Morecambe Offshore Windfarm: Generation Assets
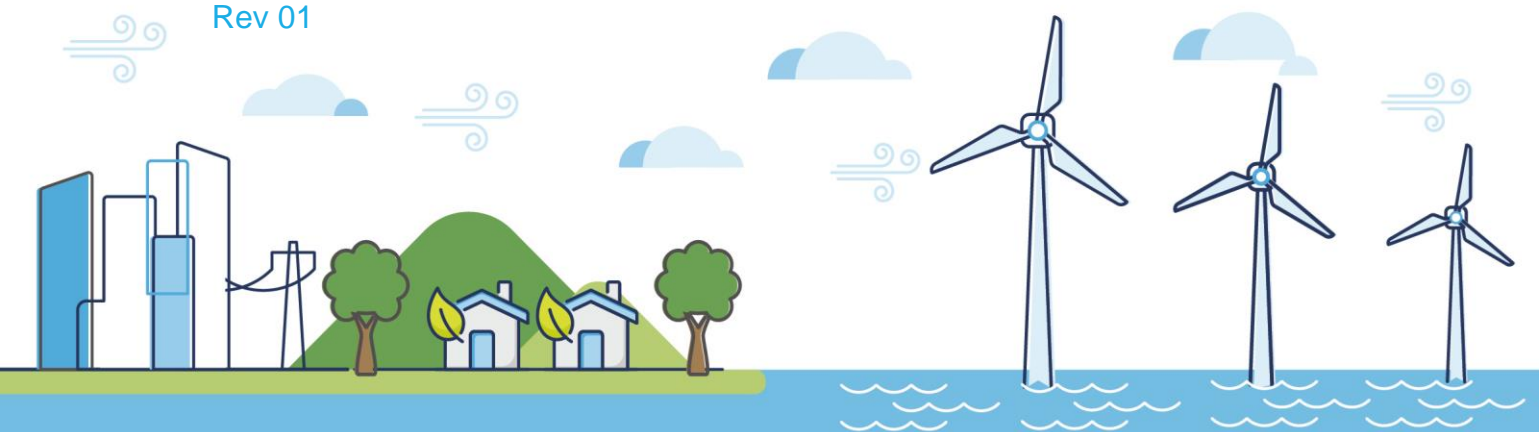
Environmental Statement

Volume 5

Appendix 12.2 Aerial Survey Two Year Report March 2021 to February 2023

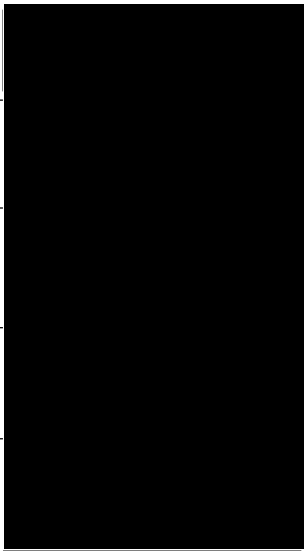PINS Document Reference: 5.2.12.2

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Digital video aerial surveys of seabirds and marine mammals at Morecambe Offshore Windfarm:
Two Year Report
March 2021 to February 2023

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Executive Summary

In March 2021, Morecambe Offshore Windfarm Ltd, a joint venture between Zero-E Offshore Wind S.L.U. (Spain) (a Cobra group company) and Flotation Energy Ltd, commissioned HiDef Aerial Surveying Limited (HiDef) to undertake a two-year programme of high-resolution digital video aerial surveys for marine megafauna, ornithological and human activity over the proposed Round 4, Morecambe Offshore Windfarm, located approximately 30km off the coast of Lancashire.

This report presents the results of both years of monthly surveys flown between March 2021 and February 2023, apart from January 2023, providing data from 24 surveys. HiDef designed a survey that placed 1km-spaced transects across the original windfarm array development area (125km^2 Agreement for Lease area) and a custom buffer ('the survey area'). Following completion of the surveys in 2023, the windfarm array development area has since been reduced to approximately 87km^2 which will form the boundary for the project Development Consent Order Application. The survey custom buffer extends 9km from the revised development area to the west, 4km from the south, and 10km to the north and east, nearer to the Liverpool Bay Special Protection Area (SPA). The total survey area flown was 651km^2.

Surveys were undertaken using an aircraft equipped with four HiDef Gen 2 Series cameras with sensors set to a resolution of 2cm Ground Sample Distance (GSD). Each camera sampled a strip of 125m width, separated from the next camera by ~25m, to provide a combined sampled width of 500m within a 575m overall strip. Two of the four cameras were analysed, achieving approximately 25% coverage of the survey area in each flight. The remaining footage is available for analysis at a later stage if required.

Data analysis followed a two-stage process in which video footage was reviewed (with a 20% random sample used for audit) and detected objects were identified to species or species group level (again with 20% selected at random for audit). The audit of both stages requires 90% agreement to be achieved.

Density and abundance estimates were calculated using strip transect analysis and kernel density estimation (KDE) was used to create density surface maps. In addition, known diving rates of four species were used to estimate the proportion of diving animals that would be underwater at the time of survey for the correction of abundance and density estimates.

The surveys recorded a total of 63,647 birds of 27 species and 1,523 non-avian animals of seven species. Additionally, 2,048 birds were partially identified to 16 species groups and 133 non-avian animals were partially identified to five species groups. An identification rate to species level of 96.05% was achieved throughout the 24-month survey period.

The primary observations, within the survey area, from the surveys were:

- Common scoters (*Melanitta nigra*) were recorded primarily during the non-breeding season (apportioned peak density 0.38 birds/km^2 (95% CI 0.13 – 0.68) in December 2022). The nearby Liverpool Bay SPA is designated for the protection of a wintering population, suggesting the presence of suitable habitat;

- Black-legged kittiwake (*Rissa tridactyla*) was the third most abundant species recorded, in relatively high densities during the post-breeding migration season (apportioned peak density 7.79 birds/km^2 (95% CI 4.47 – 11.70); September 2021);

- Little gulls (*Hydrocoloeus minutus*) peaked during the usual non-breeding season (apportioned peak density 0.81 birds/km^2 (95% CI 0.55 – 1.17) in February S02 2023);

- Common gulls (*Larus canus*) peaked during the usual non-breeding season (apportioned peak density 0.44 birds/km^2 (95% CI 0.33 – 0.56) in December 2022);

- Herring gull (*Larus argentatus*) was the most numerous gull species recorded during the 24-month survey period, peaking in December 2022 during the non-breeding season (apportioned peak density 0.75 birds/km^2 (95% CI 0.41 – 1.21));

- Lesser black-backed gulls *(Larus fuscus)* were recorded in relatively low numbers throughout the survey period, generally increasing in the breeding season compared to the non-breeding season, but peaked in the post-breeding migration period (apportioned peak density 0.57 birds/km^2 (95% CI 0.29 – 0.89) in September 2021);

- Common guillemot (*Uria aalge*) was the most abundant species, during the post-breeding migration period (apportioned peak density 40.81 birds/km^2 (95% CI 32.13 – 49.55); August 2021). High densities of sitting birds recorded at this time alongside records of adult-chick pairs suggests the survey area may be utilised during the flightless moult period, post-breeding;

- Razorbill (*Alca torda*) were abundant at most times of the year, peaking in December 2022 (apportioned peak density 3.49 birds/km^2 (95% CI 2.64 – 4.40), apart from during the end of the breeding season and start of post-breeding migration.

- Red-throated diver (*Gavia stellata*) were also most abundant during the non-breeding season, peaking during the return migration season (apportioned peak density 0.13 birds/km^2 (95% CI 0.05 – 0.23) December 2021);

- Manx shearwater (*Puffinus puffinus*) was the second most abundant species recorded, with high numbers observed during the breeding season (apportioned peak density 19.65 birds/km^2 (95% CI 12 – 29.69); July 2021). A large foraging range for the species suggest birds from colonies far afield in the Irish Sea may be foraging within the survey area;

- Northern gannet (*Morus bassanus*) were recorded in relatively high numbers during the breeding season, peaking in August 2021 (apportioned peak density 2.70 birds/km^2 (95% CI 2.09 – 3.45));

- Harbour porpoise (*Phocoena phocoena*) was the most abundant marine mammal species present within the survey region (apportioned peak density 6.25 animals/km^2 (95% CI 3.38 – 9.97); May 2022).

The work undertaken by HiDef collected 24 months of continuous data. The data collected works towards satisfying the survey requirements for the contract. This report follows, and builds upon, data presented in the annual report submitted in January 2023 (HP00135-701-02).

1 Introduction

1 The proposed Morecambe Offshore Windfarm (hereafter 'Morecambe') is located approximately 30km off the coast of Lancashire, UK. The windfarm site array (hereafter 'development area') covers approximately 87km^2.

2 In March 2021, Morecambe Offshore Windfarm Ltd, a joint venture between Zero-E Offshore Wind S.L.U. (Spain) (a Cobra group company) and Flotation Energy Ltd, commissioned HiDef Aerial Surveying Limited ('HiDef') to undertake a two-year programme of high-resolution digital video aerial surveys of marine megafauna (defined within this report as cetaceans, pinnipeds or other large, non-avian marine fauna), ornithological and human activity in support of the development proposal. The survey design consisted of 1km-spaced transects within the original Morecambe development area (the 125km^2 Agreement for Lease area) plus a surrounding buffer, with the full two-year survey programme completed across this area and buffer. The development area has since been reduced in 2023 to approximately 87km^2 with this revised development area forming the boundary of the project Development Consent Order (DCO) Application. The custom buffer extends 9km from the revised development area to the west, 4km to the south and 10km on the north and east, overlapping with the Liverpool Bay Special Protection Area (SPA), primarily to collect additional data on red-throated diver (*Gavia stellata*). The development area and the buffer together are referred to as the 'survey area', with a total area of approximately 651km^2.

3 HiDef designed the survey methodology to provide information suitable to support the proposed development for which baseline surveys and an accurate assessment of abundance and distribution of seabirds and marine mammals is required to inform the Environmental Impact Assessment (EIA) and subsequent Environmental Statement (ES), to accompany the DCO Application.

4 Multiple important bird sites classified as Special Protection Areas (SPA) under The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, are located in the vicinity of the survey area.

5 Overlapping the north and east buffer, the Liverpool Bay / Bae Lerpwl SPA (hereafter 'Liverpool Bay SPA'), extends from Morecambe Bay to Anglesey, and is designated for non-breeding populations of red-throated diver, common scoter (*Melanitta nigra*) and little gull (*Hydrocoloeus minutus*) and breeding populations of little tern (*Sternula albifrons*) and common tern (*S. hirundo*). A mixed species waterbird assemblage is also protected, with red-breasted merganser (*Mergus serrator*) and great cormorant (*Phalacrocorax carbo*; hereafter 'cormorant') listed as the main components (Natural England, 2018).

6 Located approximately 31km east of the development area, the Morecambe Bay and Duddon Estuary is designated for breeding populations of little, common and Sandwich terns (*Thalasseus sandvicensis*) as well as non-breeding populations of bar-tailed godwit (*Limosa lapponica*) and golden plover (*Pluvialis apricaria*), and other species such as lesser black-backed gull (*Larus fuscus*) and herring gull (*Larus argentatus*) (Natural England, 2019).

7 Further afield, approximately 77km north of the buffer, the Solway Firth SPA supports non-breeding populations of red-throated diver, whooper swan (*Cygnus cygnus*), herring gull, common gull (*Larus canus*) and barnacle geese (*Branta leucopsis)* (JNCC, 2020).

8 Seabirds are likely to use the waters surrounding the survey area for feeding and post-breeding dispersal, with many species foraging long distances from their breeding colonies, especially northern gannet

(Morus bassanus; hereafter 'gannet') and Manx shearwater (*Puffinus puffinus*) (Woodward *et al.,* 2019). As such, seabirds from several other Irish and UK SPAs may travel to the area to feed.

9   Important sites classified as Special Areas of Conservation (SACs) under The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, are located in the vicinity of the survey area.

10   Marine mammals are also likely to occur year-round within the survey area, with harbour porpoise (*Phocoena phocoena*) likely to be the most numerous. The North Anglesey Marine / Gogledd Môn Forol and North Channel SACs, located approximately 45km west and 99km northwest respectively, are designated for the protection of harbour porpoise (JNCC, 2019a, 2019b). Further afield, the Solway Firth SAC and the West Wales Marine/ Gorllewin Cymru Forol SAC are also designated for harbour porpoise (JNCC, 2019c), located approximately 77km north of the buffer and 113km south of the development area, respectively.

11   This report ('the Two-Year report') provides the results from 24 surveys undertaken between March 2021 and February 2023. Observations and survey effort are summarised, and results presented as density surface distribution maps, density estimates with 95% confidence intervals (CIs) and summarised data on behaviour and age. A discussion is provided as to the representativeness of the results in relation to the wider region.

2 Methods

2.1 Survey flights

12   A series of strip transects were flown monthly between March 2021 and February 2023, following the protocol agreed with the Client in March 2021 (HP00135-001). Natural England were also in agreement when consulted later in the process (HP00135_Survey Overview_291021). January 2023 was missed, due to lack of available weather windows, so two surveys were flown in February 2023 to compensate.

13   HiDef designed the survey methodology to provide information able to inform an accurate assessment of abundance and distribution of seabirds and marine mammals required to support Environmental Impact Assessment, within the Morecambe development and survey area.

14   The survey design consistent of 1km-spaced transects across the original Morecambe development area (125.64km^2) and a custom buffer extending 4km from the original development area to the west and south, and 10km to the north and east, nearer to the Liverpool Bay SPA, primarily to collect additional data on red-throated diver. This created an overall survey area of 651km^2. With the subsequent reduction in the development area to 87km^2, the custom buffer now extends 9km from the revised development area to the west, 4km to the south and 10km on the north and east (Figure 1).

15   The survey design consisted of 31 strip transects extending roughly north-east to south-west, perpendicular to the depth contours along the coast. Such a design ensures that each transect samples a similar range of habitats (primarily relating to water depth) and will reduce the variation in bird and mammal abundance estimates between transects.

16   Surveys were undertaken using an aircraft equipped with four HiDef Gen 2 Series cameras with sensors set to a resolution of 2cm Ground Sample Distance (GSD). Each camera sampled a strip of 125m width, separated from the next camera by ~25m, thus providing a combined sampled width of 500m within a 575m overall strip.

17   A minimum target of 25% site coverage was agreed, with data from two out of the four cameras being processed. This ensured a survey with sufficient coverage and number of transects for precise abundance estimation, with the remaining unprocessed data archived.

18   The surveys were flown along the transect pattern shown in Figure 1 at a height of approximately 550m above sea level (ASL; ~1800'). Flying at this height ensures that there is no risk of flushing avian species that are easily disturbed by aircraft noise. Thaxter *et al.* (2016) recommends a minimum flight altitude of 460 – 500m ASL. Hammond *et al.*, 2013 also highlight that an aerial survey flown at an altitude of 183 m is not likely to result in a responsive reaction from any marine mammal. This survey is flown at over double this altitude.

19   Position data for the aircraft was captured from a Garmin GPSMap 296 receiver with differential GPS enabled to give 1m accuracy for the positions and recording updates in location at one second intervals for later matching to bird and marine mammal observations.

Figure 1 Morecambe survey design with 4-10km hybrid buffer with 1km-spaced transects flown between March 2021 and February 2023. North and east of the revised development area 10km buffer flown; south the revised development area 4km buffer flown; west of the revised development area 9km buffer flown.
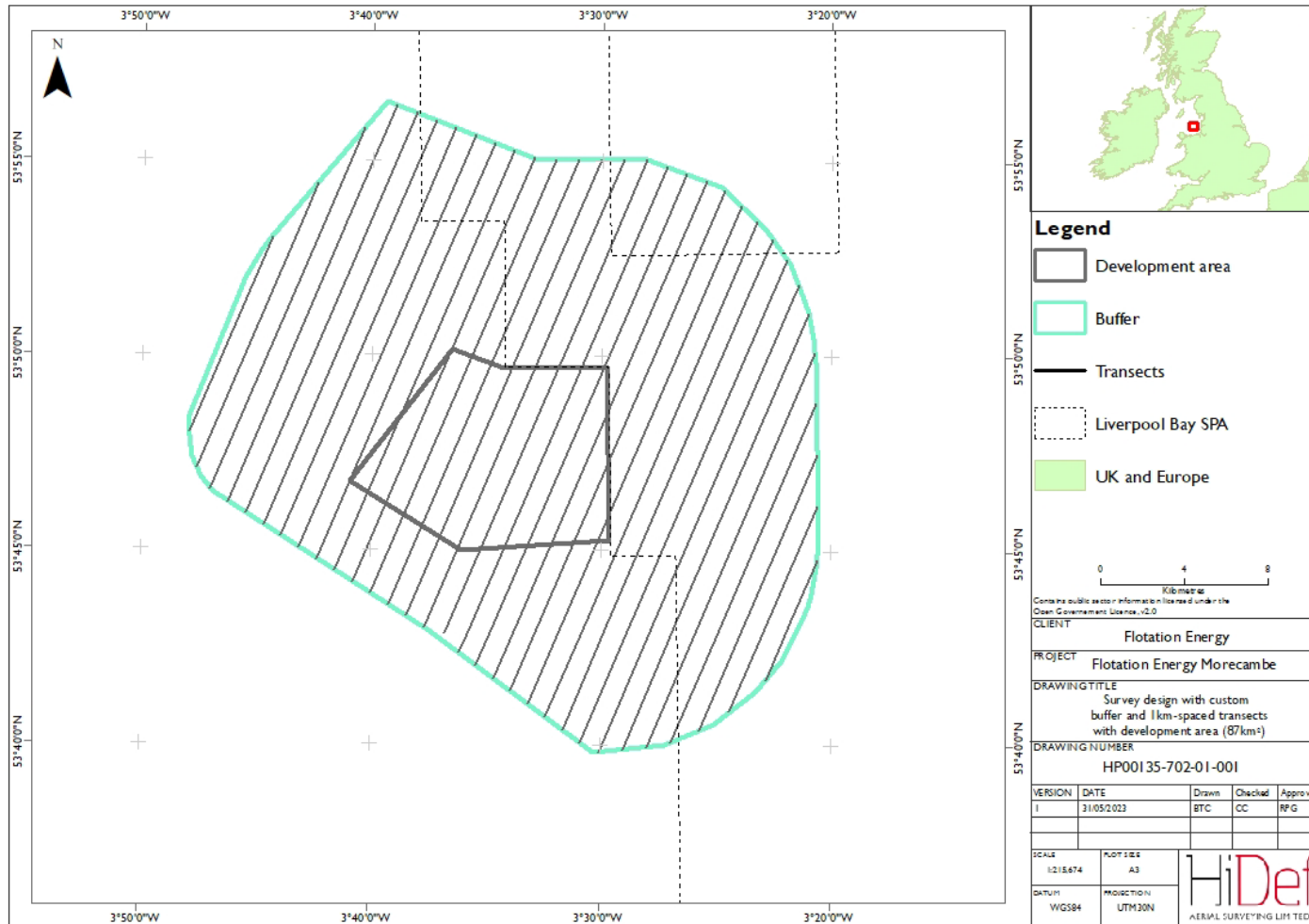
2.2   Data review and object detection

20   Data were viewed by trained reviewers who marked any objects in the footage as requiring further analysis, as well as determining which are birds, marine megafauna (defined within this report as cetaceans, pinnipeds or other large, non-avian marine fauna) or anthropogenic objects, such as ships or buoys.

21   As part of HiDef's quality assurance (QA) process, an additional 'blind' review of 20% of the raw data was carried out and the results compared with those of the original review. If 90% agreement is not attained during the QA process, then corrective action is initiated: the remaining data set is reviewed and where appropriate, the failed reviewer's data discarded and all the data re-reviewed. In addition, additional training is then given to the reviewer to improve performance.

22   Objects are only recorded where it reaches a reference line (known as 'the red line') which defines the true transect width of 125m for each camera. By excluding objects that do not cross the red line, biases to abundance estimates caused by flux (movement of objects in the video footage relative to the aircraft, such as where the survey craft is buffeted by airflow) are eliminated.

2.3   Object identification

23   Images marked as requiring further analysis were reviewed by the ID Team; ornithologists[1] and marine mammal specialists[2] for identification to the lowest taxonomic level possible and for assessment of the approximate age and the sex of each animal, as well as any behaviour traits visible from the imagery.

24   At least 20% of all objects were selected at random and subjected to a separate 'blind' QA process. If less than 90% agreement was attained for any individual camera then corrective action was initiated: if appropriate, the failed identifier's data were discarded, and the data re-identified. Any disputed identifications were passed to a third-party expert ornithologist for a final decision[1]. The level of agreement within the QA process is calculated as the final number of agreements as a percentage of all identifications subjected for QA for the entire survey.

25   All objects were assigned to a species group and where possible, each of these then further identified to species level. The species identifications were given a confidence rating of 'possible', 'probable' or 'definite'[3].

26   It is important to note that confidence ratings are not standardised. The likelihood of achieving a definite or probable identification is not consistent for all component members of a species group. For example, someone undertaking identification of a large auk will find it easier to be confident of common guillemot (*Uria aalge*; hereafter 'guillemot') identification than razorbill (*Alca torda*). Confidence scores should not be used to filter or weight the probability of 'large auk' being one species or another in any analysis, as this will lead to biased results, particularly if the identification rate is low.

27   Any animals that could not be identified to species level were assigned to a category 'No ID' and only identified to group level. If, on occasion, the unidentified bird is suspected of belonging to two possible

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[1]   HiDef currently employs three of the ten current members of the British Birds Rarities Committee ('BBRC') as expert ornithologists

[2]   HiDef staff have long-standing experience in marine mammal identification, regularly undertaking boat surveys as part of ESAS (European Seabirds At Sea Partnership) and other programmes. They process thousands of cetacean images, hold regular internal training sessions and have access to marine specialists within our wider company BioConsult SH.

[3]   Definite: as certain as reasonably possible. Probable: very likely to be this species or species group. Possible: more likely to be this species or species group than anything else.

genera, then a broader group category may be used. For example, a bird would usually be assigned to the group category 'Shearwater species' if identified as a Manx shearwater or to 'Large Auk species' if identified as a guillemot. However, if the bird has the potential to be either, then it would be assigned to a wider group category 'Shearwater / Auk species' and the species level recorded as 'No ID'.

28   In the case of birds, additional information was recorded on basic behaviour (i.e., whether the bird was sitting; loafing on land or other objects; flying; diving or taking off). Detail was recorded where possible on foraging behaviour, approximate age, sex and any other details of interest. Aging of birds was based on moults and was conducted where possible on species which show seasonal variation in plumage.

29   Marine mammals and other marine megafauna (non-avian) were recorded using the same process. Animals were first assigned to a species group (e.g., 'cetacean species') and then given a species level identification (e.g. 'harbour porpoise', 'minke whale' or 'No ID'). If a precise species group could not be ascertained, then the record was assigned to a broader group category (e.g., 'seal or small cetacean species') and the species level recorded as 'No ID'.

30   Marine mammals may be assigned to a variety of species groups: cetacean species, dolphin species, seal species and seal/small cetacean species. Theoretically, some species could be assigned to multiple species groups, e.g. an unidentifiable common dolphin could be assigned to dolphin species, cetacean species or seal/small cetacean species. All individuals are assigned to the highest level of identification possible, so preferably, this common dolphin would be assigned to dolphin species however, if a non-dolphin species cannot reasonably be ruled out, then the broader species group category will be used (e.g. cetacean species then seal/small cetacean species).

31   In the case of marine mammals, surfacing behaviour was also recorded as either 'surfacing', 'surfacing at red line', 'submerged' or 'unknown'. 'Surfacing at red line' (or snapshot surfacing) was defined as the animal's dorsal fin being above the water in the frame nearest to the 'red line' on the operator's screen and is required for calculation of availability bias (section 2.5.3). 'Surfacing' was defined as any other surfacing behaviour that was not snapshot surfacing and included any part of the animal's body breaking the surface of the water in any frame. Sexing and aging of marine mammals was carried out where possible, and are presented in the relevant sections where data is available.

32   Anthropogenic activity was recorded as either 'man-made object', 'fishing boat' or 'other boat'. Further details were noted in the comments of the observation Excel files, including further specifying the type of object (e.g. 'fishing buoy', 'marker buoy', 'wind turbine').

2.4   Final processing

33   All data were geo-referenced, taking into account the offset from the transect line of the cameras, and compiled into a single output; Geographical Information System (GIS) files for the Observation and Track data are issued in ArcGIS shapefile format, using UTM30N projection, WGS84 datum.

2.5   Data analysis

2.5.1   Data treatment

34   Raw count data were trimmed to the survey area prior for presentation in this report. After basic presentation, data were processed to estimate density, abundance and distribution of key species and species groups.

35   Records identified to species level were separated out from records of individuals only identified to group level, and the following analyses undertaken on both datasets. All confidence levels of species identifications were used in the analysis.

36   Apportioning of 'unidentified' birds and non-avian animals to species level was also undertaken per survey for the purposes of calculating population estimates. The number of unidentified animals in each species group were assigned to species where appropriate, based on their respective abundance ratios. For example, if identified guillemots and razorbills occurred in a 4:1 ratio in a survey, then 80% of unidentified birds would be assigned to guillemot and 20% assigned to razorbill.

2.5.2 Population estimates

37   Population estimates were calculated for the Morecambe survey area (development area plus buffer).

38   Each strip transect was treated as a statistically independent random sample from the site. The length and breadth (i.e. the width of the field of view of the camera) of each transect were multiplied together to give the transect area; dividing the number of observations for each species on each transect by the transect area gives a point estimate of the density of that species for the transect. The density of animals at the site (and hence the population size by multiplying by the area of the site), the standard deviation, the 95% confidence intervals (CIs) and coefficient of variance (CV) were then estimated using a non-parametric block bootstrap method with replacement (Buckland et al., 2001), to ensure equal transect effort was sampled across each bootstrap iteration. This was done by using transect ID as the sampling unit with replacement. A group of transects were randomly sampled until their total length equalled approximately the same length as the total survey length.

39   A total of 1,000 bootstrap iterations were performed from which we calculated the mean and standard deviation of the sampled means, as well as the relative standard error (or CV) as defined by the standard deviation divided by the mean multiplied by 100. Data were processed in the R programming language (version 4.1.1) and code can be provided on request.

40   The density estimate is expressed as the average number of animals per square km in the whole survey area. The population estimate is expressed as the estimated number of animals within the whole survey area. The upper and lower confidence limits (CLs) define the range that the population estimate falls within with 95% certainty. The CV is a measure of the precision of the population and density estimates.

41   For most species these abundance estimates relate to absolute abundance, but for diving species such as auks, the abundance relates to relative abundance due to a proportion of animals being submerged at the time of survey. In Section 2.5.3 we describe our method for taking account of species availability to generate estimates of absolute abundance for auks and harbour porpoise.

2.5.3 Availability bias

42   In wildlife surveys, a proportion of seabirds or marine mammals that spend any time underwater, especially while feeding, will not be detectable at the surface. This 'availability bias' leads to an under-estimate of their abundance during surveys. For species that make long dives underwater, this bias might be significant (for example, guillemot).

43   There are two main approaches to account for availability bias: by using double platform surveys (for example Borchers et al., 2002) which can be logistically difficult to achieve and relatively expensive; and by using known data on time spent underwater to apply correction factors to abundance estimates (for example Barlow et al., 1988).

44   Following Barlow et al. (1988) the probability that an animal is available at the surface is calculated as:

$$\Pr(being\ visible) = \frac{(s + t)}{(s + d)}$$

Where s is the average time spent at the surface, *t* is the window of time that the animal is within view and *d* is the average time below the surface. In the case of digital video surveys, the value of *t* is negligibly small and is treated as 0.

45   Due to a lack of diving rate data for many species, availability bias corrections were only conducted on four species: guillemot, razorbill, Atlantic puffin (*Fratercula arctica;* hereafter 'puffin') and harbour porpoise. When considering population estimates calculated for other diving species, it should be noted that population estimates for the survey area are likely to be underestimated.

46   Internal research is currently ongoing within HiDef with the aim of providing corrections for other diving species, such as Manx shearwater, as currently there are insufficient peer reviewed data for this to be performed. The results from this research will not be available within the timeframe of the current project therefore the correction is limited to the above four species.

2.5.3.1   Seabirds

47   Using Barlow's method, the proportion of time that an animal is available at the surface was calculated (Pr (visible)) for guillemot and razorbill. Absolute density, corrected for availability, is then obtained by dividing the density of birds observed by Pr(visible).

48   For guillemots and razorbills, data obtained during the breeding season using data loggers were used to estimate availability bias. Thaxter *et al.* (2010) give mean times for these species engaged in flying, feeding and underwater per trip during the chick-rearing period.

49   Thus, the proportion of time that guillemots and razorbills are available at the surface (Pr(visible)) was estimated at 0.7595 and 0.8182, respectively.

50   For puffins, the results from a study using data loggers reported in Spencer (2012) were used. The results show that puffins spend 14.16% of daylight time underwater. This infers that the proportion of time that puffins were available at the surface (Pr(visible)) was 0.8584.

51   The estimates of Pr(visible) for guillemots, razorbills and puffins were used to correct relative abundance estimates of birds sitting on the sea. These corrected abundance estimates for sitting birds are then added to the abundance estimate of flying birds to give an overall absolute abundance for the species.

2.5.3.2   Marine mammals

52   Harbour porpoise abundance is also affected by availability bias, and further complicated because detections of animals are possible while they are submerged. There are two approaches to using known diving rates to correct for availability bias for this species: to apply a correction factor to the density of animals that were recorded surfacing only using data on the surfacing rates from tagged animals; or to apply a correction factor to the density of all animals (at the surface and subsurface) using the proportion of time spent at known depths by tagged animals.

53   The depth above which animals are available for detection is not known and is likely to vary according to the turbidity of the water, and perhaps other factors, but has been estimated to be 2m by Teilmann *et al.* (2013) when correcting for availability bias during visual aerial surveys of harbour porpoise.

54   Teilmann *et al.* (2013) provides detailed information which accommodates variation in time of year, geographical location and time of day in the proportion of time spent in the surface 2m of the water column and breaking the surface. All of these metrics relate to model outputs in Teilmann *et al.* (2013)

and are used to refine the predicted amount of time that harbour porpoise spend surfacing in the outputs.

55   The tagging study of Teilmann *et al.* (2013) did not extend to the area of Irish Sea surrounding this project, and no other data are available on surfacing behaviour for this species in the relevant area. For our analysis, we assumed that diving behaviour in the survey area is comparable to that of the study area of Teilmann *et al.* (2013).

56   To estimate the density of surfacing harbour porpoise, we first calculated the proportion of animals snapshot surfacing. Snapshot surfacing indicates where the dorsal fin is clear of the water surface in the middle frame of the sequence in which the animal is present. This was done using data from all months combined because sample sizes were too small to be accurate when calculating the surfacing proportions in individual months. We then multiplied the calculated density of all harbour porpoise by the proportion of snapshot surfacing encounters in our surveys. The density of surfacing harbour porpoises was then divided by the proportion of surfacing behaviour from Teilmann *et al.* (2013) in Table 1, to derive the estimates of absolute density and abundance.

Table 1   Correction factors used to account for availability bias for harbour porpoise at different times of the year and at different times of the day (after Teilmann *et al.*, 2013)

Month	Surface behaviour	
	09:00 – 15:00	15:00 – 21:00
January	0.0490	0.0476
February	0.0398	0.0384
March	0.0543	0.0529
April	0.0646	0.0632
May	0.0563	0.0549
June	0.0518	0.0503
July	0.0493	0.0479
August	0.0530	0.0516
September	0.0420	0.0406
October	0.0413	0.0399
November	0.0406	0.0392
December	0.0429	0.0415

2.5.4   Density mapping

57   Distribution maps were generated using a Watson-Nadaraya type kernel density estimation (KDE) technique (Simonoff, 1996) for key species only. Key species were selected on the basis of their

relatively high abundance, or their significance at nearby protected sites. For diving species (guillemot, razorbill, puffin and harbour porpoise), the KDE mapping represents a relative estimate of density only and does not take account of availability bias.

58   In KDE, a small 'window' function (the kernel) was used to calculate a local density at each point in the survey area. To evaluate the density at a given point, the kernel was centred on that point and all the observations within the window were summed to obtain a local count. The total area of the transect(s) intersecting the window was then summed to obtain a local measure of effort. By dividing the local count by the local effort, a local density estimate was obtained. To build a density map, the study area was covered with a fine mesh of study points and the density was calculated at each point in the mesh in turn.

59   Kernel techniques are robust and not as complex as other density estimation techniques because they have few parameters; as a result, they are arguably the easiest density surface technique to reproduce independently. The only variables are the size and shape of the kernel or window function. For these analyses, we have used a Gaussian window function, which has the advantages of being smooth, rotationally symmetric and easy to compute. The shape of the Gaussian is determined by a single width parameter; the selection of this parameter is the only variable in the computation of the density maps.

60   Rather than set the width parameter arbitrarily, we have used a leave-one-out cross validation method. Cross validation estimates the predictive power of a model by removing some of the data from the data set and using the remainder of the data and the model to predict the values for the data that was removed. The closer the predicted values represent the removed data, the better the model performance and the width parameter used in the model.

61   To apply cross validation to the survey area, each transect is subdivided into 500m long segments. To evaluate a particular choice of kernel width, each segment is removed in turn, using the kernel and the remaining data to predict the density of the missing segment and subtract the known value from the prediction to obtain an error score. This process is repeated for every segment and the error scores for all segments are squared and summed to give a total performance score for that particular choice of kernel width. The kernel width is then varied and the process repeated; if the new score is lower than the old, the new kernel width is a better choice than the previous value. An exhaustive search over all kernel widths is then used to identify the best global choice. The result of the process is a smooth density estimate which has been derived without any manual parameter selection. The whole process is repeated from scratch for each map, as different kernel sizes are appropriate for different species.

62   It should be noted that several of the KDE maps are effectively 'flat' (i.e., they appear uniform in colour). These correspond to distributions where the density surface as obtained from a small local kernel was not effective at predicting missing data; this can happen with evenly distributed birds but can also happen for very sparse distributions. In the case of sparse distributions, the 'flat' map does not necessarily mean that the true underlying distribution is 'flat'; it could mean that the data doesn't contain enough evidence to determine what the underlying distribution is. It is therefore useful to refer back to the population estimates for the corresponding map when looking at these 'flat' densities; we have also overlaid the relevant observations as dots to help with interpretation of the maps. In extreme cases, the maps were not included in the results section, and the data presented as dot maps.

63   For less abundant bird and non-avian species, as well as those identified to group level, distribution is illustrated by dot maps only.

2.5.5 Flight direction of seabirds

64   Wind rose diagrams were created to present the flying direction of seabirds, where each cardinal point (N, E, S, W) and intercardinal point (NE, SE, SW, NW) indicates the total number of birds recorded flying in that particular direction in a given survey.

3   Results

3.1   Survey effort

65   The date, number of transects and survey effort (i.e., length of transects) undertaken between March 2021 and February 2023 are shown in Table 2. The number of transects and the total length of transects are those used in subsequent analysis (see Figure 2 to Figure 5 for the aircraft flight pattern). Variation in presentation of track data is due to differing GPS records in the equipment, frequency of the GPS records can occasionally vary for the flight pattern. This does not affect location data for the observations recorded.

66   The same transect lines were used for each survey, although effort differed slightly between surveys. This can be caused by minor differences in start and stop times for transects and minor deviations of the aircraft from the transect line.

67   High glare was recorded across much of the survey area in September 2021. Following discussion with the Client and Natural England on 03 November 2021, these data were included in the report. Raw counts, including age and behaviour, are presented for the whole survey area in data summaries for key species. However, to ensure the best available data were included in calculation of population estimates, those data from areas given a glare rating of 3 or above were excluded from design-based analysis so represents an underestimate, indicated in Figure 6 and Table 2.

68   Adverse weather conditions also affected several transects to the east of the survey area in October 2021. Raw counts, including age and behaviour, are presented for the whole survey area. Data from transects affected by weather were excluded, and design-based density and population estimates calculated for a reduced area (Figure 7 and Table 2). While these areas of glare and weather have been excluded from the population estimates, the density layer within September and October 2021 still interpolates the density across the whole area including the gaps caused by adverse conditions. Average weather conditions in each survey are presented in Table 3.

Table 2 Survey effort across the Morecambe survey area between March 2021 and February 2023 inclusive

Survey date	Survey number	Number of transects analysed	Total length of transects analysed (km)	Area covered (km²)	Area covered (%)
19 March 2021	1	31	651.26	162.81	24.99
07 April 2021	2	31	651.06	162.76	24.99
18 May 2021	3	31	652.45	163.11	25.04
01 June 2021	4	31	651.13	162.78	24.99
09 July 2021	5	31	653.28	163.32	25.07
02 August 2021	6	31	651.24	162.81	24.99
04 September 2021	7a*	31	649.93	162.48	24.94
	7b**	30	560.61	140.52	21.59
06 October 2021	8a*	31	653.00	163.25	25.06
	8b**	25	413.27	103.32	15.87
17 November 2021	9	31	646.43	161.61	24.81
05 December 2021	10	31	652.82	163.20	25.05
13 January 2022	11	31	652.69	163.17	25.05
11 February 2022	12	31	652.35	163.09	25.04
09 March 2022	13	31	651.29	162.82	25.00
01 April 2022	14	31	650.65	162.66	24.97
02 May 2022	15	31	649.37	162.34	24.92
07 June 2022	16	31	648.36	162.09	24.88
14 July 2022	17	31	650.27	162.57	24.96
09 August 2022	18	31	650.11	162.53	24.95
02 September 2022	19	31	649.57	162.39	24.93
03 October 2022	20	31	653.18	163.29	25.07
22 November 2022	21	31	645.02	161.25	24.76
03 December 2022	22	31	648.62	162.15	24.89
05 February 2023	23	31	650.94	162.73	24.98
23 February 2023	24	31	638.14	159.53	24.49

Full survey area

**Reduced survey area*

Table 3 Environmental conditions in all surveys between March 2021 and February 2023

Survey date	Survey number	Glare (average*)	Sea state (average*)	Turbidity (average*)
19 March 2021	1	1.00	2.03	0.00
07 April 2021	2	1.00	3.75	1.00
18 May 2021	3	1.00	1.00	0.99
01 June 2021	4	1.26	1.01	0.01
09 July 2021	5	1.00	1.00	0.00
02 August 2021	6	1.32	2.82	0.36
04 September 2021	7	1.85	2.32	1.00
06 October 2021	8	1.00	2.98	1.00
17 November 2021	9	1.00	4.64	1.25
05 December 2021	10	1.01	3.14	1.94
13 January 2022	11	1.55	2.04	0.98
11 February 2022	12	1.00	3.25	1.00
09 March 2022	13	1.00	4.42	1.18
01 April 2022	14	1.04	2.51	1.00
02 May 2022	15	1.00	2.00	1.00
07 June 2022	16	1.00	2.01	1.00
14 July 2022	17	1.59	3.92	1.00
09 August 2022	18	1.00	0.82	1.01
02 September 2022	19	1.00	1.96	1.22
03 October 2022	20	1.00	2.57	1.00
22 November 2022	21	1.00	1.99	1.00
03 December 2022	22	1.00	4.16	1.03
05 February 2023	23	1.00	3.25	1.00
23 February 2023	24	1.12	2.60	1.81

Average calculated from the cameras reviewed

Figure 2 **Flight pattern for surveys flown between March 2021 and August 2021 over the Morecambe survey area**
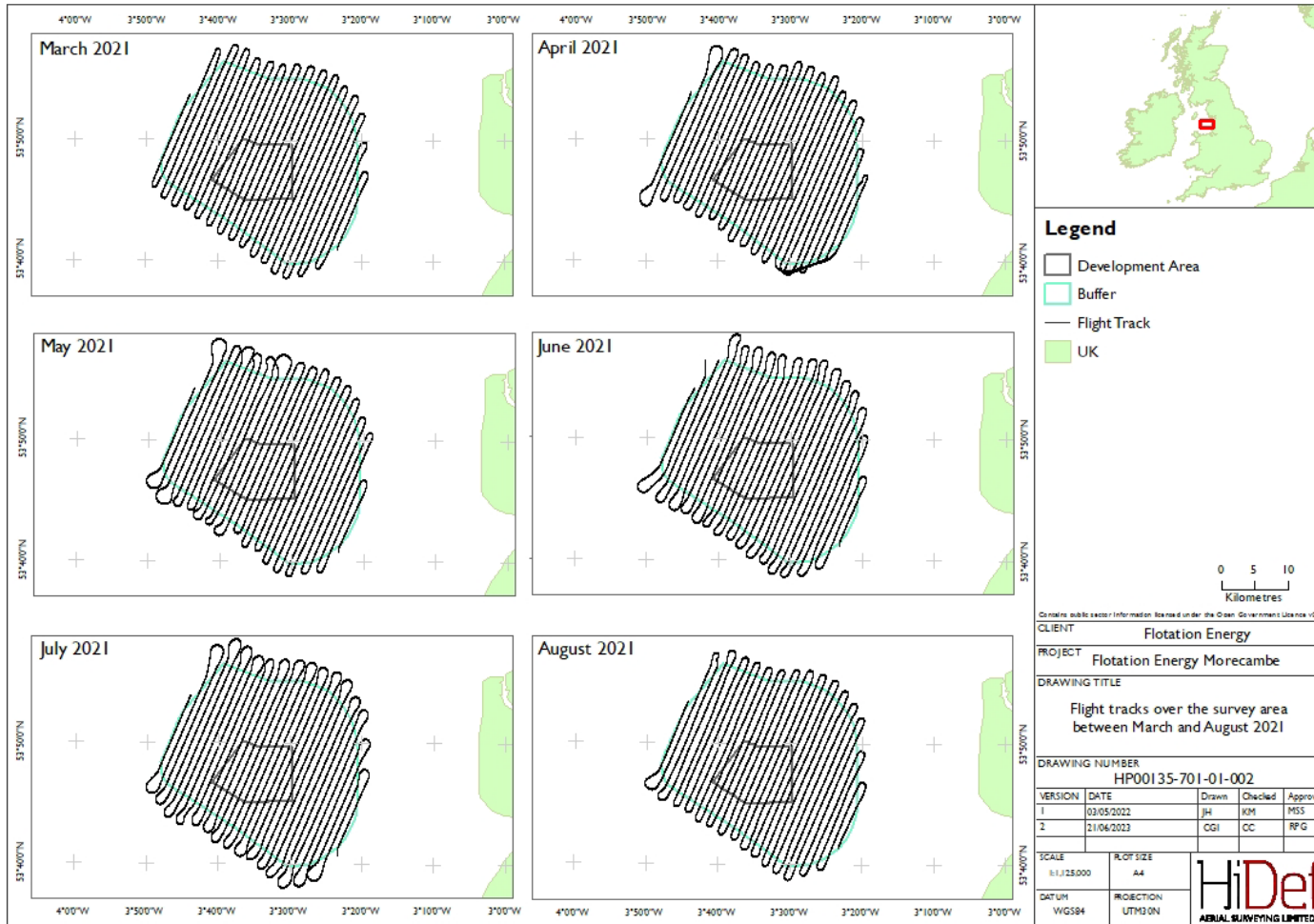
Figure 3 **Flight pattern for surveys flown between September 2021 and February 2022 over the Morecambe survey area**
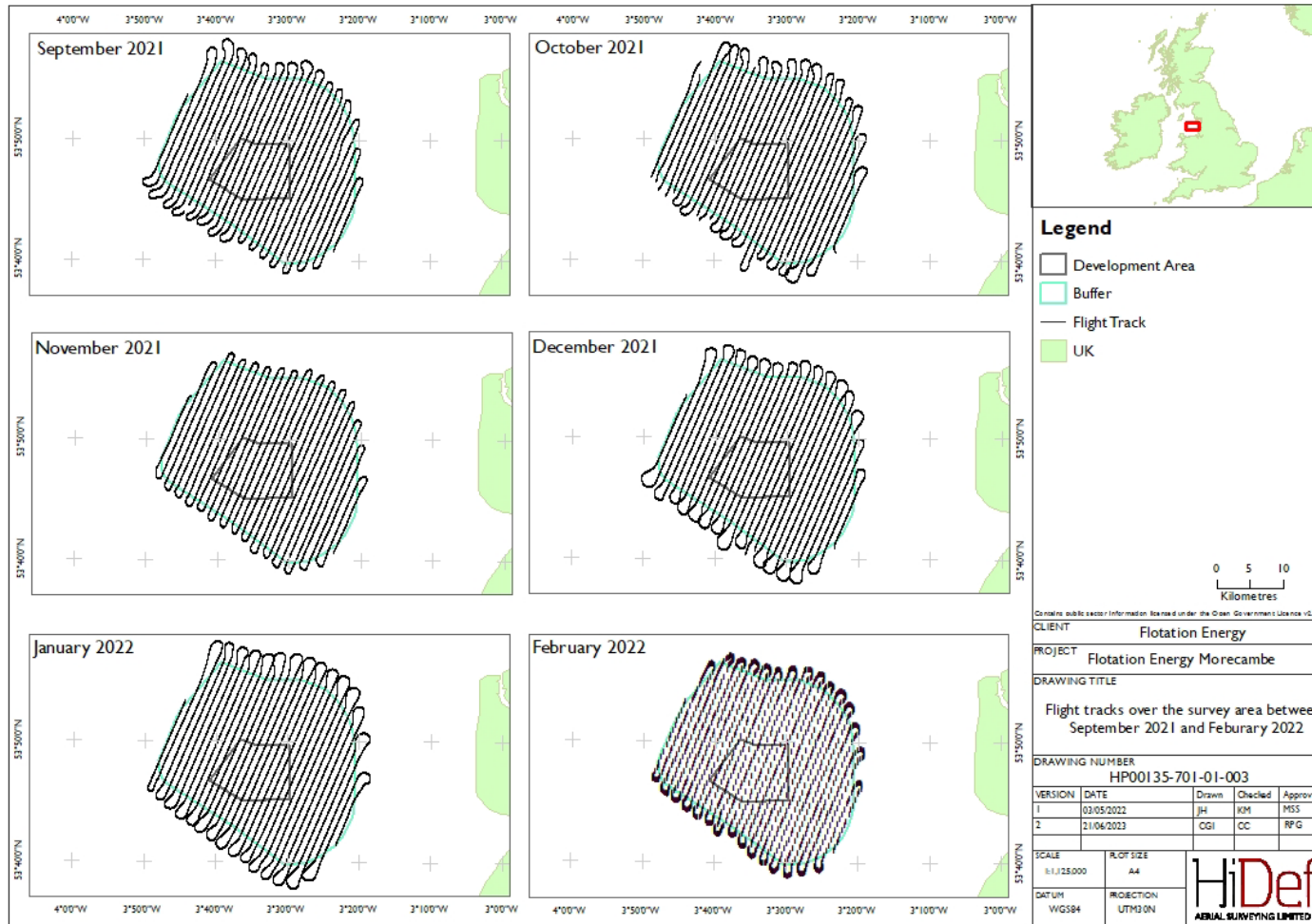
Figure 4   Flight pattern for surveys flown between March 2022 and August 2022 over the Morecambe survey area
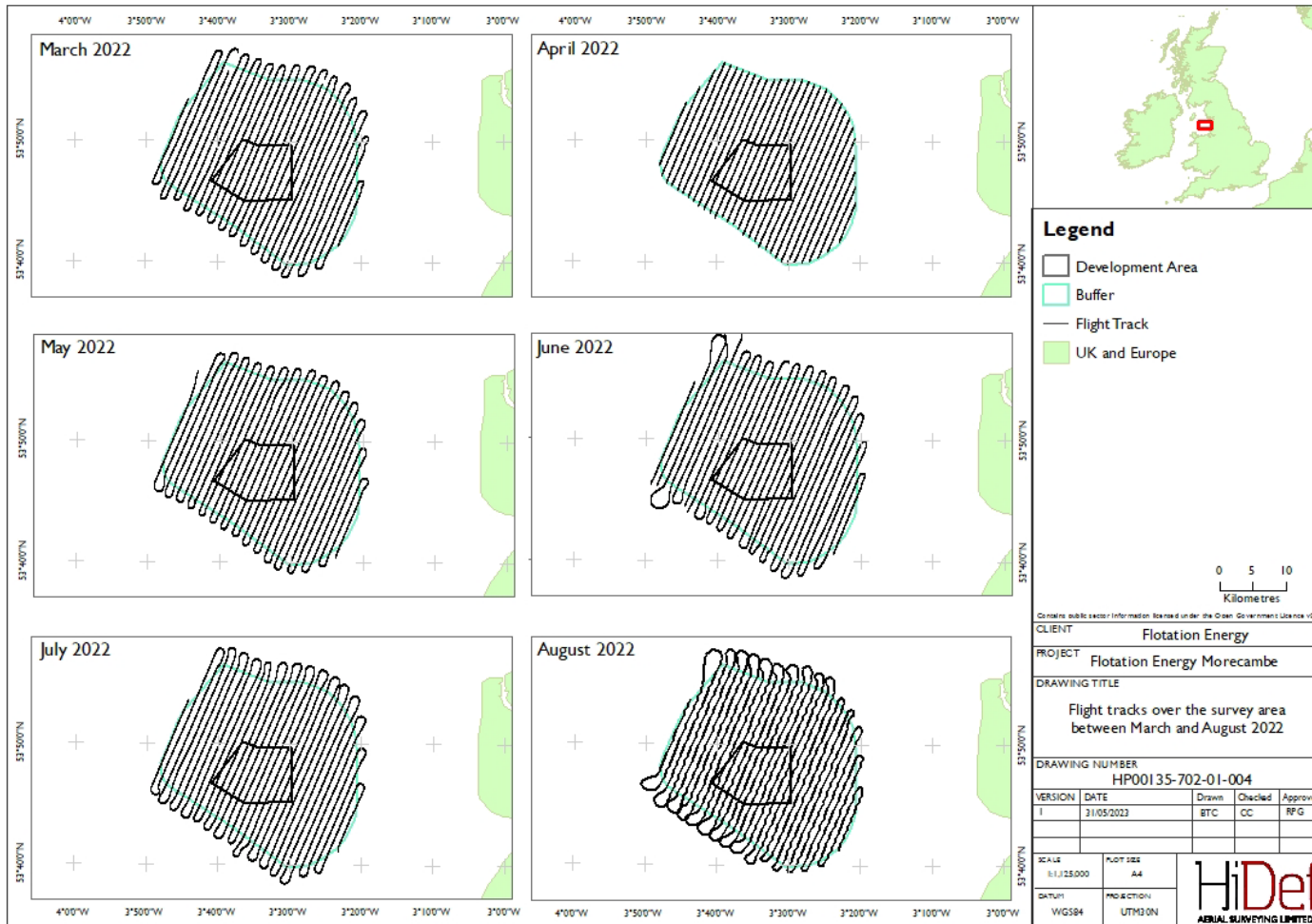
Figure 5   Flight pattern for surveys flown between September 2022 and February 2023 over the Morecambe survey area
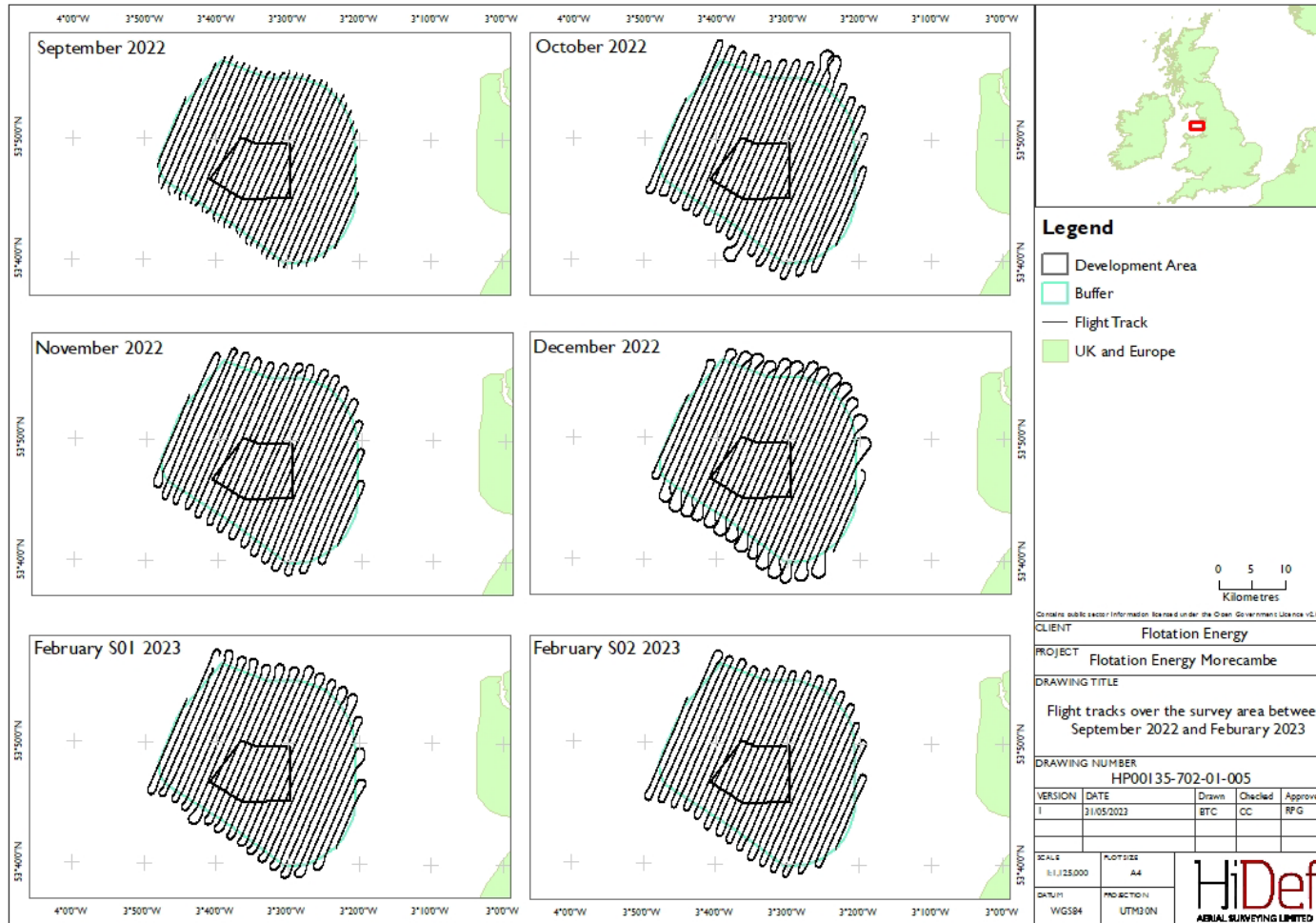
Figure 6 **Glare rating across the Morecambe survey area, September 2021. Data falling within areas with glare rating 3 or above excluded from design-based population estimation.**
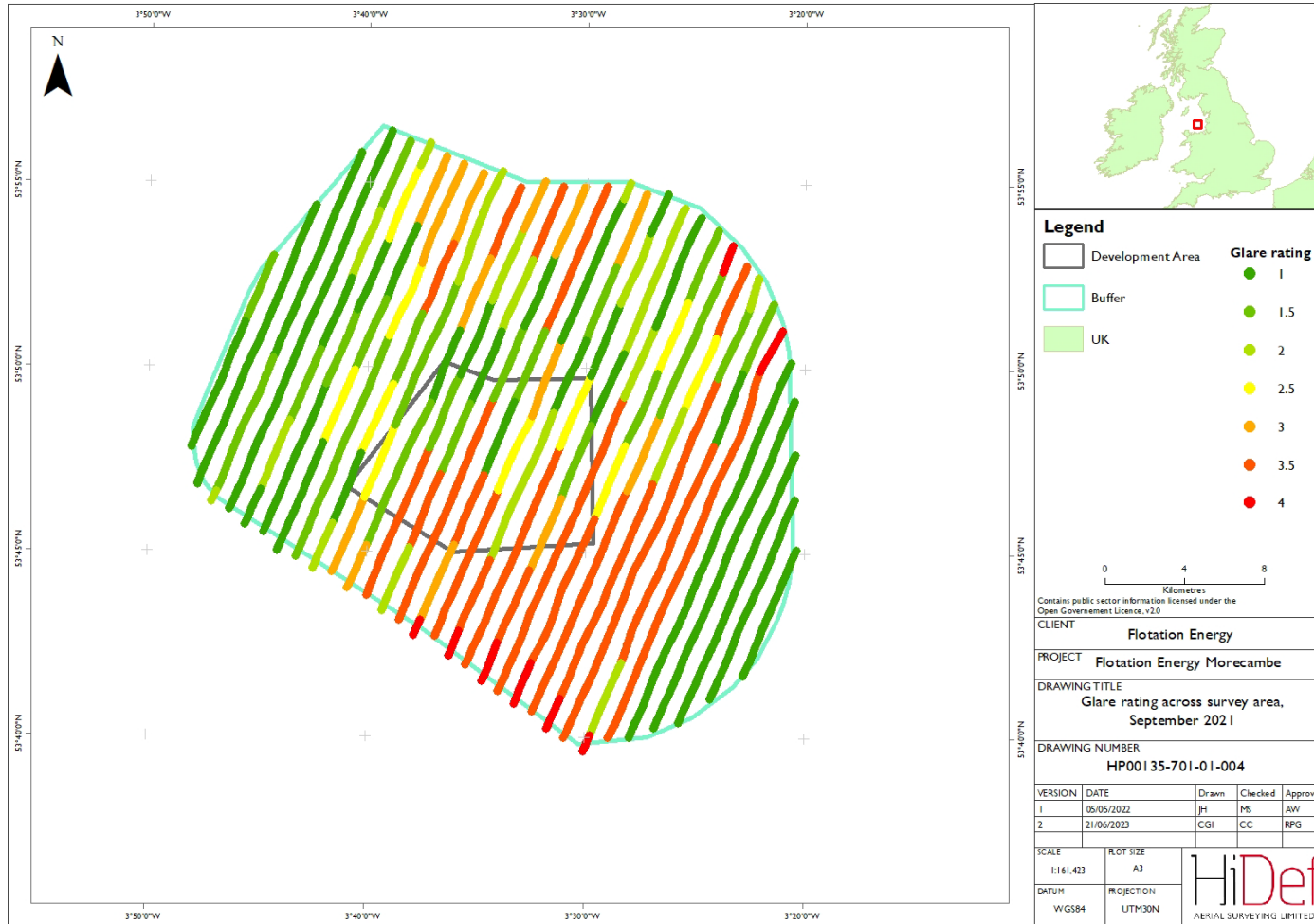
Figure 7   **Area used in design-based population estimation, October 2021**
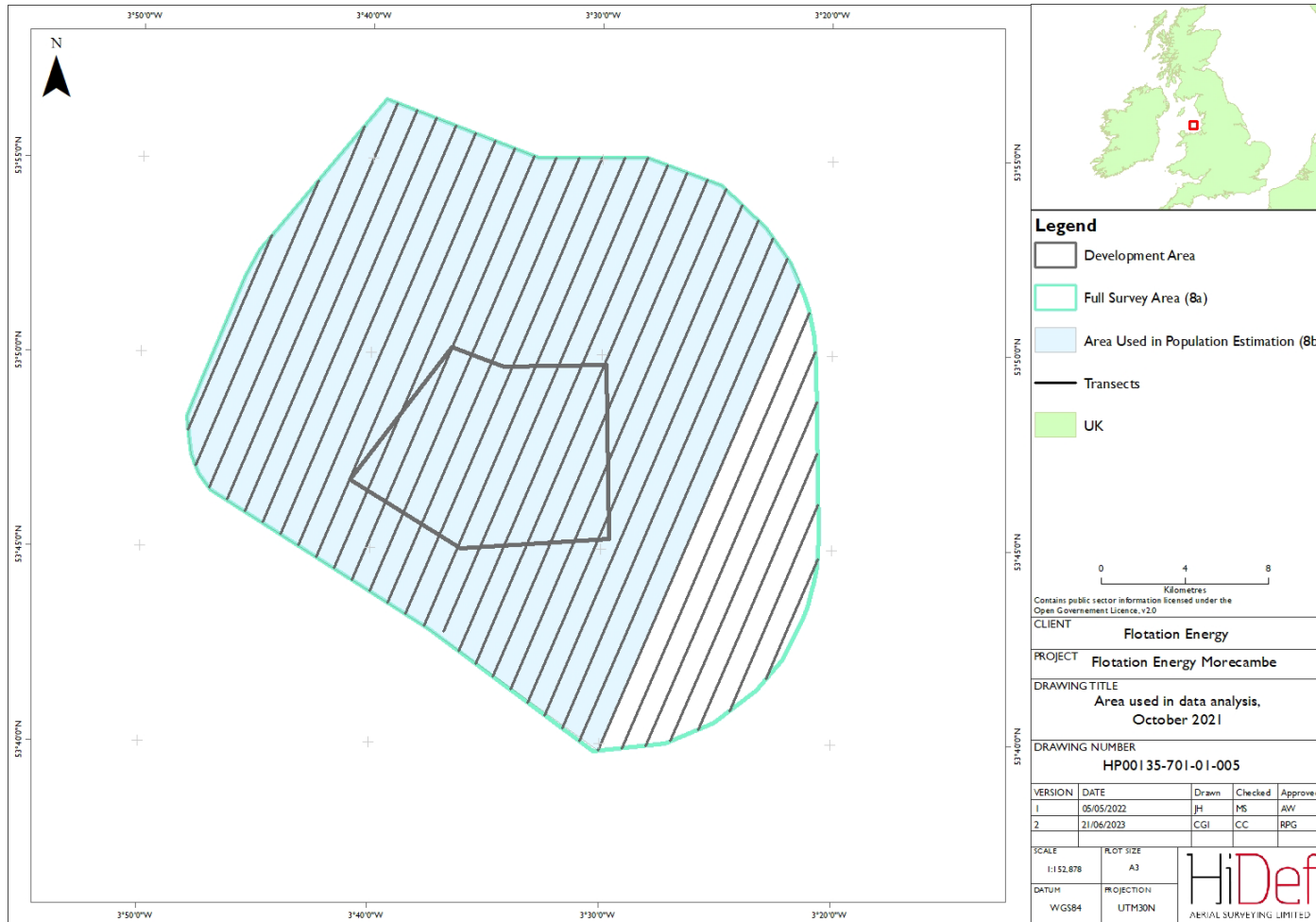
3.2 Survey results

69   Each animal was assigned to a species group, and where possible these were also assigned a species identification with confidence levels of 'Possible', 'Probable' or 'Definite'. Any animals that could not be identified to species level were assigned to a category 'No ID'. The analysis of data to species level uses all levels of identification confidence. This information is displayed in Appendix VII: Species ID confidence levels graphs. The overall identification rate of birds and non-avian animals to species level (not including 'No ID's) for the 12 surveys are given in Table 4.

70   The total number of objects detected in each survey flight, as well as numbers of species and species groups are presented in Table 5 and Table 7.

Table 4   Morecambe survey identification rates between March 2021 and February 2023 inclusive

Survey date	ID rate (%)
19 March 2021	95.10
07 April 2021	95.41
18 May 2021	95.25
01 June 2021	97.64
09 July 2021	98.51
02 August 2021	98.35
04 September 2021*	98.80
06 October 2021*	96.22
17 November 2021	91.59
05 December 2021	90.12
13 January 2022	95.76
11 February 2022	96.41
09 March 2022	97.36
01 April 2022	95.96
02 May 2022	96.54
07 June 2022	96.89
14 July 2022	97.56
09 August 2022	97.55
02 September 2022	99.38
03 October 2022	93.60
22 November 2022	95.90
03 December 2022	95.54

Survey date	ID rate (%)
05 February 2023	94.04
23 February 2023	95.69
Average	**96.05**

* Based on full dataset (inc. transects affected by adverse weather)

Table 5 **Number of objects detected during each survey assigned to species level in the Morecambe survey area between March 2021 and February 2022. Survey dates presented in Table 4. *Raw data from full dataset**

Species	Scientific name	Month												Total
		Mar	Apr	May	Jun	Jul	Aug	Sep*	Oct*	Nov	Dec	Jan	Feb	
Common scoter	*Melanitta nigra*	7	4	0	0	0	0	0	18	3	0	44	18	94
Feral pigeon	*Columba livia domestica*	0	0	0	0	0	0	1	0	0	0	0	0	1
Grey plover	*Pluvialis squatarola*	0	0	0	0	0	0	0	0	0	0	0	0	0
Dunlin	*Calidris alpina*	0	0	0	0	0	0	0	0	0	0	0	0	0
Snipe	*Gallinago gallinago*	0	0	0	0	0	0	0	2	0	0	0	0	2
Kittiwake	*Rissa tridactyla*	257	237	150	157	89	797	927	25	458	87	25	37	3246
Black-headed gull	*Chroicocephalus ridibundus*	0	0	0	0	0	0	1	0	0	0	0	1	2
Little gull	*Hydrocoloeus minutus*	26	2	0	0	0	0	0	0	8	2	6	18	62
Common gull	*Larus canus*	18	0	2	0	0	0	4	6	28	38	41	17	154
Great black-backed gull	*Larus marinus*	2	0	1	0	5	2	6	1	6	2	2	2	29
Herring gull	*Larus argentatus*	37	4	1	3	4	33	48	14	37	21	19	18	239
Lesser black-backed gull	*Larus fuscus*	1	0	2	2	12	51	69	1	1	0	1	5	145
Sandwich tern	*Thalasseus sandvicensis*	0	2	0	0	0	0	17	3	0	0	0	0	22
Common tern	*Sterna hirundo*	0	0	0	2	0	2	5	0	0	0	0	0	9
Arctic tern	*Sterna paradisaea*	0	0	0	0	0	3	3	0	0	0	0	0	6
Great skua	*Stercorarius skua*	0	0	1	0	0	3	0	0	0	0	0	0	4
Arctic skua	*Stercorarius parasiticus*	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	Scientific name	Month												Total
		Mar	Apr	May	Jun	Jul	Aug	Sep*	Oct*	Nov	Dec	Jan	Feb	
Guillemot	*Uria aalge*	1775	563	346	431	2644	5016	933	1644	1921	151	823	832	17079
Razorbill	*Alca torda*	220	165	10	3	11	6	1	294	276	95	75	206	1362
Puffin	*Fratercula arctica*	4	6	0	0	30	9	0	0	1	0	0	0	50
Red-throated diver	*Gavia stellata*	0	2	0	0	0	0	0	0	2	21	0	2	27
Fulmar	*Fulmarus glacialis*	2	1	0	1	3	17	0	0	0	0	1	0	25
Manx shearwater	*Puffinus puffinus*	1	9	56	2	3103	1221	12	0	0	0	0	0	4404
Gannet	*Morus bassanus*	7	8	33	9	208	436	90	8	12	0	0	0	811
Cormorant	*Phalacrocorax carbo*	0	0	1	1	0	1	0	0	0	0	0	0	3
Shag	*Gulosus aristotelis*	1	0	0	0	0	0	0	0	0	0	0	0	1
Carrion crow	*Corvus corone*	0	0	0	0	0	0	0	0	0	0	0	0	0
Barrel jellyfish	*Rhizostoma pulmo*	251	1	11	0	1	0	2	0	0	0	0	0	266
Lion's mane jellyfish	*Cyanea capillata*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grey seal	*Halichoerus grypus*	0	2	5	4	2	2	0	1	2	2	0	1	21
Harbour seal	*Phoca vitulina*	0	0	0	0	1	0	0	0	0	0	0	0	1
Common dolphin	*Delphinus delphis*	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose Dolphin	*Tursiops truncatus*	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbour porpoise	*Phocoena phocoena*	85	13	48	45	39	29	13	25	26	9	19	21	372
Total		**2694**	**1019**	**667**	**660**	**6152**	**7628**	**2132**	**2042**	**2781**	**428**	**1056**	**1178**	**28437**

Table 6 **Number of objects detected during each survey assigned to species level in the Morecambe survey area between March 2022 and February 2023. Survey dates presented in Table 4. *Raw data from full dataset**

Species	Scientific name	Month												Total
		Mar	Apr	May	Jun	Jul	Aug	Sep*	Oct*	Nov	Dec	Jan	Feb	
Common scoter	*Melanitta nigra*	1	5	0	0	0	0	0	0	41	62	47	0	156
Feral pigeon	*Columba livia domestica*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grey plover	*Pluvialis squatarola*	0	0	0	30	0	0	0	0	0	0	0	0	30
Dunlin	*Calidris alpina*	0	0	4	0	0	0	0	0	0	0	0	0	4
Snipe	*Gallinago gallinago*	0	0	0	0	0	0	0	0	0	0	0	0	0
Kittiwake	*Rissa tridactyla*	205	387	373	225	474	447	605	108	206	189	73	113	3405
Black-headed gull	*Chroicocephalus ridibundus*	1	1	0	0	0	0	0	0	1	0	0	0	3
Little gull	*Hydrocoloeus minutus*	8	14	0	0	0	0	0	1	34	86	46	128	317
Common gull	*Larus canus*	2	3	1	0	1	1	0	3	64	70	15	32	192
Great black-backed gull	*Larus marinus*	1	7	23	0	0	1	2	6	10	16	5	1	72
Herring gull	*Larus argentatus*	16	20	47	9	24	16	5	17	55	116	56	31	412
Lesser black-backed gull	*Larus fuscus*	8	2	18	5	37	38	21	4	5	0	2	1	141
Sandwich tern	*Thalasseus sandvicensis*	0	2	0	1	1	1	8	0	0	0	0	0	13
Common tern	*Sterna hirundo*	0	1	5	0	0	0	2	0	0	0	0	0	8
Arctic tern	*Sterna paradisaea*	0	0	49	1	0	0	0	0	0	0	0	0	50
Great skua	*Stercorarius skua*	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic skua	*Stercorarius parasiticus*	0	0	0	0	0	0	1	0	0	0	0	0	1

Species	Scientific name	Month												Total
		Mar	Apr	May	Jun	Jul	Aug	Sep*	Oct*	Nov	Dec	Jan	Feb	
Guillemot	*Uria aalge*	307	780	2563	1234	3895	4093	3526	2719	1805	1399	491	472	23284
Razorbill	*Alca torda*	184	141	103	56	8	0	4	234	154	439	152	268	1743
Puffin	*Fratercula arctica*	0	3	8	2	0	0	1	3	7	0	0	0	24
Red-throated diver	*Gavia stellata*	20	0	4	0	0	0	0	0	1	3	6	7	41
Fulmar	*Fulmarus glacialis*	2	5	29	1	6	0	0	0	5	0	0	0	48
Manx shearwater	*Puffinus puffinus*	0	7	1801	737	1258	1229	442	0	0	0	0	0	5474
Gannet	*Morus bassanus*	9	14	162	33	103	59	45	11	5	1	0	2	444
Cormorant	*Phalacrocorax carbo*	0	0	0	0	0	0	0	0	0	0	1	0	1
Shag	*Gulosus aristotelis*	0	0	0	0	0	2	0	0	4	0	0	0	6
Carrion crow	*Corvus corone*	0	0	1	0	0	0	0	0	0	0	0	0	1
Barrel jellyfish	*Rhizostoma pulmo*	0	0	1	0	0	0	20	64	159	0	1	1	246
Lion's mane jellyfish	*Cyanea capillata*	0	0	0	7	2	0	0	0	0	0	0	0	9
Grey seal	*Halichoerus grypus*	4	2	1	1	0	4	2	0	3	2	1	1	21
Harbour seal	*Phoca vitulina*	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	*Delphinus delphis*	0	0	0	0	0	32	0	0	0	0	0	0	32
Bottlenose Dolphin	*Tursiops truncatus*	0	0	0	0	0	0	0	0	0	0	2	0	2
Harbour porpoise	*Phocoena phocoena*	25	18	179	52	6	49	27	39	80	28	29	21	553
Total		**793**	**1412**	**5372**	**2394**	**5815**	**5972**	**4711**	**3209**	**2639**	**2411**	**927**	**1078**	**36733**

Table 7 **Number of objects with no species ID detected during each survey assigned to species group in the Morecambe survey area between March 2021 and February 2022. Survey dates presented in Table 4. *Raw data from full dataset**

Species group (No ID)	Month												Total
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Wader species	0	0	5	0	0	0	0	0	0	0	0	0	5
Small gull species	2	0	1	1	1	1	2	1	2	4	6	0	21
Black-backed gull species	0	0	0	0	0	1	0	0	0	0	0	0	1
Large gull species	0	0	0	0	0	0	5	0	4	0	0	0	9
Gull species	1	0	4	0	0	8	2	1	5	4	2	0	27
Arctic / common tern	0	0	0	0	0	2	7	0	0	0	0	0	9
Tern species	0	0	0	0	0	0	2	0	0	0	0	0	2
Tern / small gull	0	0	0	0	0	1	3	0	0	0	0	0	4
Skua species	0	0	0	0	0	0	0	0	0	0	0	0	0
Large auk	77	21	8	6	6	22	2	76	200	19	32	31	500
Auk species	38	11	4	4	42	16	1	6	35	8	4	9	178
Auk / small gull	3	0	0	0	0	2	0	0	5	5	2	2	19
Large auk / diver species	0	1	0	0	0	0	0	0	0	3	0	0	4
Auk / shearwater species	2	12	8	3	45	68	0	0	0	0	0	0	138
Fulmar / gull species	0	0	2	1	0	7	0	0	2	1	0	0	13
Passerine species	0	0	0	0	0	0	0	0	0	0	0	0	0
Jellyfish	47	1	1	0	0	0	2	0	0	0	0	0	51
Seal species	5	3	0	5	2	2	3	0	0	0	2	0	22

Species group (No ID)	Month												Total
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Dolphin species	0	0	0	0	0	0	0	0	0	0	0	0	0
Cetacean species	0	0	0	0	0	1	0	0	0	0	0	0	1
Seal / small cetacean species	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	176	49	33	20	96	131	29	84	253	44	48	42	1005

Table 8 **Number of objects with no species ID detected during each survey assigned to species group in the Morecambe survey area between March 2022 and February 2023. Survey dates presented in Table 4. *Raw data from full dataset**

Species group (No ID)	Month												Total
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Wader species	0	0	4	0	0	0	0	0	0	0	0	0	4
Small gull species	0	0	2	0	0	0	2	1	3	6	2	3	19
Black-backed gull species	0	0	0	0	0	0	0	0	0	0	0	0	0
Large gull species	0	0	5	0	1	8	2	0	1	4	0	0	21
Gull species	0	2	3	2	1	1	0	3	4	3	0	0	19
Arctic / common tern	0	0	27	18	3	2	1	0	0	0	0	0	51
Tern species	0	0	0	0	5	1	0	0	0	0	0	0	6
Tern / small gull	0	0	0	0	0	0	0	0	0	0	0	0	0
Skua species	0	0	0	0	0	0	1	0	0	0	0	0	1
Large auk	18	36	22	22	36	22	5	164	40	72	14	19	470
Auk species	2	6	12	3	34	2	5	29	42	13	34	5	187
Auk / small gull	0	5	6	1	4	2	3	5	11	8	1	0	46
Large auk / diver species	0	1	0	0	0	0	0	0	0	0	0	0	1
Auk / shearwater species	0	2	88	19	58	79	10	6	1	0	0	0	263
Fulmar / gull species	2	1	5	0	2	0	0	7	1	7	0	1	26
Passerine species	0	0	4	0	0	0	0	0	0	0	0	0	4
Jellyfish	0	0	0	0	0	10	0	5	0	0	0	0	15
Seal species	2	1	1	6	1	6	3	2	5	2	4	4	37

Species group (No ID)	Month												Total
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
Dolphin species	0	0	0	0	0	0	0	0	0	0	1	0	1
Cetacean species	0	0	1	0	1	0	0	0	1	0	0	0	3
Seal / small cetacean species	0	0	0	0	0	1	0	0	1	0	0	0	2
Total	24	54	180	71	146	134	32	222	110	115	56	32	1176

3.3 Distribution patterns and seasonal abundances

71 Apportioned density, total estimated population and upper and lower 95% CLs are presented for key species. Complete unapportioned and apportioned estimates, including standard deviation and CV, for all species and species groups are presented in Appendix I: Density and population estimates. An explanation of these parameters is presented in Table 9.

