

PIP, ISPSG/GSI/RC Hatton Seismic Survey GRA04_01

I.L.V. *Granuaile*: 30th June – 25th July 2004

Cetacean Observation Summary

Introduction.

As part of the PIP, ISPSG/GSI/RC (BGS) regional geophysical survey in the Hatton-Rockall area, Mick Mackey from the Coastal & Marine Resources Centre, University College, Cork, Ireland, was invited to act as a Marine Mammal Observer and to conduct general surveys of the offshore cetacean and seabird populations. This report summarizes the observations made immediately before and during the shooting of seismic lines and while the ship was steaming between lines on cruise GRA04_01.

The main aims of the research are:

1. Expand upon the baseline information on the distribution and relative abundance of cetacean populations in waters associated with the Hatton-Rockall region;
2. Identify major concentrations of cetaceans in these waters, which will assist in the evaluation of seasonal trends in their distributions;
3. Carry out duties of a Marine Mammal Observer (MMO) as outlined in the JNCC guidelines on minimising acoustic disturbance to marine mammals during active seismic surveys.

An assessment of the behavioural responses of cetaceans to the seismic operations was attempted. The observer was also asked to inform seismic staff of visual cetacean presence prior to activating seismic equipment (i.e. airgun).

Methods:

Two observation methods were employed simultaneously throughout the survey. The standard method for recording all seabirds within 90° of the ship's trackline, devised by the Joint Nature Conservation Committee (JNCC), was used when the vessel was travelling on a set course, at speeds greater than 4 knots and when climatic conditions allowed (i.e. less than wind force 7). Due to the extremely low concentrations of seabirds recorded within the study area, general scans for cetaceans were also conducted in the 180° area ahead of the ship, using waterproof 10x42 binoculars. The binocular scans allowed for early detection of cetaceans, in addition to clearer assessments of behavioural responses to seismic operations. General 360° cetacean scans were carried out prior to the initiation of seismic activity. Casual sightings recorded while the ship was stationary or during meal breaks have also been included in this brief analysis. All data collected during this survey will contribute to the Irish Cetacean and Seabirds at Sea study's database, and the central European cetacean and seabird databases maintained by the JNCC in Aberdeen.

Study Area:

The primary study area during the GRA04_01 cruise was the south and southwestern Hatton-Rockall region, which included west and southwest slope regions of the Rockall Bank, the Rockall Plateau, the Hatton-Rockall Basin and westward to the southern sector of the Hatton Bank (Figure 1). During the outward and homeward legs of the cruise, survey effort was also achieved along the northern coastal waters of Northern Ireland, over the continental shelf edge northwest of Co. Donegal and across the central sectors of the Rockall Trough and the Rockall Bank.

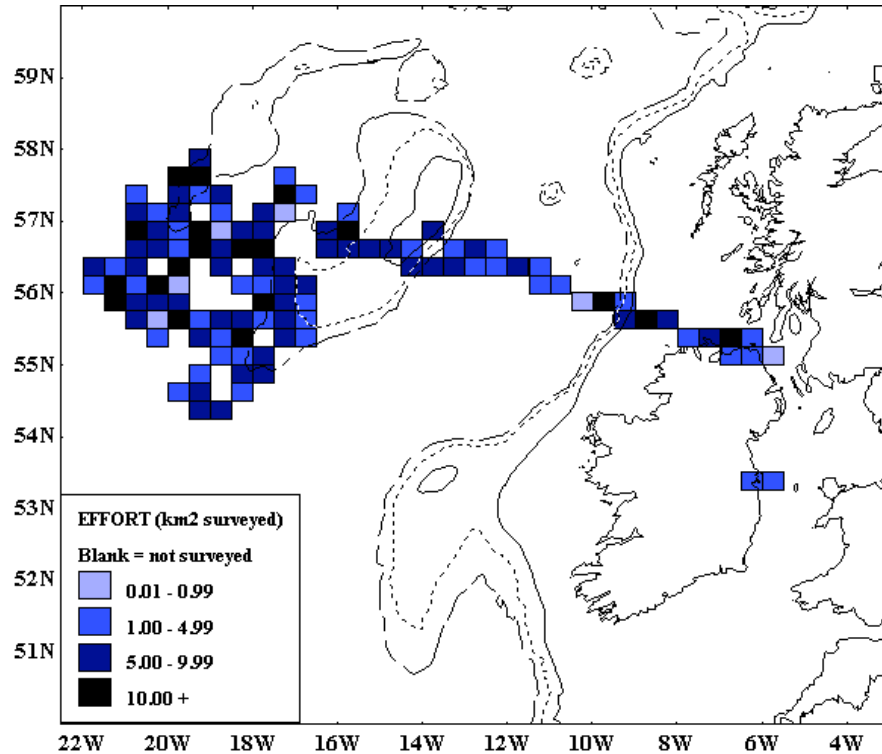


Figure 1. Full survey effort achieved for 1/4 ICES squares surveyed during the GRA04_01 cruise.

Results:

Effort

Full surveys were conducted during 23 days of the 26-day cruise (30th June – 25th July 2004). Severe wind conditions, large swell heights and ship downtime precluded the possibility of conducting standard surveys during the three days. The average working period for each day was restricted to 5.00am and 9.00pm GMT, although ship downtime, high wind conditions and severe sun glare limited available survey time further. Over 735km² of trackline were surveyed during a total of 230 hours (average 10 hours survey hours per day surveyed). The survey effort area (km²) achieved for each ¼ ICES square, each measuring 15' latitude x 30' longitude, is highlighted in Figure 1.

Cetaceans

A total of ten cetacean species and five unidentified categories were recorded during the study, comprising a total of 614 animals that were recorded during 68 sighting events, including seven multi-species encounters (Table 1). Nine toothed cetacean species (n=587 animals) and one species of baleen whale (n=1 animal) were positively identified during 43 encounters. In addition to those positively identified animals, 35 unidentified cetaceans were observed during nine separate encounters, including distant sightings of breaching whales.

Table 1. Total numbers of individuals and encounters, group size ranges and depth ranges for each cetacean species recorded during the GRA04_01 cruise.

Cetacean Species	Total Number of Animals Recorded	Total Number of Encounters ♣	Group Size Range	Depth Range (m)
Toothed Cetaceans				
Common Dolphin	80	10	1-25	500-2000
White-sided Dolphin	42	7	3-11	700-1200
White-beaked Dolphin	10	2	5	400-500
Long-finned Pilot Whale	410	36	2-32	500-1800
Sperm Whale	14	7	1-3	700-1500
Killer Whale	5	1	5	1500
False Killer Whale	10	1	10	1500
Northern Bottlenose Whale	11	4	1-4	800-2000
Sowerby's Beaked Whale	6	2	1-5	900-1500
Baleen Whale				
Humpback Whale	1	1	1	1380
Unidentified Cetaceans				
Small Whale sp	2	2	1	800-1000
Large Whale sp	2	2	1	1350-1900
Medium Whale sp	2	2	1	500-1600
Dolphin sp	9	2	4-5	95-500
Blackfish sp.	10	1	10	1000
TOTAL	614			

♣ Includes 7 multi-species encounters.

Toothed Whales

The most numerous and frequently encountered species was the Long-finned Pilot Whale, which was sighted on 36 separate occasions (53% of all encounters). This squid-eating species accounted for approximately 67% of all individuals recorded (n=410 animals). Eight separate groups of Long-finned Pilot Whales, totalling 105 animals, were observed in near perfect conditions over the Rockall Plateau during a 12-hour period on 19th July. With the exception of two relatively shallow water encounters (i.e. at ~500m), all Long-finned Pilot Whale sightings occurred at depths between 900-1800m (Figure 2). Twenty-five of the encounters (~69%) occurred during seismic operations. The Long-finned Pilot Whale frequently displayed an apparent positive response to the ship's seismic activity (i.e. actively approached vessel). This investigative behaviour has been observed during previous surveys on seismic vessels, and may help to explain the relatively high encounter rate. During most of these occasions Long-finned Pilot Whales were observed swimming rapidly towards the ship until they get within 300-500m. At this point, they tended to slow to a cautious pace, swimming parallel and in the opposite direction to the vessel. Once level with the stern/airgun region, most groups milled about in the one position, sometimes quite actively, before moving off in various directions relative to the ship's course. On two occasions, Long-finned Pilot Whales approached within 50m of the active airgun. Long-finned Pilot Whales generally approached within 10-50m when the ship was hove-to into poor weather (on three separate occasions) or when steaming (i.e. non-seismic activities). A single long-term close encounter involving approximately 15 Long-finned Pilot Whales occurred as the ship slowed to alter course. The animals circled the vessel within 10m for 30 minute while displaying numerous forms of behaviour, including spy-hopping, porpoising, logging, tail-slapping, milling and fluking. The multi-species encounters involving Long-finned Pilot Whales, also involved Atlantic White-sided Dolphins, Short-beaked Common Dolphins, False Killer Whales or a Sowerby's Beaked Whale.

