

National Research Vessels

SHIP-TIME PROGRAMME

RESEARCH SURVEY REPORT

Survey Code:	Survey Name:	Chief Scientist/ Institution
CV18033	A multi-disciplinary survey of an offshore killer whale community that associate with the Northeast Atlantic mackerel fishery	Róisín Pinfield

Section A: Award Summary

Title of Research Survey and Survey Code:	A multi-disciplinary survey of an offshore killer whale (<i>Orcinus orca</i>) community that associate with the Northeast Atlantic mackerel fishery CV18033	
Co-Ordinator/ Chief Scientist:	Róisín Pinfield	
Vessel used for ship-time:	RV Celtic Voyager <input checked="" type="checkbox"/> RV Celtic Explorer <input type="checkbox"/>	
Total number of days at sea:	10	
Total number of grant-aided ship-time days awarded:	12	
Dates of survey:	24 th Oct – 2nd Nov	
Mobilisation/Demobilisation Ports	Cork/Dublin (we demobbed in Dublin 2 days early as forecast for transit back to Cork was poor and not suitable for effort watches)	
Survey Personnel:	<i>No. of Scientists</i> 4	<i>No. of Students</i> 3
Final Report Completed by:	Róisín Pinfield	Date: 07 Feb 2019

Section B: Description of the Research Survey

B1 Overview of survey personnel

Names	Institute/ Department/ Course	Position (undergraduate/ post graduate etc)	Number of Days
Scientists			
Prof. Emer Rogan	School of BEES, UCC	Lecturer in UCC	10
Dr Milaja Nykanen	School of BEES, UCC	Post-doctoral researcher, UCC	10
William Hunt	Centre for Marine and Renewable Energy Ireland	Research assistant	10
Mary Kate Bolger	School of BEES, UCC	MSc graduate	10
Students			
Róisín Pinfield	School of BEES, UCC	PhD researcher	10
Maria Garagouni	School of BEES, UCC	PhD researcher	10
Gary Kett	School of BEES, UCC	PhD researcher	10

B2 Objectives

- 1) Carry out a **sightings-based survey** to record marine mammal sightings and to determine if killer whale distribution is heavily influenced by location of mackerel fishing vessels and/or activity of fishing vessels (steaming/trawling/hauling/fish pumping)
- 2) Take **high quality images** of killer whales for, individual identification, estimating abundance, group composition, and comparison with ID catalogues from surrounding countries to gain insights into site/fishery fidelity and year-round movements.
- 3) Take **skin biopsies** to carry out genetic and stable-isotope analyses to reveal population structure and diet.
- 4) **Environmental DNA (eDNA)** sampling for genetic analyses. DNA will be extracted from filtered seawater samples and tested for the presence of killer whale DNA.
- 5) Collect **acoustic data**, specifically individual signature whistles with the use of a dipping hydrophone, for comparison with other killer whale populations in the Northeast Atlantic to further aid in identifying geographical range and population connectivity. Note: a towed **Passive Acoustic Array** was added to the survey to allow collection of acoustic data while in transit.
- 6) Gather **drone footage** to investigate foraging behaviour and movements of the killer whales around the fishing vessels to determine if a feeding hierarchy exists.

B3 Overview of research survey

The vessel disembarked from Cork at approximately 18:30 on the 24th November following a safety briefing. The research team had a meeting that night which included, a run through of the survey protocol, equipment, forecast and plan for the coming days while in transit to the fishing grounds. A rota was drawn up and the passive acoustic monitoring equipment was deployed at 21:30 local time. A map of the planned survey area (Plan A) along with two other contingency survey areas (Plan B and C) was provided prior to the trip (Figure 1). The survey area was chosen based on killer whale sightings with the mackerel fishery in October/November in 2016 and 2017. On leaving Cork, it was decided that the vessel would head for the planned survey area (Plan A) but as the forecast was

giving poor conditions for the coming days, regular meetings between the Chief scientist and the Captain would take place to discuss weather updates and options based on the forecasted conditions.