72 For certain diving species (guillemot, razorbill, puffin and harbour porpoise), estimates were adjusted to account for availability bias (2.5.3) and estimate absolute abundance. The adjusted (absolute) density and abundances provide the best estimate of abundance at the time of survey. No calculation of availability bias was carried out for any other diving species (e.g. red-throated diver, gannet and shag (*Gulosus aristotelis*)) due to the low numbers present and/or lack of information about diving patterns, and so estimates for such species are biased low. Unapportioned and apportioned absolute density and abundance estimates can be found in Appendix II. Apportioned absolute density and population estimates are presented in results section instead of relative estimates for all key species.

73 Further Appendices have been added to display different buffer options; Appendix III: Density and population estimates for revised development area, Appendix IV: Density and population estimates for revised development area with 2km buffer, Appendix V: Density and population estimates for revised development area with 4km buffer, and Appendix VI: Density and population estimates for Red throated diver custom buffer.

74 Distribution patterns of the most abundant species are presented as density maps, in which a density surface depicts the estimated number of animals per km². Distributions of less abundant species recorded five or less, unidentified species and anthropogenic activity are presented as dot maps only.

Table 9   Terms used in population analysis

Term	Definition
Apportioning	The process of assigning unidentified birds in each species group to species where appropriate, based on respective abundance ratios
Density estimate (animals/km²)	The average number of animals per square km surveyed over the whole area
Population estimate (number)	The mean number of animals estimated within the survey area
95% confidence interval (CI)	A measure of uncertainty in the mean value. If the analysis was repeated, 95% of the time the mean population estimate would fall within this range. The smaller the CI range the more confident we can be that the mean estimate is an accurate reflection of the true population size.
Confidence limit (CL)	The upper and lower values that define the range of the 95% confidence interval.
Standard deviation (SD) of population estimate	The amount of variation or dispersion of a set of values. A low SD indicates that the bootstrap values tend to be close to the mean of the set.
CV (%)	The coefficient of variation is a standard measure that describes the dispersion of data points around the mean. The lower the CV the more precise the estimate. It is calculated as the SD / mean.
Relative abundance	In the case of diving birds and mammals, this is the estimated population size based on animals recorded on or above the sea surface and does not account for any that may be diving and thus submerged at the time of survey.
Absolute abundance	The most accurate estimate of population size. In the case of diving birds and mammals, this includes an estimate for the number that are believed to be submerged at the time of survey.

Table 10   Seasonality for the presented key seabird species (based on Furness, 2015)

Species	UK breeding season	UK non-breeding season	Migration-free breeding season	Post-breeding migration (UK waters)	Migration-free winter season	Return migration (UK waters)
Kittiwake	Mar - Aug	Sep - Feb	May - July	Aug - Dec	None	Jan - Apr
Herring gull	Mar - Aug	Sep - Feb	May - Jul	Aug - Nov	Dec	Jan - Apr
Lesser black-backed gull	Apr - Aug	Sep - Mar	May - Jul	Aug - Oct	Nov - Feb	Mar - Apr
Guillemot	Mar - Jul	Aug - Feb	Mar - Jun	Jul - Oct	Nov	Dec - Feb
Razorbill	Apr - Jul	Aug - Mar	Apr - Jun	Aug - Oct	Nov - Dec	Jan - Mar
Red-throated diver	Mar-Aug	-	May - Aug	Sep - Nov	Dec - Jan	Feb - Apr
Manx shearwater	Apr - Aug	Sep - Mar	Jun - Jul	Aug – early Oct	Nov - Feb	Late Mar - May
Gannet	Mar - Sep	Oct - Feb	Apr - Aug	Sep - Nov	-	Dec - Mar

3.3.1 All bird species

75 The total number of birds recorded across the Morecambe survey area is presented in Figure 8, whilst the distributions and densities of birds throughout the survey period are presented in Figure 9 to Figure 12.

76 The total number of birds varied between surveys, with the highest numbers recorded in August 2021 and the lowest observed in December 2021. Low numbers of birds were also recorded in May and June 2021, March 2022 and January 2023.

77 Birds were found in high densities across the survey area, such as in July and August 2021 and between July and December 2022. In some surveys, birds were distributed to the east, such as in November 2021 and February 2022.

Figure 8 **Total number of birds recorded between March 2021 and February 2023 in the Morecambe survey area**
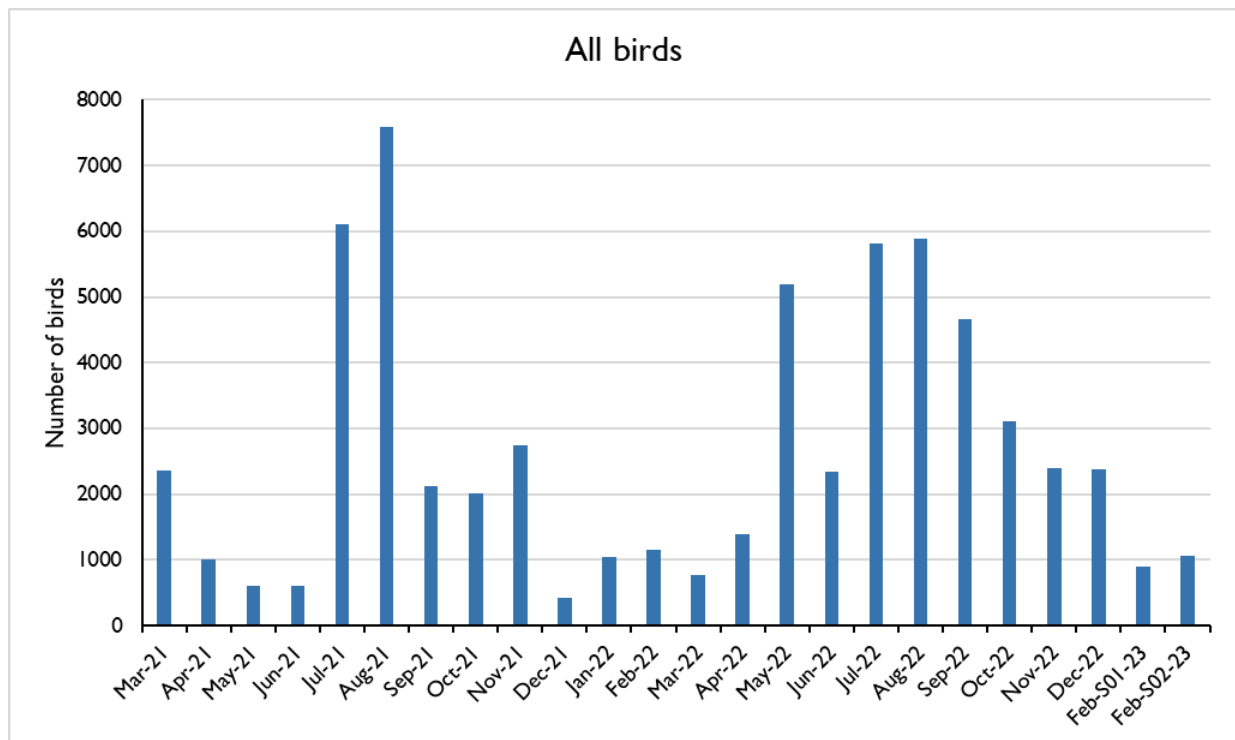
Figure 9 **Density of all birds (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021**
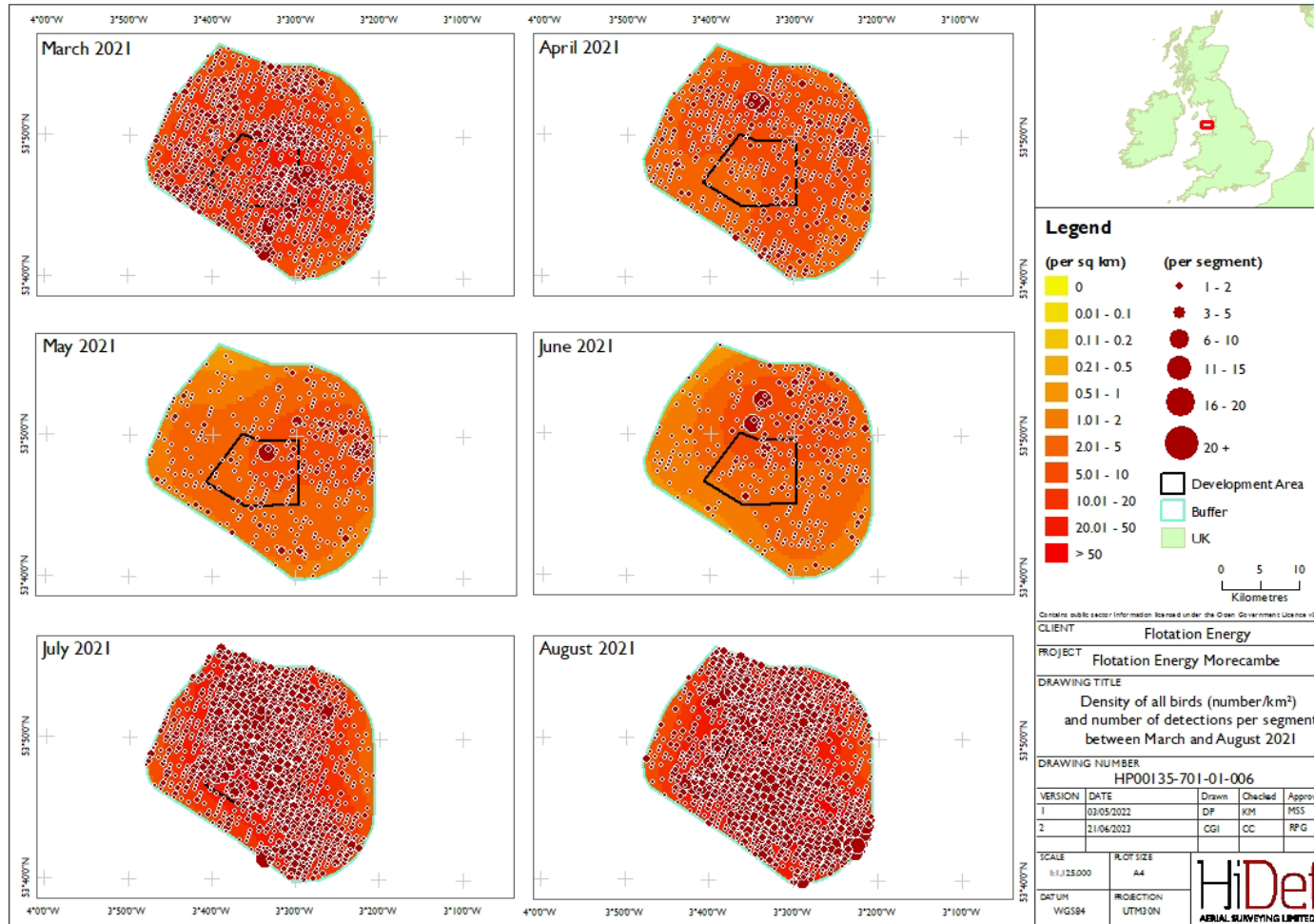
Figure 10 **Density of all birds (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022**

Figure 11   Density of all birds (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022
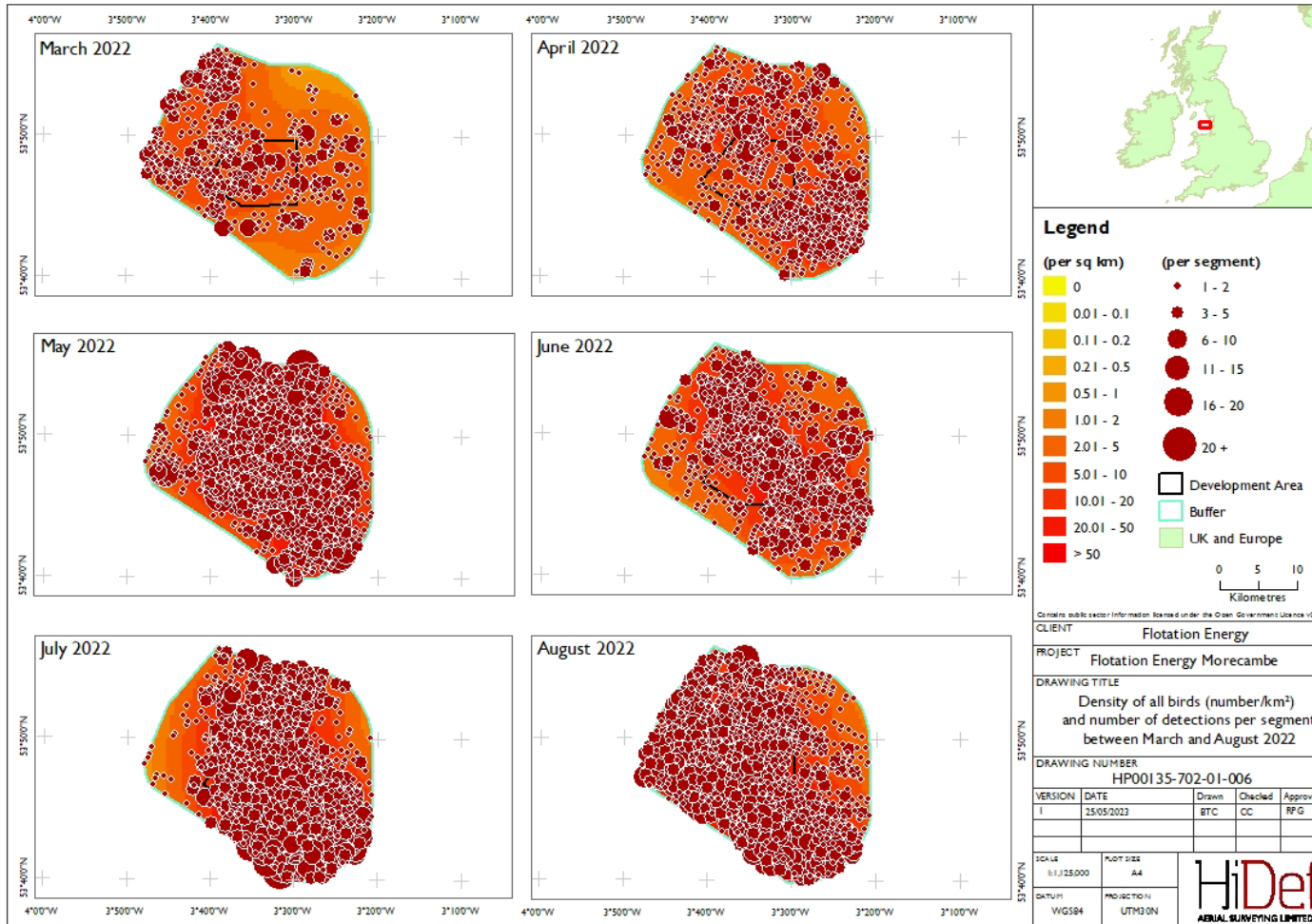
Figure 12 **Density of all birds (number/km²) and number of detections per segment in the Morecambe survey area between September 2022 and February 2023**
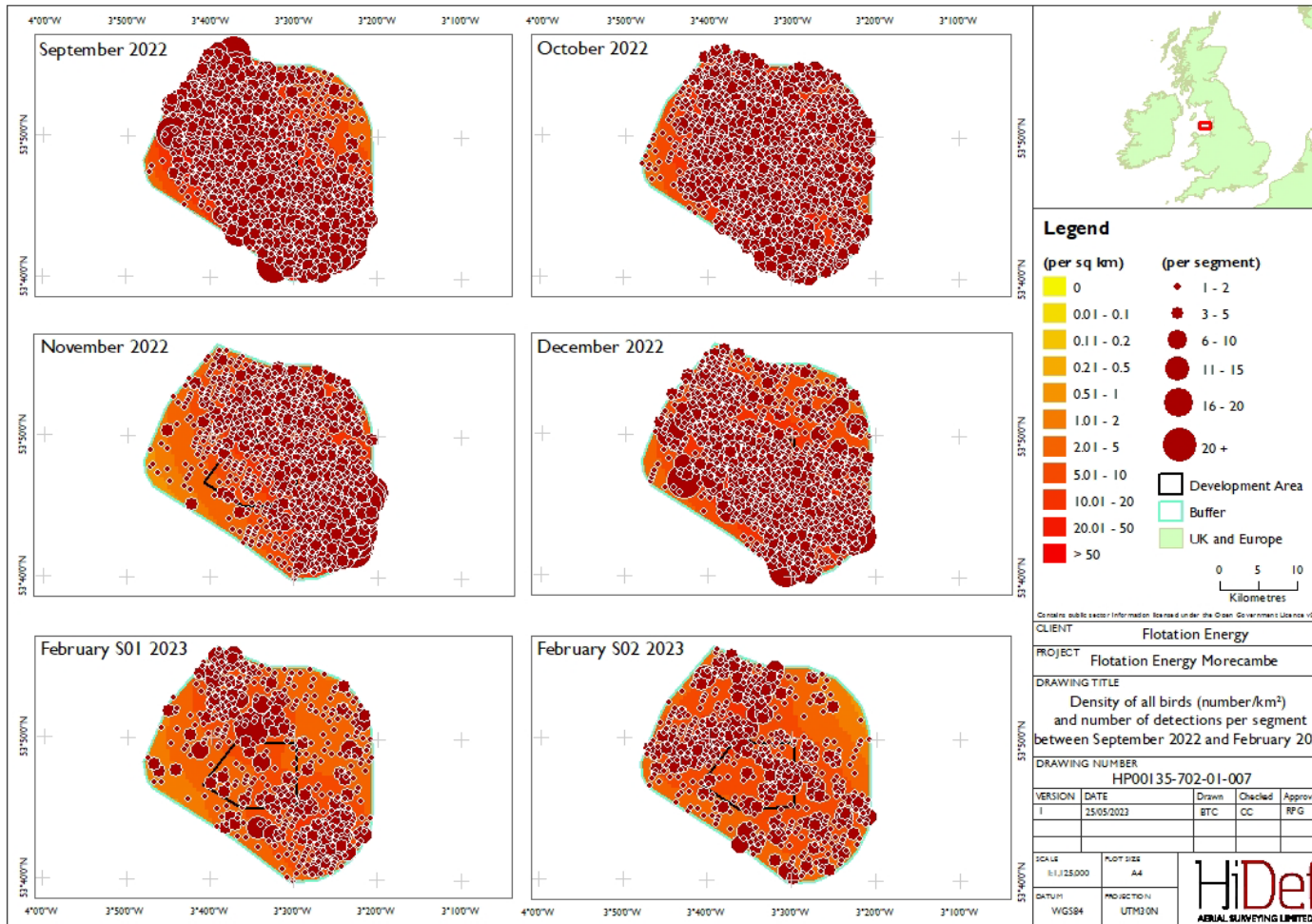
3.3.2 Common scoter

78   Common scoter were recorded in relatively moderate numbers during the non-breeding season, peaking in December 2022 (Figure 13). No birds were recorded during either breeding season as expected.

79   Apportioned density estimates for the species ranged between 0.00 birds/km^2, such as in May 2021 and 2022, and 0.38 birds/km^2 (95% CI 0.13 – 0.68) in December 2022, equating to a peak population estimate of 246 birds (95% CI 84 - 442; Figure 14 and Table 11).

80   Common scoter were primarily distributed in the eastern side of the buffer (Figure 15 to Figure 18), within the Liverpool Bay SPA. In December 2022, when records peaked, relatively high densities were observed in the north-east (Figure 18). In December 2022 and January 2023, birds were also recorded within the development area.

81   Over the survey period, 2% of birds were recorded flying, with most birds recorded as sitting on the water (Table 12).

82   In the four surveys in which common scoter were recorded flying, birds were heading in a north-easterly direction in January, March and November 2022 and a south-westerly direction in December 2022 (Figure 19).

Figure 13   Number of common scoter recorded between March 2021 and February 2023 in the Morecambe survey area
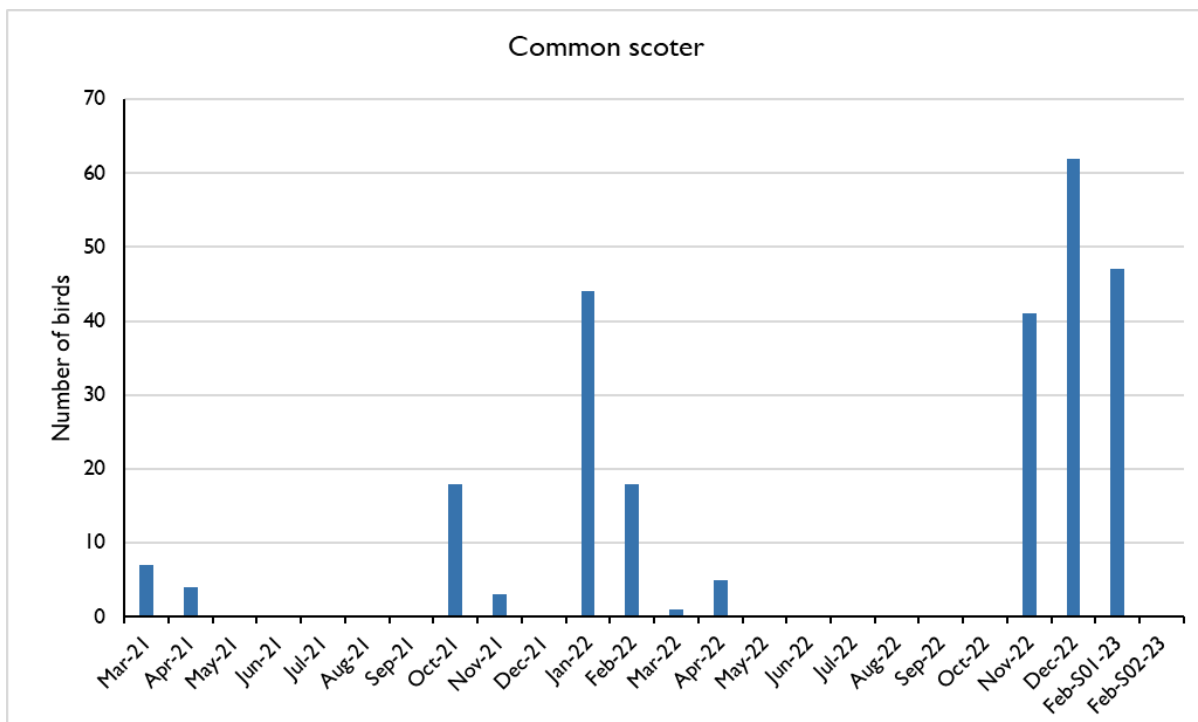
Figure 14 **Apportioned common scoter density estimates, with 95% upper and lower confidence limits, in the Morecambe survey area between March 2021 and February 2023**
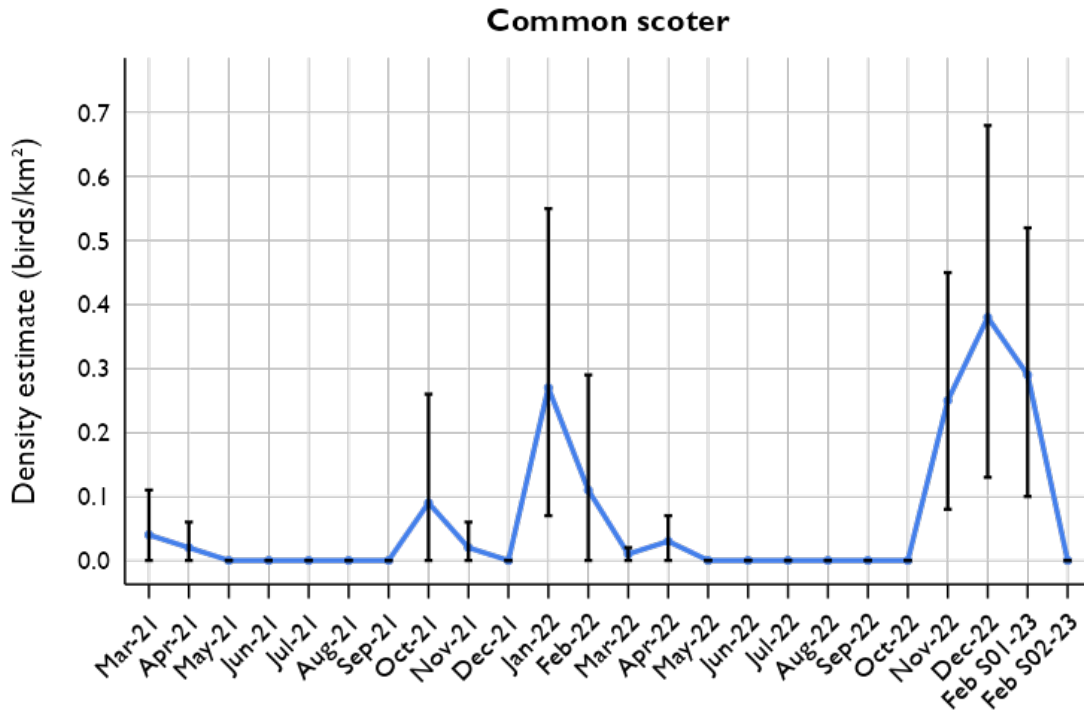
Common scoter

Table 11 **Apportioned density and population estimates of common scoter in the Morecambe survey area between March 2021 and February 2023**

Survey date	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
19 March 2021	0.04	28	0	75	21	73.85
07 April 2021	0.02	16	0	40	11	68.22
18 May 2021	0.00	0	0	0	0	0.00
01 June 2021	0.00	0	0	0	0	0.00
09 July 2021	0.00	0	0	0	0	0.00
02 August 2021	0.00	0	0	0	0	0.00
04 September 2021	0.00	0	0	0	0	0.00
06 October 2021	0.09	60	0	172	54	90.51
17 November 2021	0.02	13	0	37	12	95.69
05 December 2021	0.00	0	0	0	0	0.00
13 January 2022	0.27	176	44	359	82	46.59
11 February 2022	0.11	74	0	187	50	67.92
09 March 2022	0.01	4	0	12	4	99.59
01 April 2022	0.03	21	0	48	13	60.63
02 May 2022	0.00	0	0	0	0	0.00
07 June 2022	0.00	0	0	0	0	0.00
14 July 2022	0.00	0	0	0	0	0.00
09 August 2022	0.00	0	0	0	0	0.00
02 September 2022	0.00	0	0	0	0	0.00
03 October 2022	0.00	0	0	0	0	0.00
22 November 2022	0.25	166	52	292	64	38.57
03 December 2022	0.38	246	84	442	93	37.58
05 February 2023	0.29	187	63	337	73	39.09
23 February 2023	0.00	0	0	0	0	0.00

Table 12   Summary of common scoter behaviours in the Morecambe survey area between March 2021 and February 2022

Survey date	Number recorded diving	Number recorded flying	Number recorded sitting	Number recorded taking off	% Flying	Total
19 March 2021	0	0	7	0	0	7
07 April 2021	0	0	4	0	0	4
18 May 2021	0	0	0	0	-	0
01 June 2021	0	0	0	0	-	0
09 July 2021	0	0	0	0	-	0
02 August 2021	0	0	0	0	-	0
04 September 2021	0	0	0	0	-	0
06 October 2021	0	0	18	0	0	18
17 November 2021	0	0	3	0	0	3
05 December 2021	0	0	0	0	-	0
13 January 2022	0	3	41	0	7	44
11 February 2022	0	0	18	0	0	18
09 March 2022	0	1	0	0	100	1
01 April 2022	0	0	5	0	0	5
02 May 2022	0	0	0	0	0	0
07 June 2022	0	0	0	0	0	0
14 July 2022	0	0	0	0	0	0
09 August 2022	0	0	0	0	0	0
02 September 2022	0	0	0	0	0	0
03 October 2022	0	0	0	0	0	0
22 November 2022	0	1	40	0	2	41
03 December 2022	0	1	61	0	2	62
05 February 2023	0	0	47	0	0	47
23 February 2023	0	0	0	0	0	0
Total	**0**	**6**	**244**	**0**	**2**	**250**

Figure 15 Density of common scoter (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021
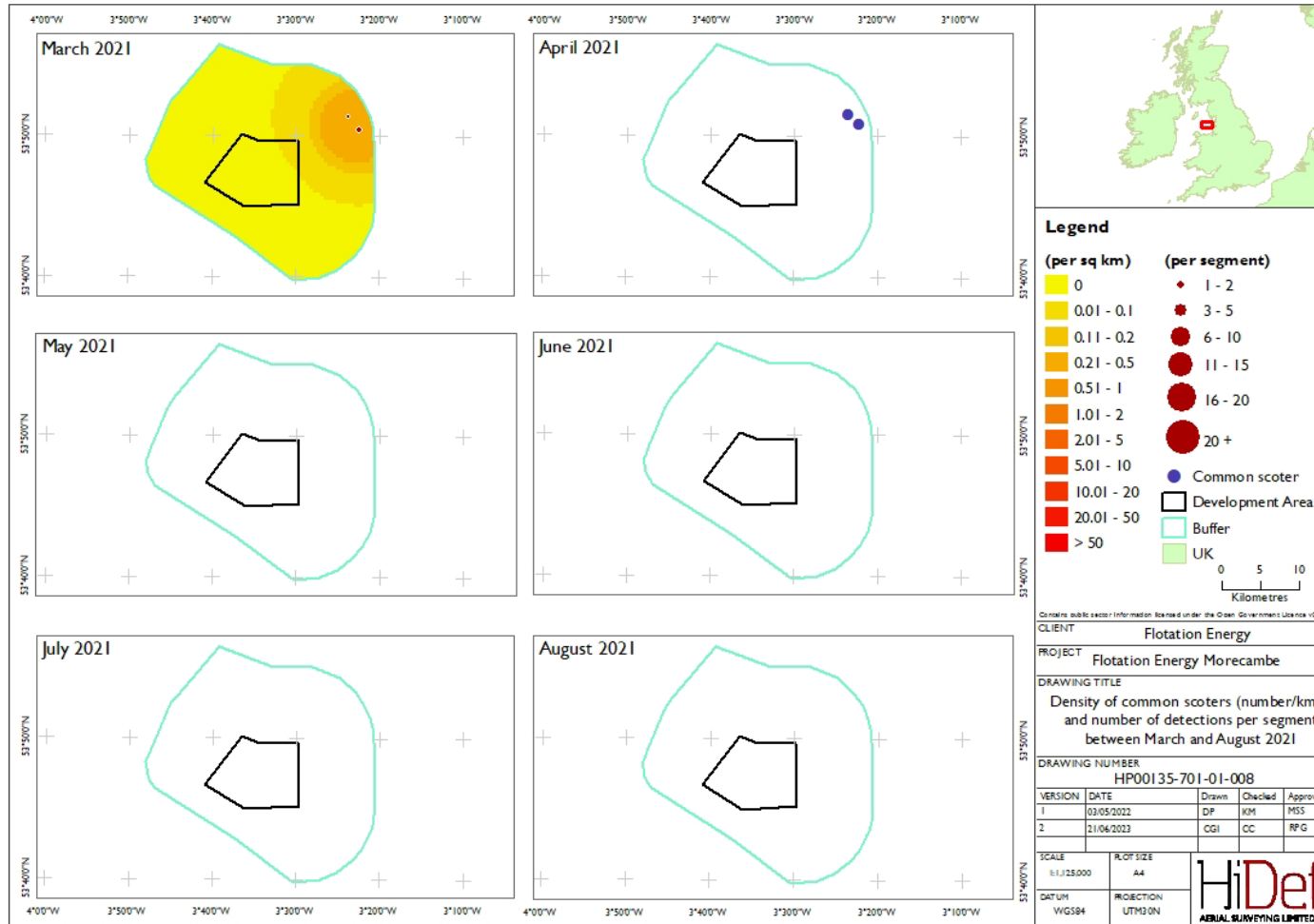
Figure 16   **Density of common scoter (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022**
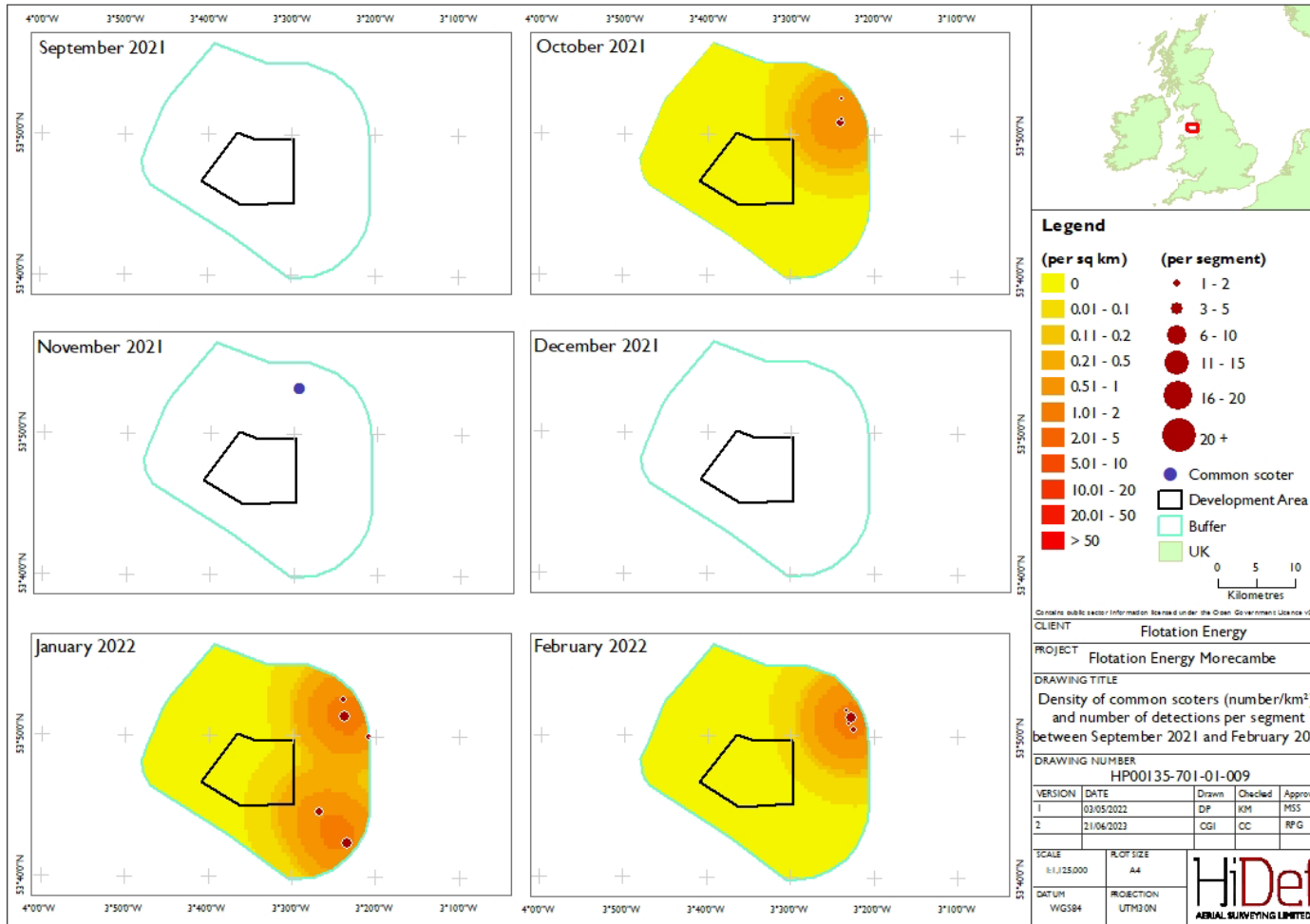
Figure 17 Density of common scoter (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022
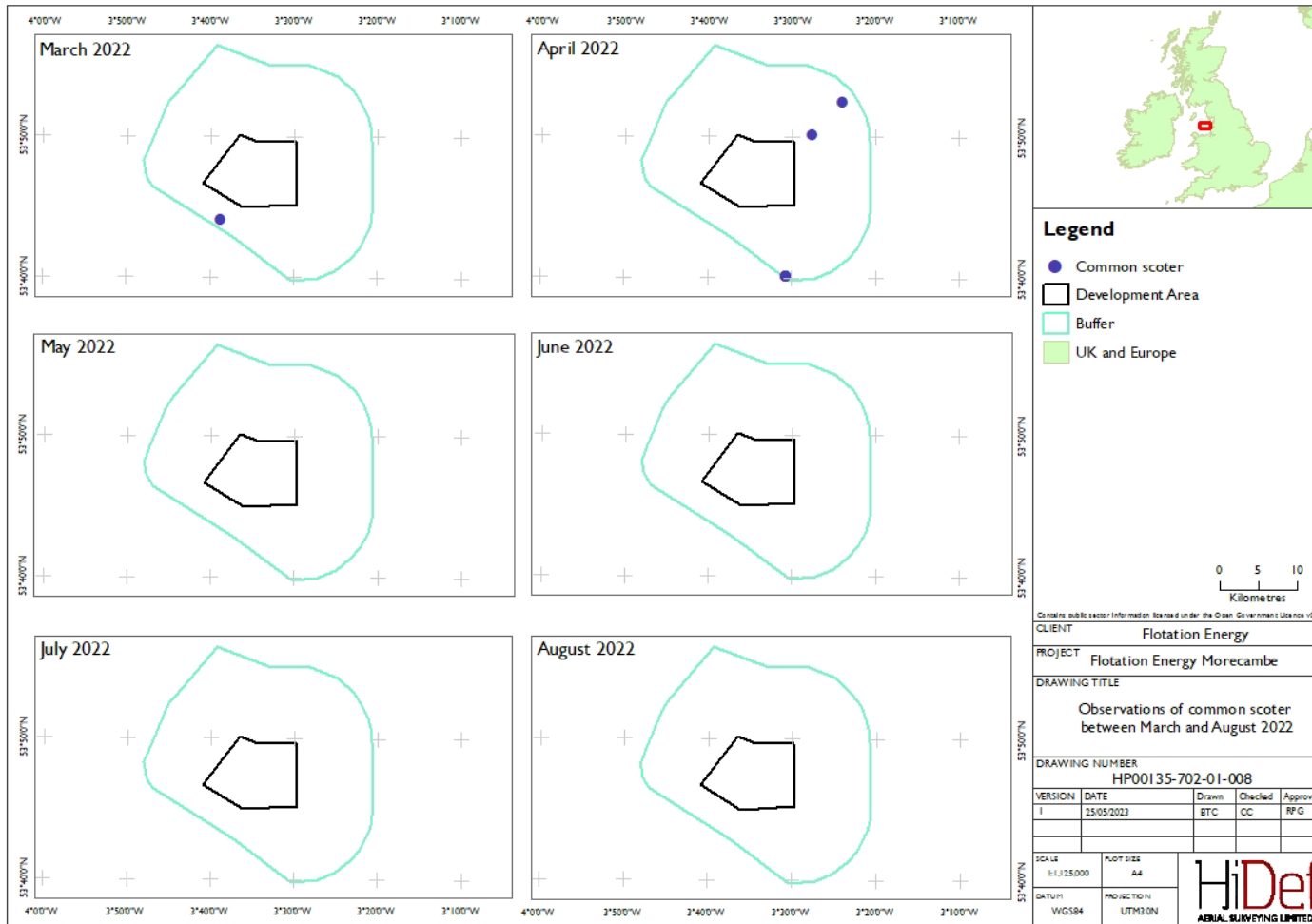
Figure 18   Density of common scoter (number/km²) and number of detections per segment in the Morecambe survey area between September 2022 and February 2023
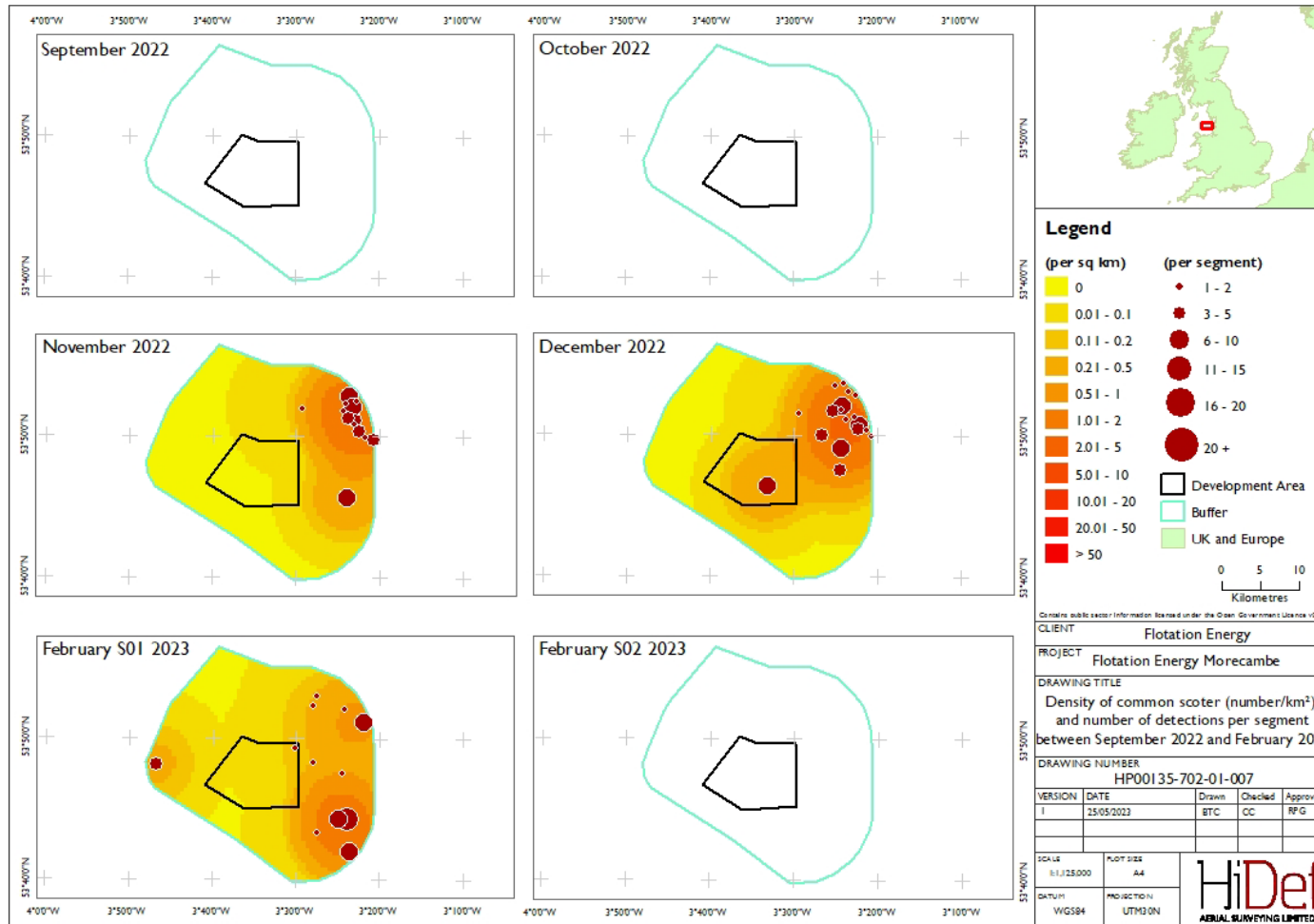
Figure 19   Summarised direction of movement of flying common scoter in the Morecambe survey area between March 2021 and February 2023

Common scoter
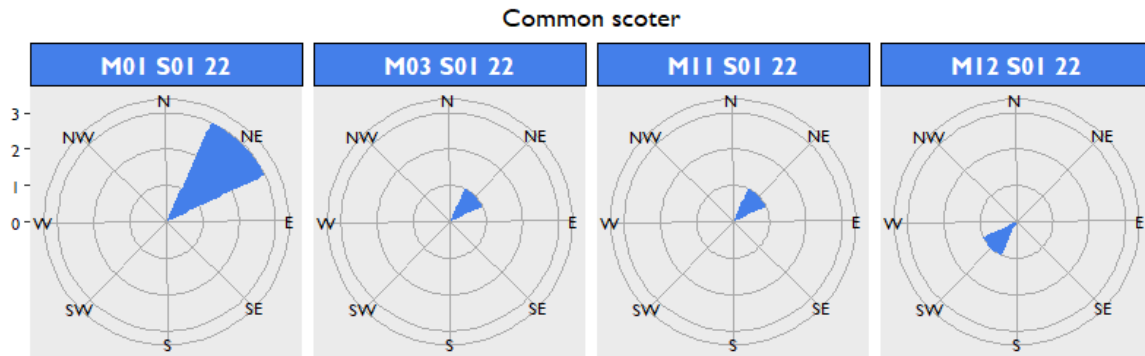
3.3.3 Kittiwake

83   Black-legged kittiwake (*Rissa tridactyla;* hereafter 'kittiwake') were the third most abundant species recorded, in relatively low numbers throughout most of the non-breeding winter period, with considerable increases between August and September 2021 and an increase in September 2022 towards the end of the breeding season and start of the non-breeding season (Figure 20).

84   Apportioned density estimates for the species peaked in September 2021, calculated at 7.79 birds/km^2 (95% CI 4.47 – 11.70), equating to a population estimate of 5,075 birds (95% CI 2,915 – 7,620) for the entire survey area (Figure 21). The lowest densities were recorded in October 2021, calculated at 0.18 birds/km^2 (95% CI 0.10 – 0.27).

85   Birds were found throughout the survey area, with higher densities generally observed in the north of the development area and buffer, such as between April and August 2021 (Figure 22). In November 2021, higher densities were also observed to the west of the survey area (Figure 23). Kittiwake were more widespread across the survey area between March 2022 and September 2022, with higher densities observed towards the south-east of the survey area in August and September 2022 (Figure 24). During the second non-breeding season, the species was spread across the survey area (Figure 25).

86   Of the birds that could be aged, 96% were recorded as adults, with the largest proportion of immature and juvenile birds recorded in September 2021 (Table 14). Over the survey period, 53% of birds were recorded flying, with a large proportion of birds recorded as sitting on the water at the start of the non-breeding season in September 2021 and 2022 and over the winter months, such as in March and April 2021 and November 2022 (Table 15). In September 2022, one of the kittiwakes was recorded dead and in August 2021, 158 kittiwakes were sitting on man-made objects.

87   There were survey months in which no data regarding flight direction were available. To allow for clear interpretation of results, only surveys which contained flight direction data are displayed (Figure 26). In August 2022, when numbers peaked, birds were flying in a variety of directions with more flying in a north-westerly and north-easterly direction. In September 2021 and 2022, when flying numbers were also high, birds were mainly heading in southerly and north-easterly to south-easterly directions respectively, while in November 2021 and July 2022 birds were primarily flying in west and northerly directions and south-westerly directions.

Figure 20 **Number of kittiwake recorded between March 2021 and February 2023 in the Morecambe survey area**
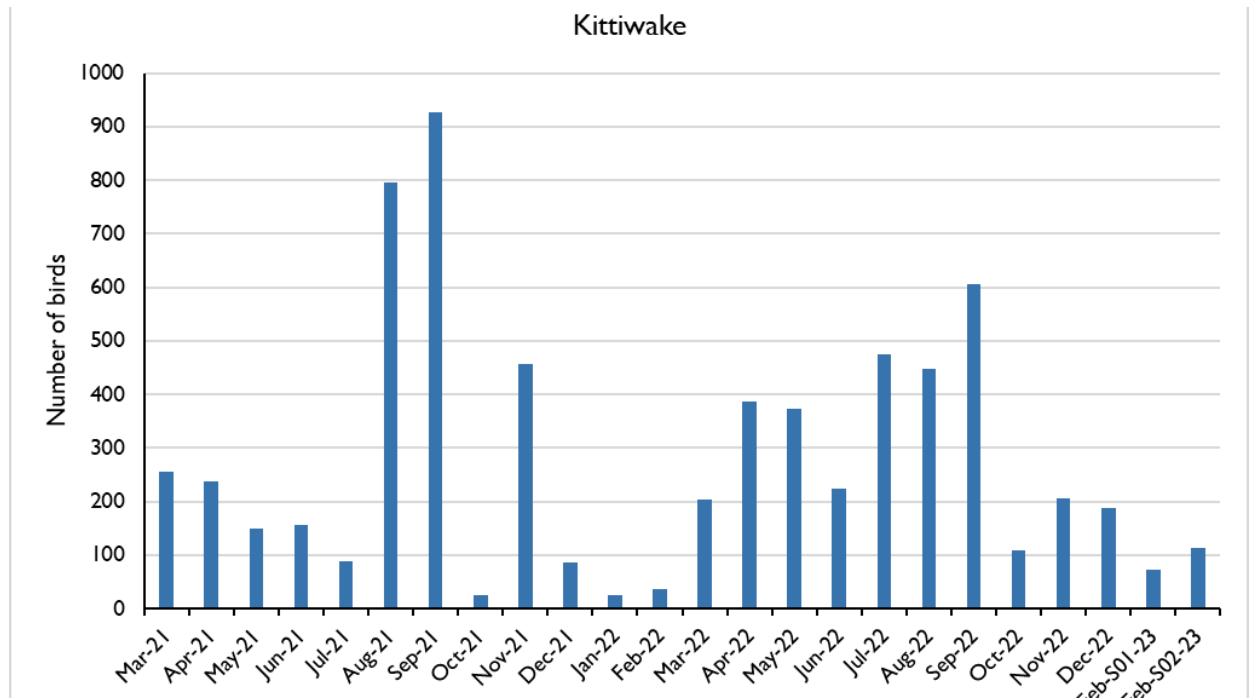
Figure 21 **Apportioned kittiwake density estimates, with 95% upper and lower confidence limits, in the Morecambe survey area between March 2021 and February 2023**
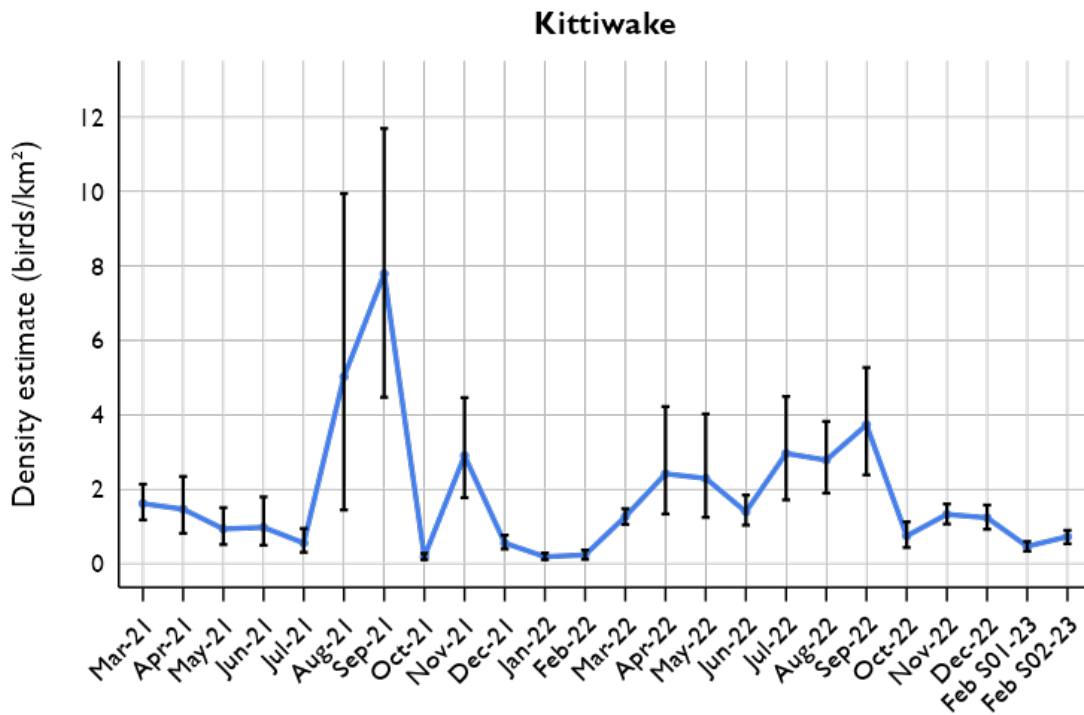
Table 13   **Apportioned density and population estimates of kittiwake in the Morecambe survey area between March 2021 and February 2022**

Survey date	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
19 March 2021	1.61	1049	764	1385	161	15.33
07 April 2021	1.46	951	526	1523	260	27.34
18 May 2021	0.93	604	331	976	168	27.74
01 June 2021	0.97	631	321	1169	224	35.47
09 July 2021	0.55	360	196	614	112	31.12
02 August 2021	5.02	3272	938	6484	1411	43.10
04 September 2021	7.79	5075	2915	7620	1211	23.85
06 October 2021	0.18	116	63	175	30	25.78
17 November 2021	2.90	1887	1151	2903	456	24.16
05 December 2021	0.55	359	257	497	63	17.46
13 January 2022	0.18	118	66	183	30	25.54
11 February 2022	0.23	148	75	234	42	27.81
09 March 2022	1.26	819	685	958	70	8.52
01 April 2022	2.41	1572	865	2746	532	33.85
02 May 2022	2.29	1493	806	2619	513	34.31
07 June 2022	1.39	908	674	1196	131	14.36
14 July 2022	2.96	1925	1115	2926	469	24.32
09 August 2022	2.78	1808	1229	2487	313	17.29
02 September 2022	3.73	2432	1551	3433	485	19.93
03 October 2022	0.74	482	278	731	119	24.53
22 November 2022	1.32	862	689	1043	92	10.59
03 December 2022	1.23	801	598	1023	111	13.75
05 February 2023	0.46	301	217	386	45	14.83
23 February 2023	0.72	467	345	582	60	12.84

Table 14 **Summary of kittiwake ages in the Morecambe survey area between March 2021 and February 2022**

Survey date	Number recorded as adult	Number recorded as immature	Number recorded as juvenile	Number recorded as unknown	% Adult (from aged birds)	Total
19 March 2021	86	3	0	168	97	257
07 April 2021	81	3	0	153	96	237
18 May 2021	65	2	0	83	97	150
01 June 2021	98	0	0	59	100	157
09 July 2021	68	2	1	18	96	89
02 August 2021	343	2	5	447	98	797
04 September 2021	358	4	11	554	96	927
06 October 2021	8	0	5	12	62	25
17 November 2021	330	0	6	122	98	458
05 December 2021	78	0	2	7	98	87
13 January 2022	10	1	0	14	91	25
11 February 2022	15	0	0	22	100	37
09 March 2022	93	6	0	106	94	205
01 April 2022	233	16	0	138	94	387
02 May 2022	248	26	0	99	91	373
07 June 2022	105	6	0	114	95	225
14 July 2022	394	2	0	78	99	474
09 August 2022	275	0	2	170	99	447
02 September 2022	206	1	8	390	96	605
03 October 2022	38	0	4	66	90	108
22 November 2022	146	0	1	59	99	206
03 December 2022	141	2	3	43	97	189
05 February 2023	26	2	0	45	93	73
23 February 2023	32	4	0	77	89	113
Total	**3477**	**82**	**48**	**3044**	**96**	**3607**

Table 15 Summary of kittiwake behaviours in the Morecambe survey area between March 2021 and February 2022

Survey date	Number recorded diving	Number recorded flying	Number recorded sitting	Number recorded taking off	% Flying	Other	Total
19 March 2021	0	91	166	0	35	0	257
07 April 2021	0	85	152	0	36	0	237
18 May 2021	0	74	76	0	49	0	150
01 June 2021	0	99	57	0	63	1	157
09 July 2021	0	75	14	0	84	0	89
02 August 2021	0	186	453	0	23	158	797
04 September 2021	0	369	556	1	40	1	927
06 October 2021	0	13	12	0	52	0	25
17 November 2021	0	261	197	0	57	0	458
05 December 2021	0	79	8	0	91	0	87
13 January 2022	0	11	14	0	44	0	25
11 February 2022	0	15	22	0	41	0	37
09 March 2022	0	98	106	1	48	0	205
01 April 2022	0	252	127	0	65	8	387
02 May 2022	1	235	137	0	63	0	373
07 June 2022	0	156	69	0	69	0	225
14 July 2022	0	367	104	2	77	1	474
09 August 2022	0	385	60	2	86	0	447
02 September 2022	0	216	361	0	36	28	605
03 October 2022	0	41	66	1	38	0	108
22 November 2022	0	125	81	0	61	0	206
03 December 2022	0	157	31	1	83	0	189
05 February 2023	0	24	49	0	33	0	73
23 February 2023	0	36	77	0	32	0	113
Total	**1**	**3450**	**2995**	**8**	**52**	**197**	**6651**

Figure 22   Density of kittiwake (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021
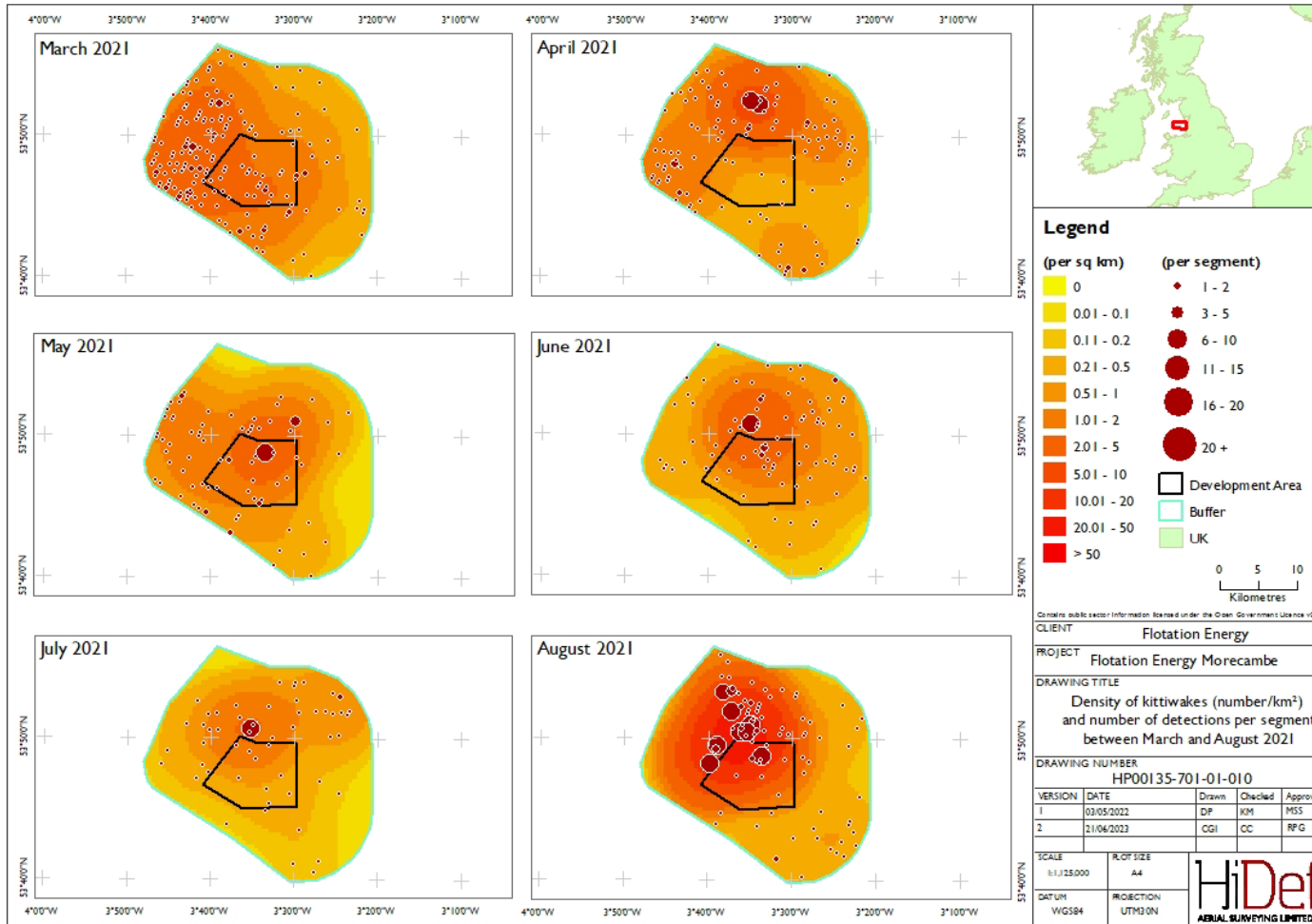
Figure 23 **Density of kittiwake (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022**
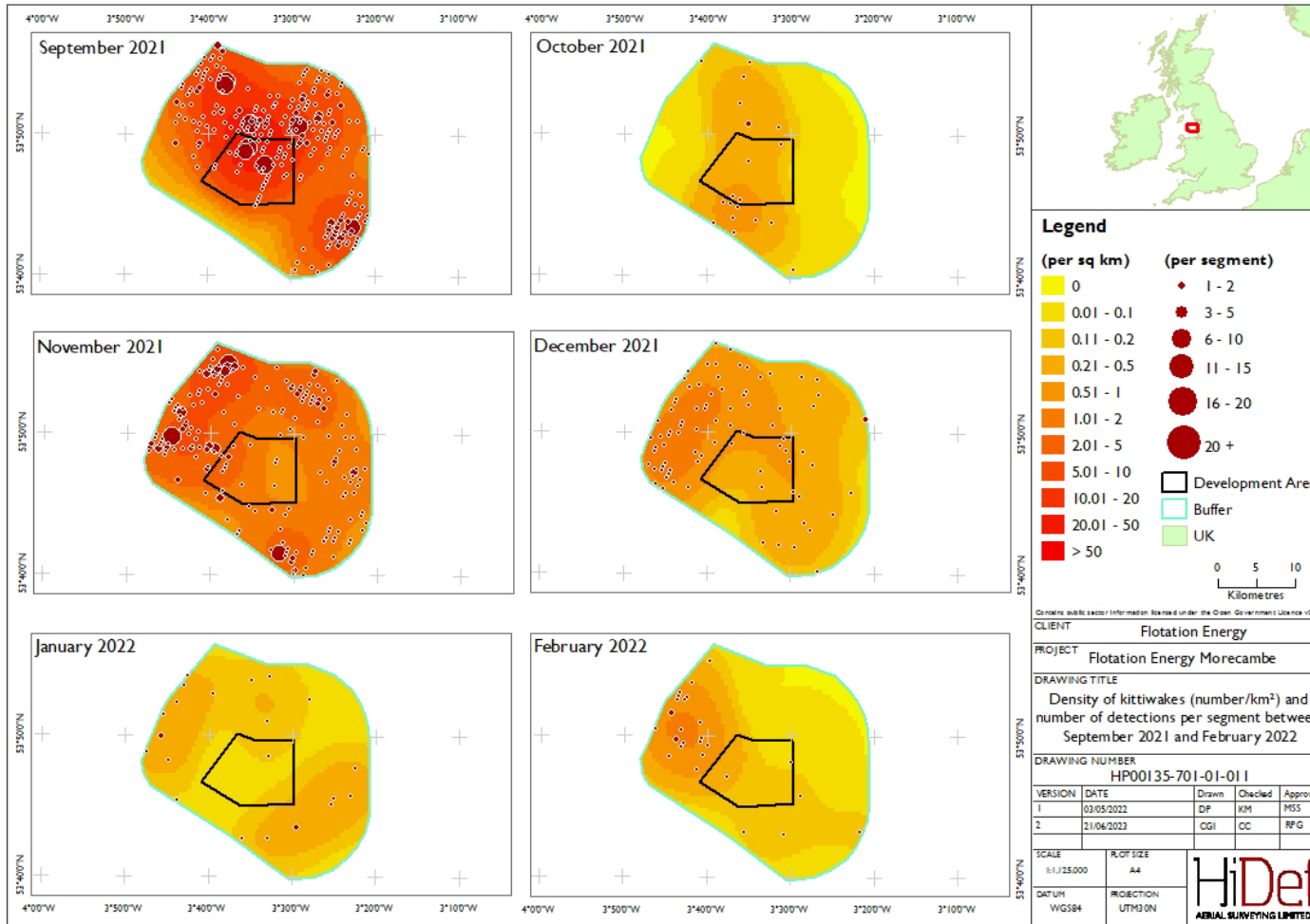
Figure 24 **Density of kittiwake (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022**
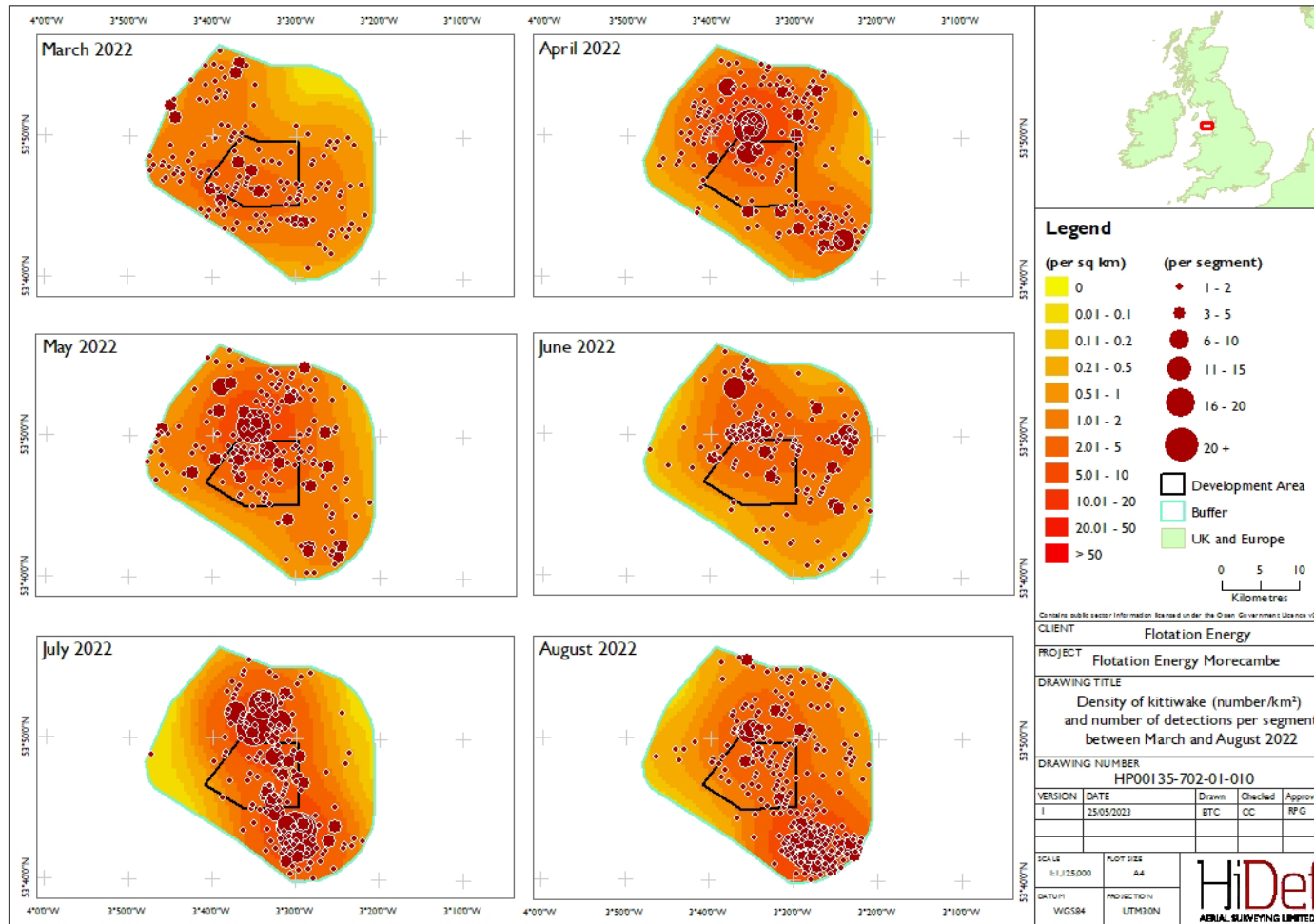
Figure 25 **Density of kittiwake (number/km²) and number of detections per segment in the Morecambe survey area between September 2022 and February 2023**
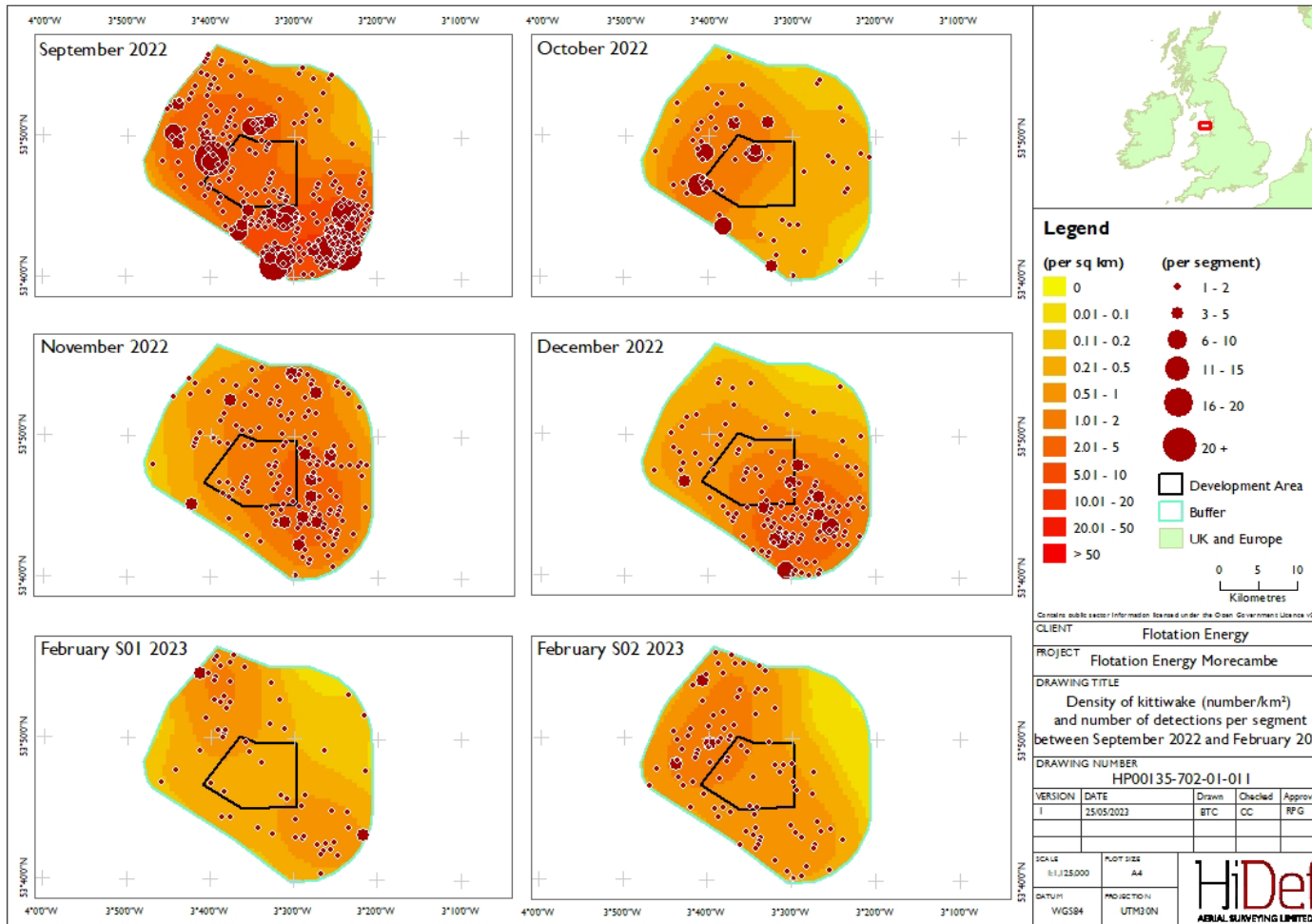
Figure 26   Summarised direction of movement of flying kittiwake in the Morecambe survey area between March 2021 and February 2023

Kittiwake
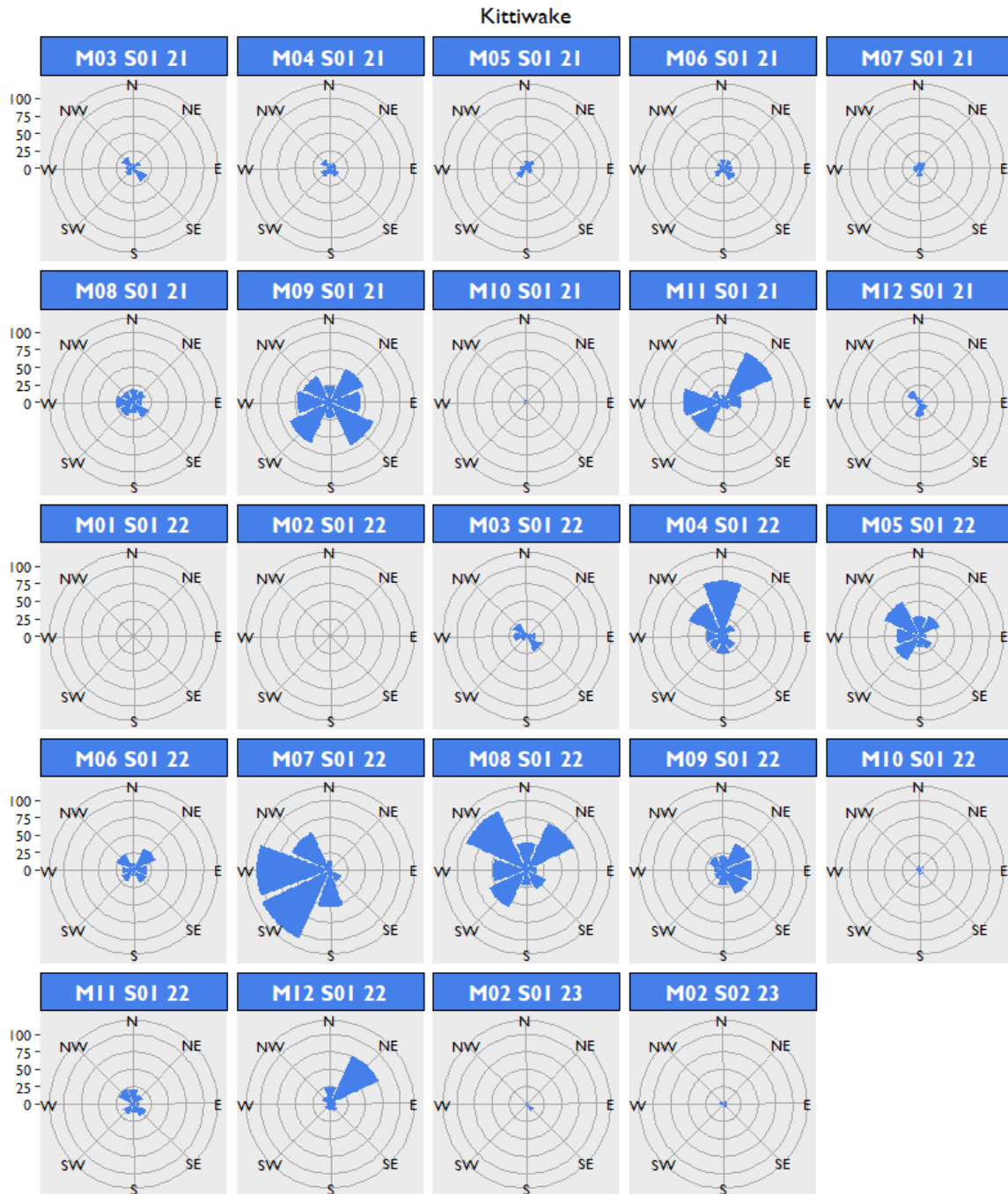
3.3.4 Little gull

88   Compared to other gull species, little gull were recorded in relatively low numbers, peaking in December 2022 and February S02 2023 during the usual non-breeding season (Figure 27). No birds were recorded during the breeding season as expected.

