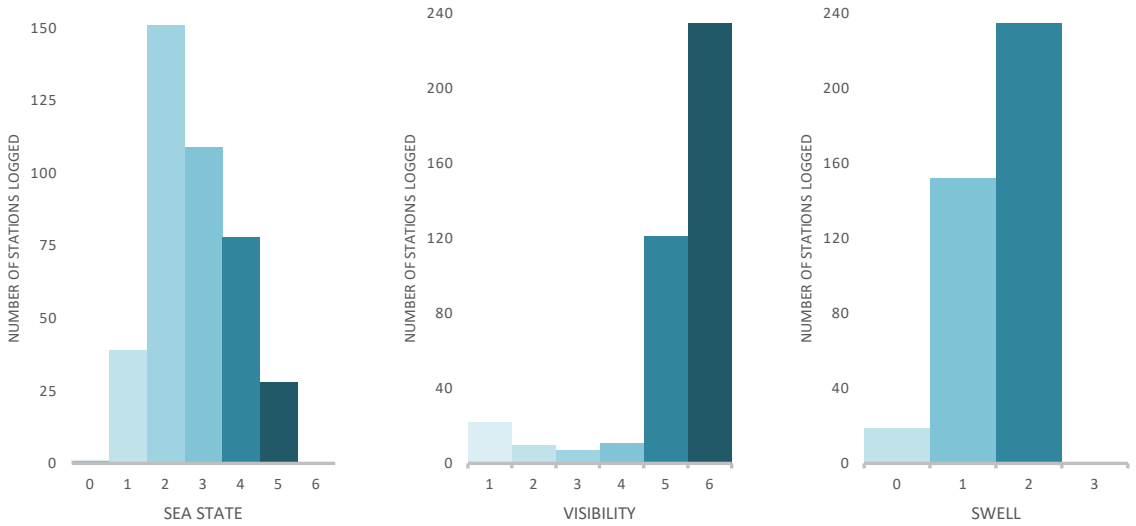

Figure 2. Overall environmental conditions: sea state, visibility, and swell height encountered during the UWTV 2023 survey. Data is presented according to the number of stations logged on effort.

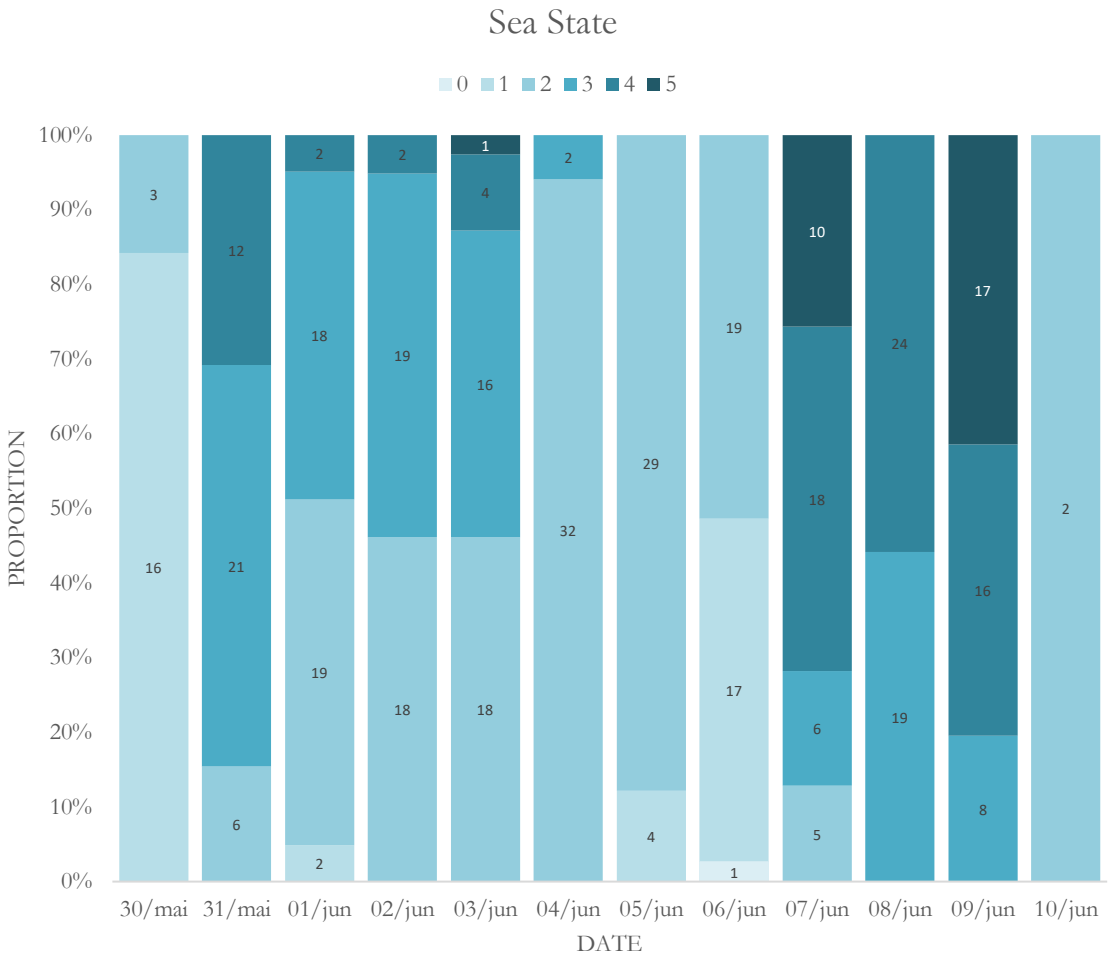

Figure 3. Daily sea state conditions recorded during the UWTV 2023 survey. Data is presented as the percentage of time spent on effort under each sea state category for each day.

Most of the cetacean survey effort was carried out at sea state 2 (37,2%) or 3 (26,8%) and ranged from 1 to 5 (Figures 2 and 3). Sea state 6 conditions were never recorded. Less favourable conditions at level 4 and 5 were mostly recorded on 3 days, between 07/06/2023 and 09/06/2023. These are considered very good sea state conditions to conduct a visual marine mammal survey, especially in south west Ireland.

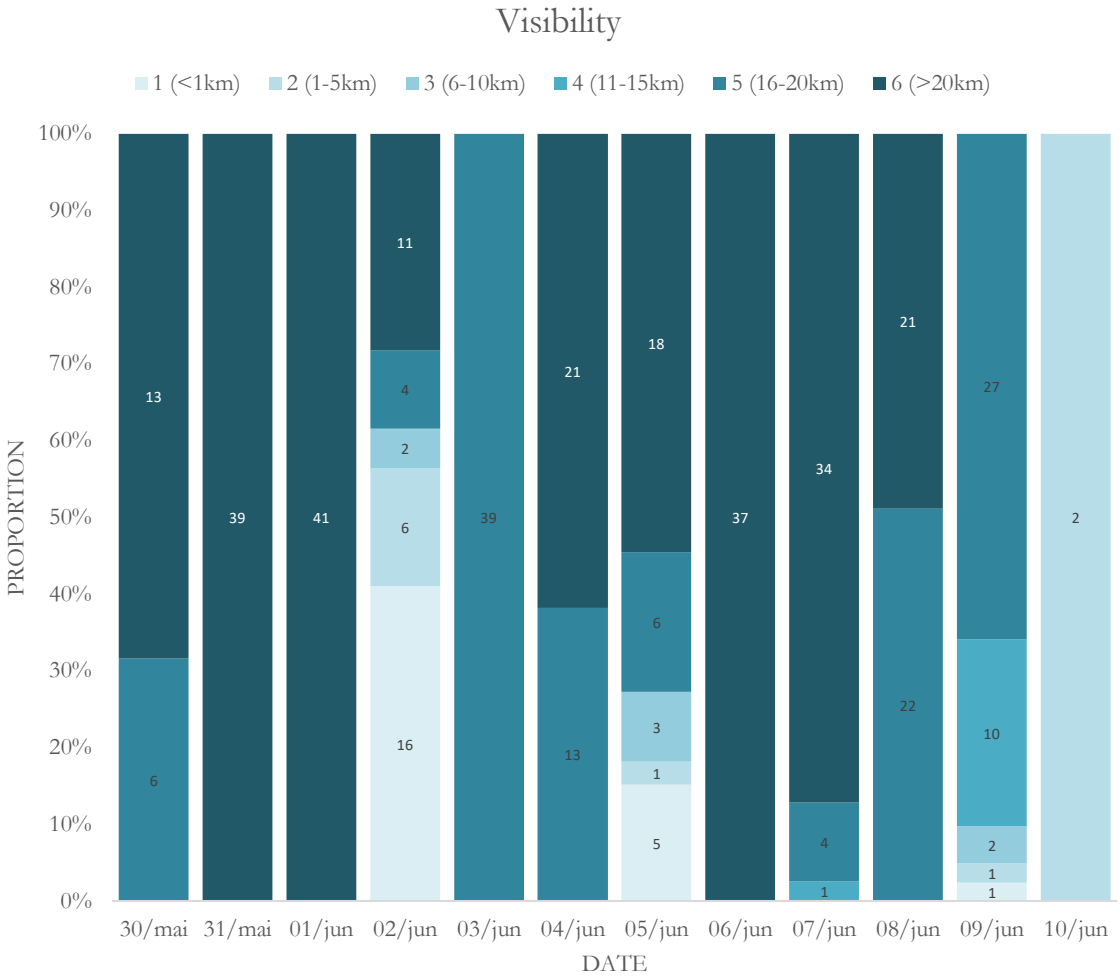

Figure 4. Daily visibility conditions encountered during the UWTV 2023 survey. Data is presented as the percentage of time spent on effort under each visibility category for each day.