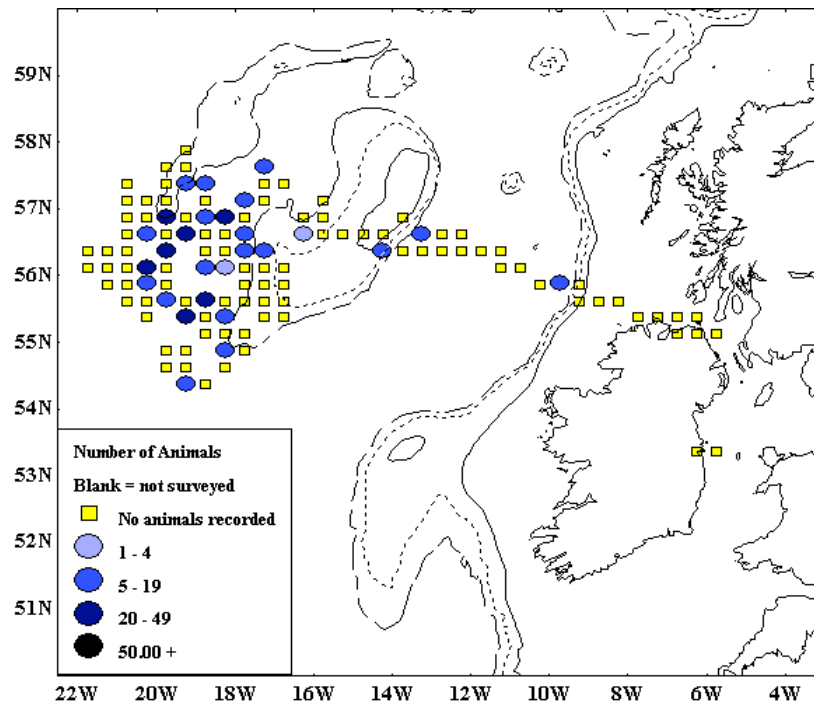


Figure 2. Sighting locations of Long-finned Pilot Whales, 2nd – 25th July 2004.

The second most frequently encountered toothed whale species was the deep-diving Sperm Whale. Fourteen Sperm Whales were recorded during seven sighting events, although seven animals were observed in close proximity to each other (i.e. within 4-5km) over the southwest slope of the Hatton Bank (Figure 3). All but one Sperm Whale encounter occurred during seismic operations, where they appeared to recognize the presence of the ship's acoustic activities. During such encounters, individual animals were observed to approach the ship to within 600-800m, and remain at the surface as the ship moved on. Spy-hopping adults were also observed during seismic operations. All Sperm Whale encounters were accompanied by the characteristic “fluking-up”, indicative of a deep dive.

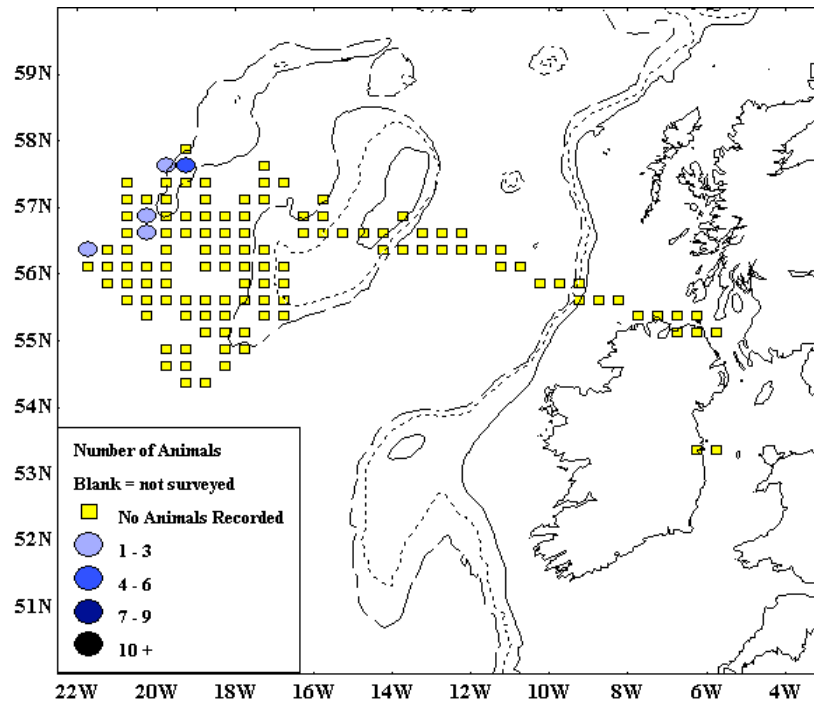


Figure 3. Sighting locations of Sperm Whales, 6th – 20th July 2004.

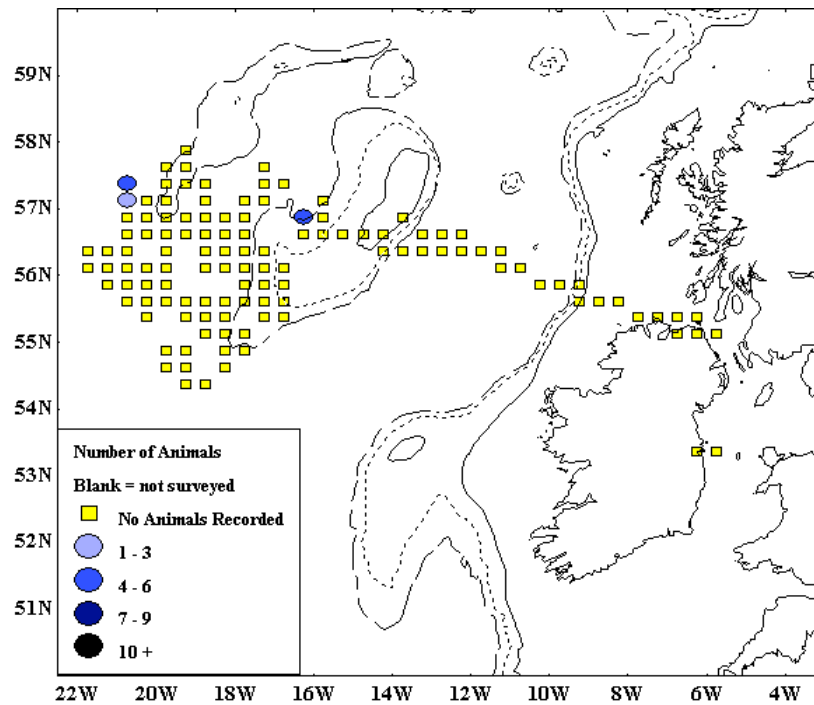


Figure 4. Sighting locations of Northern Bottlenose Whales, 9th & 24th July 2004.

The most interesting encounters during the current survey involved the records of those species that have been rarely sighted in the study area, namely Northern Bottlenose Whales, Sowerby's Beaked Whales, False Killer Whales and Killer Whales. Eleven Northern Bottlenose Whales were recorded during four separate encounters (Figure 4). Immature Northern Bottlenose Whales were observed during three encounters, one of which also included a calf. The fourth encounter involving this curious species involved three large adults that seemed to be investigating the seismic source from a distance of approximately 400m abeam. After surfacing in the same direction as the ship's course, the three animals turned quickly and swam off in the opposite direction.

Sowerby's Beaked Whales were observed on two separate occasions, both during active seismic operations. The first encounter involved five adults that swam slowly and steadily away from the vessel southwest of the Rockall Bank, while the other encounter involved a single adult that breached clear of the water five times amongst a large group of Long-finned Pilot Whales over the southern slope of the Hatton Bank (Figure 5). Approximately ten False Killer Whales of similar size appeared to displace another large group of Long-finned Pilot Whales from a possible feeding site before engaging in a frantic five-minute period of frenzied surface activity. The group then approached to within 700m of the vessel as it surveyed the deep waters southwest of the Rockall Bank (Figure 6). A family of group of three adult and two immature Killer Whales briefly approached the vessel to within 50m during seismic operations southwest of the Hatton Bank (Figure 7). No large male were observed.

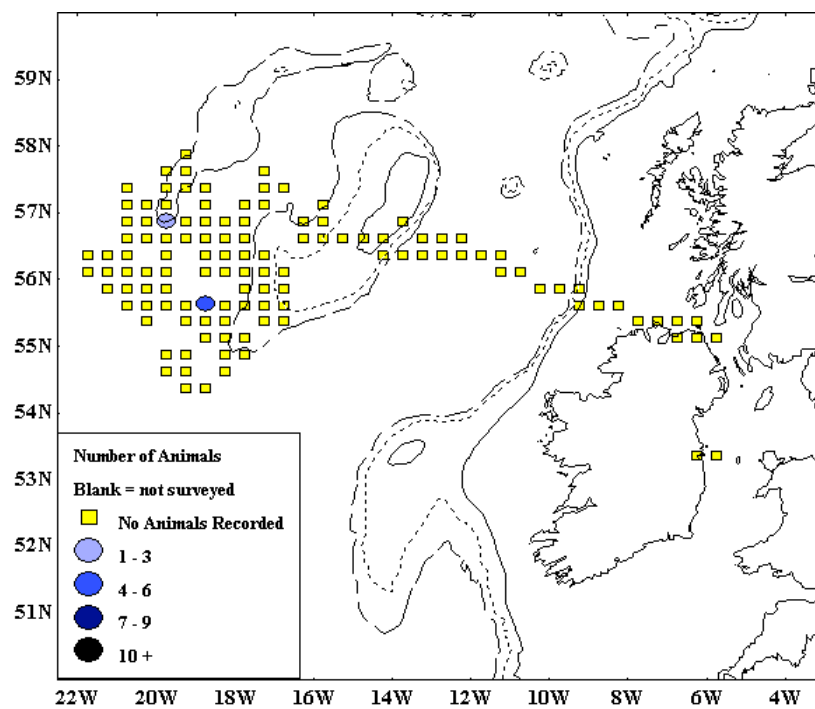


Figure 5. Sighting locations of Sowerby's Beaked Whales, 8th & 10th July 2004.

