Natural England

Ornithological and Marine Mammal Baseline Characterisation Surveys for the POSEIDON project

September-October (Seasonal) Report – Northern Isles

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1.5	14/03/2024	All	All	Finalisation	KS
1.6	07/05/2024	3	8	Client Comments & Finalisation	KS

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1.   Executive Summary

This report constitutes the first seasonal (September to October 2023) report outlining results from digital aerial surveys conducted in September 2023 within the Northern Isles under the POSEIDON project and commissioned by Natural England. Surveys were undertaken using APEM's high-resolution camera system to capture digital still imagery of birds and marine megafauna within the Survey Area.

The survey was successfully carried out across one day in September 2023. A total of 4,851 observations were recorded during the survey in September 2023, of which 4,769 were observations of birds and 82 were observations of marine megafauna. APEM will continue to monitor the site for these species and others during the remaining seasonal surveys.

1.   Executive Summary

2.   Introduction

2.1   Background

APEM has been contracted by Natural England for the supply of three seasonal digital aerial surveys within the Northern Isles, commencing from September 2023. The surveys form part of the POSEIDON project which is led by Natural England and funded through the Crown Estates Offshore Wind Evidence and Change (OWEC) programme. Analysis of existing seabird and marine mammal data for English, Welsh and Scottish waters identified gaps in the evidence base for the Survey Area. The main purpose of the survey programme is to address these evidence gaps through providing baseline information on the abundance, distribution and behaviour of birds and marine mammals within the Survey Area.

The Survey Area is located within the Northern Isles to the north, east and south of Shetland, Scotland (**Figure 1**) and covers an area of 21,594 square kilometres (km^2). The survey method has been designed to optimise the data collection for all bird, marine mammal, and other marine megafauna species using a transect-based survey design at 1.5 centimetre (cm) resolution to achieve a minimum of 3% captured and 3% analysed coverage using a twin-engine aircraft. These surveys have been carried out to meet the aims and objectives of the work by Natural England and the POSEIDON project.

This report describes the seasonal (September-October 2023) survey, undertaken in September 2023, as part of the survey programme.

2.2   Aim of Report

The report presents information on marine birds, mammals, and other megafauna, which includes the following:

- Description of, and rationale for, survey methods and design.
- Map of survey route and coverage.
- Survey details as actually flown (including dates/times, weather and other relevant conditions).
- Raw count observations for behaviours of all avian and marine mammal species, as well as any other marine megafauna recorded per month within the Survey Area.
- Bird flight heights and direction.
- Spatial distribution maps of avian, marine mammal, and other marine megafauna species.
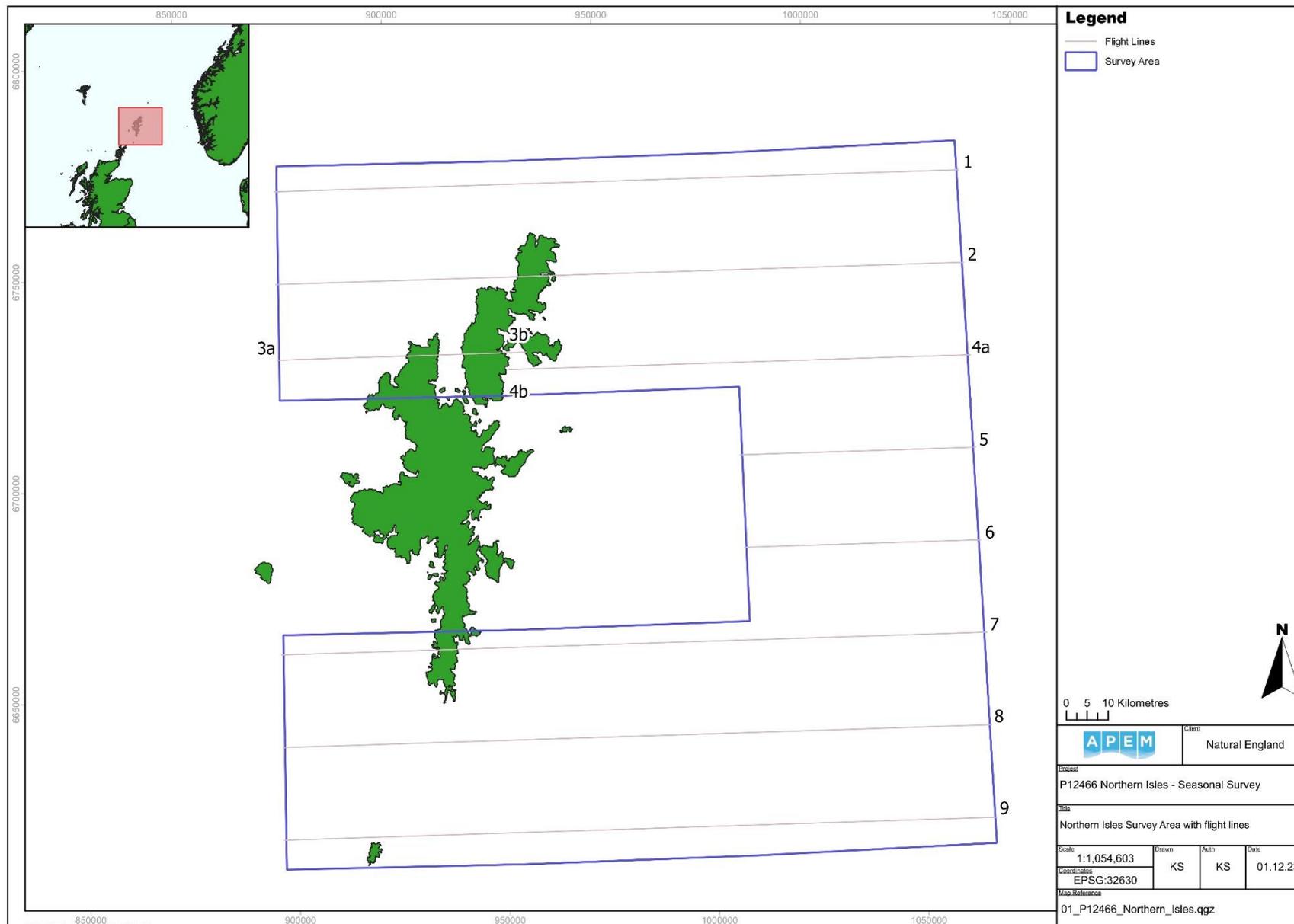
Figure 1 Location of Northern Isles Survey Area.

3. Survey and Analysis Methodologies

3.1 Digital Aerial Survey Methods

The survey was conducted using APEM's bespoke camera system, termed "Shearwater V", customised by in-house specialists for surveying the offshore environment. The camera system is integrated with custom flight planning software that allows each survey flight line to be accurately mapped before the aircraft leaves the ground. Each image capture node is precisely defined, allowing the system to fire the camera exposures at exactly the right location. This ensures that each survey is flown with the same orientation and the camera is triggered at the same position within set tolerances (**Table 1**). APEM's flight planning software enables tolerances along survey lines to be set, meaning the camera system would automatically abort data capture should the aircraft drift away from the planned flight line. The process of automatically aborting data capture is called a 'cutout'. Should this occur, the plane is required to revisit and resurvey the affected section of the survey line.

APEM's on-board camera technician continually monitored the imagery as it was collected to ensure data collected was fit for purpose. The camera technician would make the decision to cease data collection should conditions become unsuitable for surveying or data collection. Subsequently, the survey would then be resumed at the next earliest opportunity. All completed surveys therefore maintained conditions conducive to successful surveying.

Favourable conditions for surveying were defined as: a cloud base (lowest altitude of the visible portion of the cloud) of at least 1,300 ft, according to a geoidal model, to ensure there is no cloud below the planned altitude of the aircraft, visibility of greater than 5 km, wind speed of less than 30 knots, and sea state of 4 (moderate) or less. Naturally, the cloud base may vary in altitude, but aircraft will always fly lower than the lowest cloud level, if cloud base is lower than the planned aircraft altitude the survey would not take place. Whilst the image footprint and GSD both increase with altitude, the flight plan tolerances and focus of the camera lenses ensures no discernible differences occur within the range of altitudes potentially flown. Wind speed was recorded at the same altitude as the aircraft, whereas sea state was determined from the appearance of the sea surface recorded by the onboard aerial survey technician. The two measures therefore do not necessarily correlate. For safety reasons, no surveying can take place in icing conditions. Due to areas of high terrain, part of line 7 was planned at a higher geoidal altitude of 1,365 ft and lines 3 and 4 were split. Lines 3 and 4 are distinguishable in 4 separate sections: 3a, 3b, 4a, 4b. Lines in 3b and 4b refer to the area of the lines that overlap on their east-west axis.

Data capture comprised digital still images of an average 1.5 cm GSD. Images from each of the three cameras are processed at each node, resulting in slight variation in GSD across the swath width. GSD is smaller than 1.5 cm GSD at the nadir and increases with distance from the nadir, resulting in an average GSD of 1.5 cm. Image resolution is therefore clearest at the nadir, although the variation is small. Images were collected in a continuous transect-based design along a single line covered by three overlapping cameras, using a Global Positioning System (GPS) linked, bespoke flight management system to ensure the tracks were flown with a high degree of accuracy. The aircraft's internal GPS and Inertial Motion Unit (IMU) systems record to an accuracy of +/- 3 to 5 m as standard.

The flights occurred on the 27th of September 2023, the aircraft surveyed lines 6 to 9 (take off at 06:46, landing at 11:06), stopping to refuel and continued with lines 1 to 5 and 7 (take off at 12:23, landing at 16:18), respectively.

The camera system captured abutting imagery along nine survey flight lines spaced approximately 22 km apart within the Survey Area (**Figure 1**). The total Survey Area was 21,594 km². The aircraft collected the data at an average altitude of approximately 1,460 ft (445 m) according to the ellipsoid model as recorded by GPS, equivalent to 1,300 ft (396 m) above geoidal mean sea level, and at a speed of approximately 120 knots. On line 4, the flight altitude was decreased to 1,150 ft to avoid low cloud

on the line, resulting in a decrease in image footprint and GSD. At 1,300 ft, ~0.09 square kilometres (km^2) is captured at 1.5 cm GSD at each image node. At 1,150 ft, ~0.08 km^2 is captured at 1.36 GSD at each image node. As a consequence, image resolution is increased, with the target coverage still achieved. Images were collected continuously along the survey flight lines with slight overlap between image nodes. To avoid double-counting due to image overlap, all image footprints are merged into a single file, for which total area is calculated. A total of 7,832 nodes were initially captured. Of these, 7,579 were used for analysis. The difference reflects nodes removed during clipping to the boundary area. Total analysed coverage was calculated to be 3.42% generated from 7,579 image nodes (**Table 2**). The target coverage of 3% was achieved including a redundancy of an additional 0.42%, which is over 10% contingency with respect to the target coverage.

Effort data is calculated as the area (km^2) per image footprint using trigonometric methods and the pinhole camera model (the mathematical relationship between the coordinates of a point in three-dimensional space, and its projection onto the image plane of an ideal pinhole camera). Effort is dependent on altitude, camera angle and aircraft position (pitch, roll and yaw), accounting for variation both between image nodes and individual cameras at each node. Effort data is only calculated for analysed images. It is therefore possible that some images have an effort value of zero. The effort values provided in the GPS log reflect the total footprint of each image and do not account for overlap. Therefore, summing these values for a survey would result in an overestimate of effort. The true effort for a given survey is calculated geospatially by creating polygons for each image footprint and removing the overlapping areas. Summing the analysed footprints and comparing against entire survey area gives the percentage analysed.

Imagery was captured in raw format and post-processed to ensure optimal quality for the subsequent stage of image analysis, to extract information on marine fauna or other notable occurrences. When a survey was completed, data were checked to ensure the number of lines and the number of images collected was correct, and that the quality of the imagery was acceptable. Once image analysis was completed, further quality assurance (QA) processes took place (see **Section 3.3**).

Survey conditions are summarised in **Table 3**. Weather conditions are defined in **Table 4**. Weather conditions during the survey were conducive to collecting and analysing imagery for the purposes of providing data on the identification, distribution, and abundance of bird species and marine fauna within the Survey Area.