Visibility conditions ranged from 1 to 6 during the survey (Figure 2 and 4), with the most MMO effort carried out under visibility 6 conditions (>20 km), accounting for 57,9% of the time spent on effort, followed by visibility 5 conditions (29,8%). This makes up 87,7% of the total surveyed time, which represents great visibility conditions for a visual survey. Unfavourable visibility conditions, i.e., visibility less than 1 km (level 1), were recorded 5,4% of the time, in which case MMO effort was off, and was more prevalent on 02/06/2023.

Swell height ranged from 0 to 2, never reaching level 3, i.e., more than 2 m of height (Figures 2 and 5). Most of the cetacean survey effort was conducted under swell height 2 (57,9%), i.e., swell between 1 and 2 m. Swell 1 (0 to 1m) and 0 (no swell at all) conditions were recorded 37,4% and 4,7% of the time, respectively.

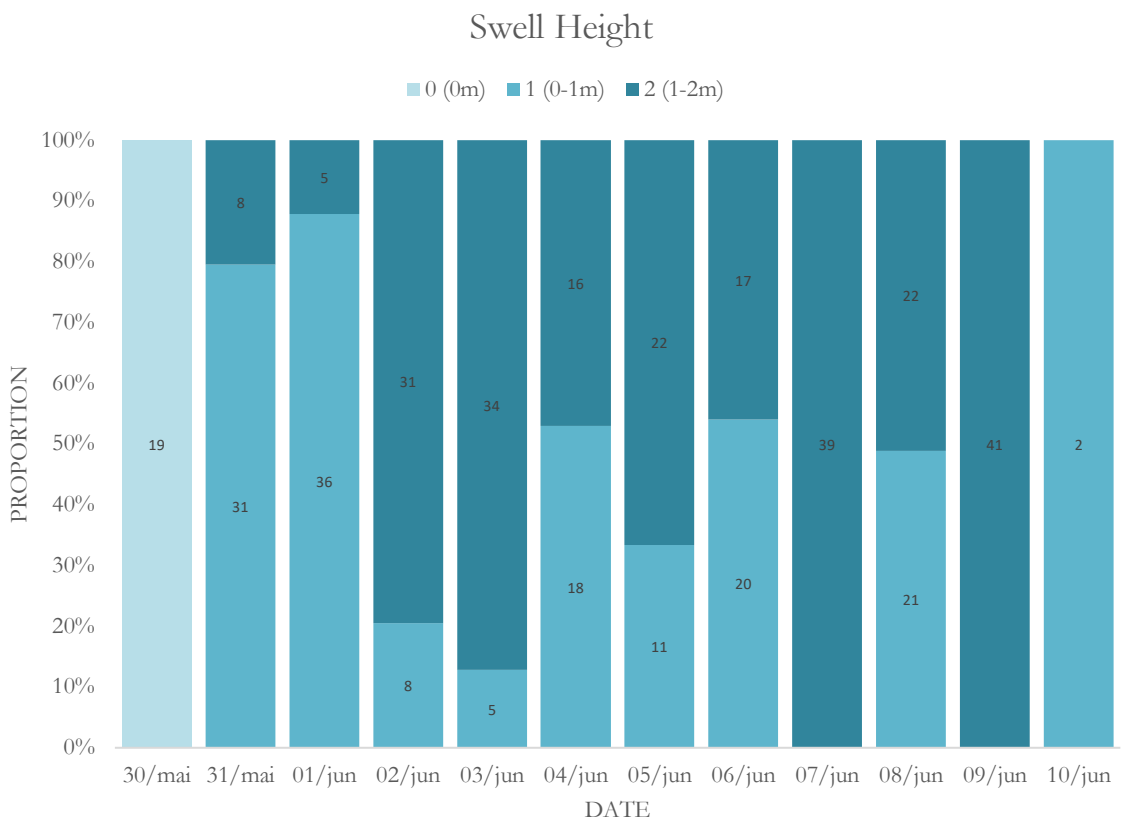

Figure 5. Daily swell height conditions encountered during the UWTV 2023 survey. Data is presented as the proportion of time spent on effort under each swell height category for each day.

Precipitation was absent for most of the survey (94,3%). Fog and rain were present at respectively 3 (0,7%) and 20 environmental stations (4,9%), of which 10 were intermittent light rain, 6 were continuous heavy, 3 was intermittent heavy and 1 was continuous light rain.

Generally, the environmental conditions during the survey were good and allowed for consistent data collection, with very few interruptions. Watches were only interrupted by bad visibility conditions (> 1 km), while all other environmental variables remained favourable for monitoring. Sea state was never higher than 5 and swell remained below 3, i.e., > 2 m of height. In the vast majority, visibility was good enough to carry on effort (Figure 2). The most common environmental conditions present throughout the survey were sea state 2 or 3, visibility between 5 and 6 (16 km to more than 20 km), swell height between 1 and 2 m and no precipitation.

4.3 Sightings

A total of 21 sightings were recorded during the course of Leg 1 of the UWTV survey 2023, with a total of 91 individuals (Table 2). All sightings but one was recorded while on effort. Two different odontocete species were identified, common dolphin (*Delphinus delphis*) and bottlenose dolphin (*Tursiops truncates*), and 2 sightings of unidentified dolphin species were recorded (Table 2; Figure 6).

Table 2. Species of cetaceans encountered during the UWTV 2022 survey (recorded on and off effort). Number of sightings, individuals, and group size (minimum, maximum and average values) are included.

	Species	**Sightings**	Individuals	Group size
Odontocetes	Bottlenose dolphin	1	15	15
	Common dolphin	17	70	1 - 25 (4)
	Unidentified dolphin	2	5	1 - 4 (3)
Other sightings	Unidentified cetacean	1	1	1
	Total	21	91	
	Species	**Auxiliary Sightings**	Individuals	Group size
Mysticetes	Unidentified whale	1	2	2
Odontocetes	Common dolphin	1	1	1

Common dolphin was the most abundant species recorded during this survey, accounting for 17 of the 21 total sightings (80,9%) and 70 indiviuals, which corresponds to 76,9% of all animals logged. Additionally, common dolphins also presented the largest group size, with one sighting registering 25 individuals. Nonetheless, most groups consisted of an average of 4 indiviuals. Bottlenose dolphins, with only one sighting, presented the second largest group size encountered, with 15 individuals in one group. Two sightings of unidentified dolphin were recorded, of which one sighting occurred while off effort, with a total of 5 individuals. Confirmed identification was difficult due to unfavourable sea conditions (sea state 5) and large distance to the vessel (800 m), in each sighting respectively.

One sighting of an unidentified cetacean was logged was well. Although the sighting occurred very close to the vessel (200 m), it was so brief, it did not allow for a confirmed species identification. From the size, surfacing behaviour displayed and area of the sighting, the MMO suggests it could be a species of beaked whale. The individual spotted had a dolphin-like body, but with an estimated body length between 4 and 5 meters, it seemed too big to be any dolphin species known to occur in Irish waters. Furthermore, the sighting consisted of two very brief breaches, one after the other, seconds apart, where the individual leaped its body vertically outside of the water at an angle of 300º, falling back into the water on its side and dived, not to be seen again. From this characteristic, the literature (Weir et al., 2004) and the MMO experience indicate that it could be some species of a beaked whale. More particularly, this breaching behaviour has been described for True's beaked whales in the North Atlantic (*Mesoplodon mirus*) (Weir et al., 2004). This species is extremely rarely sighted at sea, with only one occasion reported in Irish waters (O'Cadhla et al., 2004). Most knowledge of their presence and abundance in Irish waters have originated from acoustic studies and stranding events, having been recorded in more than 12 stranding events up to 2021, mostly on the west coast of Ireland (Hernandez-Milian et al., 2017; Barile et al., 2021). According to Berrow et al. (2010), beaked whale species, including True's beaked whales, in

offshore Irish waters show a distribution focused on the Porcupine Bank's subsea canyon systems, which corresponds to the area where this sighting occurred (Figure 6).

Notwithstanding, the species identification cannot be confirmed. The sighting was too short, and no photographs were taken for post-analysis. Other beaked whale species, such as Sowerby's or Gervais' beaked whales, are too similar in shape, colour, and size to rule out as a possibility. Given their brownish colour, much bigger size, and distinctive head shape, it is unlikely to have been a Cuvier's beaked whale, although they are more commonly seen, and might even breed, in Irish waters (Berrow et al., 2010).

