FIVE ESTUARIES OFFSHORE WIND FARM

10.27 DIGITAL AERIAL SURVEYS – OUTER TRIAL BANK

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Five Estuaries Offshore Wind Farm Ltd

Outer Trial Bank
Data analysis of bank imagery

Report – Survey June 2024

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APEM

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1.0	06/11/2024	All	All	Submission to client	AL, MA

Contents

List of Figures

List of Tables

1.   Executive Summary

APEM Ltd. has been contracted via GoBe by Five Estuaries Offshore Wind Farm Ltd for the data analysis of imagery from a digital aerial survey conducted in June 2024 of the Outer Trial Bank, a small man-made island in the Wash. The main purpose of the programme is to provide the following outputs: raw data on nesting birds, an orthomosaic, a 3D model, and habitat mapping delineating areas of grass, shrub, and rock.

The aerial survey was undertaken on the 30th of June 2024, using APEM's high-resolution camera system to capture digital still imagery. Images collected have been analysed and internally quality assured.

A total of 3,136 birds were recorded in the Survey Area during June 2024. The most abundant species recorded was herring gull (n=2,031), followed by lesser black-backed gull (n=656), large gull species (n=439) and great black-backed gull (n=10).

No health and safety issues were reported during the survey.

2. Introduction

This report presents the data collected during the aerial survey conducted in June 2024, focusing on nesting birds. It provides detailed information on the species identified, their behaviour, and visual representations of species distributions and associated habitats.

The survey was carried out by APEM using a twin-engine aircraft equipped with a bespoke camera system. From the captured imagery, an orthomosaic – a high-resolution, geometrically corrected composite image – was produced by stitching together multiple individual images.

Figure 1 incorporates nesting bird sightings, where precise geospatial data, along with habitat observations, will enable future informed decisions by Five Estuaries Offshore Wind Farm Ltd and their ornithological advisors.
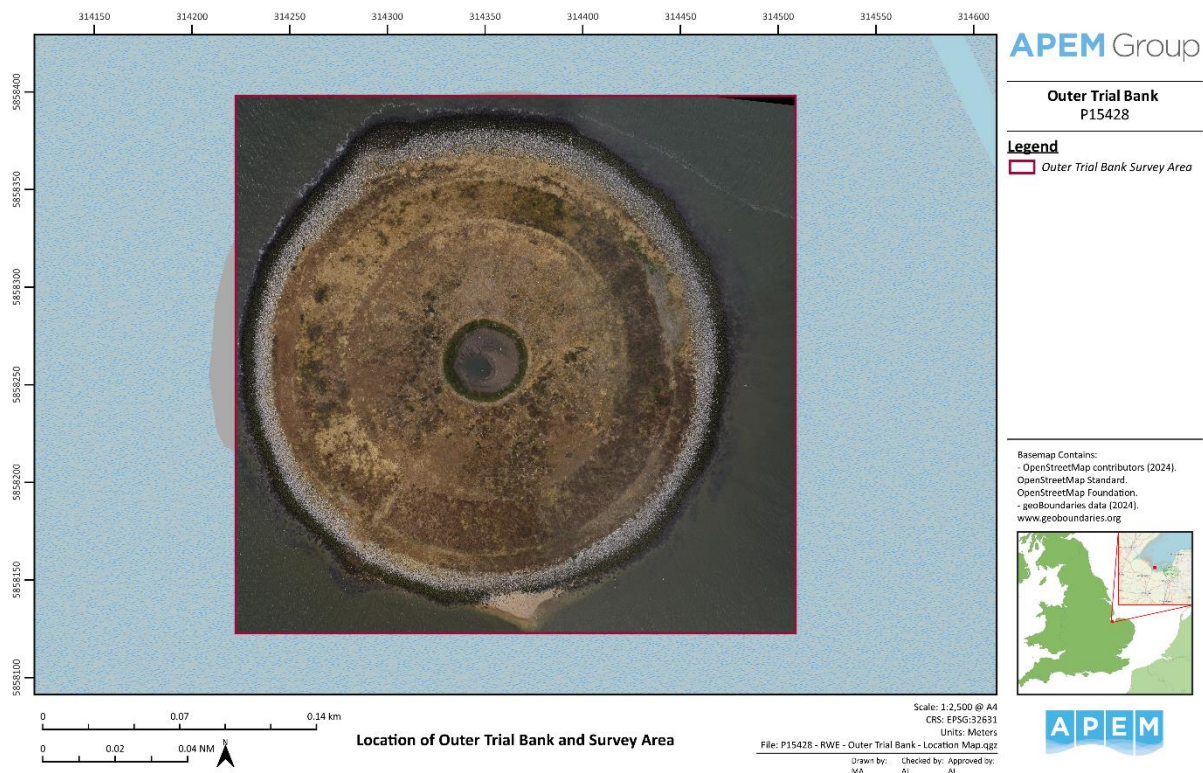
Figure 1   Orthomosaic of the Outer Trial Back in June 2024