89   Apportioned density estimates for the species ranged between 0.01 birds/km^2 in October 2022 (95% CI 0.00 – 0.02), and 0.81 birds/km^2 (95% CI 0.55 – 1.17) in February S02 2023 (Figure 28 and Table 16). Peak density estimates in February S02 2023 equated to a population estimate of 530 birds (95% CI 355 - 761).

90   Little gull were primarily distributed in the buffer area, within the Liverpool Bay SPA (Figure 29 to Figure 32). Higher densities were found in the north and east of the buffer in March and November 2021, in contrast to February 2022 when higher densities were also present to the west (Figure 30). In March and April 2022, higher densities were present to the east of the survey area in the buffer and in November 2022, higher densities were present to the north (Figure 31). For December 2022 to February 2023, little gull densities were spread across the survey area (Figure 32).

91   Of the birds that could be aged, 87% were recorded as adults, with four and three immature birds recorded in March 2021 and February 2022 respectively (Table 17). Ten immature birds were recorded in February S02 2023.

92   Over the survey period, 69% of birds were recorded flying, with few birds recorded as sitting on the water, such as in November 2021 (Table 18). High numbers of birds sitting on the water were recorded in February S02 with 62 observations. High numbers of little gull were recorded flying from November 2022 to February 2023, in which 75 were recorded flying in December 2022.

93   There were survey months in which no data regarding flight direction were available. To allow for clear interpretation of results, only surveys which contained flight direction data are displayed (Figure 33). In December 2022 and February S01 and S02 2023, when numbers peaked, birds were mainly heading in north-easterly to southerly directions.

Figure 27 **Number of little gull recorded between March 2021 and February 2023 in the Morecambe survey area**

Figure 28 **Apportioned little gull density estimates, with 95% upper and lower confidence limits, in the Morecambe survey area between March 2021 and February 2023**

Table 16   **Apportioned density and population estimates of little gull in the Morecambe survey area between March 2021 and February 2023**

Survey date	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
19 March 2021	0.16	106	59	161	27	25.00
07 April 2021	0.01	9	0	31	9	98.84
18 May 2021	0.00	0	0	0	0	0.00
01 June 2021	0.00	0	0	0	0	0.00
09 July 2021	0.00	0	0	0	0	0.00
02 August 2021	0.00	0	0	0	0	0.00
04 September 2021	0.00	0	0	0	0	0.00
06 October 2021	0.00	0	0	0	0	0.00
17 November 2021	0.05	33	9	64	14	43.12
05 December 2021	0.01	10	1	21	6	56.81
13 January 2022	0.04	24	8	48	11	43.81
11 February 2022	0.11	71	16	156	37	51.82
09 March 2022	0.05	33	16	52	10	30.05
01 April 2022	0.09	56	28	87	15	26.51
02 May 2022	0.00	0	0	0	0	0.00
07 June 2022	0.00	0	0	0	0	0.00
14 July 2022	0.00	0	0	0	0	0.00
09 August 2022	0.00	0	0	0	0	0.00
02 September 2022	0.00	0	0	0	0	0.00
03 October 2022	0.01	5	0	12	4	93.54
22 November 2022	0.21	138	86	197	28	19.77
03 December 2022	0.54	351	254	452	52	14.7
05 February 2023	0.29	187	106	280	45	23.97
23 February 2023	0.81	530	355	761	102	19.12

Table 17 **Summary of little gull ages in the Morecambe survey area between March 2021 and February 2023**

Survey date	Number recorded as adult	Number recorded as immature	Number recorded as juvenile	Number recorded as unknown	% Adult (from aged birds)	Total
19 March 2021	14	4	0	8	78	26
07 April 2021	2	0	0	0	100	2
18 May 2021	0	0	0	0	-	0
01 June 2021	0	0	0	0	-	0
09 July 2021	0	0	0	0	-	0
02 August 2021	0	0	0	0	-	0
04 September 2021	0	0	0	0	-	0
06 October 2021	0	0	0	0	-	0
17 November 2021	8	0	0	0	100	8
05 December 2021	1	0	0	1	100	2
13 January 2022	6	0	0	0	100	6
11 February 2022	12	3	0	3	80	18
09 March 2022	3	0	0	5	100	8
01 April 2022	6	1	0	7	86	14
02 May 2022	0	0	0	0	0	0
07 June 2022	0	0	0	0	0	0
14 July 2022	0	0	0	0	0	0
09 August 2022	0	0	0	0	0	0
02 September 2022	0	0	0	0	0	0
03 October 2022	1	0	0	0	100	1
22 November 2022	28	0	2	4	93	34
03 December 2022	59	5	3	19	88	86
05 February 2023	25	1	0	20	96	46
23 February 2023	49	10	4	65	78	128
Total	**214**	**24**	**9**	**132**	**87**	**379**

Table 18   Summary of little gull behaviours in the Morecambe survey area between March 2021 and February 2023

Survey date	Number recorded diving	Number recorded flying	Number recorded sitting	Number recorded taking off	% Flying	Total
19 March 2021	0	18	8	0	69	26
07 April 2021	0	2	0	0	100	2
18 May 2021	0	0	0	0	-	0
01 June 2021	0	0	0	0	-	0
09 July 2021	0	0	0	0	-	0
02 August 2021	0	0	0	0	-	0
04 September 2021	0	0	0	0	-	0
06 October 2021	0	0	0	0	-	0
17 November 2021	0	8	0	0	100	8
05 December 2021	0	1	1	0	50	2
13 January 2022	0	6	0	0	100	6
11 February 2022	0	15	3	0	83	18
09 March 2022	0	4	4	0	50	8
01 April 2022	0	9	5	0	64	14
02 May 2022	0	0	0	0	-	0
07 June 2022	0	0	0	0	-	0
14 July 2022	0	0	0	0	-	0
09 August 2022	0	0	0	0	-	0
02 September 2022	0	0	0	0	-	0
03 October 2022	0	1	0	0	100	1
22 November 2022	0	31	3	0	91	34
03 December 2022	0	75	10	1	87	86
05 February 2023	0	27	19	0	59	46
23 February 2023	0	65	62	1	51	128
Total	**0**	**262**	**115**	**2**	**69**	**379**

Figure 29 **Density of little gull (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021**

Figure 30 **Density of little gull (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022**
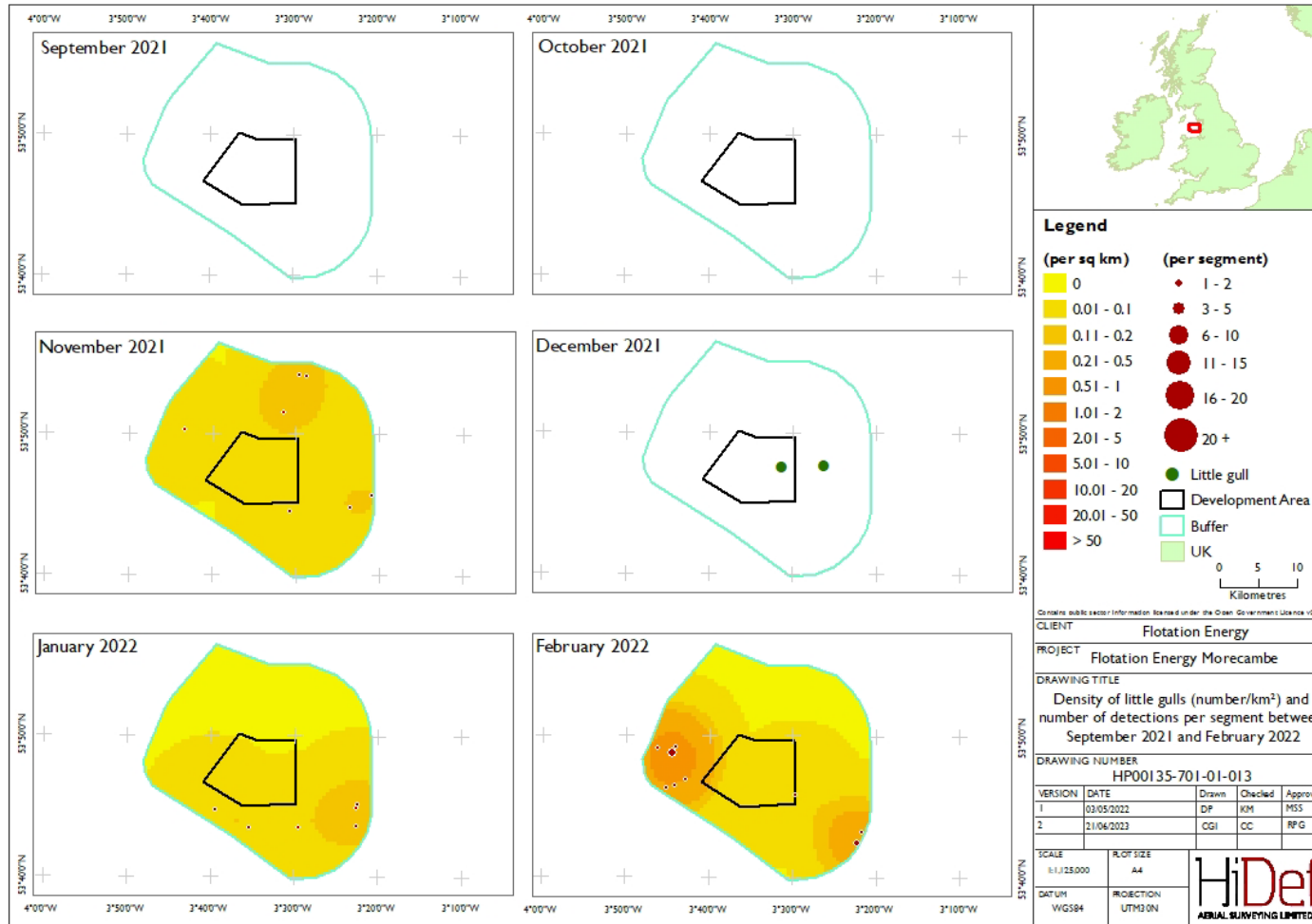
Figure 31 **Density of little gull (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022**
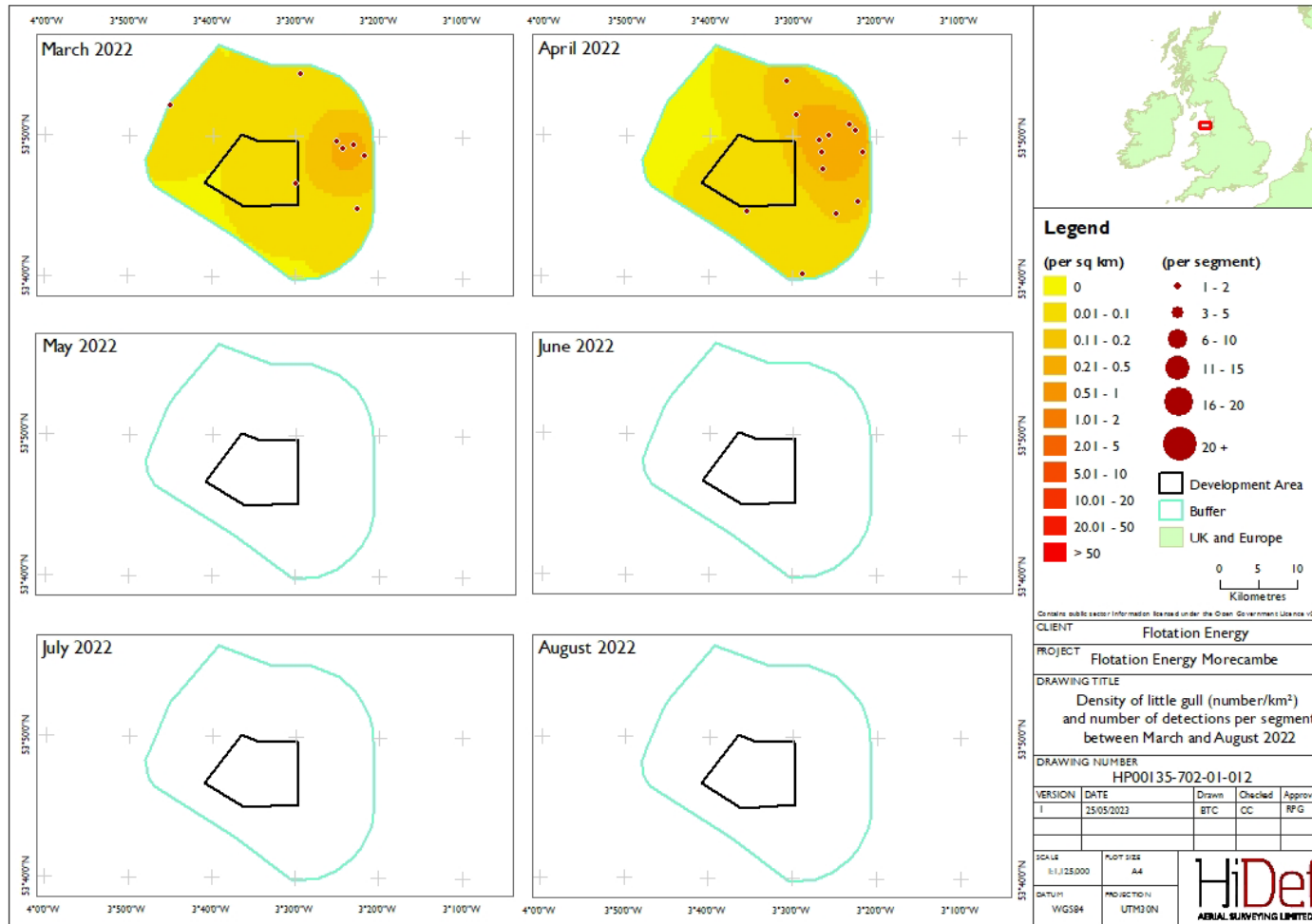
Figure 32 **Density of little gull (number/km²) and number of detections per segment in the Morecambe survey area between September 2022 and February 2023**
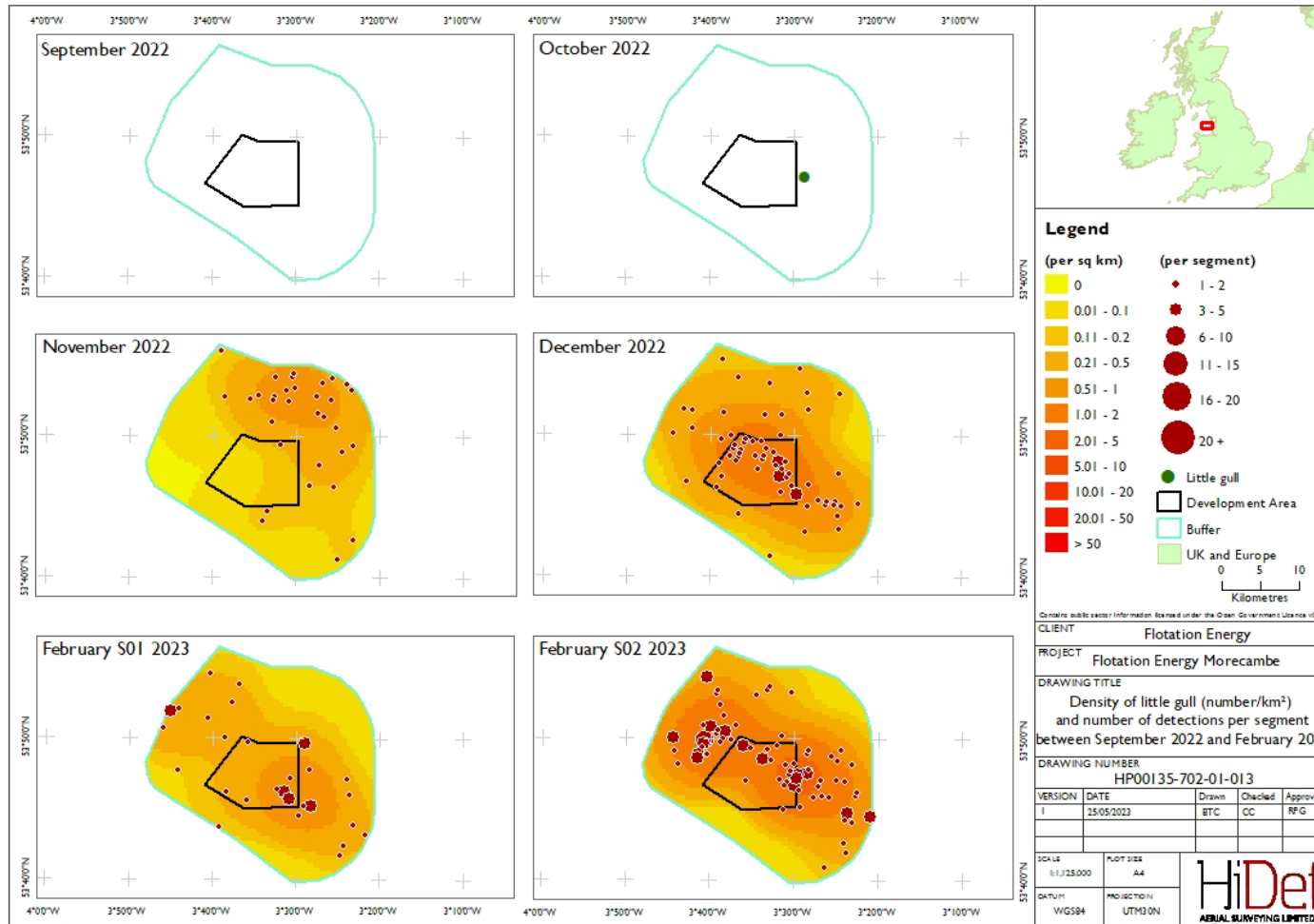
Figure 33   Summarised direction of movement of flying little gull in the Morecambe survey area between March 2021 and February 2023

Little gull
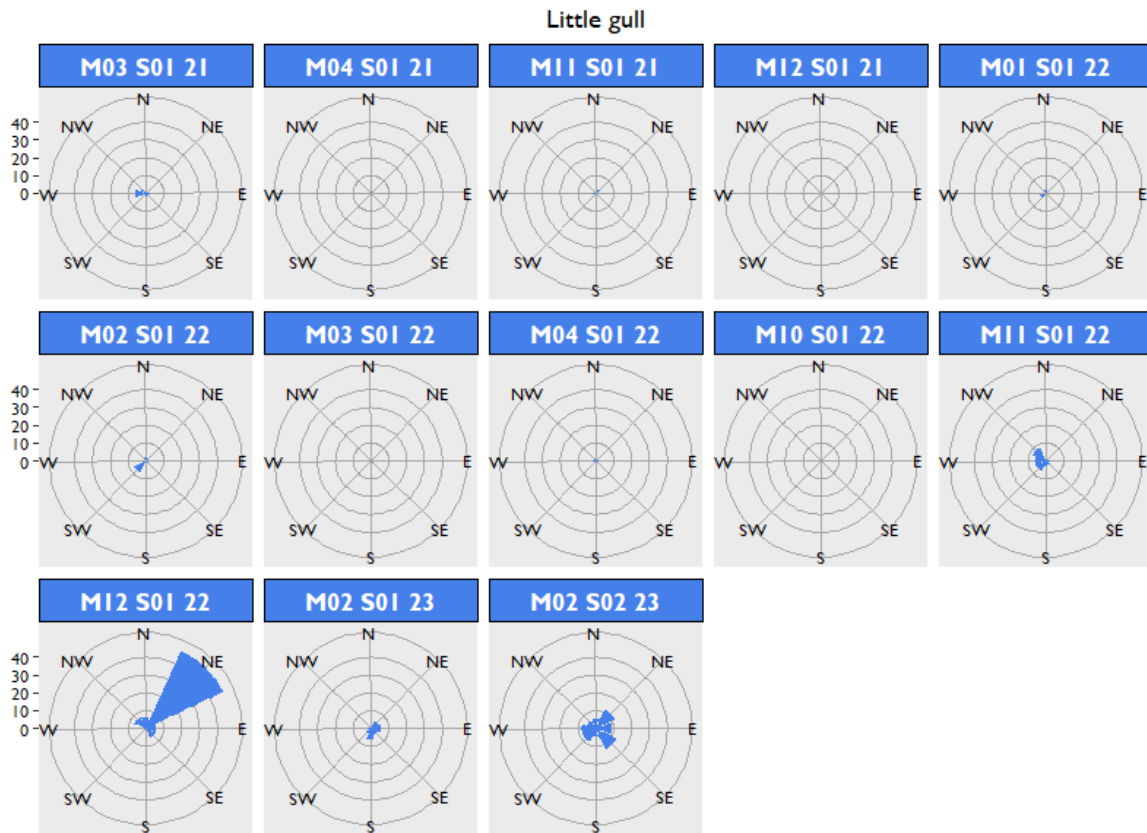
3.3.5 Common gull

94   Common gull (*Larus canus*) were primarily recorded during the non-breeding season, peaking in November and December 2022 (Figure 34). During the breeding season, very low numbers of birds were recorded in May 2021 and between March 2022 and August 2022.

95   Apportioned density estimates ranged between 0.01 birds/km^2 in July 2022 (95% CI 0.00 – 0.02), and 0.44 birds/km^2 (95% CI 0.33 – 0.56) in December 2022. Density estimates calculated for December 2022 equated to a peak population estimate for the survey area of 285 birds (95% CI 215 – 365) (Figure 35 and Table 16).

96   Generally, birds were found within the buffer, with high densities in the north and east, such as in March and December 2021 and November 2022 (Figure 36 to Figure 39). Birds were distributed throughout the survey area in January and December 2022 and February S01 and S02 2023.

97   Of the birds that could be aged, 88% were recorded as adults, with the largest proportion of immature birds recorded in March 2021 (Table 17).

98   Over the survey period, 88% of birds were recorded flying, with the highest proportion of birds recorded as sitting on the water recorded in February 2021 (Table 18). Flying birds peaked in December 2022 with 67 recorded.

99   There were survey months in which no data regarding flight direction were available. To allow for clear interpretation of results, only surveys which contained flight direction data are displayed. In December 2021 and January 2022, when high numbers of flying common gull were recorded, birds were primarily flying north and south-east (Figure 40). In December 2022 when numbers peaked, birds were primarily flying in a north-easterly direction.

Figure 34   Number of common gull recorded between March 2021 and February 2023 in the Morecambe survey area

Figure 35   Apportioned common gull density estimates, with 95% upper and lower confidence limits, in the Morecambe survey area between March 2021 and February 2023
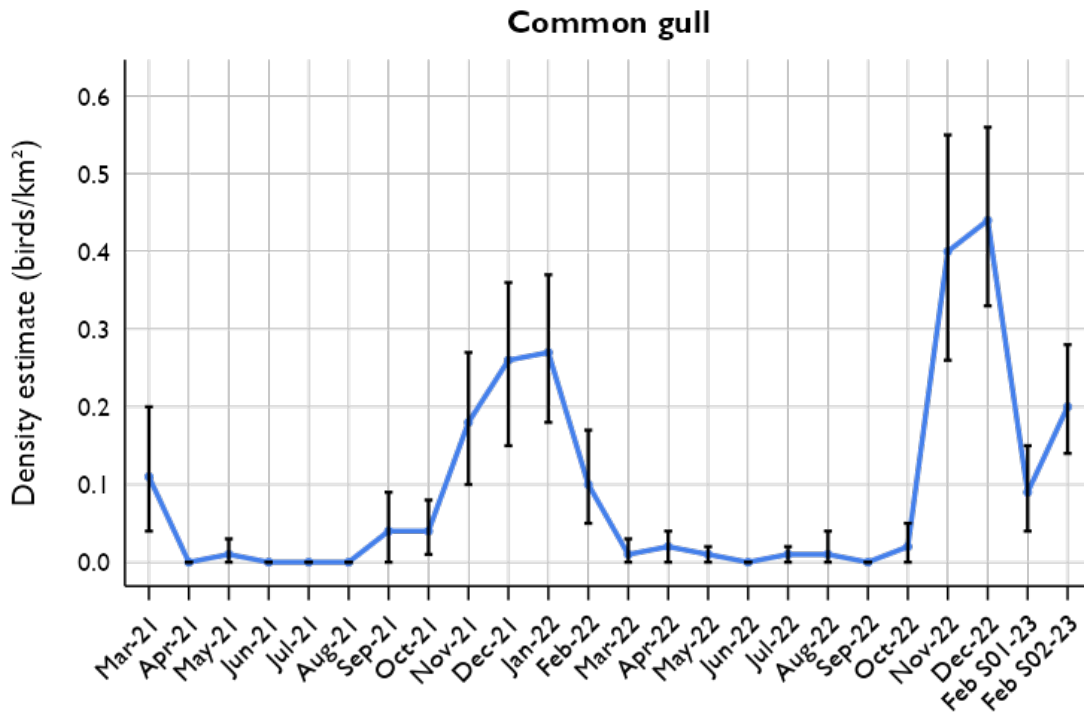
Table 19   Apportioned density and population estimates of common gull in the Morecambe survey area between March 2021 and February 2023

Survey date	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
19 March 2021	0.11	74	28	131	27	36.73
07 April 2021	0.00	0	0	0	0	0.00
18 May 2021	0.01	9	0	20	6	68.08
01 June 2021	0.00	0	0	0	0	0.00
09 July 2021	0.00	0	0	0	0	0.00
02 August 2021	0.00	0	0	0	0	0.00
04 September 2021	0.04	26	0	57	15	56.71
06 October 2021	0.04	29	9	54	12	40.18
17 November 2021	0.18	117	68	178	30	25.03
05 December 2021	0.26	169	100	238	35	20.61
13 January 2022	0.27	177	120	241	32	17.66
11 February 2022	0.10	68	32	112	21	30.48
09 March 2022	0.01	9	0	20	6	66.04
01 April 2022	0.02	12	0	28	7	55.74
02 May 2022	0.01	5	0	12	4	91.58
07 June 2022	0.00	0	0	0	0	0.00
14 July 2022	0.01	4	0	12	4	99.71
09 August 2022	0.01	9	0	25	9	96.68
02 September 2022	0.00	0	0	0	0	0.00
03 October 2022	0.02	13	0	32	9	67.7
22 November 2022	0.4	261	167	358	50	19.12
03 December 2022	0.44	285	215	365	37	12.97
05 February 2023	0.09	61	28	99	19	30.88
23 February 2023	0.2	131	88	180	24	18.04

Table 20   Summary of common gull ages in the Morecambe survey area between March 2021 and February 2023

Survey date	Number recorded as adult	Number recorded as immature	Number recorded as juvenile	Number recorded as unknown	% Adult (from aged birds)	Total
19 March 2021	6	9	0	3	40	18
07 April 2021	0	0	0	0	-	0
18 May 2021	1	1	0	0	50	2
01 June 2021	0	0	0	0	-	0
09 July 2021	0	0	0	0	-	0
02 August 2021	0	0	0	0	-	0
04 September 2021	1	1	2	0	25	4
06 October 2021	3	2	1	0	50	6
17 November 2021	24	4	0	0	86	28
05 December 2021	36	1	0	1	97	38
13 January 2022	31	2	0	8	94	41
11 February 2022	10	1	0	6	91	17
09 March 2022	1	0	0	1	100	2
01 April 2022	0	1	0	2	0	3
02 May 2022	0	1	0	0	0	1
07 June 2022	0	0	0	0	0	0
14 July 2022	1	0	0	0	100	1
09 August 2022	0	0	0	1	0	1
02 September 2022	0	0	0	0	0	0
03 October 2022	3	0	0	0	100	3
22 November 2022	59	2	0	3	97	64
03 December 2022	63	1	1	5	97	70
05 February 2023	13	0	0	2	100	15
23 February 2023	17	5	0	10	77	32
Total	**269**	**31**	**4**	**42**	**88**	**346**

Table 21   Summary of common gull behaviours in the Morecambe survey area between March 2021 and February 2023

Survey date	Number recorded diving	Number recorded flying	Number recorded sitting	Number recorded taking off	% Flying	Total
19 March 2021	0	15	3	0	83	18
07 April 2021	0	0	0	0	-	0
18 May 2021	0	2	0	0	100	2
01 June 2021	0	0	0	0	-	0
09 July 2021	0	0	0	0	-	0
02 August 2021	0	0	0	0	-	0
04 September 2021	0	4	0	0	100	4
06 October 2021	0	6	0	0	100	6
17 November 2021	0	28	0	0	100	28
05 December 2021	0	36	1	0	97	37
13 January 2022	0	34	7	0	83	41
11 February 2022	0	11	6	0	65	17
09 March 2022	0	1	1	0	50	2
01 April 2022	0	1	2	0	33	3
02 May 2022	0	0	1	0	0	1
07 June 2022	0	0	0	0	0	0
14 July 2022	0	1	0	0	100	1
09 August 2022	0	0	1	0	0	1
02 September 2022	0	0	0	0	0	0
03 October 2022	0	3	0	0	100	3
22 November 2022	0	60	3	1	94	64
03 December 2022	0	67	3	0	96	70
05 February 2023	0	13	2	0	87	15
23 February 2023	0	22	10	0	69	32
Total	**0**	**304**	**40**	**1**	**88**	**346**

Figure 36 **Density of common gull (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021**
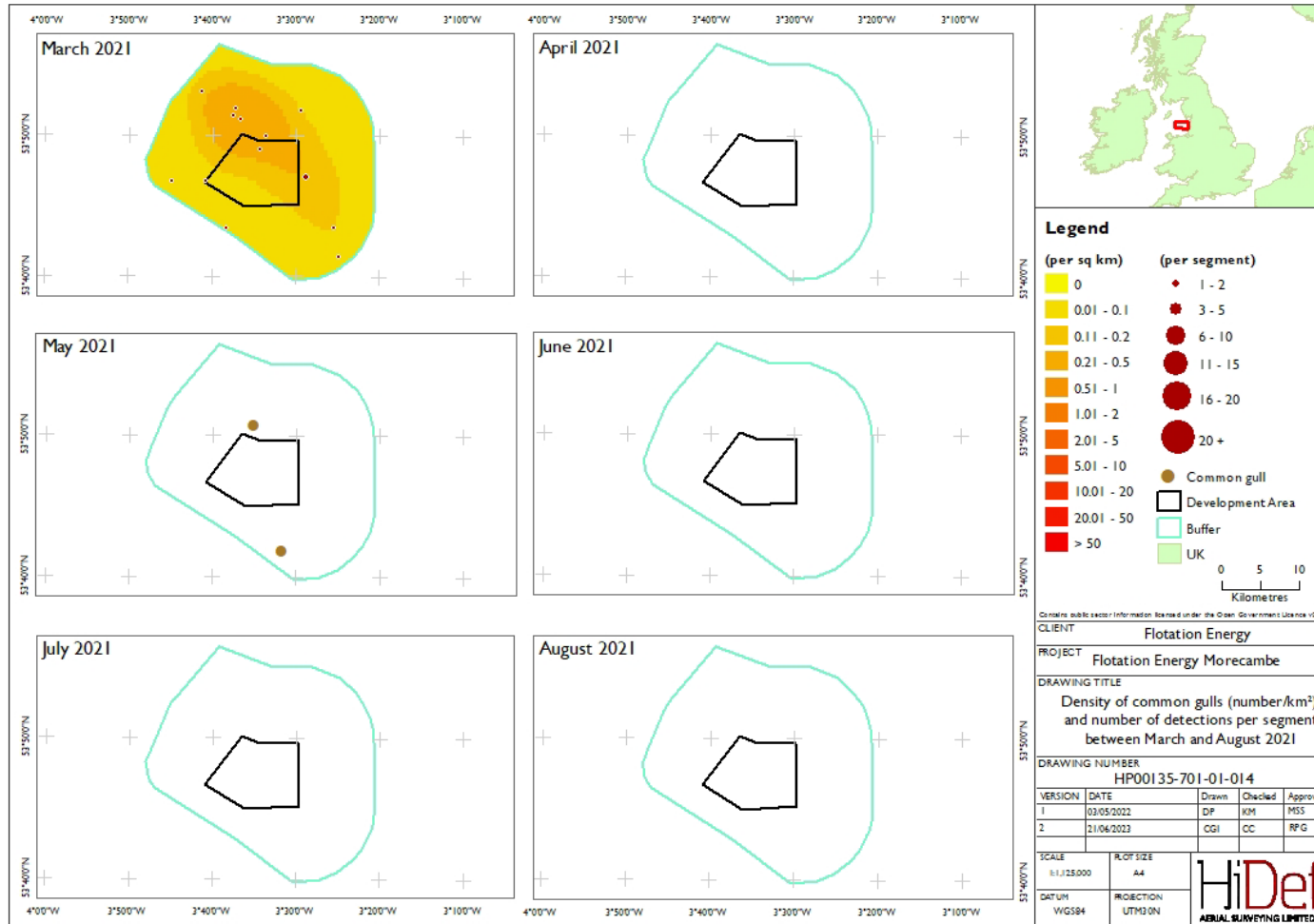
Figure 37 **Density of common gull (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022**
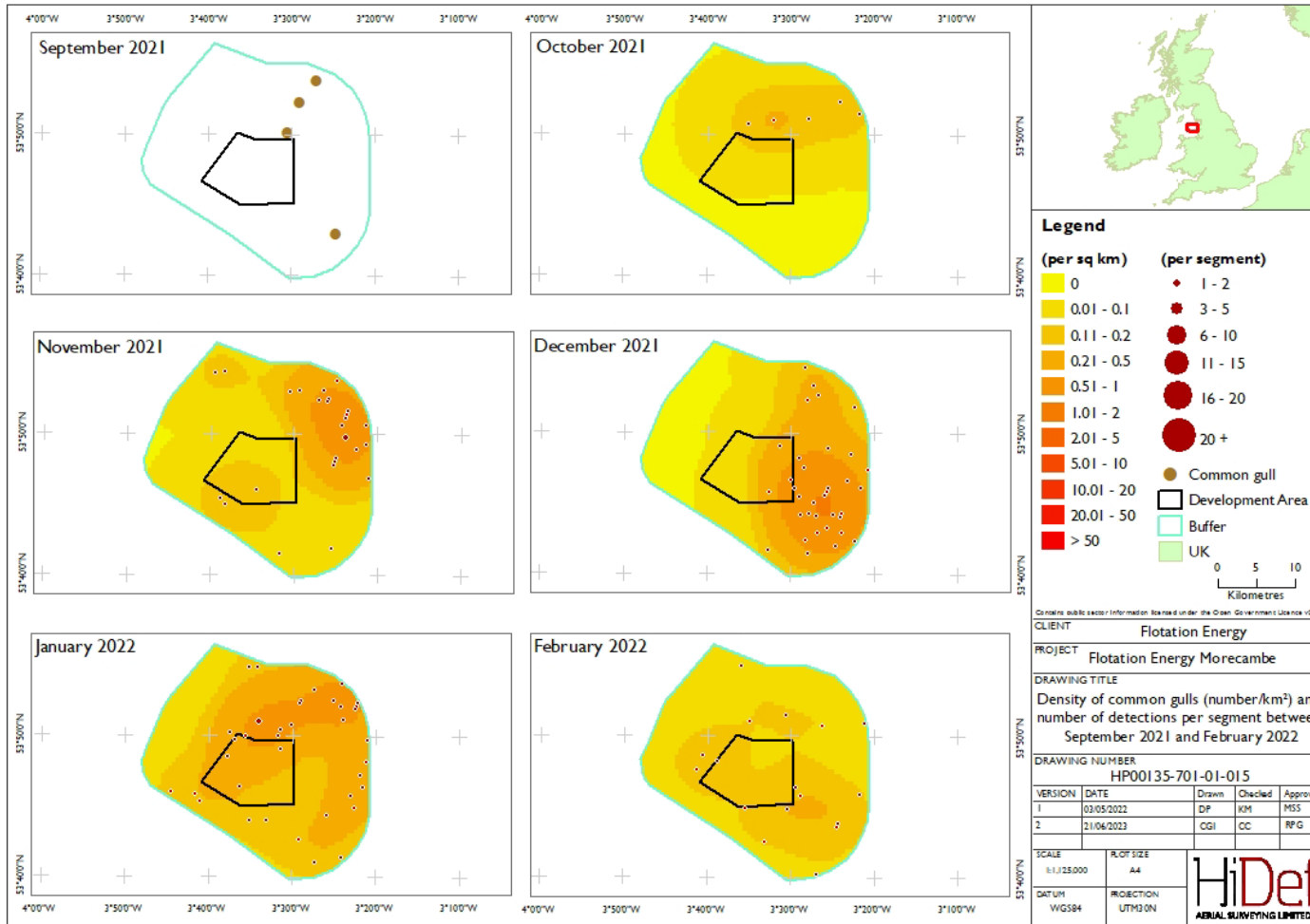
Figure 38 **Density of common gull (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022**
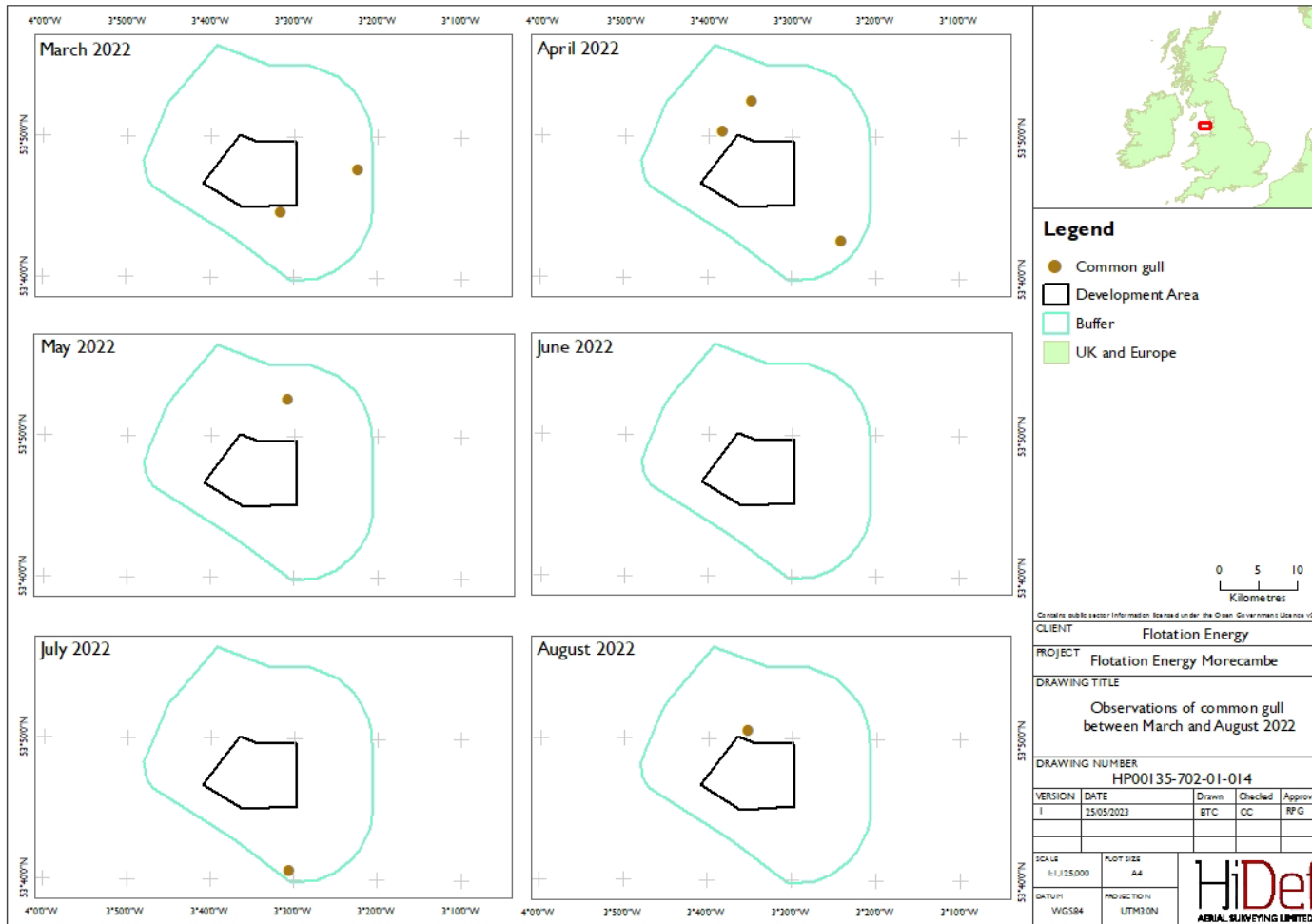
Figure 39 **Density of common gull (number/km²) and number of detections per segment in the Morecambe survey area between September 2022 and February 2023**
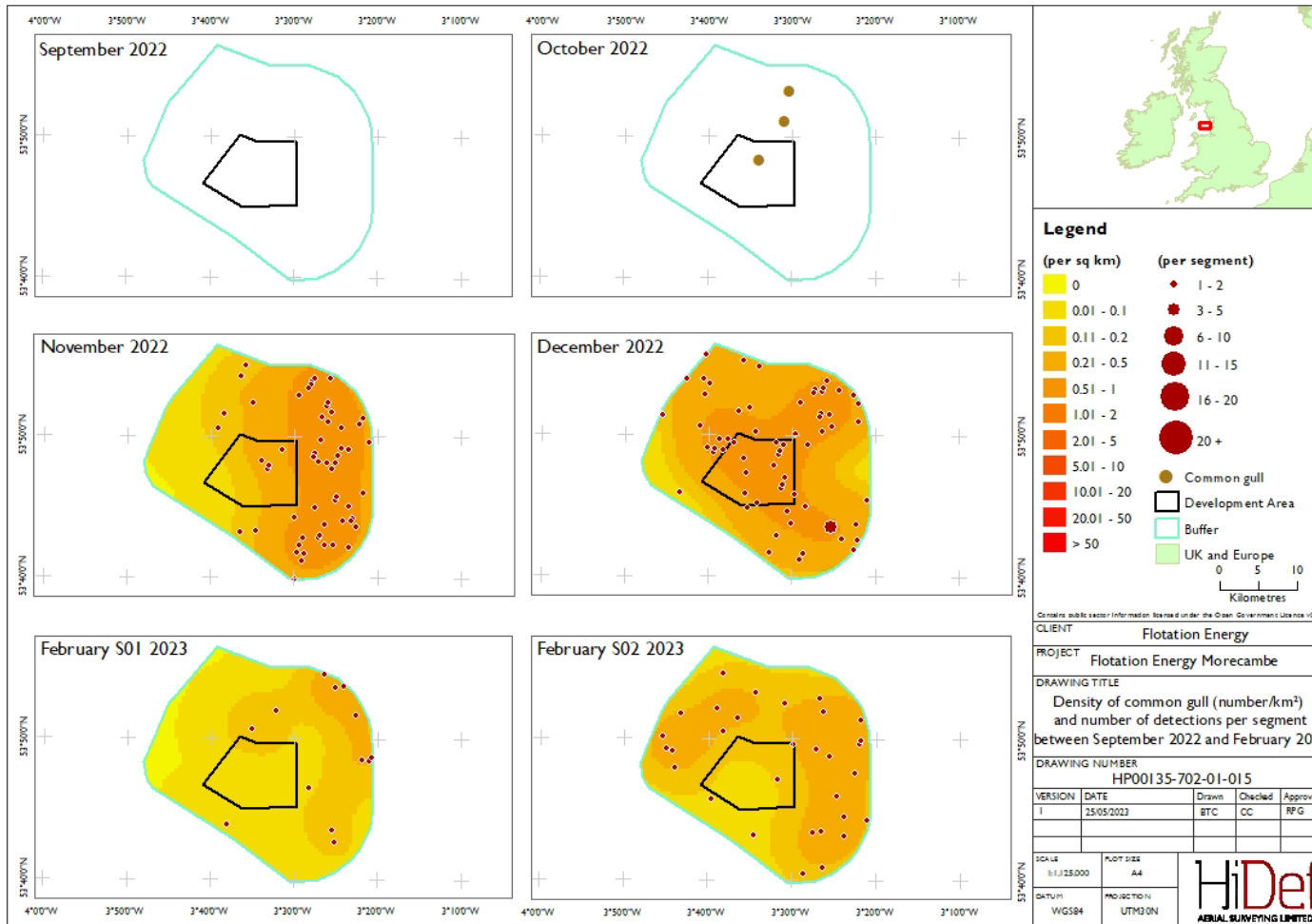
Figure 40   Summarised direction of movement of flying common gull in the Morecambe survey area between March 2021 and February 2023

Common gull
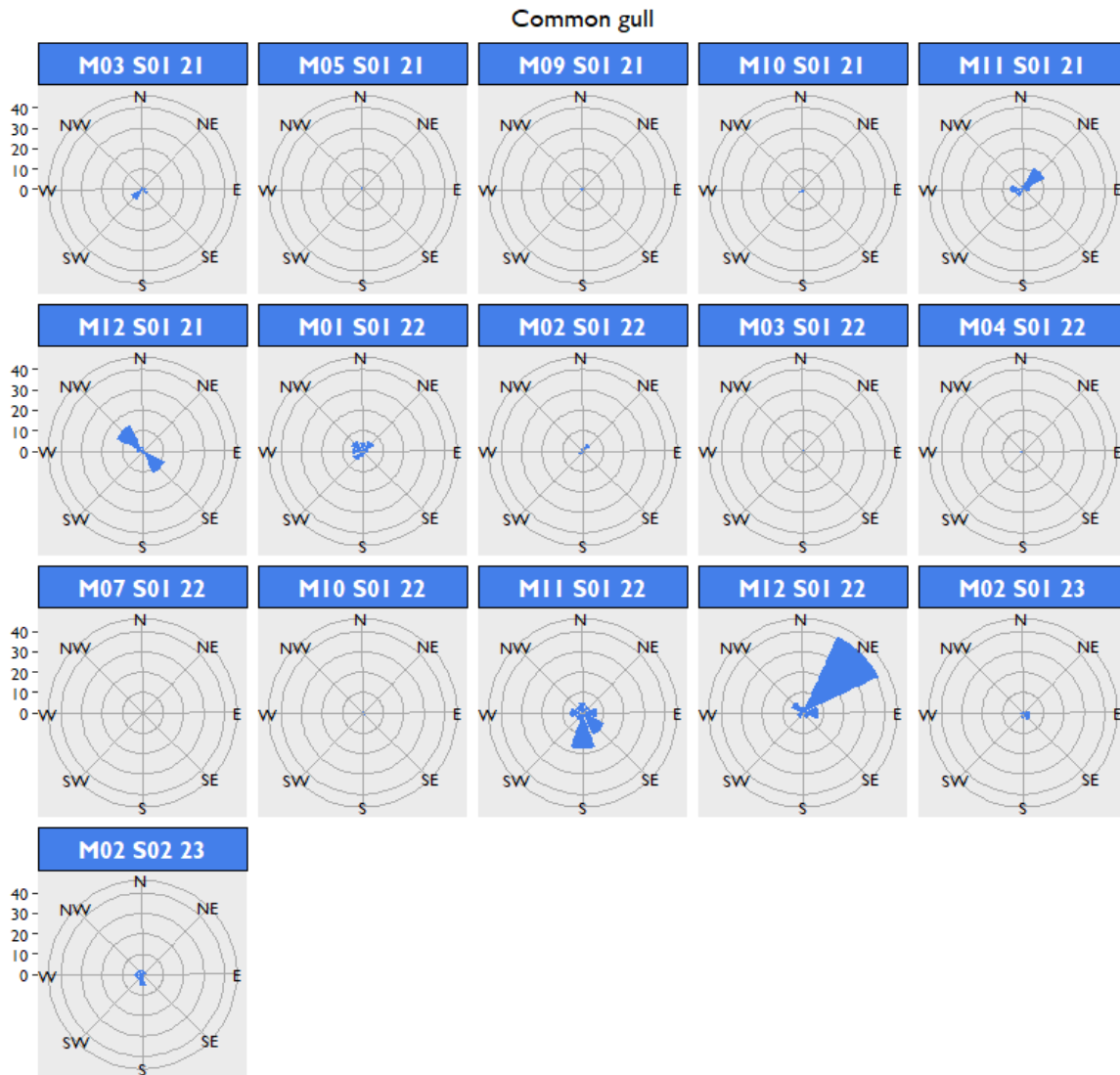
3.3.6 Herring gull

100 Herring gull (*Larus argentatus*) were the most numerous gull species recorded during the 24-month period, peaking in December 2022 during the non-breeding season (Figure 41). Relatively high numbers were recorded towards the end of the breeding season in August 2021 and in May 2022 of the second breeding season.

101 Apportioned density estimates ranged between 0.01 birds/km^2 (95% CI 0.00 – 0.02) in May 2021 and 0.75 birds/km^2 (95% CI 0.41 – 1.21) in December 2022 (Figure 42 and Table 22), equating to a peak population estimate of 488 birds (95% CI 269 – 790).

102 Birds were found throughout the survey area, in the development area and buffer, with high densities found in the north in many surveys, such as in August and November 2021 and March 2022 (Figure 43 to Figure 45). High densities in the east were also observed in December 2021 and in the south in December 2022. In October 2022, herring gull were observed inside the development area and for May 2022 and January 2023, high densities were observed just north of the development area, but within the buffer (Figure 46).

103 Of the birds that could be aged, 48% were recorded as adults, the number of immature birds peaking in December 2022 (Table 23).

104 Over the survey period, 48% of birds were recorded flying, many birds also recorded as sitting on the water, such as in November 2021 and 2022 and December 2022 (Table 24). Of the other behaviour records, this included birds loafing and sitting on anthropogenic objects.

105 There were survey months in which no data regarding flight direction were available. To allow for clear interpretation of results, only surveys which contained flight direction data are displayed (Figure 47). In August 2021, when relatively high numbers of birds were recorded, many birds were heading south-east. In November and December 2022, when flying numbers of birds peaked, the birds were mainly flying in a north-easterly or south-easterly direction.

Figure 41   Number of herring gull recorded between March 2021 and February 2023 in the Morecambe survey area
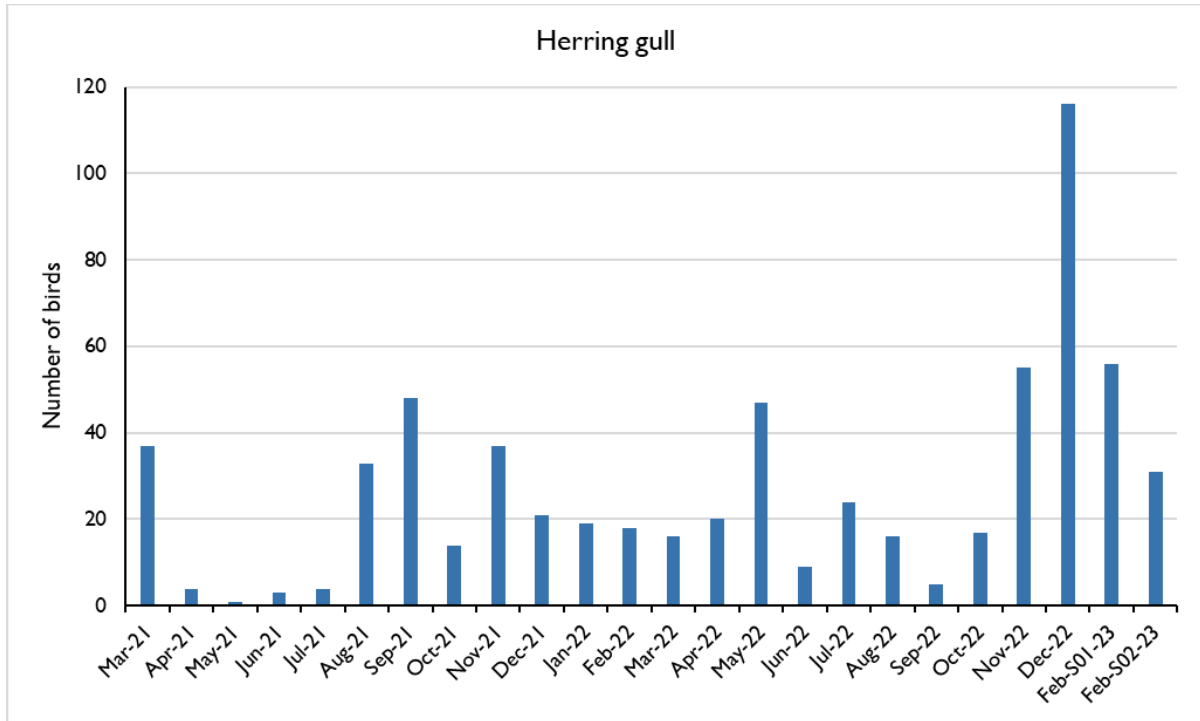
Herring gull

Figure 42   Apportioned herring gull density estimates, with 95% upper and lower confidence limits, in the Morecambe survey area between March 2021 and February 2023
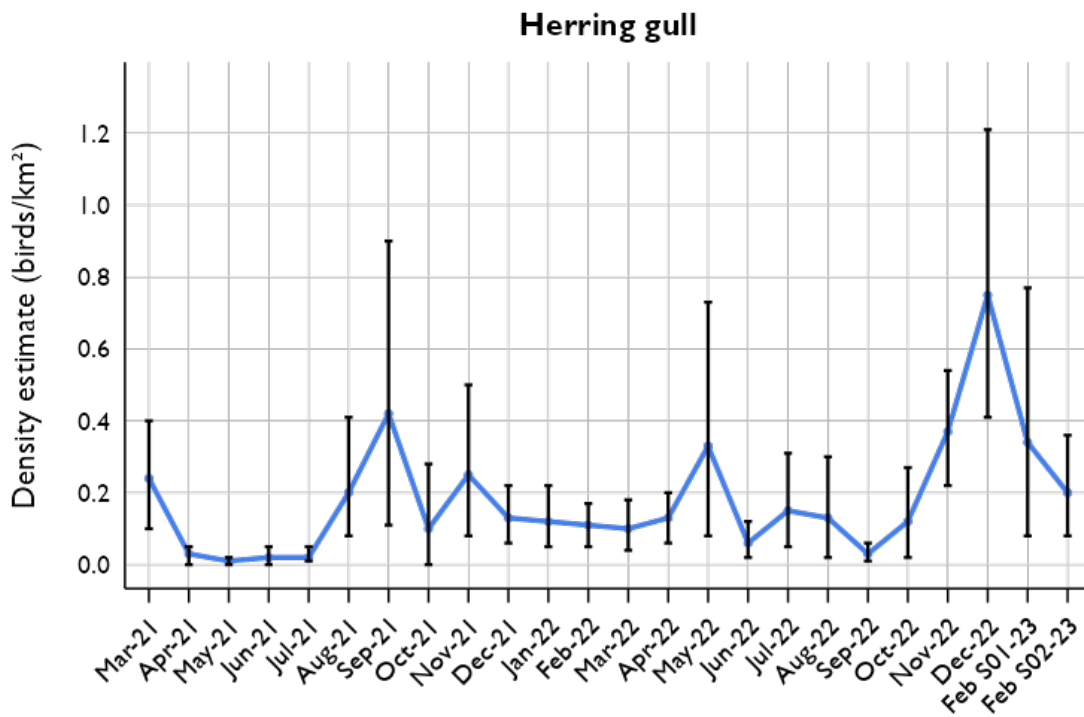
Herring gull

Table 22 **Density and population estimates of herring gull in the Morecambe survey area between March 2021 and February 2023**

Survey date	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
19 March 2021	0.24	155	67	261	52	33.61
07 April 2021	0.03	17	0	36	10	55.25
18 May 2021	0.01	5	0	12	4	98.44
01 June 2021	0.02	12	0	32	9	71.49
09 July 2021	0.02	16	4	32	8	48.04
02 August 2021	0.20	132	51	268	58	44.2
04 September 2021	0.42	271	73	584	131	48.33
06 October 2021	0.10	64	0	186	56	86.62
17 November 2021	0.25	162	54	324	72	44.36
05 December 2021	0.13	87	36	146	28	32.48
13 January 2022	0.12	78	32	141	29	36.84
11 February 2022	0.11	72	36	109	19	26.3
09 March 2022	0.10	65	24	115	24	35.68
01 April 2022	0.13	84	39	130	23	27.48
02 May 2022	0.33	212	50	475	115	53.85
07 June 2022	0.06	41	12	76	17	40.07
14 July 2022	0.15	101	30	204	46	45.14
09 August 2022	0.13	86	12	194	48	54.83
02 September 2022	0.03	20	4	41	10	48.11
03 October 2022	0.12	76	12	177	44	57.44
22 November 2022	0.37	241	142	350	54	22.17
03 December 2022	0.75	488	269	790	141	28.88
05 February 2023	0.34	225	52	501	126	56.11
23 February 2023	0.20	128	52	234	49	38.09

Table 23 **Summary of herring gull ages in the Morecambe survey area between March 2021 and February 2023**

Survey date	Number recorded as adult	Number recorded as immature	Number recorded as juvenile	Number recorded as unknown	% Adult (from aged birds)	Total
19 March 2021	3	13	0	21	19	37
07 April 2021	2	0	0	2	100	4
18 May 2021	0	1	0	0	0	1
01 June 2021	2	0	0	1	100	3
09 July 2021	3	1	0	0	75	4
02 August 2021	12	1	8	12	57	33
04 September 2021	2	18	4	24	8	48
06 October 2021	0	0	0	14	-	14
17 November 2021	16	3	1	17	80	37
05 December 2021	18	1	0	2	95	21
13 January 2022	3	9	0	7	25	19
11 February 2022	5	5	0	8	50	18
09 March 2022	1	8	0	7	11	16
01 April 2022	5	13	0	2	28	20
02 May 2022	12	7	0	28	63	47
07 June 2022	3	0	0	6	100	9
14 July 2022	12	1	0	11	92	24
09 August 2022	2	1	0	13	67	16
02 September 2022	0	3	0	2	0	5
03 October 2022	2	4	2	9	25	17
22 November 2022	13	14	5	23	41	55
03 December 2022	23	31	14	48	34	116
05 February 2023	20	9	0	27	69	56
23 February 2023	11	7	0	13	61	31
Total	**170**	**150**	**34**	**297**	**48**	**651**

Table 24 **Summary of herring gull behaviours in the Morecambe survey area between March 2021 and February 2023**

Survey date	Number recorded diving	Number recorded flying	Number recorded sitting	Number recorded taking off	% Flying	Other	Total
19 March 2021	0	16	19	0	43	2	37
07 April 2021	0	2	2	0	50	0	4
18 May 2021	0	1	0	0	100	0	1
01 June 2021	0	2	1	0	67	0	3
09 July 2021	0	3	1	0	75	0	4
02 August 2021	0	22	11	0	67	0	33
04 September 2021	0	24	22	0	50	2	48
06 October 2021	0	0	14	0	0	0	14
17 November 2021	0	9	26	0	24	2	37
05 December 2021	0	20	1	0	95	0	21
13 January 2022	0	12	7	0	63	0	19
11 February 2022	0	9	6	0	50	3	18
09 March 2022	0	9	4	0	56	3	16
01 April 2022	0	14	6	0	70	0	20
02 May 2022	0	10	25	0	21	12	47
07 June 2022	0	4	5	0	44	0	9
14 July 2022	0	15	7	0	62	2	24
09 August 2022	0	3	13	0	19	0	16
02 September 2022	0	3	2	0	60	0	5
03 October 2022	0	9	8	0	53	0	17
22 November 2022	0	26	27	2	47	0	55
03 December 2022	0	65	51	0	56	0	116
05 February 2023	0	23	8	0	41	25	56
23 February 2023	0	14	9	0	45	8	31
Total	**0**	**315**	**275**	**2**	**48**	**59**	**651**

Figure 43 **Density of herring gull (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021**
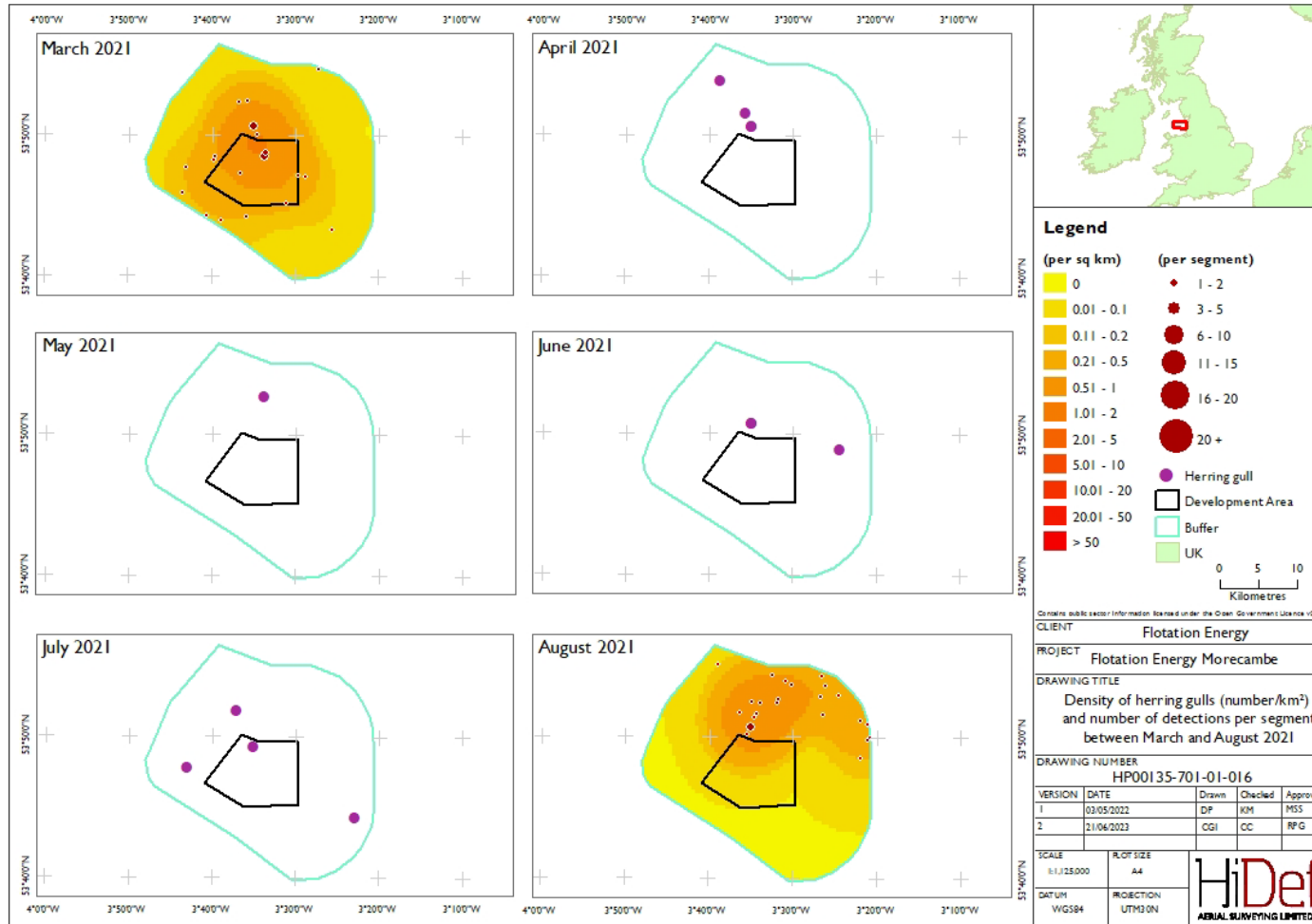
Figure 44 **Density of herring gull (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022**
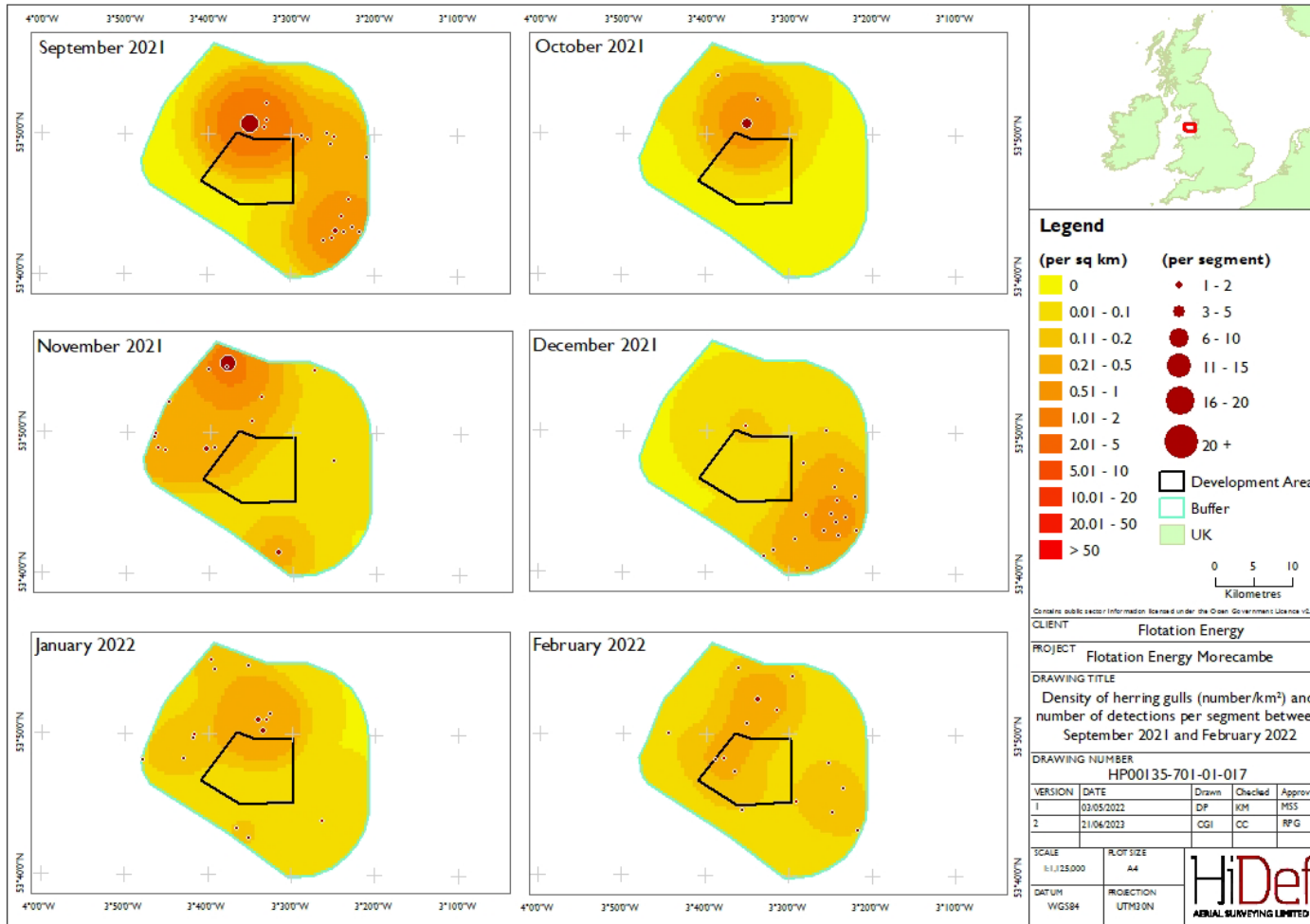
Figure 45 **Density of herring gull (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022**
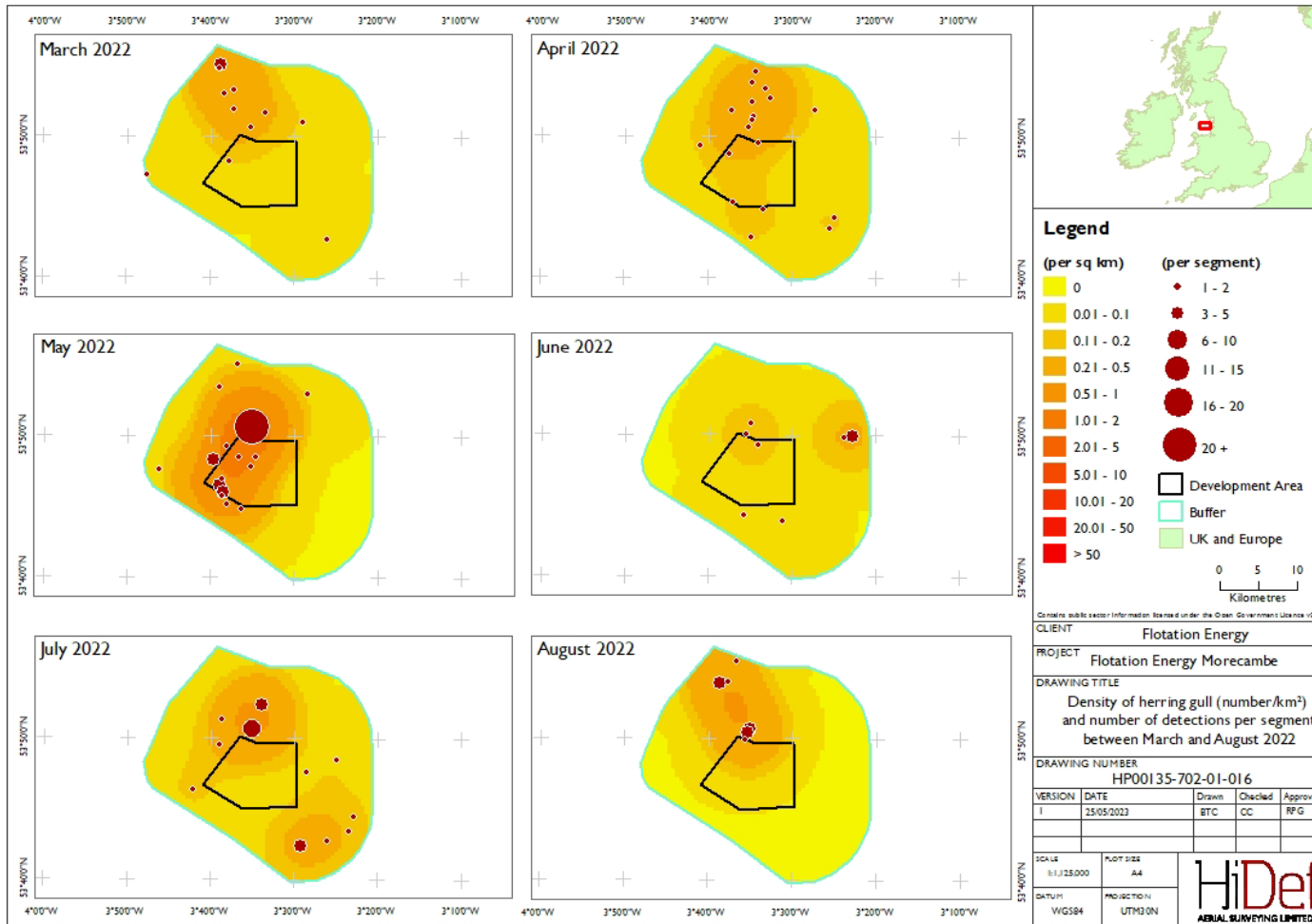
Figure 46 Density of herring gull (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2023
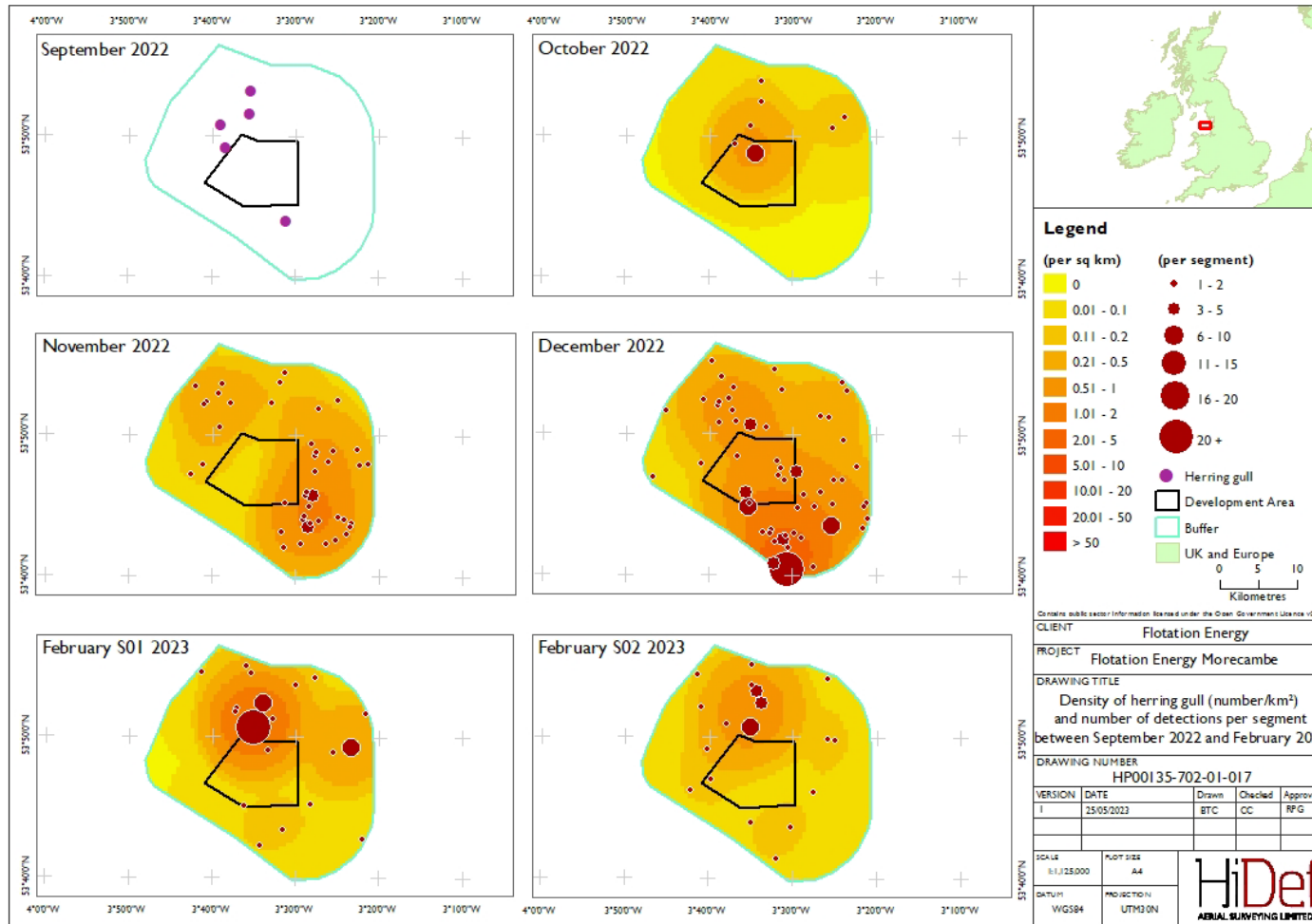
Figure 47 **Summarised direction of movement of flying herring gull in the Morecambe survey area between March 2021 and February 2023**

Herring gull
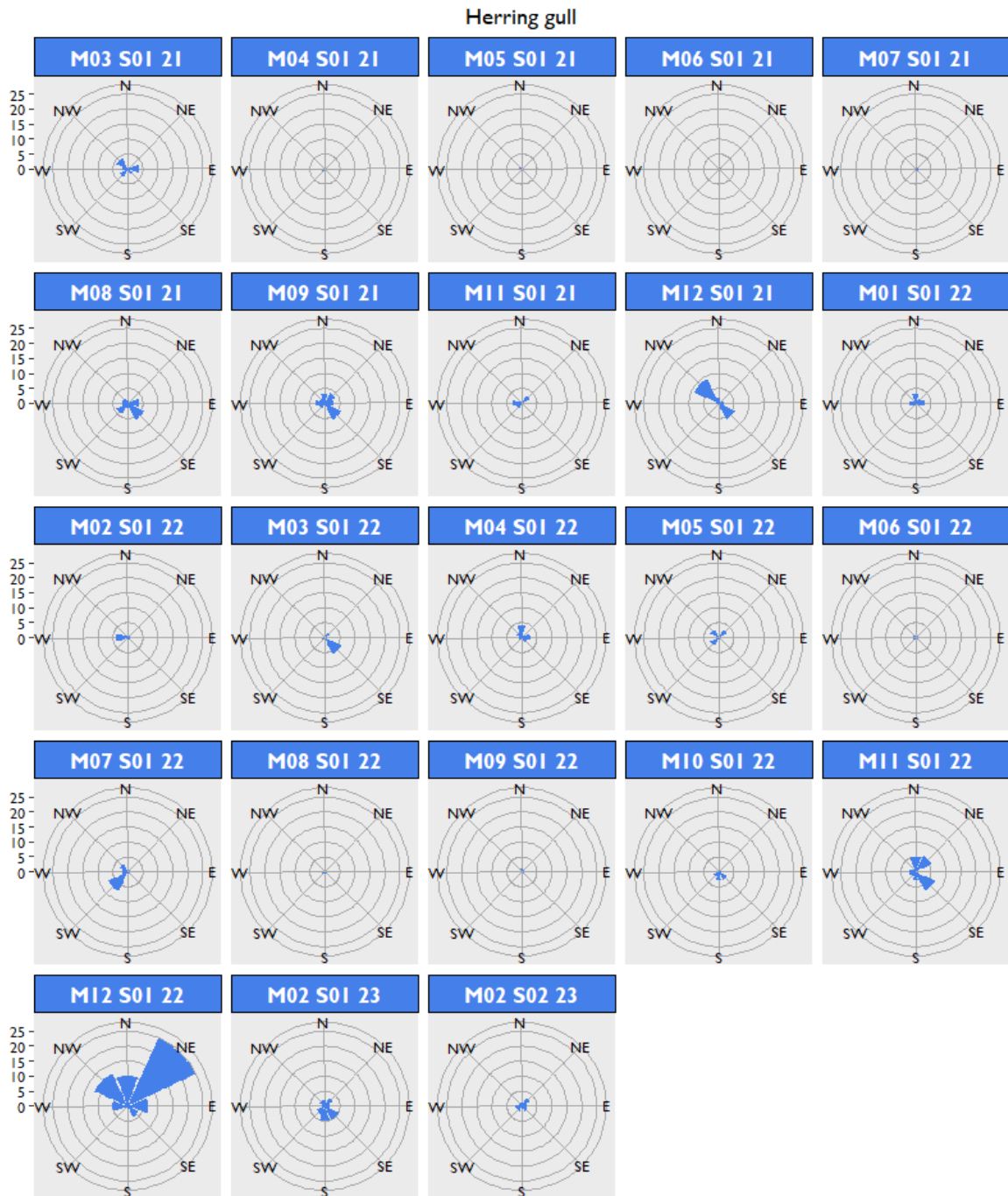
3.3.7 Lesser black-backed gull

106   Lesser black-backed gull (*Larus fuscus*) were recorded in relatively low numbers throughout the survey period, generally increasing in the breeding season compared to the winter, but peaked in the post-breeding migration period (Figure 48).