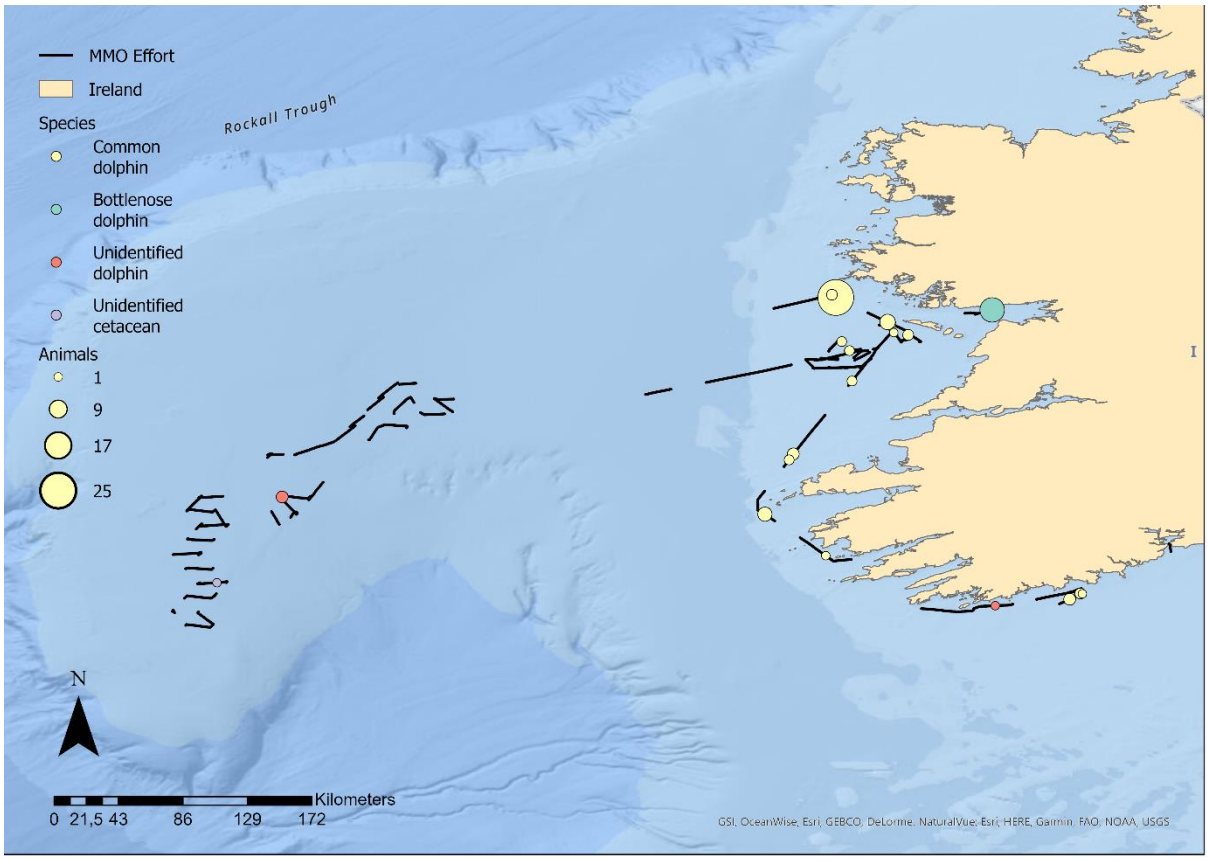

Figure 6. Sightings and group size of marine mammal species (bottlenose dolphin, common dolphin, unidentified dolphin, and unidentified cetacean) recorded during the UWTV 2023 survey. Marine mammal survey effort is also represented.

Moreover, two auxiliary sightings were logged (Figure 7). One sighting of 2 individuals of an unidentified whale species was spotted by the crew Captain, while the MMO was off effort, and another sighting of one common dolphin was spotted by another scientist onboard, while on effort. The two unidentified whale individuals might have been fin whales, given the animals characteristics explained by the captain. However, species identification was not confirmed by the MMO, who was not present during the sighting.

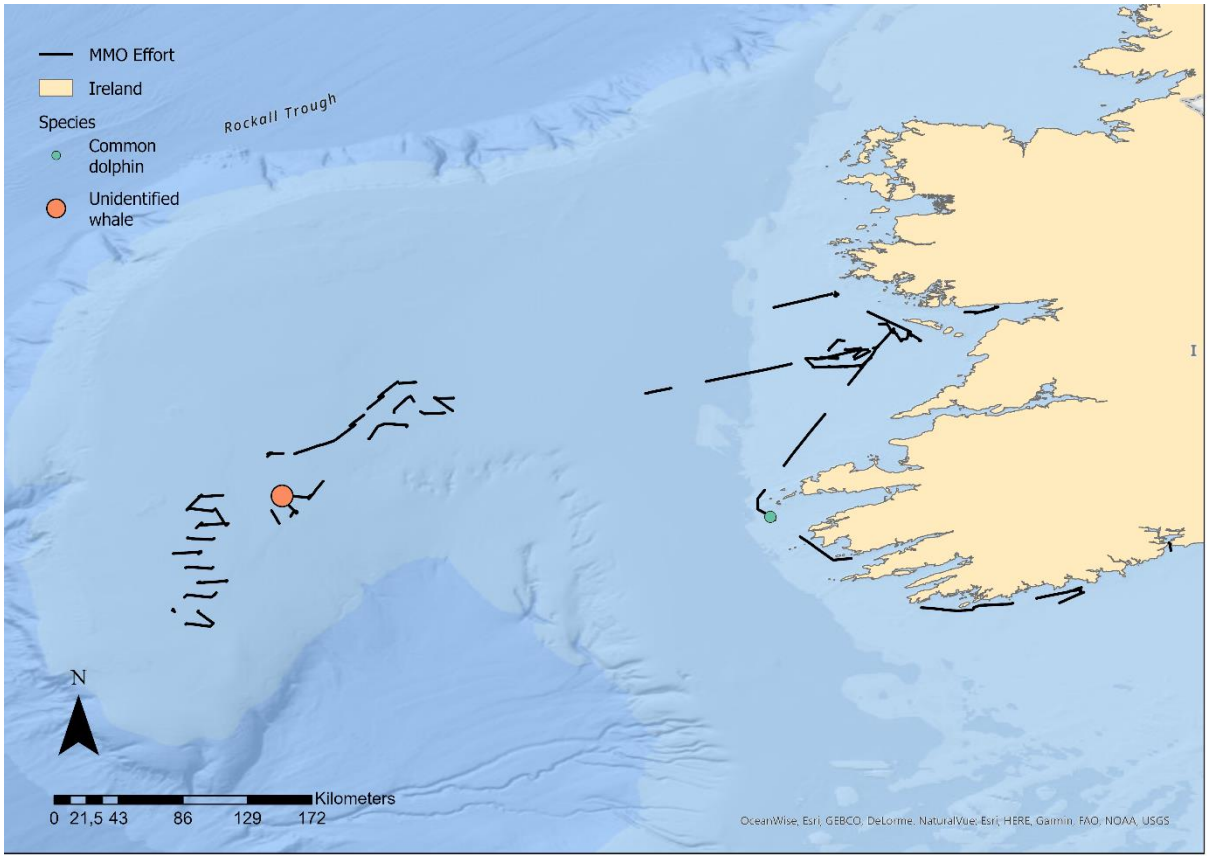

Figure 7. Auxiliary sightings and group size of marine mammal species (common dolphin and unidentified whale, with 1 and 2 individuals, respectfully) recorded during the UWTV 2023 survey. Marine mammal survey effort is also represented.

5 Discussion

The 1st Leg of the UWTV *Nephrops* Survey 2023 was carried out for 12 days, from May 30 to June 10, and it covered the FUs of Porcupine Bank (FU16), Galway Bay and Aran Islands grounds (FU17) and a few stations on the south and south west of Ireland (FU19).

Most sightings recorded during the cetacean-dedicated survey occurred in waters closer to shore, more specifically in FU17, west of the Aran Islands (Figure 6). Only 2 sightings were reported in the offshore waters of the Porcupine Bank, four unidentified dolphin individuals and one unidentified cetacean. The most frequent and abundant species encountered was the common dolphin, accounting for 80,9% of the total sightings and 76,9% of all animals recorded. According to Wall et al. (2013), these observations are in accordance with what other studies have recorded in the same area.