3.   Data Collection and Analysis

APEM's bespoke camera system was fitted into a twin-engine aircraft, wherein custom flight planning software allowed each flight line to be accurately mapped for use both before and during the flight. The aircraft collected the data at an altitude of 1,300 feet (ft). Data were collected using a transect-based survey design, providing 1.5 centimetre (cm) ground survey distance (GSD) digital still images.

The orthomosaic was analysed in GIS software to enumerate large gulls to species level, where possible. Individual birds were tagged in GIS as vector points and a species identification, age, and behaviour was assigned to each, as appropriate (**Appendix I Scientific Names of Birds and Marine Megafauna**, **Appendix II JNCC Bird and Marine Megafauna Groups**). Key features used for adult identification included mantle colour and size. Adult European herring gulls have paler grey mantles compared to the darker, charcoal grey mantles of adult lesser black-backed gulls. Great black-backed gull adults have almost jet-black mantles and are bigger in size. Juvenile birds identified to species level, was based on association and/or proximity to adult birds of known species. All birds not identified to species level (large gull sp.) were unattended juvenile birds, which varied in size and were all uniformly grey in colouration and therefore not possible to identify to species with any confidence in aerial imagery. See **Appendix III Example images** for visual illustration.

Internal quality assurance was undertaken by Technical Specialists to check for any missed birds and to ensure the correct species were identified and age and behaviour groups assigned. It is likely several obscured juvenile gulls went undetected in the aerial imagery, mainly those hidden under vegetation and in/around the rocky shore, given the tendency of young gulls to hide under/within such features. Data reported are actual counts of large gull species inhabiting the Outer Trial Bank island at the time of survey. Apparently Occupied Nests (AON's) were not determined as part of this project.

Data reported are raw counts of animals that have not yet been subject to extrapolation for abundance estimates.

4. Abundance and Distribution

4.1 Avian Abundance

A total of 3,136 birds were recorded in the Survey Area during June 2024 (**Table 1**). The most abundant species recorded was European herring gull (n=2,031), followed by lesser black-backed gull (n=656), large gull species (n=439), and great black-backed gull (n=10).

There were 3,074 birds (98.02%) recorded as sitting during the June 2024 survey with herring gull (n=1,985), lesser black-backed gull (n=641), large gull species (n=438) and great black-backed gull (n=10). A total of 59 birds (1.88%) were recorded in flight during this survey, these consisted of herring gull (n=44) and lesser black-backed gull (n=15).

All observed large gulls were unattended juveniles, making species-level identification not possible. These individuals were likely either herring gulls or lesser black-backed gulls.

A total of 979 birds were able to be aged (**Table 2**). These consisted of large gull species (439 juveniles), European herring gull (403 juveniles; one second summer), and lesser black-backed gull (140 juveniles).

In total, three birds (0.10%) were recorded deceased, consisting of European herring gull (n=2) and large gull species (n=1).

Other species observed but not counted included common eider, Eurasian oystercatcher, common shelduck, and European shag/great cormorant (**Appendix III Example images**).

Table 1   Raw counts of nesting bird species (in taxonomic order) recorded during June 2024 survey

Family	Species	Deceased	Flying	Sitting	Total
Large Gull	European Herring Gull	2	44	1,985	**2,031**
	Lesser Black-backed Gull	0	15	641	**656**
	Great Black-backed Gull	0	0	10	**10**
	Large Gull species *(European Herring Gull or Lesser Black-backed Gul)*	1	0	438	**439**
Total Birds		**3**	**59**	**3,074**	**3,136**

Table 2   Breakdown of species able to be aged

Family	Species	Adult	Second Year	Juvenile	Total
Large Gull	European Herring Gull	1,627	1	403	**2,031**
	Lesser Black-backed Gull	516	0	140	**656**
	Great Black-backed Gull	10	0	0	**10**
	Large Gull species	0	0	439	**439**
Total Birds		**2,153**	**1**	**982**	**3,136**

4.2   Habitat Mapping

A habitat map was created to present the habitat features in the area. This would then be used to determine where specific species of birds and other animals are located. Details regarding the features were collected from various sources such as Orthomosaic images, 3D models, google earth pro and APEM experts in habitats. The map was created in QGIS, this included the area of interest (site boundary) and features.