107   Apportioned density estimates for the species ranged between 0.01 birds/km^2, such as in March 2021 (95% CI 0.00 – 0.02) and December 2022, and 0.57 birds/km^2 (95% CI 0.29 – 0.89) in September 2021, equating to a peak population estimate for the survey area of 370 birds (95% CI 189 – 581) (Figure 49 and Table 25).

108   Birds were found throughout the survey area, with relatively high densities recorded to the north of the development area in March and August 2021 (Figure 50). Many birds were also distributed to the east of the buffer in July and August 2021. In May 2022, birds were found in the southwest of the survey area, across the buffer and the development area (Figure 52). In July 2022, higher densities were found to the south of the survey area, while in August 2022, higher densities were observed in the north. Few numbers were recorded during the migration free winter season across both survey years (Figure 51 and Figure 53).

109   Of the birds that could be aged, 71% were recorded as adults, with juvenile birds only recorded in August and September 2021 (Table 26).

110   Over the survey period, 60% of birds were recorded flying, with a large proportion of birds recorded as sitting on the water in August and September 2021 and July and August 2022 (Table 27). Other behaviours included the birds sitting on man-made objects.

111   There were survey months in which no data regarding flight direction were available. To allow for clear interpretation of results, only surveys which contained flight direction data are displayed (Figure 54). In August and September 2021 and in July and August 2022, when numbers peaked, birds were mainly heading south-west and south-east.

Figure 48 **Number of lesser black-backed gull recorded between March 2021 and February 2023 in the Morecambe survey area**

Figure 49 **Apportioned lesser black-backed gull density estimates, with 95% upper and lower confidence limits, in the Morecambe survey area between March 2021 and February 2023**
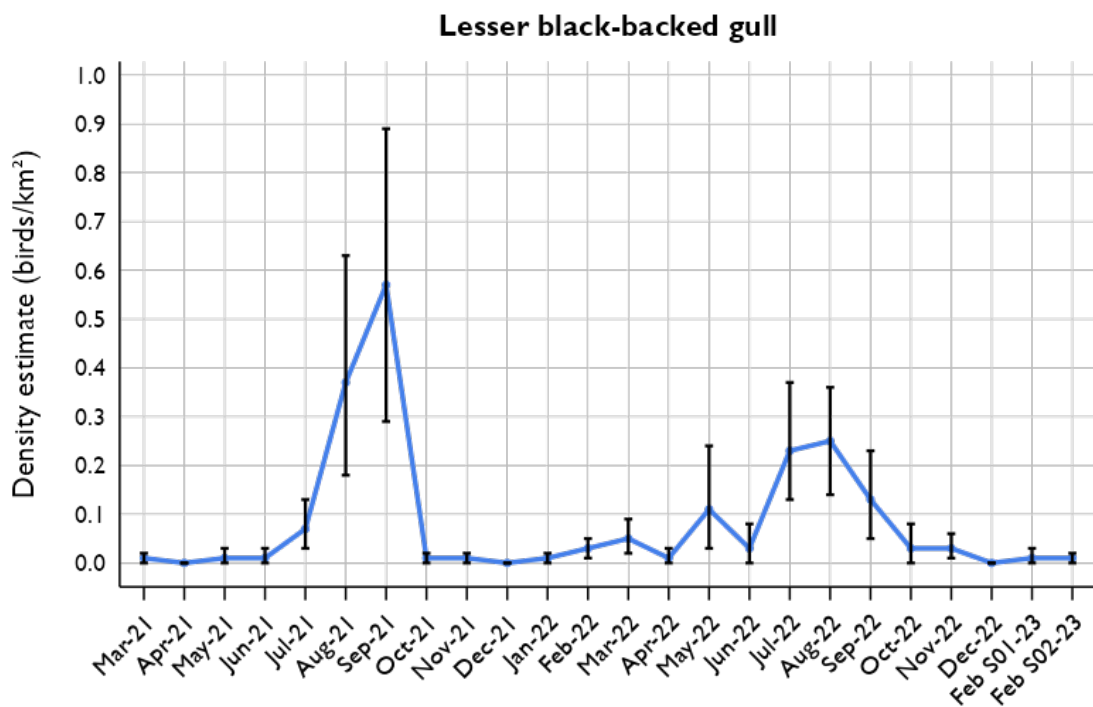
Table 25 **Apportioned density and population estimates of lesser black-backed gull in the Morecambe survey area between March 2021 and February 2023**

Survey date	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
19 March 2021	0.01	4	0	12	4	103.44
07 April 2021	0.00	0	0	0	0	0.00
18 May 2021	0.01	9	0	20	6	67.37
01 June 2021	0.01	9	0	20	6	66.40
09 July 2021	0.07	48	20	82	16	33.63
02 August 2021	0.37	239	117	413	78	32.31
04 September 2021	0.57	370	189	581	100	26.98
06 October 2021	0.01	5	0	14	5	99.57
17 November 2021	0.01	5	0	13	4	95.51
05 December 2021	0.00	0	0	0	0	0.00
13 January 2022	0.01	5	0	12	4	97.72
11 February 2022	0.03	20	8	36	9	41.66
09 March 2022	0.05	33	12	56	12	35.23
01 April 2022	0.01	8	0	20	6	68.53
02 May 2022	0.11	74	17	154	36	47.76
07 June 2022	0.03	21	0	52	13	63.38
14 July 2022	0.23	152	84	239	42	27.12
09 August 2022	0.25	163	93	238	37	22.54
02 September 2022	0.13	88	36	149	30	34.07
03 October 2022	0.03	18	0	51	15	79.66
22 November 2022	0.03	21	4	42	11	49.25
03 December 2022	0.00	0	0	0	0	0.00
05 February 2023	0.01	8	0	20	6	69.34
23 February 2023	0.01	5	0	13	4	96.64

Table 26   **Summary of lesser black-backed gull ages in the Morecambe survey area between March 2021 and February 2023**

Survey date	Number recorded as adult	Number recorded as immature	Number recorded as juvenile	Number recorded as unknown	% Adult (from aged birds)	Total
19 March 2021	0	0	0	1	-	1
07 April 2021	0	0	0	0	-	0
18 May 2021	1	1	0	0	50	2
01 June 2021	0	2	0	0	0	2
09 July 2021	10	2	0	0	83	12
02 August 2021	18	2	1	30	86	51
04 September 2021	22	3	20	24	49	69
06 October 2021	0	0	0	1	-	1
17 November 2021	1	0	0	0	100	1
05 December 2021	0	0	0	0	-	0
13 January 2022	0	0	0	1	-	1
11 February 2022	5	0	0	0	100	5
09 March 2022	5	0	0	3	100	8
01 April 2022	2	0	0	0	100	2
02 May 2022	4	2	0	12	67	18
07 June 2022	4	0	0	1	100	5
14 July 2022	23	3	0	11	88	37
09 August 2022	20	7	0	11	74	38
02 September 2022	4	5	0	12	44	21
03 October 2022	1	1	0	2	50	4
22 November 2022	3	1	0	1	75	5
03 December 2022	0	0	0	0	-	0
05 February 2023	2	0	0	0	100	2
23 February 2023	1	0	0	0	100	1
Total	**126**	**29**	**21**	**110**	**71**	**286**

Table 27 **Summary of lesser black-backed gull behaviours in the Morecambe survey area between March 2021 and February 2023**

Survey date	Number recorded diving	Number recorded flying	Number recorded sitting	Number recorded taking off	% Flying	Other	Total
19 March 2021	0	0	1	0	0	0	1
07 April 2021	0	0	0	0	-	0	0
18 May 2021	0	2	0	0	100	0	2
01 June 2021	0	2	0	0	100	0	2
09 July 2021	0	12	0	0	100	0	12
02 August 2021	0	21	23	0	48	7	44
04 September 2021	0	46	23	0	67	0	69
06 October 2021	0	0	1	0	0	0	1
17 November 2021	0	0	1	0	0	0	1
05 December 2021	0	0	0	0	-	0	0
13 January 2022	0	0	1	0	0	0	1
11 February 2022	0	5	0	0	100	0	5
09 March 2022	0	6	1	0	75	1	8
01 April 2022	0	2	0	0	100	0	2
02 May 2022	0	3	12	0	17	3	18
07 June 2022	0	4	1	0	80	0	5
14 July 2022	0	24	13	0	65	0	37
09 August 2022	0	26	12	0	68	0	38
02 September 2022	0	9	12	0	43	0	21
03 October 2022	0	2	2	0	50	0	4
22 November 2022	0	4	1	0	80	0	5
03 December 2022	0	0	0	0	-	0	0
05 February 2023	0	2	0	0	100	0	2
23 February 2023	0	1	0	0	100	0	1
Total	**0**	**171**	**104**	**0**	**60**	**11**	**286**

Figure 50 **Density of lesser black-backed gull (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021**
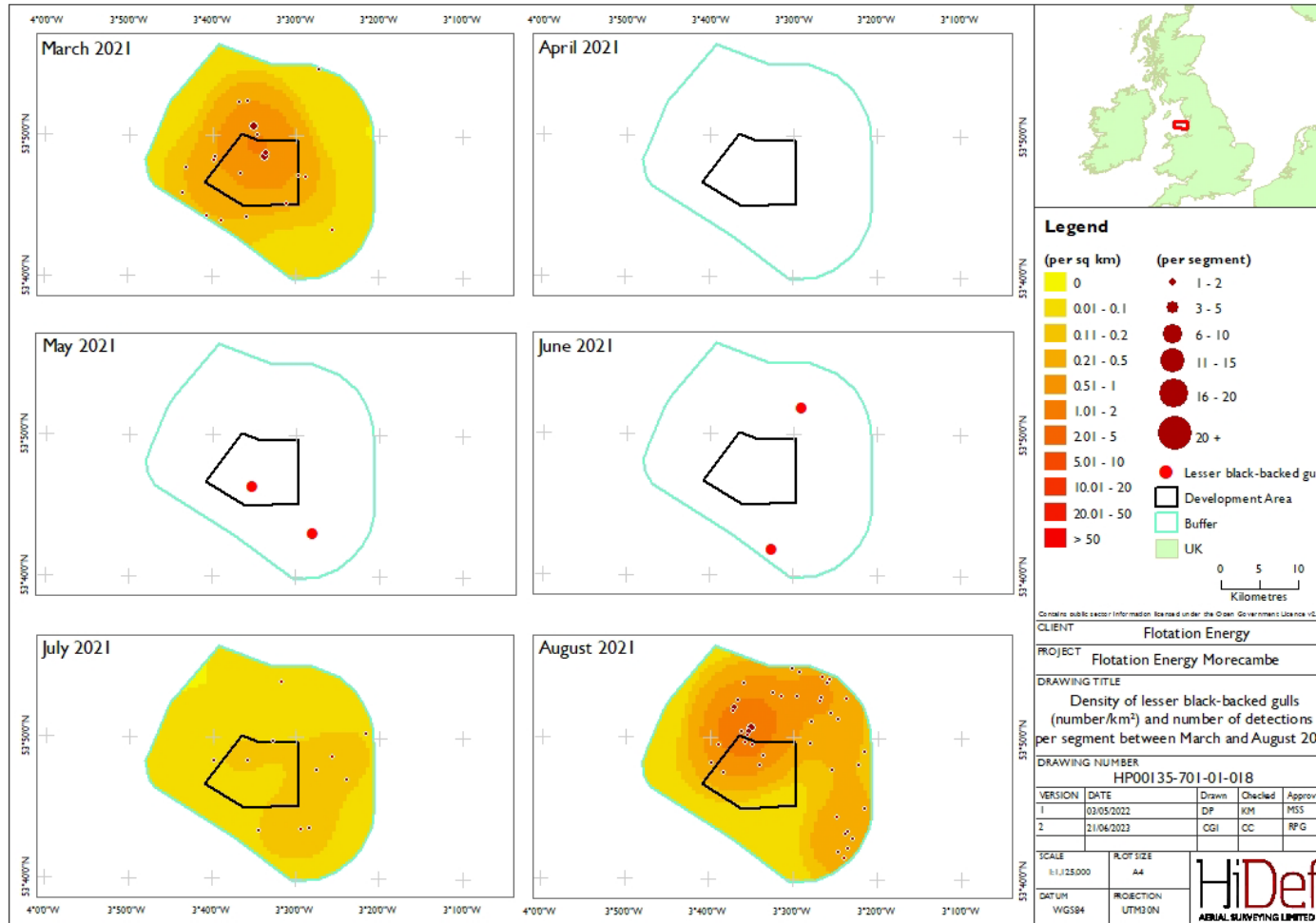
Figure 51 **Density of lesser black-backed gull (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022f**
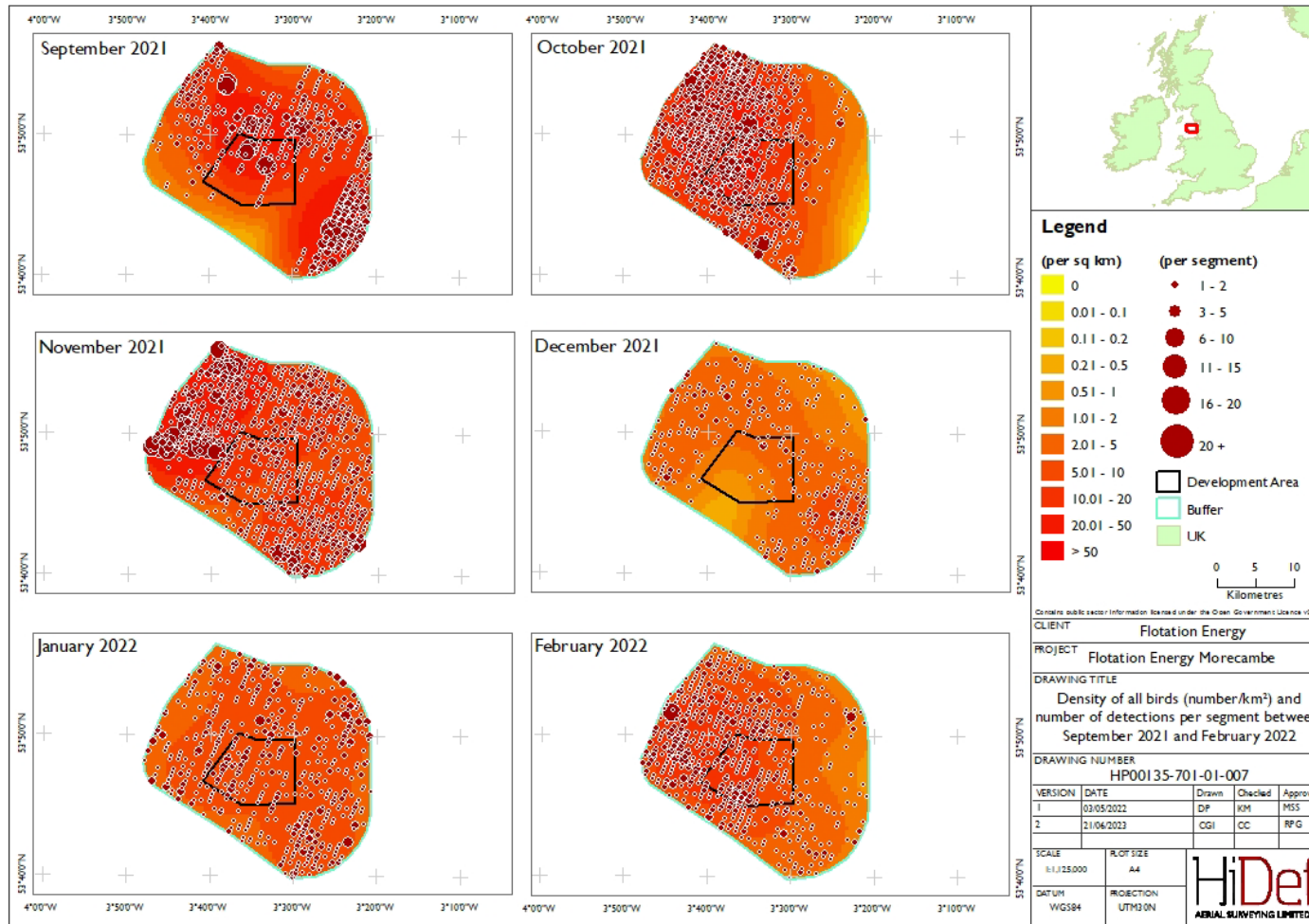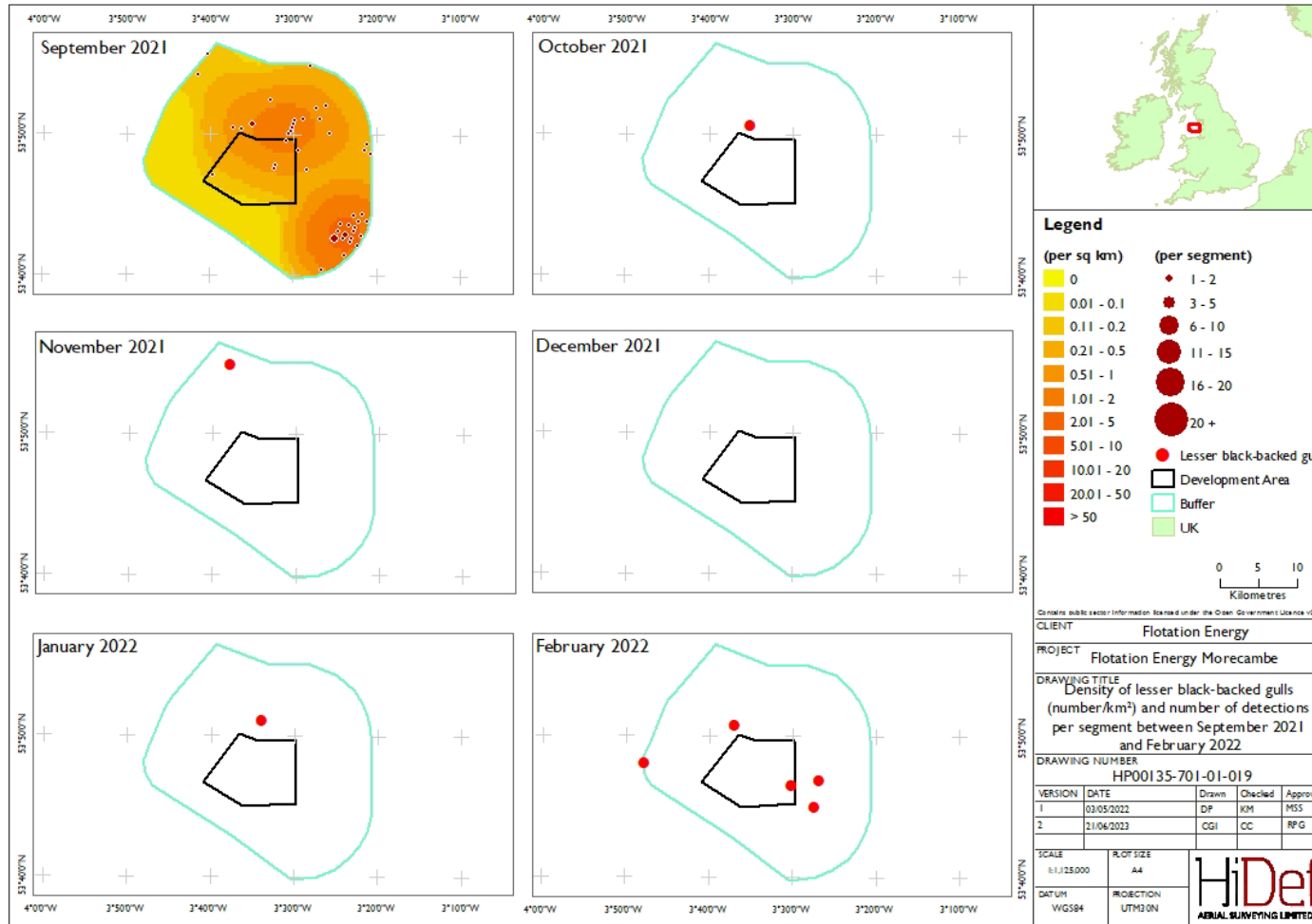
Figure 52 **Density of lesser black-backed gull (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022**
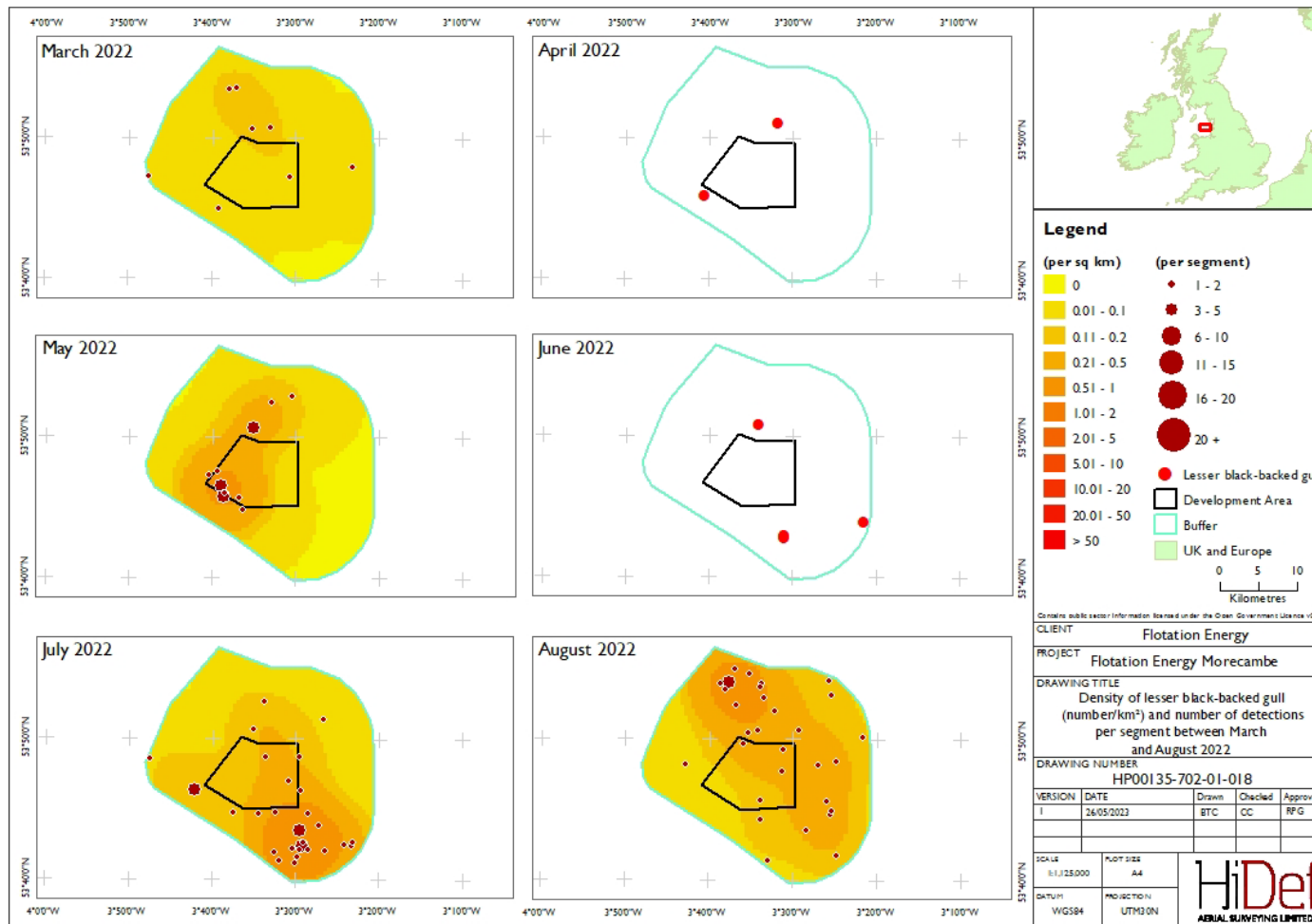
Figure 53   **Density of lesser black-backed gull (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2023**
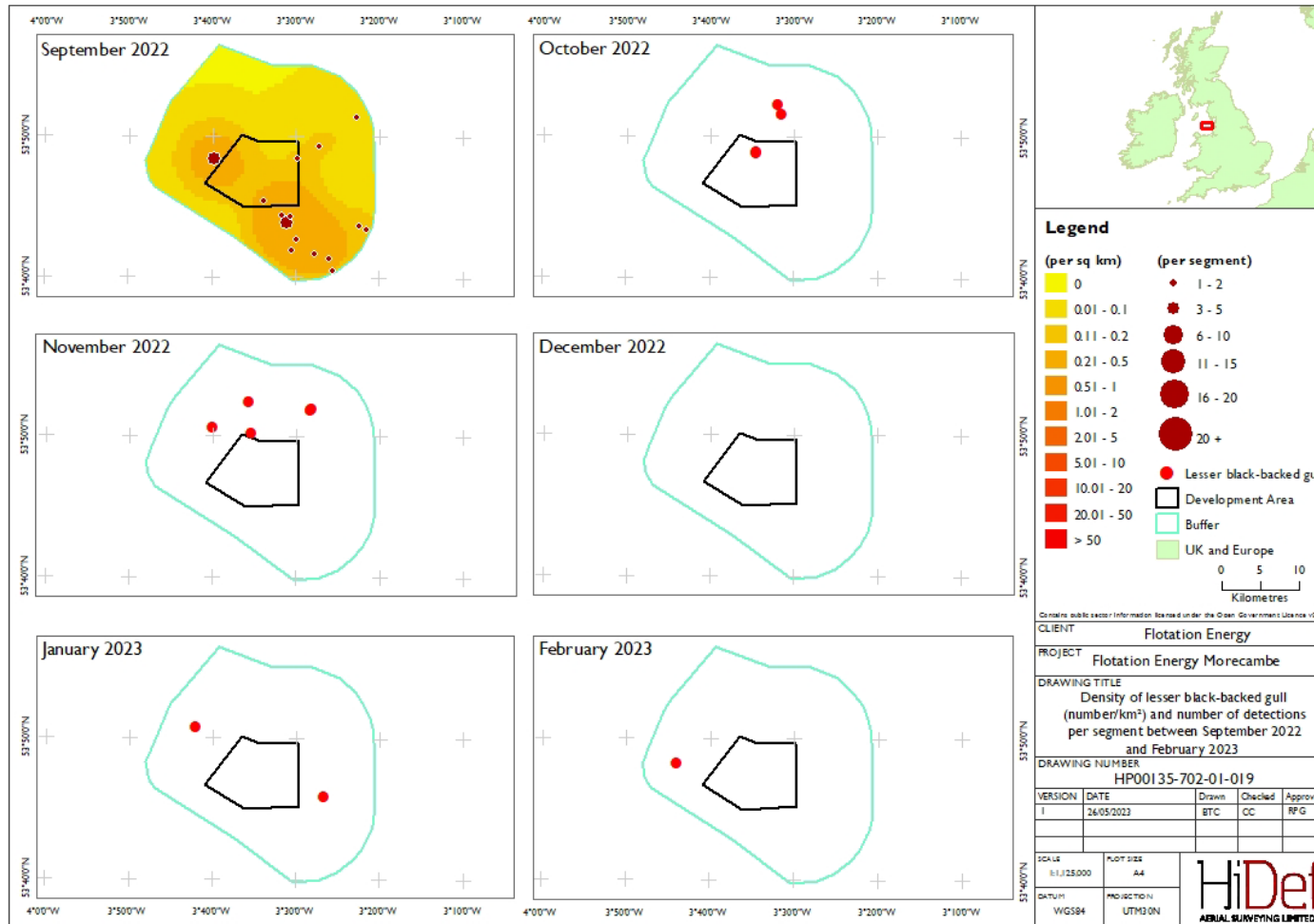
Figure 54   Summarised direction of movement of flying lesser black-backed gull in the Morecambe survey area between March 2021 and February 2023
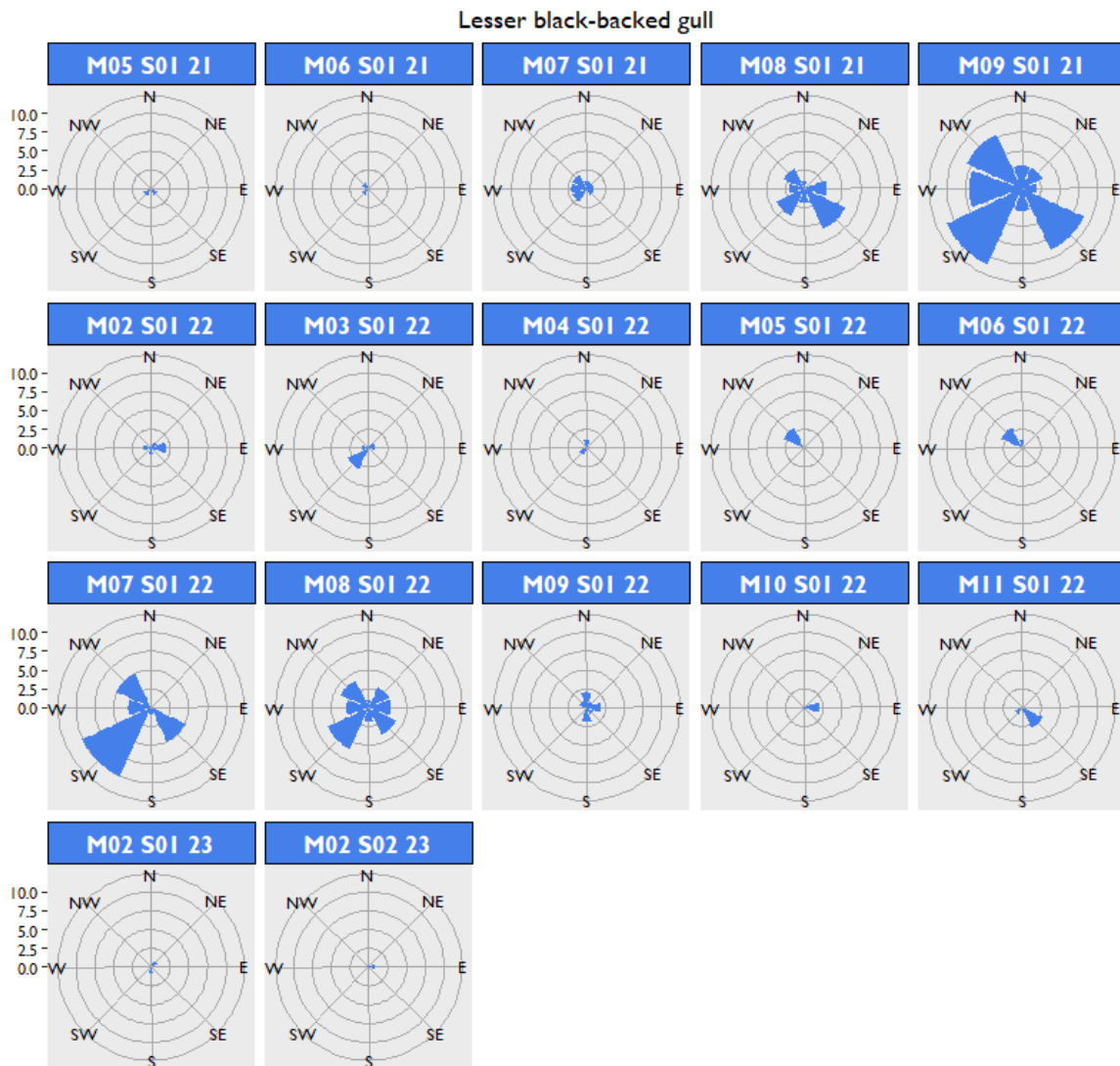
3.3.8 Guillemot

112   Guillemot were the most abundant species recorded during the 24-month period, peaking in August 2021, at the end of the breeding season/start of the non-breeding season, during the post breeding migration season (Figure 55).

113   After correcting for animals underwater at the time of the survey, apportioned density estimates ranged between 1.30 birds/km^2 (95% CI 0.87 – 1.82) in December 2021 and 40.81 birds/km^2 (95% CI 32.13 – 49.55) in August 2021 (Figure 56). Peak density estimates equated to an absolute population estimate of 26,587 birds (95% CI 20,927 – 32,283; Table 28).

114   The highest densities of guillemot were recorded in the north and east, such as in March, July and August 2021 (Figure 57). Many birds were also distributed to the west in November 2021 (Figure 58) and to the west and north-west in March and April 2022 (Figure 59). Between May and October 2022, guillemot were spread over the survey area, with higher densities observed to the south-east in November and December 2022 (Figure 60).

115   Age data for guillemots are not presented since adults can only be aged when in the presence of a juvenile for size comparison, and they occur almost always as single adult-chick pairs. At least 550 and 315 adult-chick pairs were recorded in July 202 and August 2021 respectively. In July and August 2022 at least 430 and 110 adult-chick pairs were recorded respectively.

116   As is expected for the species, the majority of birds were recorded as sitting on the water, with only 1% of birds recorded flying throughout the 24-month period (Table 29). Of the other behaviour recorded, five were recorded bathing in August 2022. The remaining records were recorded as dead guillemots, with two and one records in May 2022 and February S02 respectively.

117   Guillemot were recorded flying in all months. In November 2021 and February 2022, when the number of flying birds was relatively high, birds generally flew in northerly and westerly directions (Figure 61). In May and July 2022, when flying numbers were also high, guillemots were recorded flying in primarily north-westerly and south-westerly directions whereas in December 2022, flying direction was mainly in a north-westly to north-westly direction.

Figure 55 **Number of guillemot recorded between March 2021 and February 2023 in the Morecambe survey area**
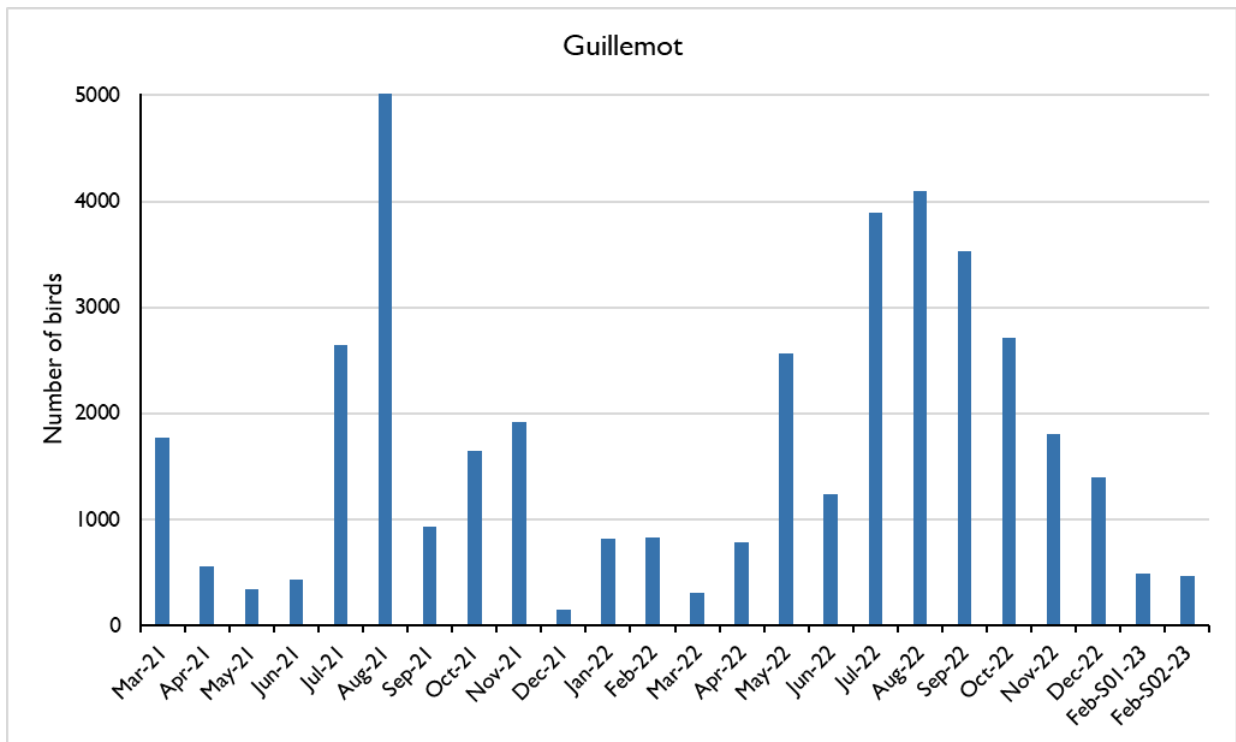
Figure 56 **Apportioned absolute guillemot density estimates, with 95% upper and lower confidence limits, in the Morecambe survey area between March 2021 and February 2023**
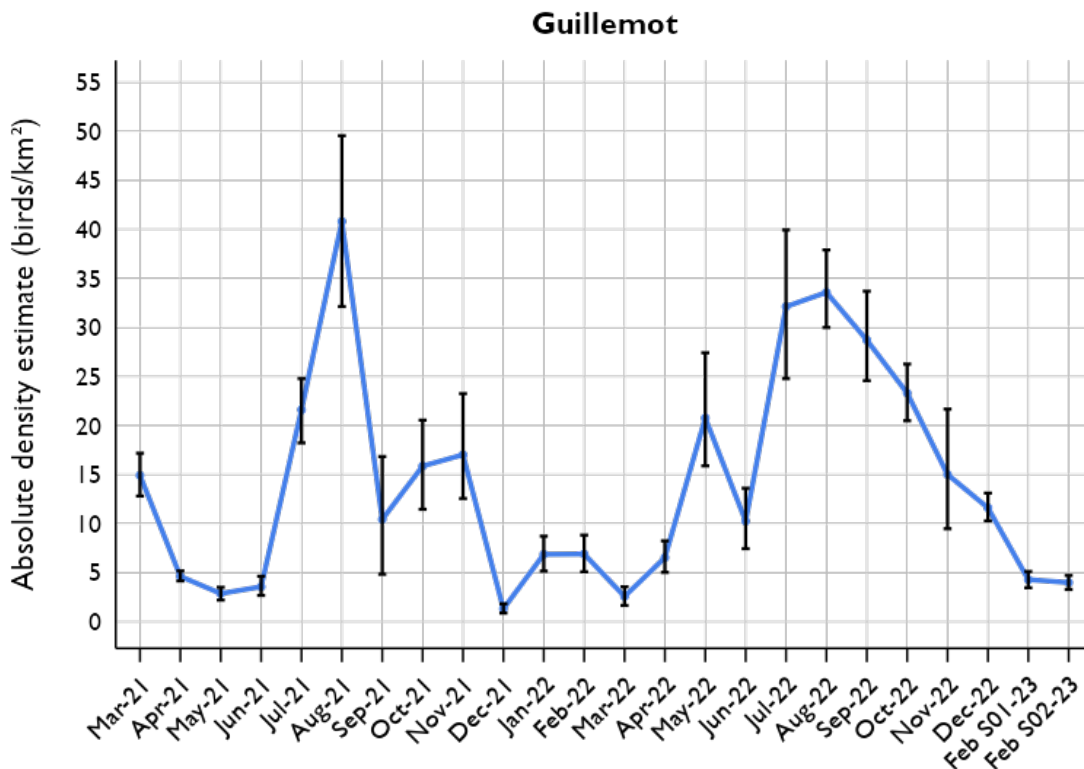
**Table 28** Apportioned relative and absolute density and population estimates of guillemot in the Morecambe survey area between March 2021 and February 2023, accounting for birds estimated as unavailable for detection

Survey date	Relative population estimates						Absolute population estimates					
	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
19 March 2021	11.39	7423	6337	8512	565	7.61	14.91	9720	8333	11184	783	8.06
07 April 2021	3.56	2319	2108	2542	112	4.80	4.61	3006	2702	3363	159	5.29
18 May 2021	2.20	1433	1120	1752	161	11.18	2.86	1864	1434	2282	228	12.23
01 June 2021	2.71	1763	1326	2266	245	13.87	3.55	2314	1736	3008	339	14.65
09 July 2021	16.46	10726	8992	12353	870	8.11	21.60	14073	11870	16149	1232	8.75
02 August 2021	31.10	20260	16036	24728	2309	11.40	40.81	26587	20927	32283	3228	12.14
04 September 2021	7.78	5068	2215	8151	1527	30.13	10.42	6788	3147	10963	2207	32.51
06 October 2021	11.93	7769	5527	10037	1161	14.93	15.86	10333	7468	13383	1604	15.52
17 November 2021	12.99	8460	6193	11268	1333	15.75	17.01	11081	8174	15149	1886	17.02
05 December 2021	1.00	650	462	878	108	16.52	1.30	841	563	1184	153	18.19
13 January 2022	5.23	3406	2552	4301	460	13.49	6.86	4461	3357	5676	650	14.57
11 February 2022	5.25	3421	2472	4381	491	14.34	6.89	4485	3305	5744	674	15.03
09 March 2022	1.93	1259	792	1750	250	19.82	2.56	1669	1076	2310	348	20.85
01 April 2022	5.03	3272	2589	4122	392	11.98	6.53	4247	3265	5354	554	13.04
02 May 2022	15.97	10393	7847	13616	1465	14.1	20.76	13511	10335	17843	2068	15.31

Survey date	Relative population estimates						Absolute population estimates					
	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
07 June 2022	7.8	5079	3680	6865	804	15.83	10.24	6662	4841	8856	1118	16.78
14 July 2022	24.45	15919	12580	19425	1784	11.21	32.12	20908	16133	26001	2561	12.25
09 August 2022	25.48	16585	14794	18673	980	5.91	33.57	21847	19525	24668	1399	6.40
02 September 2022	21.74	14149	12273	16655	1122	7.93	28.71	18691	15989	21927	1605	8.59
03 October 2022	17.72	11532	10115	12982	735	6.37	23.3	15162	13333	17091	1042	6.87
22 November 2022	11.6	7549	4785	11151	1654	21.91	15	9774	6169	14111	2244	22.96
03 December 2022	8.98	5843	5230	6553	328	5.61	11.6	7551	6678	8528	470	6.22
05 February 2023	3.3	2148	1794	2555	196	9.09	4.28	2779	2251	3331	276	9.93
23 February 2023	3.05	1984	1642	2339	180	9.05	3.98	2590	2133	3069	250	9.65

Table 29 **Summary of guillemot behaviours in the Morecambe survey area between March 2021 and February 2023**

Survey date	Number recorded diving	Number recorded flying	Number recorded sitting	Number recorded taking off	% Flying	Other	Total
19 March 2021	0	31	1744	0	2	0	1775
07 April 2021	0	31	532	0	6	0	563
18 May 2021	0	18	328	0	5	0	346
01 June 2021	0	11	420	0	3	0	431
09 July 2021	1	10	2632	0	0	1	2644
02 August 2021	1	1	5014	0	0	0	5016
04 September 2021	0	1	931	1	0	0	933
06 October 2021	0	12	1632	0	1	0	1644
17 November 2021	0	43	1878	0	2	0	1921
05 December 2021	0	8	143	0	5	0	151
13 January 2022	1	1	821	0	0	0	823
11 February 2022	0	36	796	0	4	0	832
09 March 2022	0	2	305	0	1	0	307
01 April 2022	0	21	759	0	3	0	780
02 May 2022	1	32	2528	0	1	2	2563
07 June 2022	1	24	1208	1	2	0	1234
14 July 2022	0	21	3874	0	1	0	3895
09 August 2022	0	1	4087	0	0	5	4093
02 September 2022	1	1	3523	1	0	0	3526
03 October 2022	2	8	2709	0	0	0	2719
22 November 2022	3	16	1786	0	1	0	1805
03 December 2022	0	82	1316	1	6	0	1399
05 February 2023	0	27	464	0	5	0	491
23 February 2023	0	5	466	0	1	1	472
Total	**11**	**443**	**39896**	**4**	**1**	**9**	**40363**

Figure 57   Density of guillemot (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021
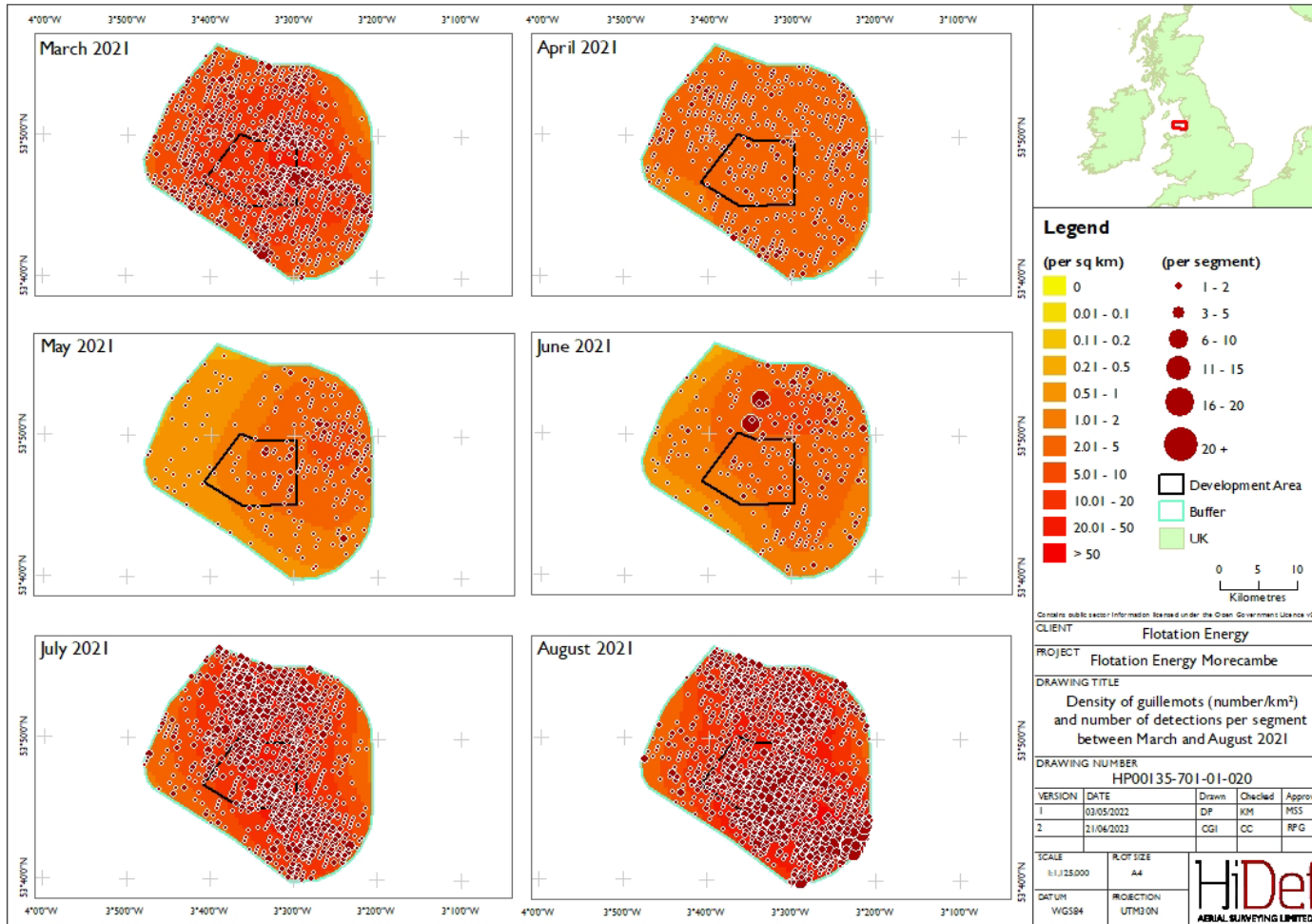
Figure 58   Density of guillemot (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022
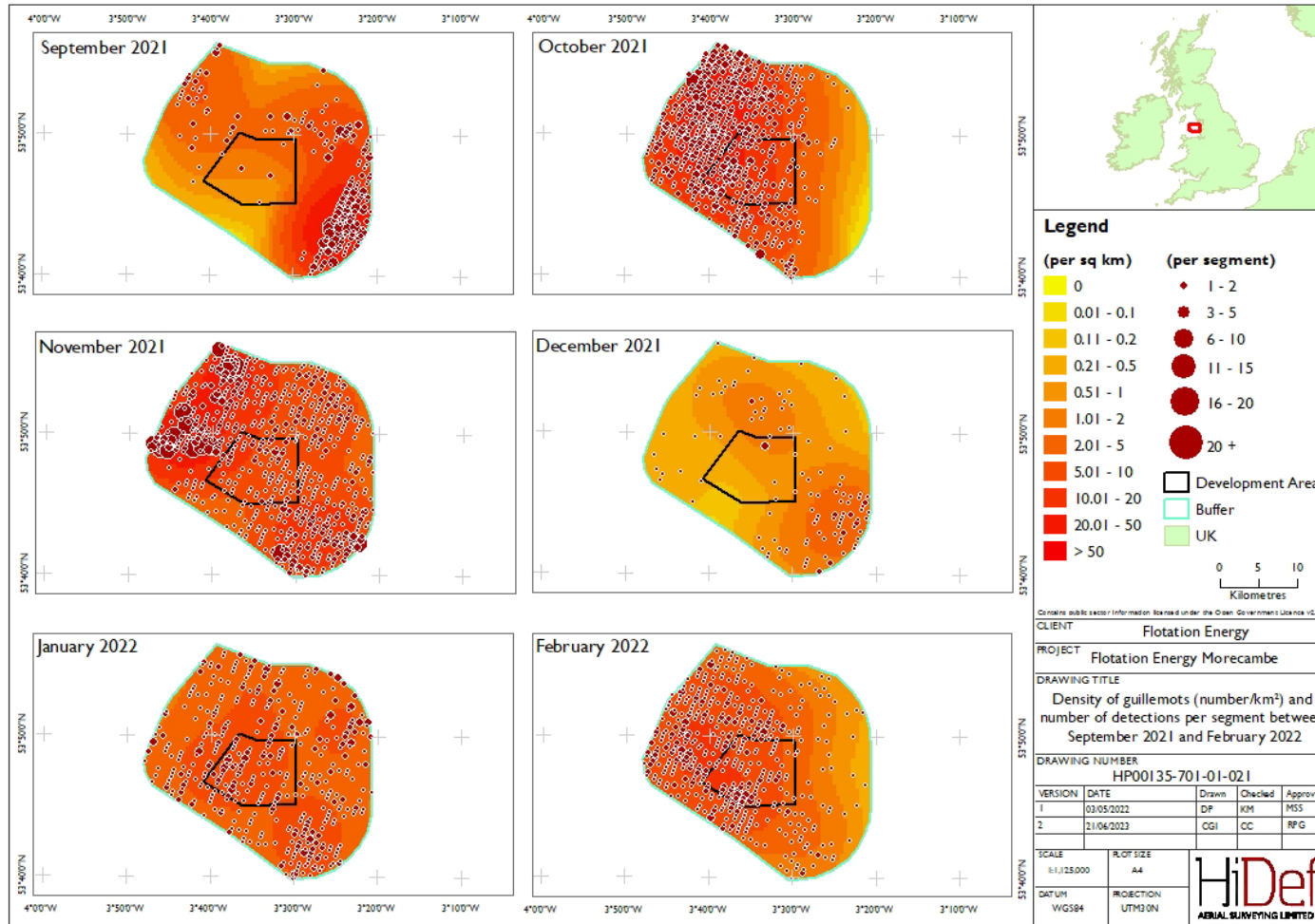
Figure 59 **Density of guillemot (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022**
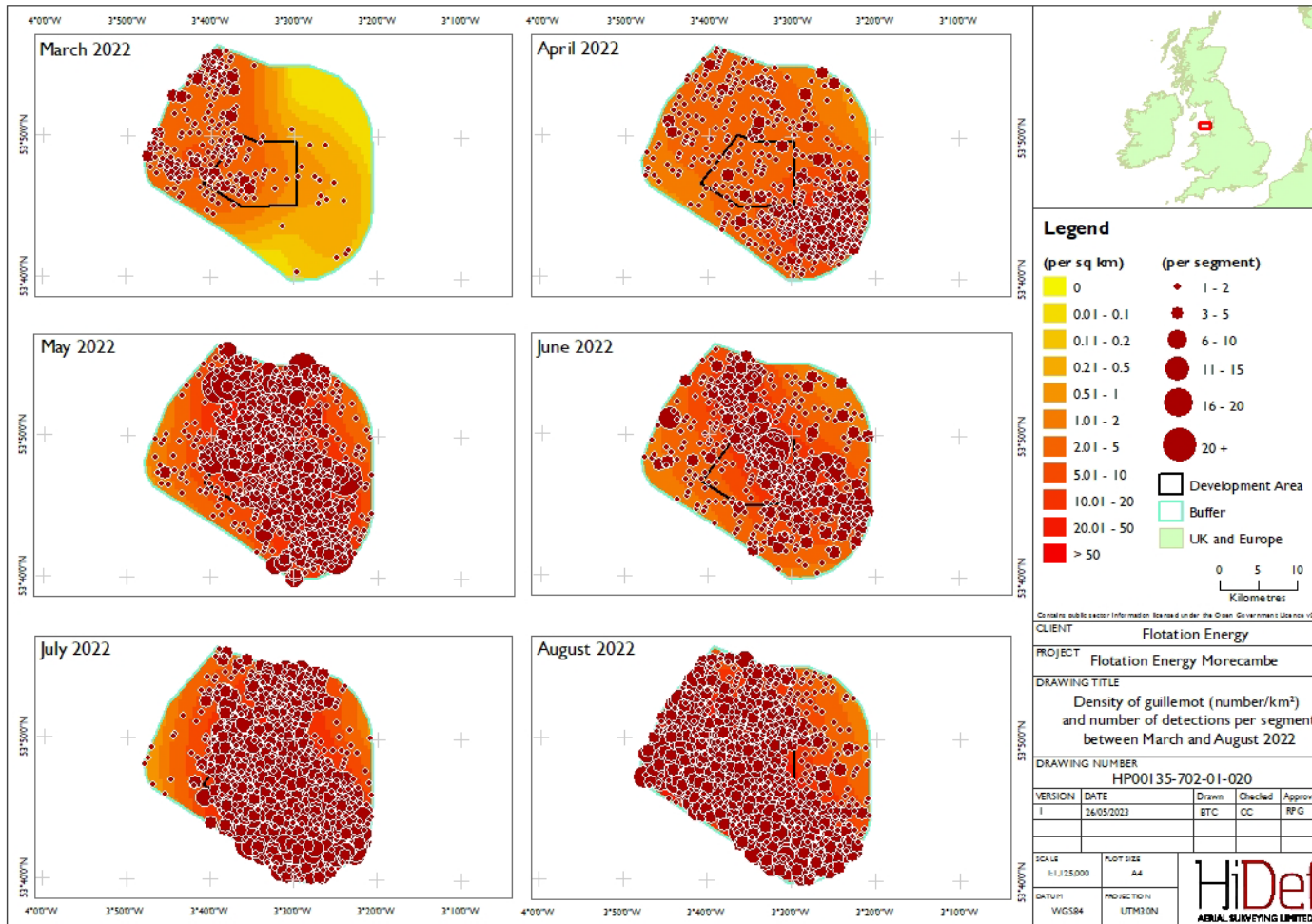
Figure 60 **Density of guillemot (number/km²) and number of detections per segment in the Morecambe survey area between September 2022 and February 2023**
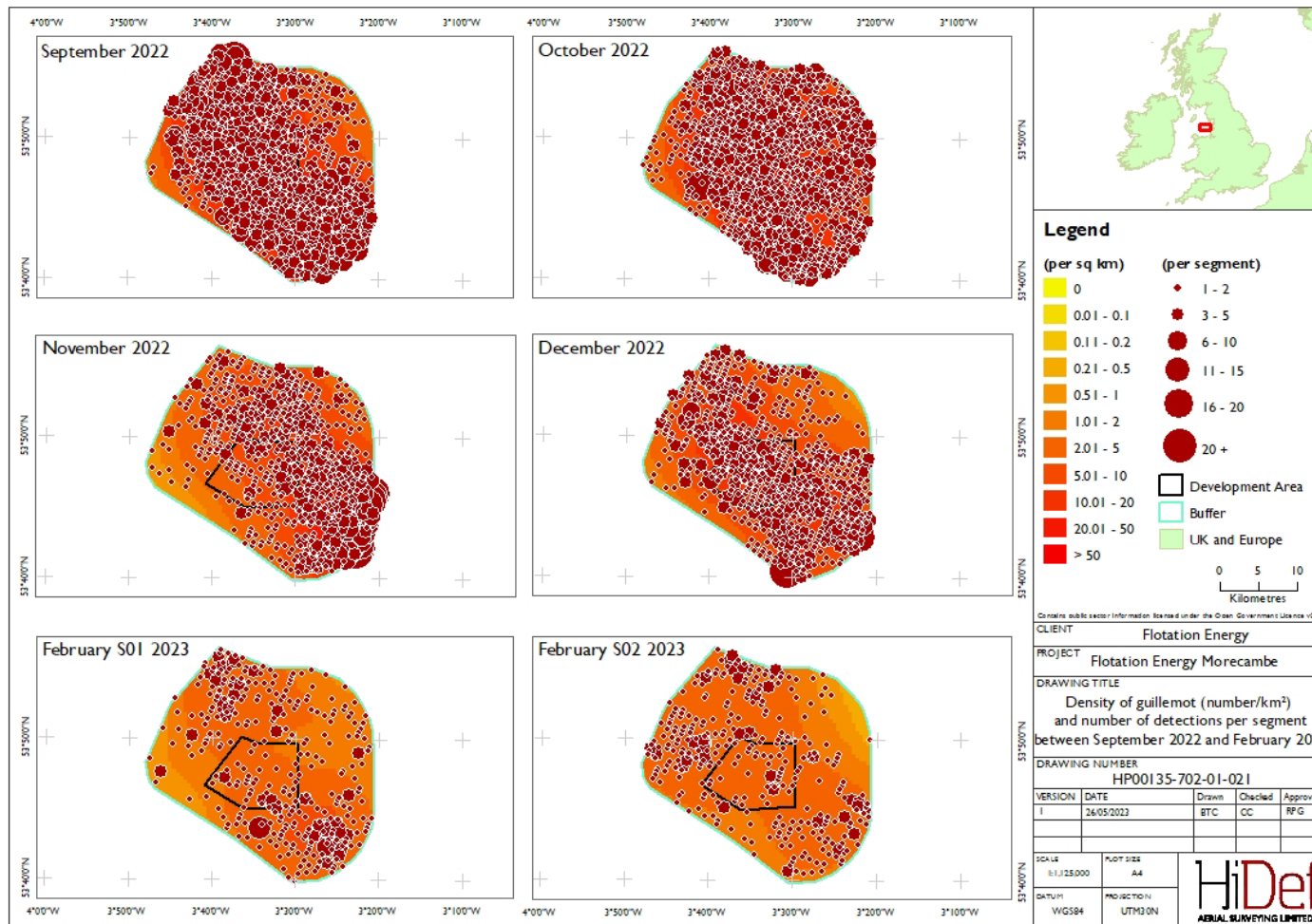
Figure 61   Summarised direction of movement of flying guillemot in the Morecambe survey area between March 2021 and February 2023
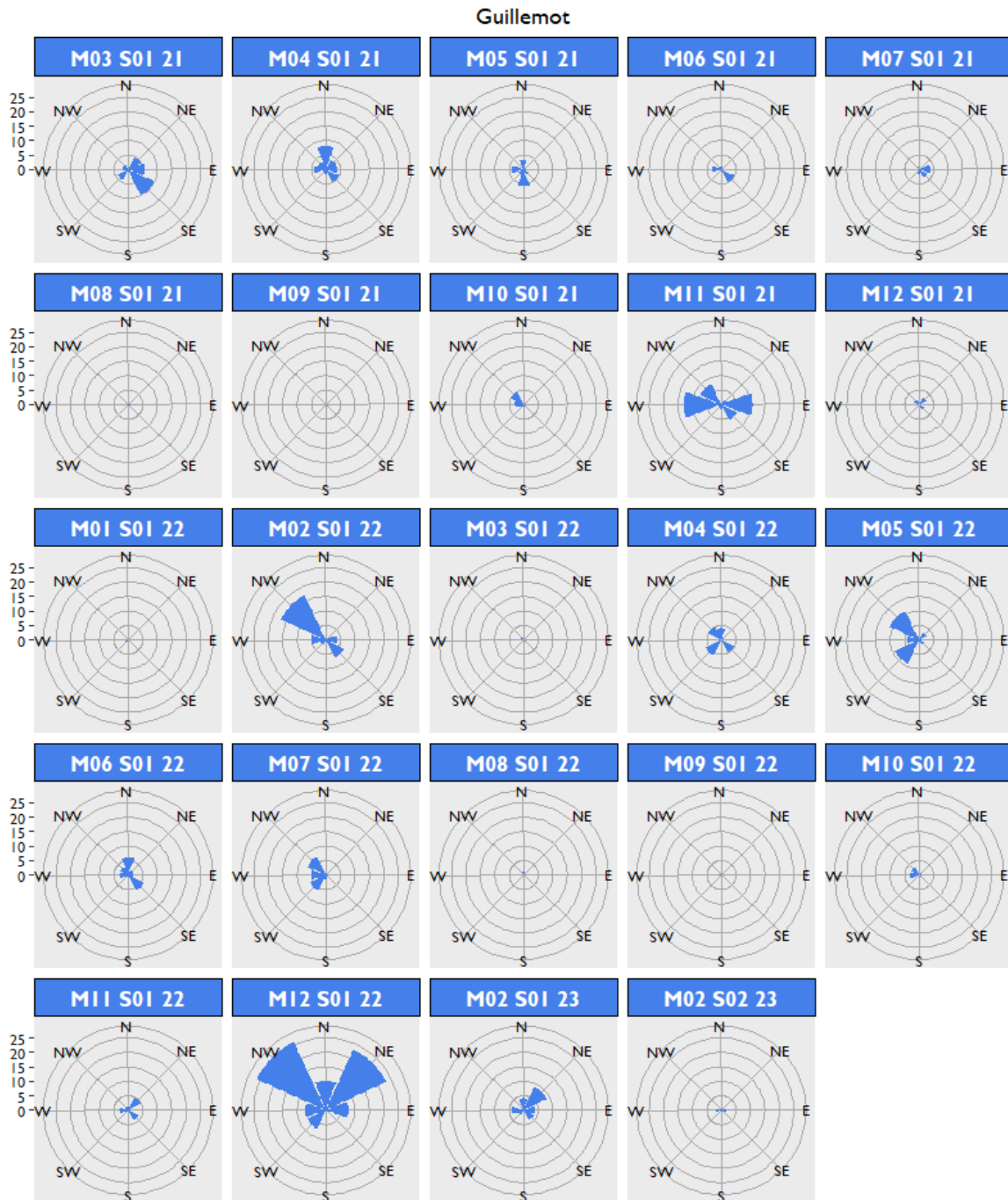
3.3.9 Razorbill

118   Razorbill were observed in high abundance during the breeding and non-breeding season, peaking in December 2022 (Figure 62), and in very low numbers between June and September coinciding with the beginning of post-breeding migration period.

119   Apportioned absolute density estimates ranged between 0.01 birds/km^2 (95% CI 0.00 – 0.04) in September 2021 and 3.49 birds/km^2 (95% CI 2.64 – 4.40) in December 2022 (Figure 63; Table 30). Absolute densities in December 2022 equated to a peak population estimate of 2,269 birds (95% CI 1,724 – 2,862).

120   Birds were recorded throughout the survey area (Figure 64 and Figure 67).

121   Age data for razorbill are not presented since adults can only be aged when in the presence of a juvenile for size comparison, and they occur almost always as single adult-chick pairs.

122   As is expected for the species, most birds were recorded as sitting on the water, with only 4% of birds recorded flying throughout the 24-month period (Table 31).

123   There were survey months in which no data regarding flight direction were available. To allow for clear interpretation of results, only surveys which contained flight direction data are displayed (Figure 68). In November 2021, when relatively high numbers of razorbill were recorded, birds generally flew north-west and south-east. In December 2022, birds were observed mainly flying in south-easterly directions.