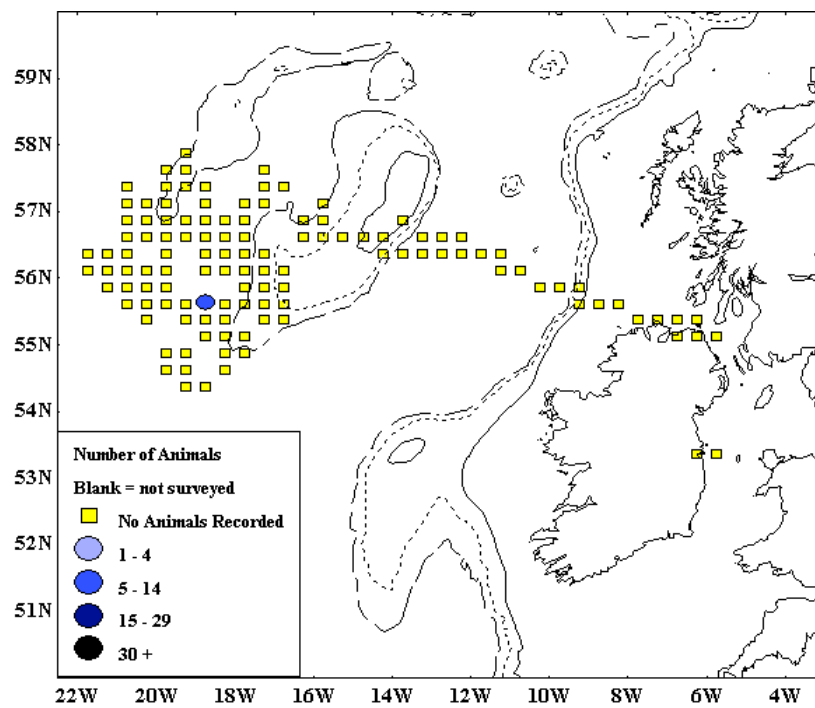


Figure 6. Sighting location of False Killer Whales, 8th July 2004.

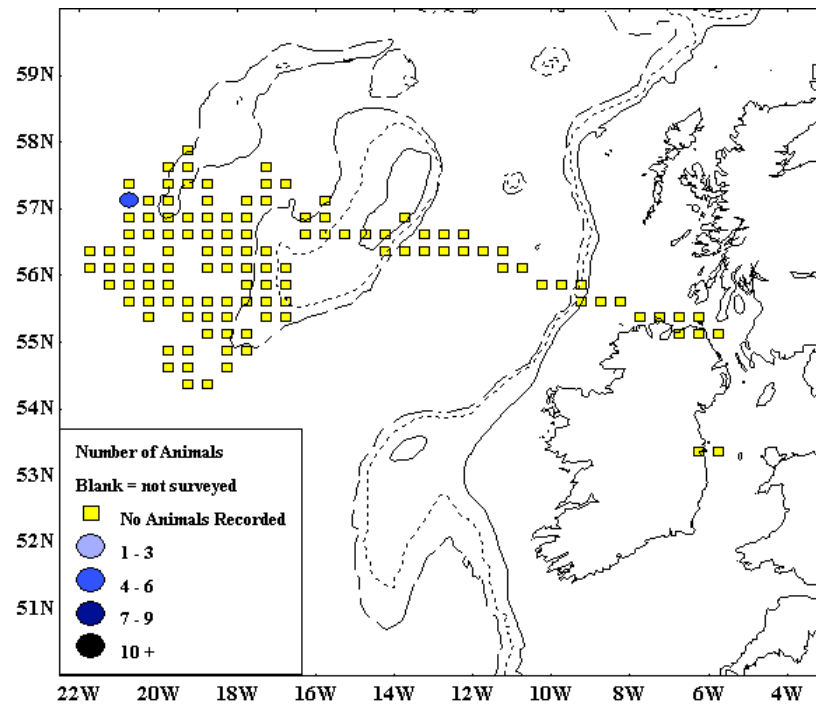


Figure 7. Sighting location of Killer Whales, 9th July 2004.

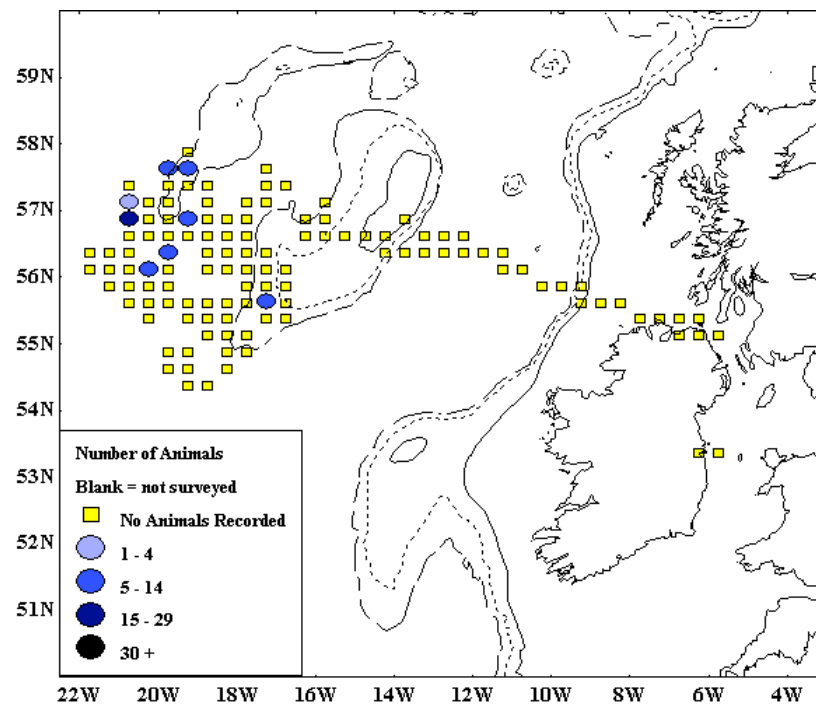


Figure 8. Sighting locations of Short-beaked Common Dolphins, 9th – 20th July 2004.

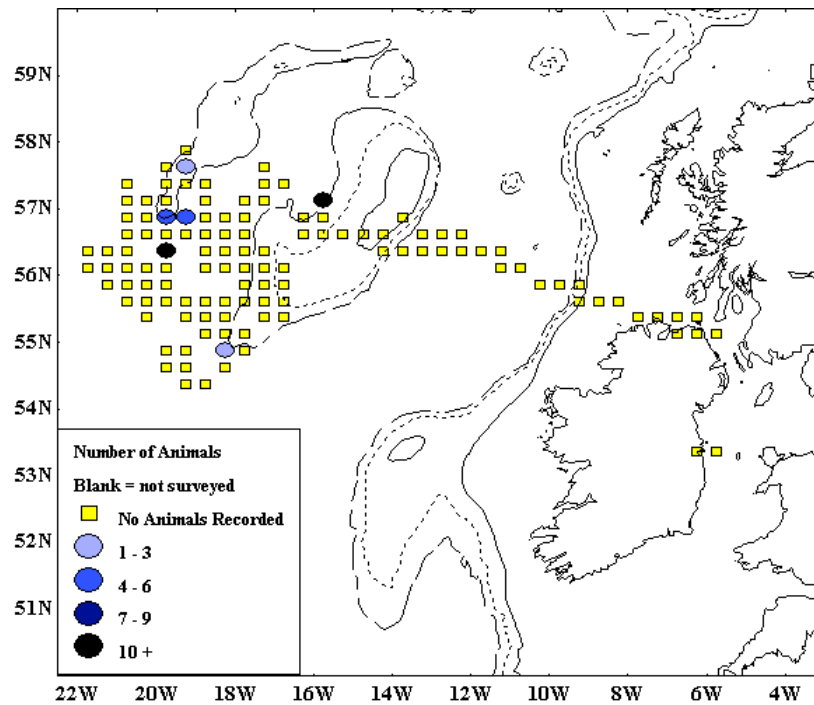


Figure 9. Sighting locations of Atlantic White-sided Dolphins, 3rd – 20th July 2004.

Short-beaked Common Dolphins and Atlantic White-sided Dolphins were observed on a total of 14 separate occasions, which included three multi-taxa encounters involving both species. Unlike encounters recorded during other seismic surveys, these two acrobatic species were observed actively approaching the ship's bow within 5-30m during seismic operations. A total of 80 Short-beaked Common Dolphins were observed during 10 separate encounters. The majority of Common Dolphin and White-sided Dolphin encounters were recorded in both the deep and shallow waters of the southern sector of the Hatton Bank, although they were also observed over the slope waters of the Rockall Bank (Figures 8 & 9).

The only cetacean species not observed within the survey area during seismic operations was the White-beaked Dolphin, which was observed 40 minutes prior to the initiating of soft-start shooting along the southern slope of the Rockall Bank, and as the ship steamed homeward over the continental slope, northwest of Co. Donegal (Figure 10).