Measures were taken to minimise glint and glare, such as avoiding surveying when the sun angle had the greatest potential to impact image quality. Furthermore, data collected provided coverage of 3.42%, thus exceeding the 3% coverage required, enabling sufficient coverage to be collected should images be affected by glint or glare.
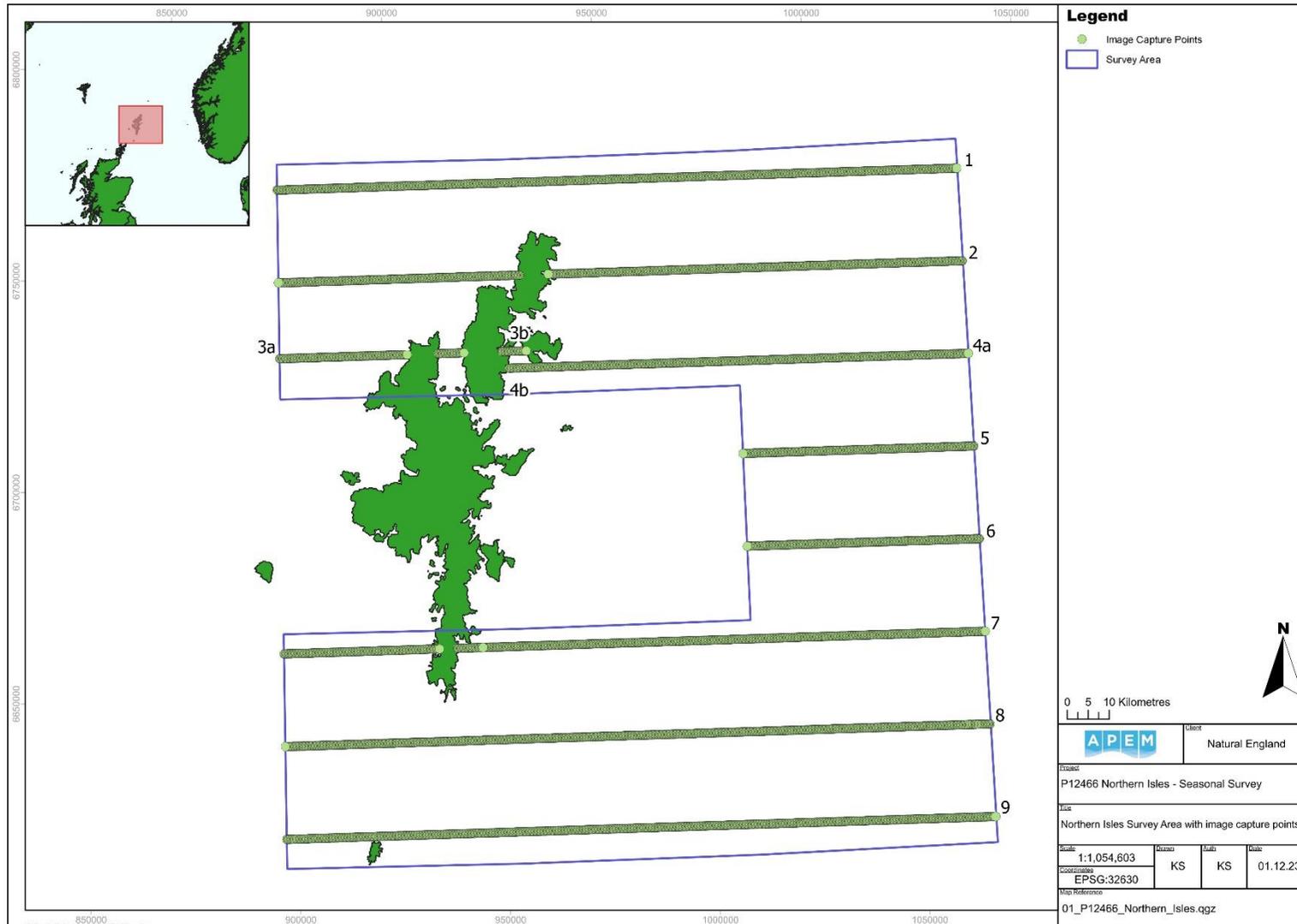
Figure 2 Individual image capture points during the September to October 2023 (September 2023) survey.

Table 1 Lateral and vertical camera tolerances (m). A 'cutout' is the process of automatically aborting data capture. Should this occur, the plane is required to revisit and resurvey the affected section of the survey line.

Survey Tolerances	Warning	Cutout	
Lateral Tolerance	30	60	m
Vertical tolerance	15	30 (No auto cutout)	m

Table 2 Image capture and other observations during the September to October 2023 seasonal survey (September 2023).

Survey line	Transect length (km)	N cameras capturing image	N image nodes (captured)	N image nodes (analysed)	Camera issues*	Shipping observations	Anecdotal observations	Health and Safety
1	162.47	3	1,144	1,137	-	-	-	-
2	163.47	3	1,147	1,097	-	-	-	-
3**	58.94	3	416	299	-	-	-	-
4**	109.69	3	774	768	-	-	Low cloud on part of line***	-
5	55.20	3	395	387	-	-	-	-
6	55.48	3	396	389	-	-	-	-
7	167.62	3	1,180	1,144	-	-	Low cloud on part of line***	-
8	168.48	3	1,186	1,174	-	-	-	-
9	169.48	3	1,194	1,184	-	-	-	-

*Due to the vast number of capture points collected during the survey it is not uncommon for camera systems to sometimes miss capture points. Typically, the number of missed capture points is low and random across the site. APEM collected additional data to ensure the required coverage was captured. Additionally, APEM's onboard camera technician monitored data as it was being captured. Surveys are aborted or lines re-surveyed if camera issues impact data collection.

** Thirty image nodes each from line 3 and 4 overlapped on their 3b and 4b subsections, on the east-west axis (**Figure 2**). However, they were offset from each other on the north-south axis so that image nodes did not directly overlap on the different lines.

***Low cloud affected part of line 4, and as a result the air crew lowered geoidal flight altitude to 1,150 ft. Target coverage was still achieved. Two image nodes on line 7 were not captured due to low cloud on the line; the air crew later returned to line 7 during the second flight to capture the missed nodes. All details for line 7 within this report refer to the combination of the two capture events.

Table 3 Survey conditions during the September to October 2023 seasonal survey (September 2023).

Survey line	Date	Time (UTC) on line (Start / End)	Ground speed (knots)	Cloud cover (%)	Visibility (km)	Outside temperature (°C)	Wind speed (knots)	Wind direction	Sea state (Douglas)	Turbidity
1	27/09/2023	12:59 / 13:41	120	10	>10	10	14	250	1	1
2	27/09/2023	13:49 / 14:36	120	10	>10	10	5	200	1	1
3	27/09/2023	14:42 / 14:58	125	10	>10	10	14	190	1	1
4	27/09/2023	15:03 / 15:32	125	20	>10	10	4	190	1	1
5	27/09/2023	15:39 / 15:54	125	10	>10	10	12	170	2	1
6	27/09/2023	10:33 / 10:48	120	10	>10	10	15	250	2	1
7	27/09/2023	09:43 / 10:26, 16:13 / 16:13	125 – 130	10	>10	10	22	240	2	2
8	27/09/2023	08:52 / 09:36	120	0	>10	11	15	260	3	1
9	27/09/2023	07:59 / 08:43	120	0	>10	10	20	200	3	2

Table 4 Explanation of weather conditions.

Wind (Beaufort Scale)			Douglas Sea State			Cloud cover (%)		Turbidity	
Scale	Description	Mean wind speed (knots)	Scale	Description	Wave height	% Cover	Description	Scale	Description
0	Calm	0	0	Calm (glass)	No wave	0	Clear	0	Clear
1	Light air	2	1	Calm (rippled)	0 – 0.10 m	1-10	Few	1	Slightly Turbid
2	Light breeze	5	2	Smooth	0.10 – 0.50 m	11-50	Scattered	2	Moderately Turbid
3	Gentle breeze	9	3	Slightly Moderate	0.50 – 1.25 m	51-95	Broken	3	Highly Turbid
4	Moderate breeze	13	*Surveys not typically flown at sea states > 3.*			Overcast	96-100		
5	Fresh breeze	19	4	Moderate	1.25 – 2.50 m				
6	Strong breeze	24							
7	Near gale	30							
8	Gale	37							

3.2   Species Identification

The images were analysed to enumerate birds and marine mammals to species level where possible. Targets identified from the images were 'snagged' (i.e., located within the images) and categorised.

There were occasions when it was not possible to identify an individual in the digital aerial survey imagery to the species level and the individual was therefore identified as belonging to a higher-level taxonomic group (e.g., 'small gull species' or 'dolphin / porpoise species'). The possible groups and the individual species attributed to them are listed in **Table 5** for birds and **Table 6** for marine mammals.

Table 5 Avian species included higher-level taxonomic groups for the September to October 2023 seasonal survey period (September 2023).

Species	Group Level 1	Group Level 2	Group Level 3	Group Level 4
Wigeon	Duck species		Wildfowl species	Unidentified Bird species
Oystercatcher	Wader species			
Kittiwake	Small Gull species		Gull species	
Common Gull				
Greater Black-backed Gull	Black-backed Gull species	Large Gull species		
Herring Gull				
Great Skua	Skua species			
Guillemot	Guillemot or Razorbill	Auk species		
Razorbill				
Black Guillemot				
Puffin				
Red-throated Diver	Diver species			
European Storm Petrel	Storm Petrel species			
Fulmar	Fulmar / Gull species			
Gannet				

Table 6 Marine mammal species included within higher-level taxonomic groups for the September to October 2023 seasonal survey period (September 2023).

Species	Group Level 1	Group Level 2	Group Level 3	Group Level 4
Common Minke Whale	Whale species			Unidentified marine organism
Orca	Dolphin species	Dolphin / Porpoise		
White-beaked Dolphin				
Harbour Porpoise				
Atlantic Bluefin Tuna	Fish species			
Porbeagle Shark	Shark species			
Basking Shark				

3.3 Summary of Quality Assurance

Internal QA was carried out on the data collected during the survey. This consists of two steps:

The first step in the QA process, referred to as Blank QA, reviewed percentage agreement between images identified as positive (containing at least on target of interest) and those identified as blank (not containing any targets of interest). A random sample of 20% of survey imagery were subjected to a QA audit review, in which agreement in positive images should reach 90% agreement versus the main analysis of the whole survey. Where 90% agreement was not reached, a complete re-analysis of the survey data was undertaken. This consists of analysing each image from the survey again, and extra positives from the re-analysis and QA audit are included in the data. For the current survey, the initial agreement was 95.5%. No re-analysis was required on this occasion.

The second step of the QA process, referred to as Species ID QA, reviewed species identifications. Target (snag) identifications made by image analysts were reviewed by our dedicated QA team and an agreement rate determined. If the original identification made by the image analyst matched that made by the QA analyst, this was considered agreement. Agreement was also made if the original and the QA identifications were both within the same taxonomic grouping, for example an initial identification of guillemot / razorbill, and a QA identification as guillemot. This method was adopted by BTO's method of species identification QA. A minimum of 10% of snags are checked with the proportion increasing depending on survey difficulty and accuracy of identifications. As the survey was relatively small and consisted of winter auks it was classed as a difficult survey; therefore, 100% of identifications were checked. For the current survey, the identification agreement rate was 92% for all snags recorded.

3.4 Species Distribution Maps

Each animal recorded during the surveys was geo-referenced, enabling locations to be related to the boundary of the Survey Area. Corresponding coordinates for each observation were accurate to ±/- 3 to 5 m. Spatial distribution maps for birds and other marine megafauna within the Survey Area have been produced using QGIS by separating individual species records during the surveys and representing these as symbols on a map. Symbols are determined by the species group, with a relevant icon and a unique colour assigned on a per species basis, the latter of which allows for a differentiation across the board between species that use the same icon. Icons in the distribution map will appear to overlap when individuals recorded during the surveys are in close proximity to each other.

3.5 Species Flight Height

Bird flight heights were estimated from the digital still images. using a size-based methodology developed by APEM from techniques described by Johnston and Cook (2016)[1]. They were determined using bespoke APEM software that applies a set of rules developed in-house and trigonometry to provide an estimate of flight height above mean sea level (MSL). The accuracy of the application of the trigonometric rules varies depending on the size and position of the bird. The trigonometric calculation is based on species-specific bird measurements (based on reference lengths taken from the literature), image GSD (the distance between pixel centres), the known height of the aircraft as the image was taken, and the pitch, roll, and yaw of the aircraft. These parameters are entered into APEM's flight height calculator to estimate the height of each individual bird captured in survey

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[1] Johnston, A. and Cook, A.S.C.P., 2016. *How High Do Birds Fly?: Development of Methods and Analysis of Digital Aerial Data of Seabird Flight Heights.* British Trust for Ornithology.

images. Flight height estimates are less reliable for birds that are diving or turning sharply (this affects the measurement of body length and wingspan from the image) or other aspects that may affect the body length measurement. Such birds are removed from the sample used to calculate flight heights. Flight height data is included within the separate raw data files.

4. Abundance and distribution

4.1 Abundance

A total of 4,769 birds were recorded in the Survey Area during the September – October 2023 seasonal (September 2023) survey. Of those, 3,208 were sitting on the water, 1,540 were in flight, 6 were perched and 15 were deceased (**Table 7**).