Figure 62   Number of razorbill recorded between March 2021 and February 2023 in the Morecambe survey area
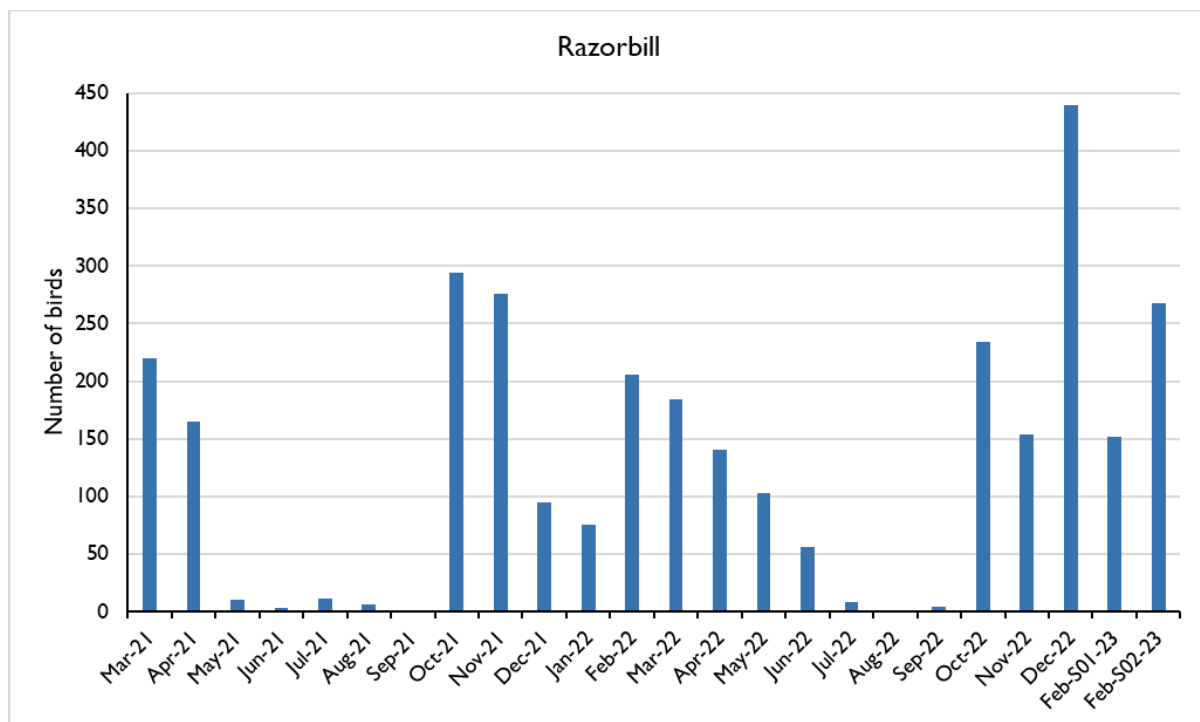
Figure 63 **Apportioned absolute razorbill density estimates, with 95% upper and lower confidence limits, in the Morecambe survey area between March 2021 and February 2023**
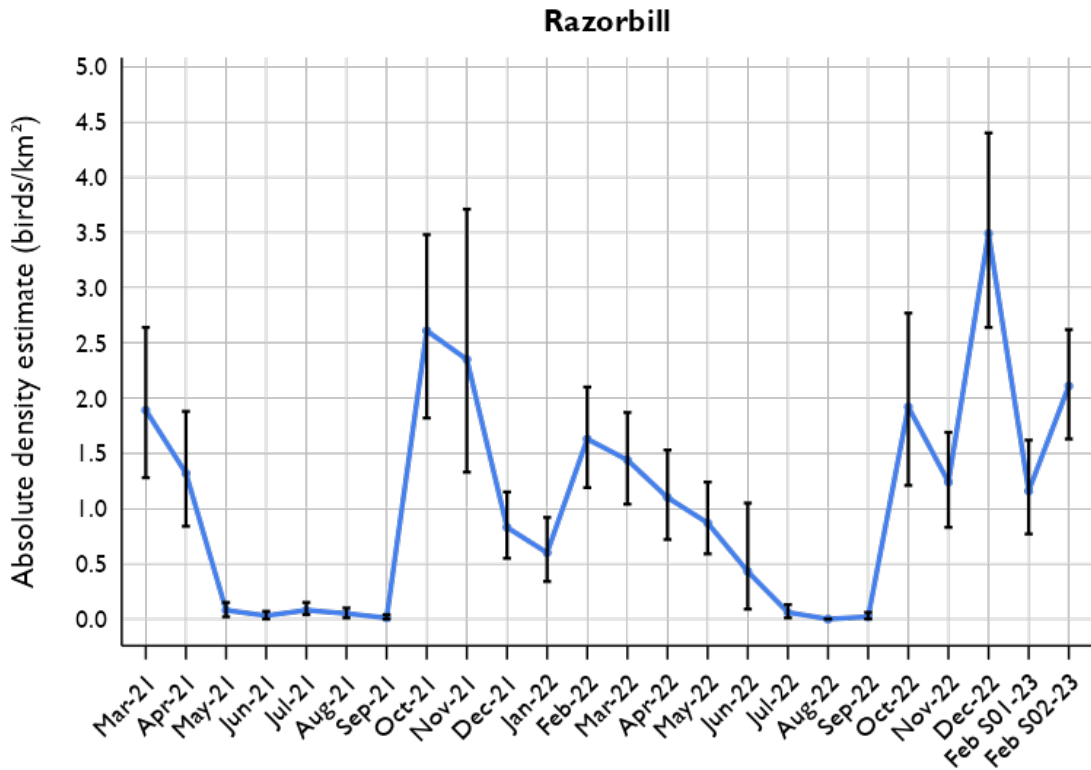
Table 30 Apportioned relative and absolute density and population estimates of razorbill in the Morecambe survey area between March 2021 and February 2023, accounting for birds estimated as unavailable for detection

Survey date	Relative population estimates						Absolute population estimates					
	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
19 March 2021	1.57	1023	698	1432	186	18.14	1.89	1237	835	1720	251	20.29
07 April 2021	1.11	723	480	972	126	17.36	1.32	864	548	1227	182	21.06
18 May 2021	0.07	45	18	80	17	36.54	0.08	56	21	101	22	39.29
01 June 2021	0.03	17	5	32	7	40.35	0.03	20	4	43	9	45.00
09 July 2021	0.07	45	21	75	14	30.85	0.08	55	21	99	20	36.36
02 August 2021	0.04	25	5	48	12	46.70	0.05	29	5	62	17	58.62
04 September 2021	0.01	7	0	19	7	92.51	0.01	9	0	24	10	111.11
06 October 2021	2.13	1389	1029	1788	199	14.30	2.61	1702	1189	2261	277	16.27
17 November 2021	1.98	1288	754	1919	304	23.56	2.35	1531	871	2421	424	27.69
05 December 2021	0.67	440	304	599	77	17.32	0.83	539	361	752	109	20.22
13 January 2022	0.50	328	180	497	82	24.87	0.60	387	222	596	114	29.46
11 February 2022	1.34	876	635	1106	122	13.91	1.63	1058	774	1372	170	16.07
09 March 2022	1.18	771	579	977	101	13.07	1.44	941	680	1227	142	15.09

Survey date	Relative population estimates						Absolute population estimates					
	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
01 April 2022	0.92	596	408	811	105	17.48	1.10	715	471	994	148	20.70
02 May 2022	0.70	455	295	644	89	19.58	0.87	562	379	810	126	22.42
07 June 2022	0.36	236	49	562	154	64.99	0.43	281	57	684	215	76.51
14 July 2022	0.05	33	8	65	15	46.74	0.06	42	11	86	22	52.38
09 August 2022	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0
02 September 2022	0.03	17	1	39	10	60.26	0.02	21	1	44	14	66.67
03 October 2022	1.59	1032	659	1508	218	21.08	1.92	1247	785	1802	300	24.06
22 November 2022	1.02	662	448	916	117	17.55	1.24	804	540	1093	162	20.15
03 December 2022	2.86	1863	1437	2284	216	11.60	3.49	2269	1724	2862	308	13.57
05 February 2023	0.96	627	428	844	111	17.57	1.16	755	502	1049	158	20.93
23 February 2023	1.71	1116	869	1389	132	11.75	2.11	1374	1057	1707	189	13.76

Table 31 **Summary of razorbill behaviours in the Morecambe survey area between March 2021 and February 2023**

Survey date	Number recorded diving	Number recorded flying	Number recorded sitting	Number recorded taking off	% Flying	Total
19 March 2021	0	9	211	0	4	220
07 April 2021	0	8	157	0	5	165
18 May 2021	0	1	9	0	10	10
01 June 2021	0	1	2	0	33	3
09 July 2021	0	1	10	0	9	11
02 August 2021	0	0	6	0	0	6
04 September 2021	0	0	1	0	0	1
06 October 2021	0	19	275	0	6	294
17 November 2021	0	24	252	0	9	276
05 December 2021	0	3	92	0	3	95
13 January 2022	0	0	75	0	0	75
11 February 2022	0	4	202	0	2	206
09 March 2022	0	7	177	0	4	184
01 April 2022	2	3	136	0	2	141
02 May 2022	0	1	102	0	1	103
07 June 2022	0	0	56	0	0	56
14 July 2022	0	0	8	0	0	8
09 August 2022	0	0	0	0	-	0
02 September 2022	0	0	4	0	0	4
03 October 2022	0	9	225	0	4	234
22 November 2022	0	4	150	0	3	154
03 December 2022	0	21	418	0	5	439
05 February 2023	2	2	148	0	1	152
23 February 2023	0	1	267	0	0	268
Total	**4**	**118**	**2983**	**0**	**4**	**3105**

Figure 64   Density of razorbill (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021
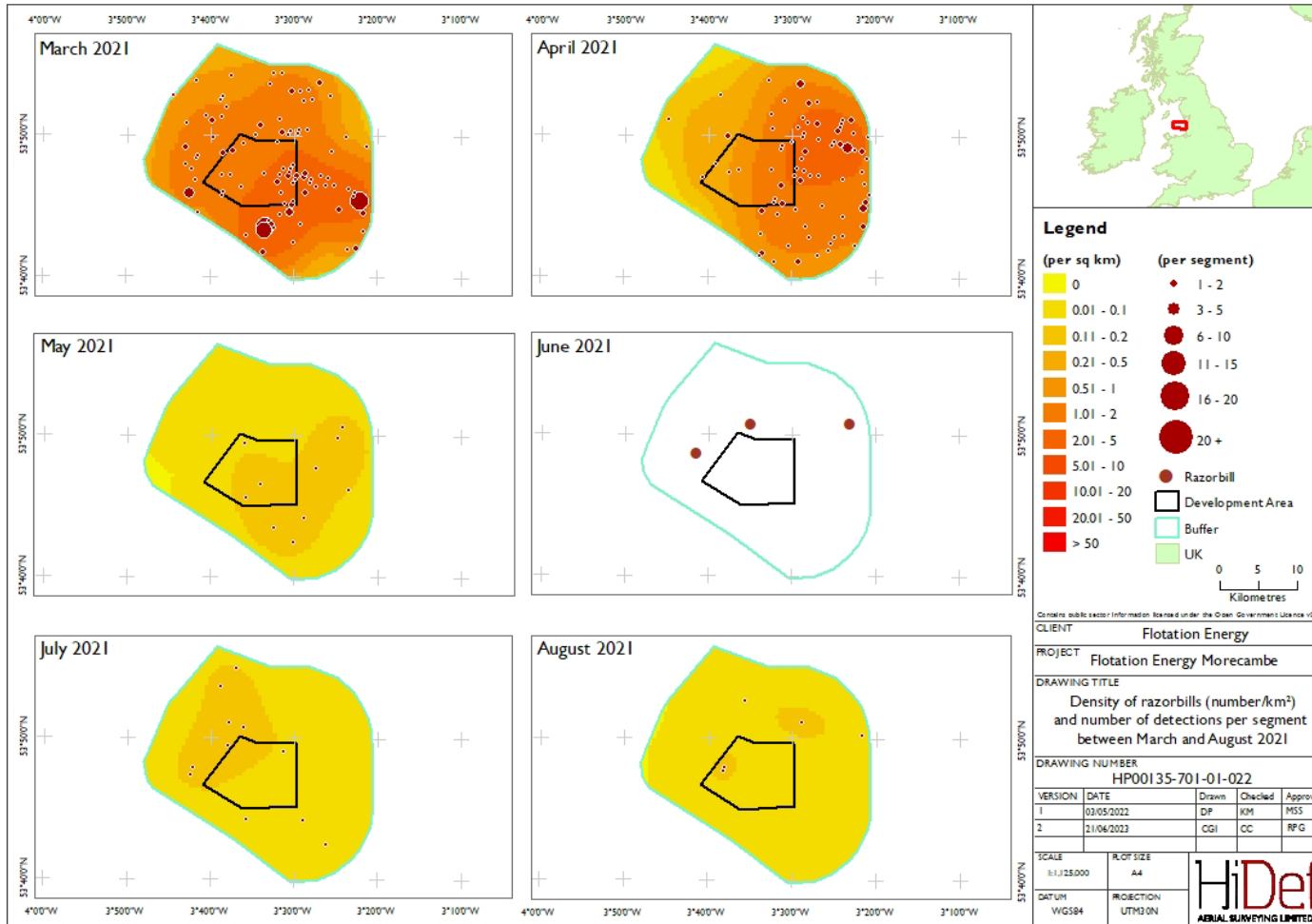
Figure 65 **Density of razorbill (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022**
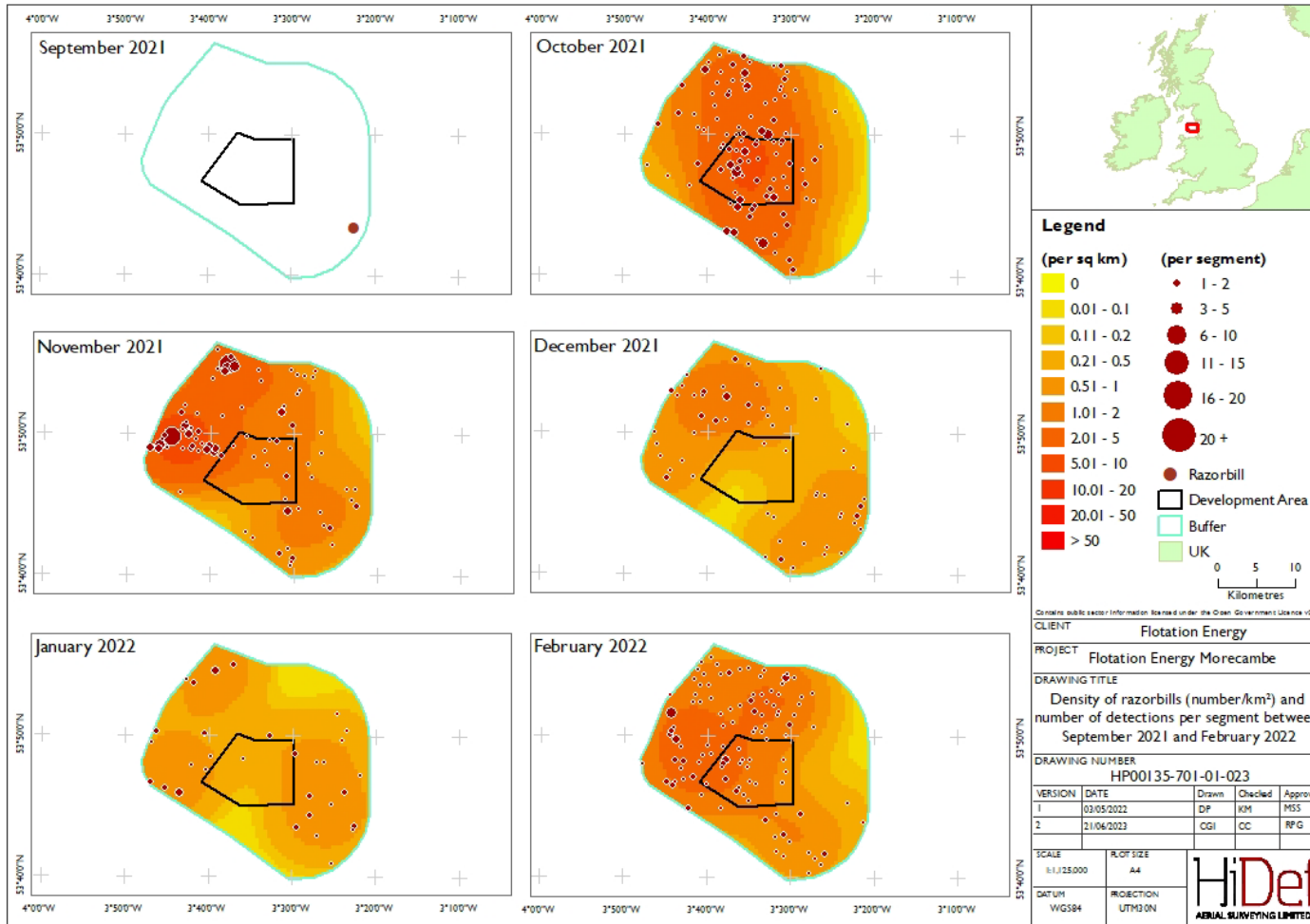
Figure 66 Density of razorbill (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022
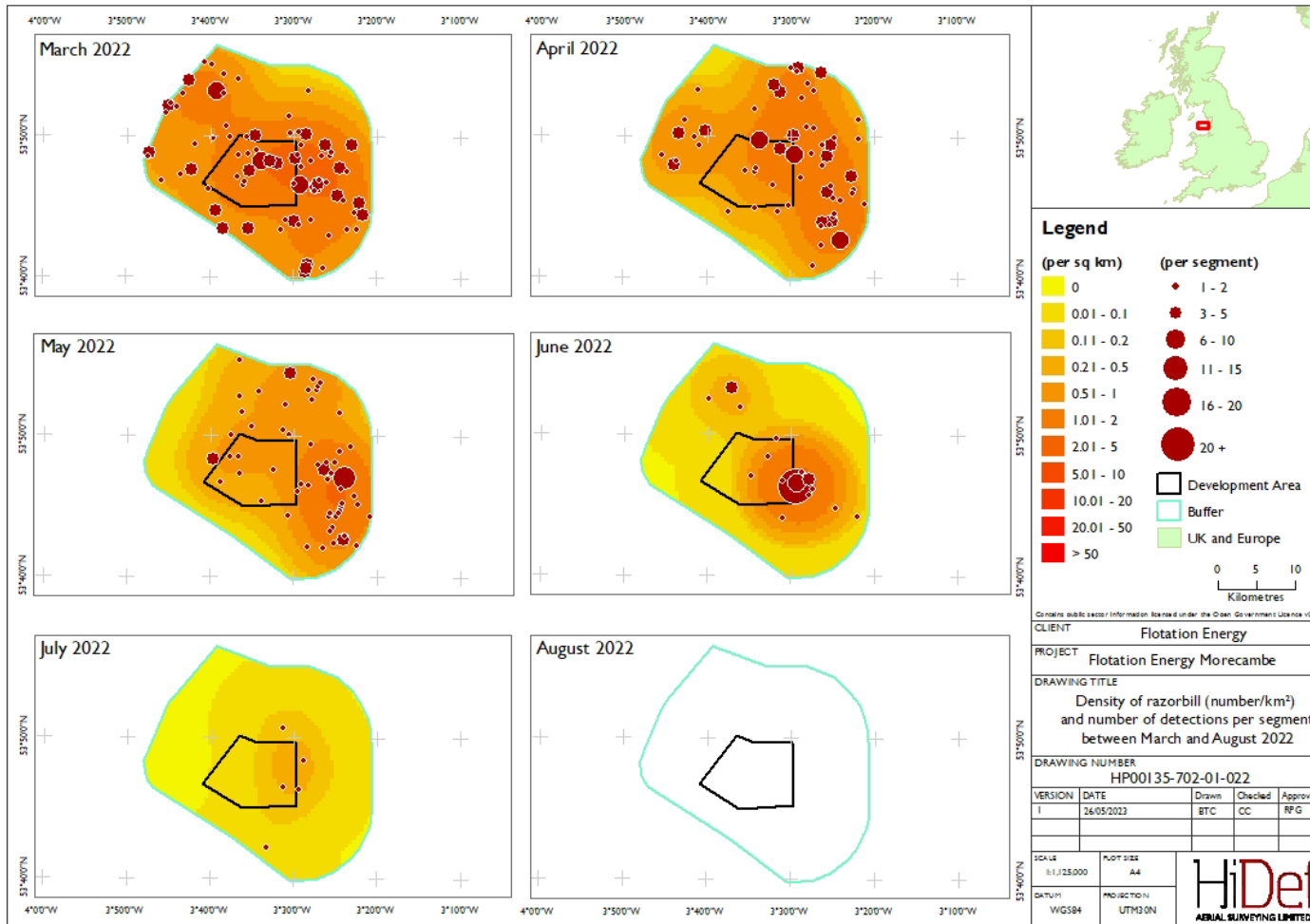
Figure 67 **Density of razorbill (number/km²) and number of detections per segment in the Morecambe survey area between September 2022 and February 2023**
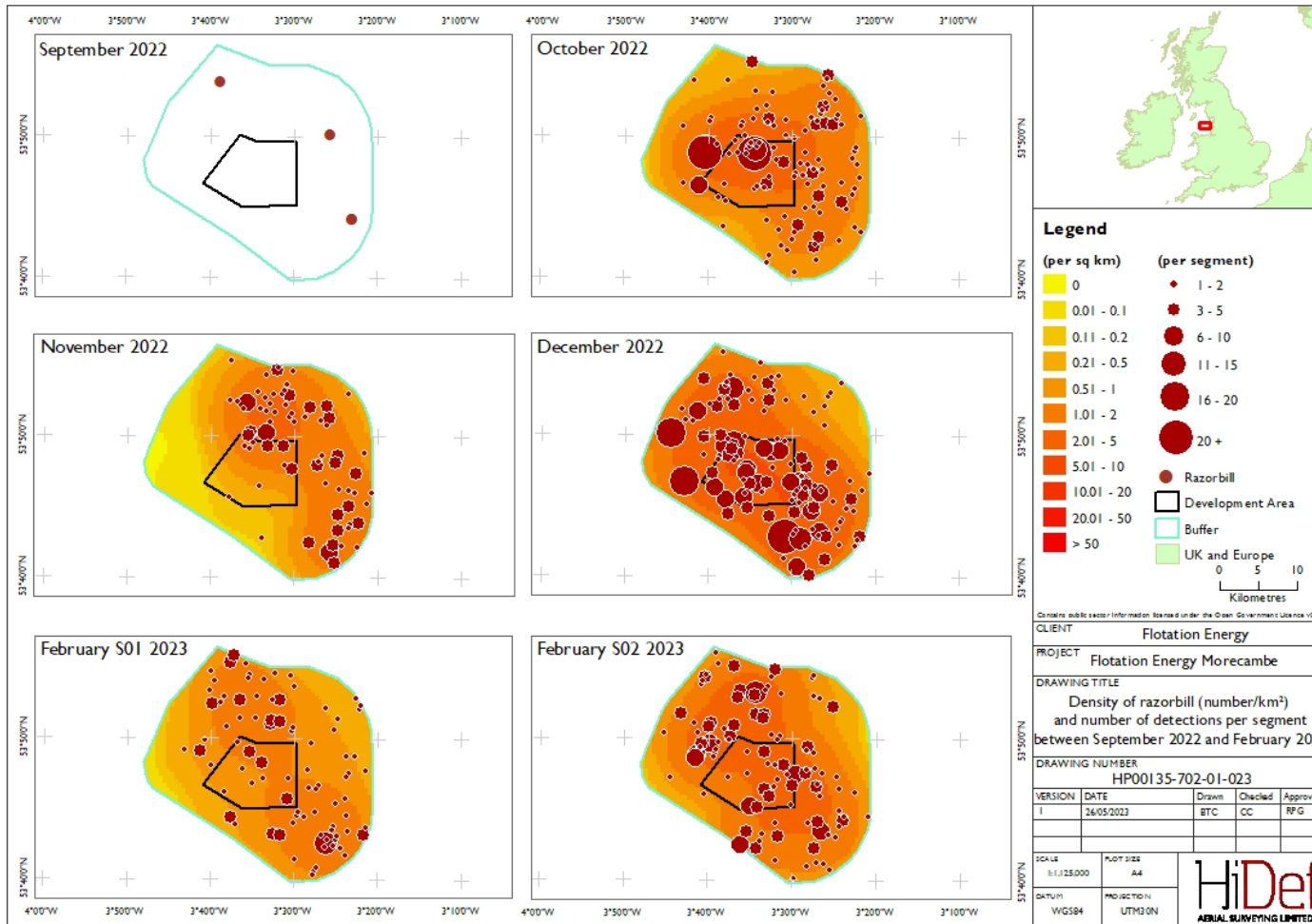
Figure 68   Summarised direction of movement of flying razorbill in the Morecambe survey area between March 2021 and February 2023
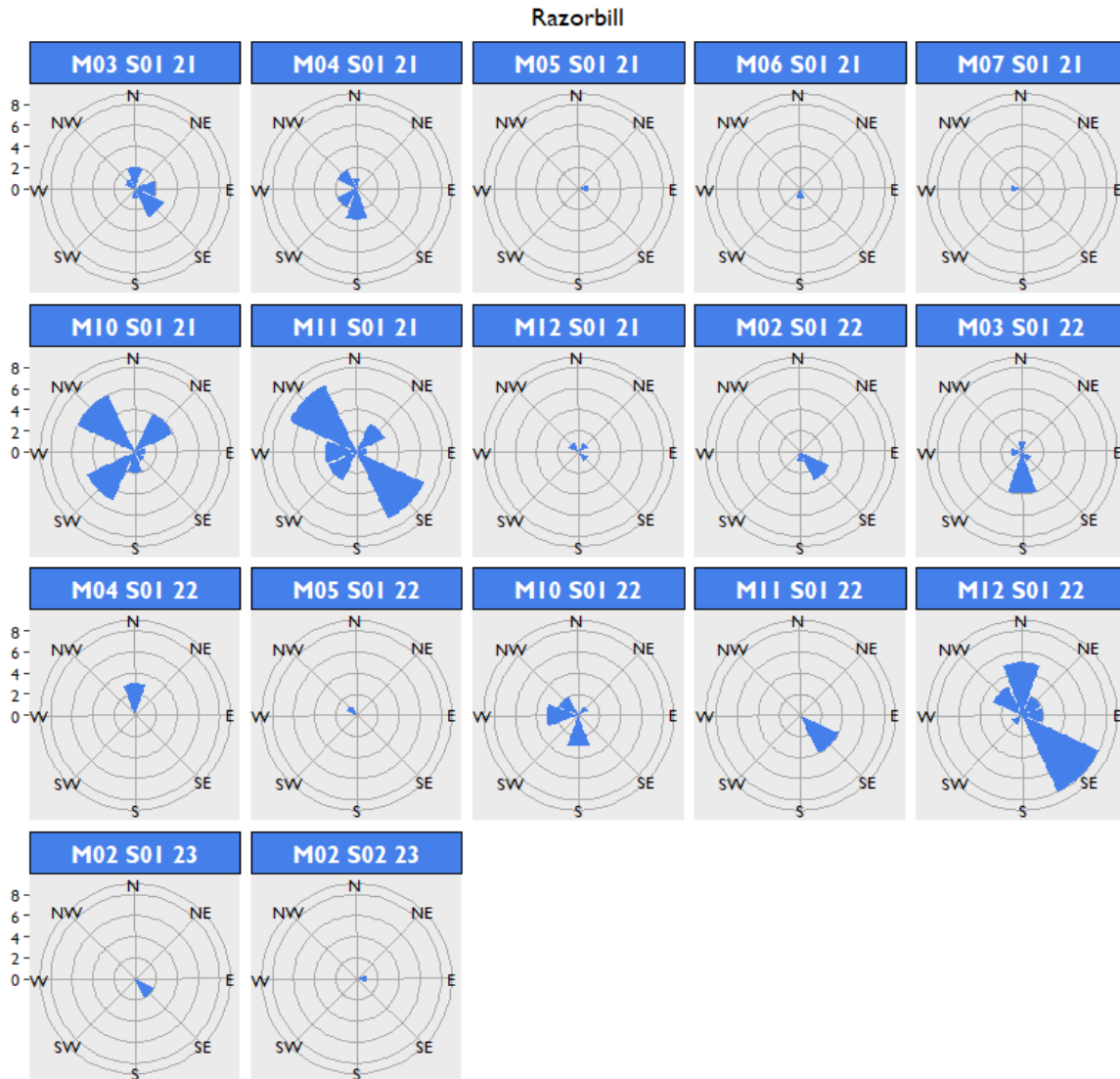
3.3.10 Red-throated diver

124   Red-throated diver were recorded intermittently over the survey programme, peaking in December 2021 and March 2022, during the usual non-breeding period, specifically the winter season and return migration season (Figure 69).

125   Apportioned density estimates for the species ranged between 0.01 birds/km^2 in November 2022, and 0.13 birds/km^2 (95% CI 0.05 – 0.23) in December 2021 (Figure 70; Table 32). The peak population for the species in December 2021 was estimated at 85 birds (95% CI 32 – 148), during which birds were primarily distributed in the eastern part of the survey area, within the Liverpool Bay SPA (Figure 71 to Figure 74). Throughout the 24-month period, majority of the observations occurred in the easterly side of the survey area, with the exception of May 2022.

126   Over the survey period, only 2 birds were recorded as flying, with all birds recorded as sitting on the water (Table 33).

Figure 69   Number of red-throated diver recorded between March 2021 and February 2023 in the Morecambe survey area
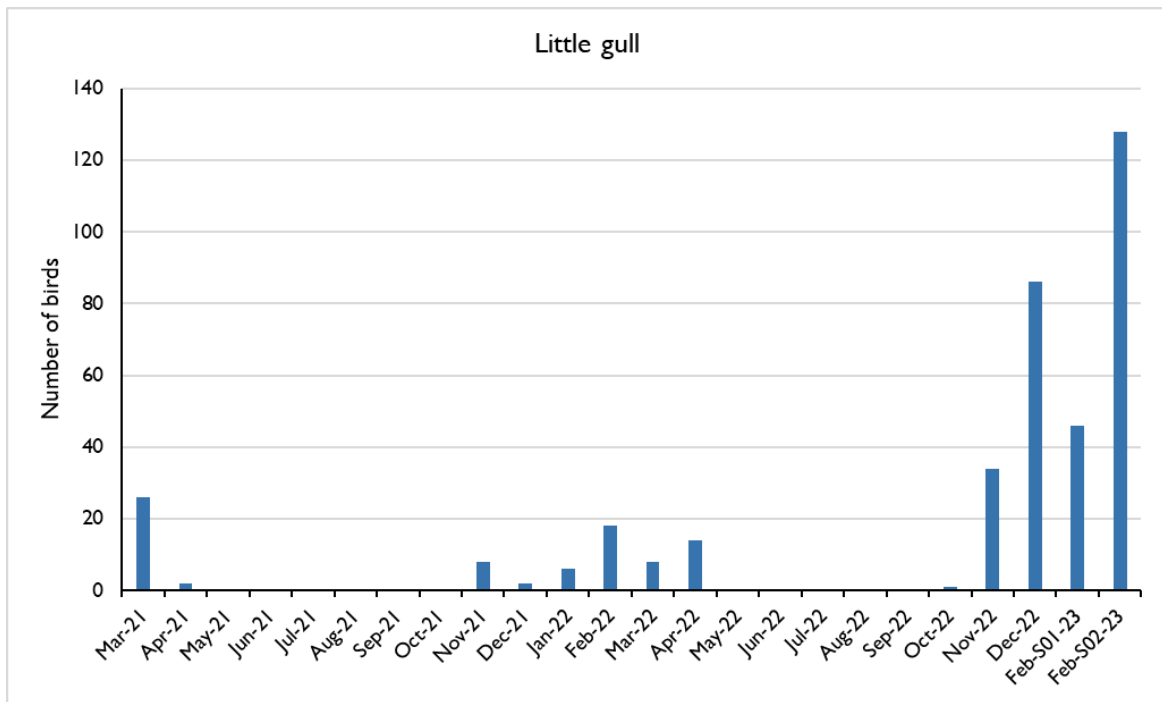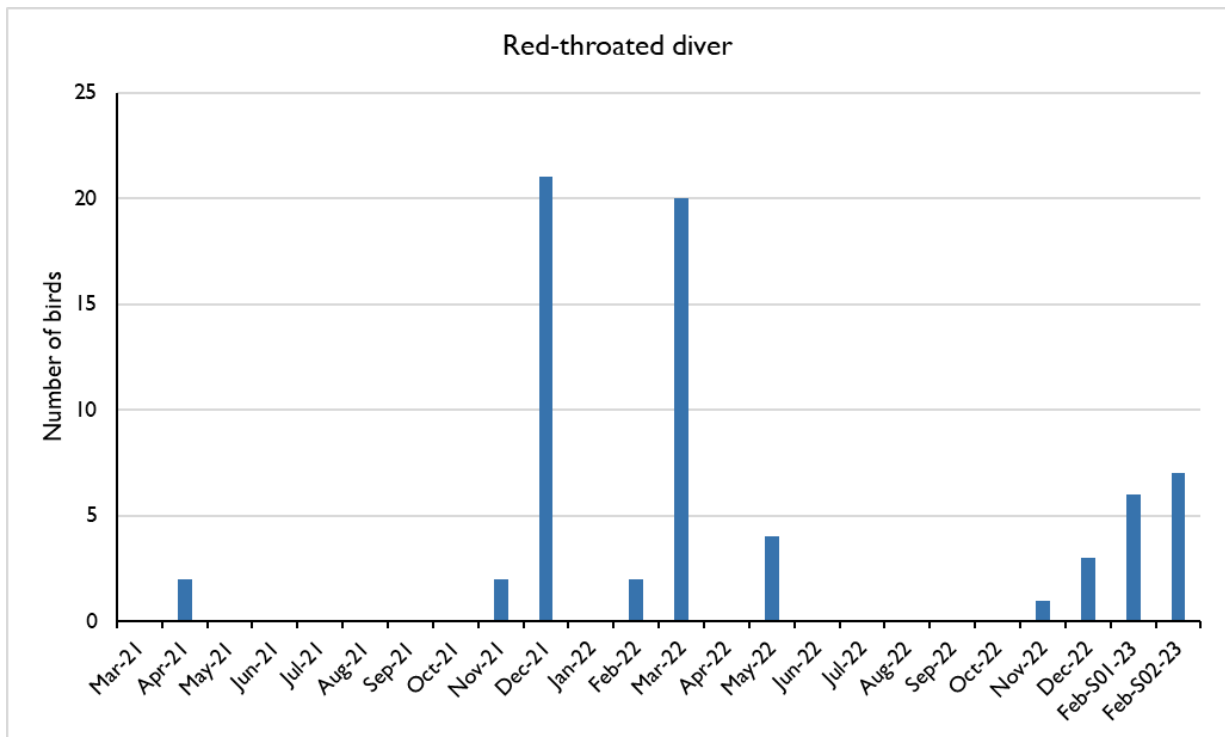
Figure 70 **Apportioned red-throated diver density estimates, with 95% upper and lower confidence limits, in the Morecambe survey area between March 2021 and February 2023**
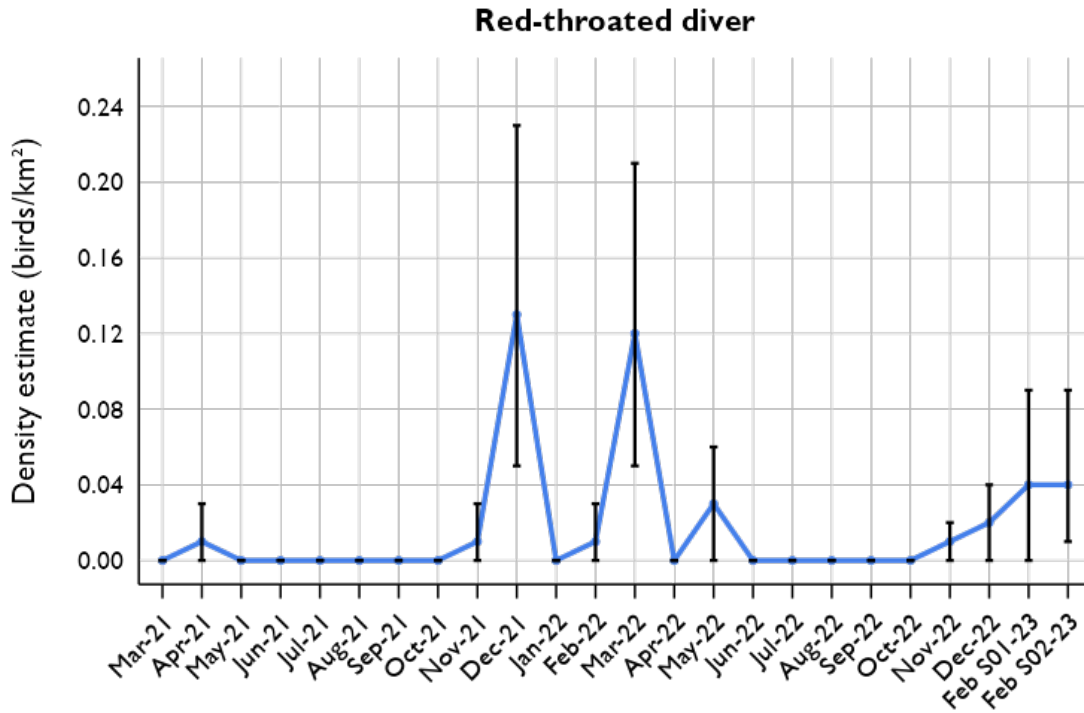
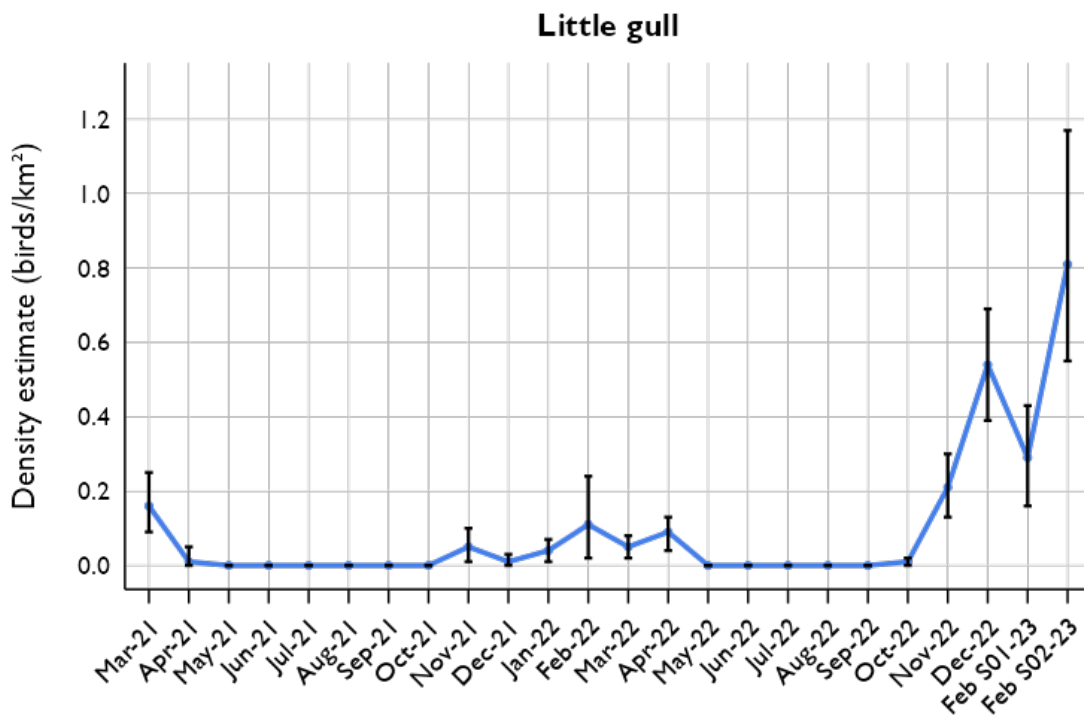**Table 32** **Density and apportioned population estimates of red-throated diver in the Morecambe survey area between March 2021 and February 2023**

Survey date	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
19 March 2021	0.00	0	0	0	0	0.00
07 April 2021	0.01	9	0	20	6	0.69
18 May 2021	0.00	0	0	0	0	0.00
01 June 2021	0.00	0	0	0	0	0.00
09 July 2021	0.00	0	0	0	0	0.00
02 August 2021	0.00	0	0	0	0	0.00
04 September 2021	0.00	0	0	0	0	0.00
06 October 2021	0.00	0	0	0	0	0.00
17 November 2021	0.01	8	0	21	6	0.71
05 December 2021	0.13	85	32	148	30	0.35
13 January 2022	0.00	0	0	0	0	0.00
11 February 2022	0.01	8	0	20	6	0.70
09 March 2022	0.12	79	32	139	29	35.72
01 April 2022	0.00	0	0	0	0	0.00
02 May 2022	0.03	17	0	36	10	56.81
07 June 2022	0.00	0	0	0	0	0.00
14 July 2022	0.00	0	0	0	0	0.00
09 August 2022	0.00	0	0	0	0	0.00
02 September 2022	0.00	0	0	0	0	0.00
03 October 2022	0.00	0	0	0	0	0.00
22 November 2022	0.01	5	0	13	5	100.07
03 December 2022	0.02	13	0	25	7	52.18
05 February 2023	0.04	25	0	60	17	67.81
23 February 2023	0.04	29	5	56	14	46.40

Table 33   Summary of red-throated diver behaviours in the Morecambe survey area between March 2021 and February 2023

Survey date	Number recorded diving	Number recorded flying	Number recorded sitting	Number recorded taking off	% Flying	Total
19 March 2021	0	0	0	0	0	0
07 April 2021	0	0	2	0	0	2
18 May 2021	0	0	0	0	0	0
01 June 2021	0	0	0	0	0	0
09 July 2021	0	0	0	0	0	0
02 August 2021	0	0	0	0	0	0
04 September 2021	0	0	0	0	0	0
06 October 2021	0	0	0	0	0	0
17 November 2021	0	0	2	0	0	2
05 December 2021	0	0	21	0	0	21
13 January 2022	0	0	0	0	0	0
11 February 2022	0	0	2	0	0	2
09 March 2022	0	0	20	0	0	20
01 April 2022	0	0	0	0	0	0
02 May 2022	0	0	4	0	0	4
07 June 2022	0	0	0	0	0	0
14 July 2022	0	0	0	0	0	0
09 August 2022	0	0	0	0	0	0
02 September 2022	0	0	0	0	0	0
03 October 2022	0	0	0	0	0	0
22 November 2022	0	1	0	0	100	1
03 December 2022	0	1	2	0	33	3
05 February 2023	0	0	6	0	0	6
23 February 2023	0	0	7	0	0	7
Total	**0**	**2**	**66**	**0**	**3**	**68**

Figure 71 **Density of red-throated diver (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021**
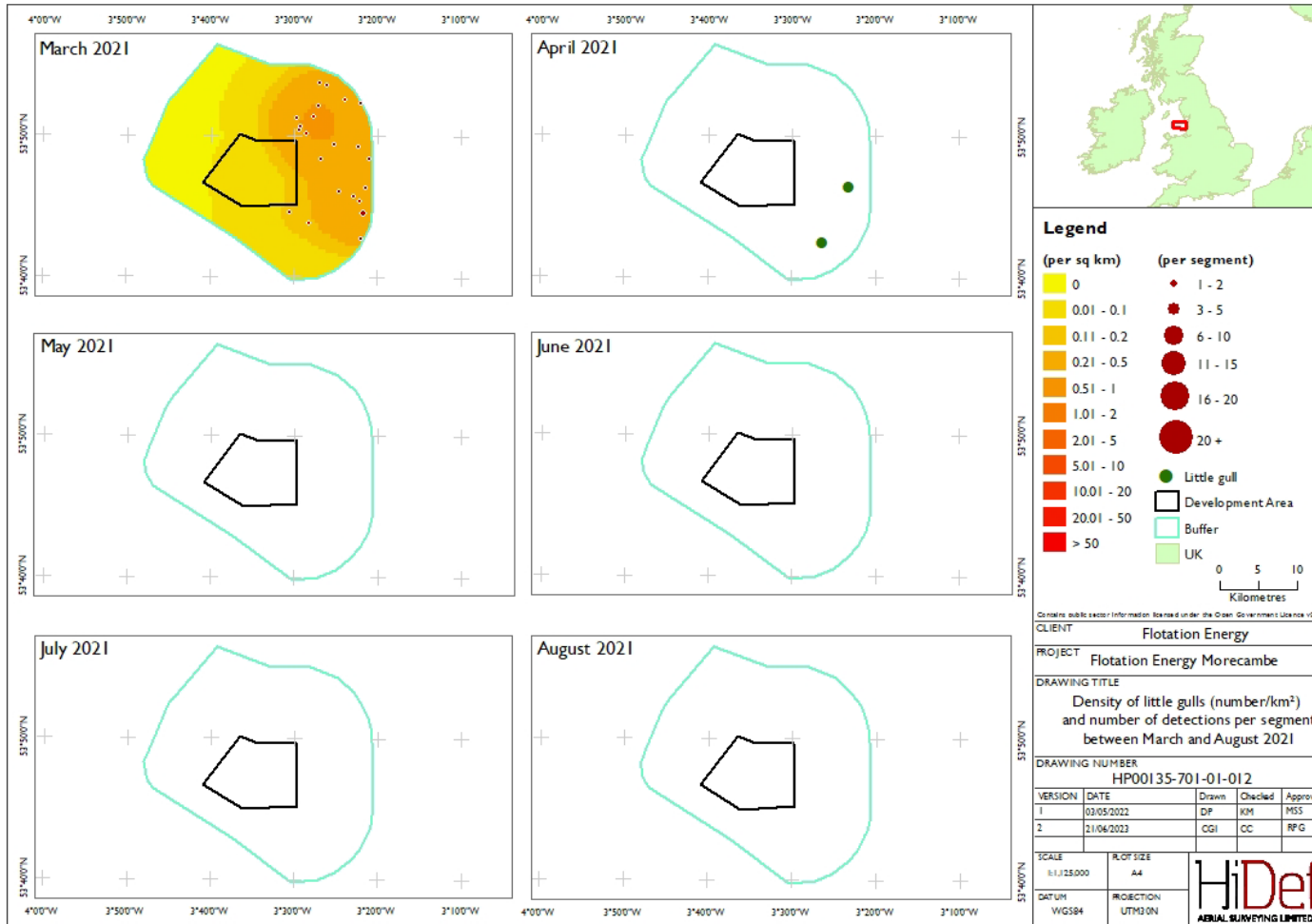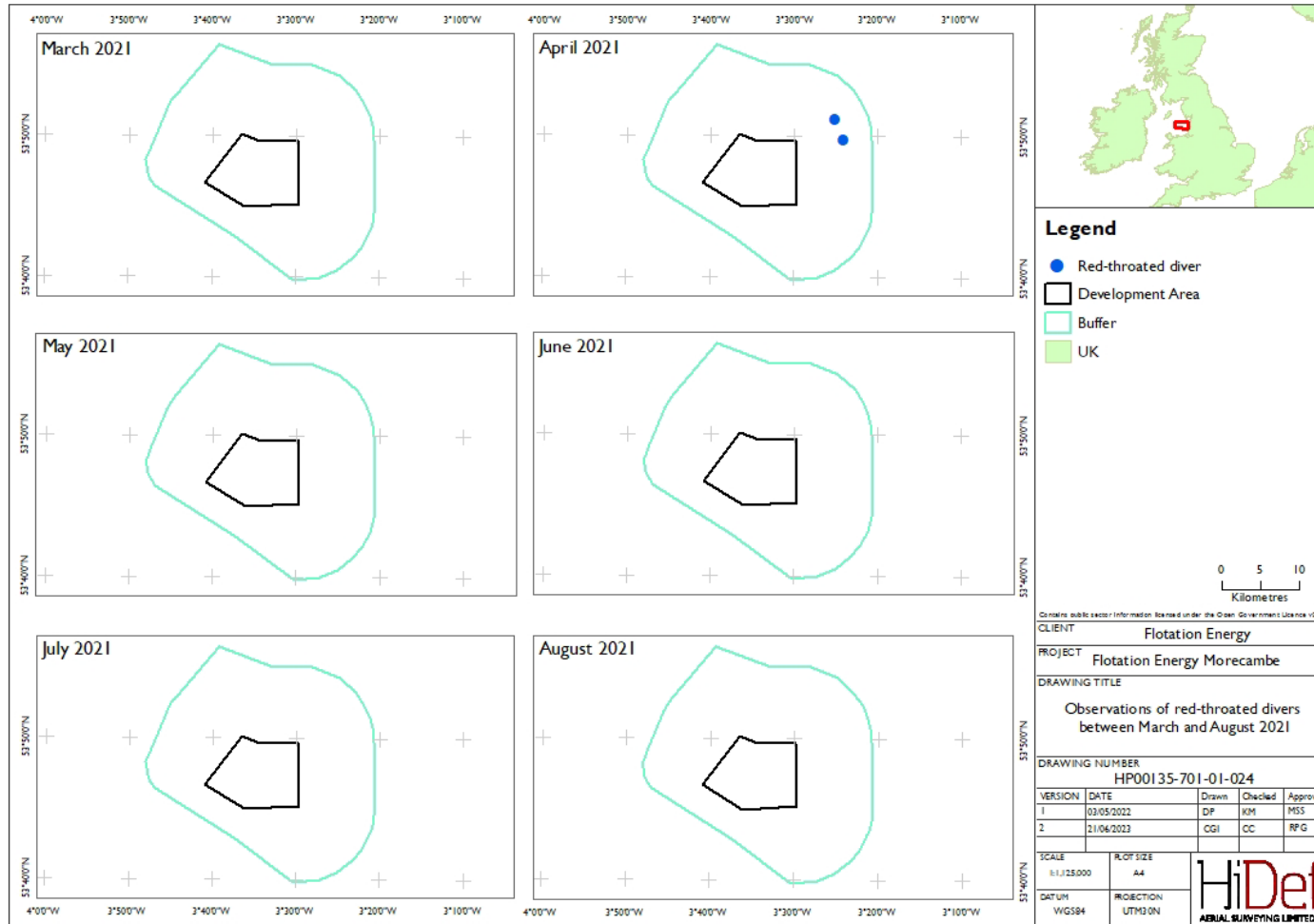
Figure 72 Density of red-throated diver (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022
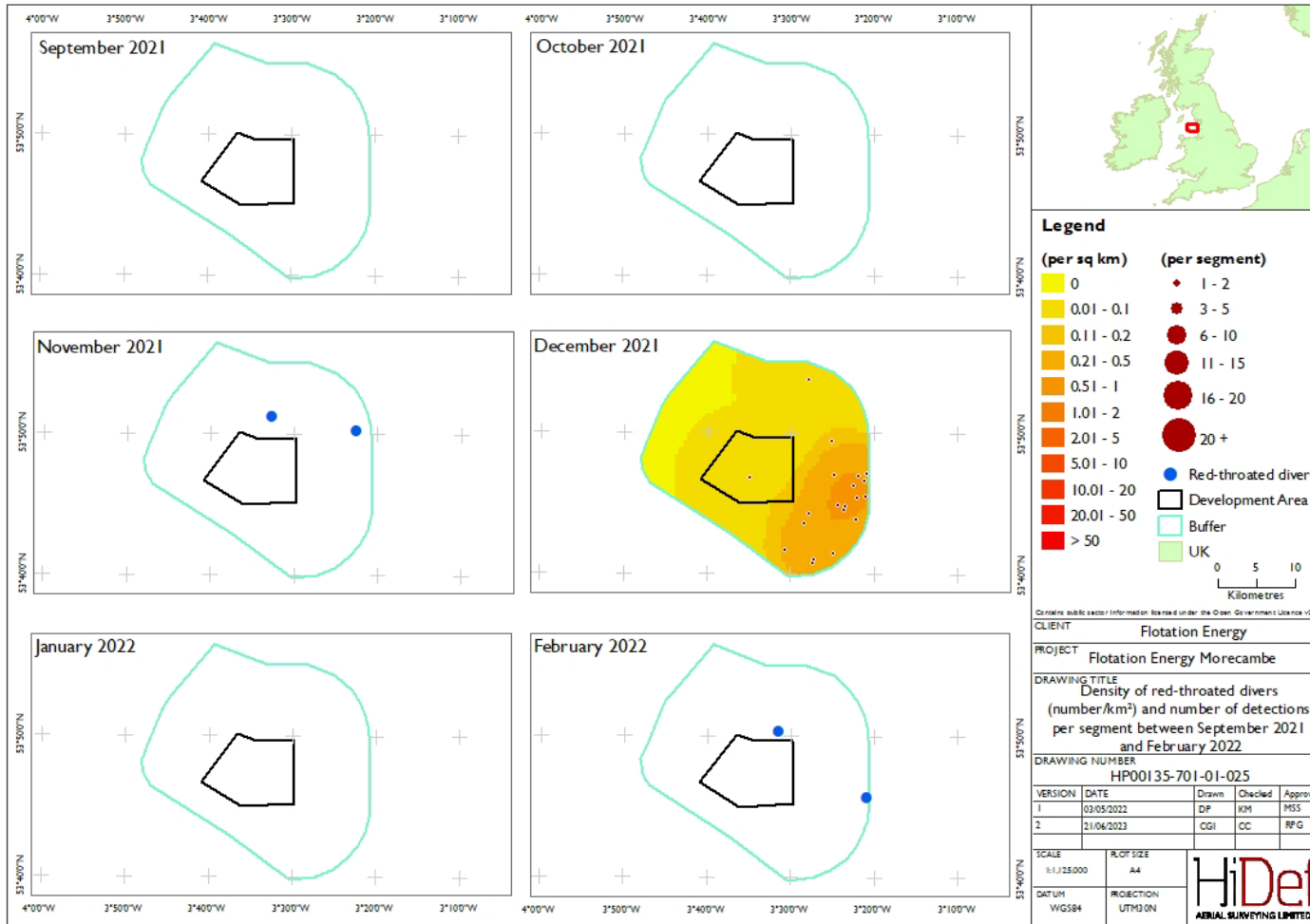
Figure 73 **Density of red-throated diver (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022**
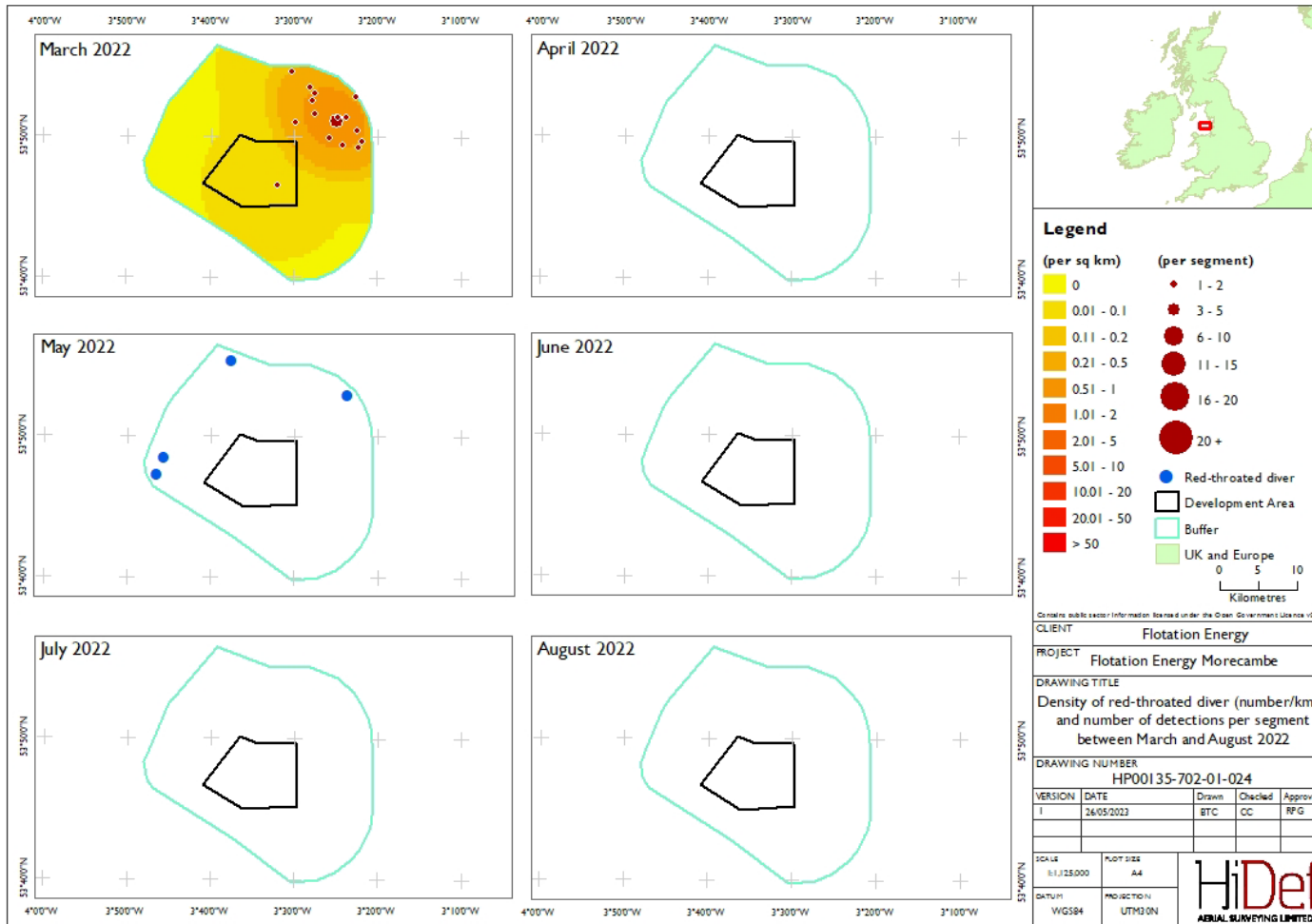
Figure 74 **Density of red-throated diver (number/km²) and number of detections per segment in the Morecambe survey area between September 2022 and February 2023**
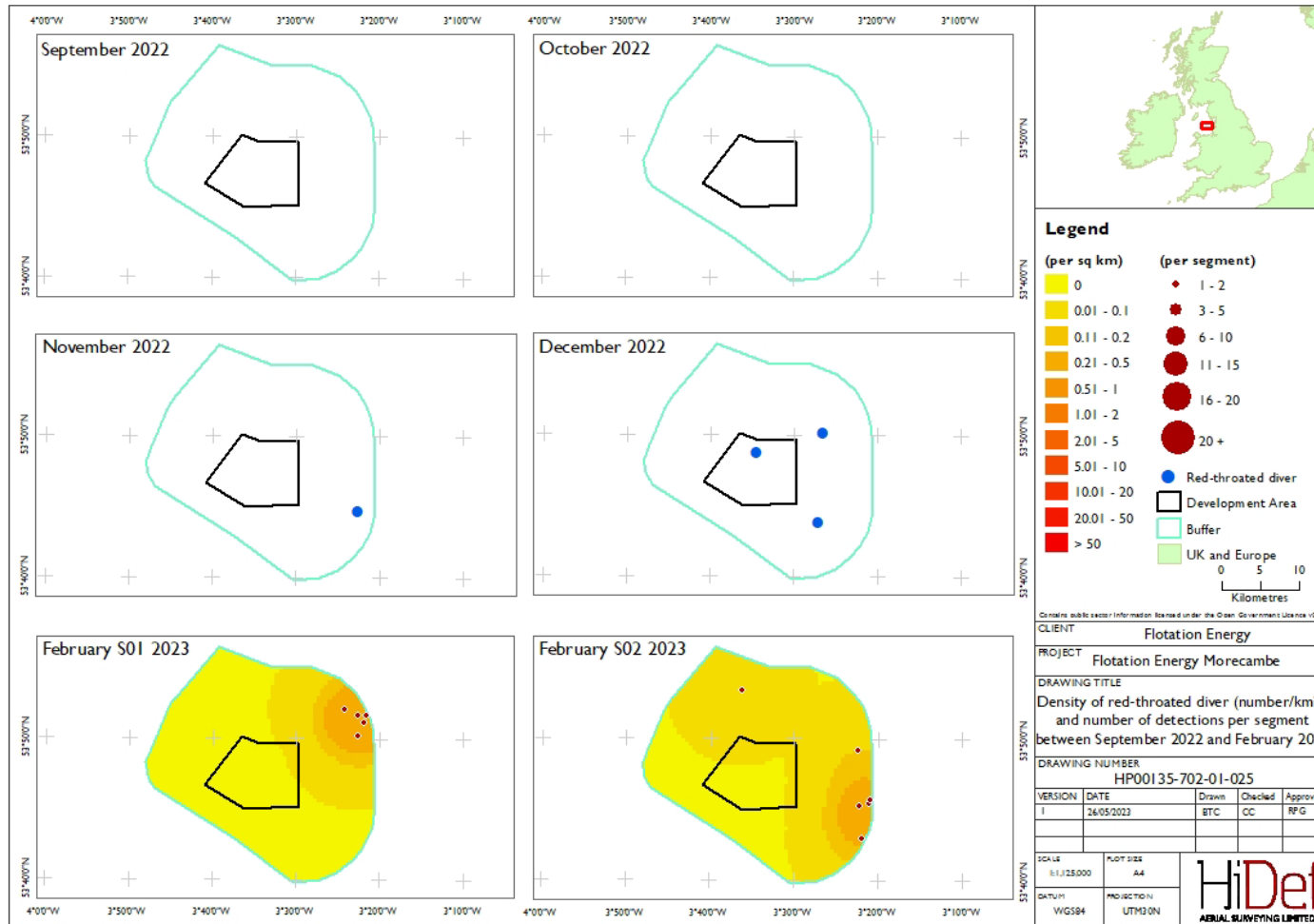
3.3.11 Manx shearwater

127   Manx shearwater were recorded in relatively high numbers during the breeding season, primarily in July 2021 with 3,103 records (Figure 75).

128   Apportioned densities of Manx shearwater ranged from 0.01 birds/km^2 (0.00 – 0.02) in March 2021 to 19.65 birds/km^2 (95% CI 12 – 29.69) in July 2021, equating to population estimates for the survey area of 4 birds (95% CI 0 – 12) and 12,803 birds (95% CI 7,820 – 19,340) respectively (Figure 76; Table 34).

129   Birds were distributed throughout the survey area, with high densities observed in the centre of the survey area (Figure 77 to Figure 80).

130   Over the survey period, 20% of birds were recorded flying, with a large proportion of birds recorded as sitting on the water, particularly in July to August 2021 and May to September 2022 (Table 35).

131   There were survey months in which no data regarding flight direction were available. To allow for clear interpretation of results, only surveys which contained flight direction data are displayed (Figure 81). In July 2021, when numbers peaked, birds were headed in all directions. No patterns in flight direction could be determined.

Figure 75   Number of Manx shearwater recorded between March 2021 and February 2023 in the Morecambe survey area
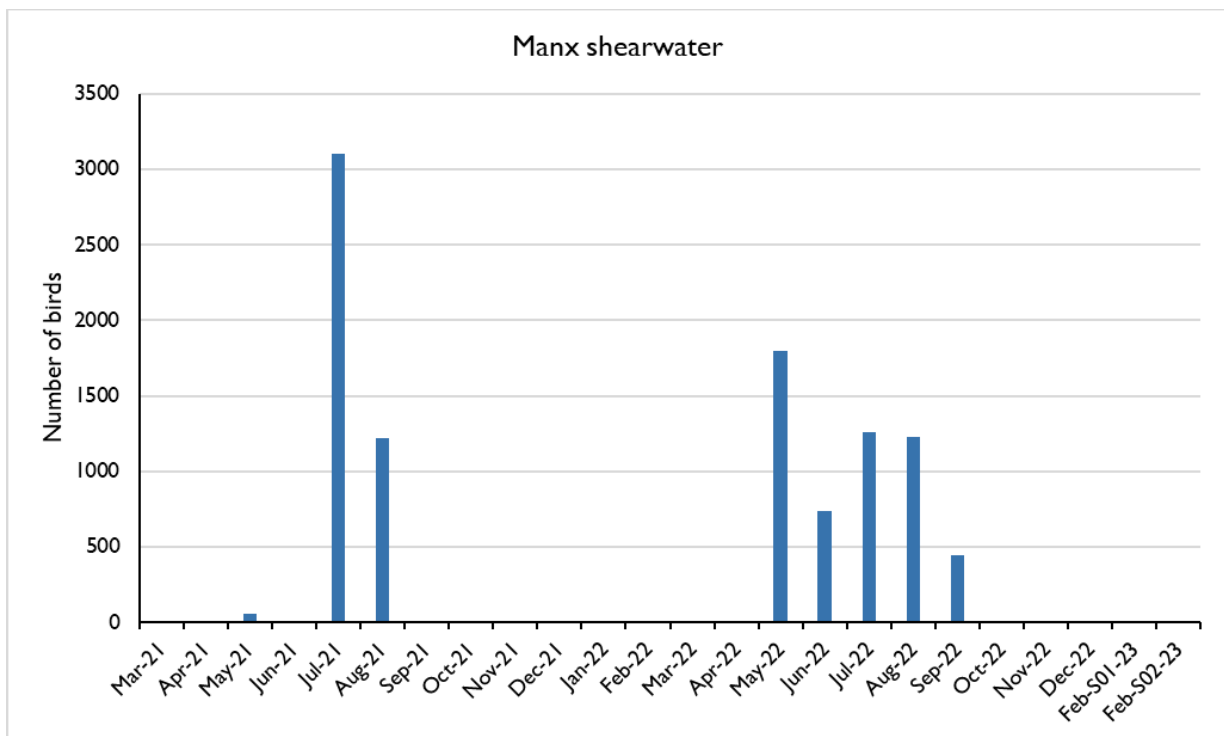
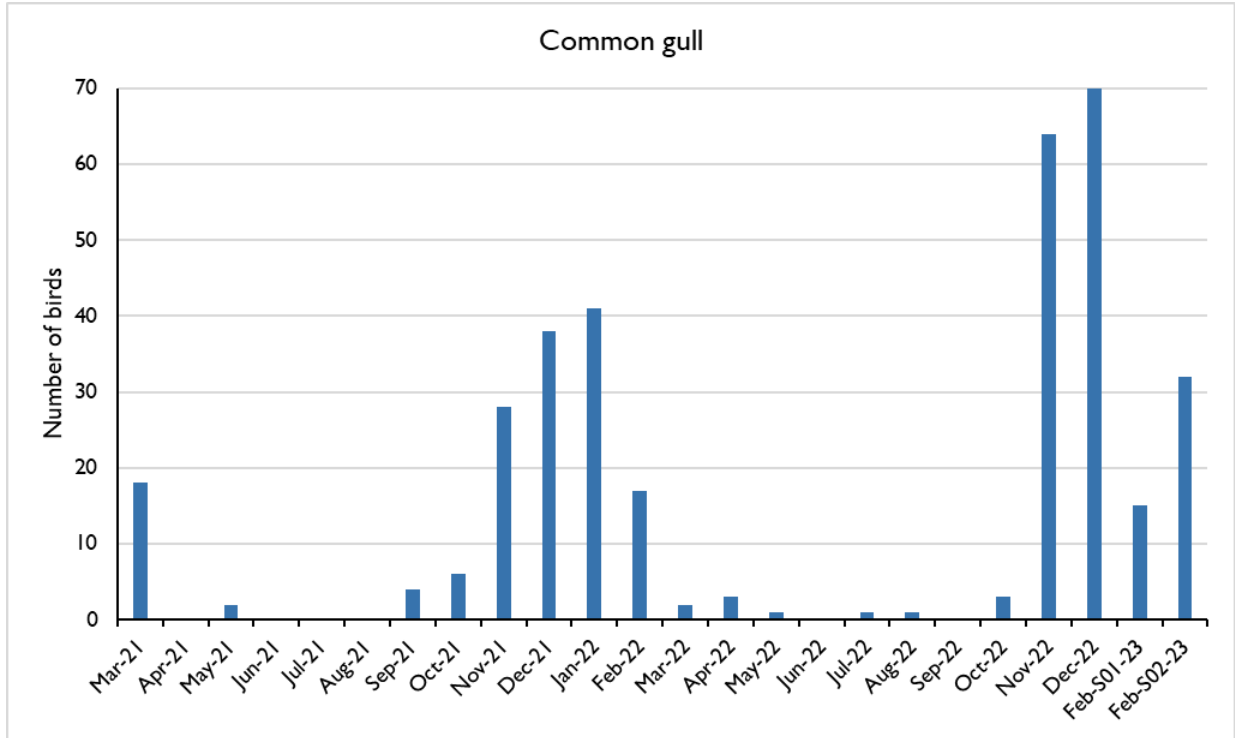**Figure 76** **Apportioned Manx shearwater density estimates, with 95% upper and lower confidence limits, in the Morecambe survey area between March 2021 and February 2023**
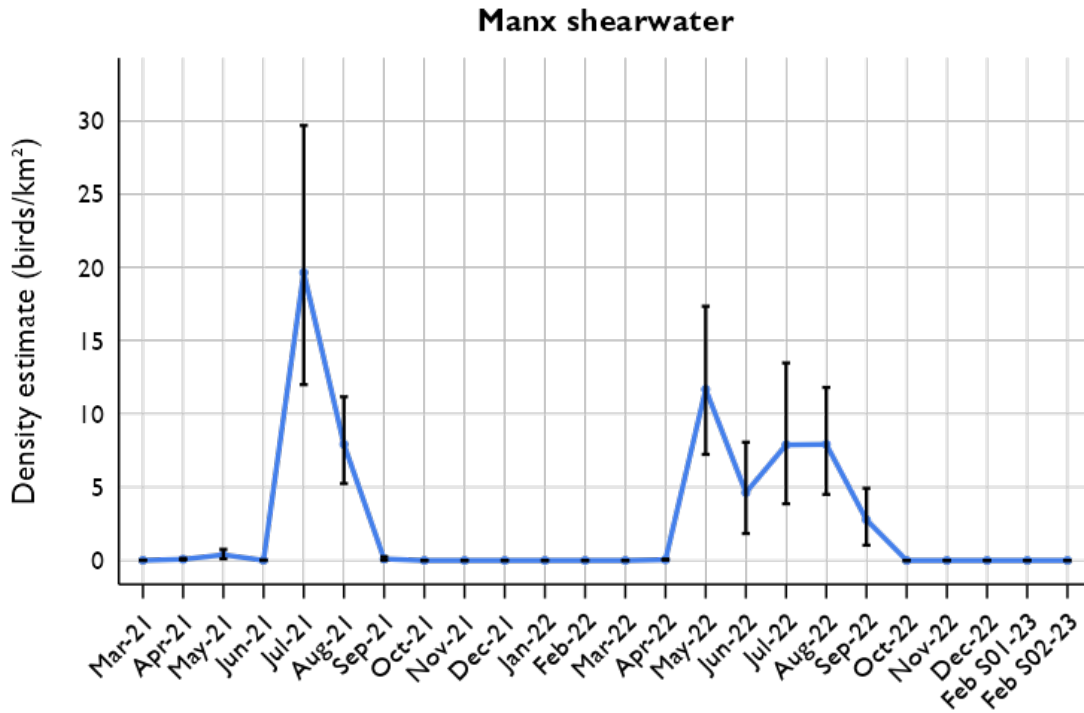
Table 34 **Density and apportioned population estimates of Manx shearwater in the Morecambe survey area between March 2021 and February 2023**

Survey date	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
19 March 2021	0.01	4	0	12	4	1.01
07 April 2021	0.08	51	21	92	18	0.35
18 May 2021	0.38	250	69	498	116	0.46
01 June 2021	0.01	8	0	20	6	0.69
09 July 2021	19.65	12803	7820	19340	2913	0.23
02 August 2021	7.93	5164	3419	7276	988	0.19
04 September 2021	0.10	64	7	162	44	0.69
06 October 2021	0.00	0	0	0	0	0.00
17 November 2021	0.00	0	0	0	0	0.00
05 December 2021	0.00	0	0	0	0	0.00
13 January 2022	0.00	0	0	0	0	0.00
11 February 2022	0.00	0	0	0	0	0.00
09 March 2022	0.00	0	0	0	0	0.00
01 April 2022	0.05	33	11	60	13	38.19
02 May 2022	11.68	7605	4716	11292	1657	21.78
07 June 2022	4.63	3017	1198	5254	1101	36.49
14 July 2022	7.89	5138	2520	8772	1682	32.72
09 August 2022	7.92	5155	2934	7689	1225	23.76
02 September 2022	2.77	1800	675	3209	671	37.25
03 October 2022	0.00	0	0	0	0	0.00
22 November 2022	0.00	0	0	0	0	0.00
03 December 2022	0.00	0	0	0	0	0.00
05 February 2023	0.00	0	0	0	0	0.00
23 February 2023	0.00	0	0	0	0	0.00

Table 35   **Summary of Manx shearwater behaviours in the Morecambe survey area between March 2021 and February 2023**

Survey date	Number recorded diving	Number recorded flying	Number recorded sitting	Number recorded taking off	% Flying	Total
19 March 2021	0	1	0	0	100	1
07 April 2021	0	7	2	0	78	9
18 May 2021	0	19	35	2	34	56
01 June 2021	0	2	0	0	100	2
09 July 2021	0	865	2233	5	28	3103
02 August 2021	1	478	729	13	39	1221
04 September 2021	0	7	5	0	58	12
06 October 2021	0	0	0	0	0	0
17 November 2021	0	0	0	0	0	0
05 December 2021	0	0	0	0	0	0
13 January 2022	0	0	0	0	0	0
11 February 2022	0	0	0	0	0	0
09 March 2022	0	0	0	0	0	0
01 April 2022	0	2	5	0	29	7
02 May 2022	0	166	1625	9	9	1800
07 June 2022	0	70	664	3	9	737
14 July 2022	0	124	1121	13	10	1258
09 August 2022	0	221	989	17	18	1227
02 September 2022	0	50	389	3	11	442
03 October 2022	0	0	0	0	0	0
22 November 2022	0	0	0	0	0	0
03 December 2022	0	0	0	0	0	0
05 February 2023	0	0	0	0	0	0
23 February 2023	0	0	0	0	0	0
Total	**1**	**2012**	**7797**	**65**	**20**	**9875**