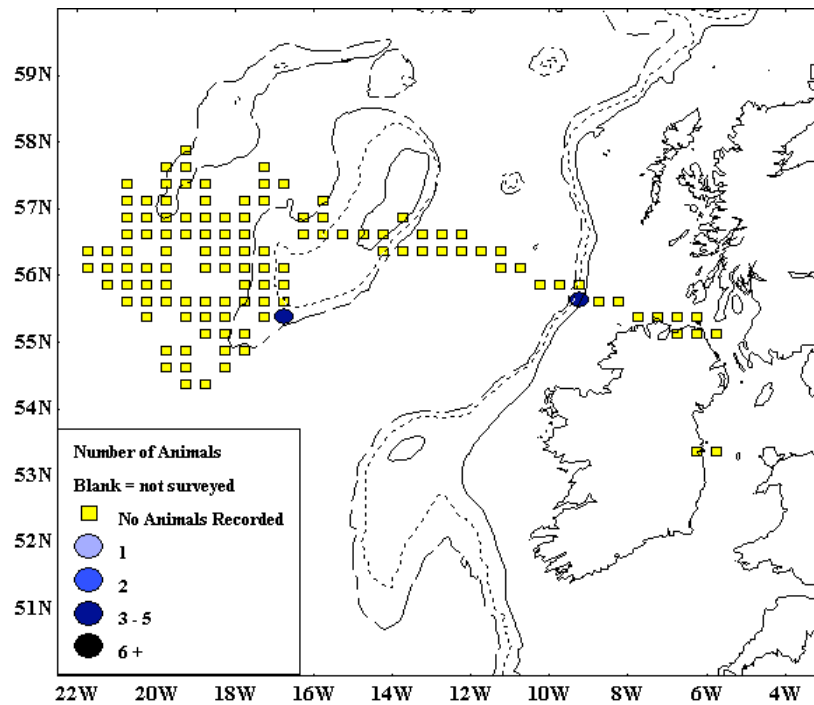


Figure 10. Sighting locations of White-beaked Dolphins, 11th & 25th July 2004.

Baleen Whales

Remarkably, only one species of the filter-feeding baleen whale group was identified throughout the cruise. A single encounter of a breaching, adult Humpback Whale was recorded 2-3km ahead of the ship during seismic operations southwest of the Hatton Bank (Figure 11). It cannot be said with any certainty that this behaviour was in response to the seismic activity.

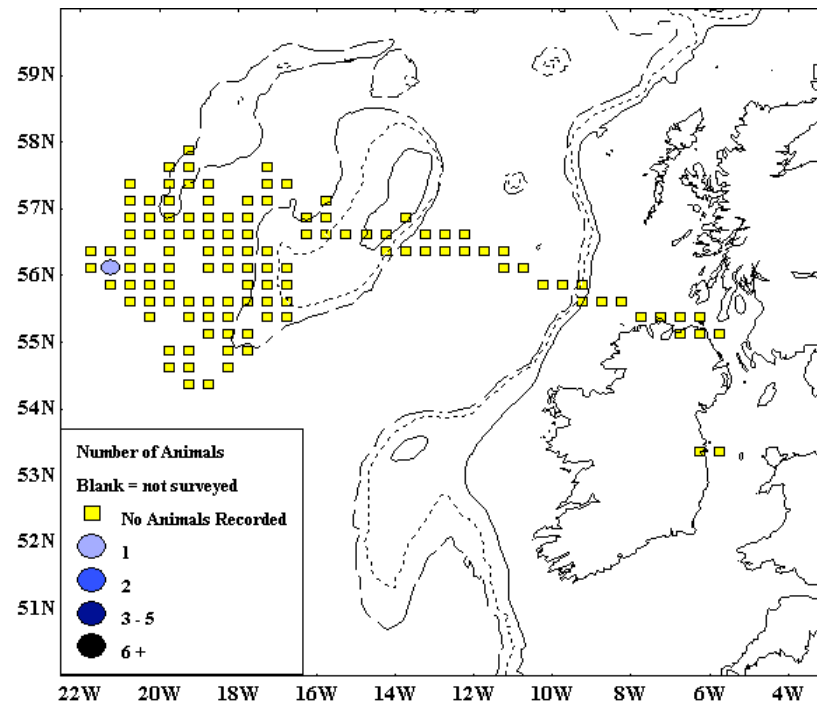


Figure 11. Sighting location of an adult Humpback Whale, 6th July 2004.

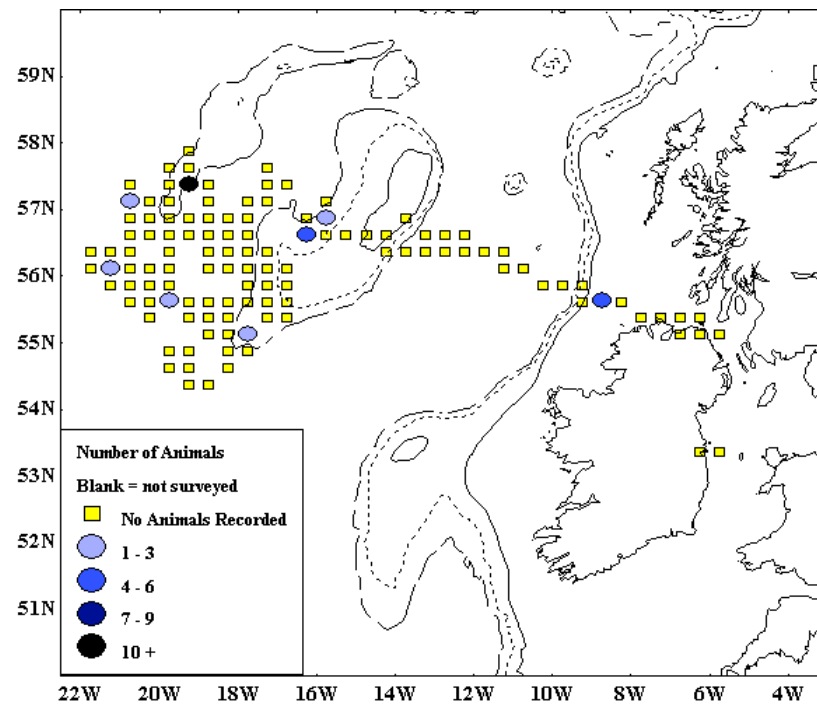


Figure 12. Sighting locations of unidentified cetaceans, 3rd – 25th July 2004.

Unidentified Cetaceans

Approximately 6% of all cetaceans recorded during the 4-week trip could not be identified to species level, due to a variety of factors (e.g. weather conditions, distance from vessel, indistinct cues, etc). This unidentified group is sub-divided into five categories based on the available sighting information. The sighting locations of all unidentified animals are outlined in Figure 12. The categories and the numerical breakdown of the unidentified cetaceans observed between 30th June and 25th July 2004 are outlined in Table 1.

Pre-soft Start Observations.

The guidelines for minimising acoustic disturbance to marine mammals during seismic surveys, devised by the JNCC, were adhered to throughout the survey. Specific 360° scans for cetaceans were conducted around the vessel for 30 minutes before all soft-start seismic activities. The only cetaceans recorded during this pre-soft start period involved a group of White-beaked Dolphins actively swimming 1000m from the ship, which is twice the recommended distance listed in the JNCC guidelines. In another incident, a small family group of 6 Short-beaked Common Dolphins were recorded within 100m of the vessel 30 minutes prior to the soft-start shooting of Line 9008b, but was not re-sighted. As such, no downtime due to the presence of whales and dolphins has been incurred during the current survey.

Seabirds

Although the primary role of the Marine Mammal Observer was to monitor the presence and behaviour of whales, dolphins and porpoises in response to the vessel's seismic operations, standard surveys of offshore seabird populations were opportunistically conducted. Twenty-four seabird species were recorded in low to moderate concentrations throughout the survey (Figures 13-28). The total number of each seabird species is listed in Table 2. As has been observed on most offshore surveys west of Ireland, The Northern Fulmar was the most numerous, widespread and most frequently recorded seabird species, with records occurring in the majority of ICES squares surveyed (Figure 13). Concentrations were generally low to moderate, except when the survey vessel was in close proximity to Russian fishing vessels. Black-legged Kittiwakes, Northern Gannets and Manx Shearwaters were the only other seabird species to be recorded in totals greater than 100 individuals during the cruise. The highest concentrations of Black-legged Kittiwakes and Northern Gannets were associated with coastal and shelf waters to the north and northwest of Ireland (Figures 25 & 19 respectively). The highest concentration of Manx Shearwaters was recorded in direct association with a group of feeding Common Dolphins along the southeast slope of the Hatton Bank (Figure 16).

Occasional records of the three small skua (Pomarine, Arctic and Long-tailed Skuas) species were observed over the Rockall-Hatton region as they headed south-southwest during their outward migration to southern wintering grounds off South America (Figures 20-22). The Great Skua was the most numerous skua species observed, with most of the records occurring over the Rockall-Hatton Plateau (Figure 23). Other migratory species occasionally recorded during the survey included the Lesser Black-backed Gull (Figure 24), the Great Shearwater (Figure 14) and the Sooty Shearwater (Figure 15). Storm petrels (i.e. European and Leach's Storm-petrels) were rarely sighted until the homeward leg over the continental shelf (Figures 17 & 18), while the vast majority of auk sightings (i.e. Common Guillemot, Razorbill and Atlantic Puffin) were recorded in coastal waters or over the continental shelf (Figures 27 & 28).

