

Natural England

# **Ornithological and Marine Mammal Baseline Characterisation Surveys for the POSEIDON project**

**January-March (Seasonal) Report – South-West Celtic  
Sea**

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COMMERCIAL IN CONFIDENCE

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## 1. Executive Summary

This report constitutes the second year two seasonal (January to March 2024) report outlining results from digital aerial surveys conducted in March 2024 and April 2024 within the South-West Celtic Sea 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.

Surveys occurred over two flights on the 21<sup>st</sup> of March 2024 and a single flight on the 14<sup>th</sup> of April 2024 using Vulcanair P68 twin-engine survey aircraft. Patches of low cloud obscured several lines on the initial survey day on 21<sup>st</sup> of March. It was agreed that a partial re-survey of the affected lines would be undertaken at the next available opportunity. Due to an extended period of poor weather, the re-survey was undertaken on the 14<sup>th</sup> of April. A technical issue occurred on the initial attempt of line 1. The affected half of the line was re-flown.

A total of 527 observations were recorded in the January-March 2024 seasonal survey, of which 332 were observations of birds and 195 observations of marine megafauna. APEM will continue to monitor the site for these species and others during the remaining seasonal surveys.

## 2. Introduction

### 2.1 Background

APEM has been contracted by Natural England for the supply of four, year two seasonal digital aerial surveys within the South-West Celtic Sea, commencing from October 2023. The programme of work repeats the four seasonal surveys of the Survey Area completed by APEM from 2022-2023. 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 and Welsh 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.

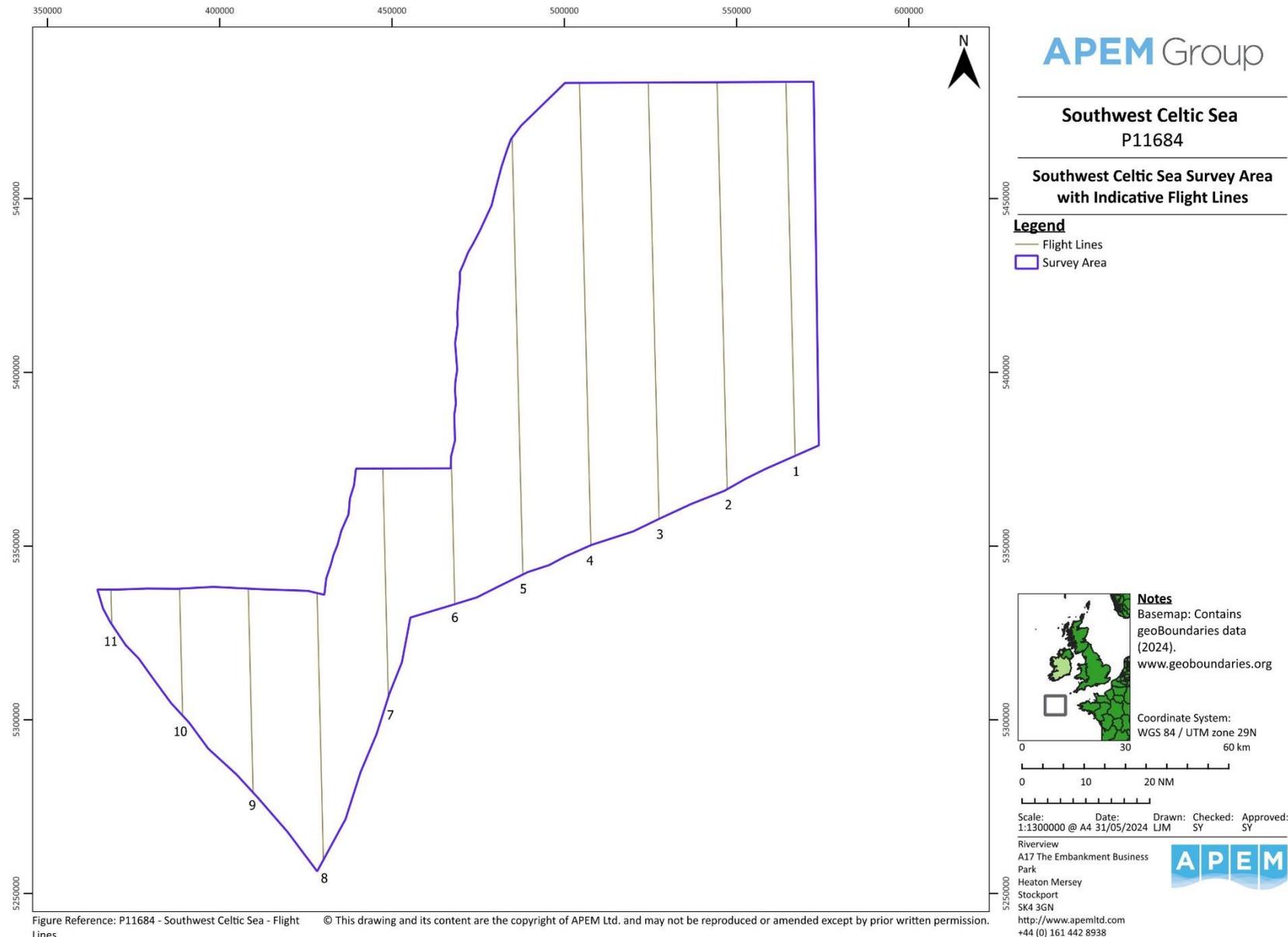
The Survey Area is located within the Celtic Sea to the west of Cornwall and Brittany (**Figure 1**) and covers an area of 18,011 square kilometres (km<sup>2</sup>). The survey method has been designed to optimise data collection for all bird, marine mammal, and other marine megafauna species using a transect-based survey design at 1.5-centimetre (cm) ground sampling distance (GSD) 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 (January to March 2024) survey, undertaken in March and April 2024 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 the South-West Celtic Sea Survey Area with indicative flight lines and line numbers.**

### 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 (

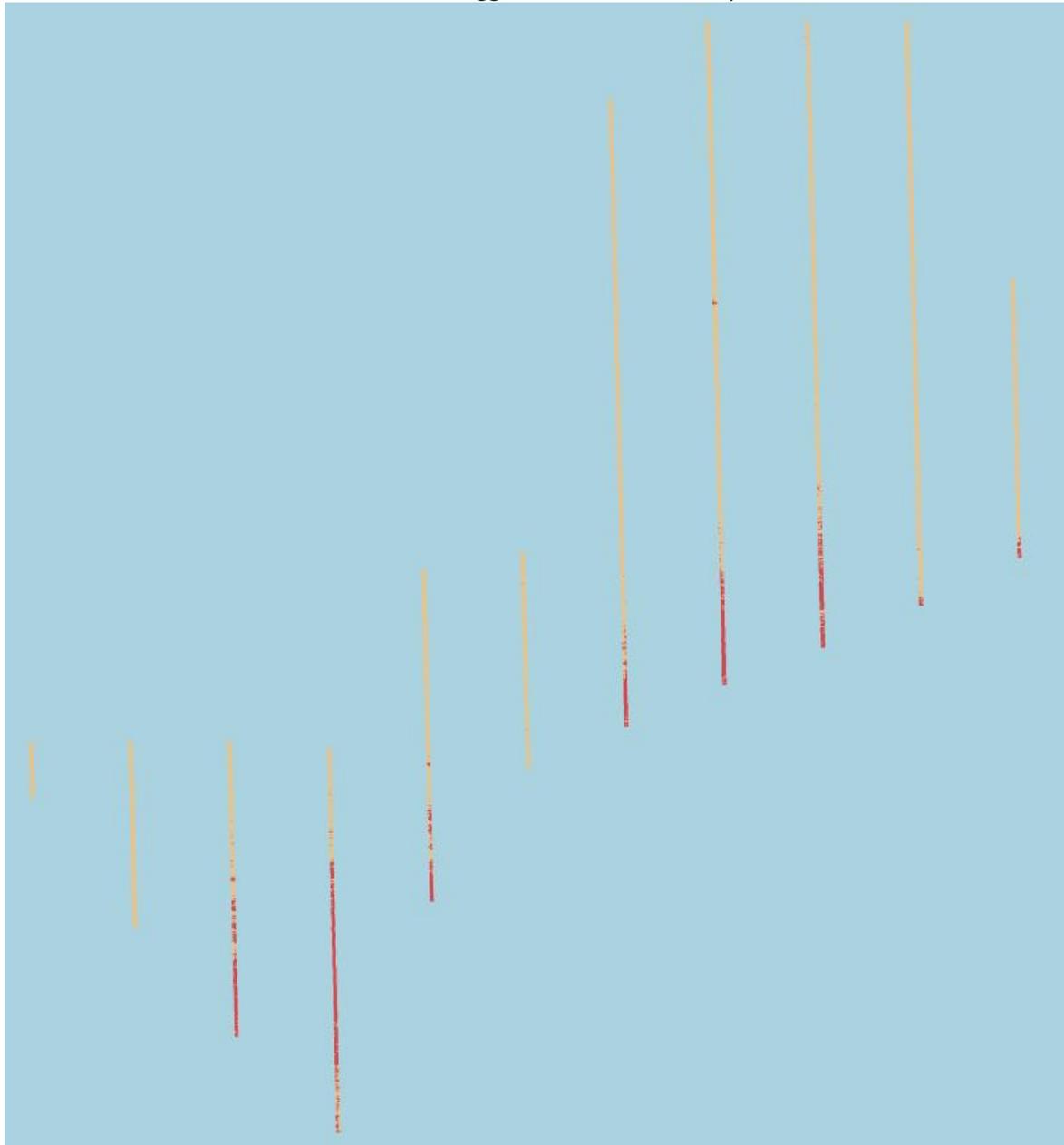


Figure 3 Nodes captured during the initial survey on 21/03/2024 (orange), and those missed due to low cloud, which were subsequently captured on 14/04/2024 (red).