A total of 82 marine megafauna were recorded in the Survey Area (**Table 8**). Scientific names and taxonomy of species recorded are provided in **Appendix I Scientific Names and Taxonomy**.

Table 7 Total number of individuals of birds by species or species group recorded during the September to October 2023 seasonal survey period (September 2023).

Species Group	Species	Flying	Sitting	Perched	Diving	Taking off	Deceased	Total
Wildfowl	Wigeon	2	-	-	-	-	-	**2**
Waders	Oystercatcher	2	-	-	-	-	-	**2**
	Wader species	3	-	-	-	-	-	**3**
Gulls	Kittiwake	16	-	-	-	-	-	**16**
	Common Gull	16	-	-	-	-	-	**16**
	Great Black-backed Gull	49	260	-	-	-	-	**309**
	Herring Gull	34	99	5	-	-	-	**138**
	Black-backed Gull species	-	3	-	-	-	-	**3**
	Large Gull species	1	23	1	-	-	-	**25**
	Gull species	-	1	-	-	-	-	**1**
Skuas	Great Skua	7	-	-	-	-	-	**7**
Auk	Guillemot	1	611	-	-	-	-	**612**
	Razorbill	3	43	-	-	-	-	**46**
	Guillemot / Razorbill	-	191	-	-	-	-	**191**
	Black Guillemot	-	94	-	-	-	-	**94**
	Puffin	1	21	-	-	-	-	**22**
	Auk species	-	15	-	-	-	-	**15**
Divers	Red-throated Diver	-	4	-	-	-	-	**4**
Storm Petrels	European Storm Petrel	8	-	-	-	-	-	**8**
	Storm Petrel species	4	-	-	-	-	-	**4**
Fulmar	Fulmar	1,023	1,299	-	-	-	-	**2,322**
Fulmar / Gull	Fulmar / Gull species	-	2	-	-	-	3	**5**
Shearwaters	Shearwater species	1	-	-	-	-	-	**1**
Gannet	Gannet	364	528	-	-	-	9	**901**

Species Group	Species	Flying	Sitting	Perched	Diving	Taking off	Deceased	Total
Cormorant or Shag	Cormorant / Shag	2	2	-	-	-	-	**4**
Unidentified Bird species	Unidentified Bird species	3	12	-	-	-	3	**18**
Total		**1,540**	**3,208**	**6**	**-**	**-**	**15**	**_4,769_**

Table 8 Total number of individuals of marine megafauna by species or species group recorded during the September to October 2023 seasonal survey period (September 2023).

Species Group	Species	Deeply Submerged*	Submerged**	Surfacing	Bottling***	Hauled Out	Deceased	Total
Whale	Common Minke Whale	-	3	1	-	-	-	**4**
Dolphin	Orca	-	-	1	-	-	-	**1**
	White-beaked Dolphin	2	18	3	-	-	-	**23**
Porpoise	Harbour Porpoise	3	29	11	-	-	-	**43**
Fish	Atlantic Bluefin Tuna	-	7	-	-	-	-	**7**
Shark	Porbeagle Shark	-	2	-	-	-	-	**2**
	Basking Shark	-	2	-	-	-	-	**2**
Total		**5**	**61**	**16**	**-**	**-**	**-**	**_82_**

*The target is far beneath the surface so that many features are difficult to distinguish. Deeply submerged targets may be difficult to identify to species level.

**The target is wholly underwater, within the first few metres of the surface. Features use to aid identification are usually visible.