The habitat types identified using aerial/orthomosaic imagery included:

- **Tall/ Short grass**: Initially categorized as "grass" in the aerial imagery, the 3D model allowed for further distinction between short and tall grass by providing insights into grass height
- **Scrub:** Scrubland exhibited slight colour variation and grew sporadically across habitats, often mixed with grassy areas. These appeared as bush-like formations, identified through a combination of aerial/orthomosaic imagery and the 3D model.
- **Rocky Shore:** Using orthomosaic imagery, wet and dry areas of the rocky shore were distinguished by the colour variation in the rocks. Wet rocks appeared darker and more saturated, while dry rocks showed lighter tones.
- **Sand**: Sand was primarily located along the shoreline, adjacent to the rocky areas, and was easily identifiable through aerial/orthomosaic imagery.
- **Mudflat:** The mudflat was identified by its brown colour and sediment patterns, with classification confirmed by another experienced member of staff.
- **Bare ground:** Originally classified as grass, certain grey-toned sections were later identified as bare ground or gravel upon closer inspection and use of the 3D model.
- **Saltwater Lagoon:** The saltwater lagoon was identified based on its location and characteristic surroundings, as it is a body of water typically separated from the shallow coastal waters. This feature was classified using aerial/ orthomosaic imagery and later confirmed through consultation with another experienced team member.
- **Overlapping features:** In some areas, features overlapped, making it difficult to assign a dominant category. It was decided to classify these areas as a combination of both features, rather than choosing one (e.g., "Bare Ground/ Scrub").

To enhance the accuracy of the classifications, APEM's team utilized the 3D model developed for the project. This allowed for a more detailed assessment of the landscape, considering both topography and elevation, to support and validate the habitat classifications.

To ensure the reliability of the classifications, a consultation with experienced team members in habitat identification took place. Their insights were used to verify the accuracy of the classifications and make any necessary adjustments.