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 maintain 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 focus of the camera lenses ensures no discernible differences 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.

Data capture comprised digital still images of an average 1.5 cm GSD. Images at each camera 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 camera system captured abutting imagery along 11 survey flight lines spaced approximately 20 km apart within the Survey Area (**Figure 2**). The total Survey Area was 18,011 km<sup>2</sup>. The aircraft collected the data at an altitude of approximately 1,429 ft (435 m) according to the ellipsoid model as recorded by GPS, equivalent to 1,249 ft (381 m) above geoidal mean sea level, and at a speed of approximately 120 knots. 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 6,589 nodes were initially captured. Of these, 5,003 were captured on the 21<sup>st</sup> of March and 1,385 were captured on the 14<sup>th</sup> of April. Of the captured images, 6,215 were used for analysis. 4,928 analysed images were from the 21<sup>st</sup> March survey flight and 1,287 analysed images were from the 14<sup>th</sup> April survey flight. The difference between captured and analysed reflects nodes removed during clipping to the boundary area. Total coverage was calculated to be 3.27% generated from 6,215 image nodes (**Table 2**). The target coverage of 3% was achieved including a redundancy of an additional 0.27%, which is almost 10% contingency with respect to the target coverage.

Effort data is calculated as the area (km<sup>2</sup>) 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 and removing the overlapping areas. Summing analysed footprints and comparing against the entire survey area gives the percentage analysed.

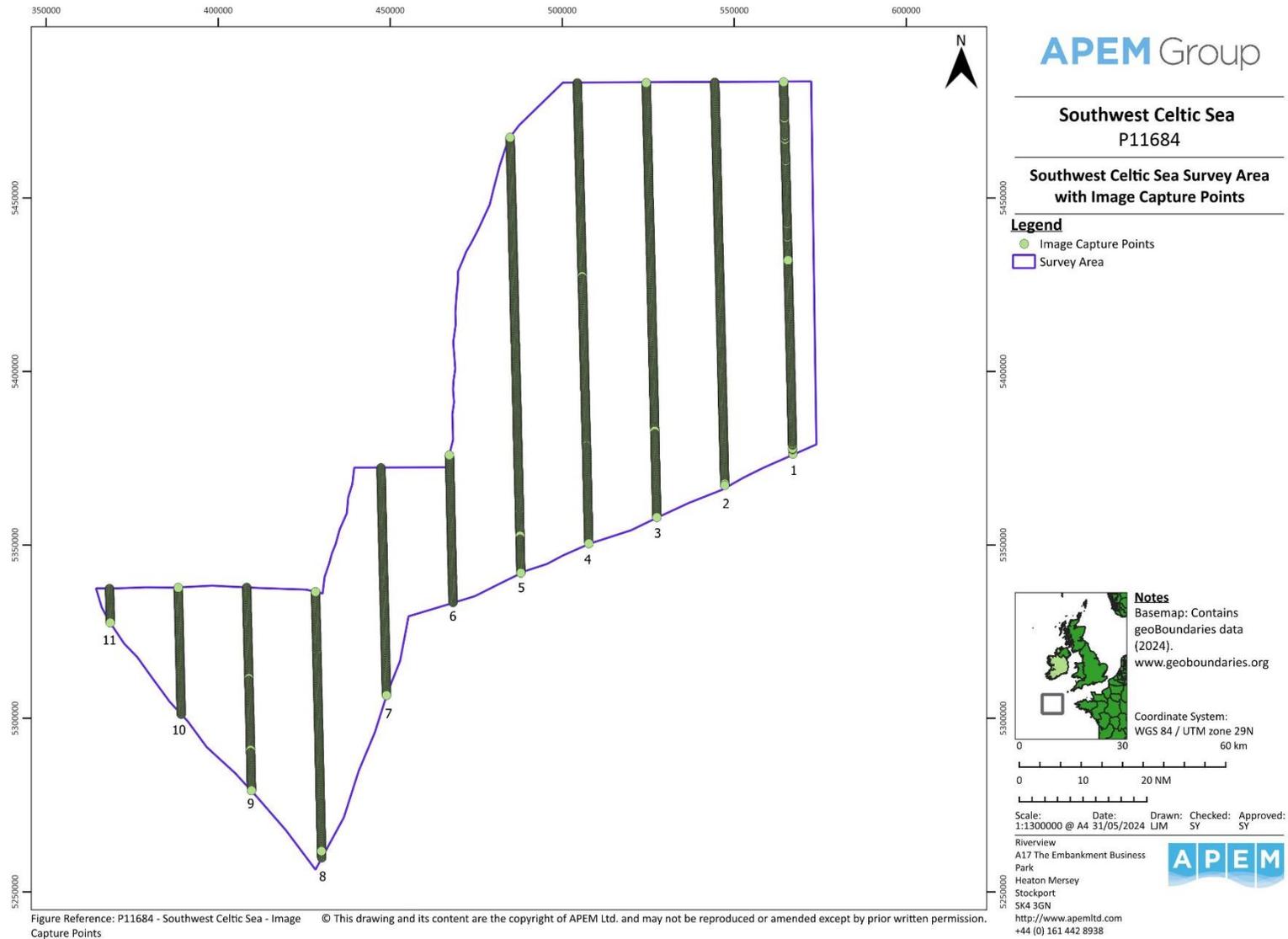
Imagery was captured in raw format and post-processed to ensure optimal quality for the subsequent stage of image analysis, to extract information on marine fauna or other notable occurrences. When a survey was completed, data were checked to ensure the number of lines and the number of images collected 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**. During the initial survey attempt, low cloud caused obstruction to image collection on some survey lines. Therefore, the survey was partially re-flown at a later date to collect suitable replacement images. Conditions for both survey days are provided in **Table 3** but only suitable images were used for analysis. For the images used for analysis, 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.

Initial survey flights occurred on the 21<sup>st</sup> of March 2024, with two survey aircrafts flying simultaneously. On 21<sup>st</sup> March, one aircraft was used to survey lines 1 to 5 (take off at 10:03, landing at 17:01), whilst another aircraft was used to survey lines 6 to 11 (take off at 09:56, landing at 16:08). Due to low cloud cover, some nodes from both flights on the 21<sup>st</sup> of March were not of sufficient quality to use for survey analysis. Lines 1, 3, 4, 5, 6, 7, 8 and 9 were each partially affected. Therefore, a third flight was scheduled to capture replacement images for the affected nodes (**Figure 3**).

Due to weather delays, the replacement flight was unable to be flown until 14<sup>th</sup> of April 2024. Take off was at 08:30 and landing was at 10:05. Replacement images were successfully captured. Suitable images from both survey days were analysed for each line as appropriate, so that the affected lines include data from both days (**Table 2**).

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 3.27%, 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 January to March 2024 (March/April 2024) survey.**