Table 2. Total numbers of seabird species recorded during the GRA04_01 cruise.

Common Name	Latin Name	Total
Northern Fulmar	<i>Fulmarus glacialis</i>	2,288
Great Shearwater	<i>Puffinus gravis</i>	5
Sooty Shearwater	<i>Puffinus griseus</i>	22
Manx Shearwater	<i>Puffinus puffinus</i>	131
European Storm-petrel	<i>Hydrobates pelagicus</i>	58
Leach's Storm-petrel	<i>Oceanodroma leucorhoa</i>	4
Northern Gannet	<i>Morus bassanus</i>	330
Great Cormorant	<i>Phalacrocorax carbo</i>	40
European Shag	<i>Phalacrocorax aristotelis</i>	2
Pomarine Skua	<i>Stercorarius pomarinus</i>	8
Arctic Skua	<i>Stercorarius parasiticus</i>	8
Long-tailed Skua	<i>Stercorarius longicaudus</i>	1
Great Skua	<i>Stercorarius skua</i>	25
Lesser Black-backed Gull	<i>Larus focus</i>	25
Herring Gull	<i>Larus argentatus</i>	1
Yellow-legged Gull	<i>Larus argentatus cachinnans</i>	1
Great Blacked-backed Gull	<i>Larus marinus</i>	14
Black-legged Kittiwake	<i>Rissa tridactyla</i>	928
Common Tern	<i>Sterna hirundo</i>	1
Arctic Tern	<i>Sterna paradisaea</i>	34
Common Guillemot	<i>Uria aalge</i>	85
Razorbill	<i>Alca torda</i>	48
Black Guillemot	<i>Cepphus grylle</i>	3
Atlantic Puffin	<i>Fratercula arctica</i>	8

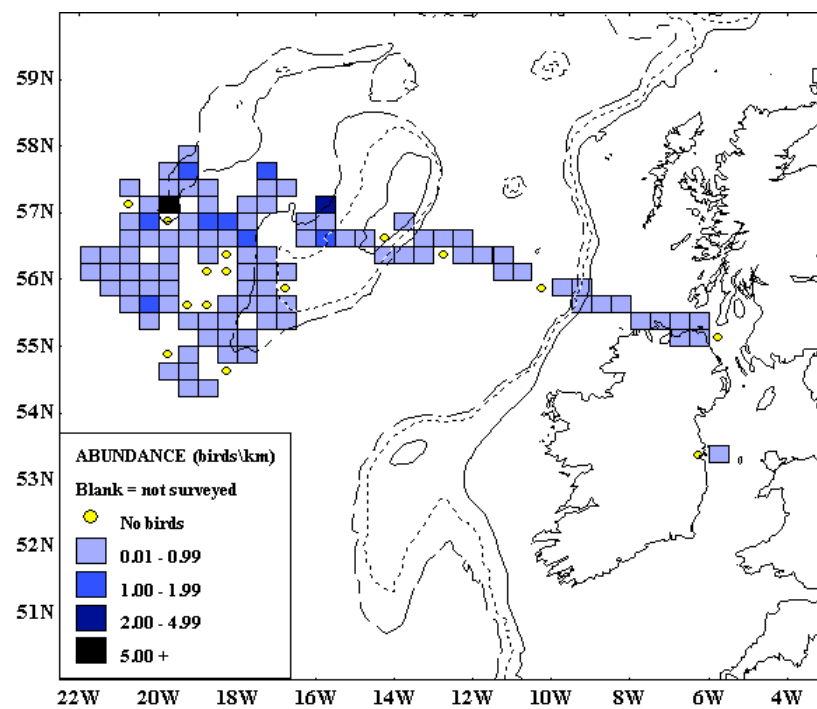


Figure 13. Relative abundance of Northern Fulmars, 30th June – 25th July 2004.

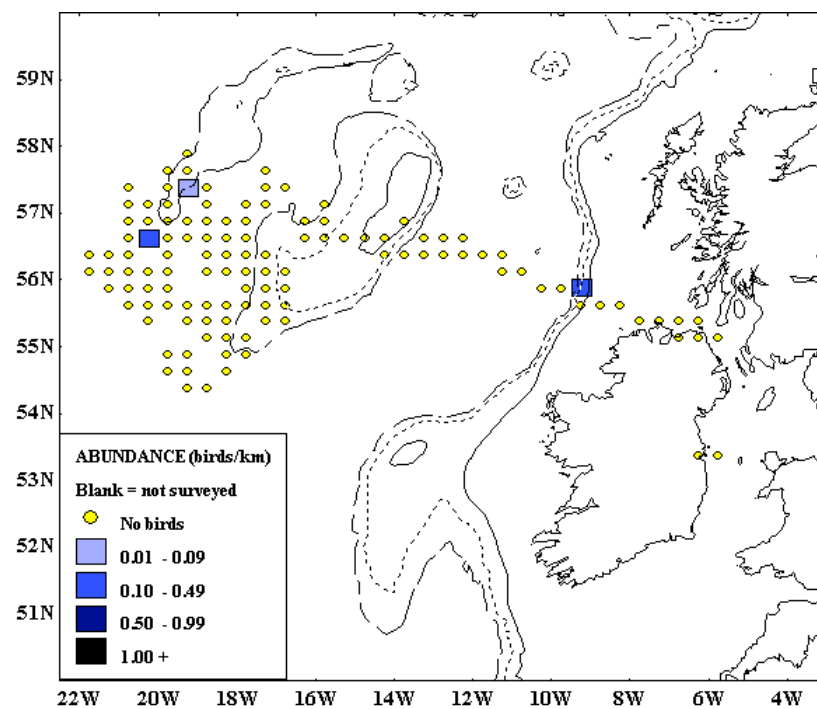


Figure 14. Relative abundance of Great Shearwaters, 30th June – 25th July 2004.

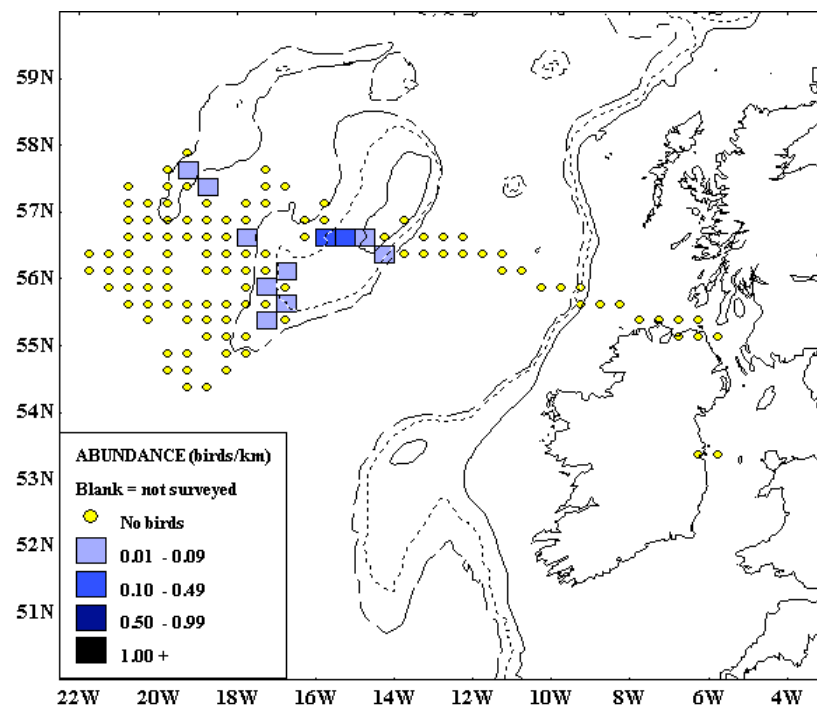


Figure 15. Relative abundance of Sooty Shearwaters, 30th June – 25th July 2004.

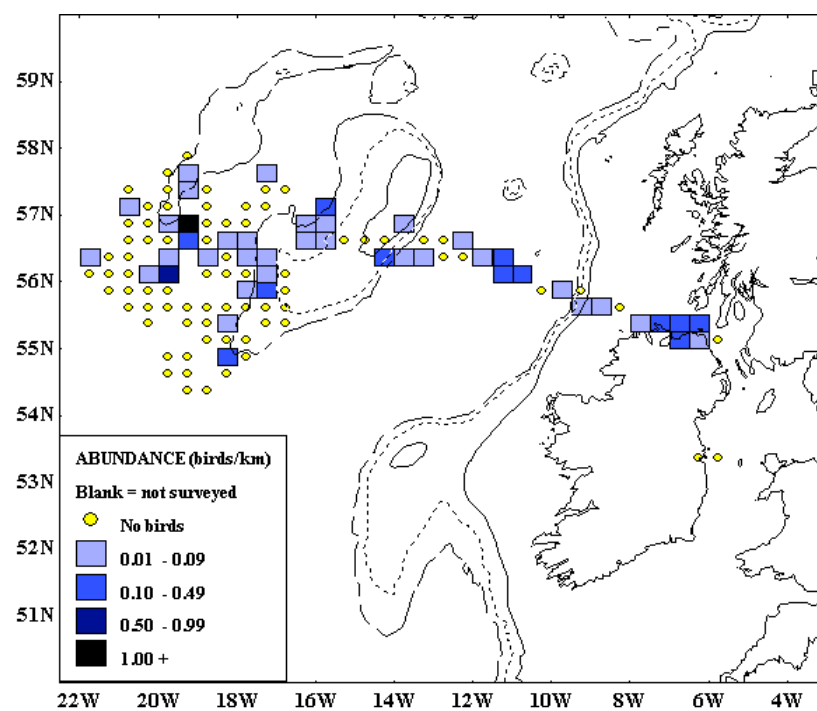


Figure 16. Relative abundance of Manx Shearwaters, 30th June – 25th July 2004.