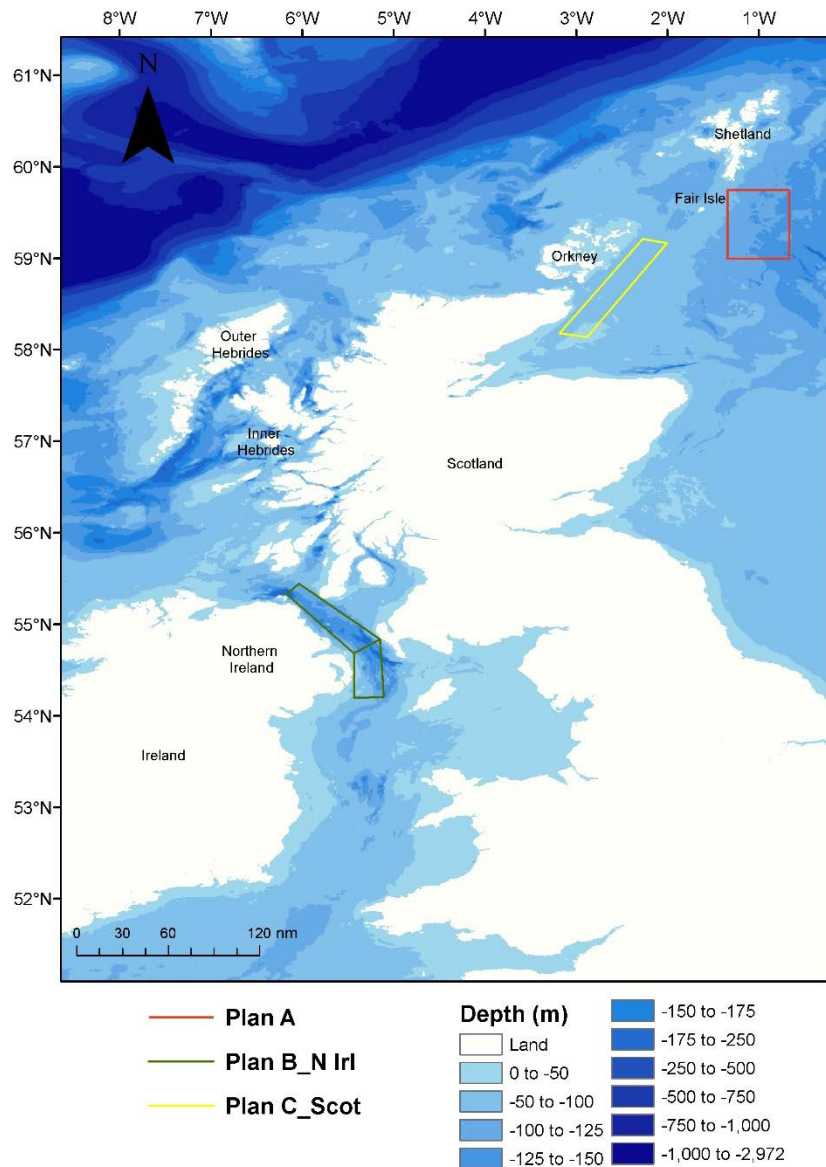


Figure 1: Map of survey area (Plan A). Also included is two contingency survey areas (Plan B and C).

Effort watches for marine mammals were carried during daylight hours (07:00–17:00UTC) by two observers, positioned on the bridge wings (1 port, 1 starboard). Observers used 8x50 binoculars and a distance sampling stick. Effort watches ceased if conditions increased above a Beaufort seastate 6.