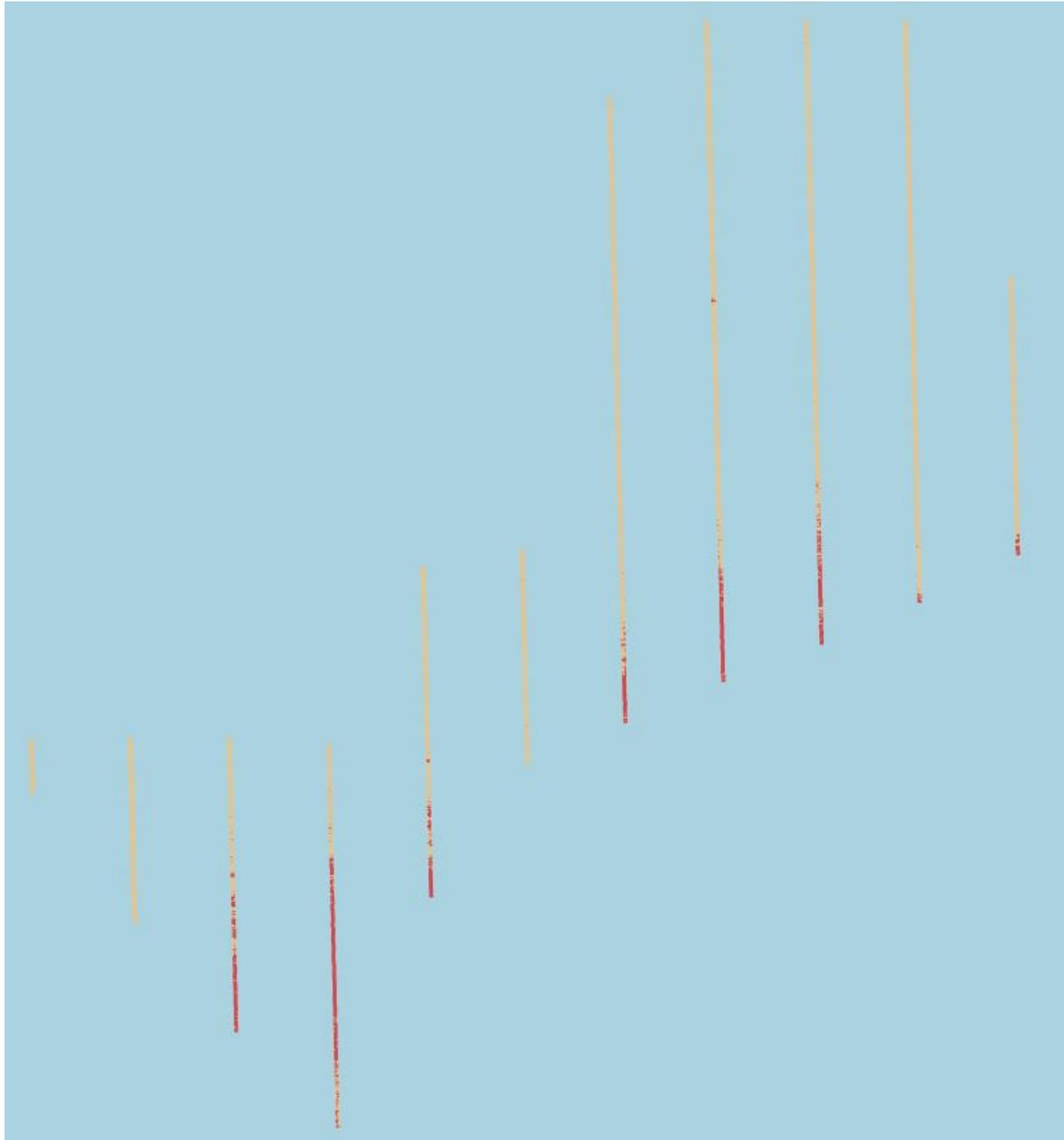


Figure 3 Nodes captured during the initial survey on 21/03/2024 (orange), and those missed due to low cloud, which were subsequently captured on 14/04/2024 (red).

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

Lateral Tolerance  
Vertical tolerance

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

**Table 2 Image capture and other observations during the January to March 2024 seasonal survey (March/April 2024).**

Survey line	Survey flight *	Transect length (km)	N cameras capturing images	N image nodes (captured)	N images nodes (analysed)	Camera issues**	Shipping observations	Anecdotal observations	Health and Safety
1	1	105.23	3	708	708	Cloud on the line. Flight system crashed and issues with the GPS. Affected line section was re-flown.	-	-	-
	2	1.73		41	13	-	-	-	-
	<b>Total</b>	<b>106.96</b>		<b>749</b>	<b>721</b>				
2	1	116.26	3	829	811	-	-	-	-
	2	N/A		N/A	N/A	-	-	-	-
	<b>Total</b>	<b>116.26</b>		<b>829</b>	<b>811</b>				
3	1	99.22	3	701	688	-	-	Cloud on the line.	-
	2	25.98		187	183	-	-	-	-
	<b>Total</b>	<b>125.20</b>		<b>888</b>	<b>871</b>	-	-	-	-
4	1	110.62	3	781	763	-	-	Cloud on the line.	-
	2	22.12		160	156	-	-	-	-
	<b>Total</b>	<b>132.74</b>		<b>941</b>	<b>919</b>				
5	1	109.03	3	771	758	-	-	Cloud on the line. Flown at 1,225 ft.	-
	2	16.42		120	116	-	-	-	-
	<b>Total</b>	<b>125.45</b>		<b>891</b>	<b>874</b>	-	-	-	-
6	1	42.524	3	308	298	-	-	Cloud on the line. Flown at 1,200-1,300ft.	-
	2	N/A		N/A	N/A	-	-	-	-
	<b>Total</b>	<b>42.524</b>		<b>308</b>	<b>298</b>				
7	1	37.52	3	270	264	-	-	Cloud on the line. Flown at 1,200ft. Low cloud.	-
	2	27.95		201	197	-	-	-	-
	<b>Total</b>	<b>65.47</b>		<b>672</b>	<b>461</b>	-	-	-	-



8	1	20.82	3	155	134	-	-	Cloud on the line. Flown at 1,200ft.	-
	2	55.76		392	392	-	-	-	-
	<b>Total</b>	<b>76.58</b>		<b>547</b>	<b>526</b>	-	-	-	-
9	1	25.81	3	136	177	-	-	Cloud on the line.	-
	2	32.64		284	230	-	-	-	-
	<b>Total</b>	<b>58.45</b>		<b>420</b>	<b>407</b>	-	-	-	-
10	1	36.49	3	265	257	-	-	-	-
	2	N/A		N/A	N/A	-	-	-	-
	<b>Total</b>	<b>36.49</b>		<b>265</b>	<b>257</b>	-	-	-	-
11	1	9.84	3	79	70	-	-	-	-
	2	N/A		N/A	N/A	-	-	-	-
	<b>Total</b>	<b>9.84</b>		<b>79</b>	<b>70</b>	-	-	-	-
Total (1)		713.364	3	5,003	4,928	N/A	N/A	N/A	N/A
Total (2)		182.600		1,385	1,287				
<b>Total (survey)</b>		<b>895.964</b>		<b>6,589</b>	<b>6,215</b>				

\*Low cloud cover on the 21<sup>st</sup> of March obscured part of lines 1, 3, 4, 5, 7, 8 and 9. A successful re-survey of the affected nodes was undertaken on the 14<sup>th</sup> of April. Nodes captured and other observations on each line on the initial survey flight on the 21<sup>st</sup> of March are indicated as Survey flight 1. Those captured on the follow-up flight on the 14<sup>th</sup> of April are indicated as Survey flight 2.

\*\*Due to the vast number of capture points collected during a 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. APPEM collected additional data to ensure the required coverage was captured. Additionally, APPEM’s onboard camera technician monitored data as it was being captured. Surveys are aborted or lines re-surveyed if camera issues impact data collection.

**Table 3 Survey conditions during the January to March 2024 seasonal survey (March/April 2024).**

Survey line *	Date	Time on line (UTC) (Start / End)	Ground speed (knots)	Cloud cover (%)	Visibility (km)	Outside temperature (°C)	Wind speed (knots)	Wind direction (°)	Sea state (Douglas)	Turbidity
1	21/03/2024	14:59 / 15:54**	113	50	8	8	6	240	1	0
1 (2)	14/04/2024	15:32 / 15:34	125	50	>10	7	8	270	1	1
2	21/03/2024	14:09 / 14:51	115	60	8	8	6	240	1	0
3	21/03/2024	13:33 / 14:02	114	90	2-8	8	5	180	1	0
3 (2)	14/04/2024	15:10 / 15:17	120	30	>10	7	8	270	1	1
4	21/03/2024	12:45 / 13:22	115	80	8	10	10	170	1	0
4 (2)	14/04/2024	14:55 / 15:01	123	10	>10	8	7	250	1	1
5	21/03/2024,	12:02 / 12:38	120	90	1	8	10	170	1	0
5 (2)	14/04/2024	14:43 / 14:47	121	20	>10	8	8	270	1	1
6	21/03/2024	14:23 / 14:35	128	100	>10	8	13	270	1	0-1
7	21/03/2024	13:55 / 14:13	119	20	>10	8	13	270	1	0-1
7 (2)	14/04/2024	14:21 / 14:28	122	20	>10	8	5	300	1	1
8	21/03/2024	13:20 / 13:40	123	100	>10	8	6	180	1	0-1
8 (2)	14/04/2024	13:55 / 14:10	120	10	9	8	4	300	2	1
9	21/03/2024	12:52 / 13:08	121	10	>10	8	13	270	1	0-1
9 (2)	14/04/2024	13:35 / 13:44	120	90	9	8	5	320	2	1
10	21/03/2024	12:34 / 12:44	124	15	>10	8	12	250	1	0-1
11	21/03/2024	12:17 / 12:20	120	10	>10	8	12	250	1	0-1

\*Lines resurveyed on the 14<sup>th</sup> of April are indicated with (2) after the line number.

\*\*The initial survey of line 1 on the 23<sup>rd</sup> of March did not capture all nodes due to a flight system crash and GPS issues, and part of the line was immediately re-flown. Time on the line is therefore longer than usual.