***Applies to seals, where the head is positioned above the surface and the rest of the body is submerged vertically.

4.2   Spatial Distribution

Figure 3 and **Figure 4** show the locations of all birds and marine megafauna, respectively, recorded in the Survey Area. Birds were recorded across the Survey Area, with the greatest concentrations found throughout the north and south of the Survey Area. Marine megafauna species were scattered across the Survey Area, with the majority of records in the south. **Figure 5** to **Figure 14** show distributions of more abundant birds by species, whilst **Figure 15** shows the distribution of less frequently recorded bird species**. Figure 16** to **Figure 17** shows the distributions of more abundant marine megafauna species within the Survey Area and **Figure 18** shows distributions of less frequently recorded marine megafauna by species. **Figure 19** shows distribution of vessels and abiotic structures in the Survey Area.
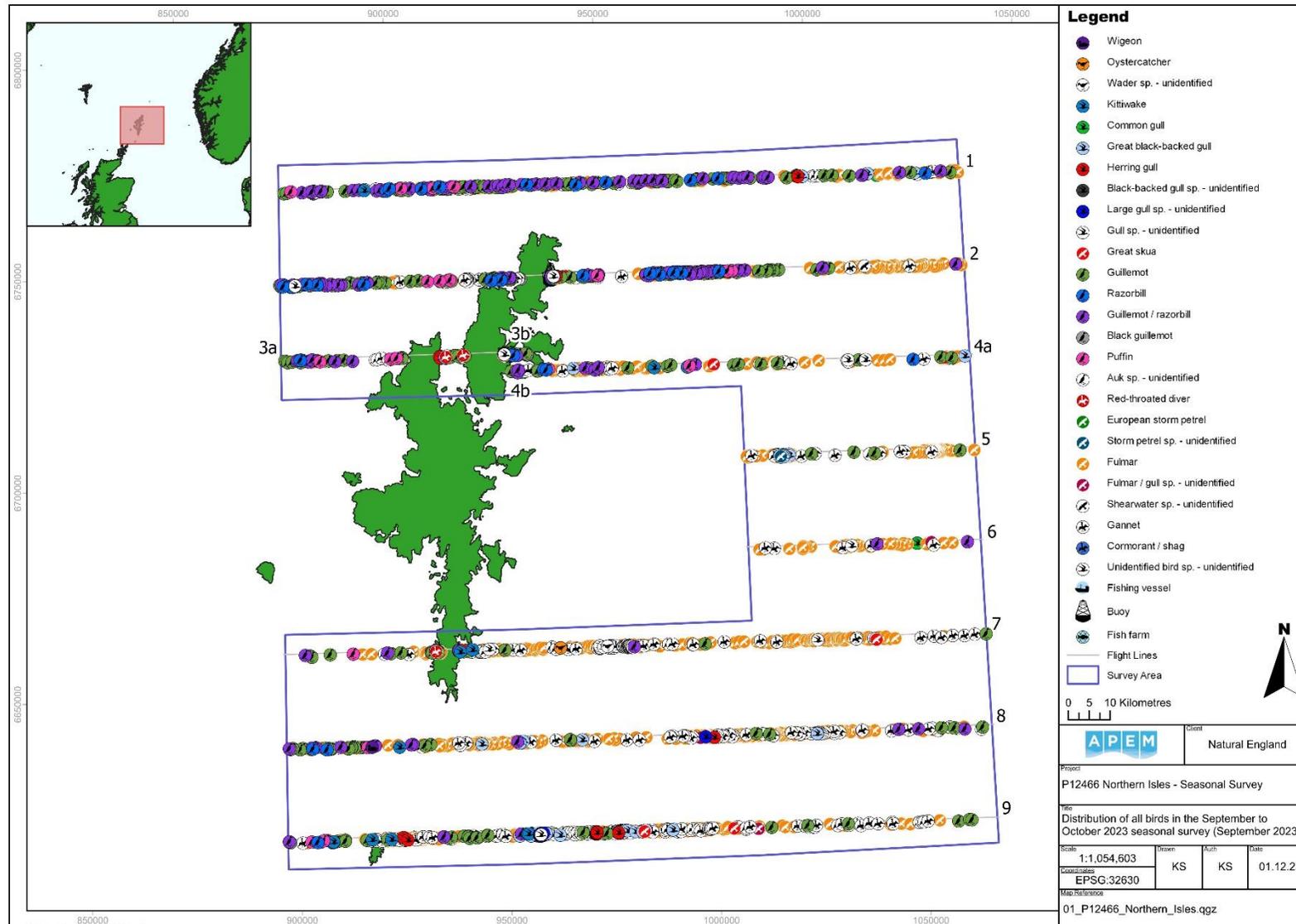
Figure 3 Distribution of all birds recorded in the September to October 2023 seasonal survey (September 2023).
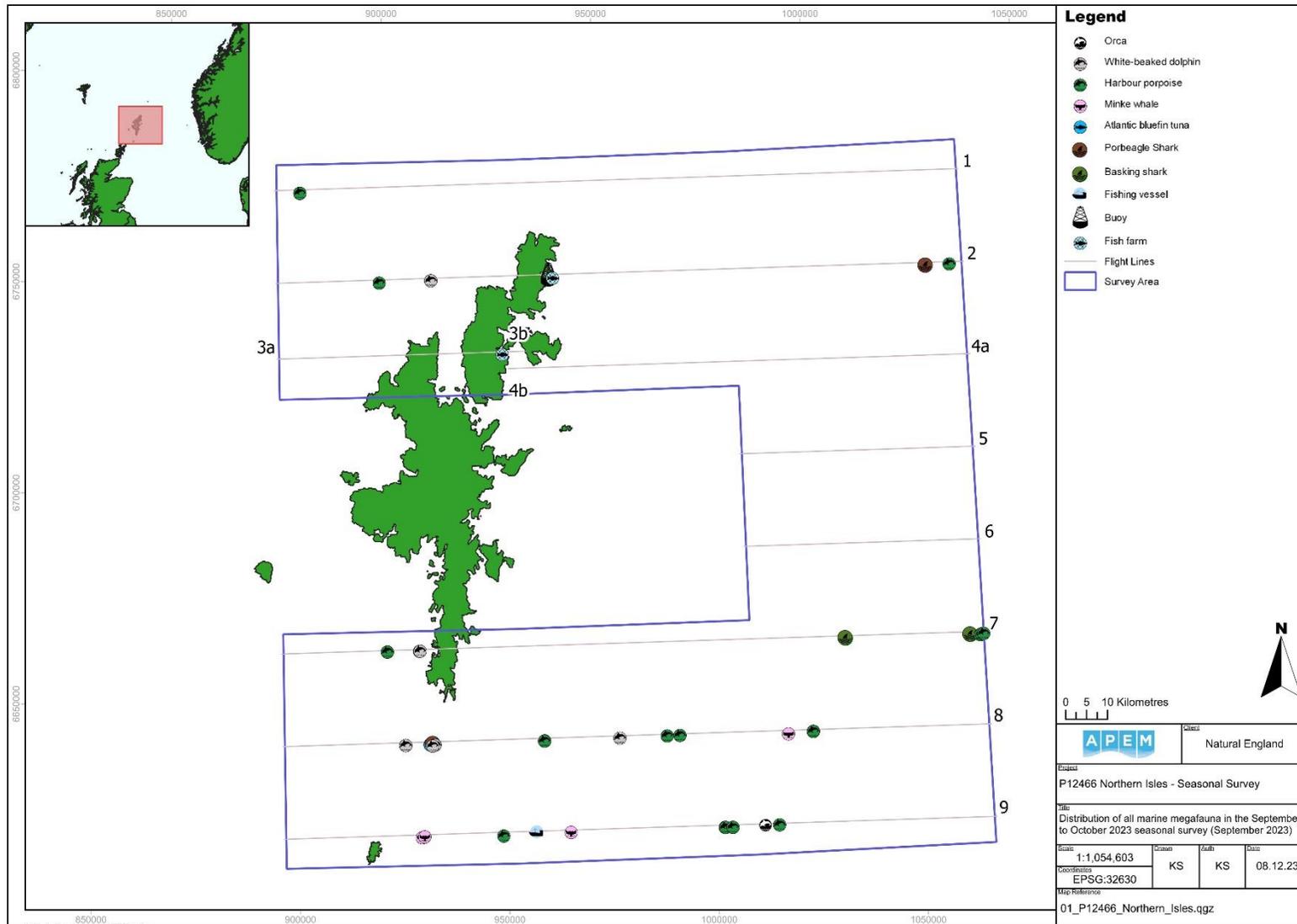
Figure 4 Distribution of all marine megafauna recorded in the September to October 2023 seasonal survey (September 2023).
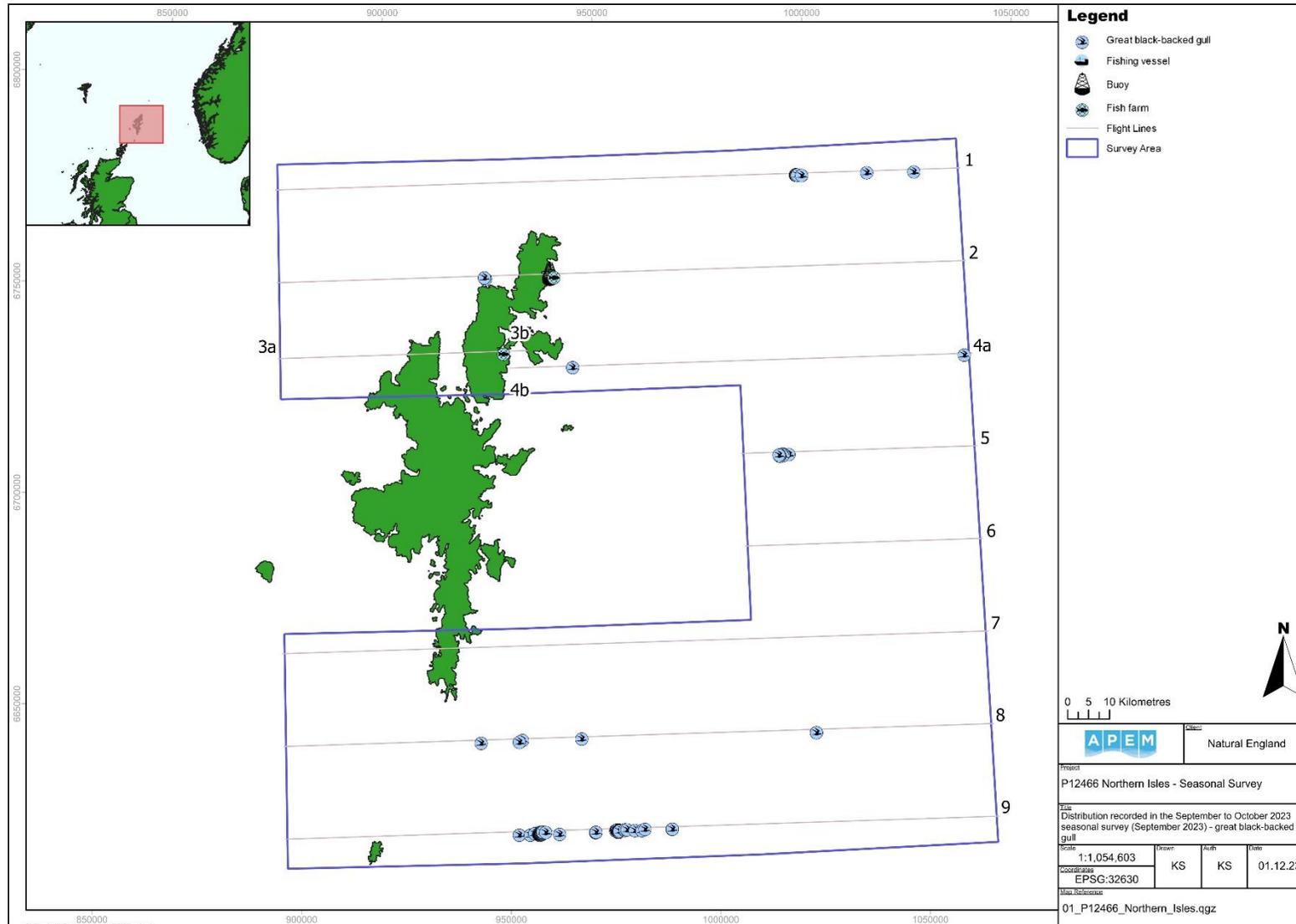
Figure 5 Great black-backed gull distribution recorded in the September to October 2023 seasonal survey (September 2023).
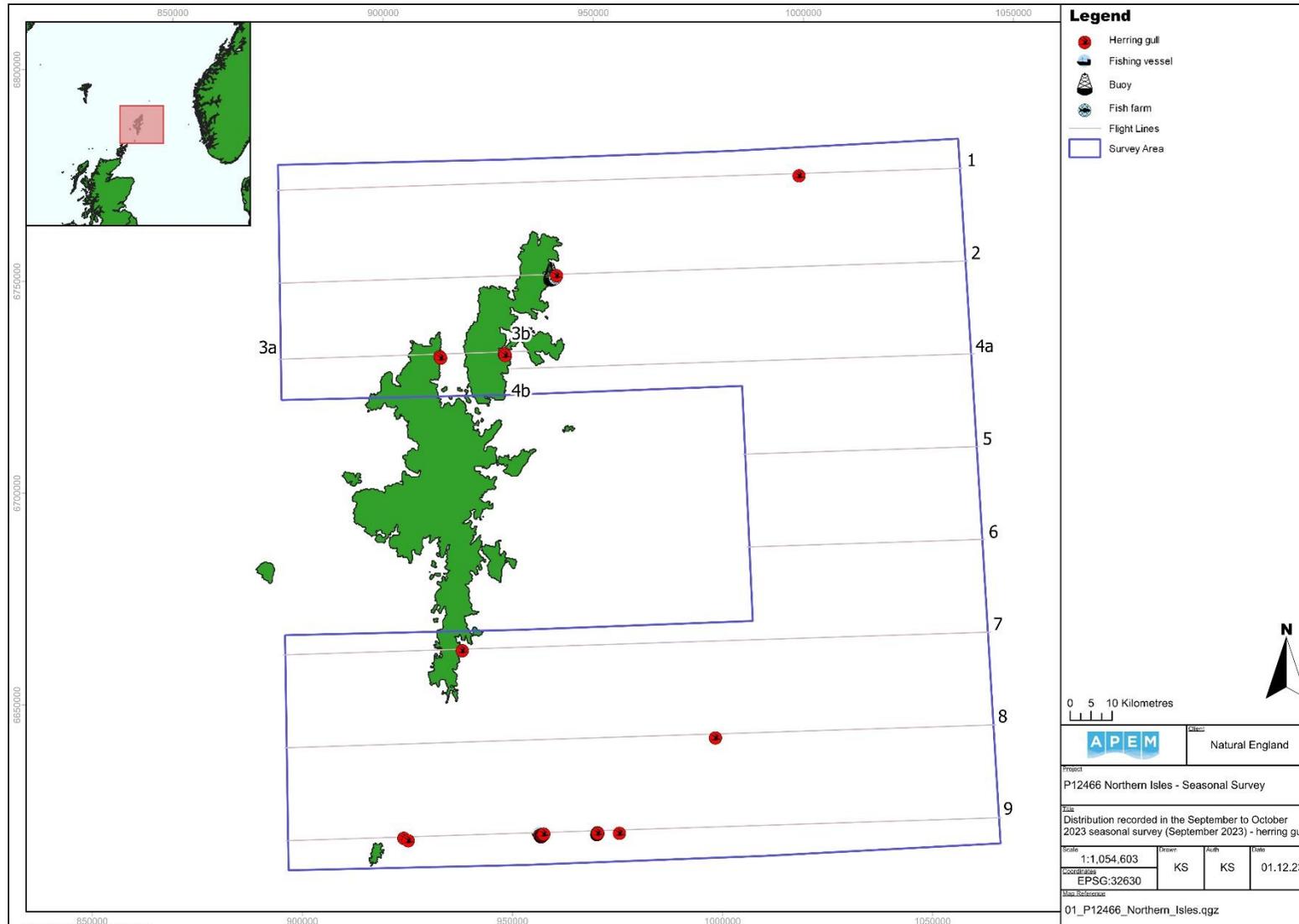
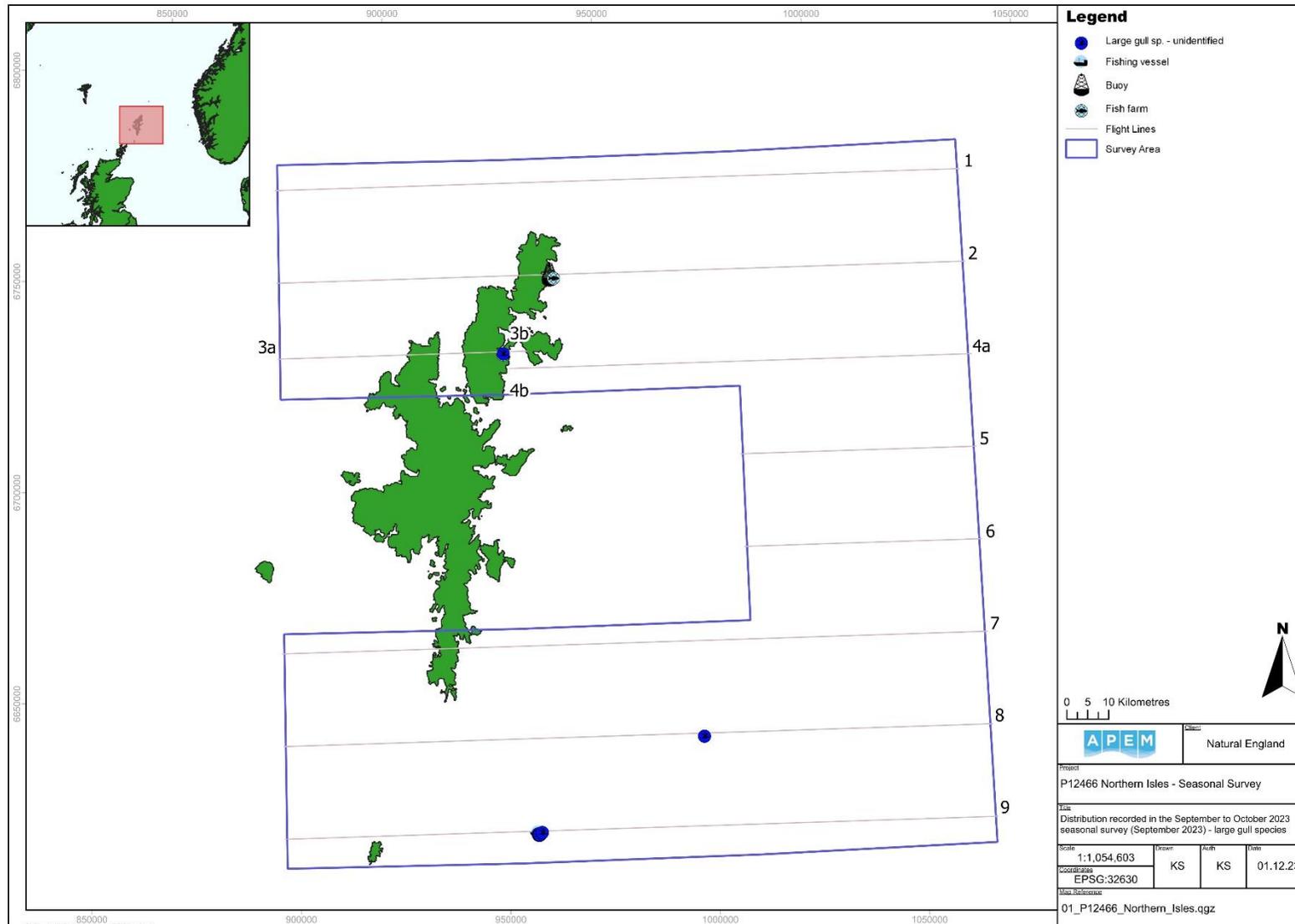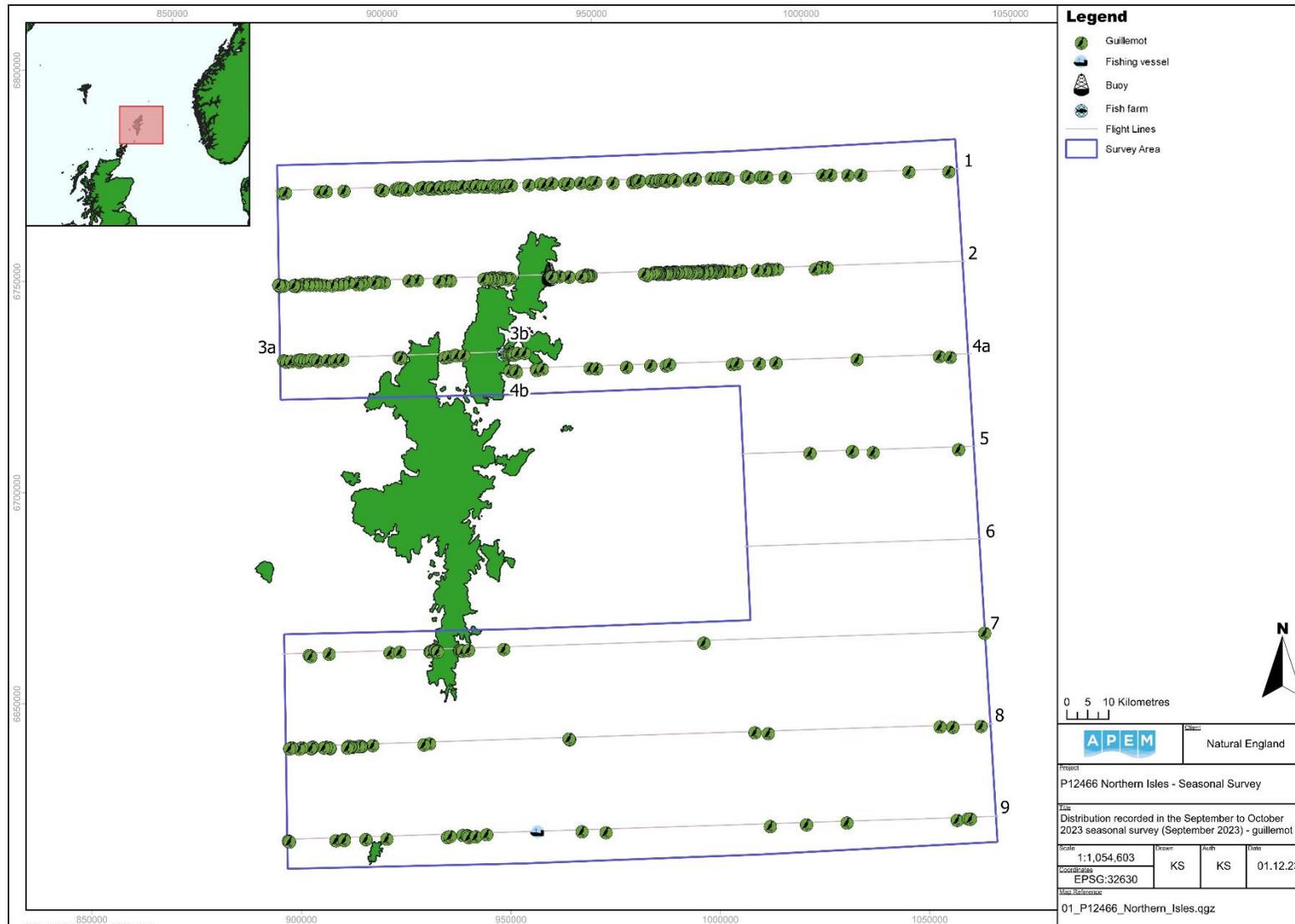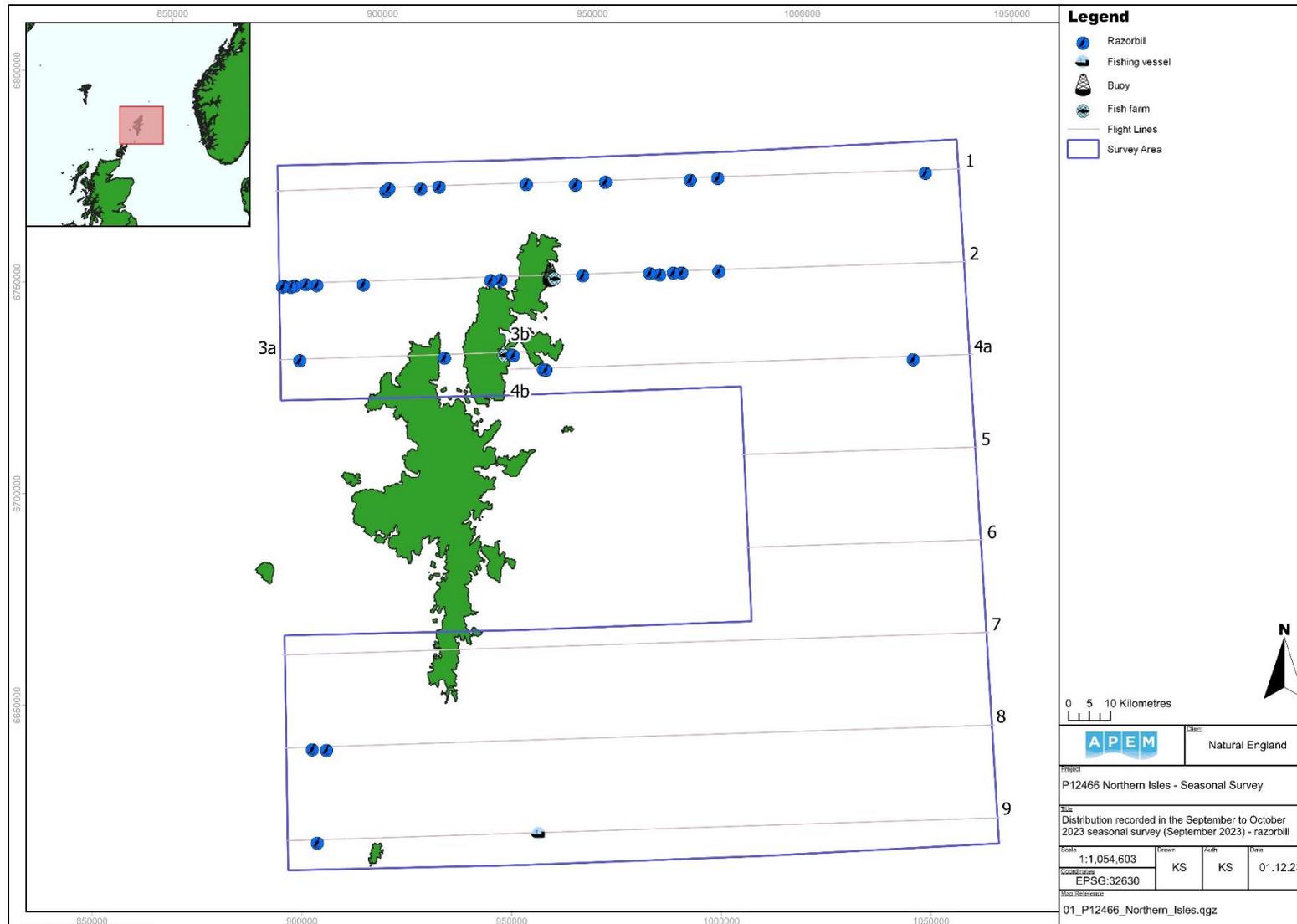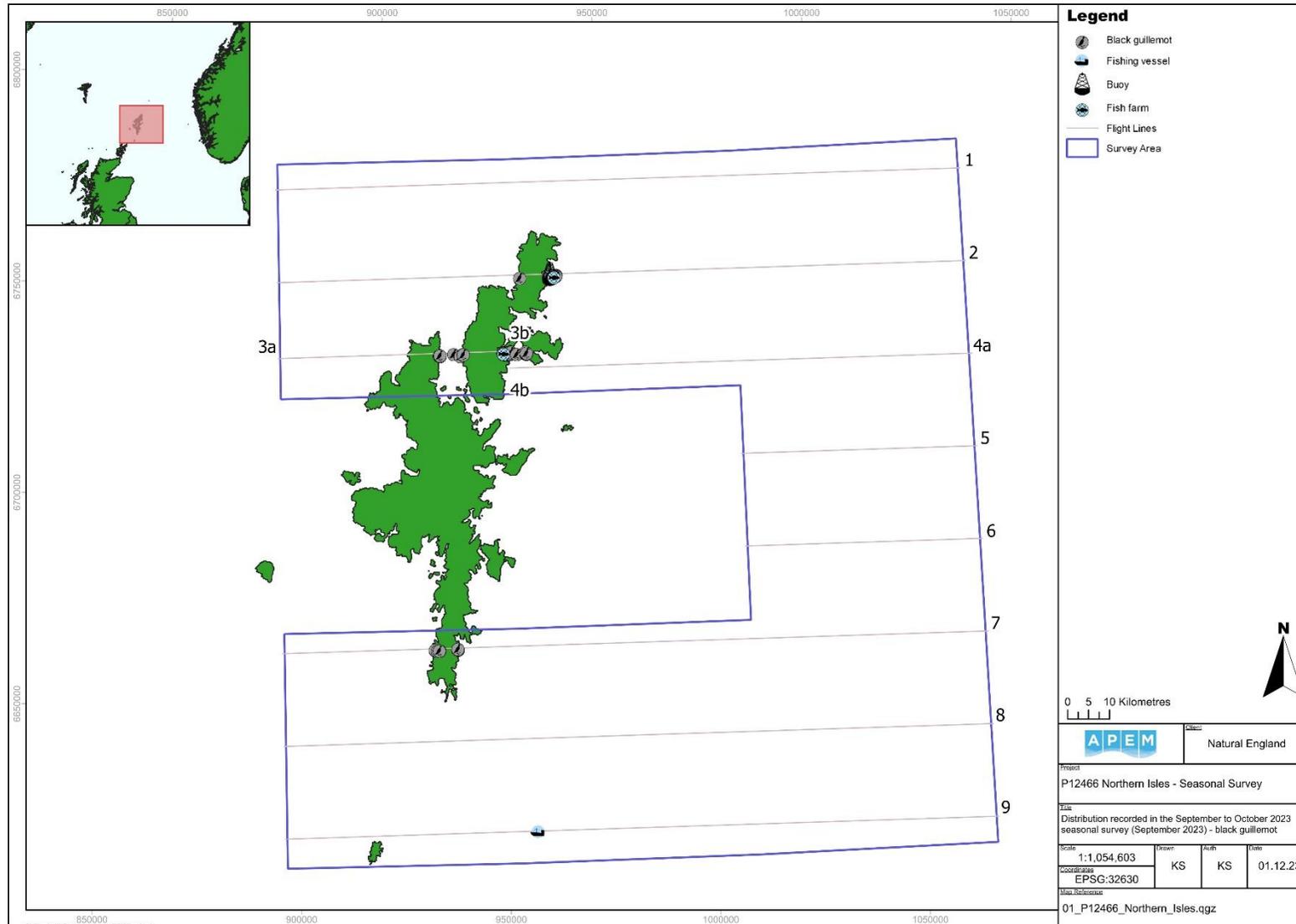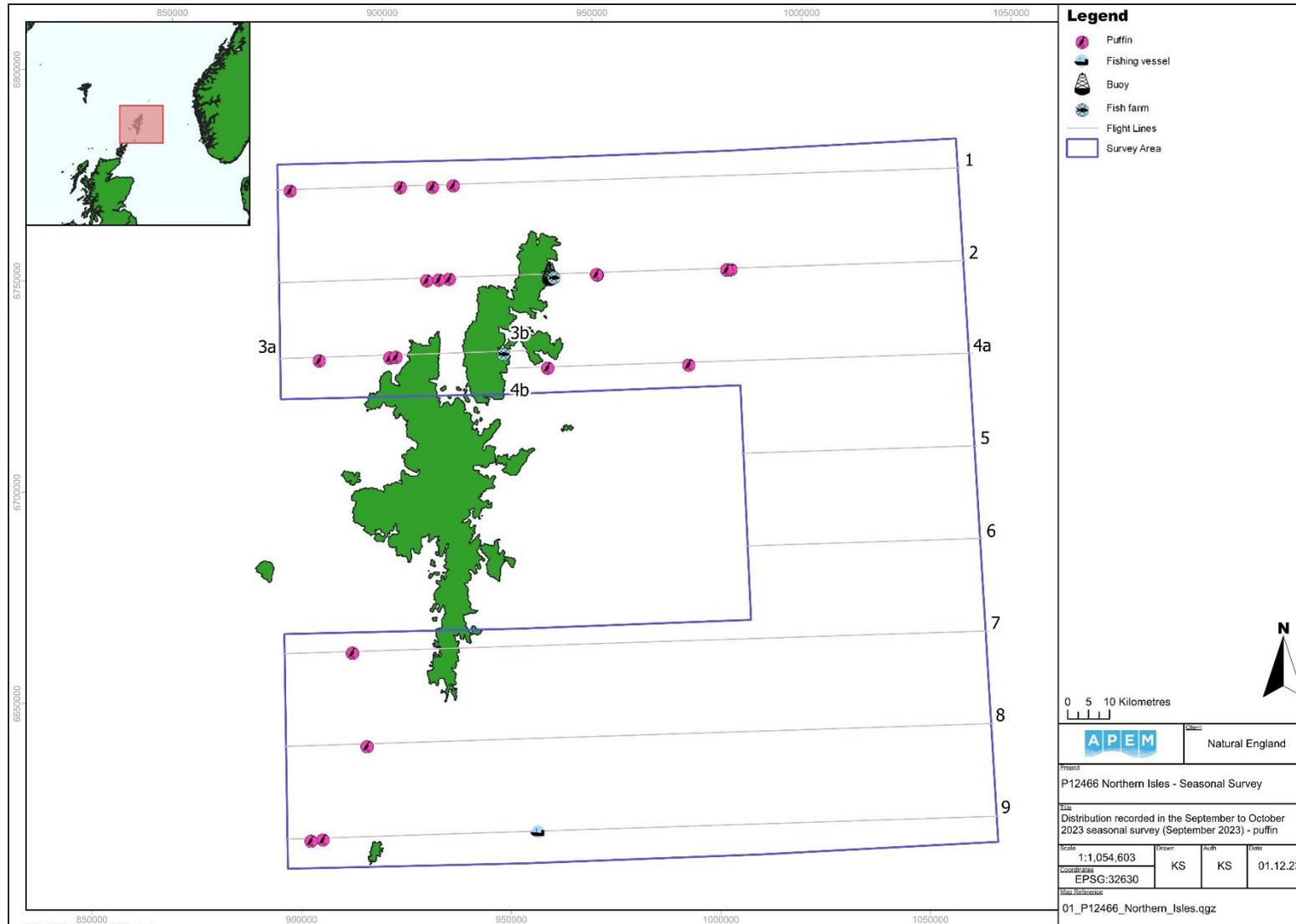**Figure 6 Herring gull distribution recorded in the September to October 2023 seasonal survey (September 2023).**
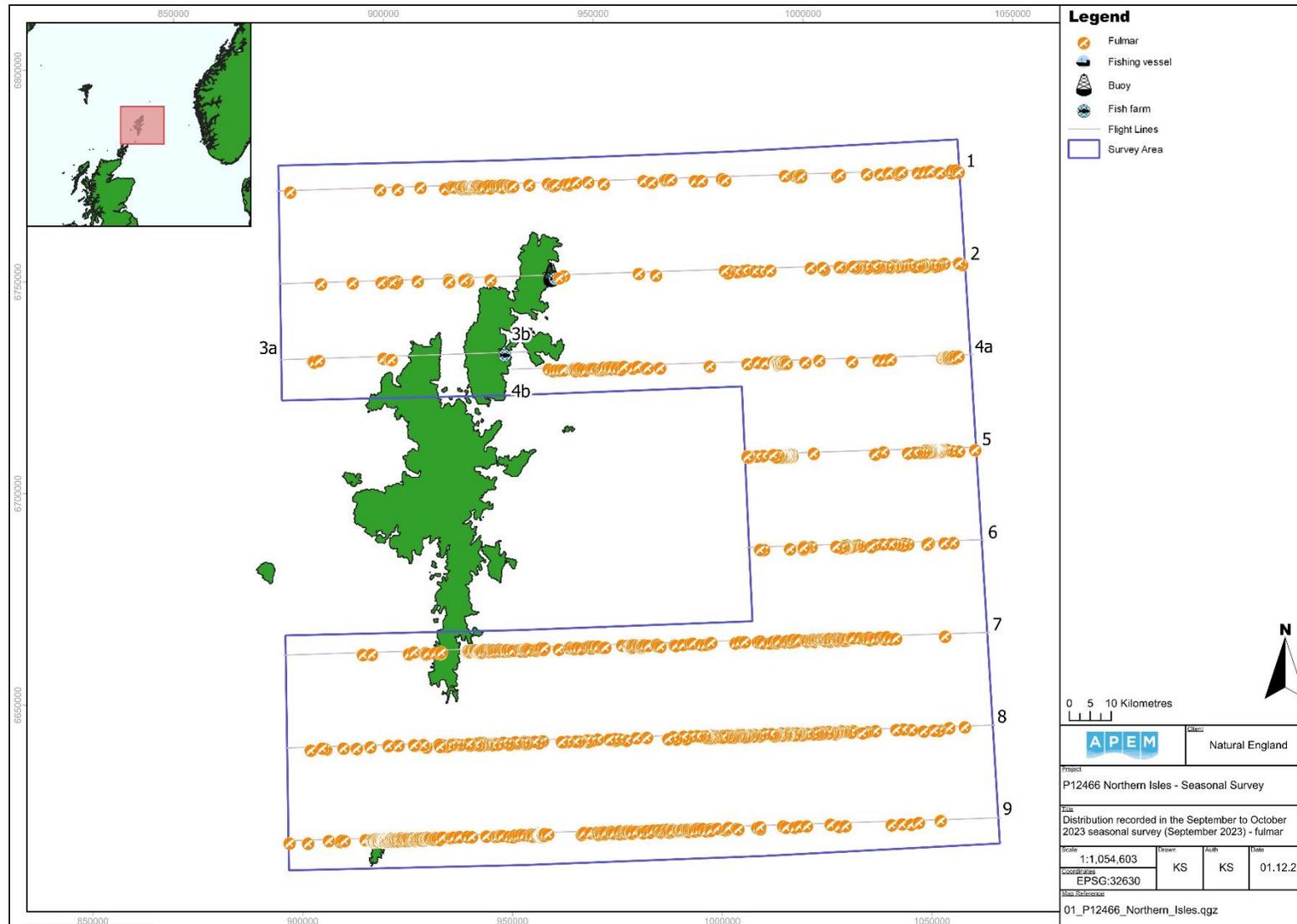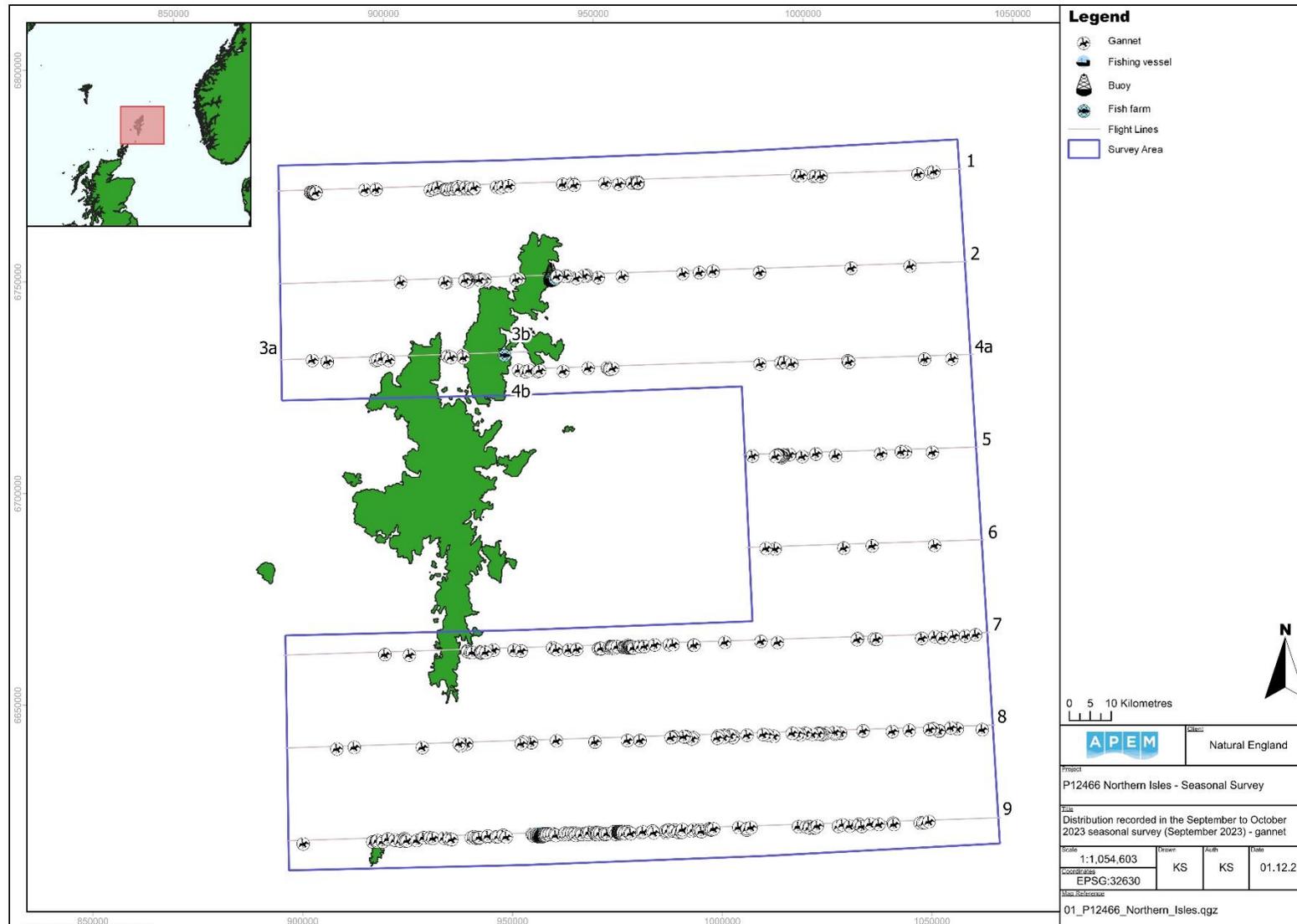
Figure 7 Large gull species distribution recorded in the September to October 2023 seasonal survey (September 2023).