Figure 77 **Density of Manx shearwater (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021**
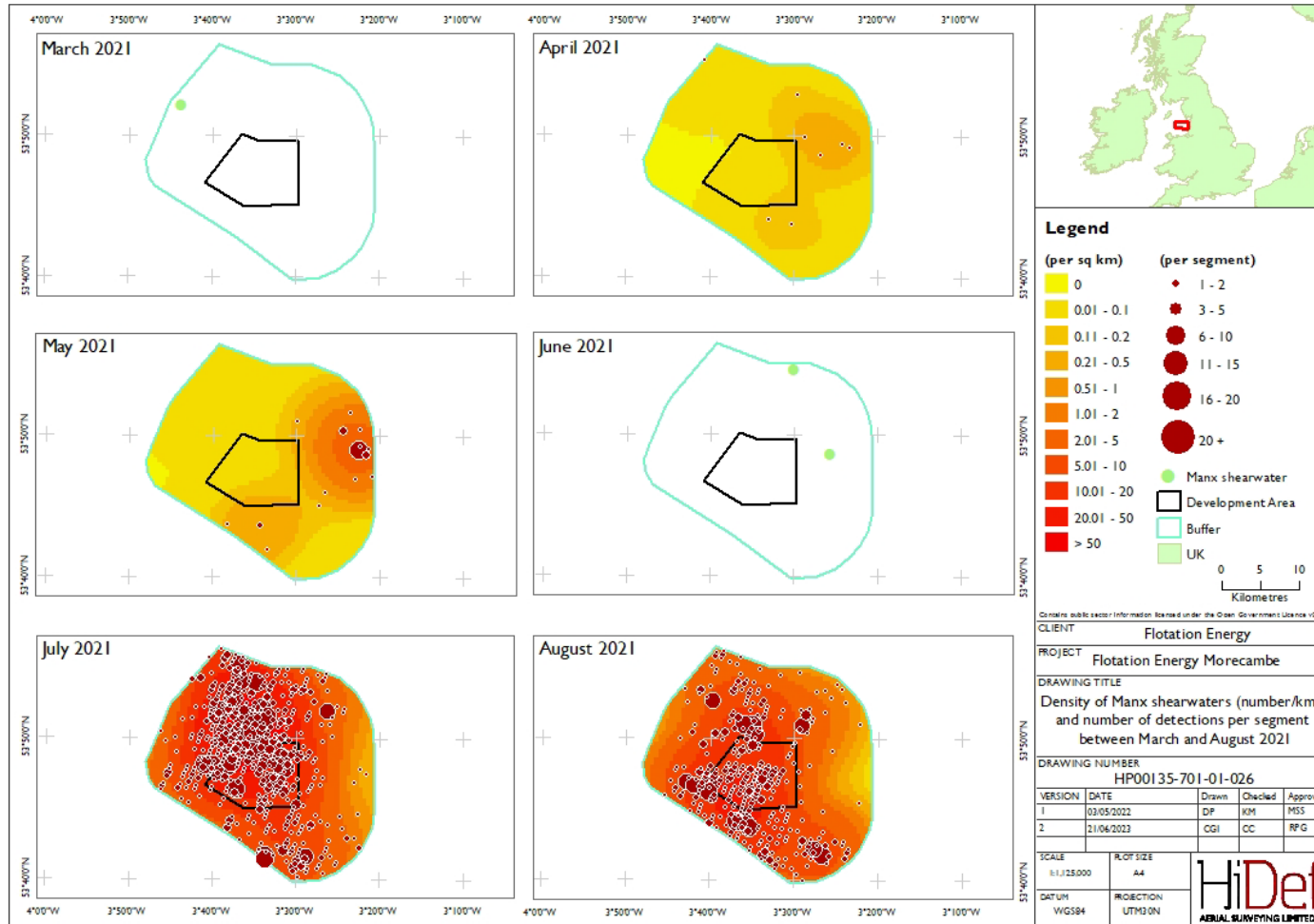
Figure 78 **Density of Manx shearwater (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022**
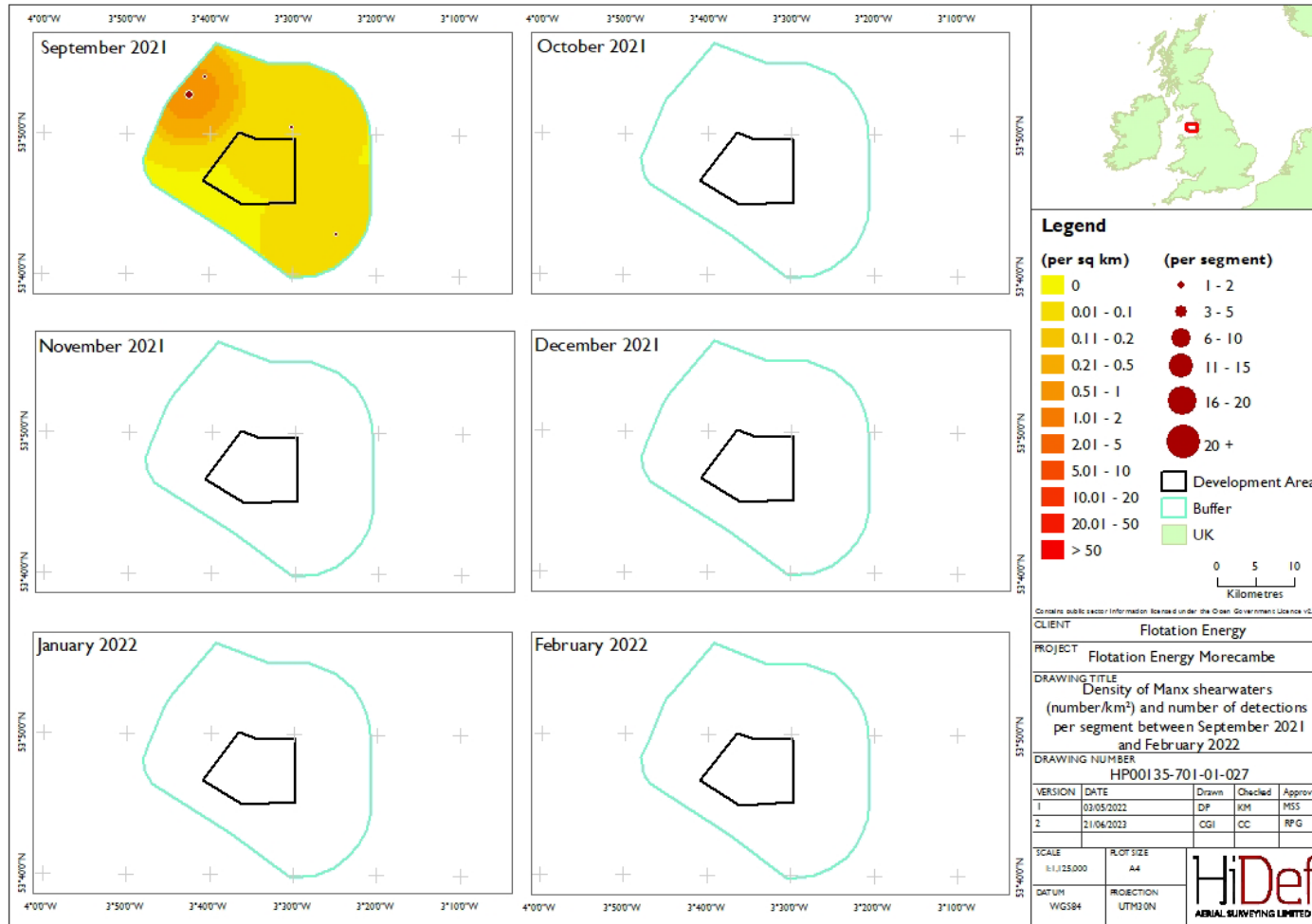
Figure 79 **Density of Manx shearwater (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022**
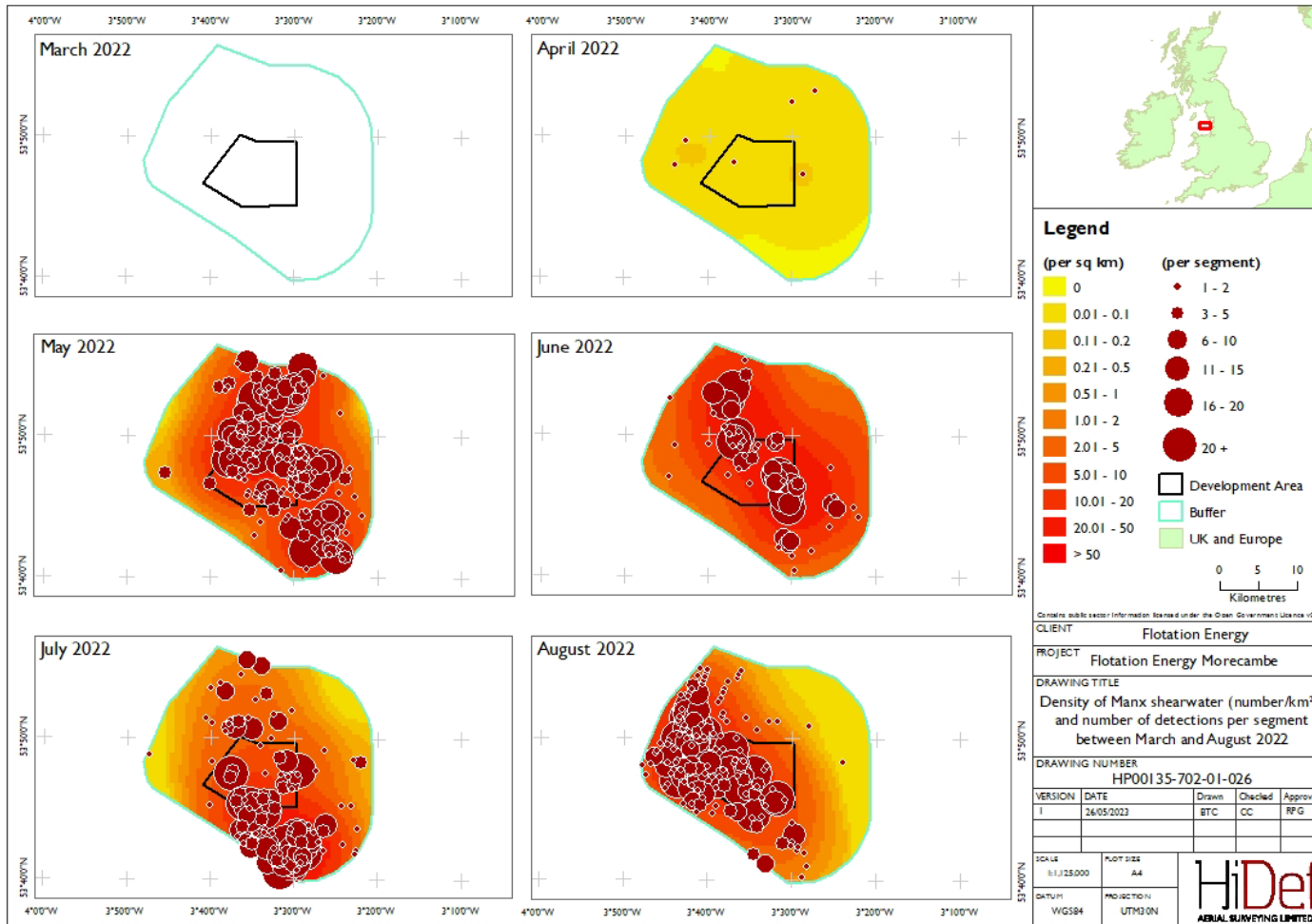
Figure 80 **Density of Manx shearwater (number/km²) and number of detections per segment in the Morecambe survey area between September 2022 and February 2023.**
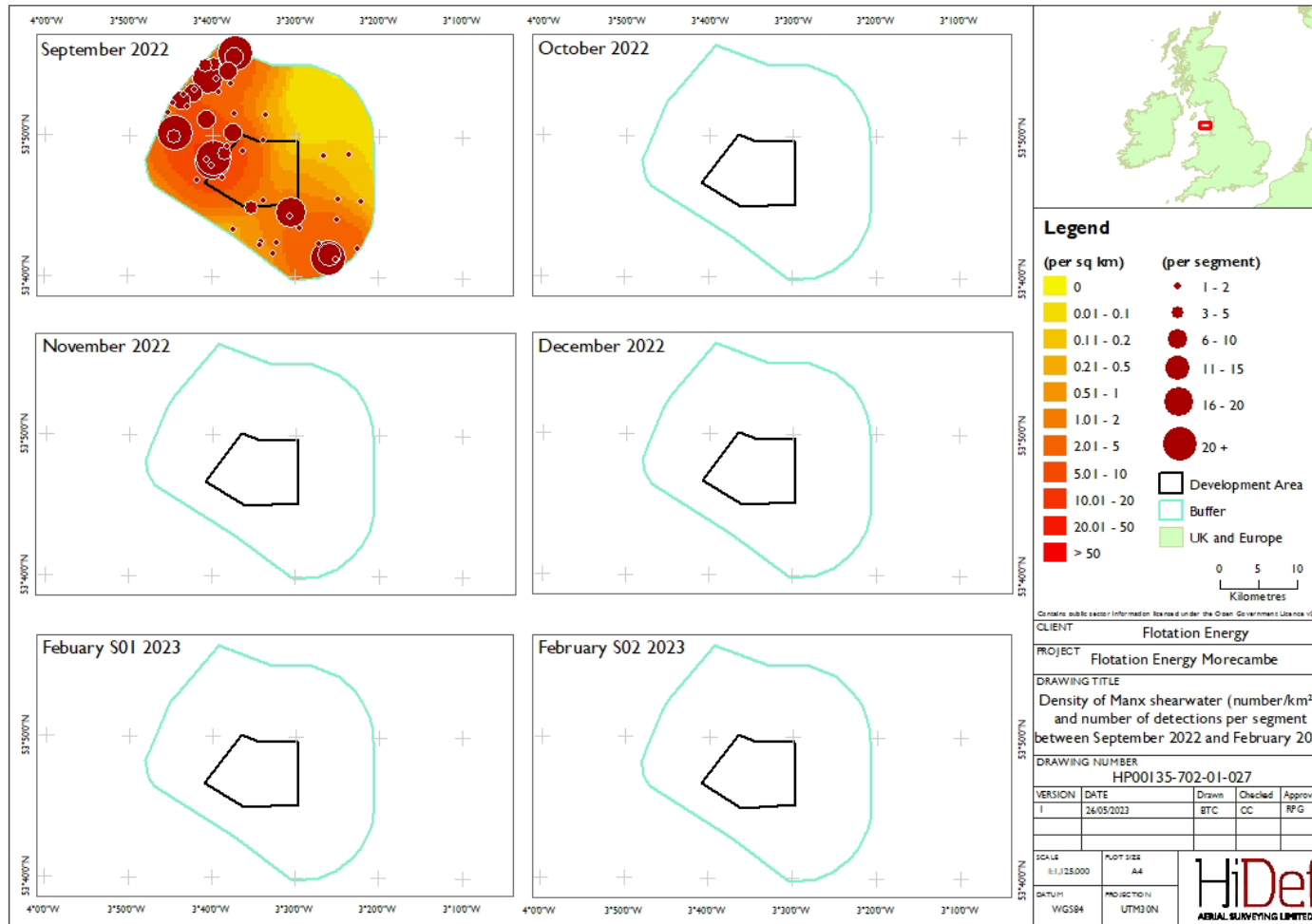
Figure 81   Summarised direction of movement of flying Manx shearwater in the Morecambe survey area between March 2021 and February 2023
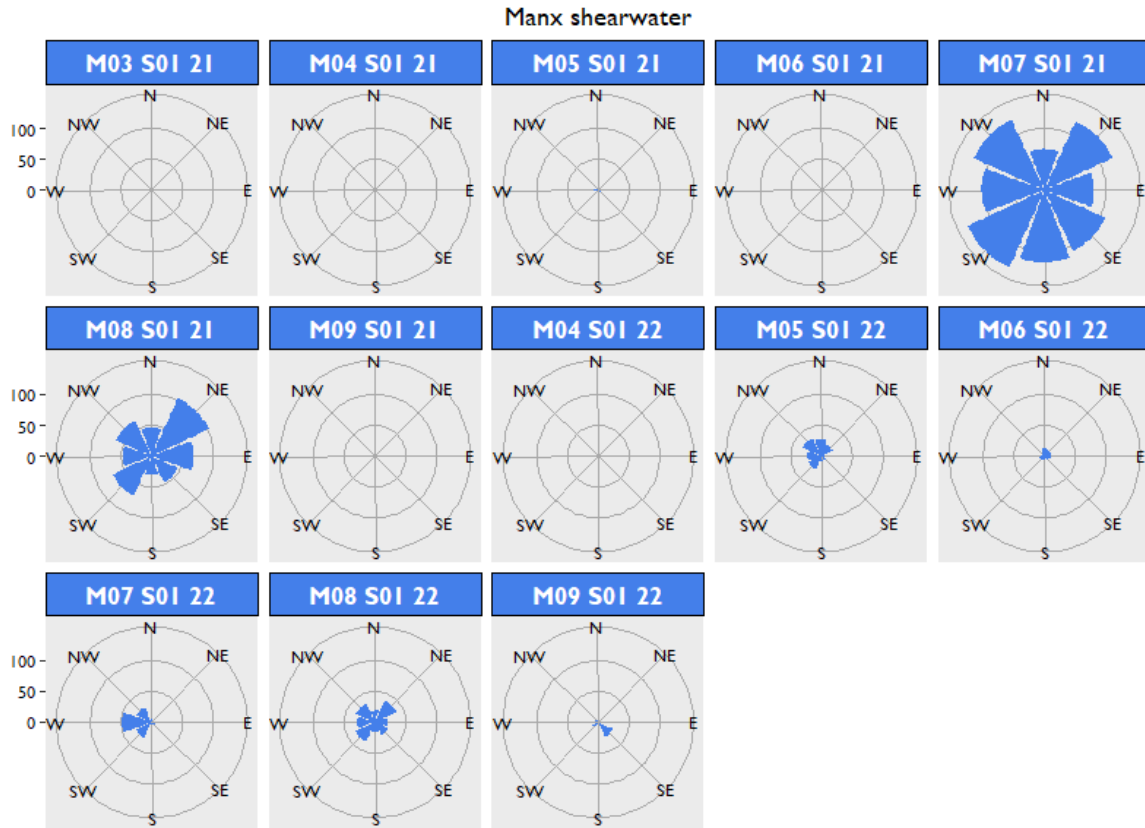
3.3.12 Gannet

132   Gannet were recorded in relatively high numbers during the breeding season, peaking in August 2021, with intermittent observations occurring over the non-breeding period (Figure 82).

133   Apportioned density estimates ranged between 0.01 birds/km^2, such as in December 2022, and 2.70 birds/km^2 in August 2021 (95% CI 2.09 – 3.45), equating to a population estimate of 5 birds (95% CI 0 – 12) and 1,762 birds (95% CI 1,360 – 2,249) respectively (Figure 83; Table 36).

134   Gannets were widely distributed across the survey period, with south-westerly patterns in months September to November 2021 and March to July 2022 (Figure 84 and Figure 87).

135   Of the birds that could be aged, 74% were recorded as adults, with the largest proportion of immature birds recorded in August 2021 (Table 37).

136   Over the survey period, 39% of birds were recorded flying, with many birds recorded as sitting on the water in July and September 2021 and in May to September 2022 (Table 38).

137   There were survey months in which no data regarding flight direction were available. To allow for clear interpretation of results, only surveys which contained flight direction data are displayed (Figure 88). In August 2021, when numbers peaked, birds were mainly heading in north-west and north-east directions.

Figure 82   Number of gannet recorded between March 2021 and February 2023 in the Morecambe survey area
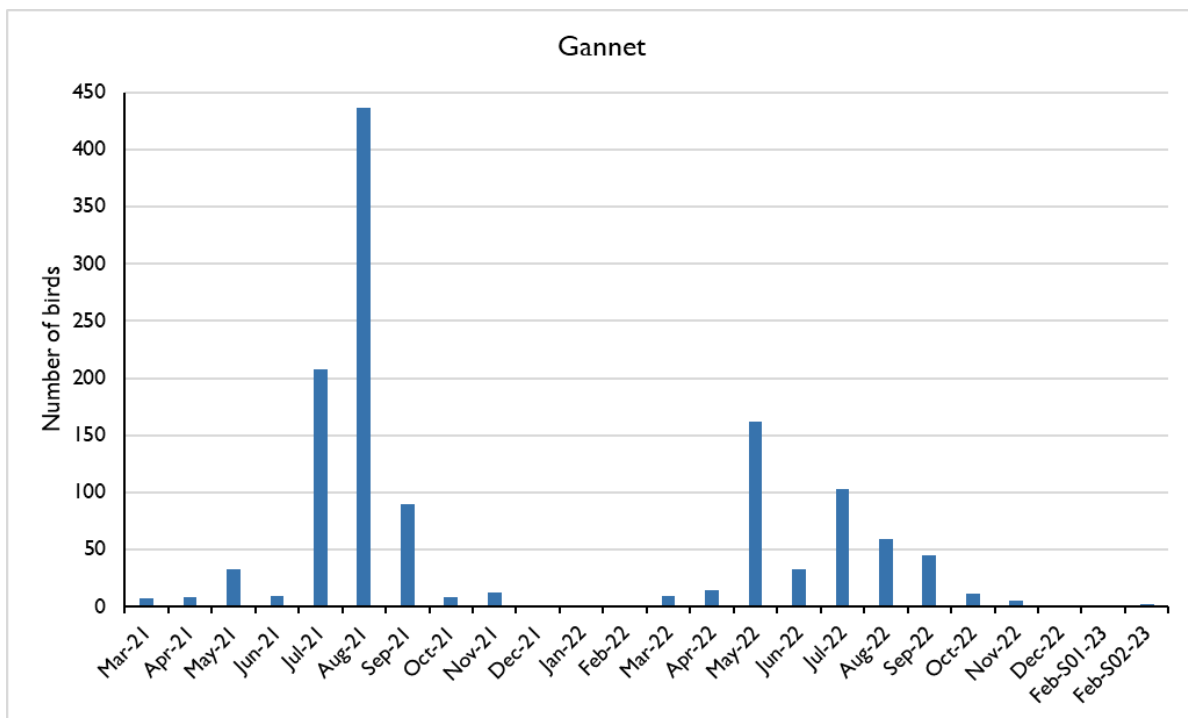
Figure 83 **Apportioned gannet density estimates, with 95% upper and lower confidence limits, in the Morecambe survey area between March 2021 and February 2023**
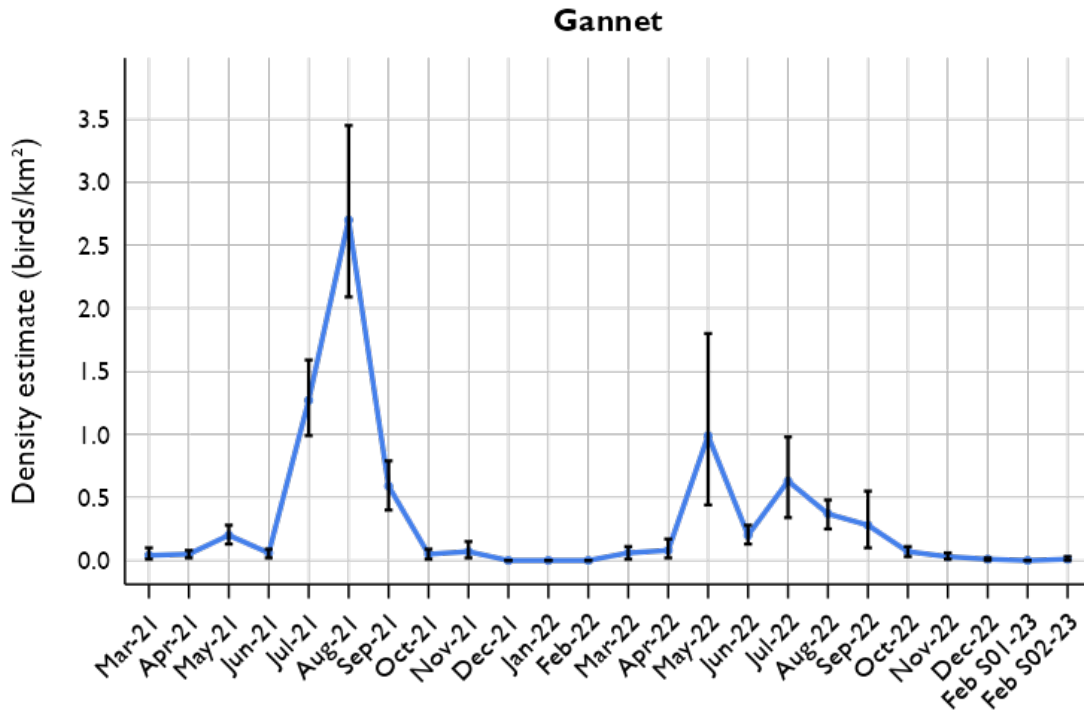
Gannet

Table 36 **Apportioned density and population estimates of gannet in the Morecambe survey area between March 2021 and February 2023**

Survey date	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
19 March 2021	0.04	28	4	64	17	59.09
07 April 2021	0.05	32	16	51	10	29.04
18 May 2021	0.20	132	84	185	27	20.39
01 June 2021	0.06	36	16	60	12	32.07
09 July 2021	1.27	829	647	1033	102	12.20
02 August 2021	2.70	1762	1360	2249	228	12.90
04 September 2021	0.59	384	263	513	64	16.42
06 October 2021	0.05	33	10	56	13	38.03
17 November 2021	0.07	48	12	96	22	45.92
05 December 2021	0.00	0	0	0	0	0.00
13 January 2022	0.00	0	0	0	0	0.00
11 February 2022	0.00	0	0	0	0	0.00
09 March 2022	0.06	36	8	75	18	49.91
01 April 2022	0.08	56	16	108	25	44.79
02 May 2022	0.99	645	288	1170	223	34.54
07 June 2022	0.20	132	87	181	25	18.92
14 July 2022	0.63	409	221	639	108	26.23
09 August 2022	0.37	238	166	314	39	16.18
02 September 2022	0.28	181	66	360	82	45.45
03 October 2022	0.07	45	20	70	14	29.41
22 November 2022	0.03	21	4	40	10	46.38
03 December 2022	0.01	5	0	12	4	91.39
05 February 2023	0.00	0	0	0	0	0.00
23 February 2023	0.01	9	0	21	6	68.74

Table 37 **Summary of gannet ages in the Morecambe survey area between March 2021 and February 2023**

Survey date	Number recorded as adult	Number recorded as immature	Number recorded as juvenile	Number recorded as unknown	% Adult (from aged birds)	Total
19 March 2021	1	0	0	6	100	7
07 April 2021	6	0	0	2	100	8
18 May 2021	5	1	0	27	83	33
01 June 2021	3	0	0	6	100	9
09 July 2021	56	15	0	137	79	208
02 August 2021	139	65	10	222	65	436
04 September 2021	61	9	0	20	87	90
06 October 2021	3	1	0	4	75	8
17 November 2021	4	0	0	8	100	12
05 December 2021	0	0	0	0	-	0
13 January 2022	0	0	0	0	-	0
11 February 2022	0	0	0	0	-	0
09 March 2022	8	0	0	1	100	9
01 April 2022	11	0	0	3	100	14
02 May 2022	56	0	0	106	100	162
07 June 2022	9	1	0	23	90	33
14 July 2022	24	40	2	37	36	103
09 August 2022	11	1	0	47	92	59
02 September 2022	13	3	0	29	81	45
03 October 2022	7	2	0	2	78	11
22 November 2022	2	0	0	3	100	5
03 December 2022	1	0	0	0	100	1
05 February 2023	0	0	0	0	-	0
23 February 2023	2	0	0	0	100	2
Total	**422**	**138**	**12**	**683**	**74**	**1255**

Table 38   **Summary of gannet behaviours in the Morecambe survey area between March 2021 and February 2023**

Survey date	Number recorded diving	Number recorded flying	Number recorded sitting	Number recorded taking off	% Flying	Other	Total
19 March 2021	0	1	6	0	14	0	7
07 April 2021	0	6	2	0	75	0	8
18 May 2021	0	6	27	0	18	0	33
01 June 2021	0	3	6	0	33	0	9
09 July 2021	0	71	136	1	34	0	208
02 August 2021	0	179	250	7	41	0	436
04 September 2021	0	60	29	1	67	0	90
06 October 2021	0	4	4	0	50	0	8
17 November 2021	0	3	9	0	25	0	12
05 December 2021	0	0	0	0	0	0	0
13 January 2022	0	0	0	0	0	0	0
11 February 2022	0	0	0	0	0	0	0
09 March 2022	0	8	1	0	89	0	9
01 April 2022	0	8	6	0	57	0	14
02 May 2022	0	27	133	2	17	0	162
07 June 2022	0	14	19	0	42	0	33
14 July 2022	0	56	45	2	54	0	103
09 August 2022	0	18	38	2	31	1	59
02 September 2022	0	16	29	0	36	0	45
03 October 2022	0	6	3	0	55	2	11
22 November 2022	0	2	3	0	40	0	5
03 December 2022	0	0	1	0	0	0	1
05 February 2023	0	0	0	0	0	0	0
23 February 2023	0	2	0	0	100	0	2
Total	**0**	**490**	**747**	**15**	**39**	**3**	**1255**

Figure 84   Density of gannet (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021
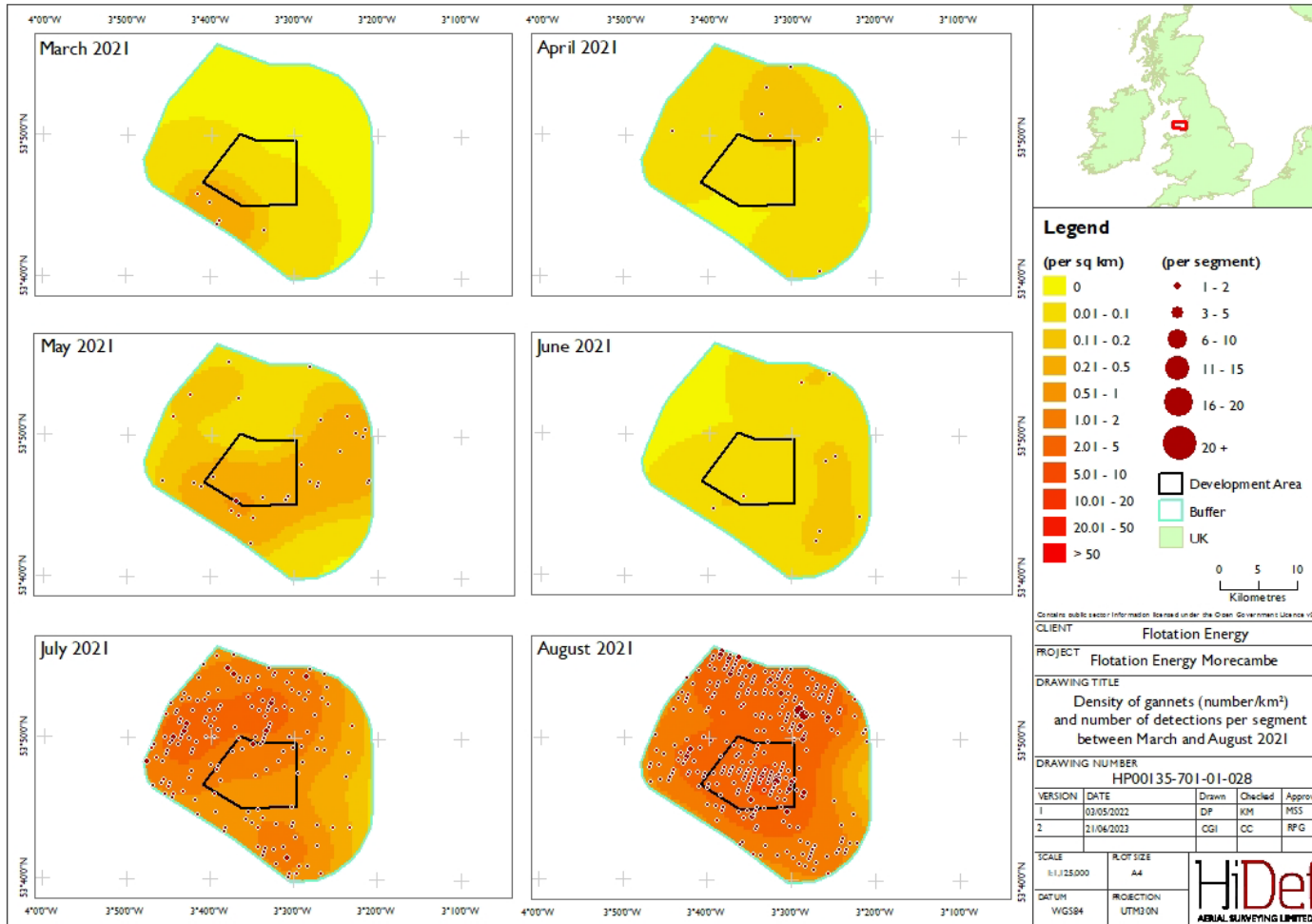
Figure 85 **Density of gannet (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022**
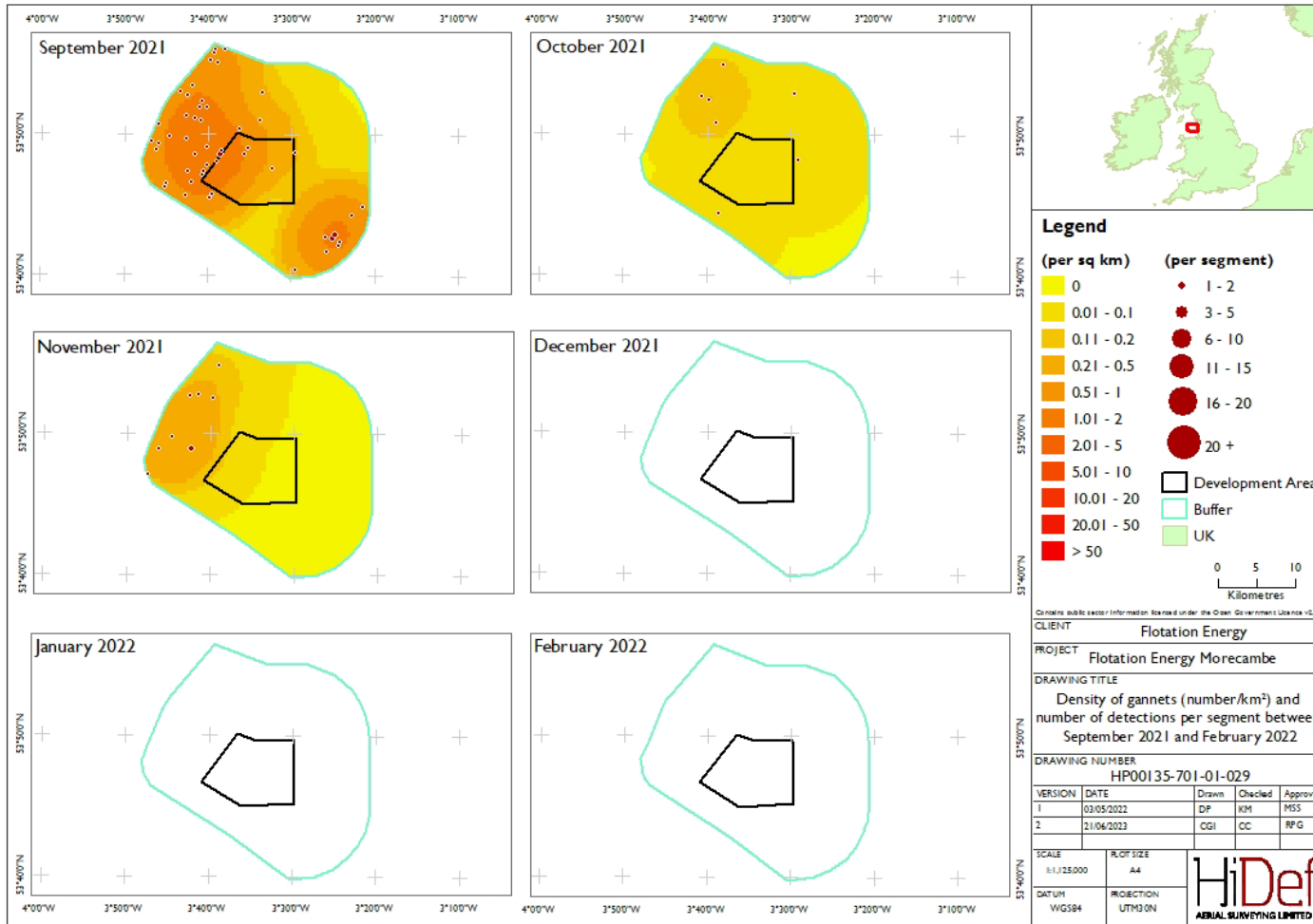
Figure 86 **Density of gannet (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022**
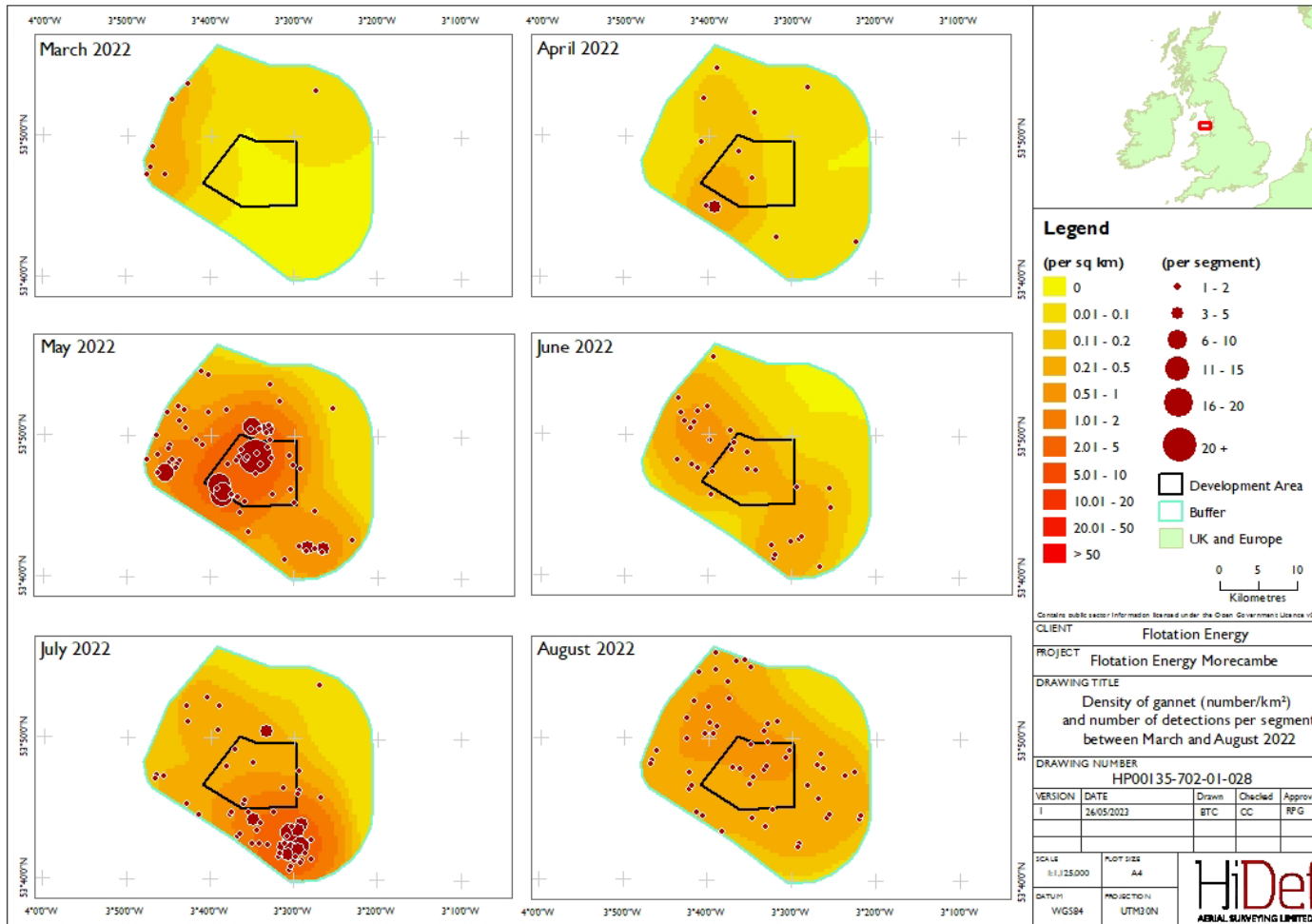
Figure 87   Density of gannet (number/km²) and number of detections per segment in the Morecambe survey area between September 2022 and February 2023
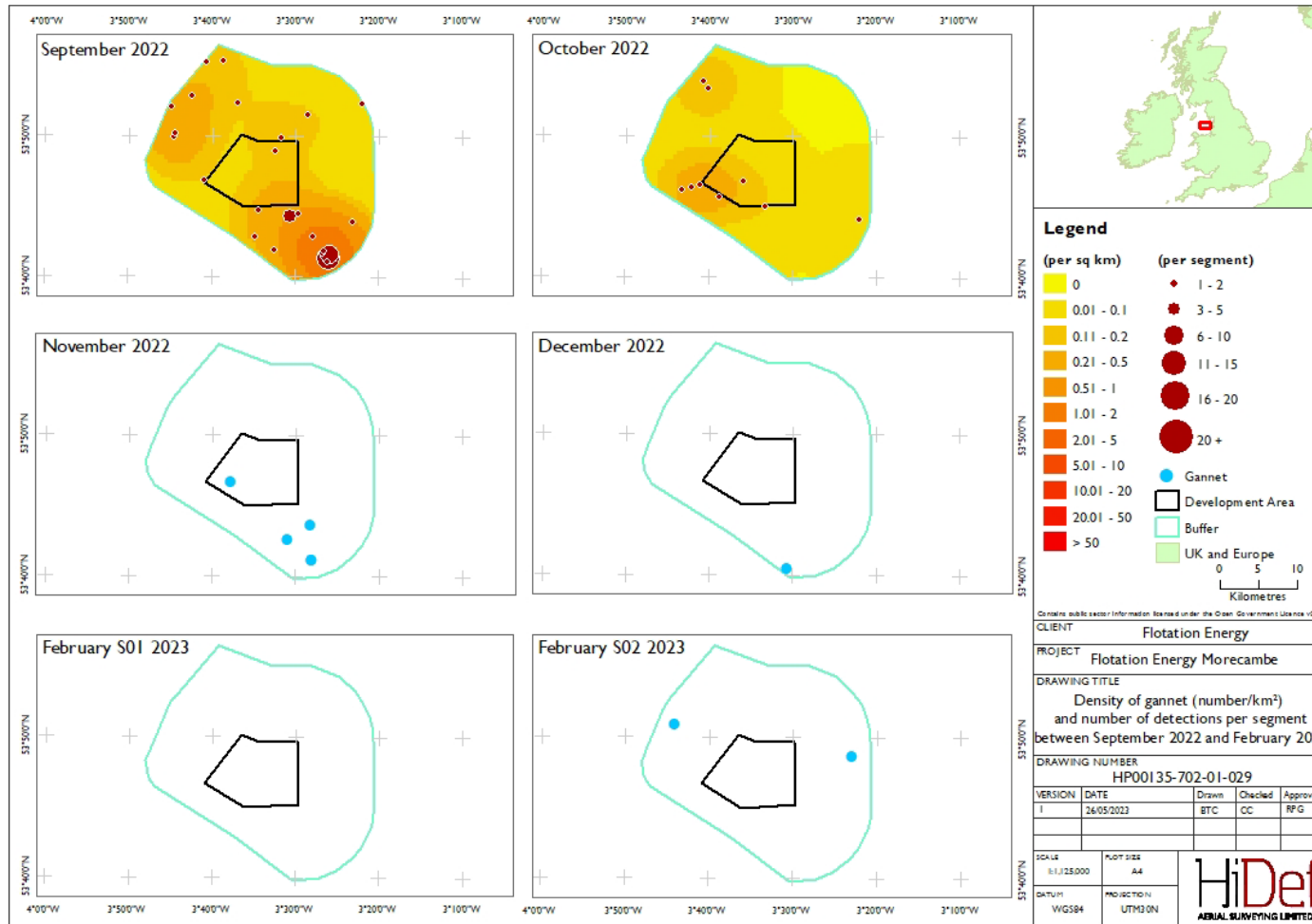
Figure 88 **Summarised direction of movement of flying gannet in the Morecambe survey area between March 2021 and February 2023**
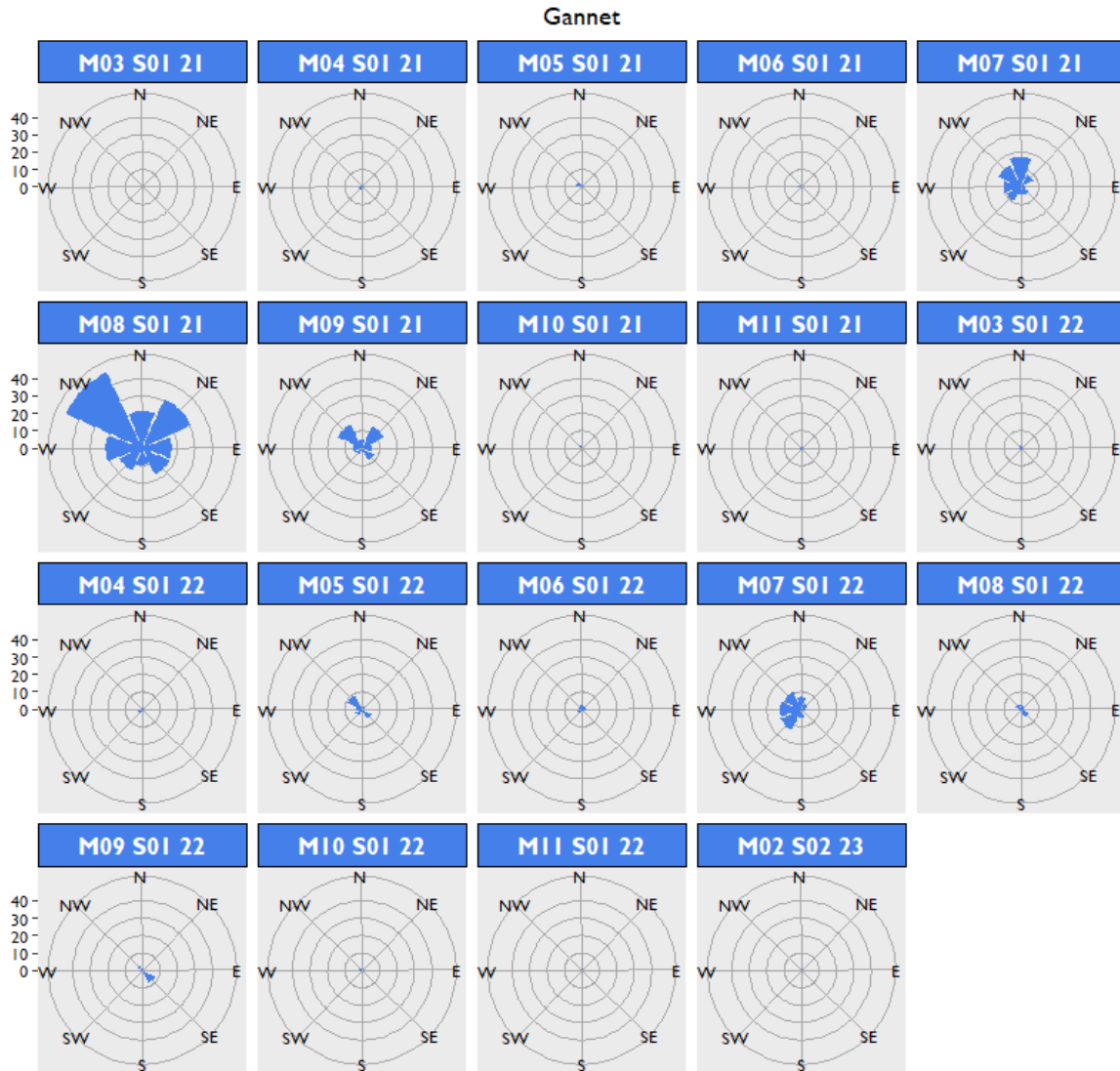
3.3.13 Less abundant bird species

138   A total of 16 less abundant bird species were recorded throughout the survey period, the most numerous being great black-backed gull (*Larus marinus*), puffin and fulmar (*Fulmarus glacialis*), with 101, 74 and 73 records respectively over the 24-month period (Figure 89 and Figure 90). Distributions are presented in Figure 91 to Figure 94, while apportioned and unapportioned population and density estimates for these species can be found in Appendix I.

139   Great black-backed gulls were recorded intermittently, during both the breeding and non-breeding period, primarily distributed in the northern buffer, such as in May and July 2021. The species peaked in May 2022 with 23 observations (Figure 89 to Figure 94).

140   The majority of puffins were recorded in July 2021, during the breeding season, distributed in the northern and eastern buffer, and the development area. Fulmars were also recorded intermittently with records peaking at 17 and 29 observations in August 2021 and May 2022 respectively (Figure 89 to Figure 94).

141   Sandwich terns were also recorded in relatively moderate numbers at the end of the breeding season, in September 2021. During this survey, birds were generally observed to the east of the survey area in the buffer, within the Liverpool Bay SPA. In the second year of surveys, fewer numbers were recorded, with only 8 observations in September 2022. Other tern species were also recorded across the survey period, including Arctic terns (*Sterna paradisaea)* with observations peaking in May 22 with 49 records (Figure 89 to Figure 94).

142   Other species, such as shag and snipe (*Gallinago gallinago*) were recorded infrequently, present in the March and October 2021 surveys. Black-headed gull (*Chroicocephalus ridibundus*) were recorded in the September 2021 and February 2022 surveys, distributed in the eastern buffer and development area, respectively (Figure 89 to Figure 94).

Figure 89   **Numbers of less abundant bird species recorded within the Morecambe survey area between March 2021 and February 2022**

Less abundant birds
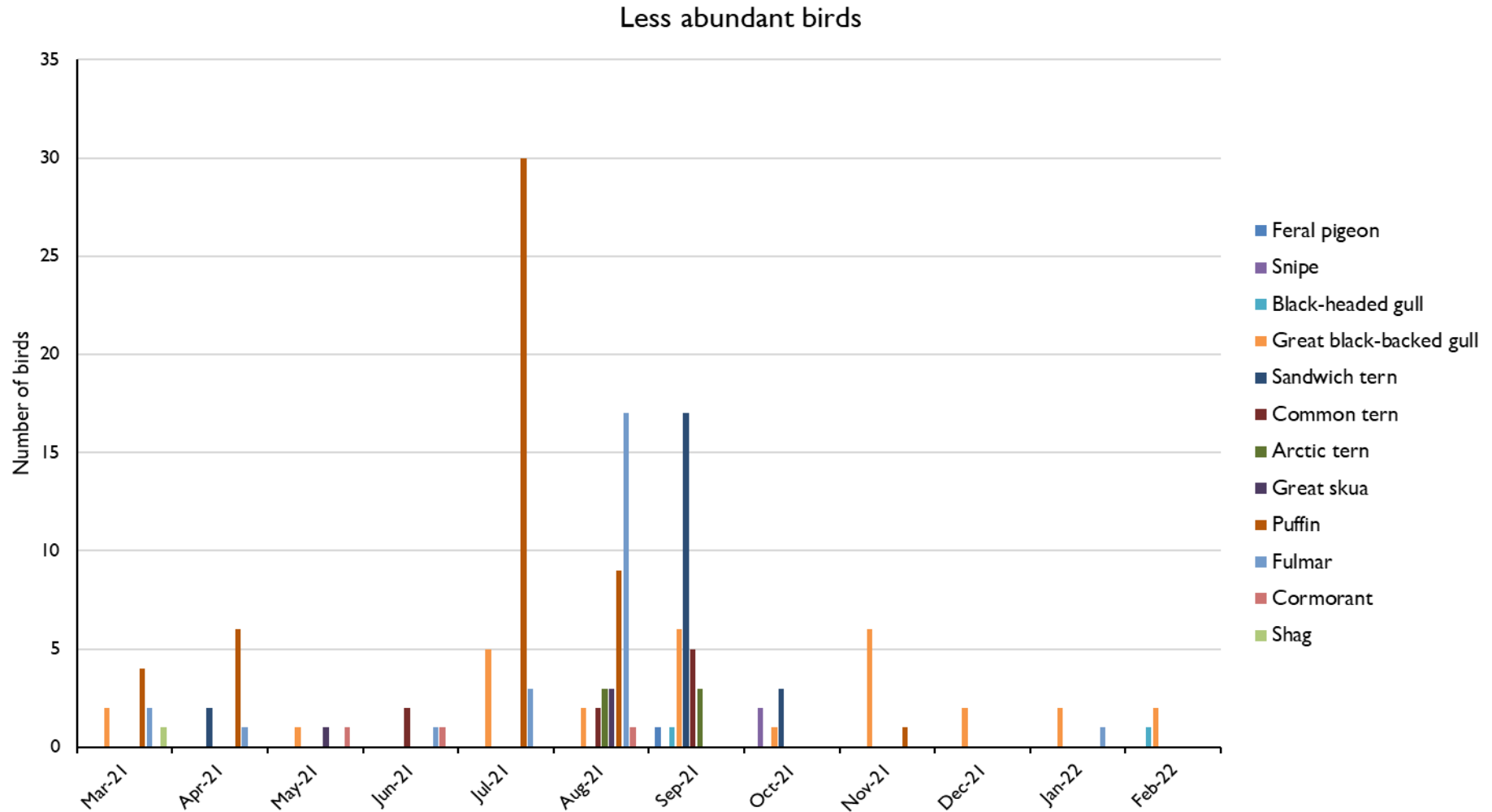
Figure 90 **Numbers of less abundant bird species recorded within the Morecambe survey area between March 2022 and February 2023**

Less abundant birds
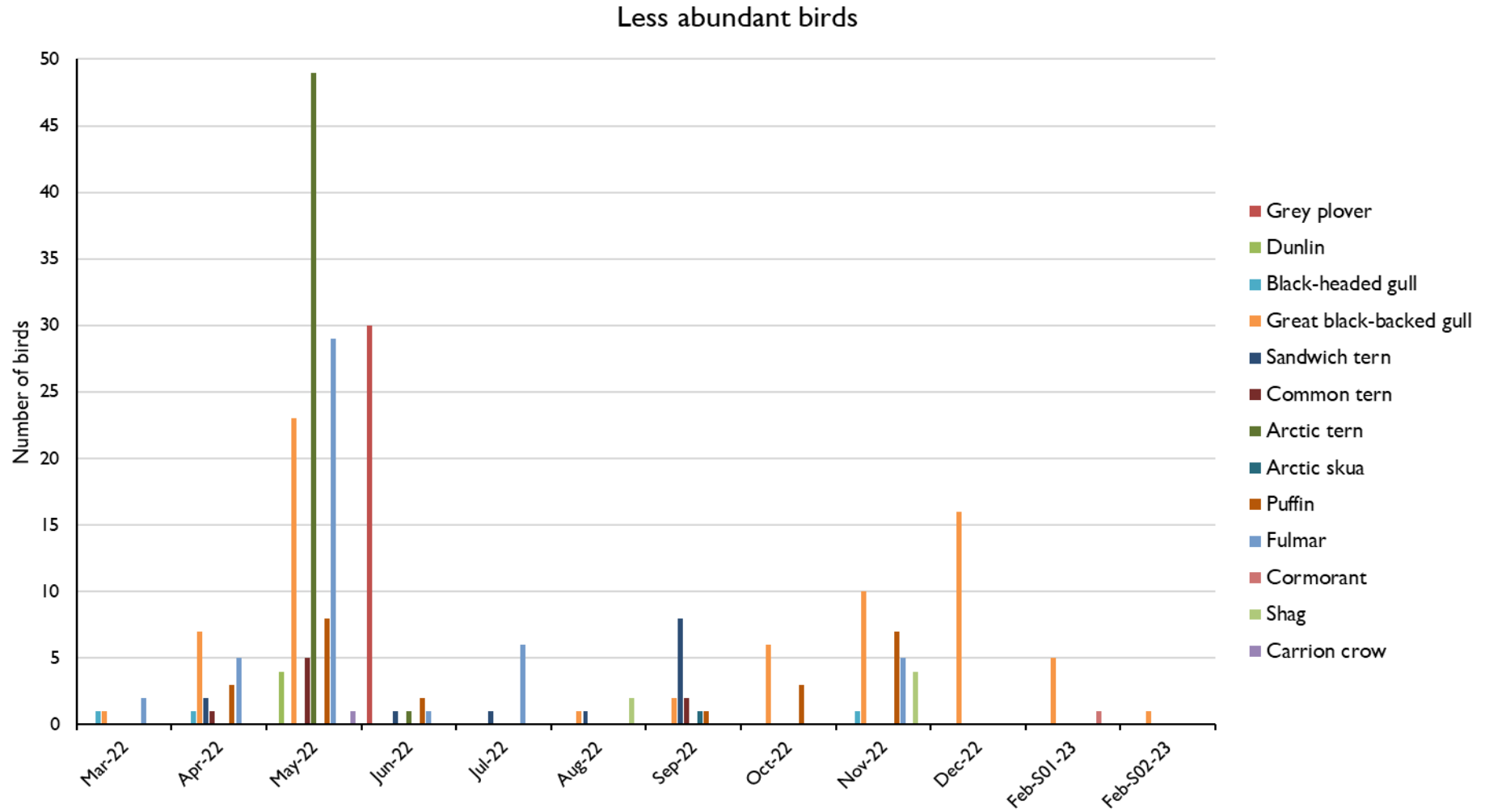
Figure 91   Detections of less abundant bird species in the Morecambe survey area between March and August 2021
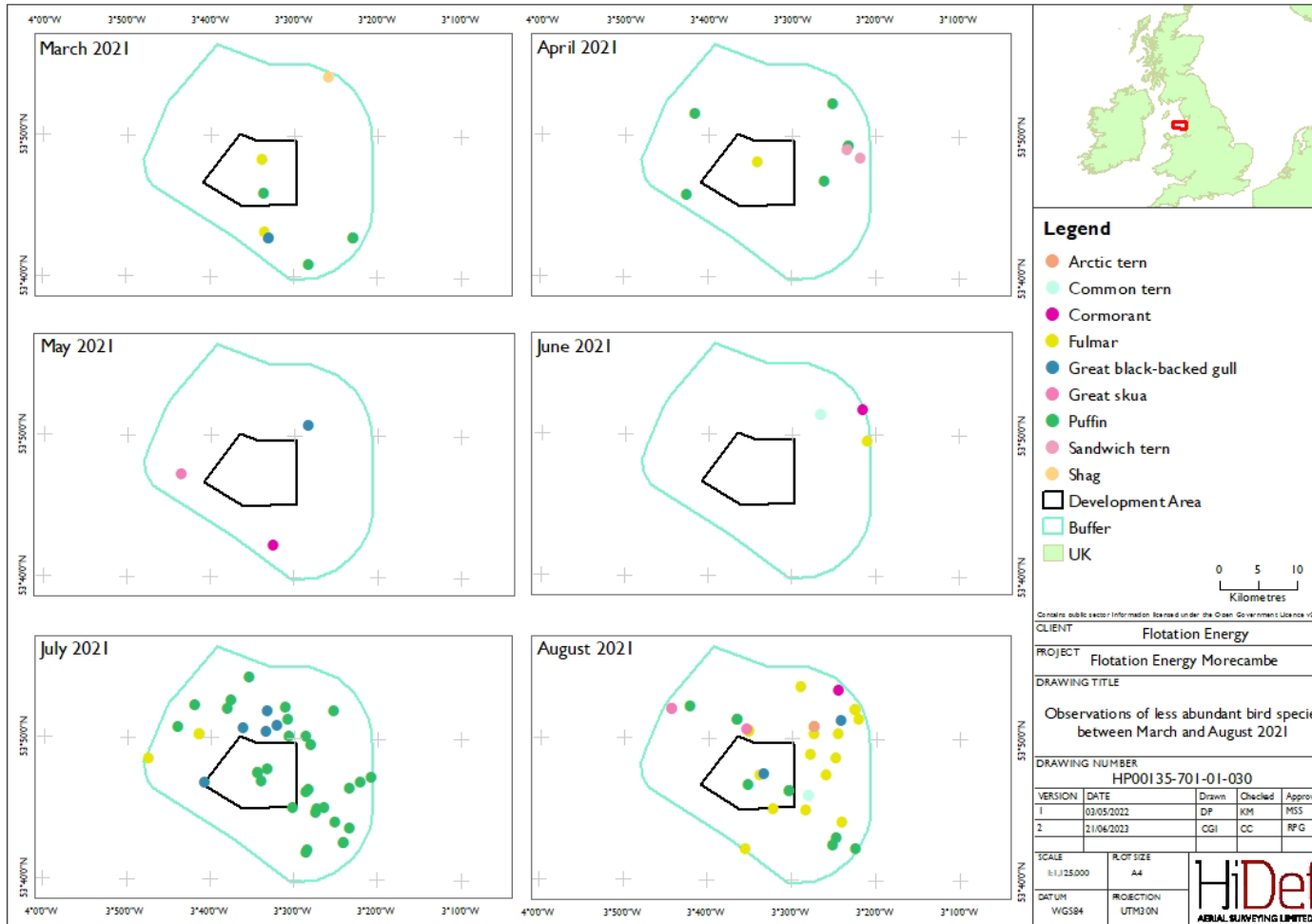
Figure 92   Detections of less abundant bird species in the Morecambe survey area between September 2021 and February 2022
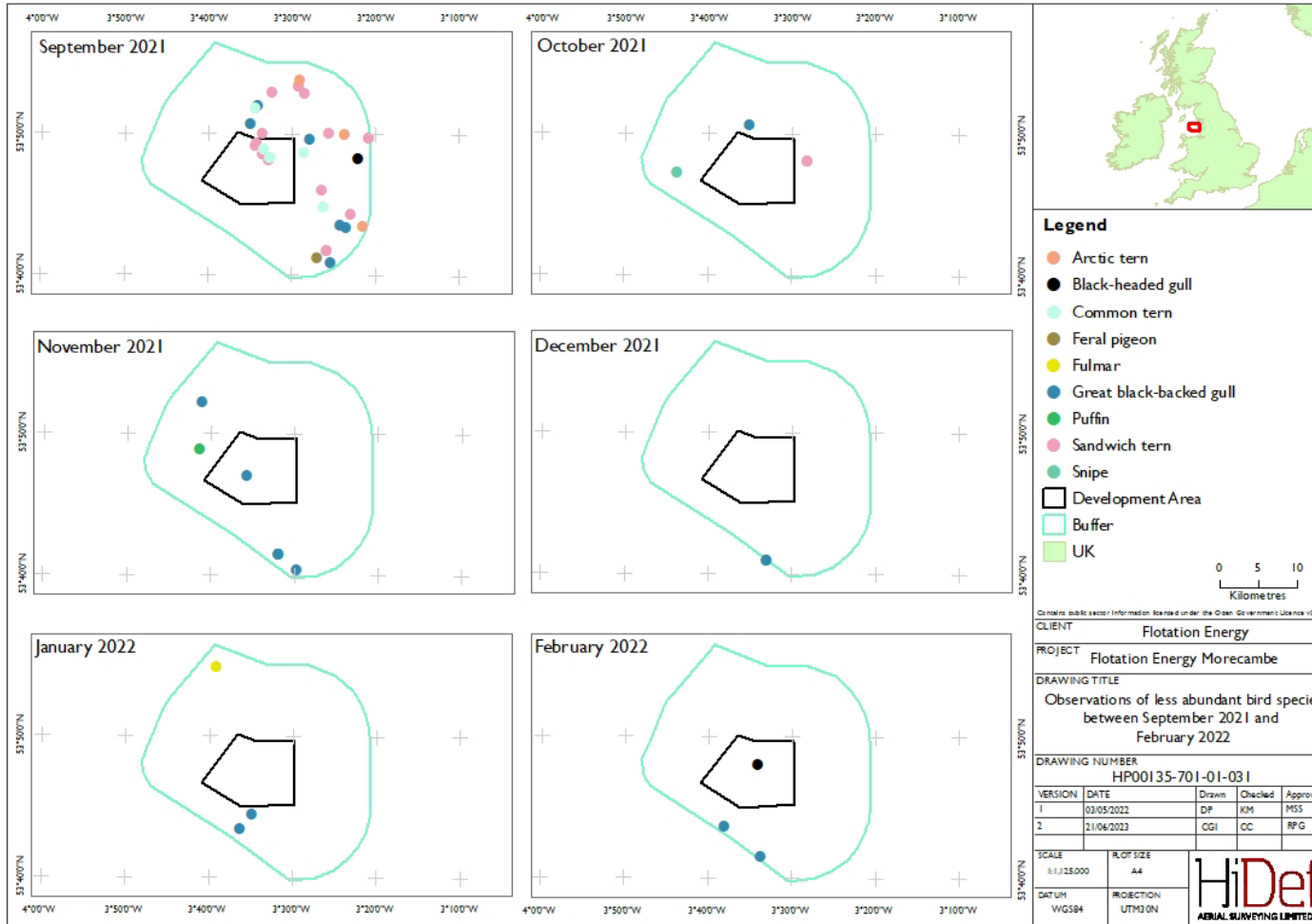
Figure 93   Detections of less abundant bird species in the Morecambe survey area between March and August 2022
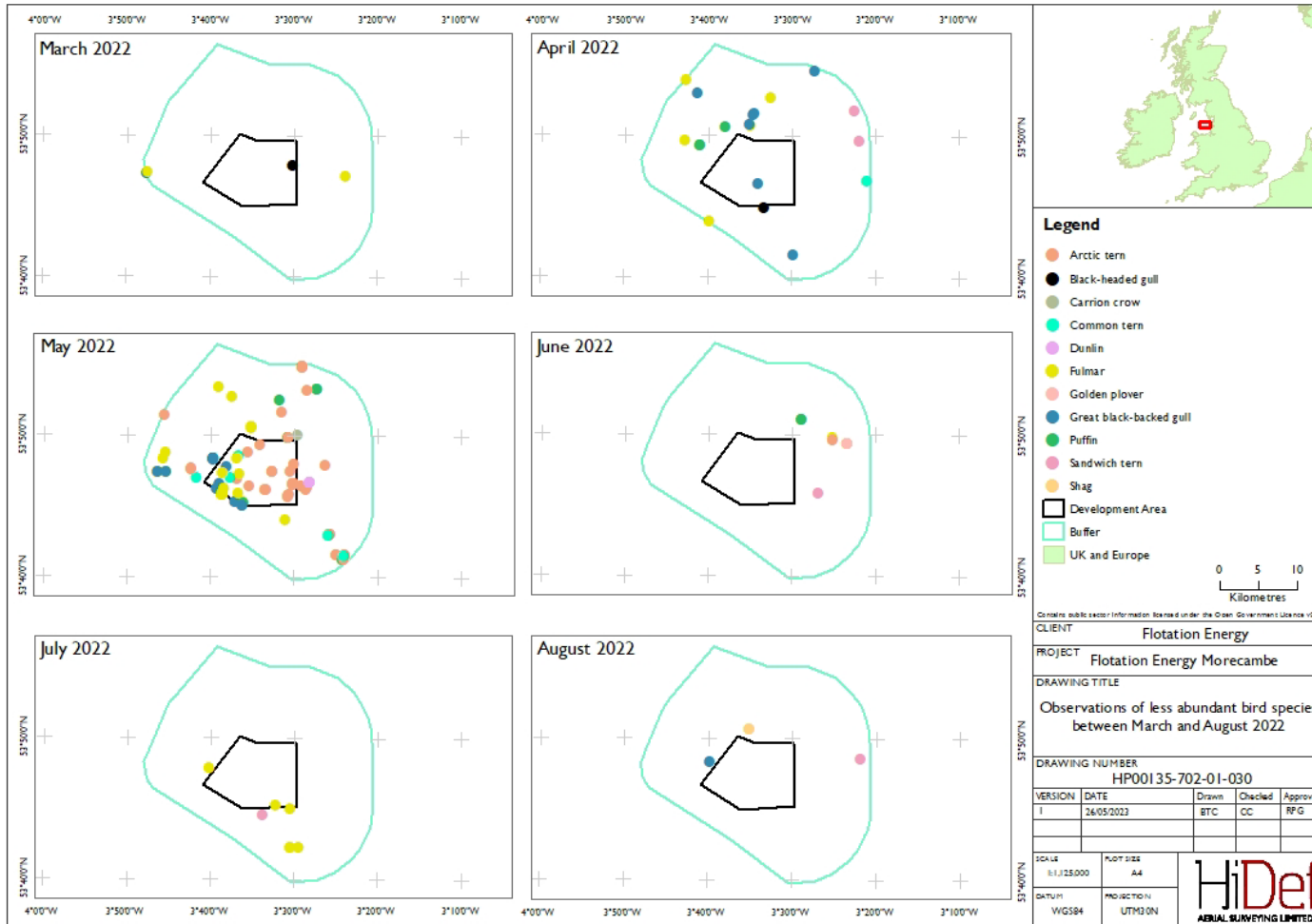
Figure 94   Detections of less abundant bird species in the Morecambe survey area between September 2022 and February 2023
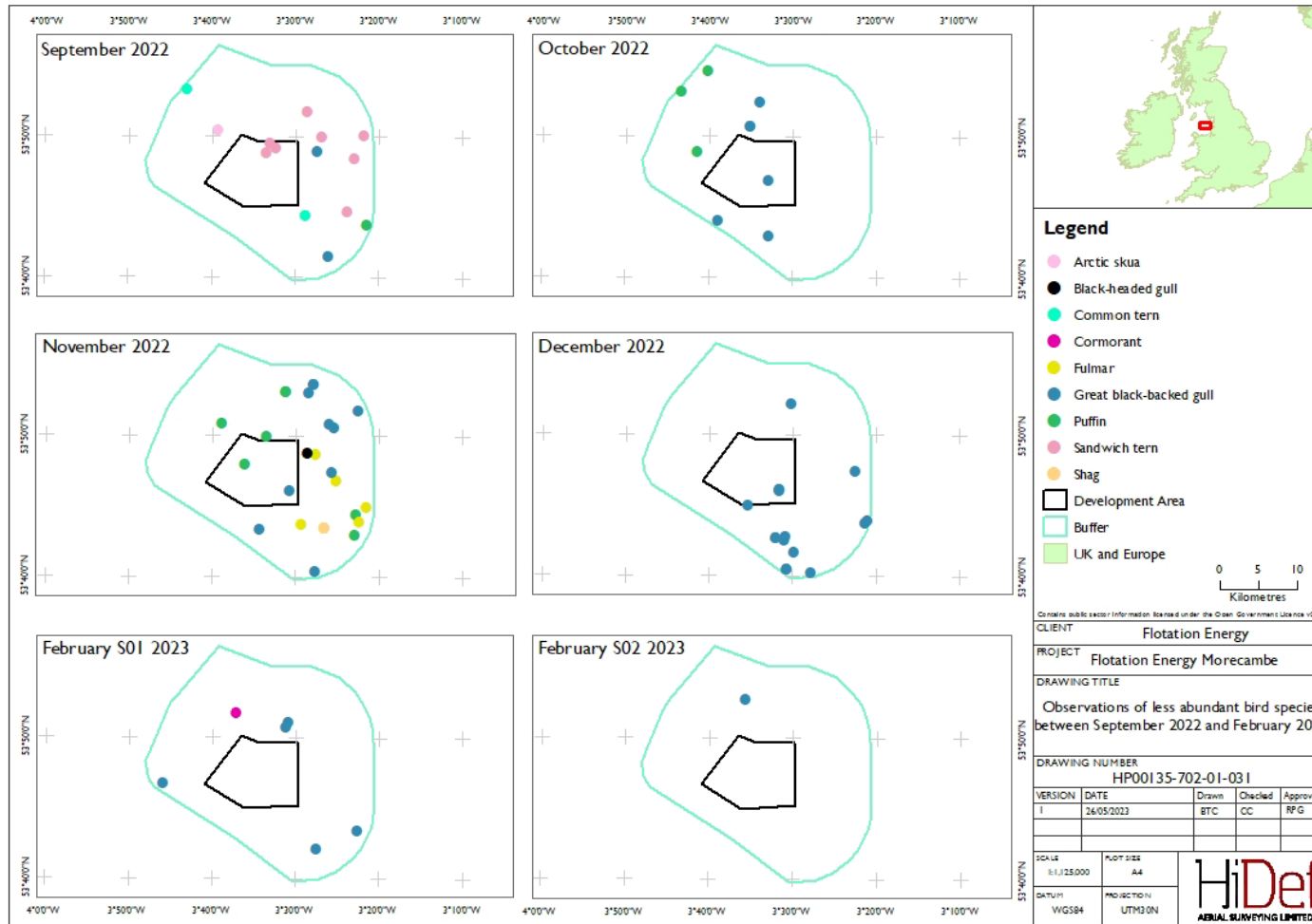
3.3.14 Unidentified bird species

143   Unidentified birds were recorded throughout the survey period with greater numbers recorded in March, August and November 2021 and May and October 2022 (Figure 95 and Figure 96). Due to adverse weather conditions affecting data quality, raw count data should be treated with caution. Peaks in non-identification relate primarily to difficulties separating razorbill and guillemot and reflect the large number of birds present at that time.

144   Unidentified birds were apportioned for estimating species density and abundance in the sections above. However, we summarise the raw data here for completeness.