**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	<i>Surveys not typically flown at sea states &gt; 3.</i>			96-100	Overcast		
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 within higher-level taxonomic groups for the January to March 2024 seasonal survey period (March/April 2024).**

Species	Group Level 1	Group Level 2	Group Level 3	Group Level 4
Kittiwake	Small Gull species	Gull species	Fulmar/ Gull species	Unidentified Bird species
Fulmar				
Arctic Tern	'Commic' Tern		Tern species	
Arctic Skua	Arctic/ Long-tailed Skua		Skua species	
Long-tailed Skua				
Guillemot	Guillemot and / or Razorbill	Auk species	Auk and / or Shearwater species	
Razorbill				
Puffin				
Manx shearwater	Unidentified Shearwater species			
Gannet				

**Table 6 Marine mammal species included within higher-level taxonomic groups for the January to March 2024 seasonal survey period (March/April 2024).**

Species	Group Level 1	Group Level 2	Group Level 3	Group Level 4
Grey Seal	Seal species			Unidentified Marine Mammal species
Common Dolphin	Dolphin species			
Common Bottlenose Dolphin				
Unidentified Dolphin species				
Minke Whale	Rorqual Whale species			
Fin Whale				
Cuvier's Beaked Whale	Beaked Whale species			

### 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 (Image Screening QA), reviewed percentage agreement between two sets of analysts for images identified as positive (containing at least one target of interest) and those identified as blank (not containing any targets of interest). A random sample of 20% of the 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 93%. No re-analysis was necessary on this occasion. The target agreement rate was 96%.

Prior to the second step in the QA process, the tagged data underwent initial data checks, which are a series of discretionary sense checks carried out by QA Analysts. No fixed metrics are associated with these checks, this step provides an additional layer of checks to ensure the tagged data is as accurate as possible. This process involves sense checking tagged images for missed targets such as images or areas containing large aggregations of birds, pods of marine mammals and anthropogenic structures. A selection of images was checked for accuracy in target duplication and a sample of blank images were also checked for potential missed targets around busy areas of the survey.

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. As the current standard, 100% of the identifications were checked to ensure data accuracy. All data underwent a final review by a Technical Specialist. For the current survey, the identification agreement rate was 88% for all snags recorded. Additional checks on behaviour, age, sex and flight height suitability were also reviewed.

### 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  $\pm$  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 Heights

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)<sup>1</sup>. 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 (based on reference lengths taken from the literature) bird measurements, 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 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.

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<sup>1</sup> 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.

## 4. Abundance and distribution

### 4.1 Abundance

A total of 332 birds were recorded in the Survey Area during the January to March 2024 seasonal (March/April 2024) survey. Of those, 258 were sitting on the water and 74 were in flight (Table 7).

A total of 195 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 January to March 2024 seasonal survey period (March/April 2024).**

Species Group	Species	Flying	Sitting	Perched	Diving	Taking off	Deceased	Total
Gull	Kittiwake	9	12	-	-	-	-	21
Tern	Arctic tern	1	-	-	-	-	-	1
Skua	Arctic / long-tailed skua	1	-	-	-	-	-	1
Auk	Guillemot	-	9	-	-	-	-	9
	Razorbill	-	2	-	-	-	-	2
	Guillemot / razorbill	-	3	-	-	-	-	3
	Puffin	-	83	-	-	-	-	83
	Auk species	-	11	-	-	-	-	11
Fulmar	Fulmar	6	7	-	-	-	-	13
Shearwaters	Manx shearwater	44	47	-	-	-	-	91
	Unidentified shearwater species	1	1	-	-	-	-	2
Auk / shearwater	Auk / shearwater species	2	3	-	-	-	-	5
Gannet	Gannet	10	79	-	-	-	-	89
Bird	Unidentified bird species	-	1	-	-	-	-	1
<b>Total</b>		<b>74</b>	<b>258</b>	-	-	-	-	<b>332</b>

**Table 8 Total number of individuals of marine megafauna by species or species group recorded during the January to March 2024 seasonal survey period (March/April 2024).**

Species Group	Species	Deeply Submerged*	Submerged**	Surfacing	Bottling***	Hauled Out	Deceased	Total
Dolphin	Common dolphin	7	157	15	-	-	-	179
	Bottlenose dolphin	2	2	-	-	-	-	4
	Dolphin species	1	-	-	-	-	1	2
Baleen Whale	Minke whale	-	2	-	-	-	-	2
	Fin whale	-	-	1	-	-	-	1
Beaked Whale	Cuvier's beaked whale	-	1	1	-	-	-	2
Bony fish	Ocean sunfish	-	3	-	-	-	-	3
Shark	Blue shark	-	2	-	-	-	-	2
<b>Total</b>		<b>10</b>	<b>167</b>	<b>17</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>195</b>

\*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 used 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 4 and Figure 5 show the locations of all birds and other marine megafauna, respectively, recorded in the Survey Area. Figure 6 to Figure 9 show the locations of the most abundant birds by species within the Survey Area. Figure 10 shows the aggregated distribution of less abundant bird species recorded in the Survey Area. Figure 11 shows the location of common dolphin within the Survey Area and Figure 12 shows the aggregated distribution of less abundant marine megafauna recorded in the Survey Area. There were no vessels or abiotic structures recorded during this survey period. Birds were evenly distributed across the Survey Area. Marine megafauna species were relatively evenly distributed throughout the Survey Area but had slightly higher concentrations in the central east of the Survey Area, mainly due to aggregations of common dolphins.

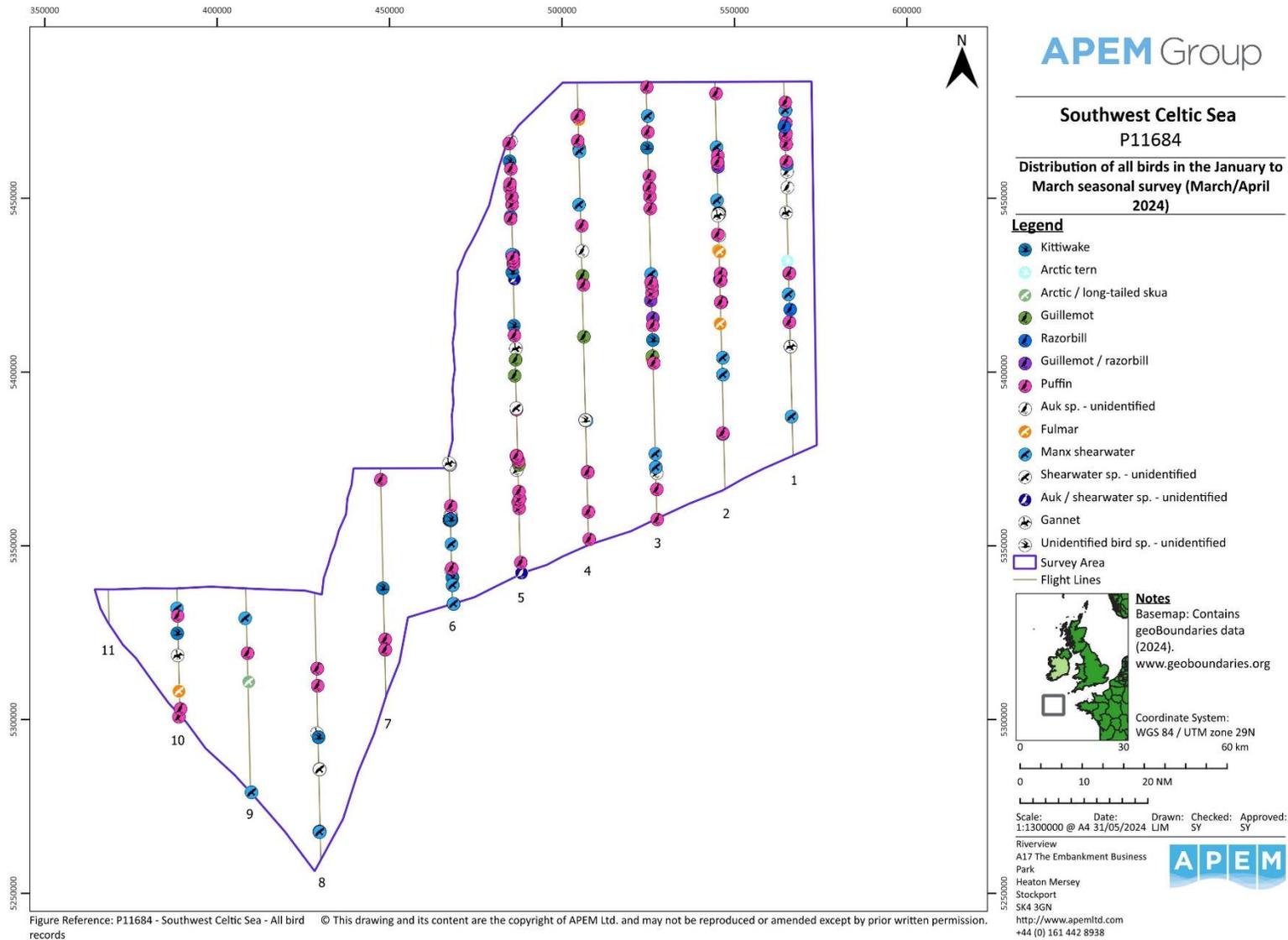


Figure 4 Distribution of all birds recorded in the January to March 2024 seasonal survey (March/April 2024).