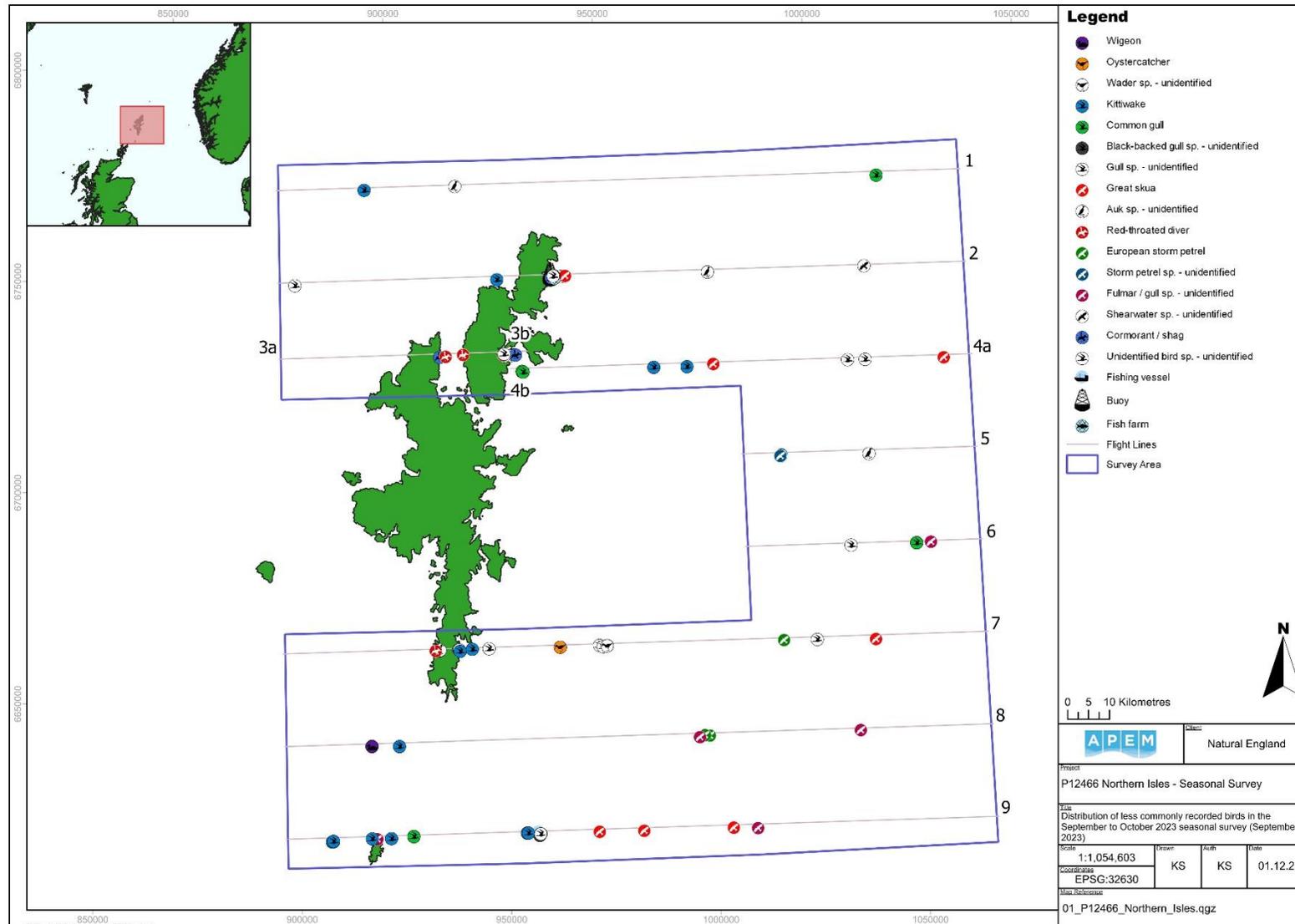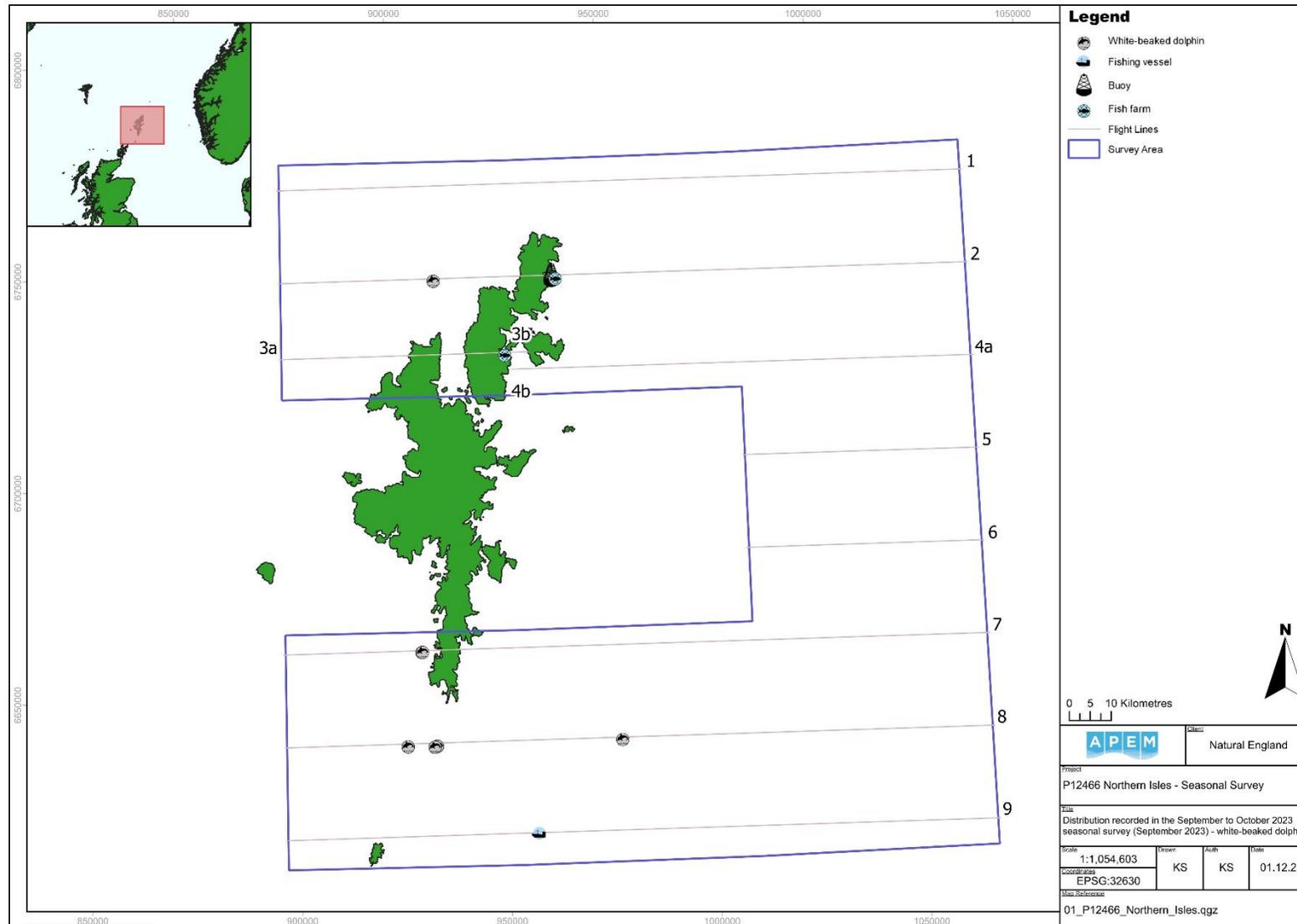**Figure 8 Guillemot distribution recorded in the September to October 2023 seasonal survey (September 2023).**