However, the low species diversity recorded and lack of sightings in the Porcupine Bank come at a surprise. The Porcupine Bank has been reported as an important area for many cetacean species, given its closeness to the continental shelf and the subsea canyons located along the shelf slopes and slopes (Berrow et al., 2010; Wall et al., 2013). Especially considering the very good weather and sea conditions encountered during this survey, apart from brief moments of bad visibility, it is very unexpected the absence of sightings reported in the area, particularly of mysticetes, such as the minke whale (*Balaenoptera acutorostrata*) and the fin whale (*Balaenoptera physalus*), often observed in the Porcupine Bank (Wall et al., 2006 and 2013). The only mysticetes species reported during the entire survey was an auxiliary sighting, not confirmed by the MMO. Offshore bottlenose dolphins regularly occur in the Porcupine Bank as well (Berrow et al., 2010), but were not observed in this survey.

The data collected on relative abundance and distribution of cetacean species in Irish water on the first Leg of the UWTV *Nephrops* survey 2023 will be added to time-series data from previous surveys conducted by the Marine Institute.

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1. Executive Summary

The Underwater Television Survey (UWTV) in the Celtic Sea took place from the 10th to 21st of June 2023, on board the Marine Institute's R.V. Tom Crean. The research survey covered majority of the Celtic Sea's *Nephrops* grounds. A dedicated marine mammal survey was carried out in tandem with the UWTV survey, by an observer on board. A standard single platform line-transect method was used to collect the relative abundance and distribution of marine mammals in the Celtic Sea.

The marine mammal survey was carried out over 10 days, with a total effort watch of 103 hours, 5 minutes, and 51 seconds by the observer.

Overall, the environmental conditions were favourable for carrying out marine mammal surveys. The survey was conducted under a sea state of 2 for 56.1% of the duration. The sea state never rose above 4. The visibility ranged from 1 to 3. But for 98% of the survey visibility ranged from 6-10km. The swell height was recorded between 0-1m for 95% of the duration of the survey. The other 5% of the survey had a swell of 1-2m. Cloud cover varied across the survey as well as precipitation. There was only one minor interruption to the survey during the 19/06/23, where visibility impaired the effort of the observer.

A total of 49 sightings of marine mammal species were recorded. Common dolphin accounted for over 85% of these sightings, with Minke whale accounting for 12% and a single Grey seal sighting making up 2% of the sightings.

2. Introduction

The Underwater Television Surveys for *Nephrops* (UWTV) began in 2013. This is the second year in which the R.V. Tom Crean from the Marine Institute has been used for the survey in the Celtic Sea.

The main objectives of this survey were to use burrow density to determine the current stock of *Nephrops* in the Labadie, Jones, and Cockburn Banks (Doyle et. al., 2022) the Celtic Sea. A UWTV sled with a HD camera mounted on it was deployed at different stations consisting of different seabed sediments. At each of these deployment stations, the sled is towed along the seabed for approximately 10 minutes. The footage recorded is then analysed and the burrows counted by the trained scientists on board.

The Celtic Sea has proved to be an important area/region for a great deal cetacean species. The UWTV surveys provide an excellent opportunity to gather abundance and distribution of cetacean species present in the Celtic Sea. The data collected by the Marine Mammal Observer (MMO) will be added to previous survey results by the Marine Institute.

3. Materials and Methods

3.1 Data Collection

The cetacean survey was carried out from the 10th to 20th June 2023. It was carried out by a MMO on board the *R.V Tom Crean* during the 2nd leg of the UWTV Survey in 2023.

The effort watch was conducted during daylight hours from 06:00 to 21:30, this included small breaks for breakfast and lunch as well as a 2-hour break from 14:00 to 16:00. This was to reduce fatigue. The watches were carried out from the monkey island which is located 13.5m above sea level. The survey followed a single platform line-transect when travelling, and to each of the UWTV sledge deployment stations. The survey would only cease when the observer deemed the conditions unfavourable (*i.e.,* sea state ≥ 6, swell > 2 m and/or visibility < 1km).

The effort watch was focused on an arc of 60° on both sides of the vessel's track line and up to 1km away. Sightings were occurred outside of this arc were also recorded. Opticron 10x42 were used to carry out watches. The binoculars also allowed for accurate species identifications, group size and behaviour.

The distance and bearing of any sighting from the monkey island were estimated using a range-finding stick (Heinemann, 1981) and an angle board. The species, group size, approximate age, behaviour, and heading were also recorded for every sighting. When the species could not be identified, the appropriate taxonomy label was used along with the observer's confidence in the identification of the sighting. All cetacean sightings which occurred off effort or by other crew members were recorded an auxiliary sighting in a separate database.

The environmental conditions were recorded approximately every 15 minutes. However, if there was a change within the 15-minute period, it was recorded as well. The environmental conditions recorded were sea state (0 to 6), the visibility (with 1 = <1km, 2 = 1-5 km, 3 = 6-10 km, 4 = 11-15 km, 5 = 16-20 km, 6 = >20 km), the cloud cover (1 to 8 degrees), the swell height (with 0 = no swell, 1 = light 0-1 m, 2 = moderate 1-2 m, 3 = heavy >2 m) and precipitation if it occurred (type and intensity).

The software Logger 2010 by IFAW (IFAW, 2010) was used to record the vessel's track, sightings, and environmental data. A Microsoft Access database was linked to Logger and all data entries were saved to the database. the GPS track of the boat was recorded using an external GPS receiver with a USB connection to the observer's laptop. The GPS track of the vessel was recorded every 10 seconds into the Access database from the external receiver. All data was recorded using Greenwich Mean Time (GMT).

3.2 Data Treatment

After the survey had finished, the GPS data of sightings and vessel track as well as the environmental data was verified. The corresponding GPS data for eery sighting and the vessel track line were used for mapping using ArcGIS Pro (3.0.0, 2022). A Microsoft Excel sheet was created, containing a copy of the environmental data recorded in the Access database. Microsoft Excel was also used for the generation of tables and graphs.

4. Results

4.1 MMO Survey Effort

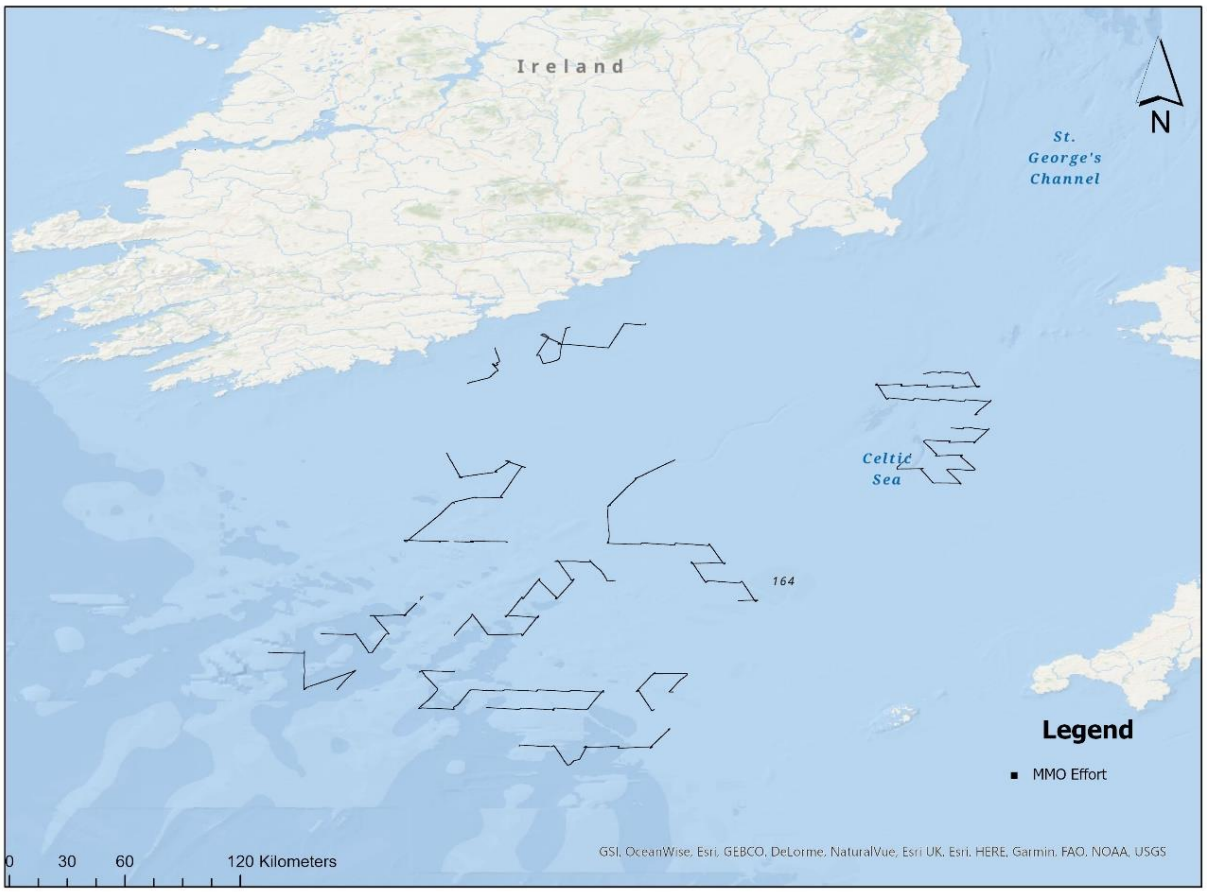

Figure 1. Marine mammal observer survey effort track line of the UWTV survey 2023 in the Celtic Sea.