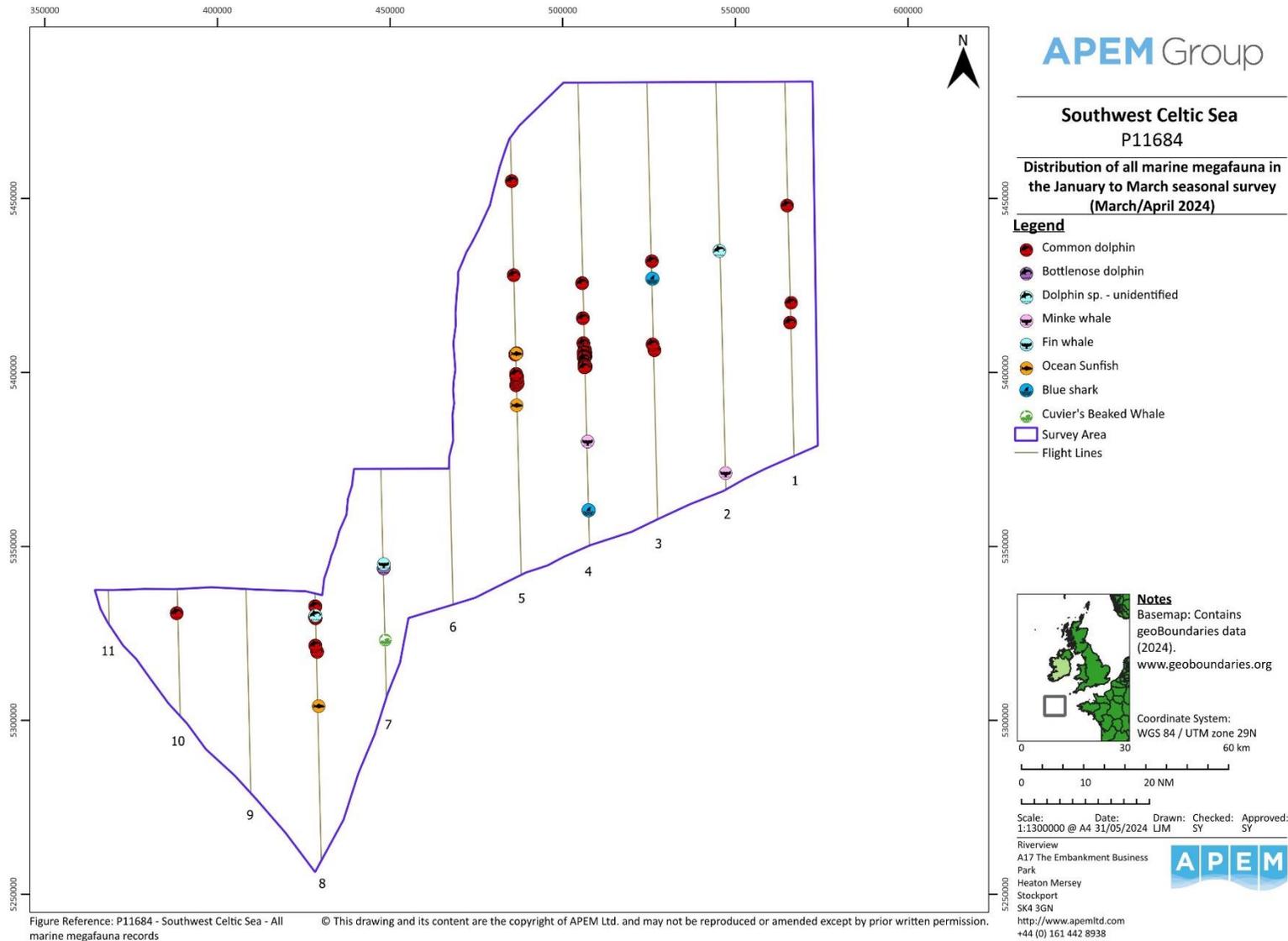


Figure 5 Distribution of all marine megafauna recorded in the January to March 2024 seasonal survey (March/April 2024).

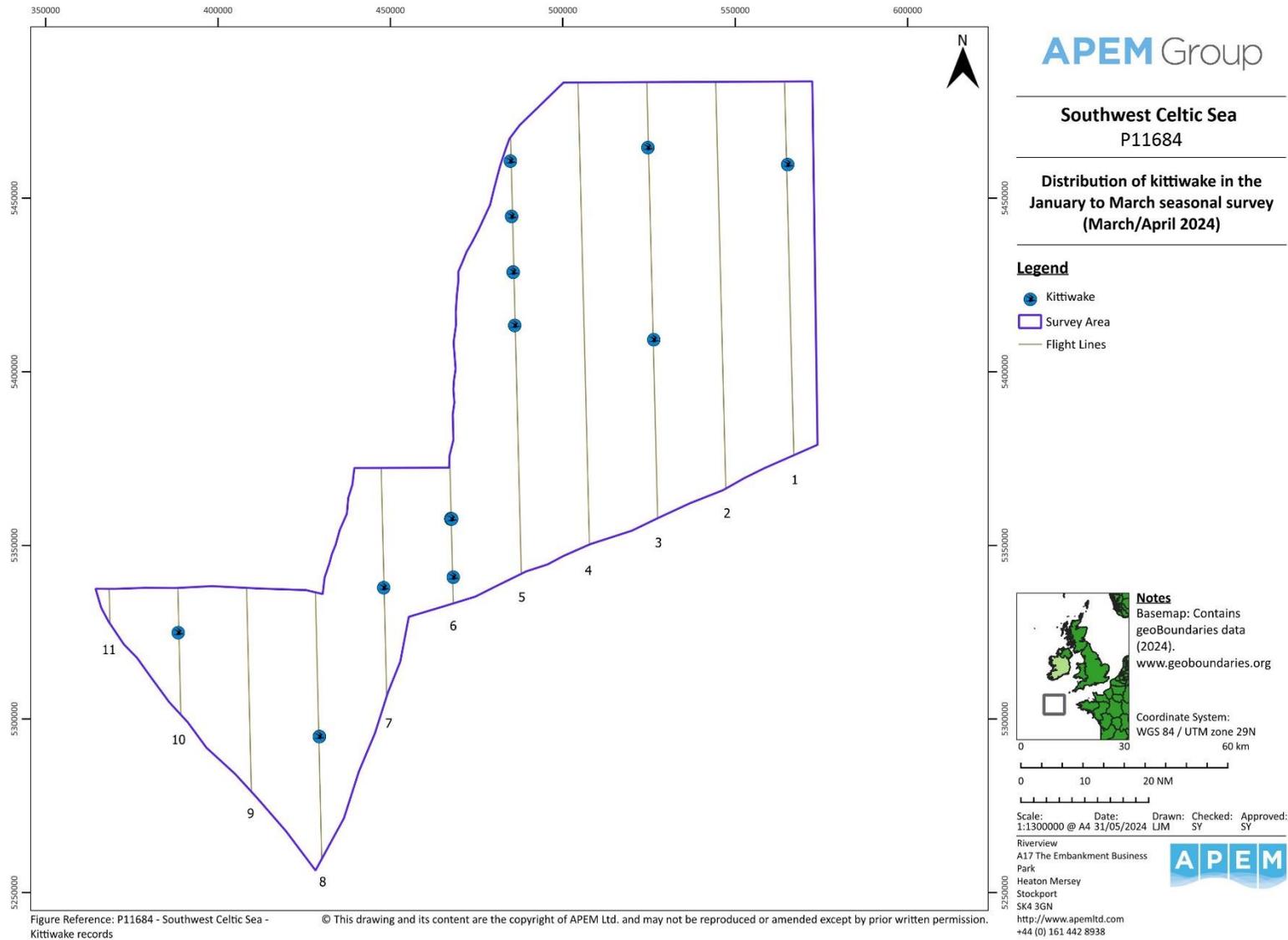


Figure 6 Kittiwake distribution recorded in the January to March 2024 seasonal survey (March/April 2024).