Figure 9 Razorbill distribution recorded in the September to October 2023 seasonal survey (September 2023).
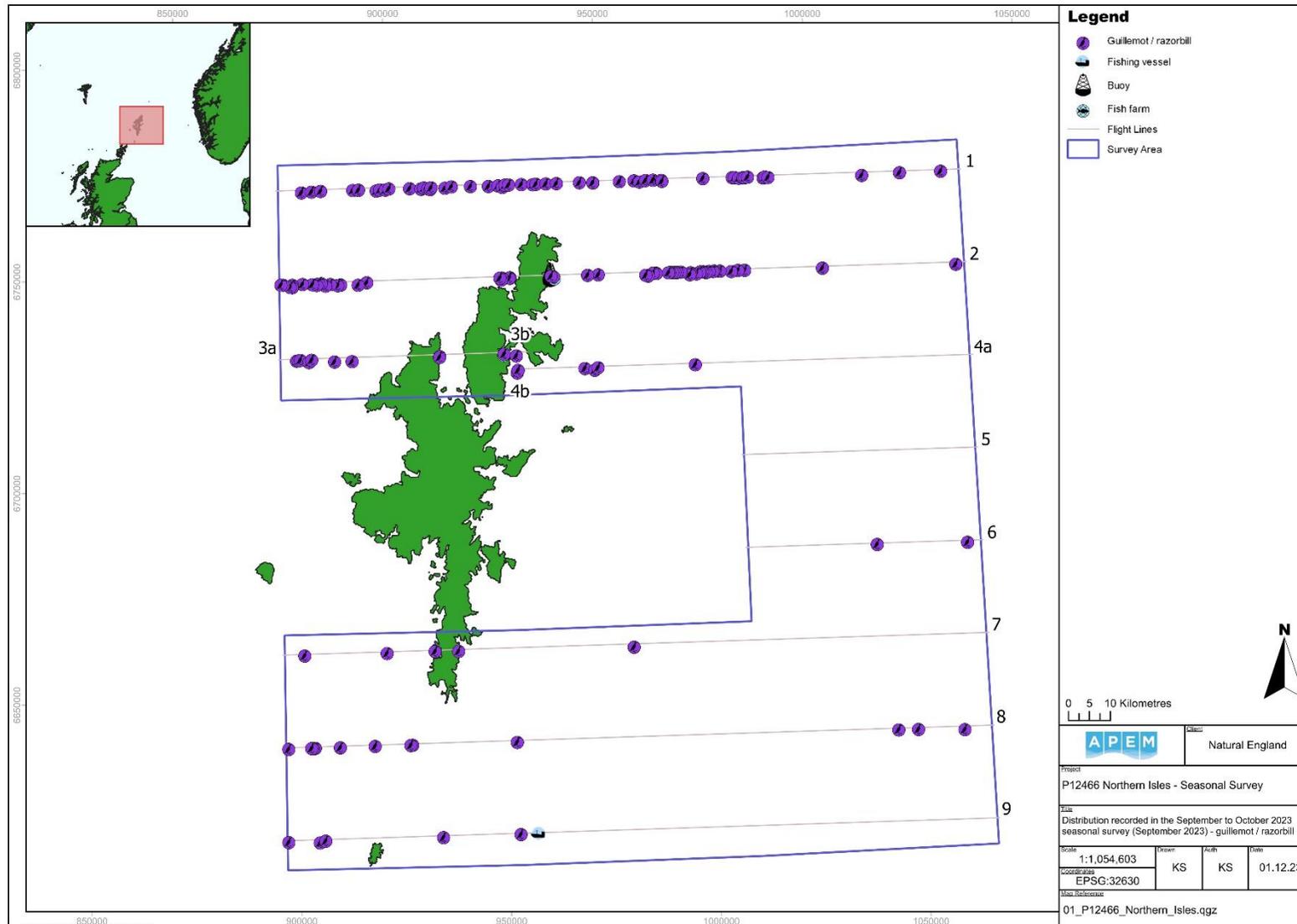
Figure 10 Guillemot / razorbill distribution recorded in the September to October 2023 seasonal survey (September 2023).