The R.V Tom Crean departed Cork at 13:00 (GMT), on the 11/06/2023. The observer carried out the first effort watch that afternoon. From the next morning regular daily watches were carried out. However, on 16/06/2023, the effort watch was put on hold as there was poor visibility during the midday. The watch resumed at 16:30. Over the whole survey, the cetacean effort watch amounted to 103 hours, 5 minutes, and 51 seconds. The cetacean survey effort is summarised in Table 1 and presented in Figure 1.

Table 1. Details of the MMO survey effort from watches carried out from the Monkey Island (MI). The times entered correspond to those logged in IFAW Logger 2012 in GMT.

Date	Start time	End time	Duration	Transects surveyed	Platform
11/06/2023	15:29:36	20:24:47	04:15:11	Travelling	MI
12/06/2023	07:13:15	20:29:38	12:16:23	UWTV Stations in Celtic Sea	MI
13/06/2023	06:25:36	21:44:36	12:19:00	UWTV Stations in Celtic Sea	MI
14/06/2023	06:17:49	21:12:34	11:54:45	UWTV Stations in Celtic Sea	MI
15/06/2023	06:18:57	21:29:40	12:10:43	UWTV Stations in Celtic Sea	MI
16/06/2023	06:16:45	20:59:53	06:43:08	UWTV Stations in Celtic Sea	MI
17/06/2023	06:41:28	21:26:41	11:45:13	UWTV Stations in Celtic Sea	MI
18/06/2023	06:21:59	21:14:11	11:43:25	UWTV Stations in Celtic Sea	MI
19/06/2023	06:30:46	21:28:39	11:57:53	UWTV Stations in Celtic Sea	MI
20/06/2023	06:37:53	18:07:03	08:29:10	UWTV Stations in Celtic Sea	MI
Total Survey	**-**	**-**	**103:05:51**		

4.2 Environmental Conditions

The environmental conditions were recorded every 15 minutes while an effort watch was carried out.

The sea state ranged from 0 to 4 during the survey (Figure 2). Most of the effort watch was conducted under a sea state of 2. This made up 56.1% of the total time spent on effort. This is followed by the sea state 1 (31%), sea state 3 (11.9%) and finally sea state 4 (1%). Therefore, 87.1% of the effort watches were carried out in favourable sea states. The cetacean survey did not have to stop as result of the sea state.

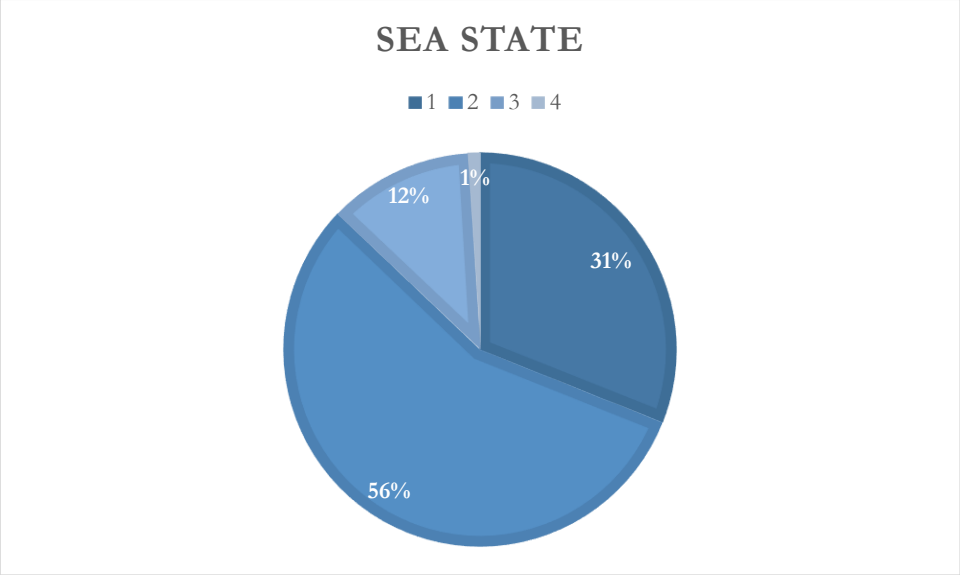

Figure 2. The proportion of the daily sea state across the UWTV survey 2023 in the Celtic Sea.

The visibility ranged from 1 (less than 1km) to 3 (6-10km) during the survey (Figure 3). For 98% of the survey's duration, there was a visibility of 3. Only 2% of the survey, there was a visibility of 2 (1-5 km). Less than 1% of the survey was conducted under a visibility of 1(less than 1km). Therefore, the marine mammal survey was conducted under favourable visibility conditions.

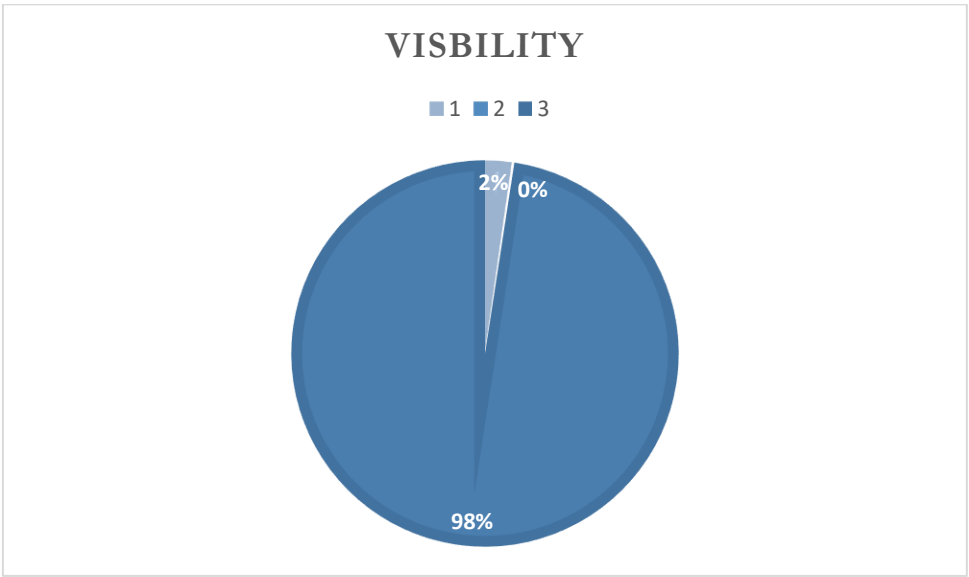

Figure 3. The proportion of daily visibility across the UWTV survey 2023 in the Celtic Sea.

Swell height was between 1 and 2 for the survey. 95% of the survey was carried out under a swell 1 (0 – 1m swell, Figure 4. Swell height 2 (1-2 m) was recorded for only 5% of the survey period.

These swell heights were also a part of the favourable environmental conditions for cetacean effort watches.

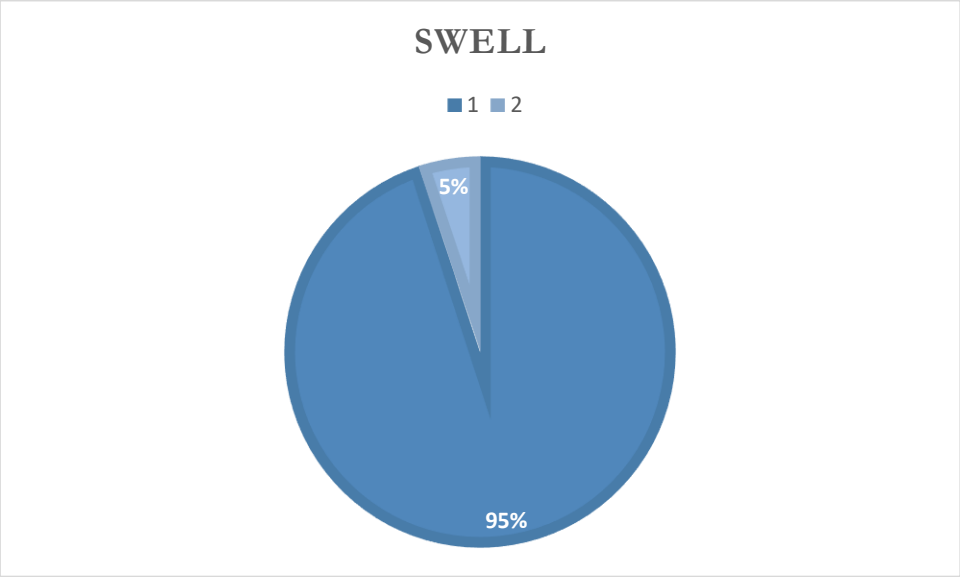

Figure 4. The proportion of the daily swell across the UWTV survey 2023 in the Celtic Sea.