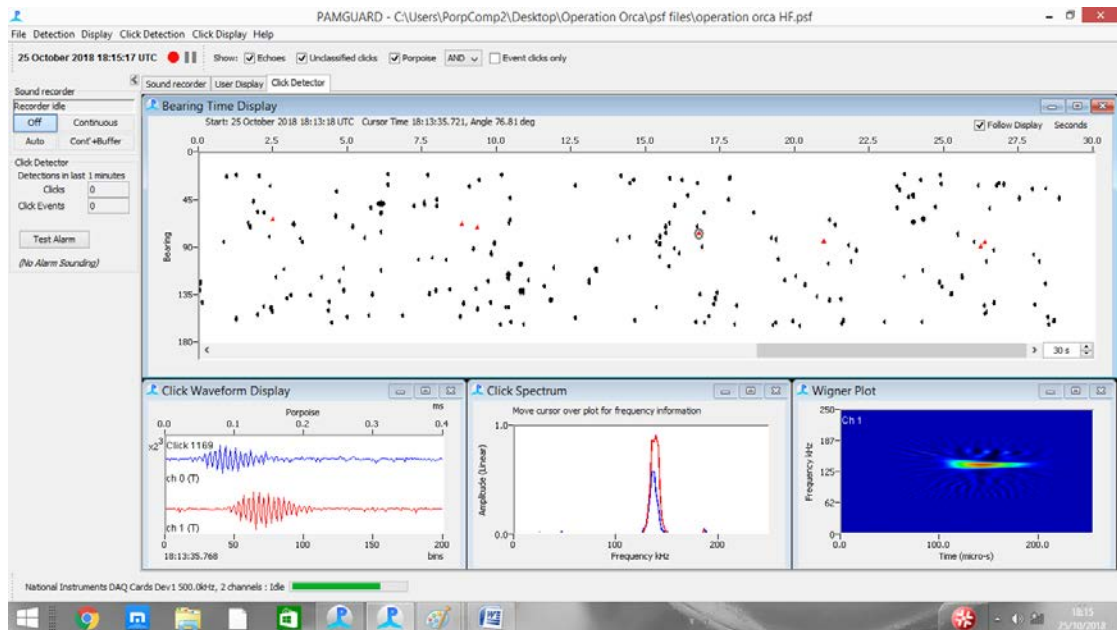


Figure 2: Harbour porpoise detection clicks detected on PAMGUARD during passive acoustic monitoring on the 25th October 2018.

A towed passive acoustic array (Vanishing Point) was used to carry out passive acoustic monitoring (PAM) while in transit to the survey area. PAMGUARD software was used to examine any cetacean echolocation clicks or whistles heard through a live acoustic feed into the dry lab and was carried out over a 24-hour period. PAM was deployed at approximately 21:30 on the night we departed Cork (24th November). Several dolphin and harbour porpoise (*Phocoena phocoena*) detections were recorded on route until we were about to enter the Inner Hebrides on the 25th October (Figure 2), at which point a decision was made to bring PAM back onboard as we were entering an area of varying depths, some of which would be too shallow for PAM and could possibly damage the equipment. The vessel continued up the inside of the Inner Hebrides to stay out of adverse weather conditions and then moved out into the Minch (inside of the Outer Hebrides) on the night of the 26th October. On the morning of the 27th October we came into port in Stornoway, Isle of Lewis due to stormy weather conditions at sea.

At 7am on the 28th October, we departed Stornoway. Sightings observations were carried out as before, however, a technical issue with PAM occurred so acoustic monitoring could not be carried out. Several attempts were made to fix PAM and a few hours later it was resolved, and PAM was redeployed, however the pins in the connector plug got damaged during this re-deployment and could not be fixed. Unfortunately, PAM could not be carried out for the rest of the survey. Effort watches were carried out throughout the day with several sightings of cetaceans recorded, including harbour porpoise, common dolphin (*Delphinus delphis*), bottlenose dolphin (*Tursiops truncatus*), minke whale (*Balaenoptera acutorostrata*), white-beaked dolphin (*Lagenorhynchus albirostris*), Atlantic white-sided dolphins (*Lagenorhynchus acutus*) and two separate sightings of two unidentified large whale species, one of which was a possible juvenile fin whale (*Balaenoptera physalus*) or a northern sei whale (*Balaenoptera borealis*). The position of the target survey area was moved slightly that evening following communications with Irish fishermen and observations of fishing vessels positions on AIS marine traffic.