Figure 11 Black guillemot distribution recorded in the September to October 2023 seasonal survey (September 2023).

Figure 12 Puffin distribution recorded in the September to October 2023 seasonal survey (September 2023).

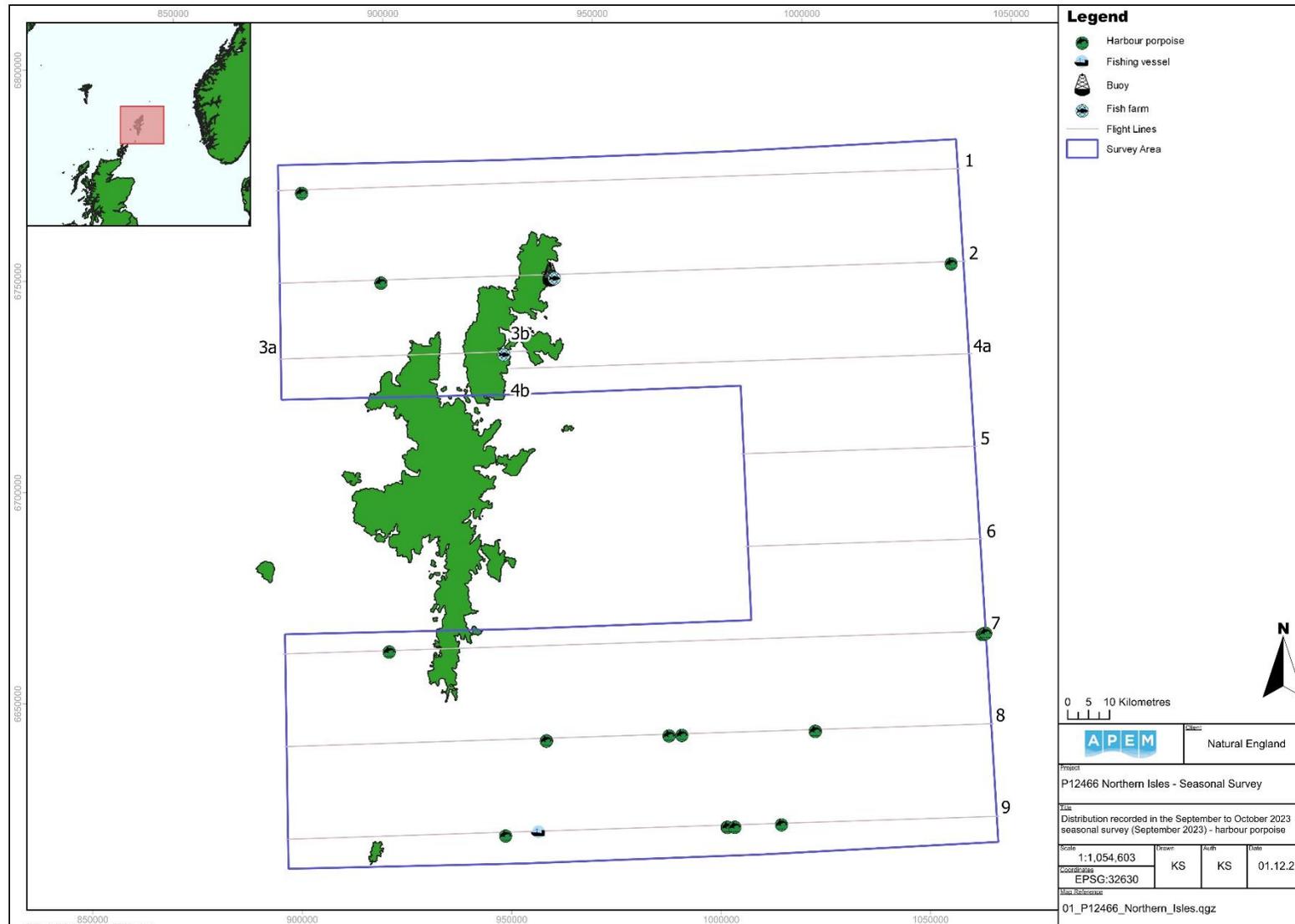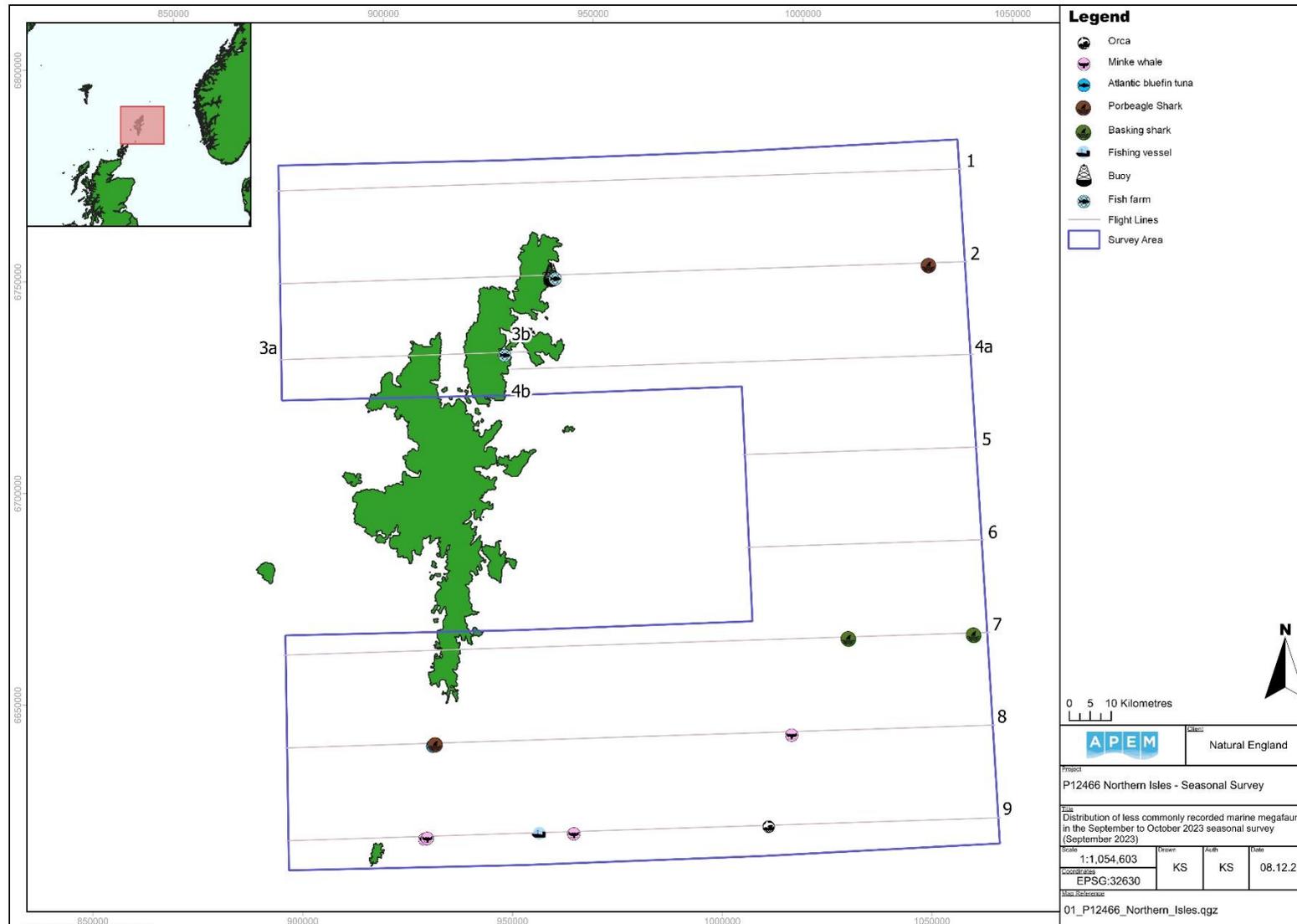**Figure 13 Fulmar distribution recorded in the September to October 2023 seasonal survey (September 2023).**