The cloud cover ranged from 2 to 5 degrees out of a possible 8 degrees of cover (Figure 5). It varied across the survey. 33.2% of the survey was carried out under 4 degrees of cloud cover. This was followed by 3 degrees (30%), 2 degrees (18%), 5 degrees (15.5%) and finally 6 degrees (3.3%). The cloud cover did not affect the effort of the survey.

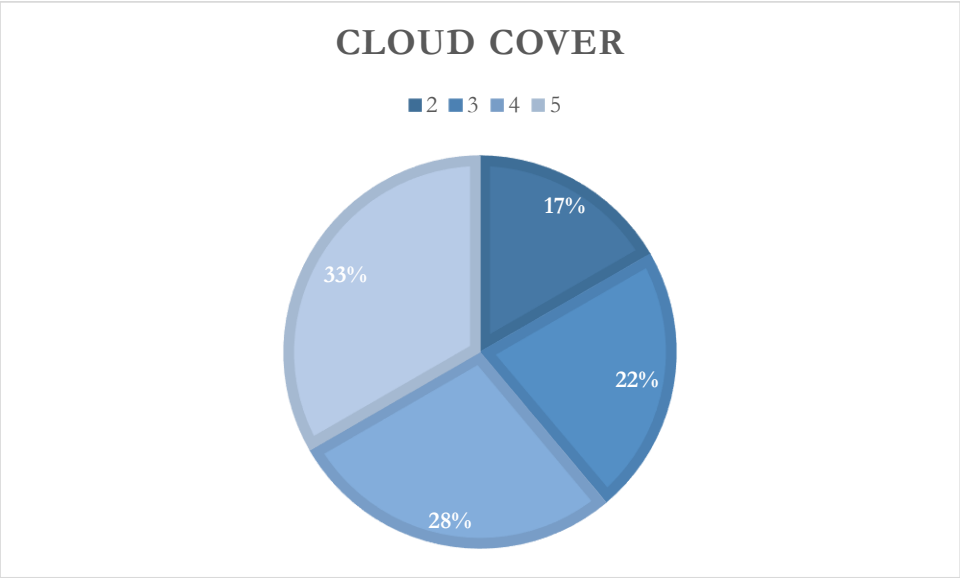

Figure 5. The proportion of daily cloud cover across the UWTV survey 2023 in the Celtic Sea.

There was precipitation on 5 of the survey days. It was recorded for a total duration of 4 hours, 51 minutes, and 54 seconds while on effort. Continuous light rain was recorded for 3 hours, 13 minutes and 44 seconds. Continuous heavy rain was recorded for 1 hour, 38 minutes and 10 seconds.

There was a minor disruption to the survey effort during the midday of 16/06/2023. The effort watch continued in the evening. Otherwise, the environmental conditions were favourable for most of the survey efforts.

4.3 Sightings

There was a total of 49 sightings on effort were recorded during the second leg of the UWTV survey in the Celtic Sea (Figure 6, Table 2). There was a total of 283 individuals recorded. Two cetacean species were recorded – Common dolphin (*Delphinus delphis*) and Minke whale (*Balaenoptera acutorostrata*) as well as one grey seal (*Halichoerus grypus*). Photographs were not taken during the survey.

Common dolphin were the only species of odontocetes species recorded. There were 42 sightings of common dolphin during the survey. The group size of sightings ranged from a single individual to 35 individuals. Minke whale was the only mysticetes species recorded during the survey, with 7 individuals recorded from 6 sightings.

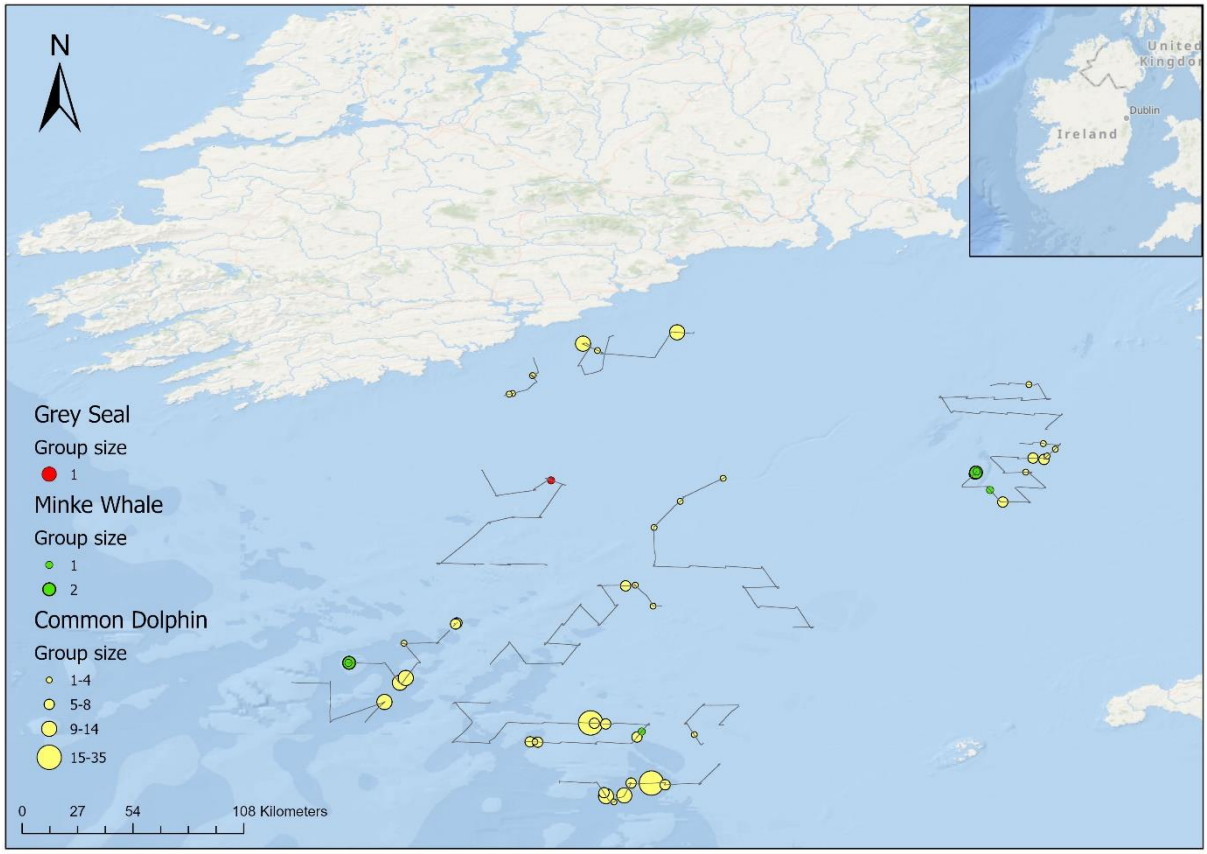

Figure 6. The total sightings and group size for each marine mammal species recorded (common dolphin, minke whale and grey seal), during the UWTV survey 2023 in the Celtic Sea. The MMO effort track line is also represented.

Table 2. All marine mammal species recorded on effort, during the second leg of the UWTV survey in the Celtic Sea 2023.

Species	Sightings	Individuals	Group Size Range
Common Dolphin	42	275	1-35
Minke whale	6	7	1-2
Grey seal	1	1	1
Total Marine Mammals	49	283	-

5. Discussion

All sightings recorded were concentrated in the Celtic Sea during the second leg of the UWTV 2023 survey. Common dolphins were the most frequently sighted species during the survey.

Common dolphins accounted for 85.7% of all sightings recorded. They were also the most abundant species per sighting, making up 97% of all individuals recorded. Minke whales accounted for 12.2% of sightings and only 2.5% of individuals recorded. The singular grey seal sightings contributed to 2.1% of overall sightings and only 0.4% of the total number of individuals recorded.

Overall, this survey produced a great deal of cetacean sightings. The favourable environmental conditions throughout the survey did provide excellent opportunities to record sightings.

The abundance and distribution of species recorded in the Celtic Sea will be added to database of previous surveys carried out by the Marine Institute.

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EMFF Operational Programme 2014-2020

Marine Biodiversity

Underwater Television Survey

Marine Mammal Observer Report

R.V. Tom Crean

26 – 29 August 2023

EMFF 2014-2020

Marine Institute Report Series

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Foras na Mara
Marine Institute

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1 Executive Summary

The Underwater TV survey (UWTV) took place on the Irish Sea from the 26th-29th of August 2023 on board the Marine Institute's *R.V. Tom Crean*. The survey covers an area of the Irish Sea *Nephrops* grounds. A dedicated marine mammal survey was carried out on board by a certified marine mammal observer following a single platform line- transect methodology aiming to gather data relating to relative abundance and distribution of marine mammals in the dedicated area.

The marine mammal survey was conducted over a 4-day period. The total amount of time the marine mammal observer spent on effort was 23 hours and 25 minutes.