145   Distributions of unidentified birds are displayed in Figure 97 to Figure 100.

Figure 95   Number of unidentified birds recorded within the Morecambe survey area between March 2021 and February 2023
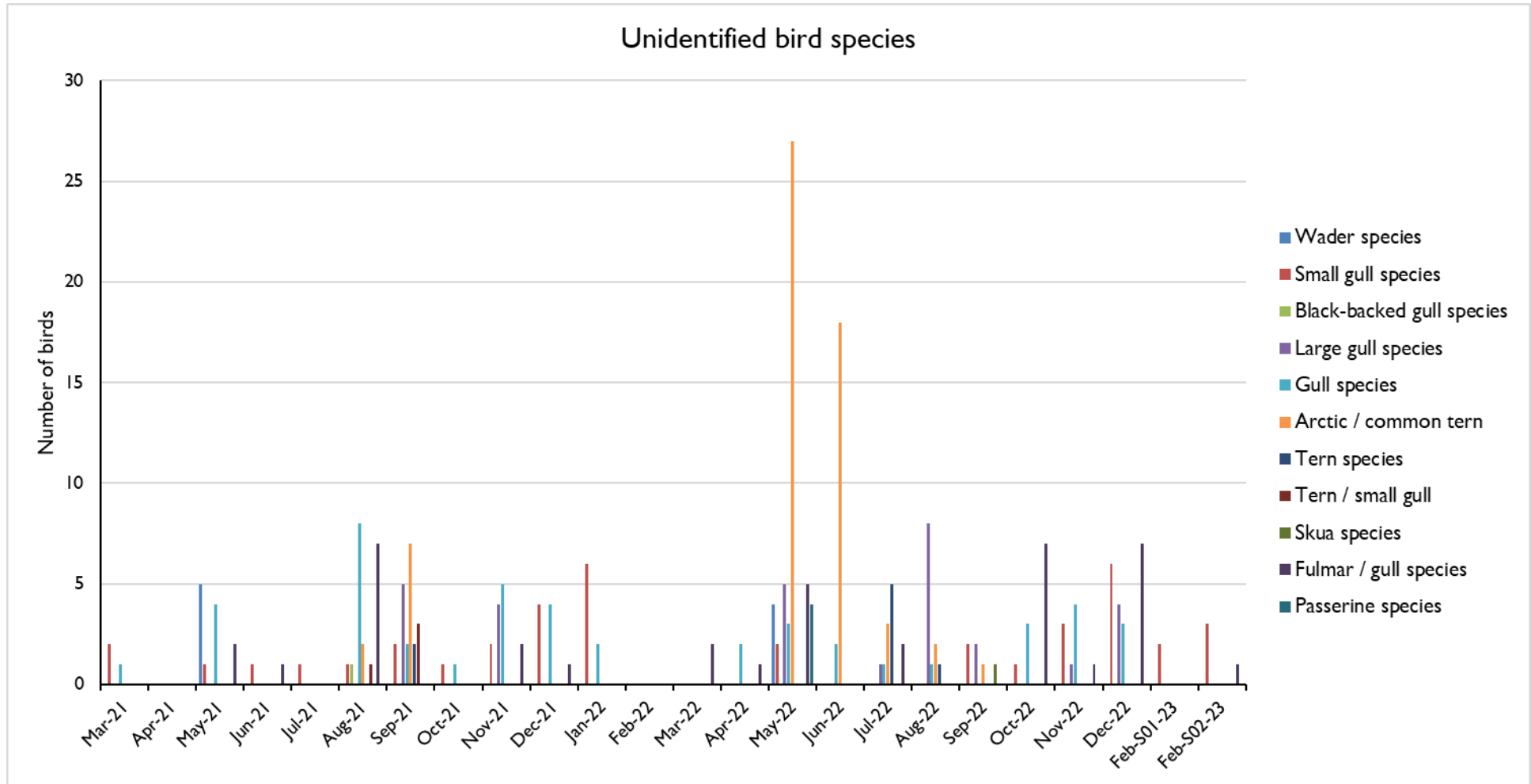
Figure 96   Number of unidentified bird species recorded within the Morecambe survey area between March 2021 and February 2023
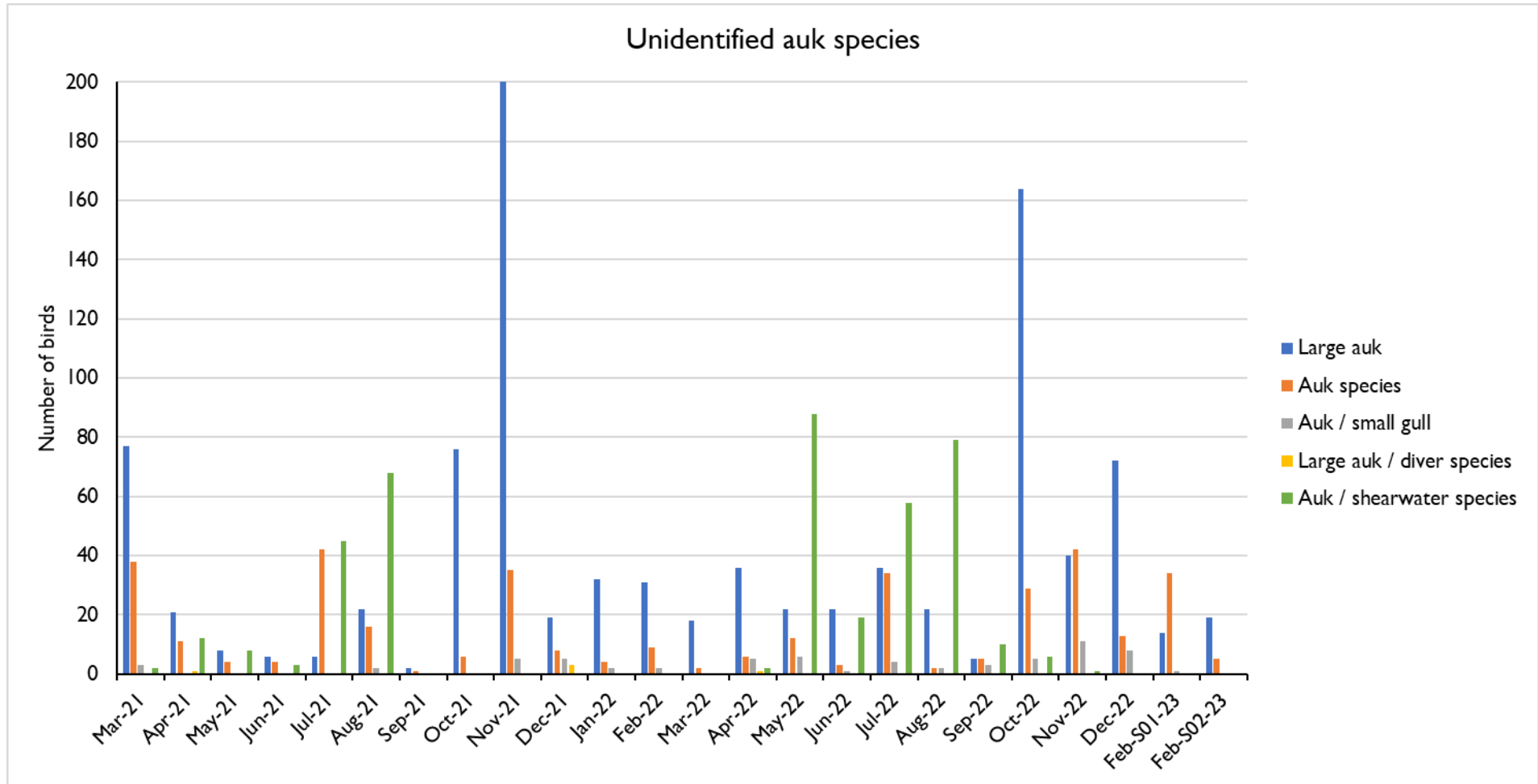
Figure 97 Detections of unidentified bird species in the Morecambe survey area between March and August 2021
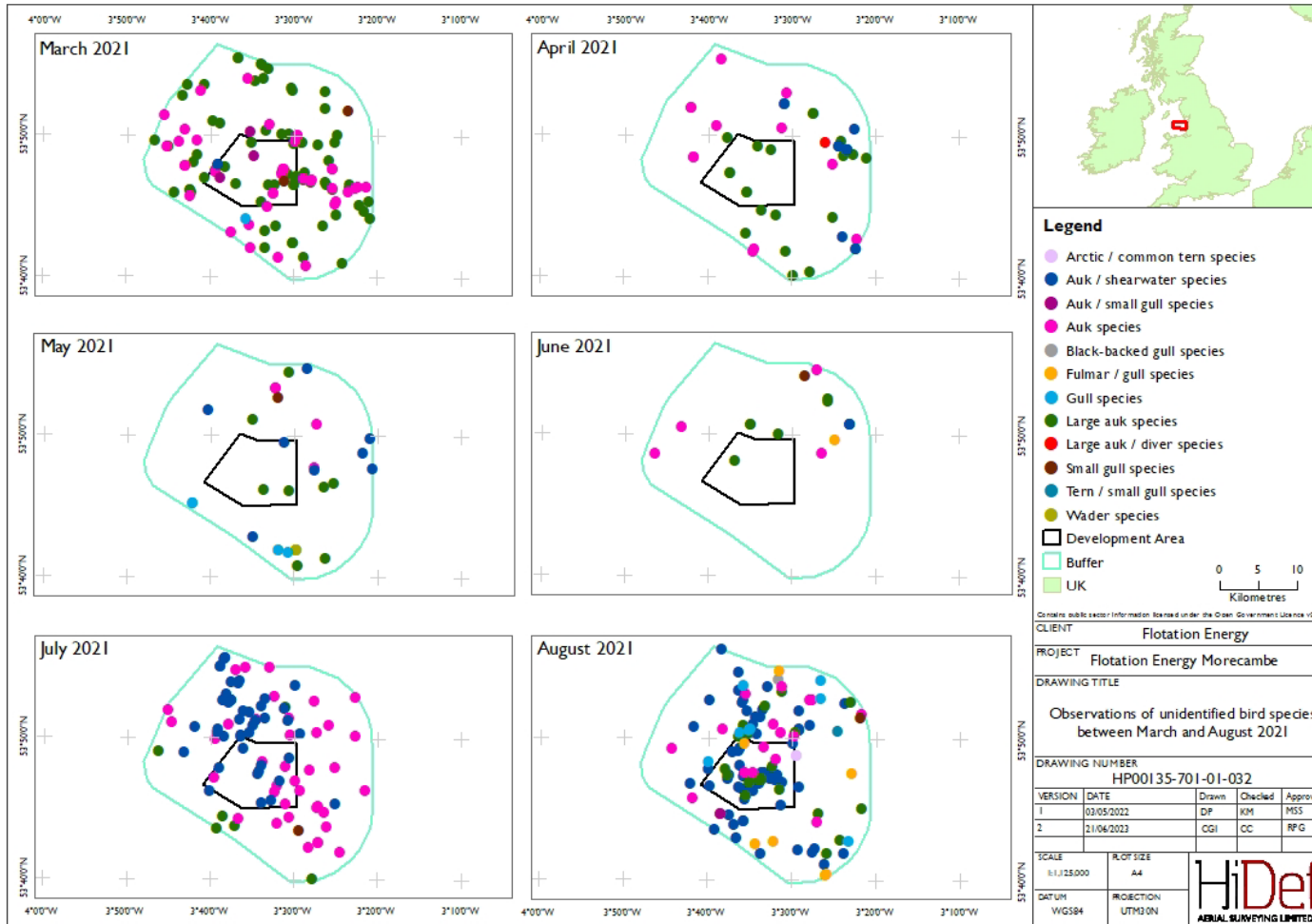
Figure 98   Detections of unidentified bird species in the Morecambe survey area between September 2021 and February 2022
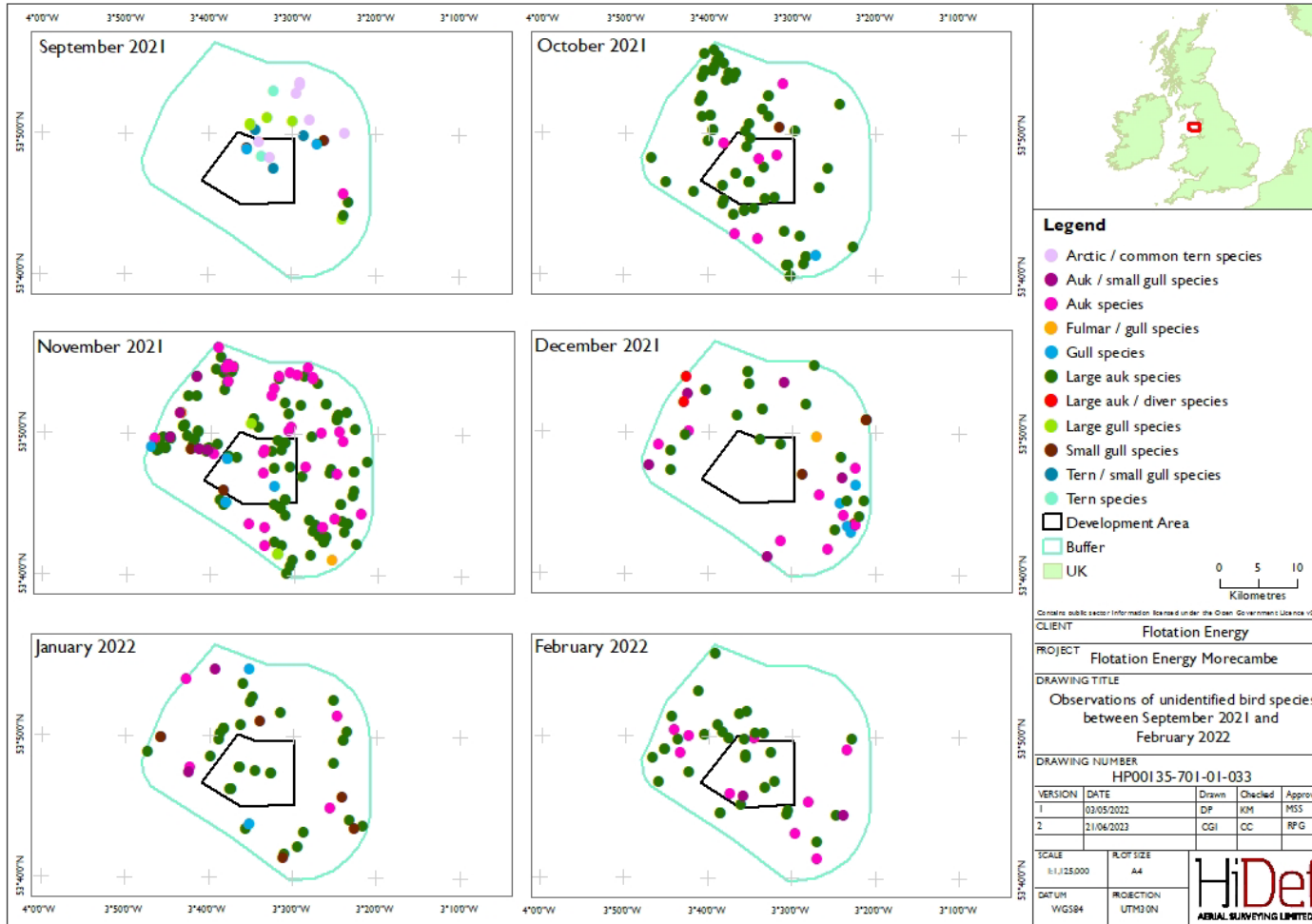
Figure 99 **Detections of unidentified bird species in the Morecambe survey area between March and August 2022**
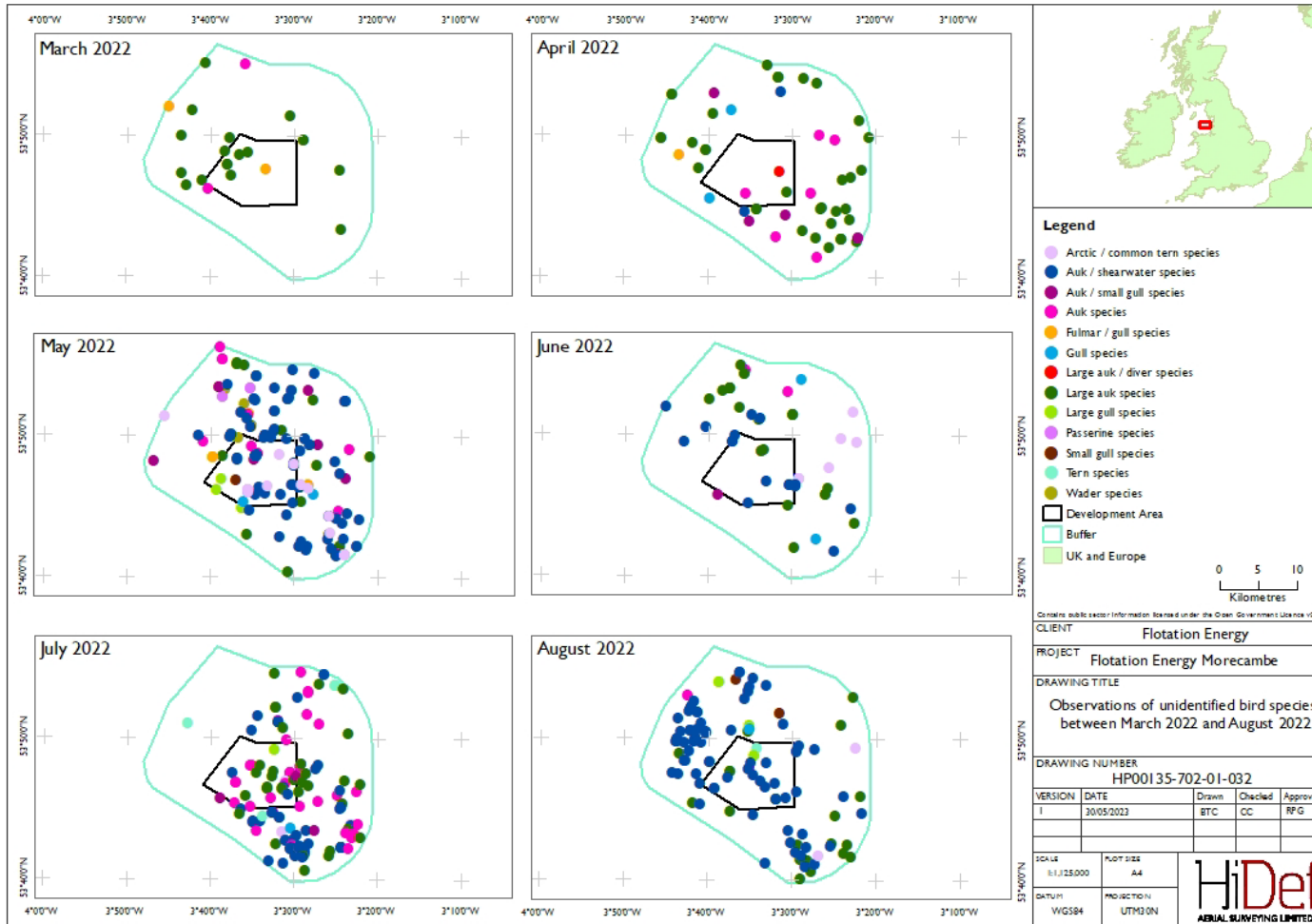
Figure 100   Detections of unidentified bird species in the Morecambe survey area between September 2022 and February 2023
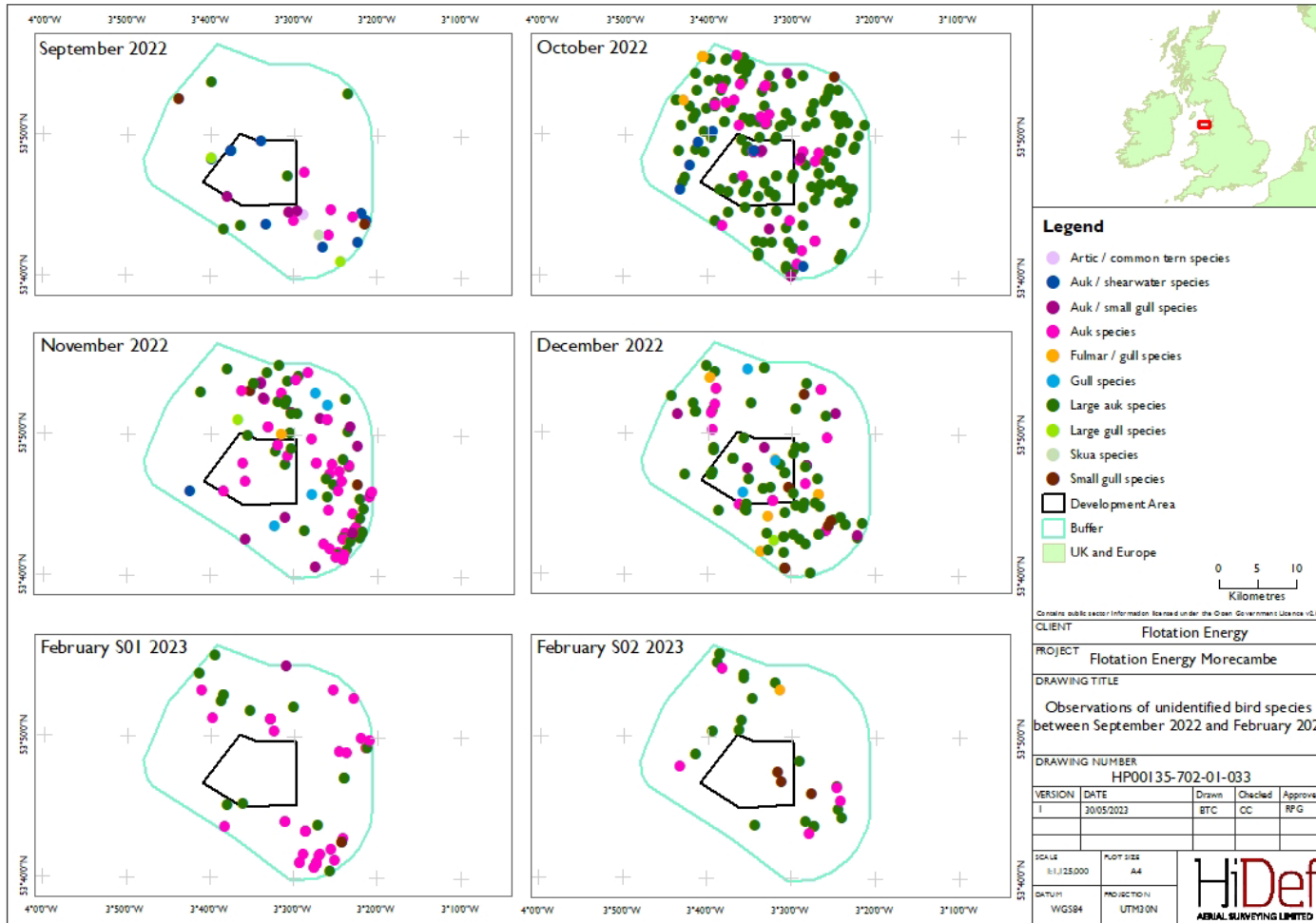
3.3.15 All non-avian animals

146   Non-avian animals were recorded in all surveys, with the highest numbers recorded in March 2021 and November 2022 (Figure 101), primarily attributed to a swarm of barrel jellyfish (*Rhizostoma pulmo*; Figure 113) in March 2021, October and November 2022. Surfacing rates of species and unidentified animals can be found in (Table 39), while the densities of all non-avian animals are presented in (Figure 102 to Figure 105).

Figure 101   Total number of non-avian animals recorded in the Morecambe survey area, between March 2021 and February 2023
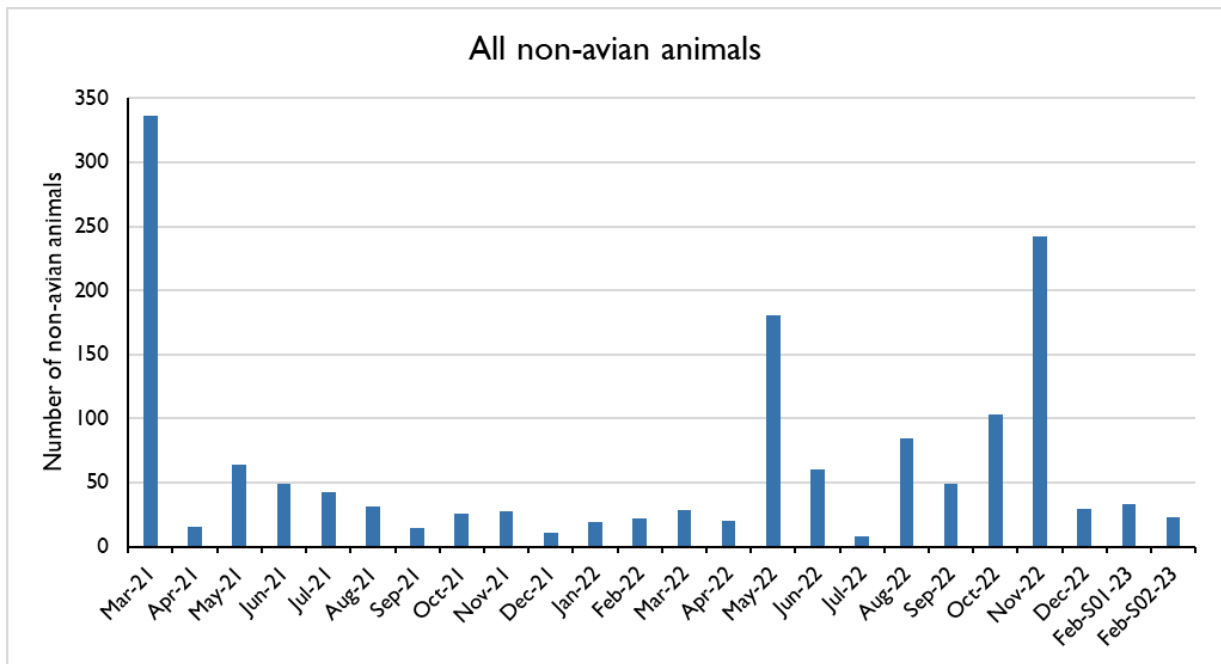
Table 39 Summary of surfacing behaviour for all non-avian animals in the Morecambe survey area between March 2021 and February 2023

Species	Submerged	Surfacing	Snapshot surfacing (at red line)	Unknown	% Surfacing at red line	Total
Barrel jellyfish	512	0	0	0	0	512
Bottlenose dolphin	2	0	0	0	0	2
Common dolphin	23	3	6	0	19	32
Grey seal	6	6	28	2	67	42
Harbour porpoise	485	116	293	31	32	925
Harbour seal	0	0	1	0	100	1
Lion's mane jellyfish	9	0	0	0	0	9
No ID						
Cetacean species	4	0	0	0	0	4
Dolphin species	1	0	0	0	0	1
Jellyfish	66	0	0	0	0	66
Seal / small cetacean species	3	0	0	0	0	3
Seal species	6	6	47	0	80	59
Total	**1117**	**131**	**375**	**33**	**23**	**1656**

Figure 102   Density of all non-avian animals (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2021
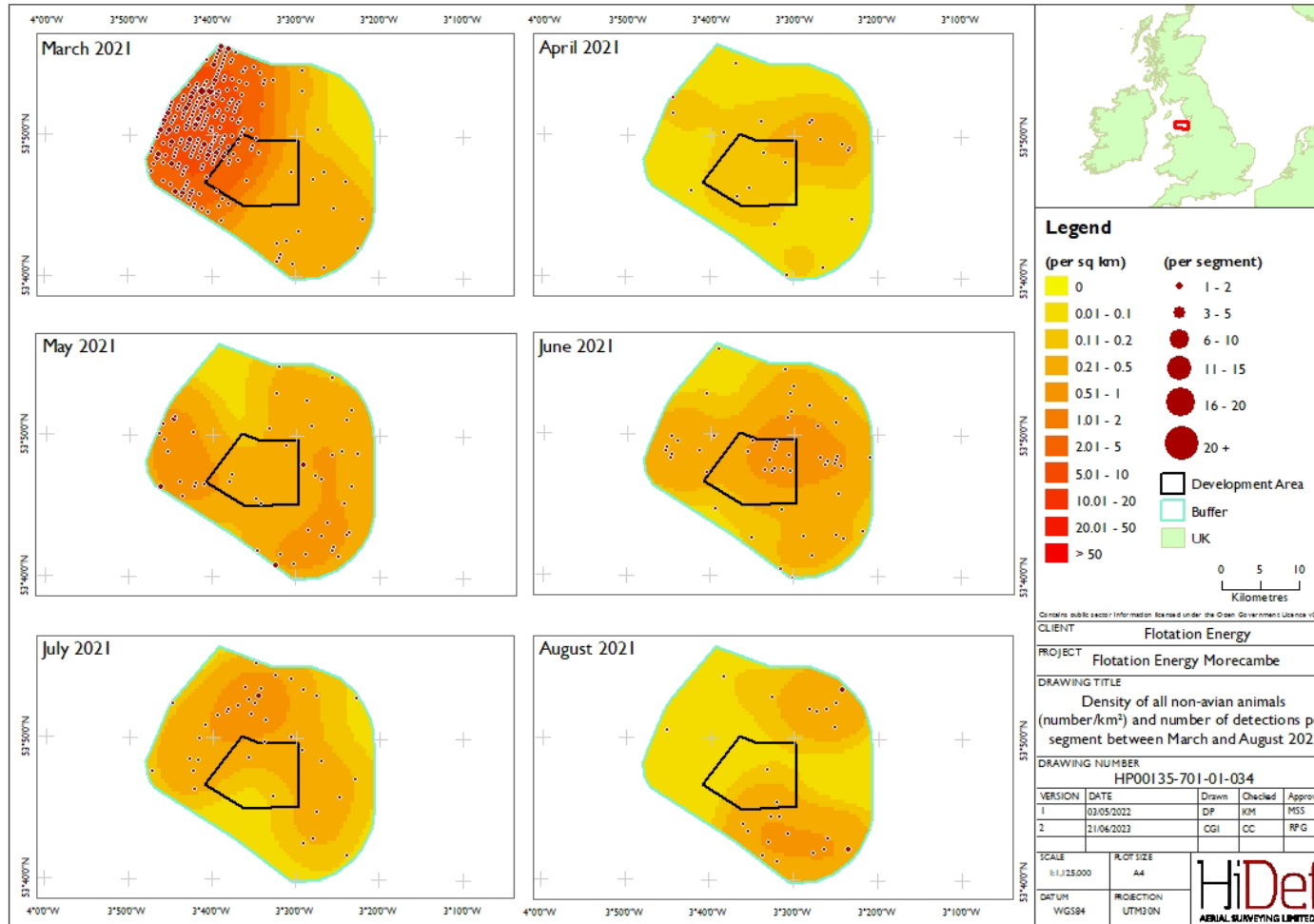
Figure 103   Density of all non-avian animals (number/km²) and number of detections per segment in the Morecambe survey area between September 2021 and February 2022
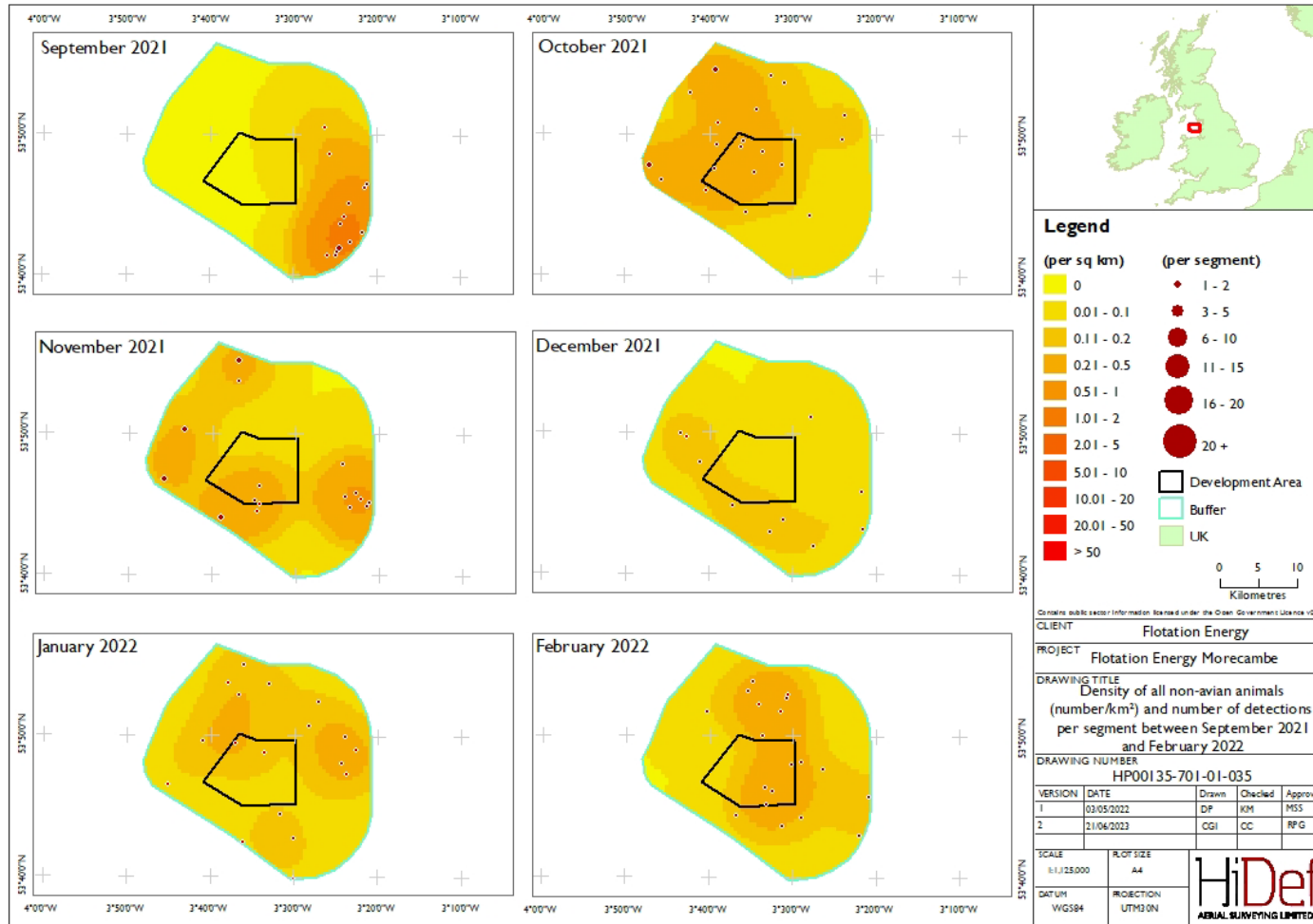
Figure 104   Density of all non-avian animals (number/km²) and number of detections per segment in the Morecambe survey area between March and August 2022
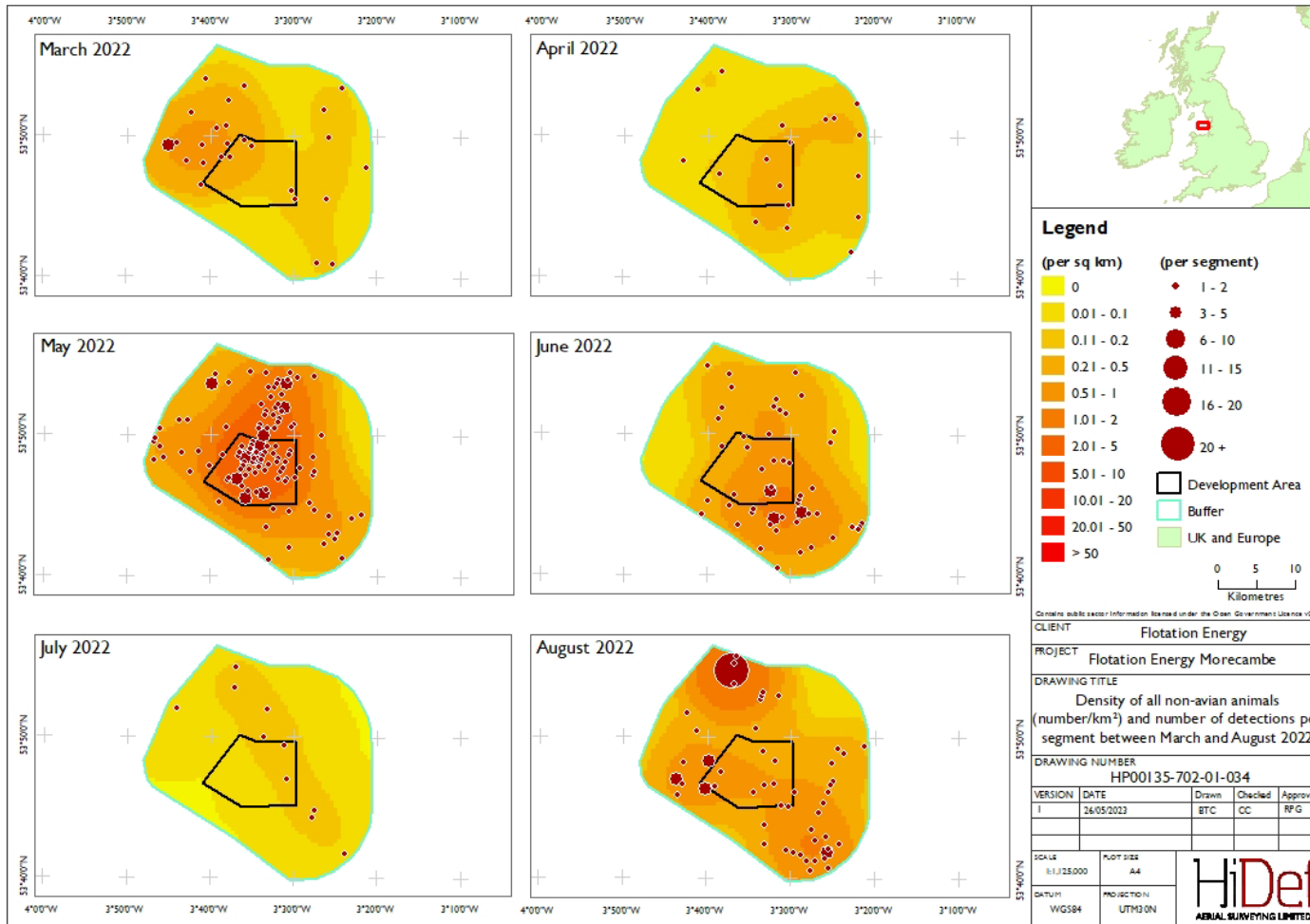
Figure 105   Density of all non-avian animals (number/km²) and number of detections per segment in the Morecambe survey area between September 2022 and February 2023
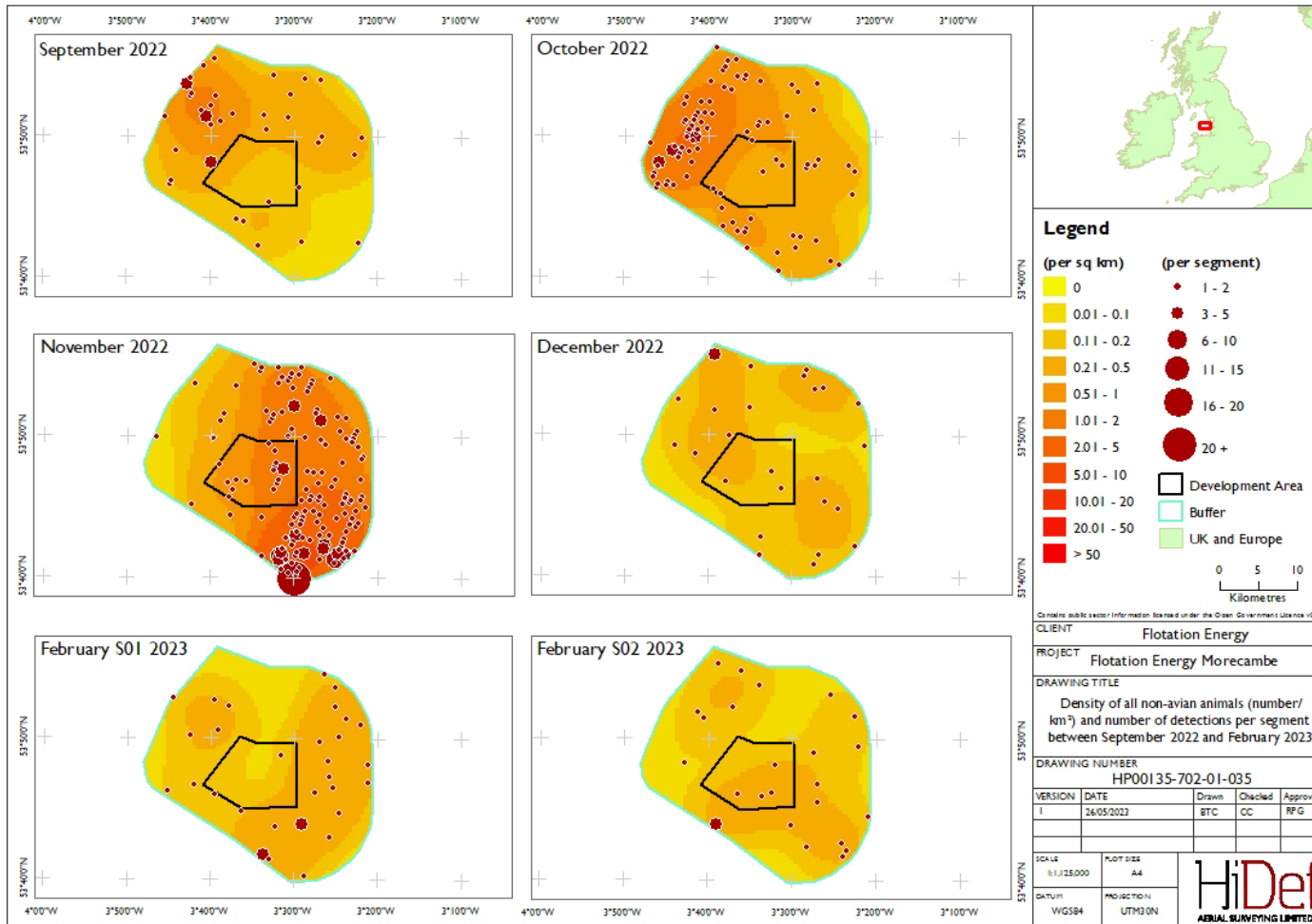
3.3.16 Harbour porpoise

147   Harbour porpoise were recorded in all surveys across the 24-month period (Figure 106). When accounting for animals submerged at the time of the survey, peak apportioned density estimates for the survey area were estimated as 6.25 animals/km^2 (95% CI 3.38 – 9.97) in May 2022, equating to an absolute abundance estimate of 4,060 individuals (95% CI 2,196 – 6,481; Figure 107; Table 40).

148   Harbour porpoise were widespread across the survey area (Figure 108 to Figure 111).

149   Proportions of surfacing animals can be found in Table 39; 53% of individuals were recorded as submerged.

Figure 106   Number of harbour porpoise recorded between March 2021 and February 2023 in the Morecambe survey area
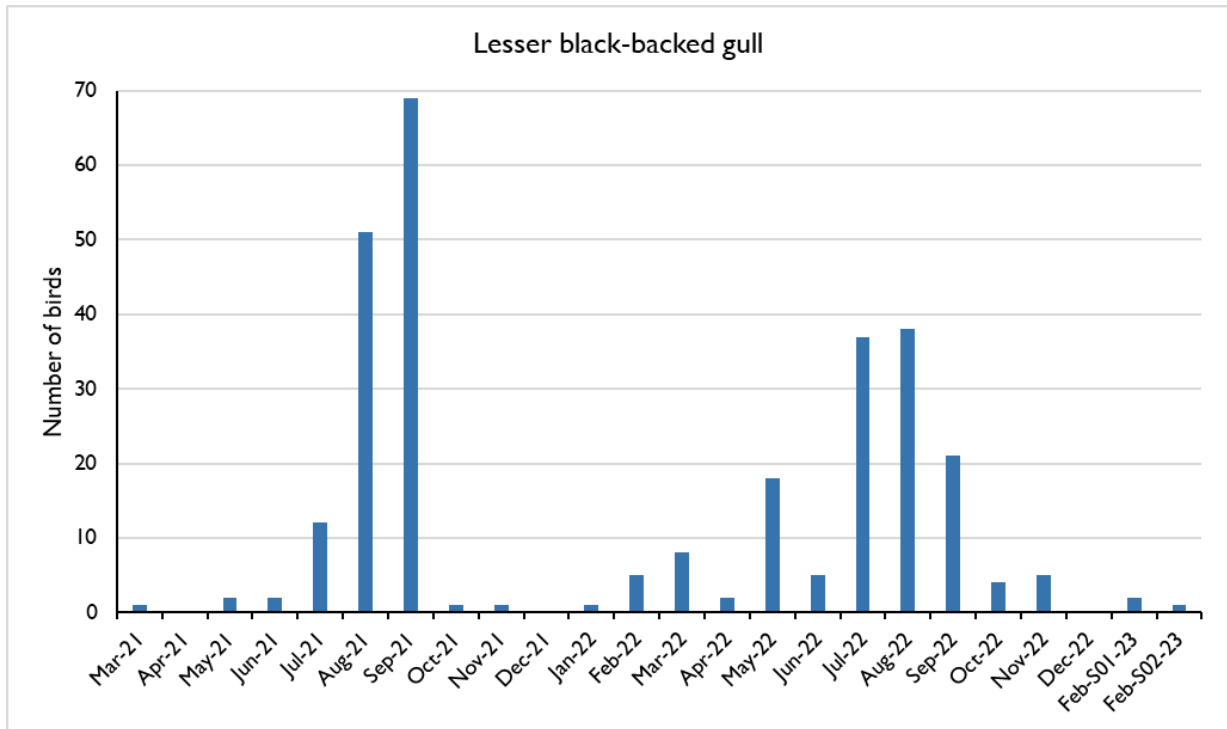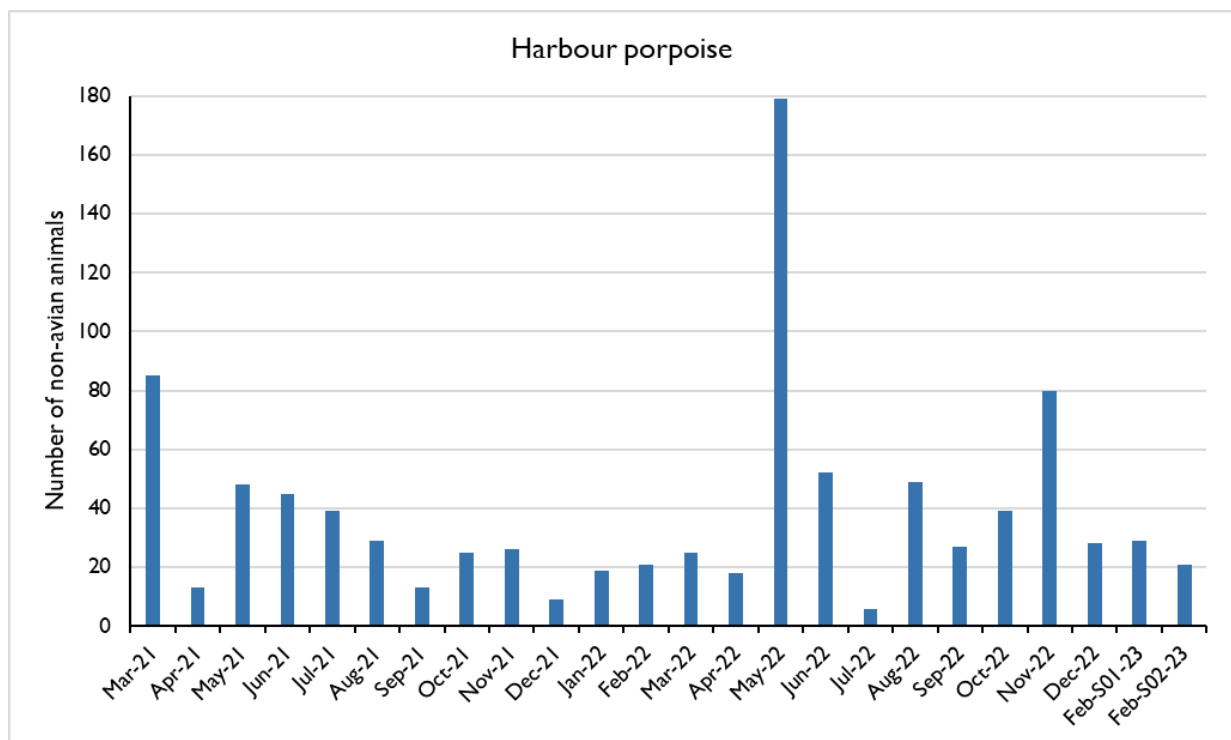
Figure 107 Apportioned absolute harbour porpoise density estimates, with 95% upper and lower confidence limits, in the Morecambe survey area between March 2021 and February 2023
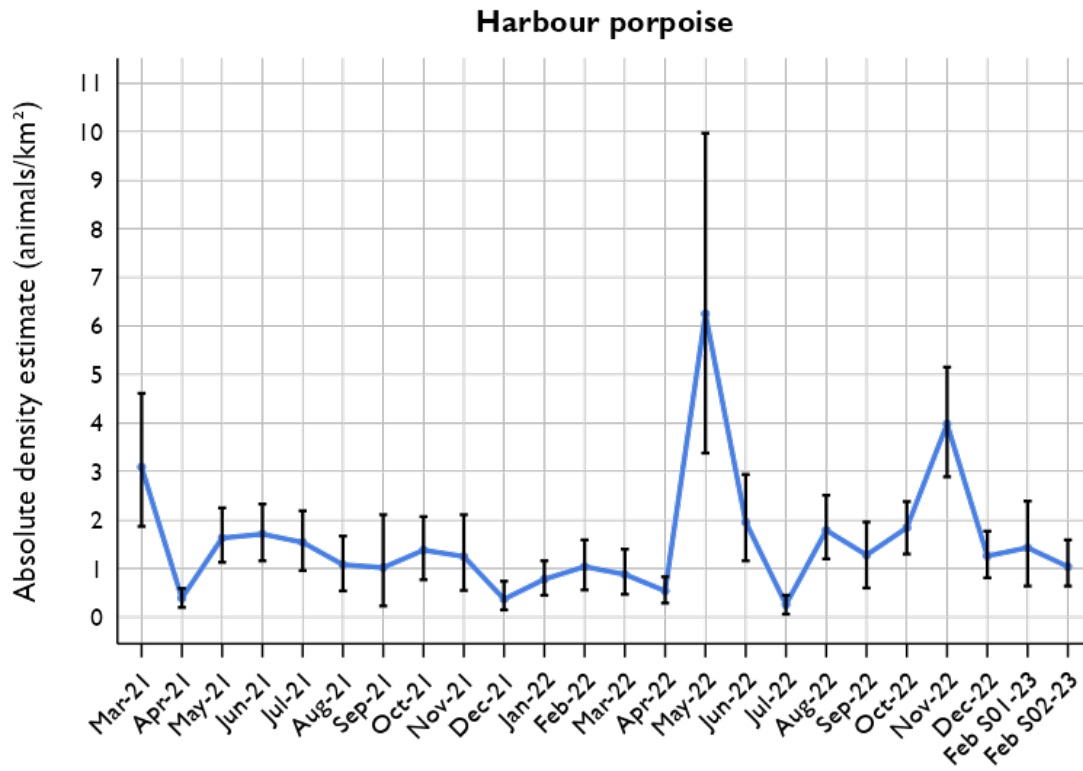
**Table 40**   **Apportioned relative and absolute monthly density and population estimates for harbour porpoise in the Morecambe survey area between March 2021 and February 2023, accounting for animals estimated as unavailable for detection**

Survey date	Relative population estimates						Absolute population estimates			
	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)
19 March 2021	0.53	347	209	517	78	22.31	3.09	2026	1220	3018
07 April 2021	0.08	52	28	79	14	26.02	0.39	255	137	388
18 May 2021	0.29	192	130	259	34	17.38	1.63	1081	732	1458
01 June 2021	0.28	181	122	245	32	17.46	1.71	1108	747	1499
09 July 2021	0.24	157	100	222	32	20.29	1.54	1010	643	1427
02 August 2021	0.18	120	62	184	32	26.22	1.08	718	371	1101
04 September 2021	0.13	83	19	174	41	48.78	1.02	648	148	1359
06 October 2021	0.18	117	65	179	30	25.52	1.38	898	499	1374
17 November 2021	0.16	105	48	173	33	31.02	1.25	820	375	1351
05 December 2021	0.05	36	16	63	12	32.95	0.37	266	118	466
13 January 2022	0.12	77	43	115	19	24.26	0.78	498	278	744
11 February 2022	0.13	85	44	131	22	25.84	1.04	677	350	1043
09 March 2022	0.15	101	52	159	28	27.66	0.88	590	304	928
01 April 2022	0.11	73	36	113	20	27.50	0.54	358	177	555

Survey date	Relative population estimates						Absolute population estimates			
	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)
02 May 2022	1.11	721	390	1151	196	27.09	6.25	4060	2196	6481
07 June 2022	0.32	210	122	316	49	23.36	1.96	1285	747	1934
14 July 2022	0.04	28	8	48	11	36.70	0.26	180	51	309
09 August 2022	0.30	197	128	274	37	18.72	1.79	1178	766	1639
02 September 2022	0.17	109	55	173	30	27.42	1.28	823	415	1306
03 October 2022	0.24	156	111	202	24	15.20	1.84	1197	852	1550
22 November 2022	0.51	329	244	427	47	14.08	3.98	2569	1905	3334
03 December 2022	0.17	113	71	160	23	20.36	1.26	835	525	1182
05 February 2023	0.18	116	52	196	37	31.99	1.43	924	414	1561
23 February 2023	0.13	86	49	128	21	23.76	1.04	685	390	1019

Figure 108   Density of harbour porpoise (number/km²) and number of detections per segment in the Morecambe survey area March and August 2021
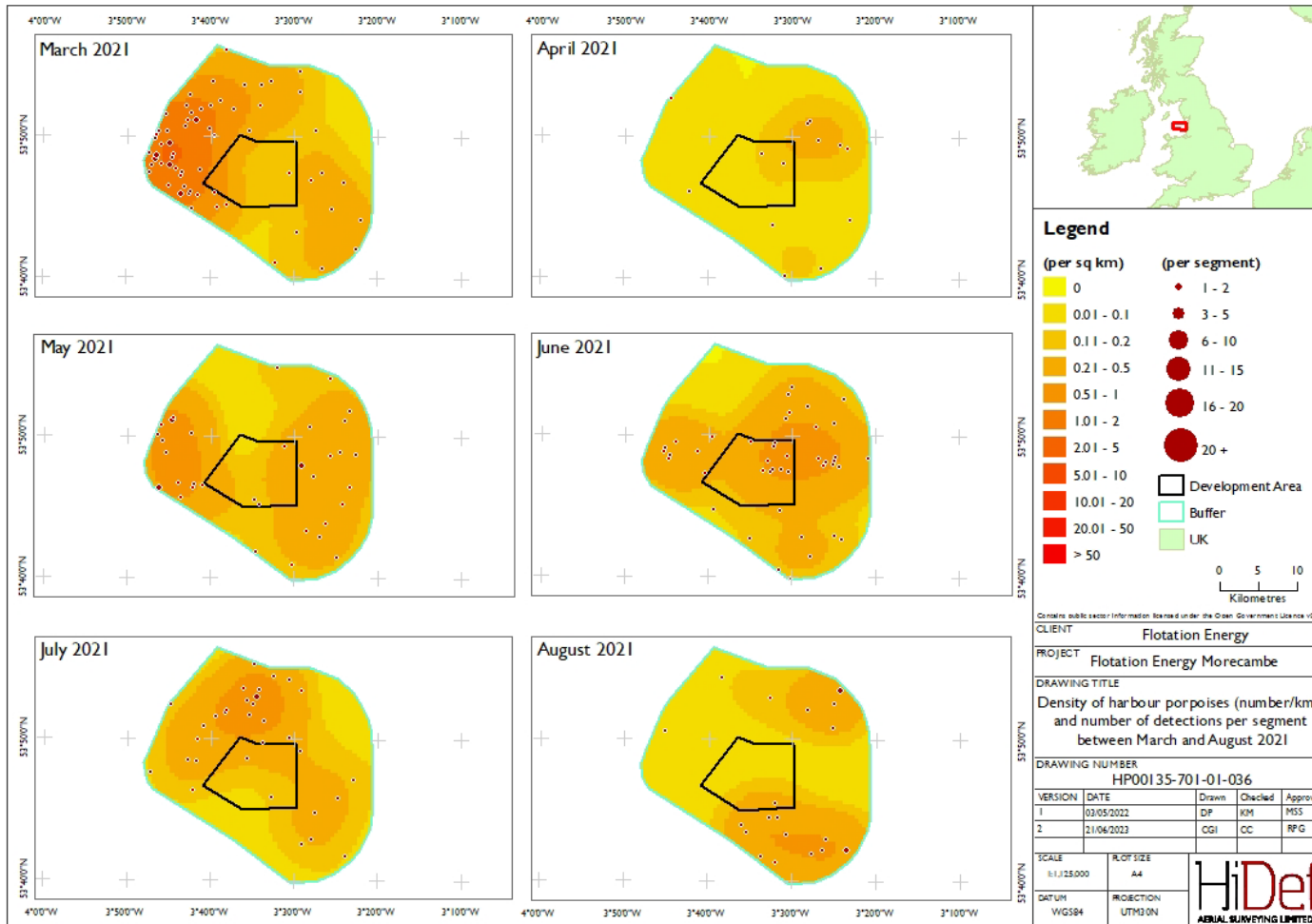
Figure 109 Density of harbour porpoise (number/km²) and number of detections per segment in the Morecambe survey area September 2021 and February 2022
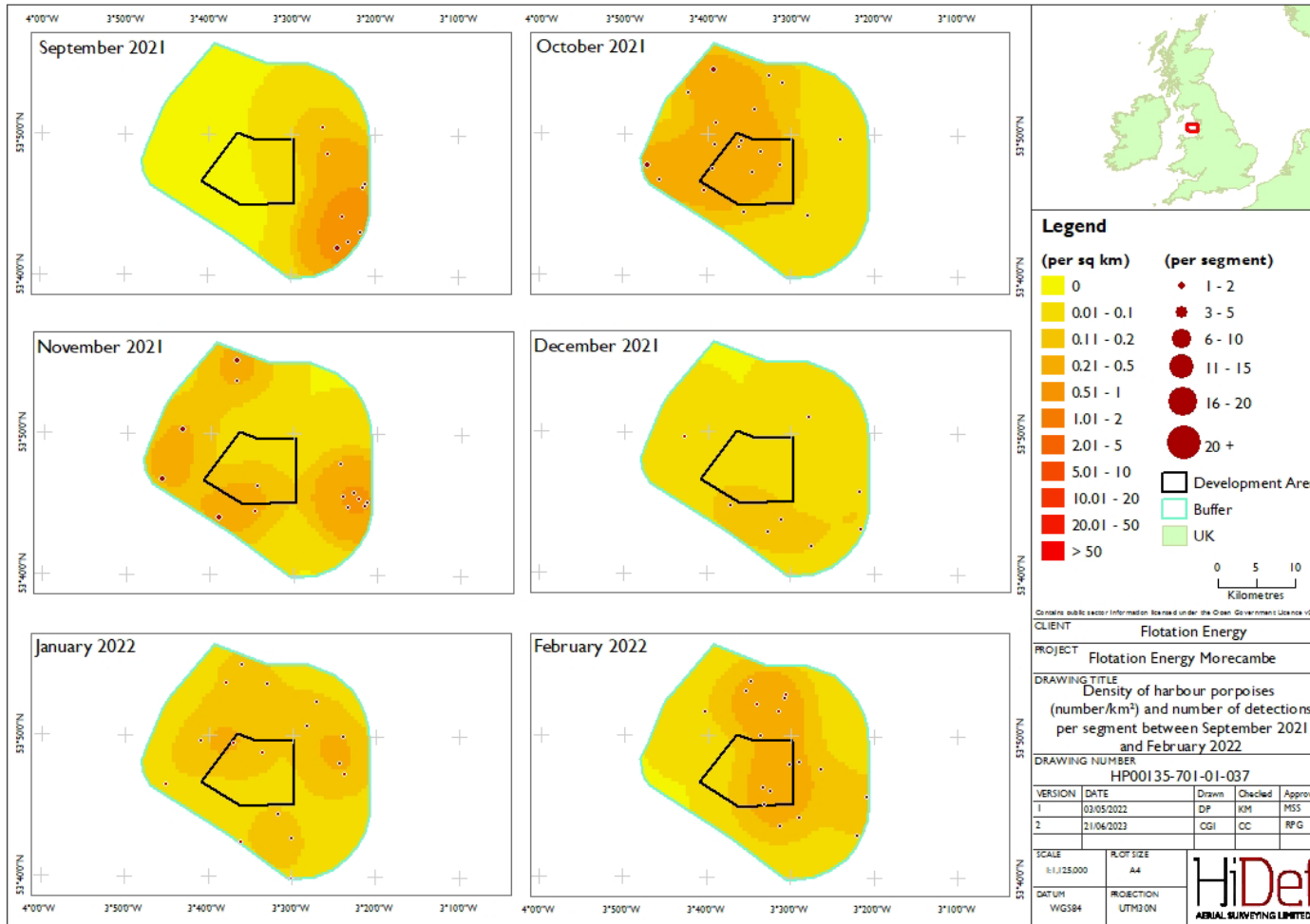
Figure 110 Density of harbour porpoise (number/km²) and number of detections per segment in the Morecambe survey area March and August 2022
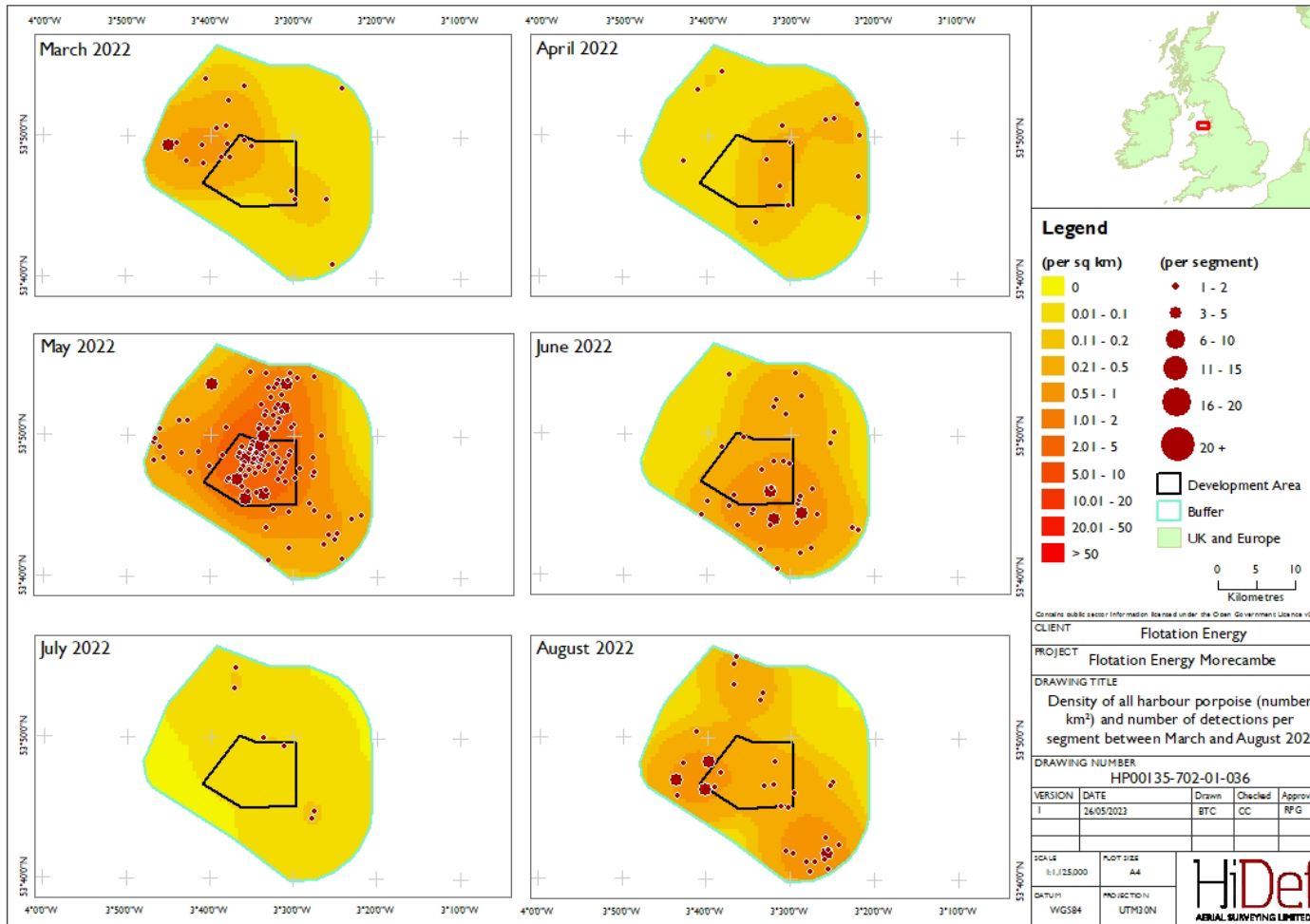
Figure 111   Density of harbour porpoise (number/km²) and number of detections per segment in the Morecambe survey area September 2022 and February 2023
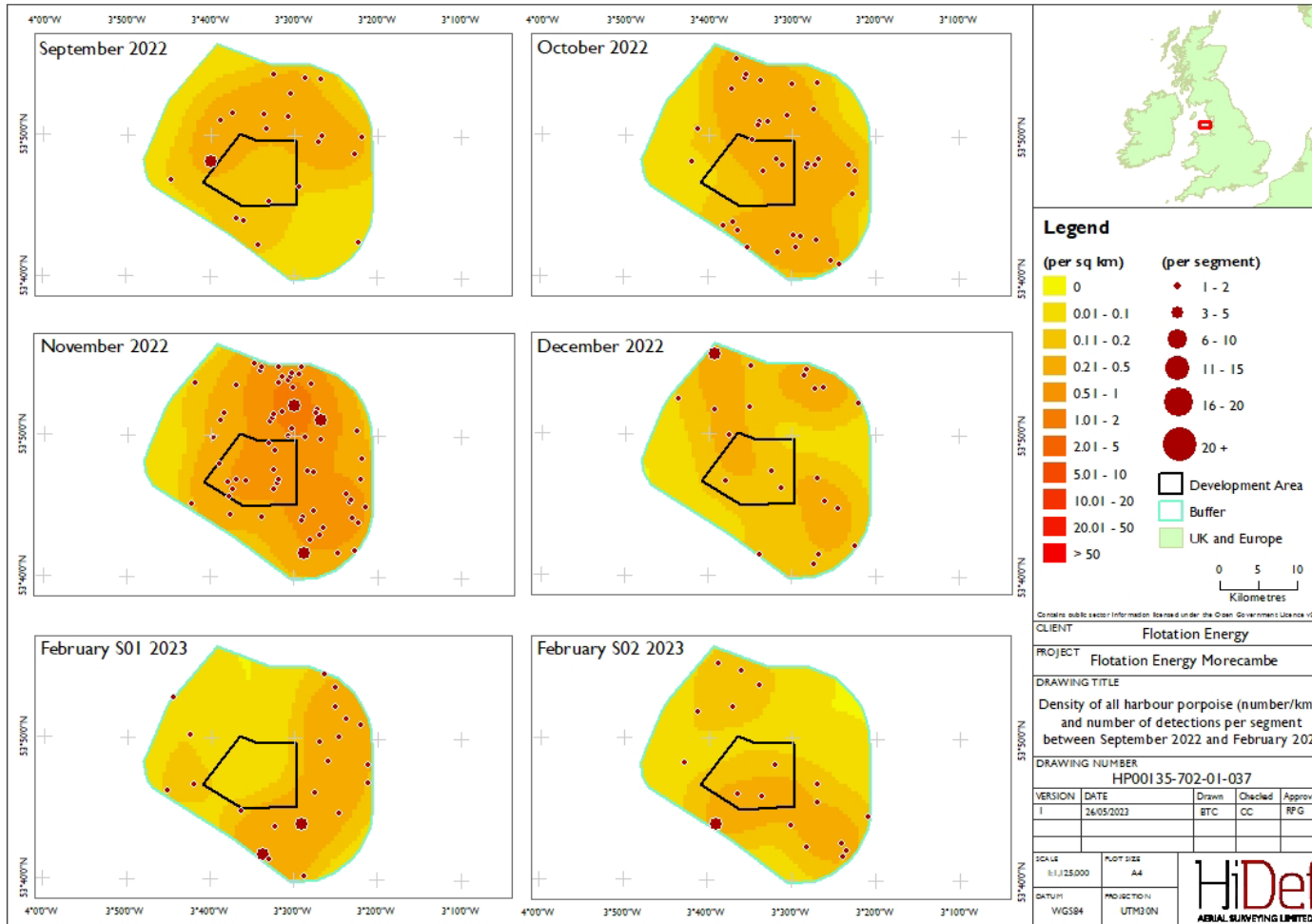
3.3.17 Less abundant non-avian animal species

150   Six additional non-avian animal species were recorded throughout the survey period (Figure 112). Over 250 barrel jellyfish were recorded in March 2021, concentrated in the north-west buffer (Figure 113 and Figure 115) with high numbers for the species also recorded in October and November 2022.

151   Few individuals were recorded for the remainder of the survey period. Grey seals (*Halichoerus grypus*) were recorded intermittently, while one harbour seal (*Phoca vitulina*) identified in July 2021, distributed to the north of the survey area.

152   Two dolphin species were recorded across the survey period of which 32 observations of common dolphin (*Delphinus delphis*) were recorded in August 2022 and two records of bottlenose dolphin (*Tursiops truncatus*) in January 2023, located to the north and the centre of the survey area outside of the development area respectively.