Figure 14 Gannet distribution recorded in the September to October 2023 seasonal survey (September 2023).

Figure 15 Distribution of less abundant birds in the September to October 2023 seasonal survey (September 2023).

Figure 16 White-beaked dolphin distribution recorded in the September to October 2023 seasonal survey (September 2023).

Figure 17 Harbour porpoise distribution recorded in the September to October 2023 seasonal survey (September 2023).

Figure 18 Distribution of less abundant marine megafauna in the September to October 2023 seasonal survey (September 2023).
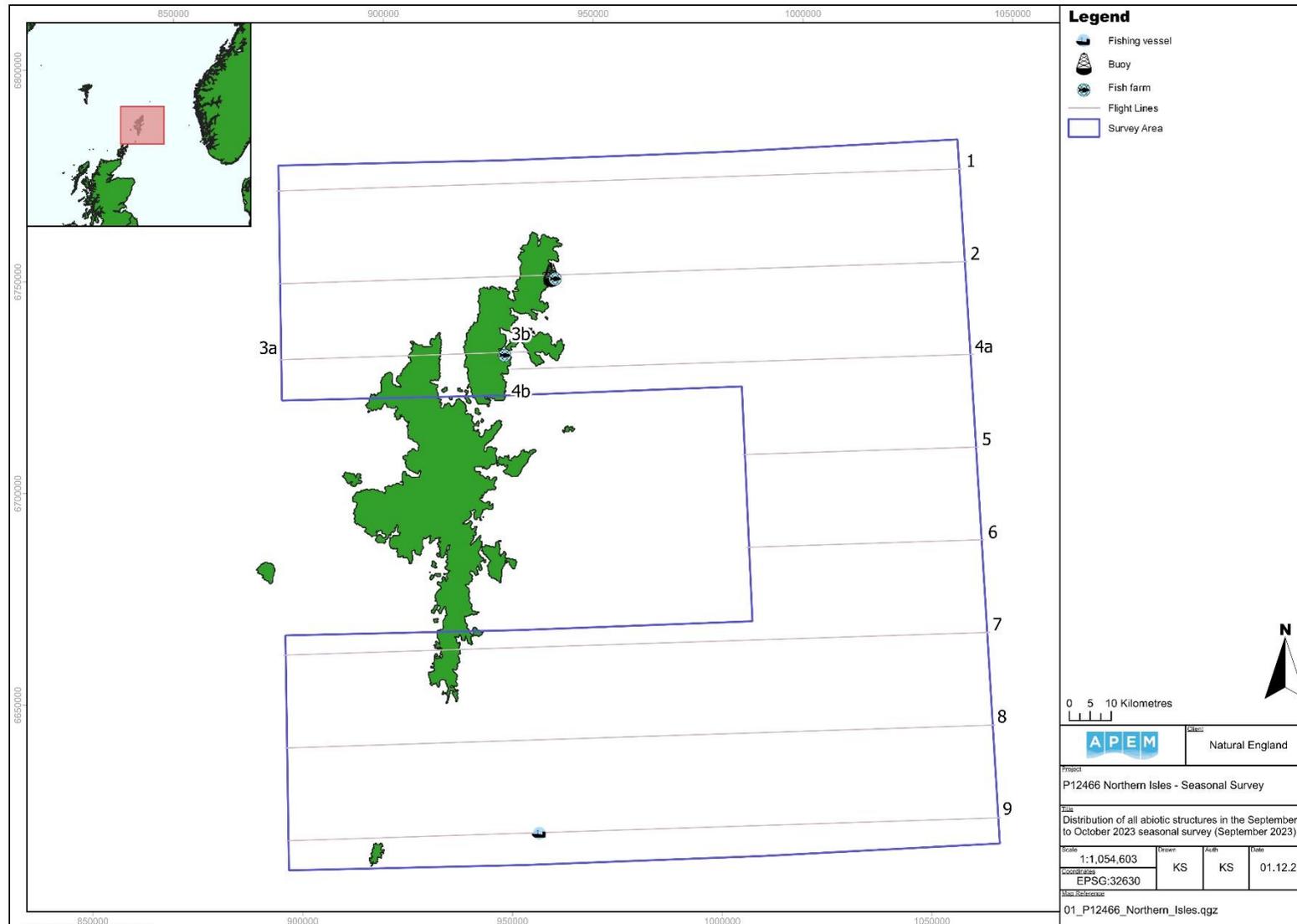
Figure 19 Distribution of abiotic structures and vessels recorded in the September to October 2023 seasonal survey (September 2023).

5.   Abiotic Structures and Observations

The following abiotic structures were observed during the survey period:

Two buoys and a fish farm were present on line 2; another fish farm was present on line 3a; and a single fishing vessel was present on line 9. The fishing vessel was observed heading toward the west-southwest.

Appendix I Scientific Names and Taxonomy

Scientific names and taxonomy for all species can be found in the below appendix.

Species	Scientific Name
Wigeon	*Mareca penelope*
Oystercatcher	*Haematopus ostralegus*
Kittiwake	*Rissa tridactyla*
Common Gull	*Larus canus*
Great Black-backed Gull	*Larus marinus*
Herring Gull	*Larus argentatus*
Great Skua	*Stercorarius skua*
Guillemot	*Uria aalge*
Razorbill	*Alca torda*
Black Guillemot	*Cepphus grylle*
Puffin	*Fratercula arctica*
Red-throated Diver	*Gavia stellata*
European Storm Petrel	*Hydrobates pelagicus*
Fulmar	*Fulmarus glacialis*
Gannet	*Morus bassanus*
Common Minke Whale	*Balaenoptera acutorostrata*
Orca	*Orcinus orca*
White-beaked Dolphin	*Lagenorhynchus albirostris*
Harbour Porpoise	*Phocoena phocoena*
Atlantic Bluefin Tuna	*Thunnus thynnus*
Porbeagle Shark	*Lamna nasus*
Basking Shark	*Cetorhinus maximus*

Appendix II Example images (snags) of birds and marine mammals

Images are jpeg files of a lower resolution than those used by image analysts when performing identifications.

Figure 20 Fulmar in flight.
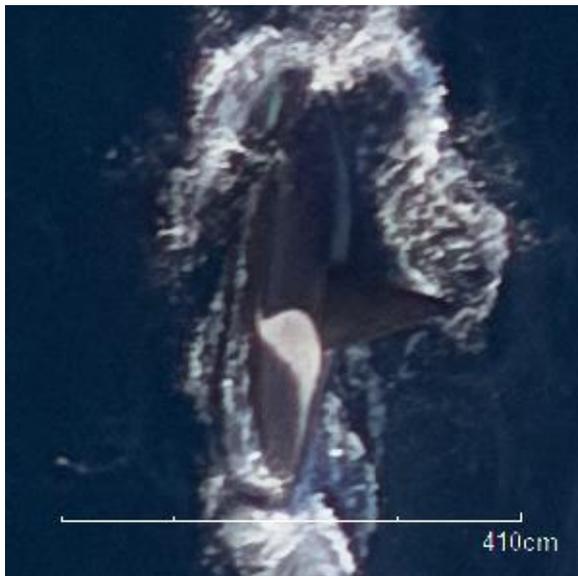

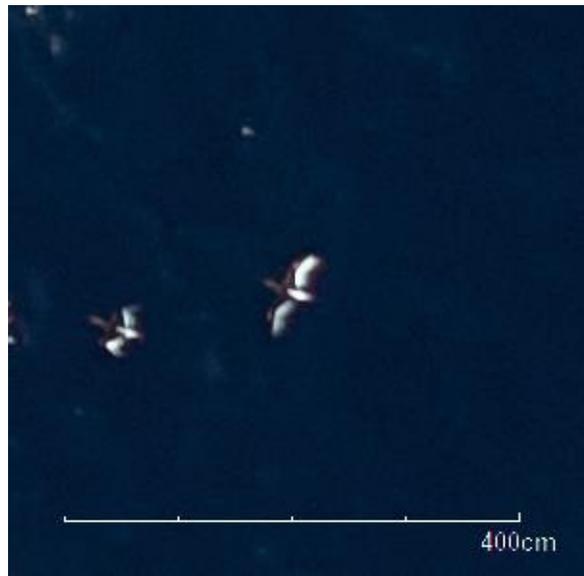**Figure 21 Great skua in flight.**

Figure 22 Orca.

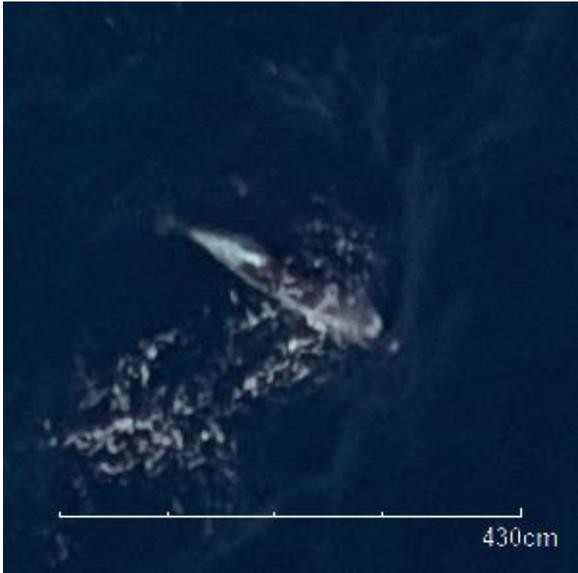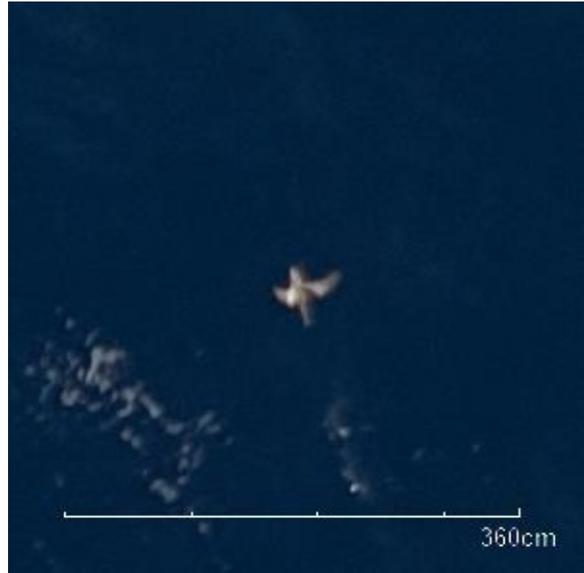**Figure 23 Oystercatchers in flight.**

Figure 24 White-beaked dolphin.

Figure 25 Female wigeon in flight.

Figure 26 Atlantic bluefin tuna.