Environmental conditions were overall good throughout the survey period. Visibility was very good, with most of the time spent on effort under visibility 6 (i.e., greater than 20 km) accounting for 83.11% of the time. Sea state conditions were also favourable with most of the effort being conducted under sea state 2 (45.45% of the time) and sea state 3 (accounting for 37.66%). Swell height was recorded as no greater than 1 metre throughout the survey period for most of the time spent on effort. Marine Mammal survey effort was conducted during all days onboard the vessel with a late start on the 26th of August (departure from dock at 6pm) and early arrival on the 29th of August (arrival to dock at 3pm).

A total of 2 sightings of marine mammal species were recorded over the course of the survey, both of which were common dolphins.

2 Introduction

Since 2013 Underwater Television Surveys (UWTV) have been carried out on the Irish Sea. These surveys were previously carried out onboard the marine institute vessel *R.V. Celtic Voyager*. However, this vessel has since been decommissioned and the UWTV survey is now conducted on the *R.V. Tom Crean*, this survey is the second annual UWTV survey to be conducted on the *R.V. Tom Crean.*

The main objectives of the UWTV survey are to access and quantify *Nephrops* abundance on the sea floor by estimating burrow densities at designated observation stations (Aristegui et al., 2021). The implemented methodology of UWTV sampling includes deploying a sledge with a high-quality camera attached to the sea floor and dragging this sledge along the sea floor for a 10-minute period. *Nephrops* burrows seen during this process are recorded and counted by trained scientists onboard the vessel.

As these waters are rich in diversity of cetacean species this survey provided a platform for marine mammal observation. This survey was the second annal UWTV survey carried out with a marine mammal observer present. Data collected by the marine mammal observer will be added to the catalogue of previous UWTV survey data carried out by the Marine Institute.

3 Materials and Methods

3.1 Data Collection

The cetacean-dedicated survey was carried out by a Marine Mammal Observer (MMO) on board the *R.V. Tom Crean* during the Underwater Television Survey 2023, from the 26th to the 29th of August 2023.

Cetacean survey was carried out during daylight hours from approximately 08:00 to 20:00, with intermittent small breaks to prevent fatigue and ensure the highest quality of data was obtained. Watches were carried out from the monkey island, located 13.5 metres above sea level. The methodology followed was a standard single platform line-transect survey when travelling and a point survey when the UWTV sledge was being deployed or retrieved. Should unfavourable environmental conditions occur, i.e., sea state ≥ 6, swell > 2 m and/or visibility < 1km, the MMO would immediately bring the survey effort to a stop. Should the MMO deem these conditions safe and appropriate, the effort would be continued.

Effort was focused based on an arc of 60º at both sides of the vessel's track and up to 1 km distance in priority. Sightings outside this arc and at further distance from the vessel were also logged. Watches were conducted with the naked eye and the help of high-quality Nikon Monarch 7 binoculars when needed, to confirm species identification the key entitled "*A guide to the identification of the Whales & Dolphins of Ireland*" by Jim Wilson and Simon Berrow was used. Photographs and videos of sighted animals were taken using the marine mammal observers' phone as a high-quality camera was not made available. If necessary, these photographs and videos would be used for confirmation of species and number of individuals present.

The distance and bearing of any sighted animal were recorded from the vessel were estimated using a range-stick (Heinemann 1981) an angle board was also used in association with the range- stick. Species identification, group size, age composition and behaviour were recorded for each animal sighting. Where the identification of a species could not be confirmed, appropriate taxonomic levels and associated confidence levels were assigned to the sightings. All marine mammal sightings that occurred off effort and were reported to the MMO were also recorded as auxiliary sightings, stored in an independent file within the database.

Environmental conditions were continuously logged approximately every 15 minutes or when a change in conditions occurred. The recorded variables include the following: sea state (from 0-6), visibility (from 1 to 6), swell height (from 1 to 3) and precipitation (type and intensity).

Vessel position, sightings and environmental data were recorded by the MMO using the software Logger 2010 (Marine Conservation Research, 2023), which logged the data into a premade Microsoft Access database. The vessel's GPS position was recorded every 10 seconds into the database using an external GPS receiver with USB connection. All records were automatically time-stamped and assigned a unique GPS index. The time recorded by the software corresponds to the Greenwich Meantime (GMT) which was an hour late than standard Irish time.

3.2 Data Treatment

The GPS data recorded into the database was revised along with the GPS index of all the sightings, the environmental stations recorded were also verified prior to mapping.

Cetacean survey effort and the sightings recorded were mapped using ArcGIS Provision 2.5.0 (ESRI 2020).

4 Results

4.1 Marine Mammal Survey Effort

Figure 1. Marine Mammal Survey Effort during UWTV survey 2023.

Team of six scientist's boarded the *R.V Tom Crean* on the 26/08/2023 at Horgan's Quay, Cork and departed at 17:00 local time. The marine mammal observer commenced her watch at 18:00 hours that evening and stopped her watch at 20:00 hours. The next morning the watch commenced at 09:30 hours while travelling to the Irish Sea. Watches were carried out continuously throughout the 4 days onboard. Effort was carried out from the monkey island during each watch, however on the final day onboard the marine mammal observer had to carry out the final two hours of her watch from the deck as operations were in place to clear the monkey island and prepare if for the next marine mammal observer coming onboard. *R.V Tom Crean* docked at Hogan's Quay, Cork on the 29/08/2023 at 15:00 hours local time. Marine Mammal Survey effort amounted to 23 hours and 25 minutes (Figure 1, Table 1).

Table 1. Contains the daily log of the marine mammal observer's schedule including start times, end times, total duration of watches, transects surveyed and the location in which the survey was carried out. Times correspond to those entered via IFAW Logger 2010 software in GMT. Note that breaks are not included in the total duration. (MI= Monkey Island).

Date	Start Time	End Time	Duration	Transects Surveyed	Platform
26/08/2023	17:00	19:00	02:00	Travelling	MI
27/08/2023	08:30	16:15	06:25	UWTV Transect Stations in the Irish Sea	MI
28/08/2023	07:00	18:30	10:00	UWTV Transect Stations in the Irish Sea	MI
29/08/2023	07:00	13:00	05:00	Travelling	MI
Total Survey			**23:25**		

4.2 Environmental Conditions

Environmental conditions encountered during this survey were recorded at 77 stations (Figure 2).

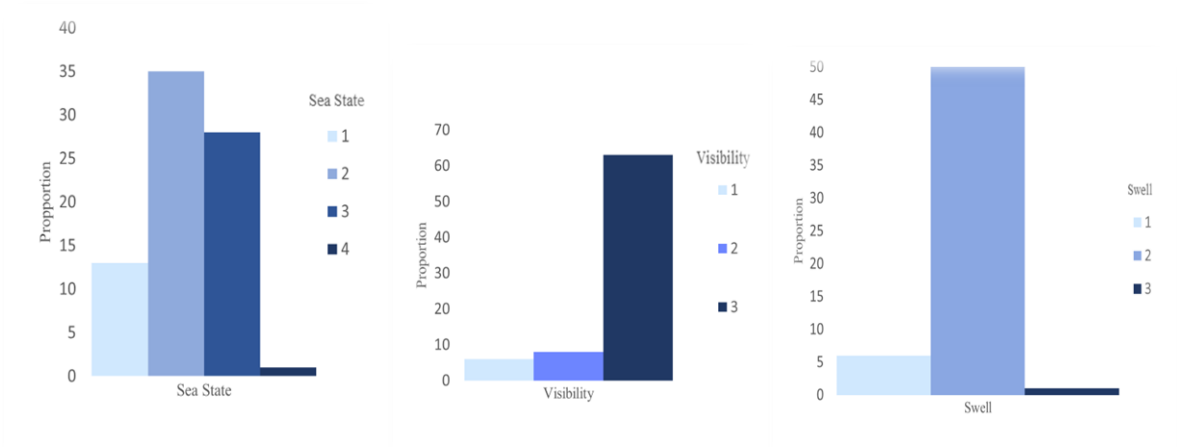

Figure 2. Environmental Conditions: sea state, visibility, and swell encountered during UWTV survey 2023. Data is presented as proportional to time spent on effort under each changing sea state category during survey.

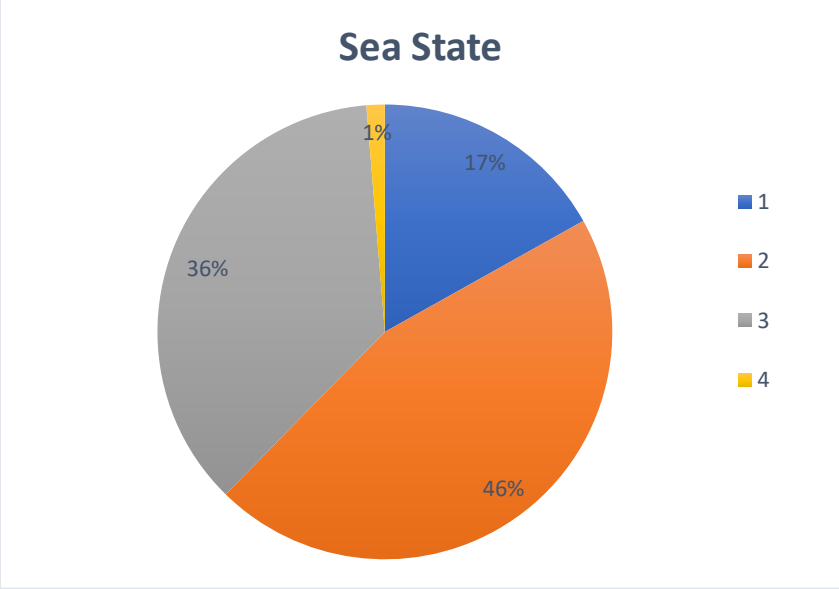

Figure 3. Proportion of daily sea state conditions across UWTV survey 2023.