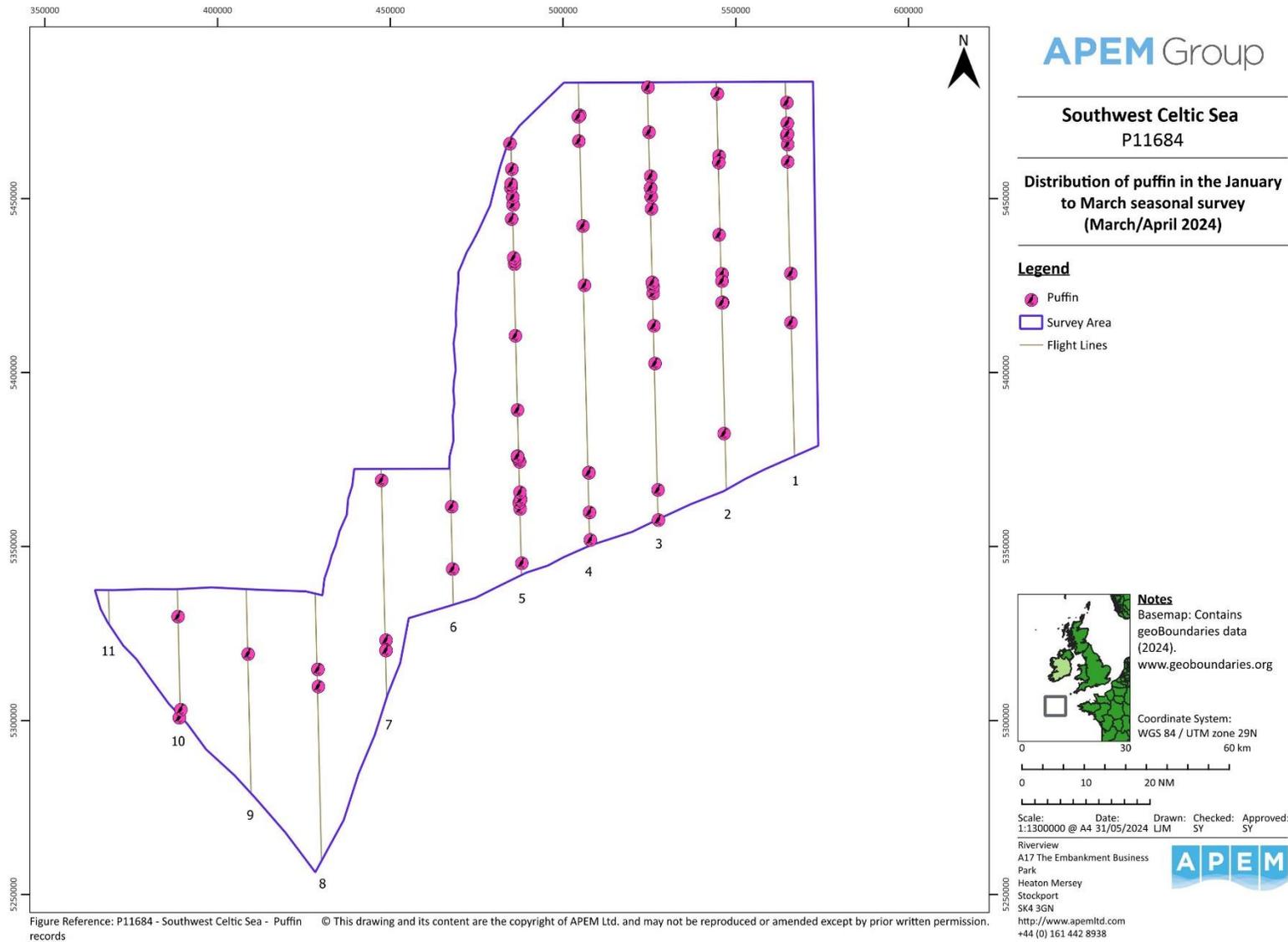
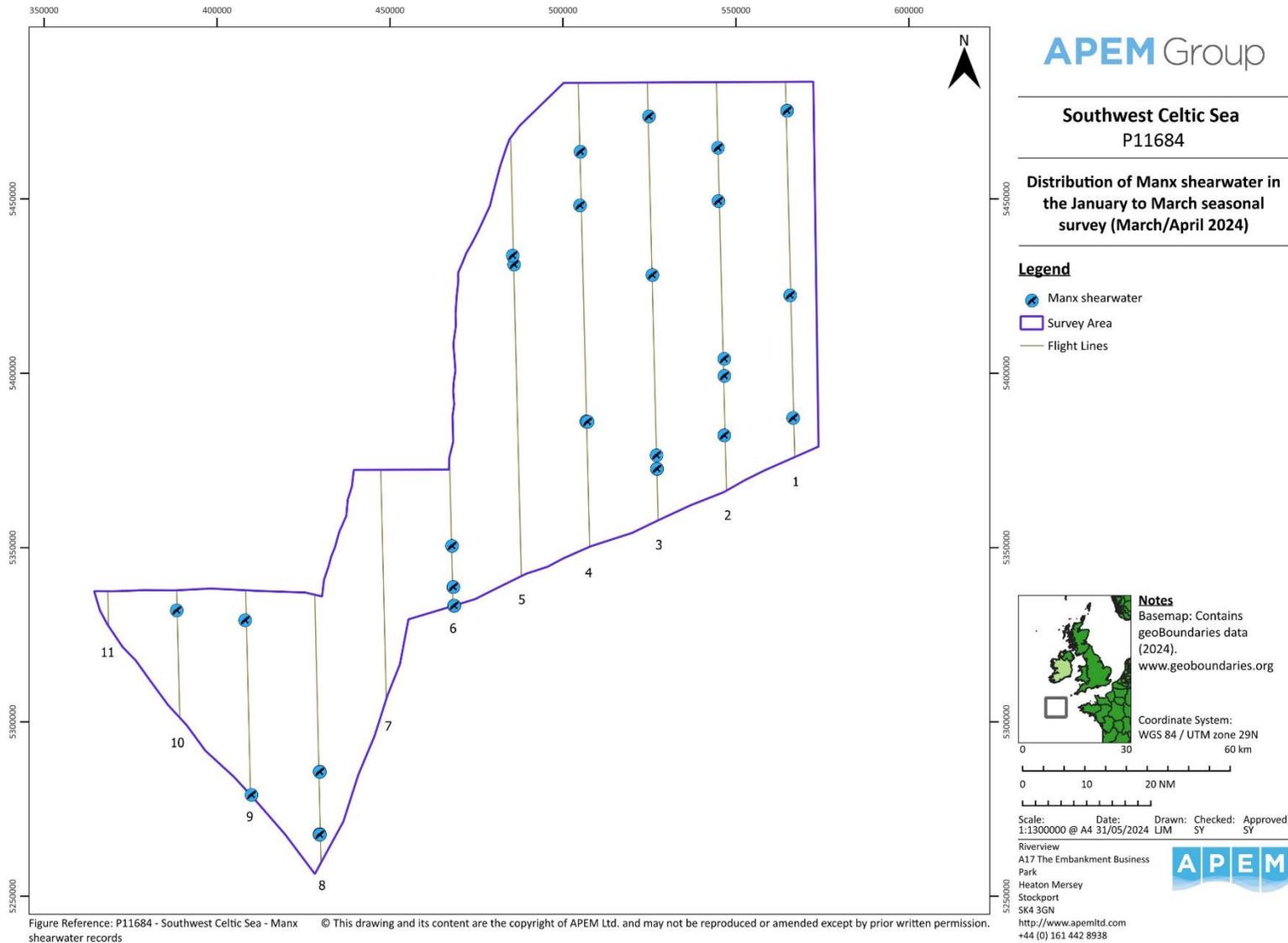
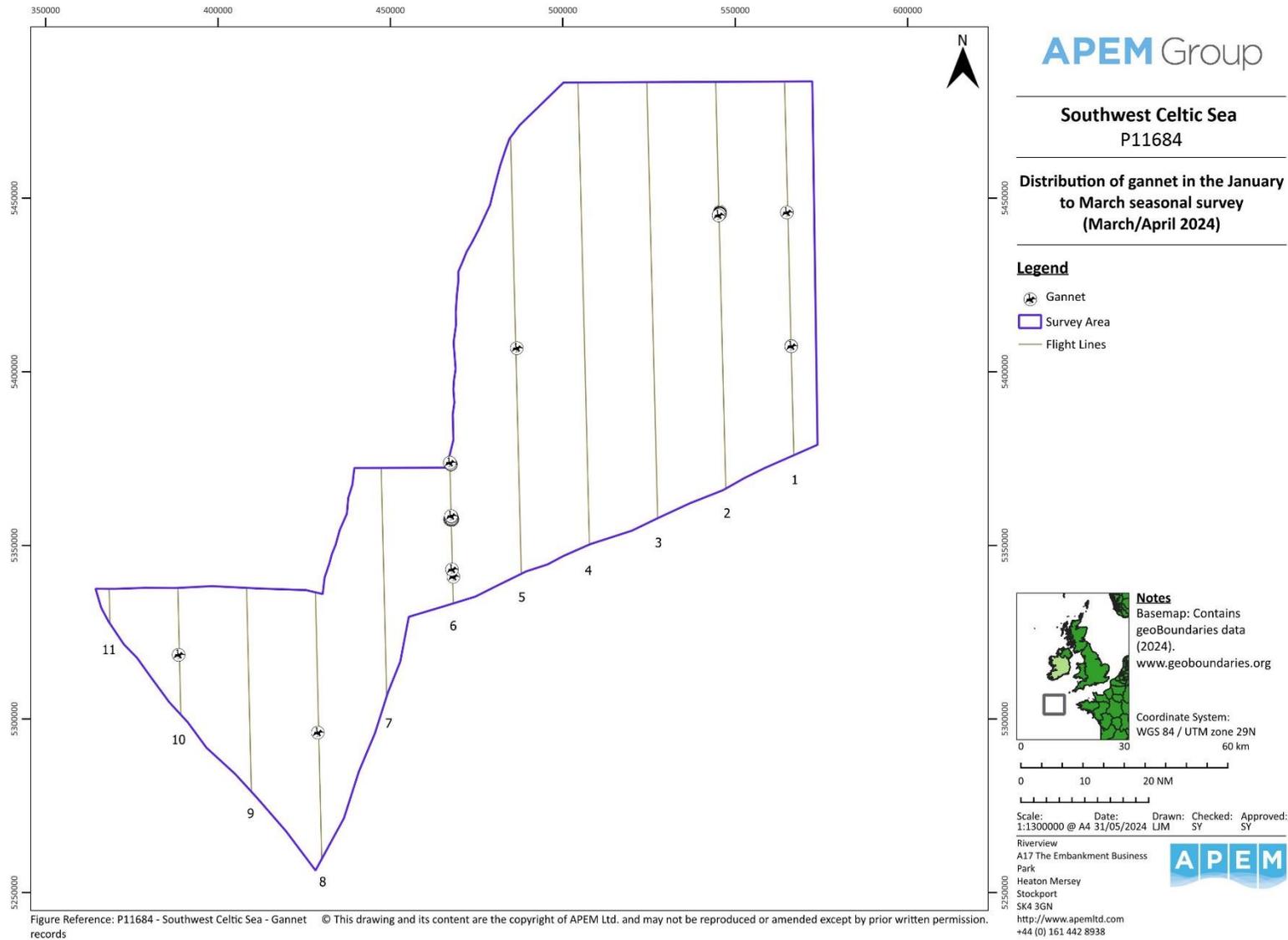