The locations of all nesting birds recorded during the survey are presented in **Figure 2**, individuals may appear to overlap when in close proximity to one another. A per-species breakdown of the species-habitat map is also presented in **Figure 3**. From here, distribution patterns can more easily be distinguished. Herring gulls were primarily distributed in central areas and along the shoreline. Lesser black-backed gulls had a small concentration in the southeast, while great black-backed gulls were mainly found along the shoreline. Large gulls were distributed across the northeast, north, northwest, and west regions.
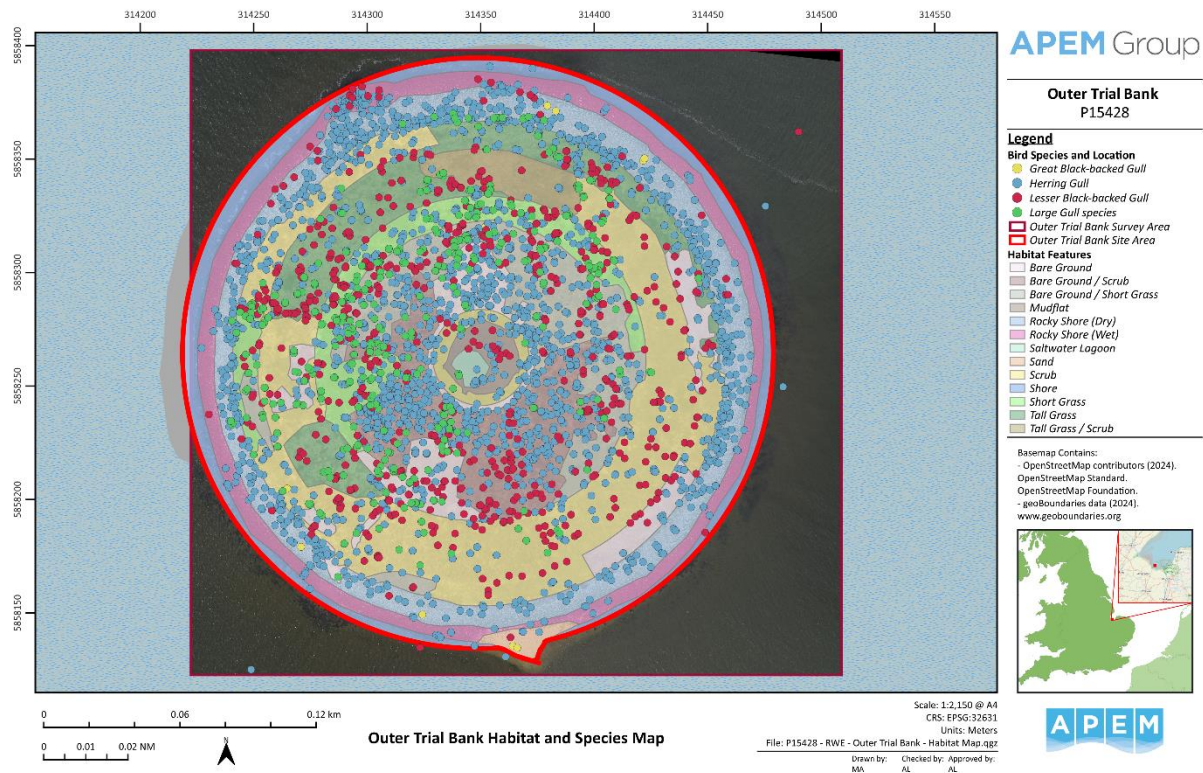
Figure 2 **Habitat mapping for nesting birds recorded within the Survey Area during June 2024**
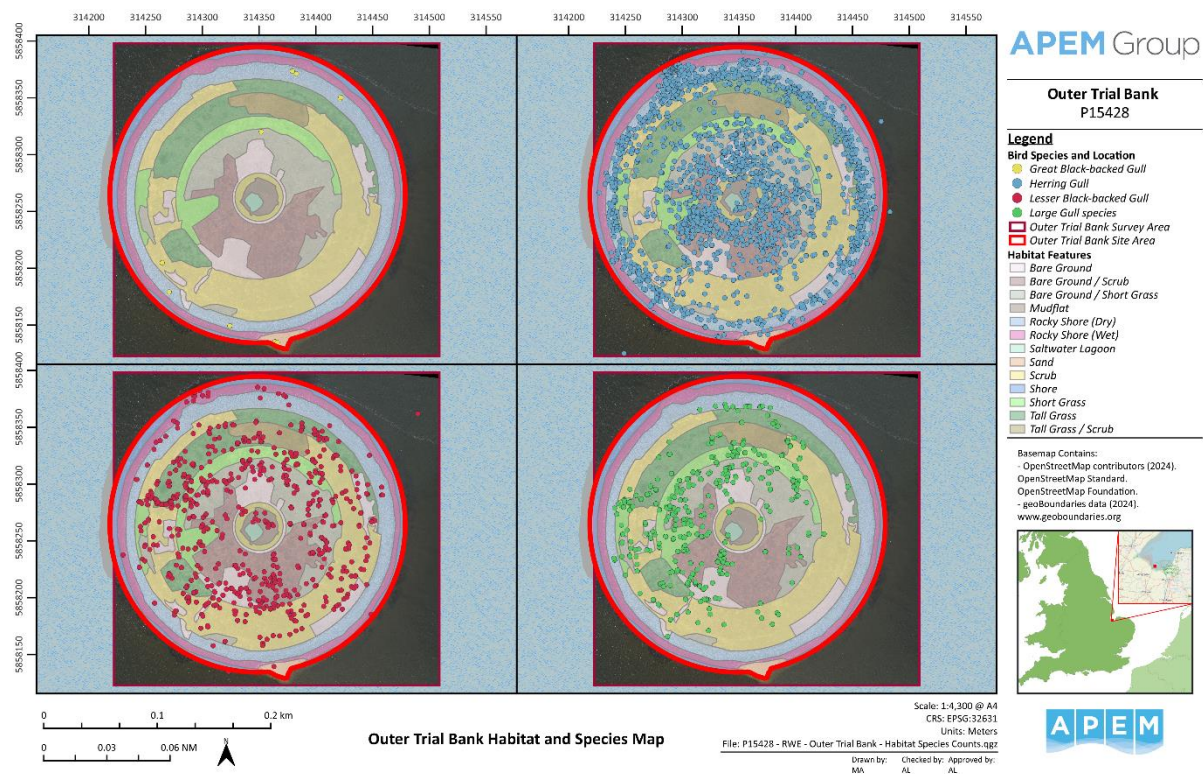
Figure 3 **Habitat species counts for nesting birds recorded within the Survey Area during June 2024**

Further to the distribution maps, species associations with habitat as observed at time of image capture can also be described, though this should not be considered evidence of habitat preference without in-depth statistical analysis and should only be taken as a snapshot into potential species-habitat interactions.