On the morning of the 29th, conditions were very poor and following a discussion with the Captain, we started to move slowly (<3kts) towards the Shetlands for shelter, however the trip was proving hard on the vessel and uncomfortable for all onboard and the decision was made to stop the vessel and wait out the storm that

day until the following morning when conditions looked to be improving. No sightings effort watches were carried out that day.



Figure 3: Killer whales in tight formation (left) and foraging in close to a mackerel vessel during fish pumping operations (right). Photo credit Gray Kett (left) and Mary-Kate Bolger (right).

Following communications with Irish fishermen at 04:30 on the 30th November, the chief scientist was informed that the Irish vessels would be travelling several nautical miles south of us to an area where very few vessels had been fishing mackerel in the days previous. At approximately 11:45 we received information about killer whales behind a trawler north of us, and as we moved towards it, the team spotted killer whales foraging behind a different vessel as they were hauling so we moved towards this vessel. We stayed with these whales, gathered photo-ID and made biopsy attempts. After that, we had multiple encounters with at least 5 other groups. Most of the groups had two to three large bulls, with very large dorsal fins and many of the groups had calves. We saw many different behaviours including breaches, tail slaps and what is known as spy hopping, where the animal lifts approximately half of its body vertically out of the water. In total, at least 60 animals were encountered with different groups coming and going. We stayed with the killer whales for 4.5 hours. Many of the individuals were tightly grouped, swimming in close synchrony, while others were more spread out (Figure 3).

Approximately 4,000 photo-identification photographs were taken in total by several of the team and photo-identification and cataloguing of these individuals is on-going. Seven biopsy attempts were made by Róisín Pinfield, one of which was successful. All attempts were made outside UK territorial waters where no ASPA licencing is required from the Home Office, London (Kim Willoughby, personal communications). As the daylight faded, we ceased following the killer whales and stopped the vessel so that water samples for eDNA could be taken and we deployed a dipping hydrophone for 20 minutes to record echolocation clicks and whistles. Due to poor weather conditions the RIB was not deployed nor was it possible to fly the drone.