Sea state conditions ranged from 0 to 4 throughout this survey (Figure 2 and 3). Most efforts were carried out under sea state 2 accounting for 45.45% of the total time spent of effort. Other sea states recorded while on effort were sea state 1 (16.88%) and 3 (36.36%). The survey was carried out under continuous favourable environmental conditions with the highest sea state record occurring once (sea state 4 accounting for 1.29% of the total time spent on effort).

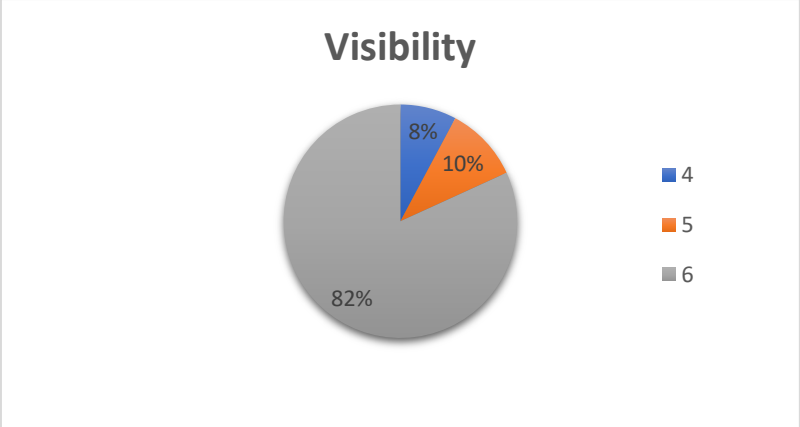

Figure 4. Proportion of daily visibility conditions across UWTV survey 2023.

Levels of visibility throughout this survey ranged from 4 (between 11to 15km) to 6 (greater than 20km, Figure 4). Visibility remained favourable throughout the entire period of the survey. Majority of on-effort watches were conducted under a visibility level of 6 (greater than 20 km) accounting for (81.81%).

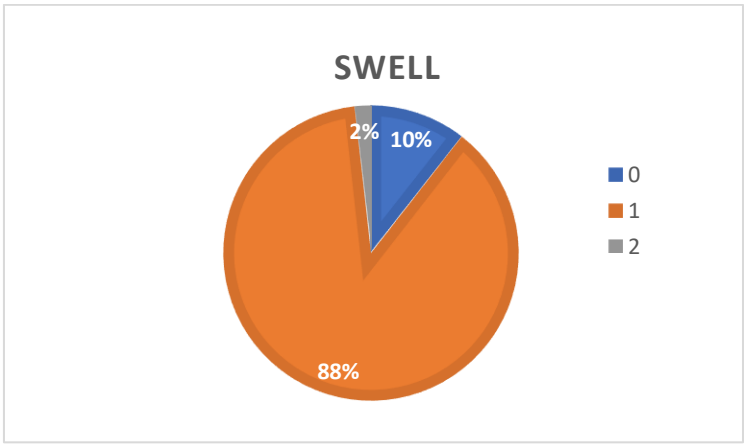

Figure 5. Proportion of daily sea swell height encountered across UWTV survey 2023.

Swell height throughout this survey ranged from 0 to 3 (Figure 5). With most on- effort watches carried out under swell height 1 (less than 1m) accounting for 88%.

Precipitation (i.e., rain) was recorded for a total of 2 hours and 5 seconds while on effort. Continuous light rain accounted for 42 minutes and 44 seconds. Intermittent fog was recorded for a period of 31 minutes and 8 seconds.

4.3 Sightings

Table 2. Species of cetaceans encountered during the UWTV 2023 survey. Number of sightings, individuals and group size are shown.

	Species	Sightings	Individuals	Group Size
Odontocetes	Common Dolphin	2	6	(2) (4)
Total marine mammals		**2**	**6**	_

Common dolphins (*Delphinus delphis*) were the only species seen while on effort accounting for 100% of sightings (Table 2, Figure 6). No auxiliary sightings were recorded while off effort. Common dolphins presented as small group sizes with only two sightings of 2 and 4 individuals in each group.

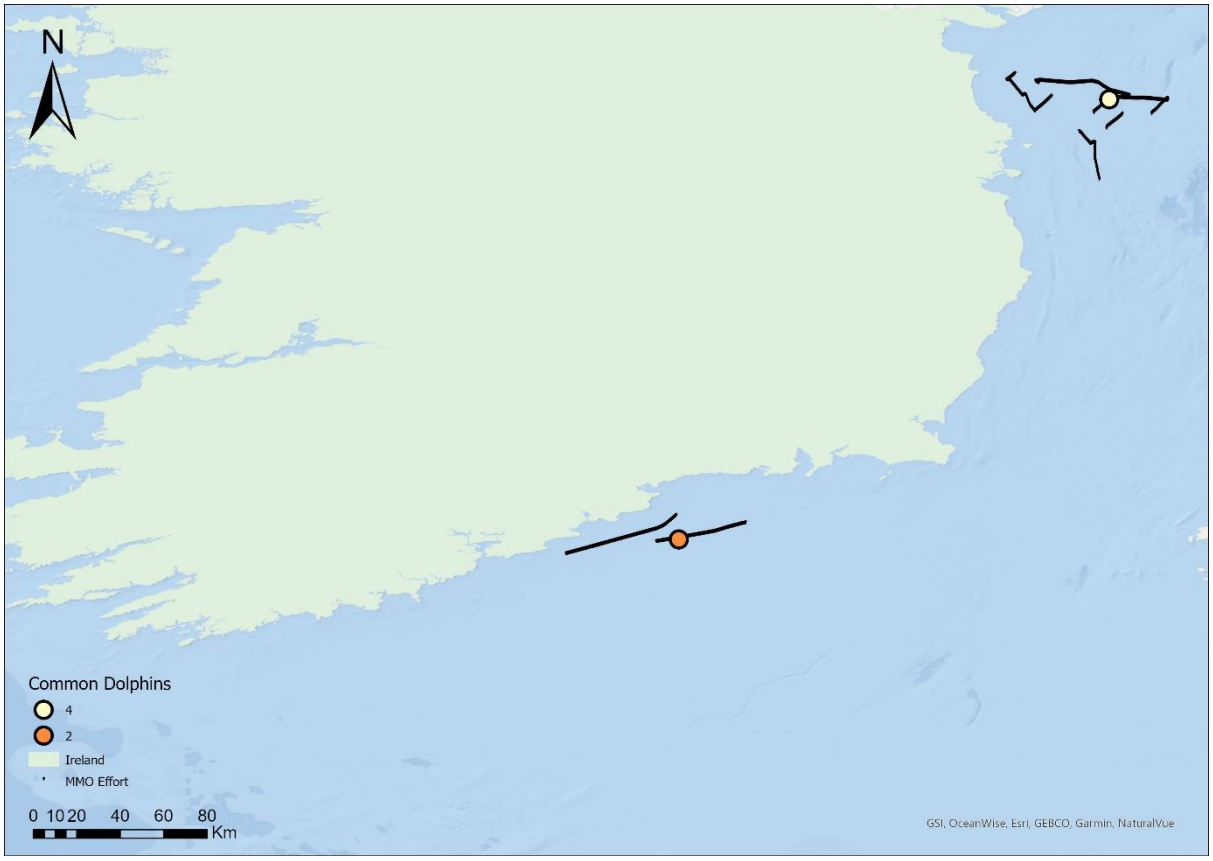

Figure 6. Sightings and group size of marine mammal species (common dolphin) recorded on effort during the UWTV 2023 survey. Marine mammal survey effort is also shown.

5 Discussion

During the Underwater Television Survey (UWTV) two sightings of common dolphins and mysticetes were recorded in the Irish Sea.

Although favourable environmental conditions were present, recorded sightings were at a minimum. This could be in relation to the vessel moving at a slow speed while surveying and coming to a stop at multiple designated stations. The animals that were seen were recorded at high speeds (11-12 knots) while the vessel was in motion without a sledge deployed. Animals were recorded on the port side of the vessel demonstrating leaping behaviour.

The data collected while on relative abundance and distribution of the species encountered while on effort in the Irish Sea will be compiled and added to time-series data from previous surveys conducted by the Marine Institute.

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