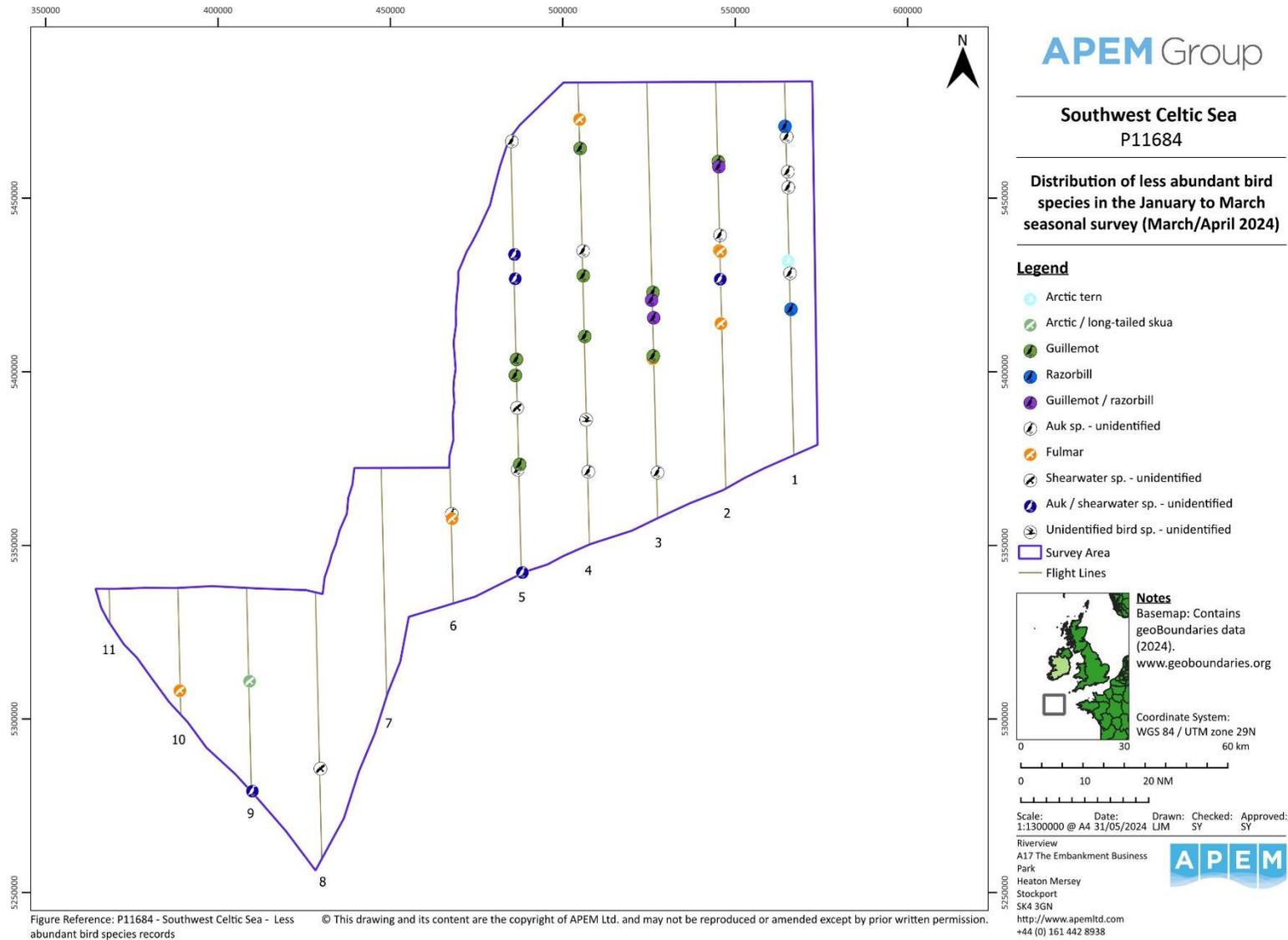
Figure 7 Puffin distribution recorded in the January to March 2024 seasonal survey (March/April 2024).



**Figure 8 Manx shearwater distribution recorded in the January to March 2024 seasonal survey (March/April 2024).**



**Figure 9 Gannet distribution recorded in the January to March 2024 seasonal survey (March/April 2024).**



**Figure 10 Distribution of less abundant bird species recorded in the January to March 2024 seasonal survey (March/April 2024).**

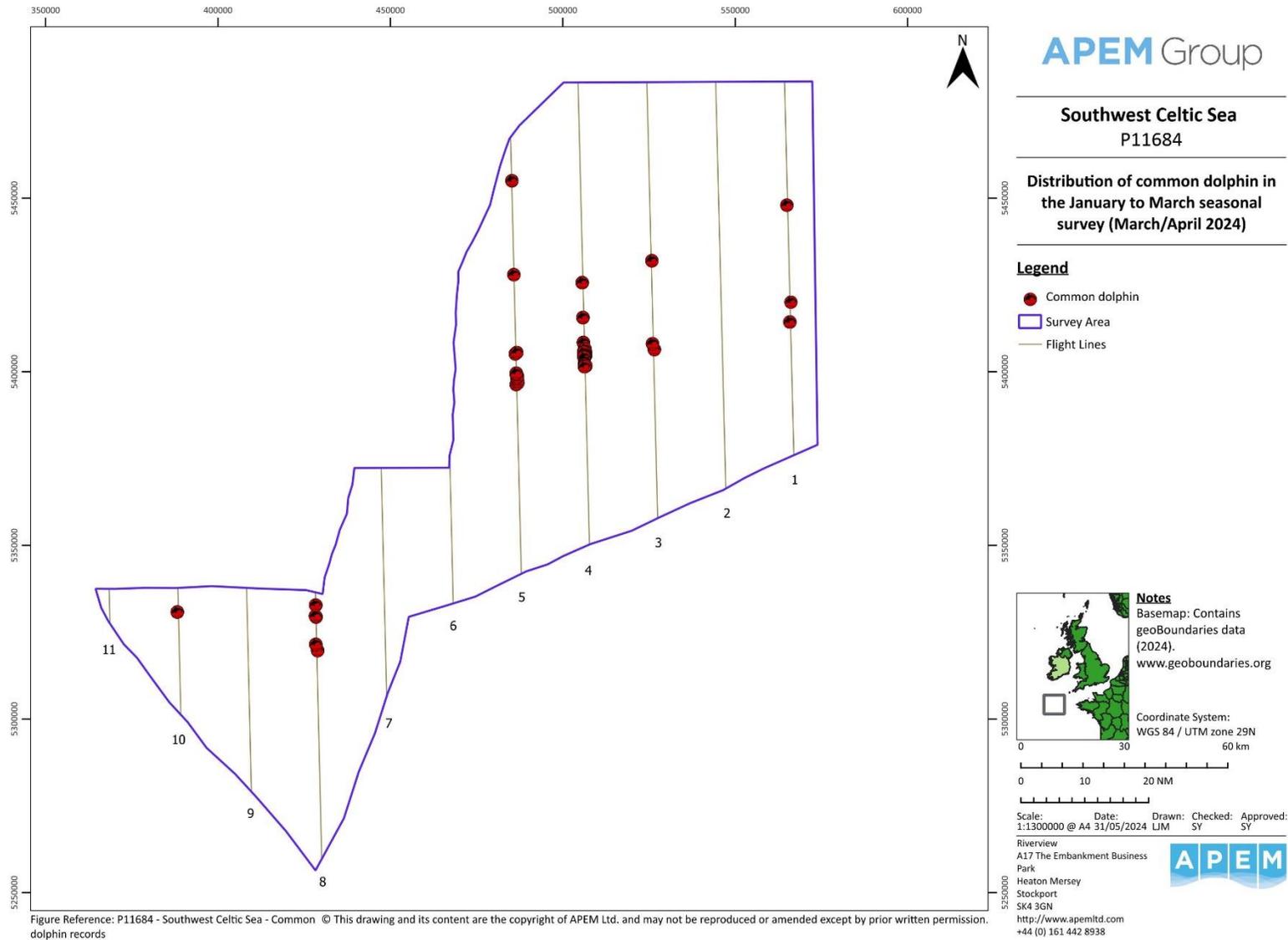


Figure 11 Common dolphin distribution recorded in the January to March 2024 seasonal survey (March/April 2024).