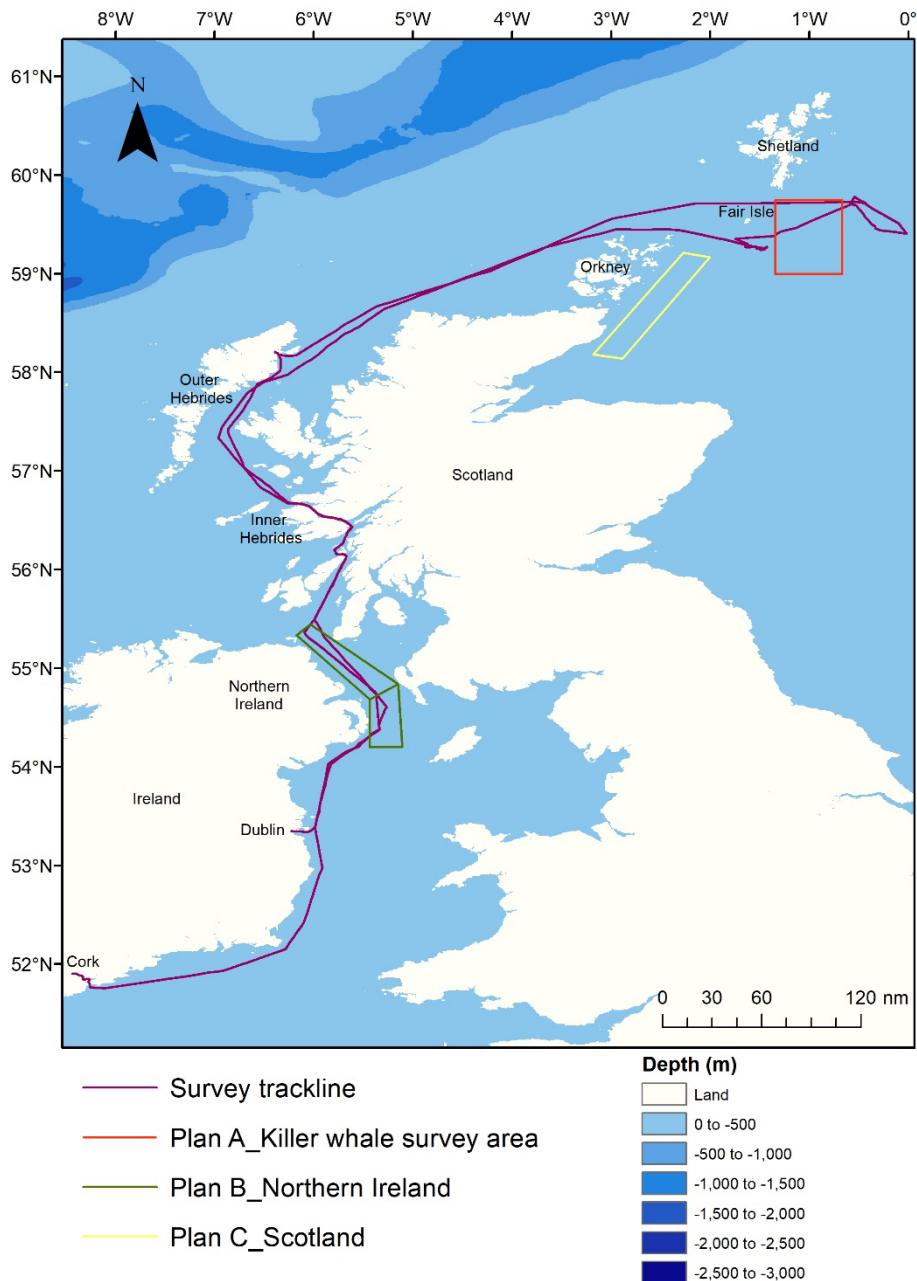


Figure 4: Map of ship trackline during CV18033 killer whale research cruise. Included is the survey area box (Plan A) plus two contingency survey areas (Plan B and C).

The following three days were spent in transit back to Ireland along approximately the same route (Figure 4). Effort watches were carried out during these three days and many sightings were recorded (Figure 5). Following several weather updates for the coming days, the chief scientist requested that the team disembark in Dublin as the final two days of the trip back to Cork were forecasted to be too poor for effort watches.

Table 1: Marine mammal sightings recorded during effort watches onboard *R.V. Celtic Voyager* for the CV18033 killer whale research cruise. Resightings of marine mammals are not included.

SPECIES (COMMON NAME)	NO. SIGHTINGS
Harbour Porpoise	18
Common dolphin	12
Bottlenose dolphin	1
White-beaked dolphin	1
Atlantic white-sided dolphin	1
Killer whale	1
Minke whale	2
Unidentified dolphin species	6
Unidentified large whale species	2
Grey seal	3
Harbour seal	6
Leatherback turtle	1
Total	54

A total of 53 marine mammal sightings and one leatherback turtle were recorded from 7 days of effort watches carried out during the entire trip (Table 1, Figure 5). Harbour porpoise and common dolphin were the two most commonly sighted species (Table 1).