From the habitat designations assigned, 'Rocky Shore (Dry)' featured the greatest number of habitat-species association, though this was predominantly due to the greater number of herring gulls associated with the habitat (**Table 3**). On a per species basis, 'Rocky Shore (Dry)' was most associated with great black-backed gulls and herring gulls, whilst 'Scrub' was predominantly associated with lesser black-backed gulls, and 'Bare Ground / Short Grass' was predominantly associated with large gull species. 'Saltwater Lagoon' featured the lowest number of species association with five gulls though appropriately featured the lowest overall habitat cover at 0.34%, which was closely followed by 'Sand' with six gulls and 0.63% overall coverage. 'Scrub' featured the highest habitat coverage at 22.03%, though did not feature the greatest overall species association. 'Rocky Shore (Dry)' followed 'Scrub' as the second highest overall coverage at 15.43% which is more in line with assumed probability of association when considering the number of birds compared with coverage.

However, despite the apparent lower association with 'Scrub' cover, it should also be noted that areas designated as 'Scrub' were more highly associated with elevation changes as shown in **Figure 4**, and mostly occur on the sloped sides of the elevated ground.

Table 3   Species counts with habitat association as observed at time of image capture

Habitat	Percentage Cover (Site)	Species				Total
		Great Black-backed Gull	Herring Gull	Lesser Black-backed Gull	Large Gull species	
Bare Ground	7.36	-	199	57	50	**306**
Bare Ground / Scrub	9.35	-	362	82	66	**510**
Bare Ground / Short Grass	9.75	1	225	118	95	**439**
Mudflat	1.16	-	18	11	2	**31**
Rocky Shore (Dry)	15.43	6	635	22	21	**684**
Rocky Shore (Wet)	8.92	-	122	15	-	**137**
Saltwater Lagoon	0.34	-	4	1	-	**5**
Sand	0.63	2	3	1	-	**6**
Scrub	22.03	1	204	133	59	**397**
Shore	7.13	-	5	1	-	**6**
Short Grass	6.39	-	121	81	85	**287**
Tall Grass	9.29	-	118	118	45	**281**
Tall Grass / Scrub	2.22	-	11	14	16	**41**
N/A (open water)	-	-	4	2	-	**6**
Total		**10**	**2,031**	**656**	**439**	**3,136**