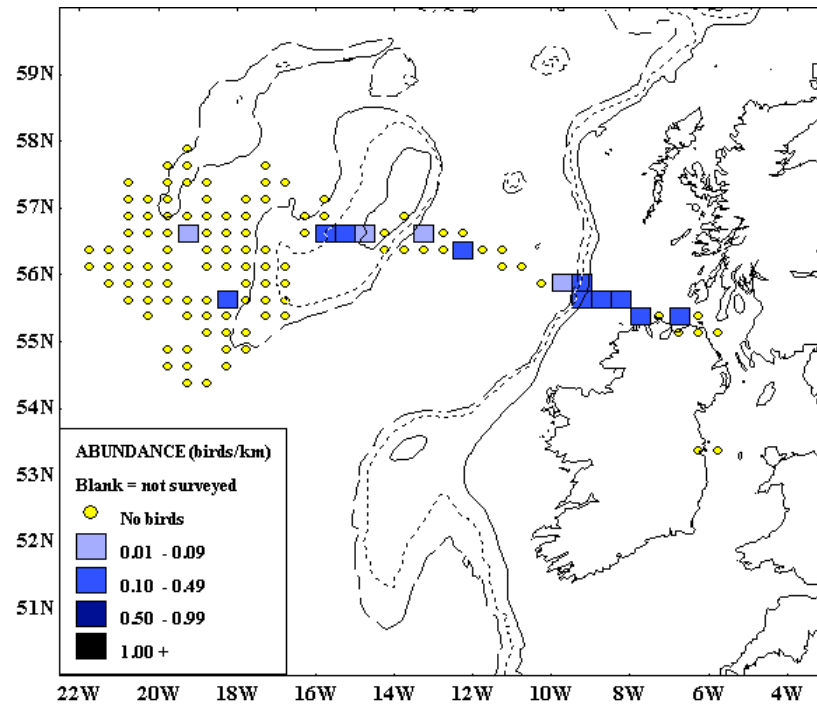


Figure 17. Relative abundance of European Storm-petrels, 30th June – 25th July 2004.

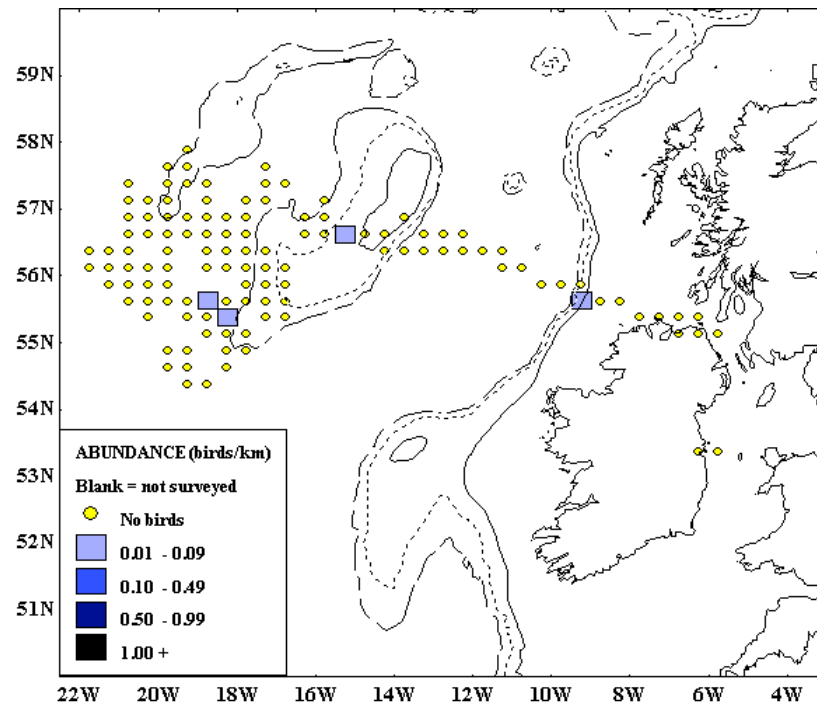


Figure 18. Relative abundance of Leach's Storm-petrels, 30th June – 25th July 2004.

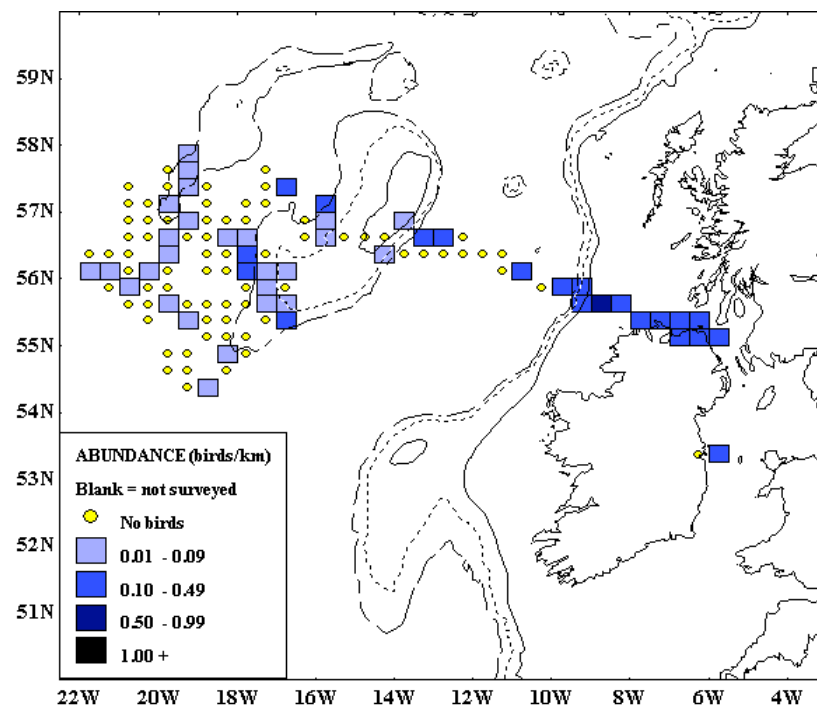


Figure 19. Relative abundance of Northern Gannets, 30th June – 25th July 2004.

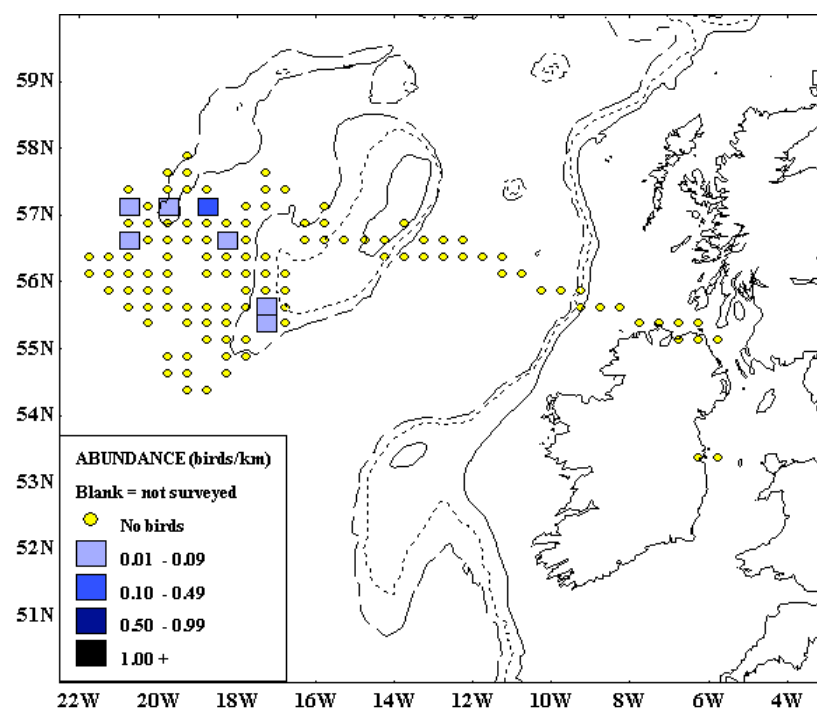


Figure 20. Relative abundance of Pomarine Skuas, 30th June – 25th July 2004.