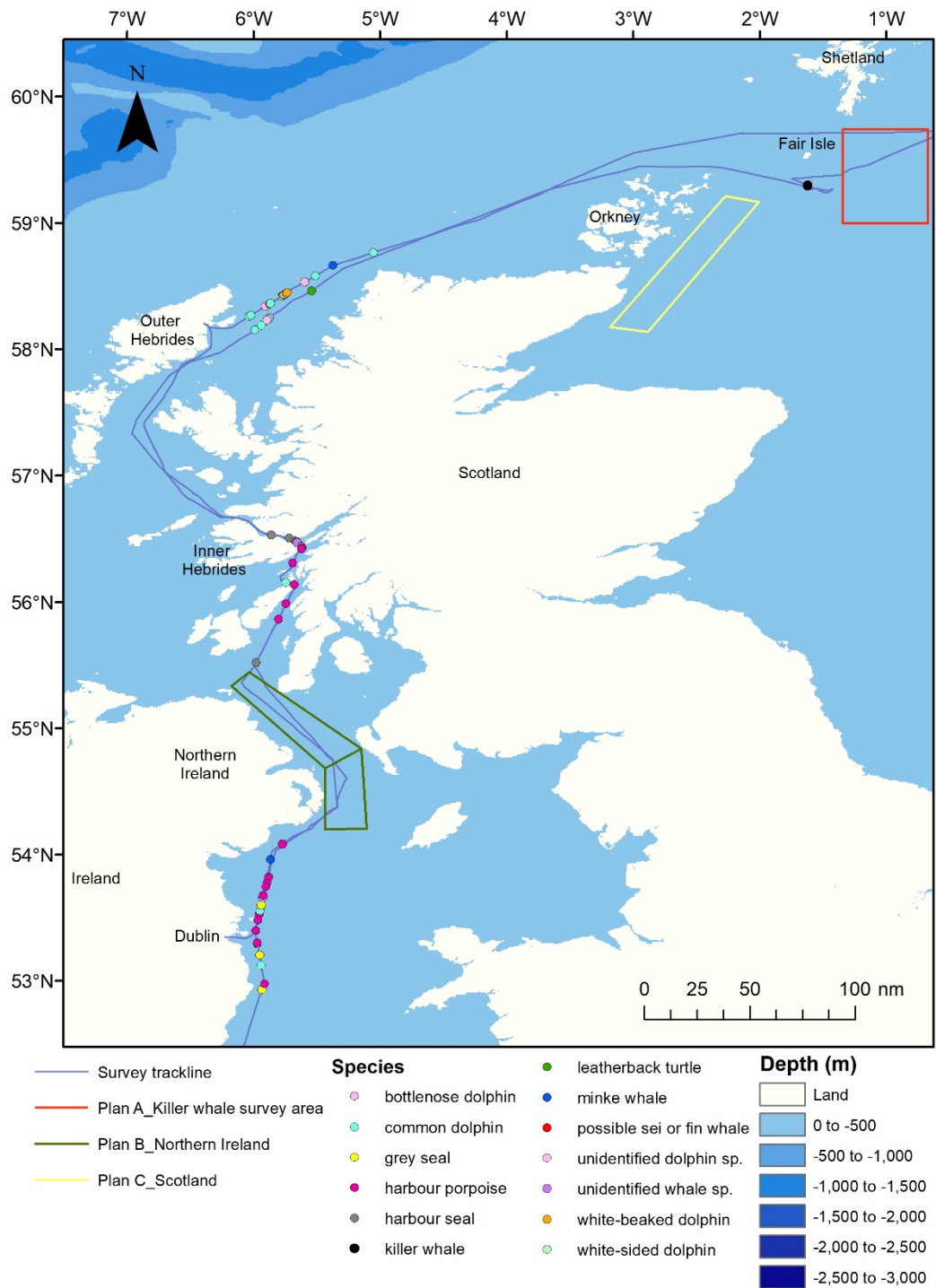


Figure 5: Map of sightings during CV18033 killer whale research cruise. Included is the survey area box (Plan A) plus two contingency survey areas (Plan B and C). Resightings of marine mammals are not included in the map.

Appendices

Please number and attach any relevant Appendices here.