4.3   3D Modelling

The 3D model process involves capturing high-quality photos from multiple angles with an APEM format camera system and aligning these photos to create a dense point cloud, which is formed by common points in overlapping images. This is followed by constructing a 3D mesh and applying textures to achieve a realistic appearance. APEM's experts are then able to export the model into various formats, in this case the model was exported as an SLPK which can be loaded in various 3D viewing software's such as ArcGIS Pro (**Figure 4**).
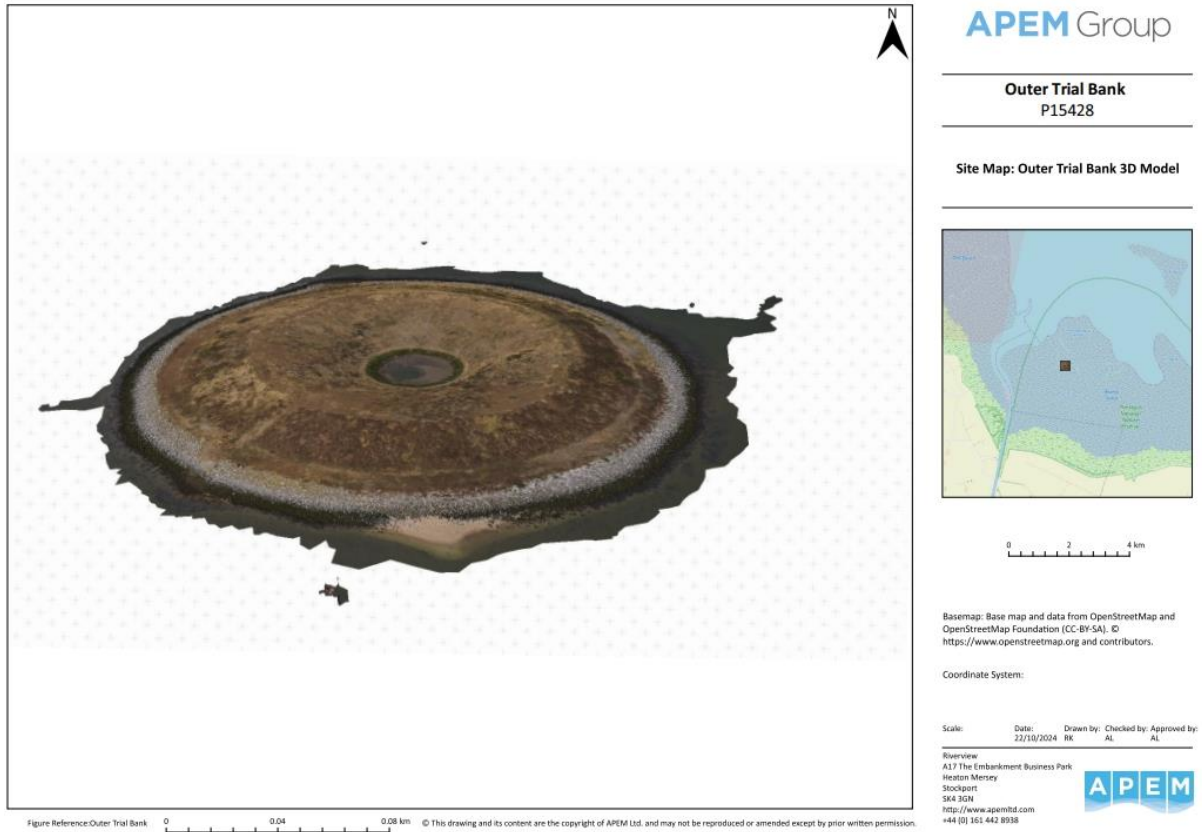
Figure 4   3D model of Outer Trial Bank Survey Area

5.   General Conclusions

Overall, European herring gull constituted the most abundant species recorded on Outer Trial Bank, with a total of 2,029 individuals recorded, adjusted for deceased. Of these, the majority were recorded as adults (n=1,627) with the remainder consisting of juveniles (n=403), and second year gulls (n=1). Additionally, in decreasing order of observations, lesser black-backed gulls (n=656), large gull species (n=439), and great black-backed gulls (n=10) were also recorded. Non-target species, namely common shelduck, common eider, Eurasian oystercatcher, great cormorant, and European shag were also recorded present on Outer Trial Bank. Thirteen habitat types were identified, with open water not included as part of the habitat analysis. Scrub constituted the greatest habitat coverage, whilst Rocky Shore (Dry) featured the second greatest habitat coverage alongside the largest species association count with 684 gulls recorded at or located on the Rocky Shore (Dry) habitat.

Appendix I Scientific Names of Birds and Marine Megafauna

English Vernacular Name	Scientific Name	Family	Class
Common Shelduck	*Tadorna tadorna*	Anatidae	Aves
Common Eider	*Somateria mollissima*	Anatidae	Aves
Eurasian Oystercatcher	*Haematopus ostralegus*	Haematopodidae	Aves
Great Black-backed Gull	*Larus marinus*	Laridae	Aves
European Herring gull	*Larus argentatus*	Laridae	Aves
Lesser Black-backed Gull	*Larus fuscus*	Laridae	Aves
Great Cormorant	*Phalacrocorax carbo*	Phalacrocoracidae	Aves
European Shag	*Gulosus aristotelis*	Phalacrocoracidae	Aves

Appendix II JNCC Bird and Marine Megafauna Groups

JNCC Code	Grouping	Species Code	Species
95034	Large Gull species	6000	Great Black-backed Gull
		5920	European Herring Gull
		5910	Lesser Black-backed Gull

Appendix III Example images

Figure 1 **Three adult herring gulls (left) and two adult lesser black-backed gulls (right), showing difference in mantle colour**

Figure 2 **Two unattended large gull chicks (juveniles), where identification to species isn't possible**

Figure 3   **Adult herring gull in attendance with two chicks (juveniles)**

Figure 4   **Two adult great black-backed gulls (left) and a single adult lesser black-backed gull (right), showing difference in size and colour**

Figure 5   Roosting oystercatchers with three common shelduck

Figure 6   Group of common eider in eclipse plumage