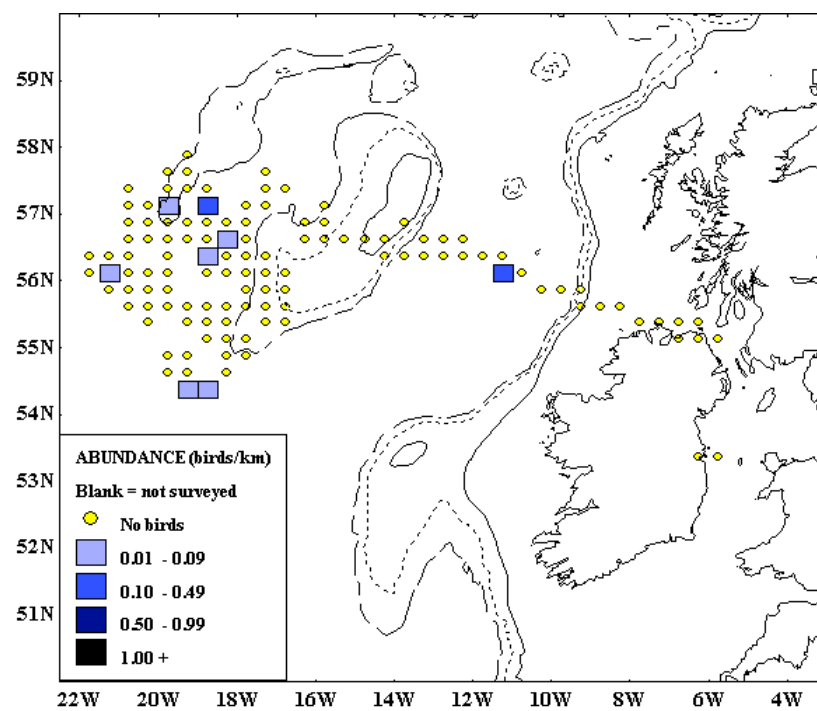


Figure 21. Relative abundance of Arctic Skuas, 30th June – 25th July 2004.

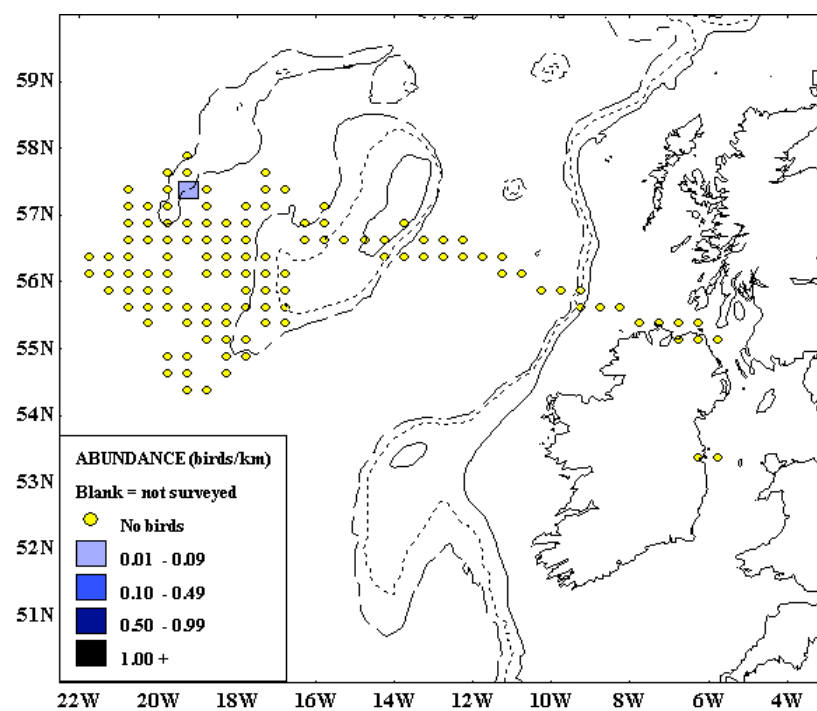


Figure 22. Relative abundance of Long-tailed Skuas, 30th June – 25th July 2004.

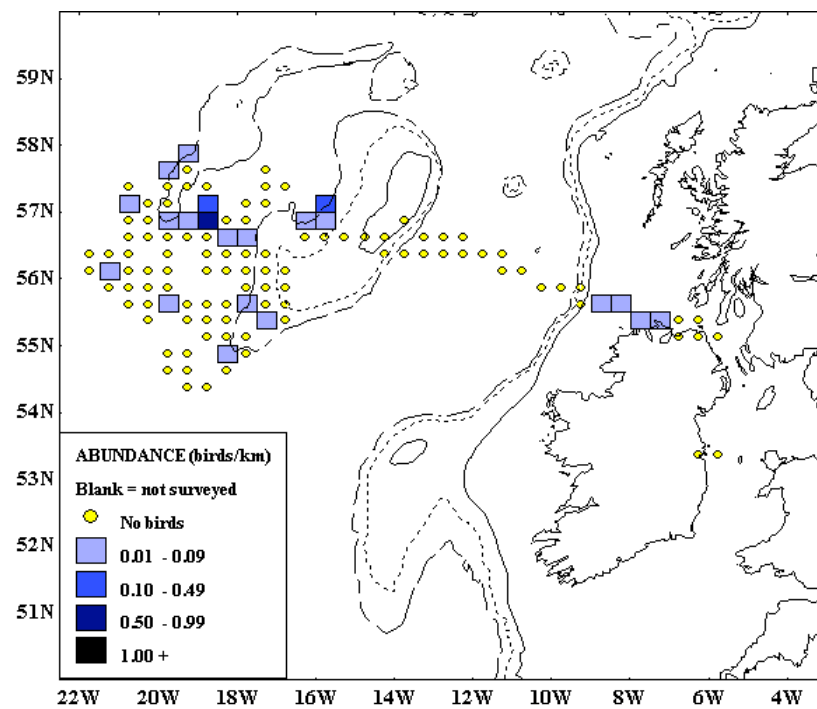


Figure 23. Relative abundance of Great Skuas, 30th June – 25th July 2004.

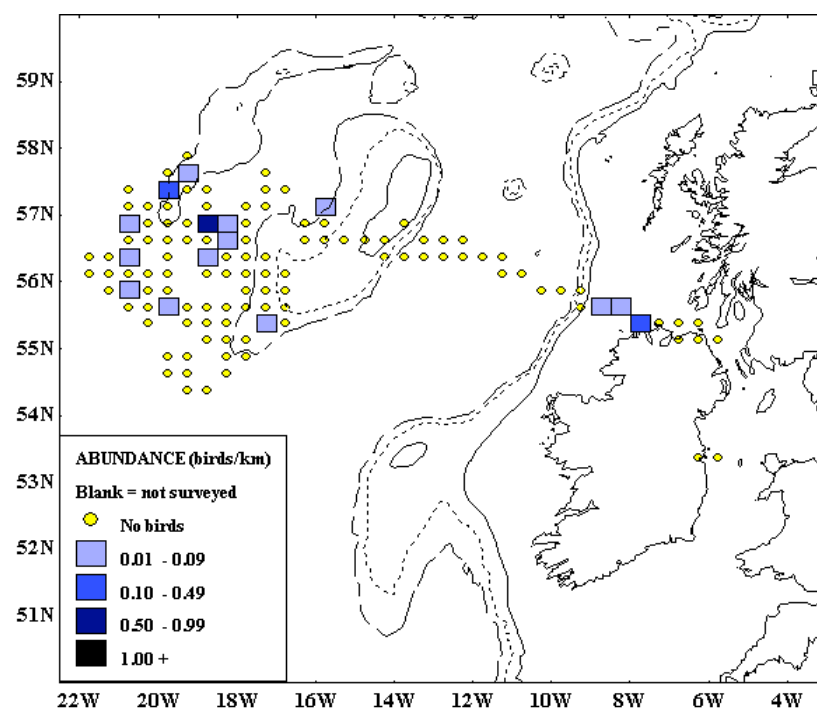


Figure 24. Relative abundance of Lesser Black-backed Gulls, 30th June – 25th July 2004.

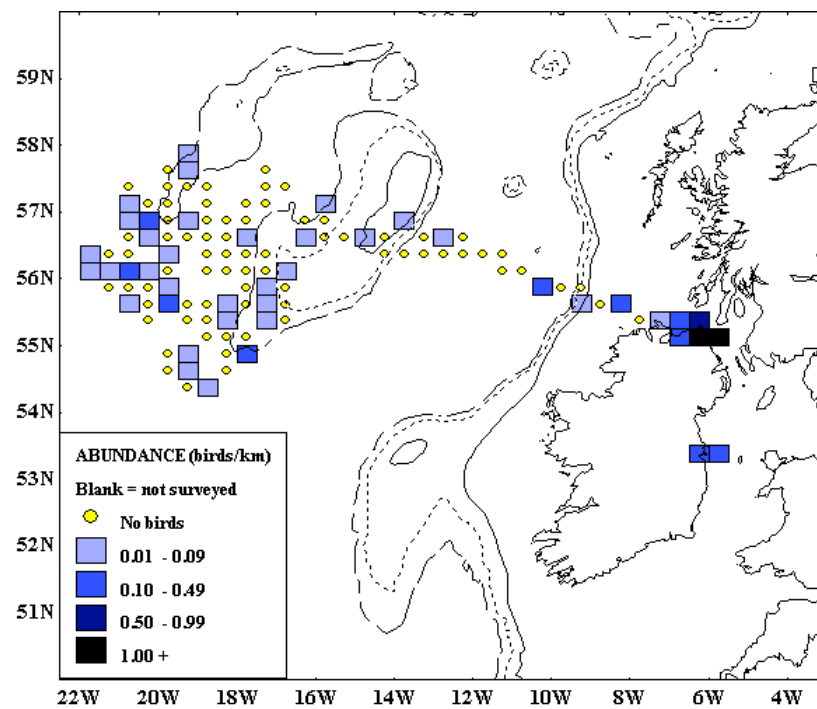


Figure 25. Relative abundance of Black-legged Kittiwakes, 30th June – 25th July 2004.