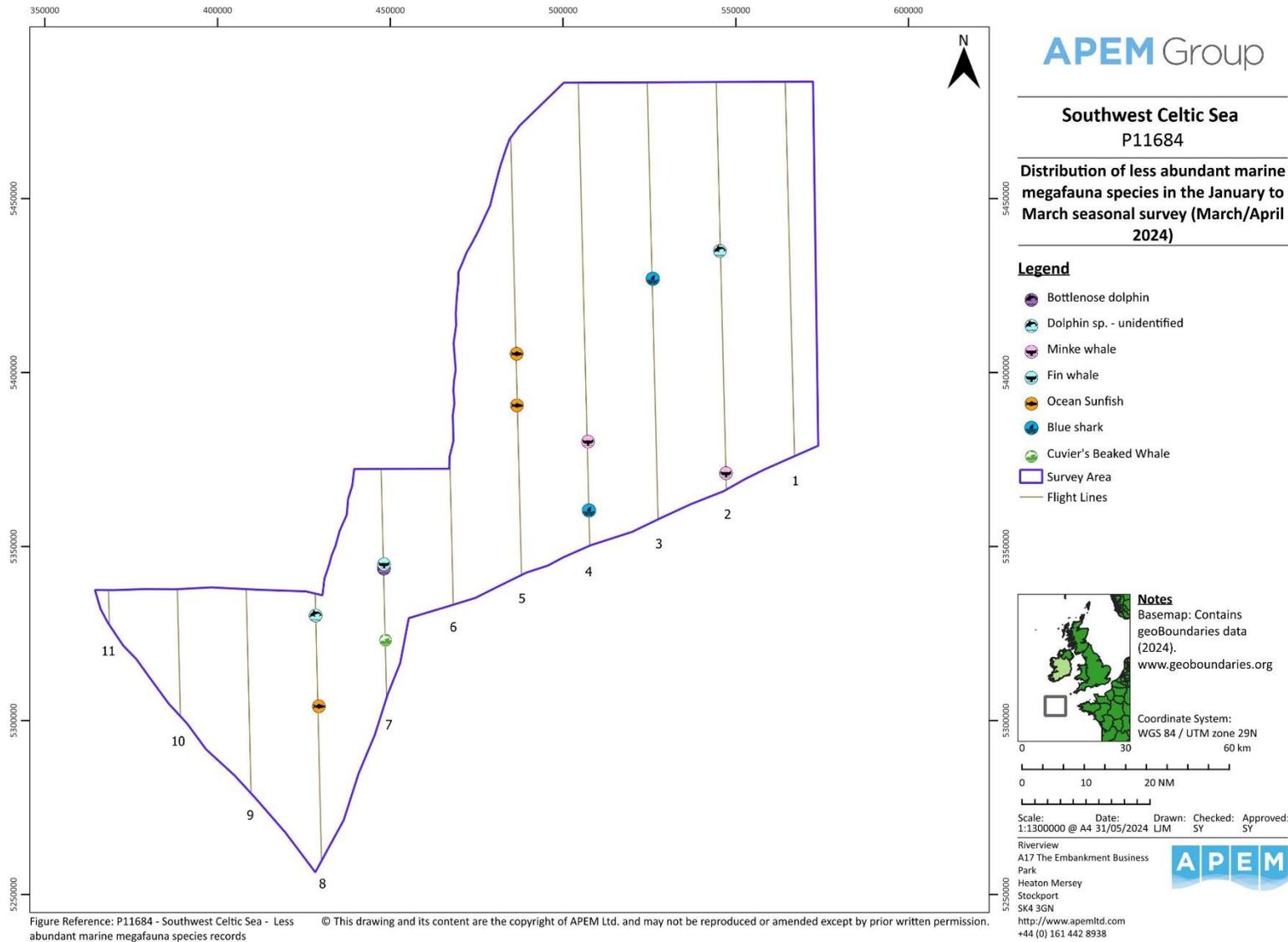


Figure 12 Distribution of less abundant marine megafauna recorded in the January to March 2024 seasonal survey (March/April 2024).

## 5. Abiotic Structures and Observations

No abiotic structures or vessels were observed during this survey period.

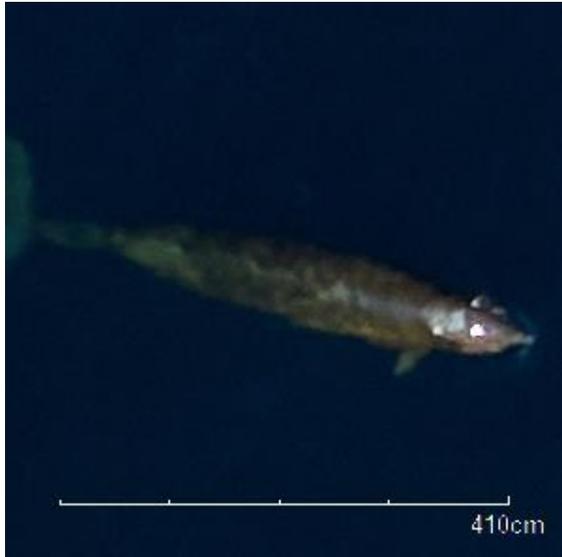
## Appendix I Scientific Names and Taxonomy

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

Species	Scientific Name
Kittiwake	<i>Rissa tridactyla</i>
Arctic tern	<i>Sterna paradisaea</i>
Arctic/ long-tailed skua	<i>Stercorarius parasiticus/ longicaudus</i>
Guillemot	<i>Uria aalge</i>
Razorbill	<i>Alca torda</i>
Puffin	<i>Fratercula arctica</i>
Fulmar	<i>Fulmarus glacialis</i>
Manx shearwater	<i>Puffinus puffinus</i>
Gannet	<i>Morus bassanus</i>
Common Dolphin	<i>Delphinus delphis</i>
Bottlenose dolphin	<i>Tursiops truncatus</i>
Minke whale	<i>Balaenoptera acutorostrata</i>
Fin whale	<i>Balaena physalus</i>
Cuvier's beaked whale	<i>Ziphius cavirostris</i>
Ocean Sunfish	<i>Mola mola</i>
Blue Shark	<i>Prionace glauca</i>

## 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.



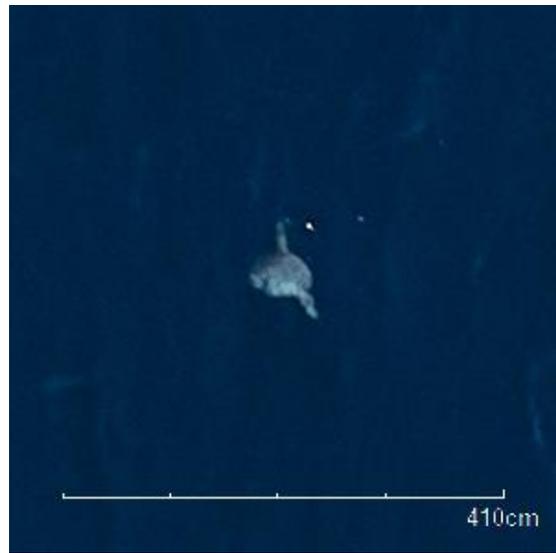
**Figure 13 Cuvier's beaked whale.**



**Figure 14 Common dolphin. Although submerged, it is still visible and identifiable.**



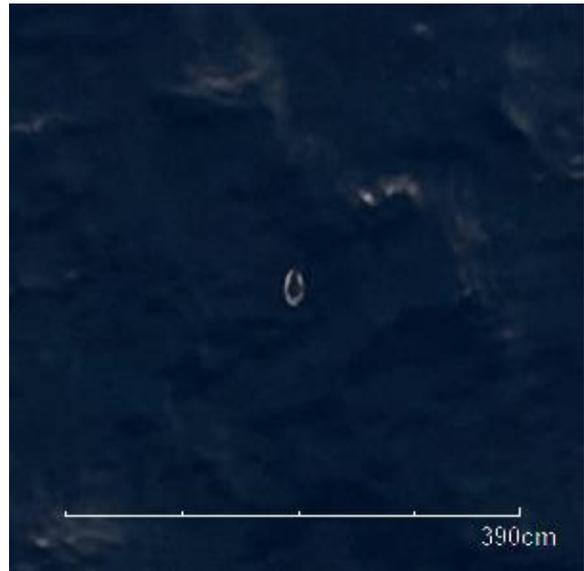
**Figure 15 Kittiwake in flight.**



**Figure 16 Ocean sunfish. Although submerged, it is still visible and identifiable.**



**Figure 17** Sitting guillemot.



**Figure 18** Sitting guillemot / razorbill.