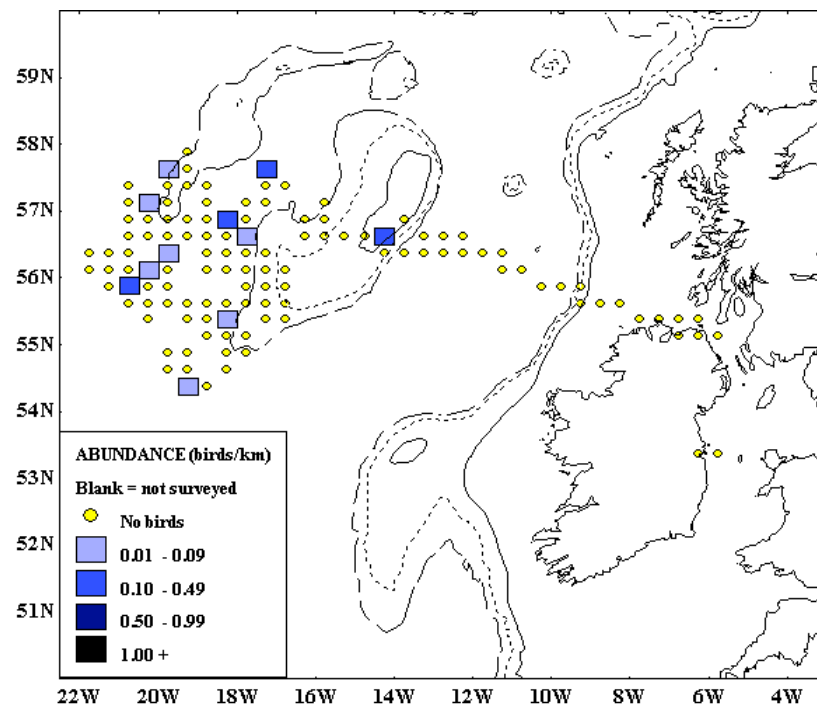


Figure 26. Relative abundance of Arctic Terns, 30th June – 25th July 2004.

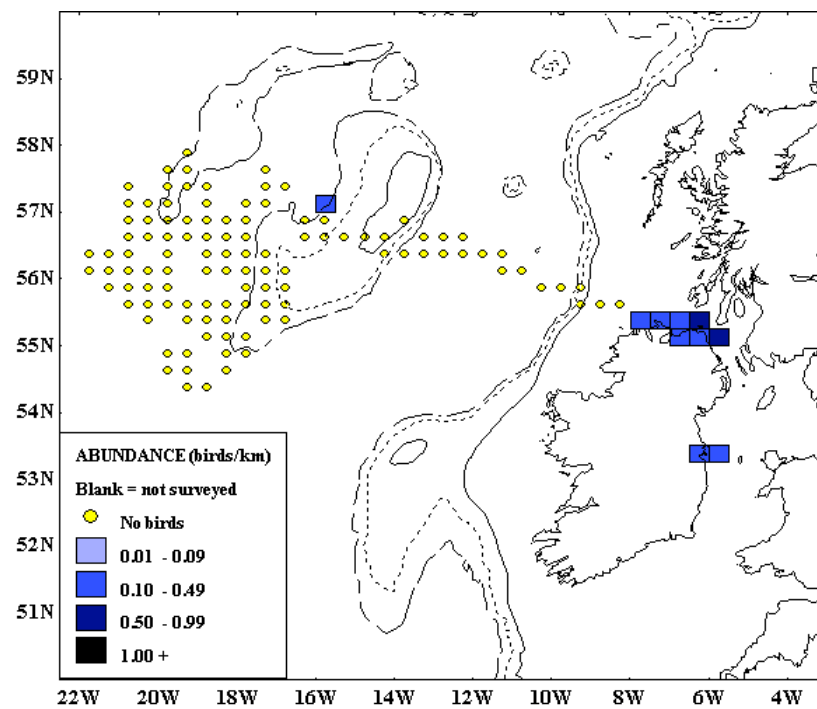


Figure 27. Relative abundance of Common Guillemots, 30th June – 25th July 2004.

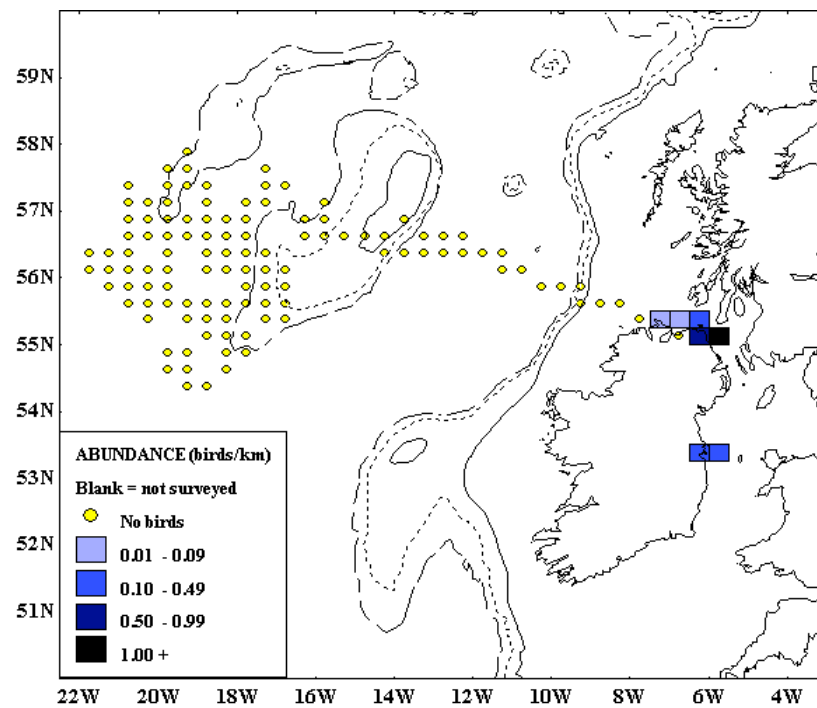


Figure 28. Relative abundance of Razorbills, 30th June – 25th July 2004.

Miscellaneous Species.

Sunfish

Fourteen Sunfish (*Mola mola*) were recorded during a two-week period between the 8th and 21st July (Figure 29). Ten individuals were recorded in near perfect conditions off the southwest slope of the Rockall Bank on 8th July. The 14 individuals recorded were the greatest number of sunfish observed in a single Irish survey.

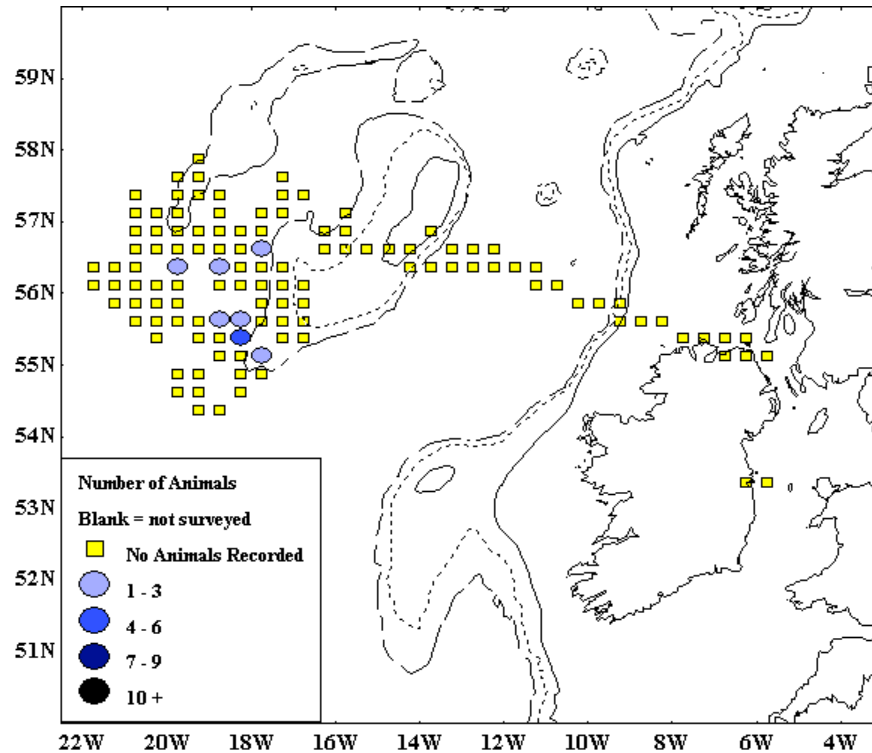


Figure 29. Sighting locations of Sunfish, 8th – 21st July 2004.

Acknowledgements

We would like to acknowledge the role of the PIP, ISPSG and the Geological Survey of Ireland (GSI) in funding the offshore survey conducted in July 2004 and for providing the CMRC with the opportunity to expand upon the foundation of results obtained between 1999 and 2003.