Figure 112   Number of less abundant non-avian animals recorded within the Morecambe survey area between March 2021 and February 2023

Barrel Jellyfish: Mar 21, 251 observations; Oct 22, 64 observations; Nov 22, 159 observations
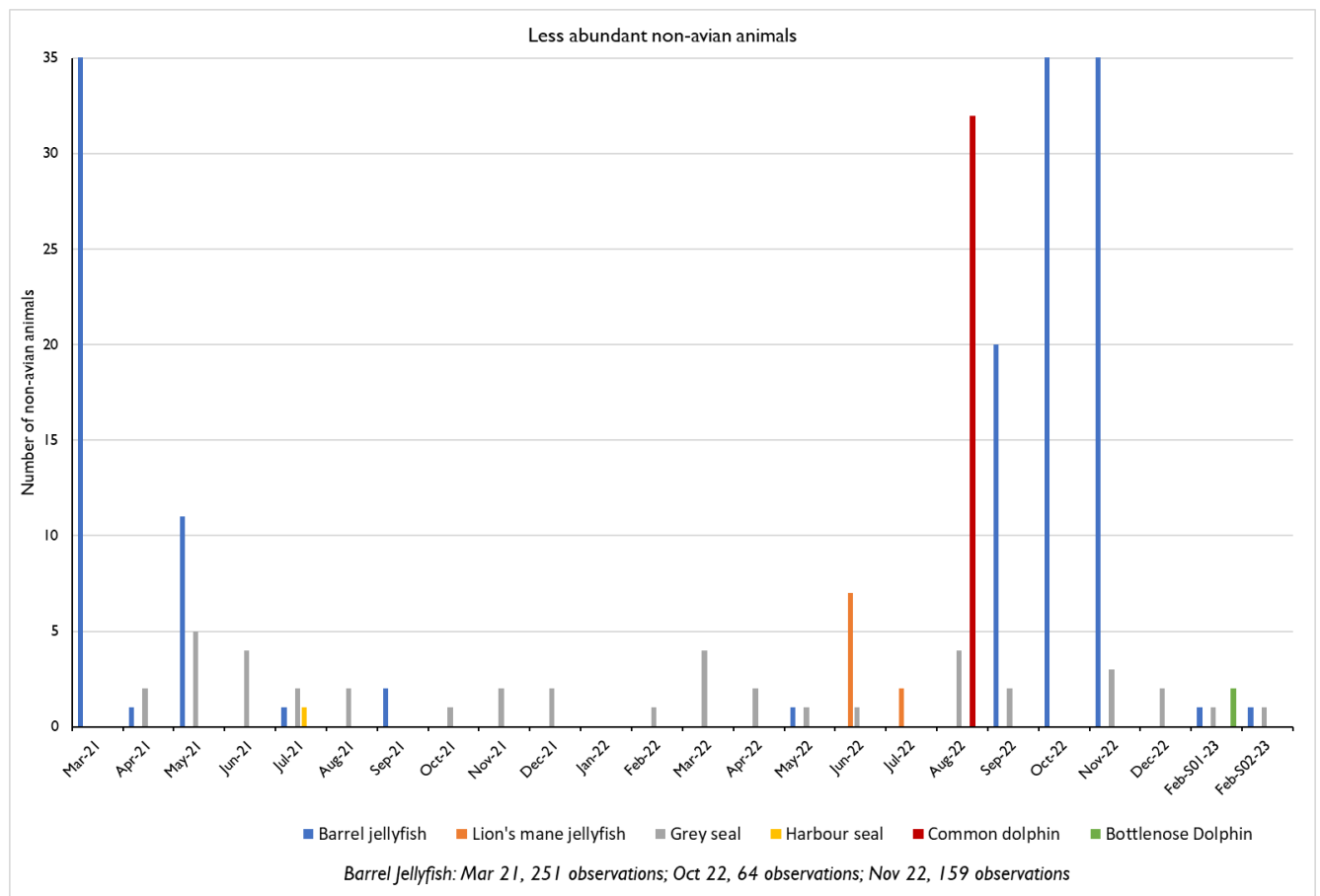
Figure 113   Detections of less abundant non-avian animal species in the Morecambe survey area between March and August 2021
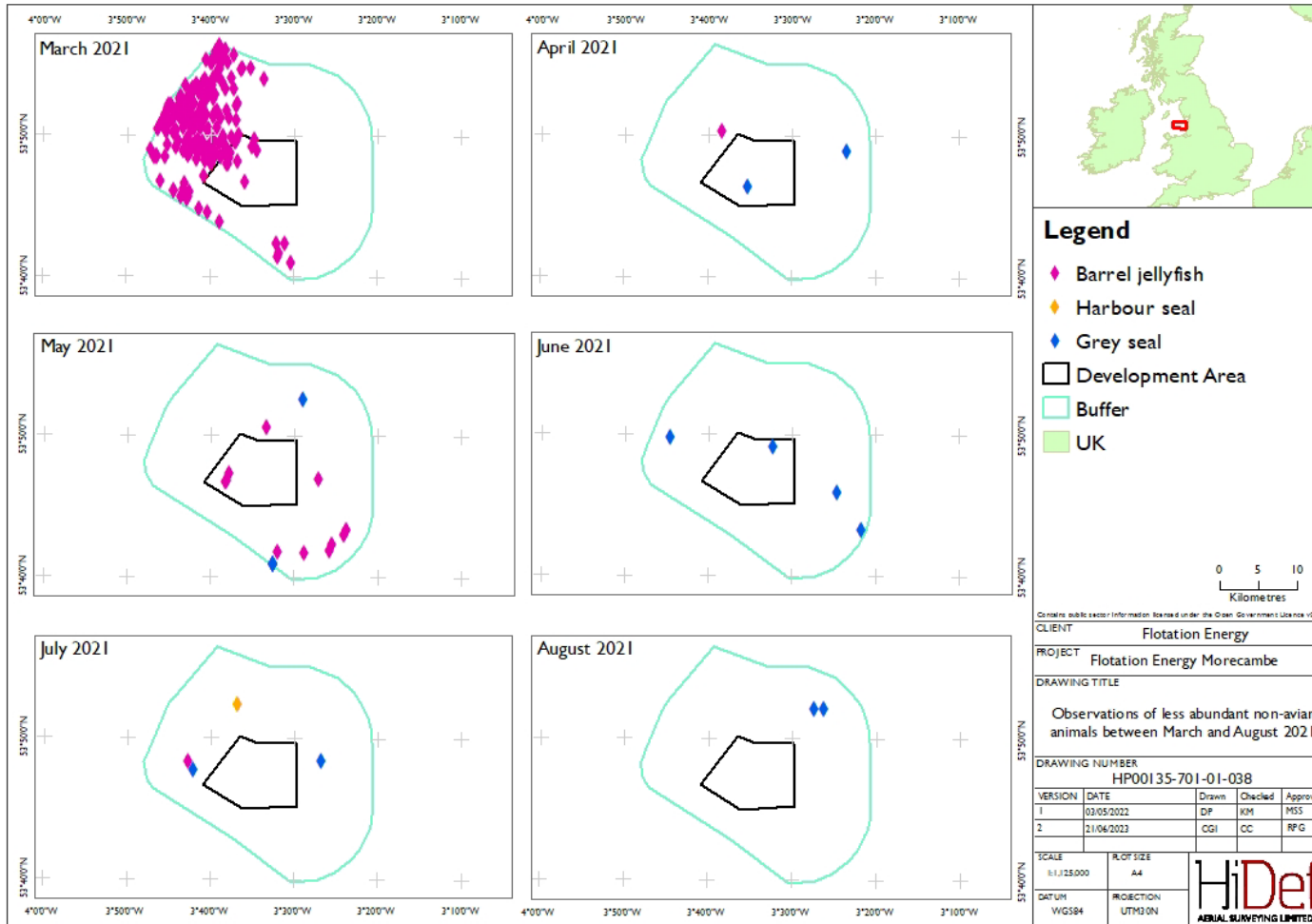
Figure 114   Detections of less abundant non-avian animal species in the Morecambe survey area between September 2021 and February 2022
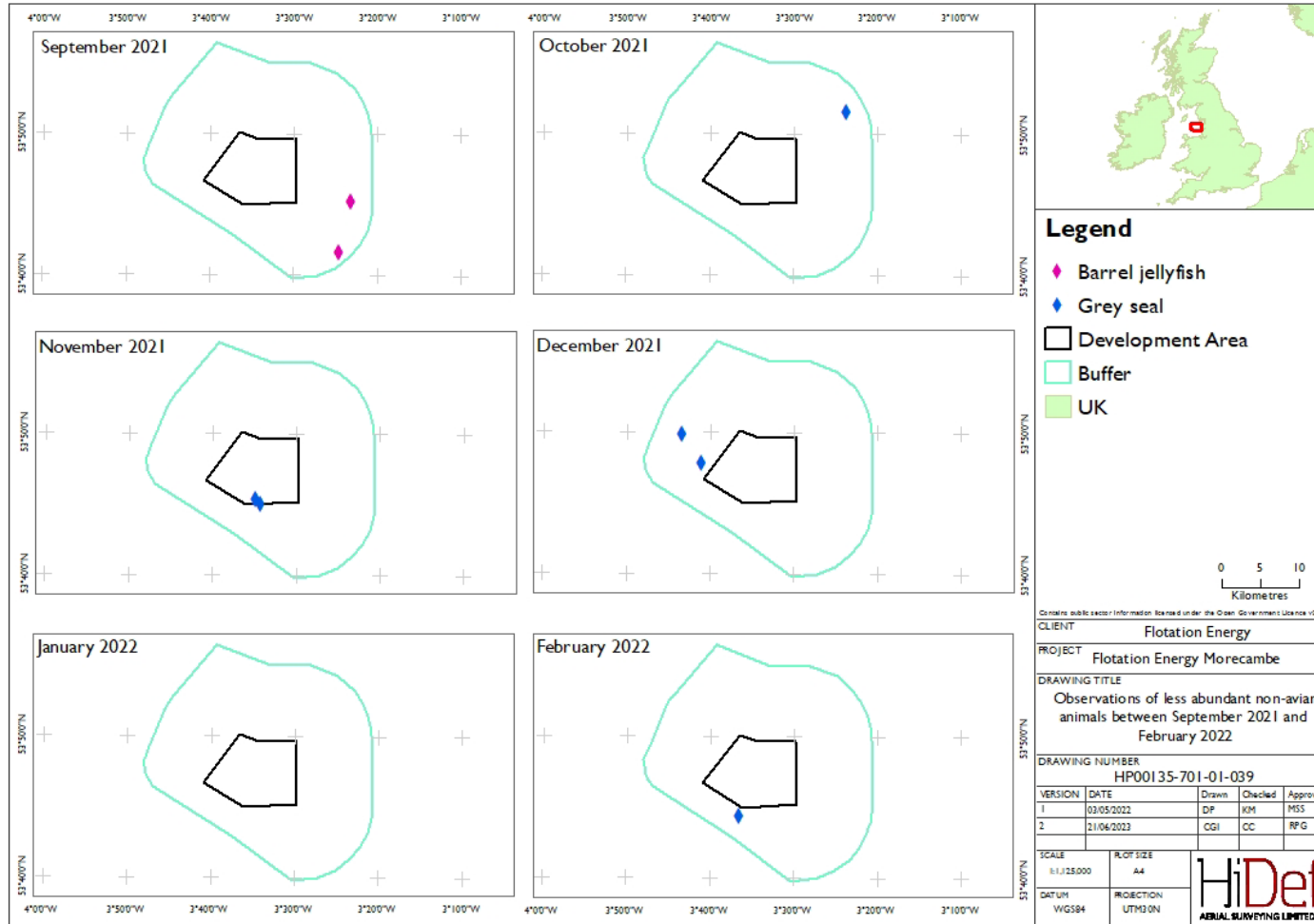
Figure 115   Detections of less abundant non-avian animal species in the Morecambe survey area between March and August 2022
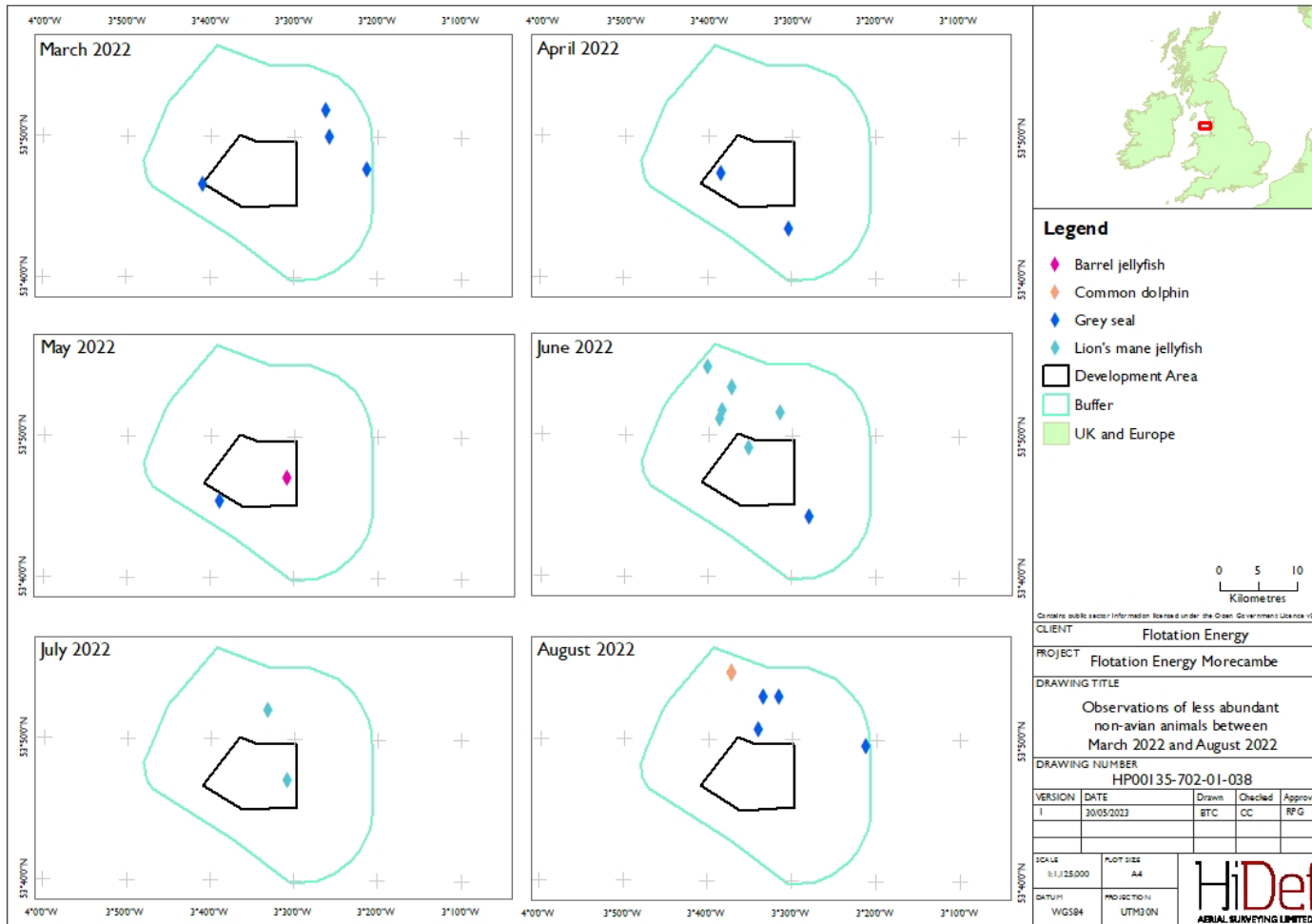
Figure 116   Detections of less abundant non-avian animal species in the Morecambe survey area between September 2022 and February 2023
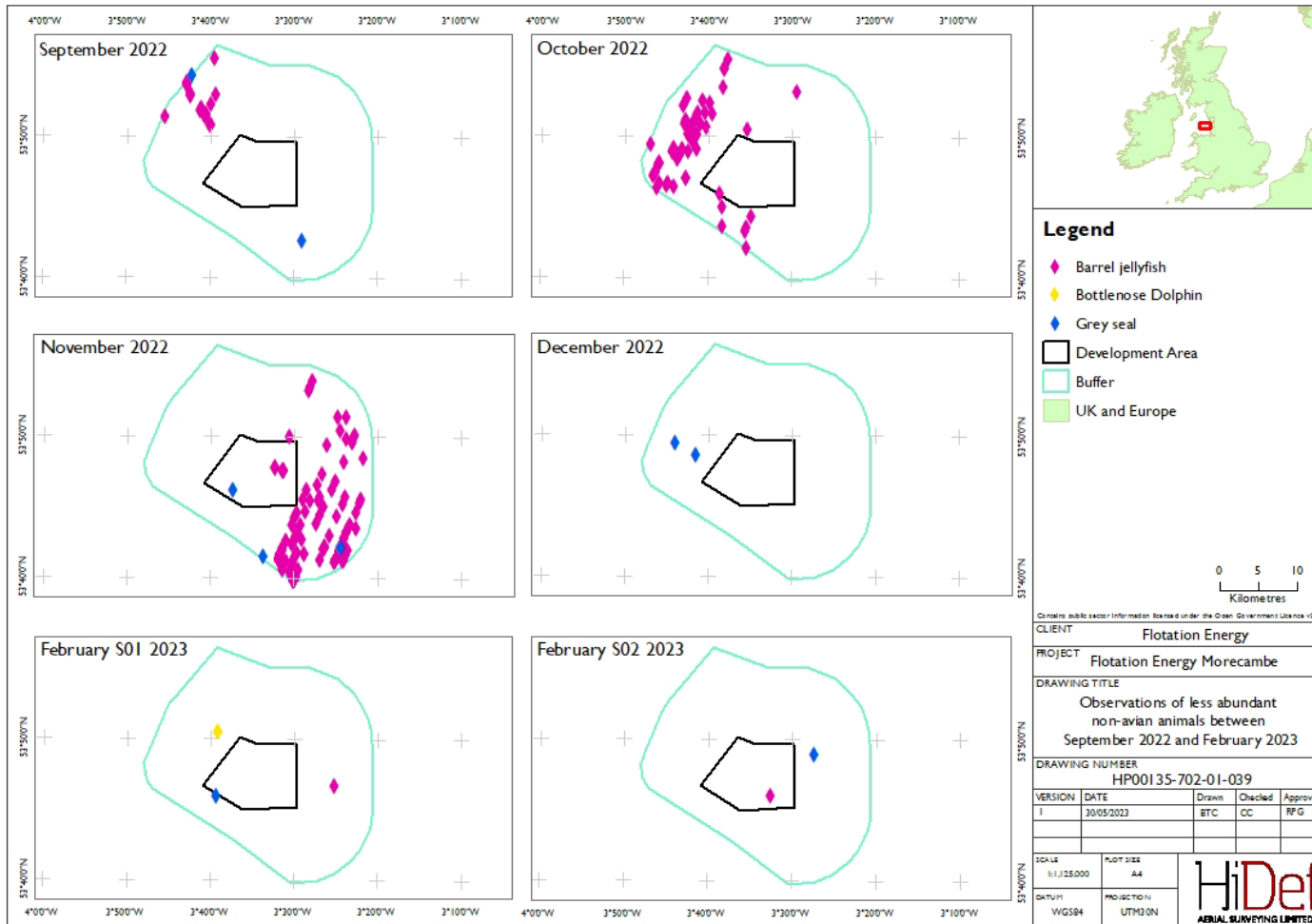
3.3.18 Unidentified non-avian animals

153   Several unidentified non-avian animals were recorded through the survey period, with peaks in non-identification related to jellyfish (in March 2021) and seal species (Figure 117). Seal non-identification is primarily related to difficulties differentiating between harbour and grey seals, which can be problematic as females and juveniles of each species overlap in size.

154   One dolphin species was unidentified in January 2023 and 4 unidentified cetacean observations were recorded across the survey period.

155   Although animals were dispersed throughout the survey area, numerous observations were found in the northern and western buffer (Figure 118 to Figure 121). In August 2022, more observations were found in the eastern buffer.

Figure 117 Number of unidentified non-avian animals recorded within the Morecambe survey area between March 2021 and February 2023
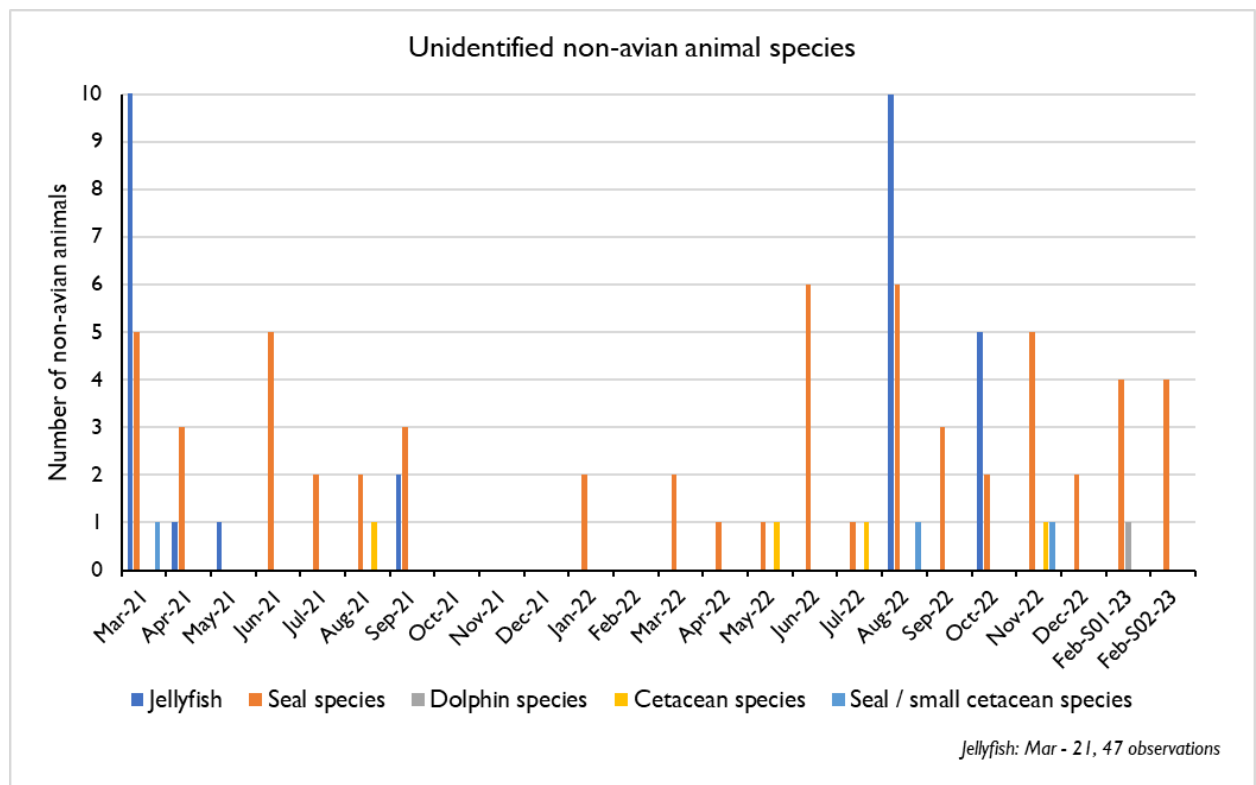
Figure 118   Detections of unidentified non-avian animal species in the Morecambe survey area between March and August 2021

Figure 119 Detections of unidentified non-avian animal species in the Morecambe survey area between September 2021 and February 2022
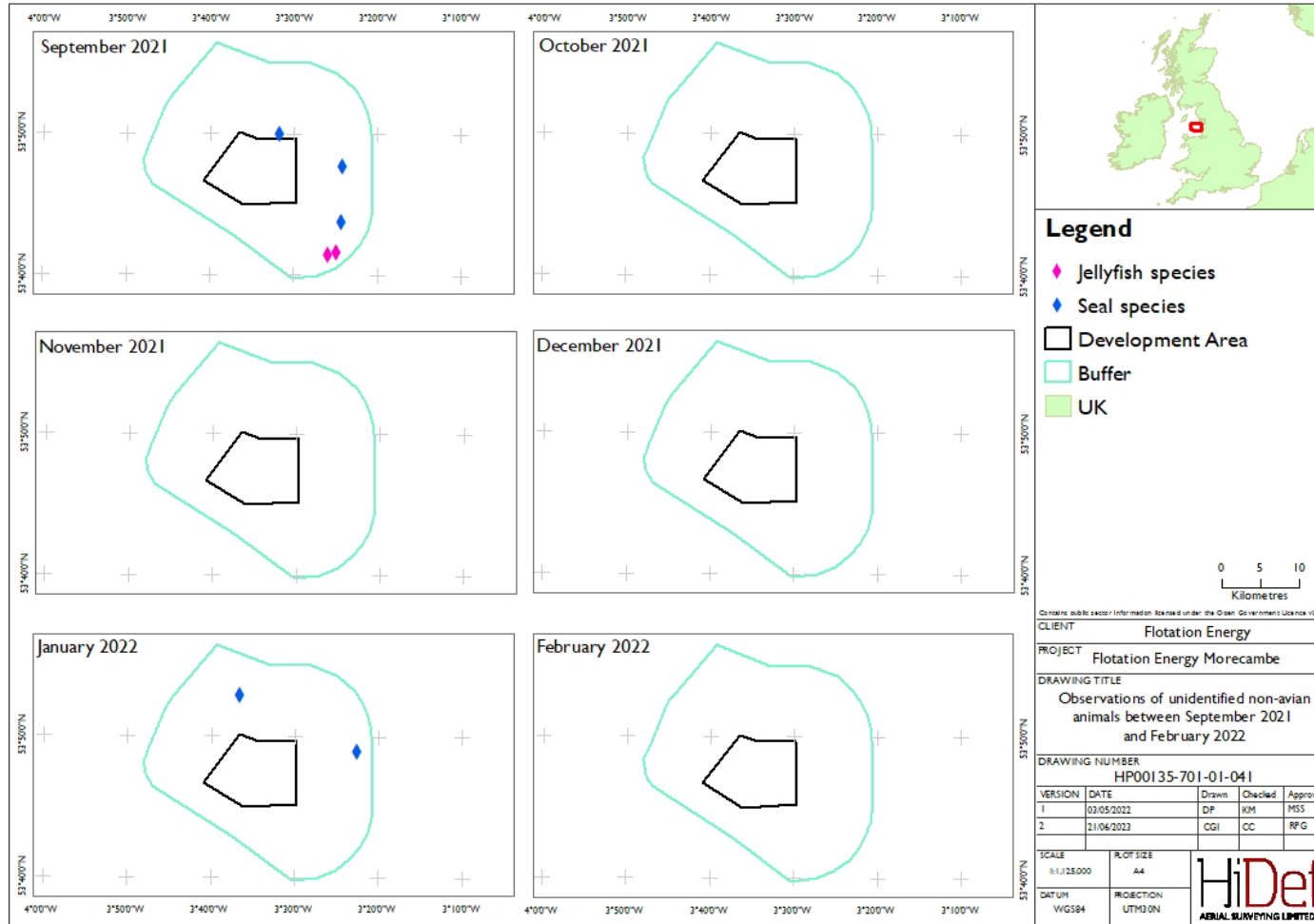
Figure 120   Detections of unidentified non-avian animal species in the Morecambe survey area between March and August 2022
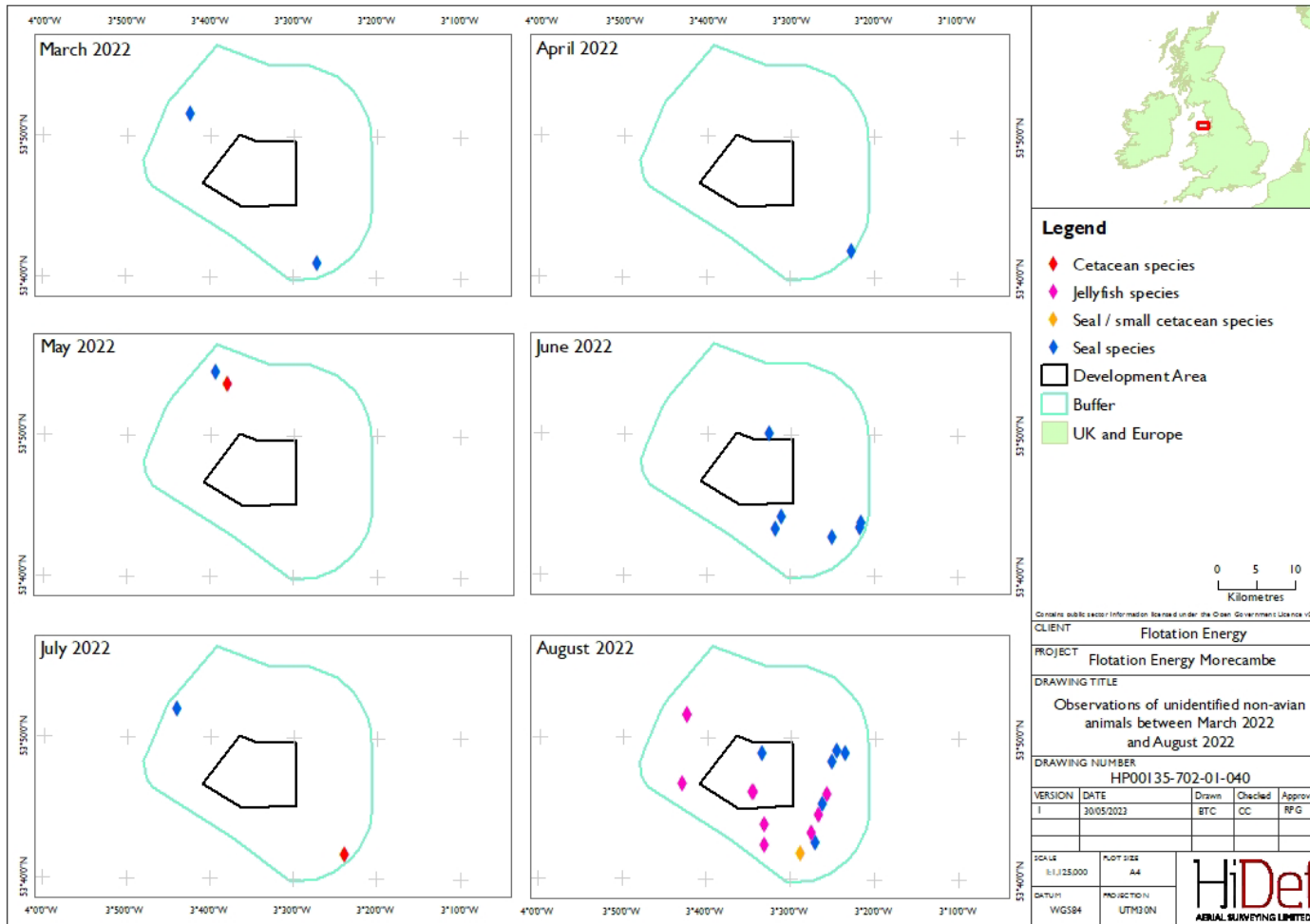
Figure 121 Detections of unidentified non-avian animal species in the Morecambe survey area between September 2022 and February 2023

3.3.19 Anthropogenic activity

156   Anthropogenic activity was recorded in all surveys (Figure 122). Seven fishing boats were recorded in in the survey area, while other boats were recorded intermittently across the survey period. Distribution of objects is presented in (Figure 123 to Figure 126). Many man-made objects were recorded within the buffer, particularly in the east in May and June 2021 and 2022, this included observations such as fishing buoys and navigation buoy. Fixed man-made objects were also records on the project with disused oil and gas platforms observed as well as more recent gas platforms for Calder and South Morecambe. Boats were recorded within the development area in March and July 2021 and July 2022.

Figure 122 Number of vessels and anthropogenic objects recorded within the Morecambe survey area between March 2021 and February 2023
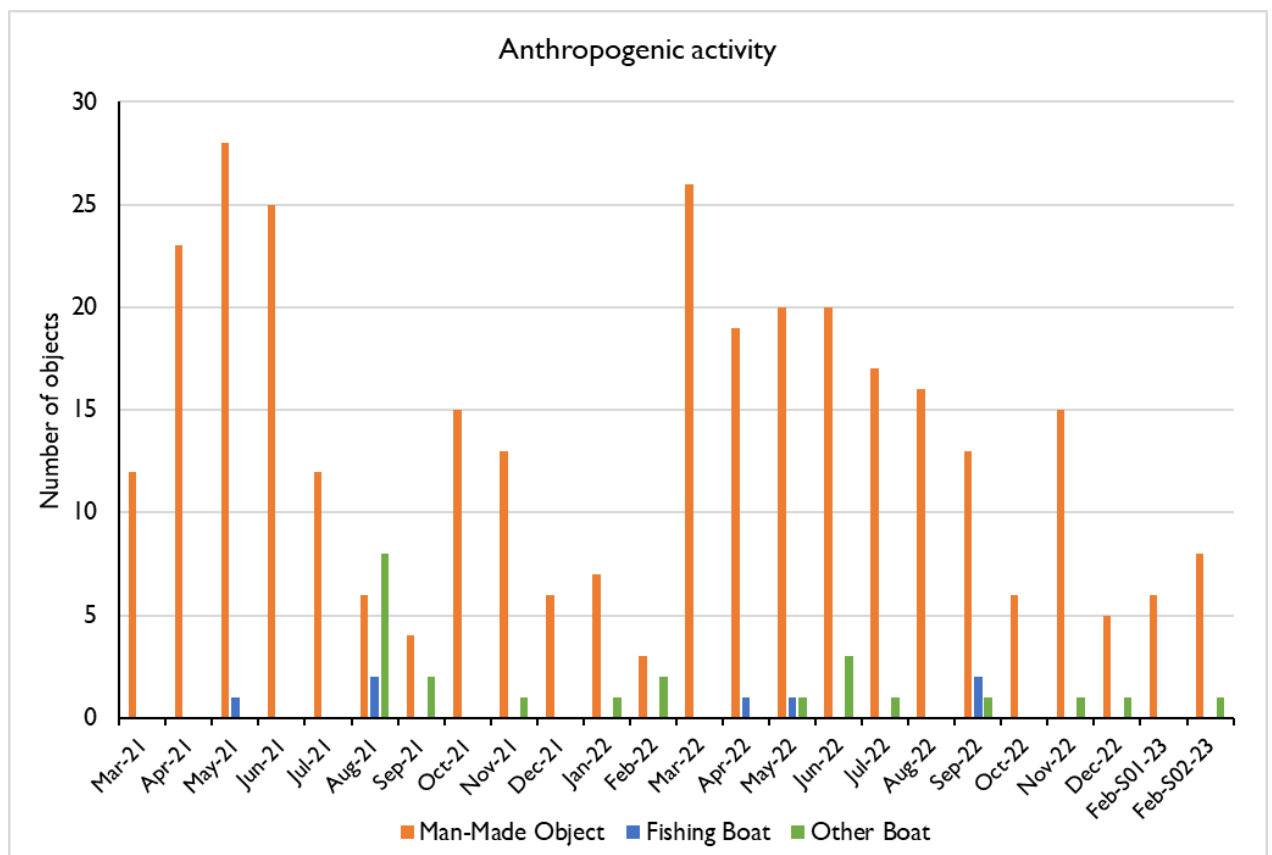
Figure 123 Detections of anthropogenic activity within the Morecambe survey area between March and August 2021
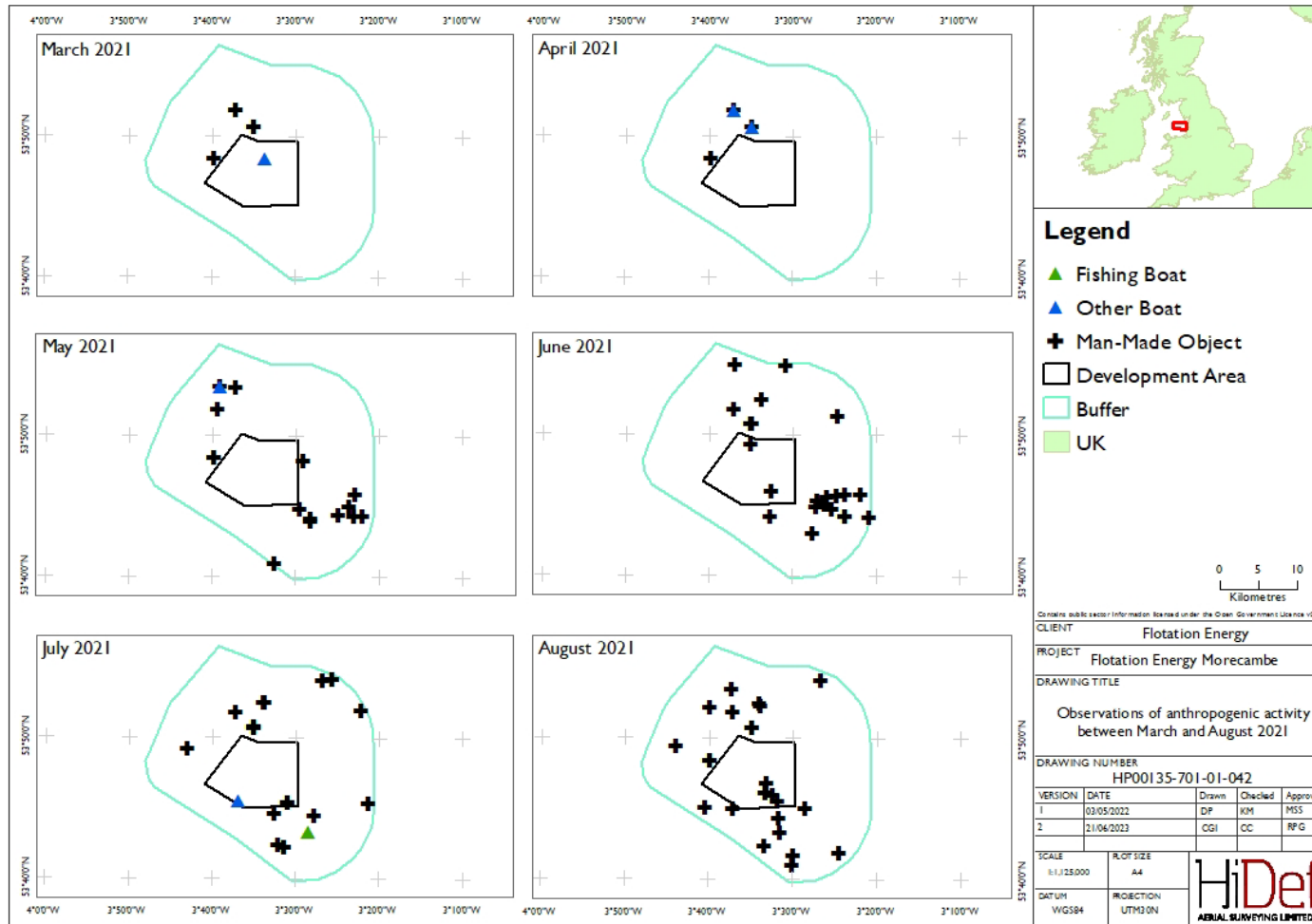
Figure 124 Detections of anthropogenic activity within the Morecambe survey area between September 2021 and February 2022
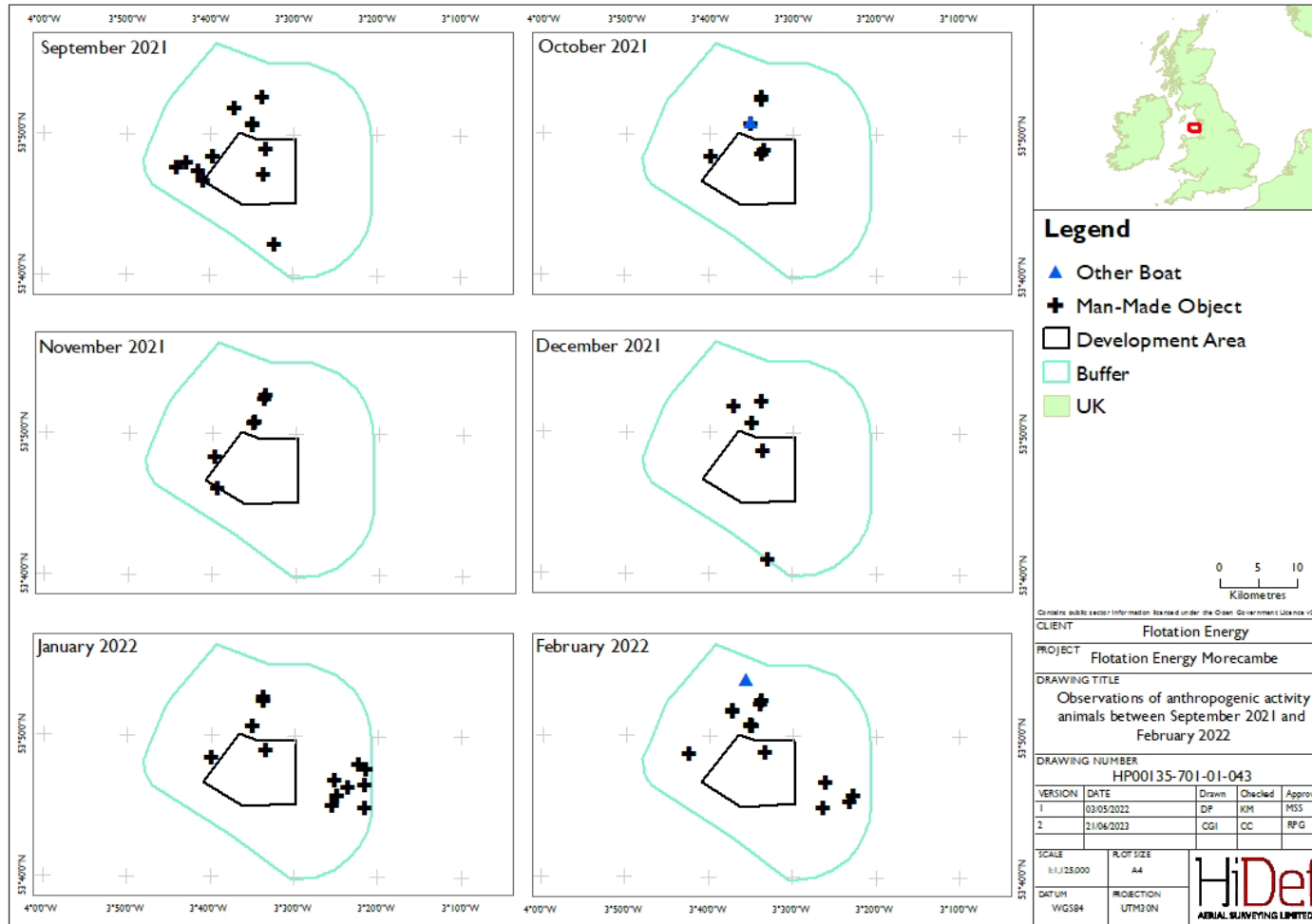
Figure 125 Detections of anthropogenic activity within the Morecambe survey area between March and August 2022
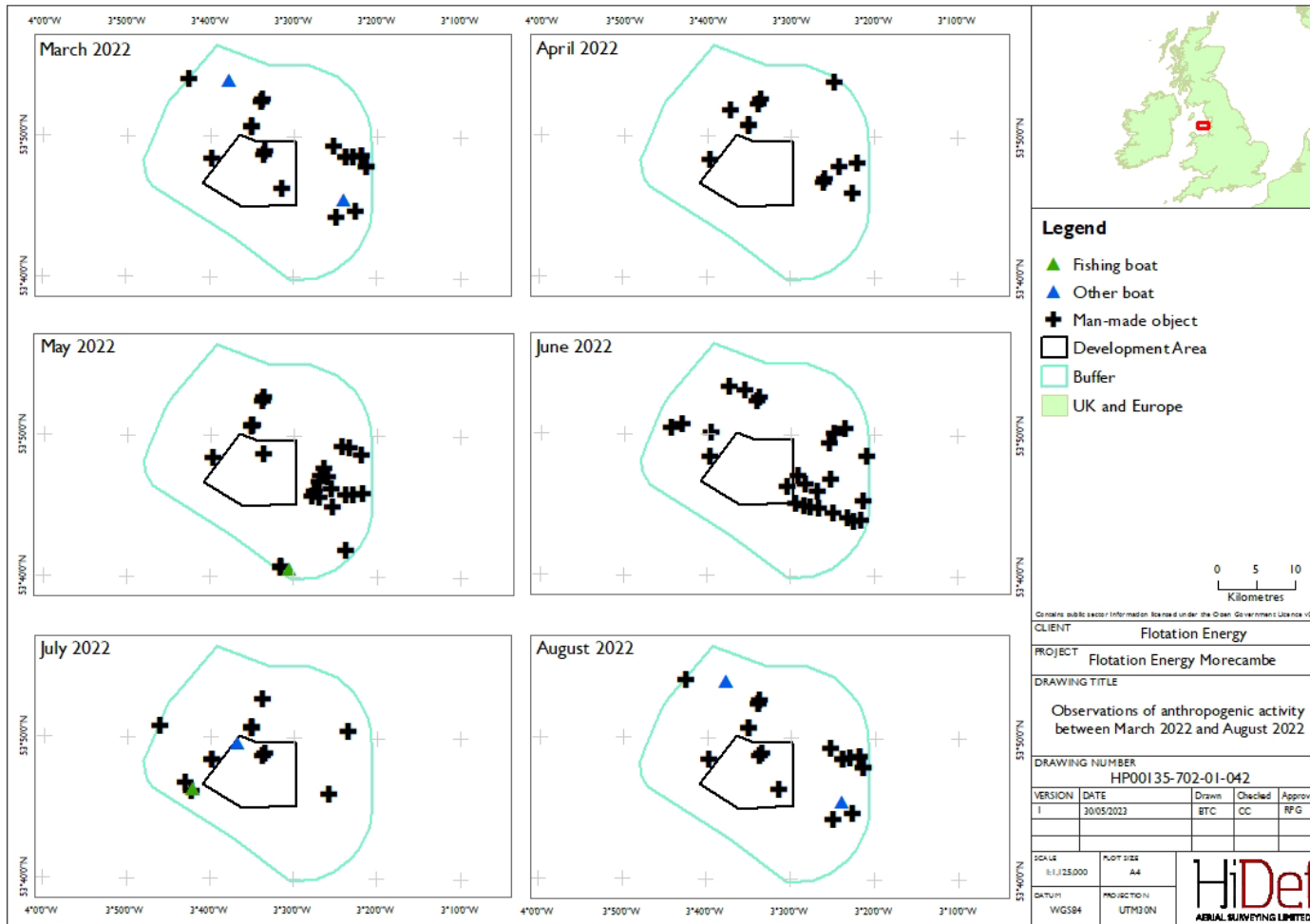
Figure 126   Detections of anthropogenic activity within the Morecambe survey area between September 2022 and February 2023
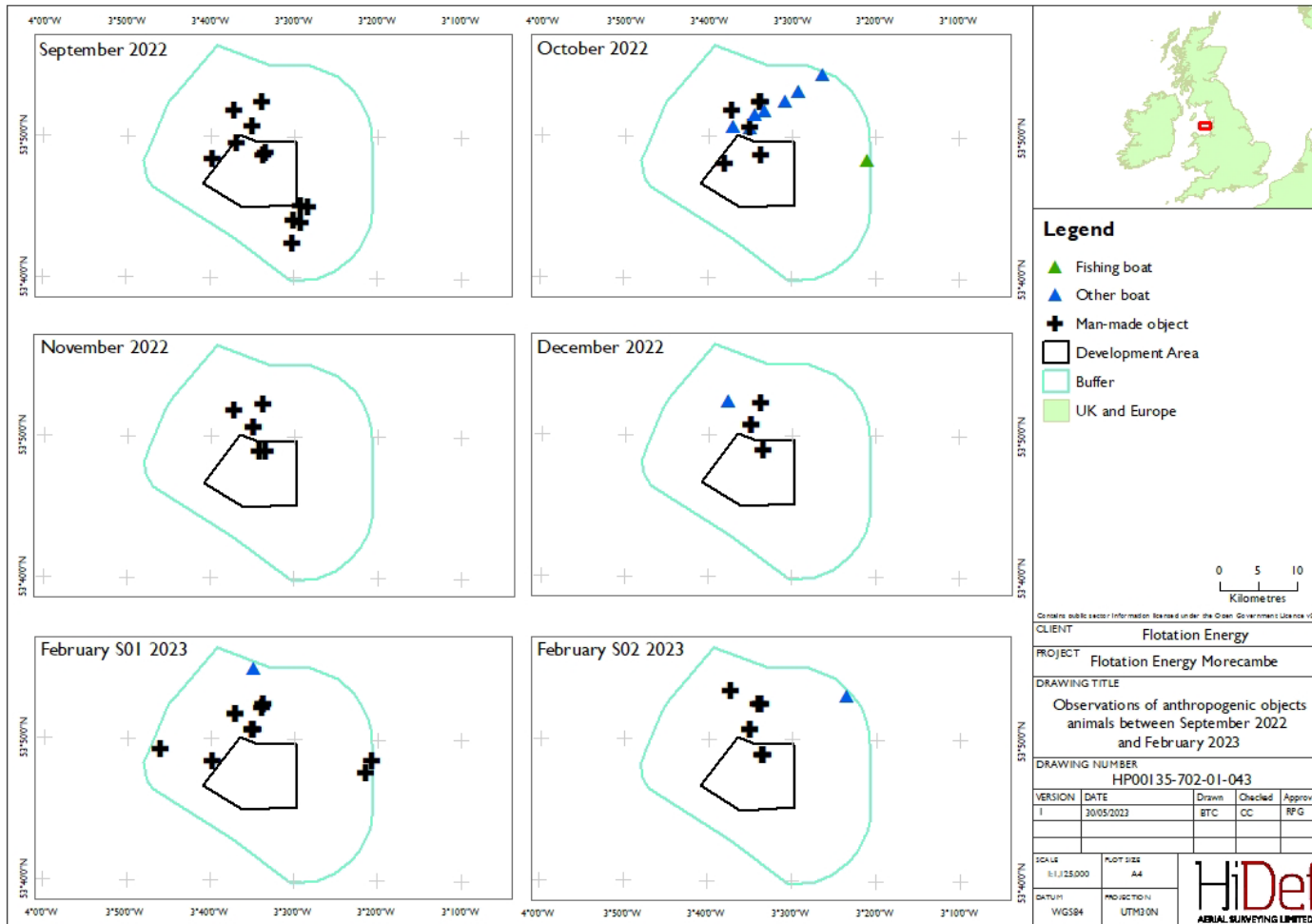
4 Discussion

157 The surveys recorded a total of 63,647 birds of 27 species and 1,523 non-avian animals of seven species. Additionally, 2,048 birds were partially identified to 16 species groups and 133 non-avian animals were partially identified to five species groups. An identification rate to species level of 96.05% was achieved throughout the 24-month survey period.

158 Common scoters were recorded in relatively moderate abundance during the non-breeding season, peaking in December 2022. Observations were distributed in the east of the survey area, as expected, since the Liverpool Bay SPA, which overlaps the eastern and northern buffer, is designated to protect a non-breeding wintering population (Natural England, 2018). It is likely that the area in the vicinity of the development area provides suitable foraging habitat, with shallow, sandy substrate supporting large populations of bivalves and molluscs, a key food source for the species (Kaiser, 2002; Natural England, 2010; Schwemmer *et al.,* 2019).

159 Kittiwake was the third most abundant species recorded, in relatively lower abundance throughout most of the non-breeding winter period with relative increases in the non-breeding season. However, abundance peaked in September of both years, during the post-breeding migration period. During this time relatively high numbers of birds were recorded flying in multiple directions, possibly suggesting the presence of suitable foraging habitat in the vicinity of the development area. The presence of many flying birds in November 2021 could be attributed to passage of birds to offshore wintering areas, and suggest the area is used as a migration route, perhaps by birds moving offshore from nearby breeding colonies such as that at the Ailsa Craig or Rathlin Island SPAs (Furness, 2015).

160 Little gull, compared to other gull species, was recorded in relatively low numbers, peaking in December 2022 and February S02 2023, during the usual non-breeding season. No birds were recorded during the breeding season. Over the winter season, Liverpool Bay and the wider Irish Sea is known to be of importance for little gull, with the Liverpool Bay SPA known to encompass suitable little gull foraging areas, located near the Morecambe development area. Relatively low abundance of little gull is consistent with data from All Wales Common Scoter surveys in 2002/03 (Cranswick *et al.,* 2004).

161 Common gulls were primarily recorded during the non-breeding season, peaking in November and December 2022. These could be associated with the Solway Firth SPA, approximately 77km north of the buffer (JNCC, 2020) where they are protected under non-breeding waterbird assemblage.

162 Similarly to other gull species, herring gull peaked in December 2022, during the non-breeding season.

163 Lesser black-backed gulls were recorded in relatively low numbers throughout the survey period, generally increasing in the breeding season compared to the winter, but peaked in the post-breeding migration period with highest densities recorded in September 2021. Some of these birds could be associated with the Morecambe Bay and Duddon Estuary SPA, located approximately 31km east of the development area, designated for the species (Natural England, 2019).

164 Guillemot was the most abundant species recorded during the 24-month survey period, observed in all surveys, peaking in August 2021, during the post-breeding migration season. High densities observed at this time coupled with the high proportion of birds recorded as sitting on the water, and a number of adult-chick pairs, suggest the survey area is used during the flightless moult period (i.e., post-breeding dispersal). The nearest colonies to the survey area are likely to be those associated with the Rathlin Island or Ailsa Craig SPAs (Furness, 2015).

165   Razorbills were abundant during most months, peaking in December 2022. Elevated densities in March and April coincide with the start of the breeding season, with birds in full attendance at colonies in April, suggesting some birds may be using the area to forage from nearby colonies, such as Rathlin Island SPA (JNCC, 2021). Numbers generally reduced from May onwards, when eggs are laid and incubation and chick-rearing follow. Abundance increased markedly again in October; the usual time of post-moult dispersal, indicating that birds may be utilising the site over the winter period.

166   Red-throated divers were recorded intermittently over the survey programme, peaking in December 2021 and March 2022, during the usual non-breeding period and return migration season. Observations were primarily distributed towards the eastern part of the survey area, close to the Liverpool Bay SPA, which is designated to protect non-breeding populations of the species, suggesting a suitable wintering habitat is available in close proximity of the survey area. Along the west coast of the UK, the wintering population of red-throated divers is patchily distributed, primarily consisting of breeding birds from the UK, Greenland, Iceland and Scandinavia (Natural England, 2010; Furness, 2015; Allen *et al.,* 2020).

167   Manx shearwater was the second most abundant species observed, recorded in relatively high abundance during the breeding season, primarily in July 2021. The relatively large proportion of birds were recorded sitting on the water. Due to their large foraging range (mean max 1346.8km ± 1018.7 SD; Woodward *et al.,* 2019), individuals may be linked to a number of colonies and foraging areas within the Irish Sea and further north, including the Irish Sea Front SPA or Aberdaron Coast and Bardsey Island SPA, south of the survey area (Furness, 2015; JNCC, 2017). Studies, such as Guilford *et al.,* 2008, have shown through GPS tagging that birds from Skomer are capable of foraging in nearby areas to the project.

168   Gannets were recorded in relatively high numbers during the breeding season, peaking in August 2021, with intermittent observations occurring over the non-breeding period. The high proportion of birds recorded as sitting on the water during times of peak densities suggests the survey area provides good foraging habitat for the species. Relatively high numbers of juvenile birds at this time indicates use of the survey area post-breeding, perhaps during migration to wintering areas, with young birds possibly entering the area from gannetries further afield, such as that at Aisla Craig.

169   Harbour porpoise were the most abundant non-avian animals recorded throughout the survey period. As the most common cetacean in UK waters (Hammond *et al.*, 2021), it is not unexpected that this species was the most abundant non-avian animal recorded during the 24-month period. In the survey area, harbour porpoise reached relatively high absolute density estimates for the region when accounting for animals submerged at the time of the survey with an estimated peak absolute density of 6.25 porpoise/km^2 (95% CI 3.38 – 9.97) in May 2022. The estimated densities in the survey area in July 2021 and 2022 equated to 1.54 porpoise/km^2 (20.29% CV) and 0.26 porpoise/km^2 (36.70% CV), respectively. This compares to a mean density of 0.09 porpoise/km^2 (38.30% CV) within the SCANS-III survey Block F and 0.52 porpoise/km^2 (25.0% CV) within the SCANS-IV survey Block CS-E, which overlapped the development area in July 2016 and July 2022, respectively (Hammond *et al.,* 2021; Gilles *et al.,* 2023). The presence of harbour porpoise in the survey area could be linked to the nearby SACs designated for harbour porpoise; The North Anglesey Marine / Gogledd Môn Forol and North Channel SACs, located approximately 45km west and 99km northwest respectively (JNCC, 2019a, 2019b).

5   Conclusions

170   High-resolution digital aerial video footage has provided robust distribution and density data for seabird and marine mammal species in the Morecambe survey area, off the coast of Lancashire. The survey design allows calculation of highly repeatable estimates of species spatial abundance, and the digital aerial platform provides a unique, auditable record of species identification.

171   Regular data collection is essential to begin to determine trends in distributions and abundance of marine species and will be important in informing further assessments and decisions on the development of the area.

172   The surveys recorded a total of 63,647 birds of 27 species and 1,523 non-avian animals of seven species. Additionally, 2,048 birds were partially identified to 16 species groups and 133 non-avian animals were partially identified to five species groups. An identification rate to species level of 96.05% was achieved throughout the 24-month survey period.

173   Several species, such as common scoter, red-throated diver, kittiwake and other gull species were recorded in relatively high densities during the non-breeding period, suggesting the area is utilised as wintering and foraging grounds.

174   The relatively high abundance of species such as Manx shearwater, razorbill and kittiwake during the breeding period suggest the survey area also hosts suitable habitat for some species during this time, with birds likely to visit the area from further afield during long foraging trips. The presence of flying birds, such as by gannet, suggests use of the site post-breeding during passage to wintering areas.

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Appendix I: Density and population estimates for full survey area

176   The density, total estimated population, upper and lower 95% CLs, standard deviation and CV for each species and species group have been calculated using strip transect analysis and are presented here for each of the surveys undertaken.

Table 41   Abundance estimates of species groups in the Morecambe survey area during Survey 1 on 19 March 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	15.32	9982	8606	11379	725	7.26
All non-avian animals	2.4	1564	864	2395	403	25.75
Species group						
Duck species	0.04	27	0	75	21	76.36
Small gull species	1.83	1191	886	1533	161	13.51
Large gull species	0.17	109	44	188	37	33.86
Gull species	0.07	48	24	75	13	26.74
Tern / small gull species	0.01	8	0	20	6	70.47
Large auk	12.45	8108	6964	9340	631	7.78
Auk species	0.54	351	239	504	69	19.62
Auk / small gull	0.03	21	4	43	10	49.11
Auk / shearwater species	0.02	16	0	36	10	59.37
Fulmar / gull species	0.04	27	0	76	23	85.28
Gannet species	0.04	29	4	63	16	56.71
Cormorant / shag	0.01	5	0	12	4	95.59
Jellyfish	1.83	1194	597	1892	337	28.19
Seal species	0.03	20	4	39	9	42.67

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Cetacean species	0.52	336	192	485	77	22.64
Seal / small cetacean species	0.01	8	0	20	6	69.35

Table 42   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 1 on 19 March 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.04	29	0	75	21	72.18
Kittiwake	1.59	1034	723	1364	167	16.06
Little gull	0.16	105	56	157	26	24.21
Common gull	0.11	72	28	128	27	37.24
Great black-backed gull	0.01	8	0	24	8	99.27
Herring gull	0.23	150	63	255	51	33.88
Lesser black-backed gull	0.01	5	0	12	4	97.63
Guillemot	10.97	7148	6144	8267	537	7.50
Razorbill	1.35	882	562	1268	184	20.84
Puffin	0.02	17	0	36	10	58.14
Fulmar	0.01	9	0	20	6	65.18
Manx shearwater	0.01	5	0	12	4	94.38
Gannet	0.04	28	4	63	16	57.48
Shag	0.01	5	0	12	5	99.68
Barrel jellyfish	1.54	1001	499	1632	293	29.30
Harbour porpoise	0.53	344	203	490	74	21.35

Table 43   Apportioned abundance estimates of species in the Morecambe survey area during Survey 1 on 19 March 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.04	28	0	75	21	73.85
Kittiwake	1.61	1049	764	1385	161	15.33
Little gull	0.16	106	59	161	27	25
Common gull	0.11	74	28	131	27	36.73
Great black-backed gull	0.01	8	0	24	8	99.06
Herring gull	0.24	155	67	261	52	33.61
Lesser black-backed gull	0.01	4	0	12	4	103.44
Guillemot	11.39	7423	6337	8512	565	7.61
Razorbill	1.57	1023	698	1432	186	18.14
Puffin	0.04	28	11	51	11	36.75
Fulmar	0.01	9	0	20	6	64.60
Manx shearwater	0.01	4	0	12	4	100.51
Gannet	0.04	28	4	64	17	59.09
Shag	0.01	5	0	12	4	96.78
Barrel jellyfish	1.83	1193	647	1892	330	27.65
Harbour porpoise	0.53	347	209	517	78	22.31

Table 44   Abundance estimates of species groups in the Morecambe survey area during Survey 2 on 07 April 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	6.44	4199	3660	4814	304	7.24
All non-avian animals	0.12	81	52	111	16	18.86
Species group						
Duck species	0.02	16	0	40	11	66.97
Small gull species	1.44	938	538	1531	261	27.83
Large gull species	0.02	16	0	36	10	58.67
Tern species	0.01	8	0	20	6	68.02
Large auk	4.56	2969	2640	3302	179	6.02
Small auk	0.02	17	4	32	8	45.43
Auk species	0.08	52	27	82	15	28.02
Auk / small gull	0.01	5	0	13	5	99.37
Large auk / diver species	0.01	5	0	12	5	100.41
Auk / shearwater species	0.11	73	24	128	27	36.60
Diver species	0.01	8	0	20	6	67.21
Fulmar / gull species	0.01	5	0	12	4	93.49
Shearwater species	0.04	28	8	55	13	45.42

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Gannet species	0.05	33	16	52	10	29.84
Jellyfish	0.01	8	0	20	6	71.17
Seal species	0.03	20	8	36	8	39.45
Cetacean species	0.07	49	24	76	14	26.95
Seal / small cetacean species	0.01	5	0	12	4	93.08

Table 45   **Unapportioned abundance estimates of species in the Morecambe survey area during Survey 2 on 07 April 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.02	16	0	40	11	67.97
Kittiwake	1.46	955	520	1559	261	27.32
Little gull	0.01	9	0	24	8	95.64
Herring gull	0.02	17	0	39	10	59.51
Sandwich tern	0.01	9	0	20	6	66.17
Guillemot	3.47	2258	2043	2485	111	4.90
Razorbill	1.02	665	433	915	126	18.89
Puffin	0.04	24	8	48	11	41.83
Red-throated diver	0.01	8	0	20	6	68.38
Fulmar	0.01	5	0	12	5	98.19
Manx shearwater	0.06	37	8	74	17	46.43
Gannet	0.05	33	16	52	10	29.11
Barrel jellyfish	0.01	5	0	12	4	98.55
Grey seal	0.01	8	0	20	6	68
Harbour porpoise	0.08	53	28	79	14	24.97

Table 46   Apportioned abundance estimates of species in the Morecambe survey area during Survey 2 on 07 April 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.02	16	0	40	11	68.22
Kittiwake	1.46	951	526	1523	260	27.34
Little gull	0.01	9	0	31	9	98.84
Herring gull	0.03	17	0	36	10	55.25
Sandwich tern	0.01	8	0	20	6	65.95
Guillemot	3.56	2319	2108	2542	112	4.80
Razorbill	1.11	723	480	972	126	17.36
Puffin	0.1	67	36	102	18	25.53
Red-throated diver	0.01	9	0	20	6	69.38
Fulmar	0.01	5	0	16	5	96.95
Manx shearwater	0.08	51	21	92	18	35.26
Gannet	0.05	32	16	51	10	29.04
Barrel jellyfish	0.01	8	0	20	6	71
Grey seal	0.03	21	4	40	9	41.20
Harbour porpoise	0.08	52	28	79	14	26.02

Table 47   Abundance estimates of species groups in the Morecambe survey area during Survey 3 on 18 May 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	3.92	2557	2046	3141	286	11.15
All non-avian animals	0.4	260	189	335	39	15.02
Species group						
Wader species	0.03	21	0	60	20	96.14
Small gull species	0.93	606	320	1009	178	29.26
Large gull species	0.02	16	4	32	8	45.96
Gull species	0.03	17	0	36	10	55.36
Skua species	0.01	5	0	12	4	96.38
Large auk	2.22	1445	1125	1756	162	11.17
Auk species	0.03	20	4	43	10	49.21
Auk / small gull	0.01	5	0	12	4	98.73
Auk / shearwater species	0.1	63	28	111	22	34.50
Fulmar / gull species	0.01	8	0	24	8	101.13
Shearwater species	0.3	194	31	440	113	58.08
Gannet species	0.2	132	82	187	27	19.84
Cormorant / shag	0.01	4	0	12	4	98.53
Jellyfish	0.07	49	16	84	18	35.65

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Seal species	0.03	20	0	55	16	78.76
Cetacean species	0.29	192	128	260	35	17.90

Table 48   **Unapportioned abundance estimates of species in the Morecambe survey area during Survey 3 on 18 May 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.93	608	327	1013	178	29.20
Common gull	0.01	9	0	20	6	65.91
Great black-backed gull	0.01	4	0	12	4	101.85
Herring gull	0.01	4	0	12	4	97.36
Lesser black-backed gull	0.01	9	0	20	6	65.57
Great skua	0.01	4	0	12	4	100.63
Guillemot	2.13	1385	1079	1709	161	11.62
Razorbill	0.06	41	12	79	17	41.34
Manx shearwater	0.34	223	51	496	116	51.95
Gannet	0.2	134	85	186	27	19.93
Cormorant	0.01	4	0	12	4	97.94
Barrel jellyfish	0.07	45	16	80	17	37.42
Grey seal	0.03	22	0	63	17	76.59
Harbour porpoise	0.29	192	126	257	35	17.98

Table 49   **Apportioned abundance estimates of species in the Morecambe survey area during Survey 3 on 18 May 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.93	604	331	976	168	27.74
Common gull	0.01	9	0	20	6	68.08
Great black-backed gull	0.01	4	0	12	4	94.34
Herring gull	0.01	5	0	12	4	98.44
Lesser black-backed gull	0.01	9	0	20	6	67.37
Great skua	0.01	5	0	12	4	93.82
Guillemot	2.2	1433	1120	1752	161	11.18
Razorbill	0.07	45	18	80	17	36.54
Manx shearwater	0.38	250	69	498	116	46.43
Gannet	0.2	132	84	185	27	20.39
Cormorant	0.01	4	0	12	4	91.86
Barrel jellyfish	0.07	48	20	84	17	34.68
Grey seal	0.03	21	0	56	16	76.84
Harbour porpoise	0.29	192	130	259	34	17.38

Table 50   Abundance estimates of species groups in the Morecambe survey area during Survey 4 on 01 June 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	3.83	2496	1781	3524	466	18.66
All non-avian animals	0.33	216	145	298	38	17.54
Species group						
Small gull species	0.96	625	316	1131	222	35.55
Large gull species	0.03	21	4	40	10	48.47
Gull species	0.03	17	0	63	17	99.19
Arctic / common tern	0.01	8	0	24	8	98.12
Large auk	2.65	1729	1325	2261	246	14.18
Auk species	0.06	41	20	64	12	29.12
Auk / small gull	0.01	4	0	16	5	103.80
Auk / shearwater species	0.02	12	0	36	12	99.48
Fulmar / gull species	0.01	8	0	20	6	68.54
Shearwater species	0.01	9	0	20	6	67.06
Gannet species	0.05	36	16	59	12	31.81
Cormorant / shag	0.01	4	0	12	4	96.75
Seal species	0.06	37	12	64	14	37.82
Cetacean species	0.27	178	119	243	33	18.27

Table 51   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 4 on 01 June 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.97	633	315	1130	222	35.08
Herring gull	0.02	12	0	32	9	71.94
Lesser black-backed gull	0.01	9	0	20	6	67.72
Common tern	0.01	9	0	24	8	98.34
Guillemot	2.66	1735	1314	2246	235	13.52
Razorbill	0.02	12	0	25	7	54.81
Fulmar	0.01	5	0	16	5	93.85
Manx shearwater	0.01	9	0	20	6	68.09
Gannet	0.06	37	16	60	12	32.86
Cormorant	0.01	4	0	12	4	98.05
Grey seal	0.02	17	4	32	8	46.60
Harbour porpoise	0.28	182	121	253	33	18.01

Table 52   Apportioned abundance estimates of species in the Morecambe survey area during Survey 4 on 01 June 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.97	631	321	1169	224	35.47
Herring gull	0.02	12	0	32	9	71.49
Lesser black-backed gull	0.01	9	0	20	6	66.40
Common tern	0.01	8	0	24	8	97.11
Guillemot	2.71	1763	1326	2266	245	13.87
Razorbill	0.03	17	5	32	7	40.35
Fulmar	0.01	8	0	20	6	70.16
Manx shearwater	0.01	8	0	20	6	69.41
Gannet	0.06	36	16	60	12	32.07
Cormorant	0.01	5	0	12	5	102.61
Grey seal	0.06	37	16	64	13	35.77
Harbour porpoise	0.28	181	122	245	32	17.46

Table 53   **Abundance estimates of species groups in the Morecambe survey area during Survey 5 on 09 July 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	37.95	24724	18682	31900	3441	13.92
All non-avian animals	0.28	180	121	259	35	19.26
Species group						
Small gull species	0.46	299	199	430	62	20.70
Black-backed gull species	0.08	53	24	84	16	30.14
Large gull species	0.05	33	12	63	14	41.99
Gull species	0.09	59	0	179	59	100.47
Large auk	15.08	9826	8243	11497	825	8.39
Auk species	1.71	1112	902	1341	114	10.19
Auk / small gull	0.01	5	0	12	4	93.89
Auk / shearwater species	1.47	955	502	1489	262	27.43
Fulmar / gull species	0.02	12	0	32	9	72.04
Shearwater species	17.88	11648	6545	17961	2871	24.65
Gannet species	1.27	827	648	1025	101	12.13
Jellyfish	0.01	5	0	12	4	95.99
Seal species	0.03	20	8	36	8	40.02
Cetacean species	0.24	157	98	231	33	20.68

Table 54   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 5 on 09 July 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.55	360	194	617	116	32.07
Great black-backed gull	0.03	20	4	36	8	39.40
Herring gull	0.02	17	4	32	8	45.87
Lesser black-backed gull	0.07	48	20	82	16	33.51
Guillemot	16.25	10584	8921	12368	861	8.13
Razorbill	0.07	46	20	75	15	32.23
Puffin	0.18	121	76	168	24	19.53
Fulmar	0.02	12	0	32	9	73.22
Manx shearwater	18.95	12346	6924	18385	2922	23.66
Gannet	1.27	828	661	1021	97	11.70
Barrel jellyfish	0.01	4	0	12	4	97.15
Grey seal	0.01	8	0	20	6	69.25
Harbour seal	0.01	5	0	12	4	94.09
Harbour porpoise	0.24	155	95	218	32	20.54

Table 55   Apportioned abundance estimates of species in the Morecambe survey area during Survey 5 on 09 July 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.55	360	196	614	112	31.12
Great black-backed gull	0.03	21	8	40	9	41.55
Herring gull	0.02	16	4	32	8	48.04
Lesser black-backed gull	0.07	48	20	82	16	33.63
Guillemot	16.46	10726	8992	12353	870	8.11
Razorbill	0.07	45	21	75	14	30.85
Puffin	0.22	142	92	196	27	18.91
Fulmar	0.02	13	0	32	9	71.51
Manx shearwater	19.65	12803	7820	19340	2913	22.75
Gannet	1.27	829	647	1033	102	12.20
Barrel jellyfish	0.01	4	0	12	4	99.67
Grey seal	0.02	14	3	28	7	47.46
Harbour seal	0.01	7	0	17	5	64.47
Harbour porpoise	0.24	157	100	222	32	20.29

Table 56   Abundance estimates of species groups in the Morecambe survey area during Survey 6 on 02 August 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	47.33	30833	25065	36709	2971	9.64
All non-avian animals	0.21	135	76	198	32	23.67
Species group						
Small gull species	4.84	3154	857	6022	1336	42.37
Black-backed gull species	0.09	57	28	92	17	28.57
Large gull species	0.42	273	117	516	106	38.72
Gull species	0.06	41	12	77	16	39.23
Arctic / common tern	0.04	29	0	63	16	54.97
Tern / small gull species	0.01	5	0	12	4	94.48
Skua species	0.02	12	0	32	9	74.14
Large auk	30.86	20100	15904	24695	2250	11.19
Auk species	0.19	125	70	190	31	24.74
Auk / small gull	0.02	13	0	32	9	73.18
Auk / shearwater species	0.54	353	221	519	75	21.28
Fulmar / gull species	0.16	108	60	164	26	24.02
Shearwater species	7.43	4839	3141	6848	972	20.09
Gannet species	2.68	1744	1318	2188	226	12.94

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Cormorant / shag	0.01	4	0	12	4	98.32
Seal species	0.02	16	0	36	9	55.85
Cetacean species	0.18	119	67	180	30	25.01

Table 57   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 6 on 02 August 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	4.88	3180	917	5959	1312	41.26
Great black-backed gull	0.01	9	0	20	6	66.73
Herring gull	0.2	131	48	254	55	41.59
Lesser black-backed gull	0.32	207	96	349	67	32.42
Common tern	0.01	9	0	24	9	94.27
Arctic tern	0.02	13	0	36	12	90.46
Great skua	0.02	13	0	32	9	73.64
Guillemot	30.77	20043	15575	24882	2282	11.38
Razorbill	0.04	24	4	48	12	49.35
Puffin	0.06	37	12	64	14	37.95
Fulmar	0.1	68	29	115	23	32.73
Manx shearwater	7.44	4849	3110	6940	946	19.50
Gannet	2.68	1749	1346	2173	216	12.34
Cormorant	0.01	4	0	12	4	99.83
Grey seal	0.01	9	0	20	6	67.23
Harbour porpoise	0.18	116	60	180	31	26.68

Table 58   Apportioned abundance estimates of species in the Morecambe survey area during Survey 6 on 02 August 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	5.02	3272	938	6484	1411	43.10
Great black-backed gull	0.01	9	0	21	6	63.75
Herring gull	0.2	132	51	268	58	44.20
Lesser black-backed gull	0.37	239	117	413	78	32.31
Common tern	0.01	8	0	24	8	101.14
Arctic tern	0.02	12	0	36	12	96.66
Great skua	0.02	12	0	36	10	78.81
Guillemot	31.1	20260	16036	24728	2309	11.40
Razorbill	0.04	25	5	48	12	46.70
Puffin	0.11	70	37	106	19	26.08
Fulmar	0.14	93	50	140	24	25.02
Manx shearwater	7.93	5164	3419	7276	988	19.13
Gannet	2.7	1762	1360	2249	228	12.90
Cormorant	0.01	4	0	12	4	97.52
Grey seal	0.02	16	0	36	10	57.73
Harbour porpoise	0.18	120	62	184	32	26.22

Table 59   Abundance estimates of species groups in the Morecambe survey area during Survey 7 on 04 September 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	17.76	11571	7838	15649	2063	17.82
All non-avian animals	0.17	113	19	245	59	51.63
Species group						
Small gull species	7.88	5136	3030	7635	1220	23.74
Black-backed gull species	0.13	83	31	147	30	35.99
Large gull species	0.9	589	264	992	182	30.76
Gull species	0.04	25	7	50	12	45.35
Arctic / common tern	0.13	84	19	174	41	49.07
Tern species	0.15	101	44	165	32	31.39
Tern / small gull species	0.03	19	0	38	10	52.80
Large auk	7.87	5126	2133	8486	1631	31.80
Auk species	0.01	7	0	19	7	99.31
Shearwater species	0.1	63	7	162	44	68.46
Gannet species	0.59	386	265	512	63	16.14
Passerine species	0.01	6	0	19	6	100.81
Jellyfish	0.04	27	0	63	17	65.34
Seal species	0.01	7	0	19	7	95.51

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Cetacean species	0.12	82	19	171	41	49.46

Table 60 Unapportioned abundance estimates of species in the Morecambe survey area during Survey 7 on 04 September 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	7.83	5098	2956	7913	1248	24.46
Black-headed gull	0.01	7	0	19	6	96.93
Common gull	0.04	26	0	62	15	56.83
Great black-backed gull	0.06	39	7	80	20	49.86
Herring gull	0.38	250	63	562	128	51.30
Lesser black-backed gull	0.53	349	182	571	96	27.34
Sandwich tern	0.15	96	38	162	32	33.40
Common tern	0.03	19	0	43	11	55.30
Arctic tern	0.03	20	0	44	11	53.87
Guillemot	7.79	5076	2284	8760	1664	32.78
Razorbill	0.01	7	0	19	7	96.60
Manx shearwater	0.09	62	7	157	43	68.93
Gannet	0.59	388	275	515	63	16.26
Barrel jellyfish	0.02	13	0	31	9	68.21
Harbour porpoise	0.12	82	19	177	43	51.96

Table 61   Apportioned abundance estimates of species in the Morecambe survey area during Survey 7 on 04 September 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	7.79	5075	2915	7620	1211	23.85
Black-headed gull	0.01	7	0	19	7	95.75
Common gull	0.04	26	0	57	15	56.71
Great black-backed gull	0.06	40	7	86	21	51.71
Herring gull	0.42	271	73	584	131	48.33
Lesser black-backed gull	0.57	370	189	581	100	26.98
Sandwich tern	0.15	101	43	177	35	34.49
Common tern	0.07	47	11	98	24	49.31
Arctic tern	0.05	36	5	78	19	54.18
Guillemot	7.78	5068	2215	8151	1527	30.13
Razorbill	0.01	7	0	19	7	92.51
Manx shearwater	0.1	64	7	162	44	69.33
Gannet	0.59	384	263	513	64	16.42
Barrel jellyfish	0.04	25	0	63	17	68.89
Harbour porpoise	0.13	83	19	174	41	48.78

Table 62   Abundance estimates of species groups in the Morecambe survey area during Survey 8 on 06 October 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	14.78	9627	7504	11953	1157	12.01
All non-avian animals	0.18	119	67	179	29	24.22
Species group						
Duck species	0.09	62	0	175	55	87.55
Wader species	0.01	10	0	36	10	97.85
Small gull species	0.21	135	70	212	36	26.32
Black-backed gull species	0.01	5	0	14	5	93.94
Large gull species	0.1	68	0	205	64	94.47
Gull species	0.01	10	0	23	7	62.77
Tern species	0.02	14	0	42	14	102.63
Large auk	13.97	9101	6967	11318	1149	12.62
Auk species	0.16	103	56	155	26	25.26
Gannet species	0.05	33	10	60	14	40.38
Seal species	0.01	5	0	14	5	93.94
Cetacean species	0.18	118	61	182	32	26.34

Table 63   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 8 on 06 October 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.09	61	0	175	55	89.36
Snipe	0.01	10	0	28	10	97.75
Kittiwake	0.17	111	60	173	30	26.72
Common gull	0.04	28	9	55	12	42.18
Great black-backed gull	0.01	5	0	14	5	94.81
Herring gull	0.1	66	0	186	59	89.71
Lesser black-backed gull	0.01	5	0	14	5	96.08
Sandwich tern	0.02	14	0	42	14	98.50
Guillemot	11.56	7532	5570	9604	1044	13.86
Razorbill	2.03	1324	993	1713	188	14.16
Gannet	0.05	33	10	60	13	37.83
Grey seal	0.01	5	0	14	5	98.51
Harbour porpoise	0.18	117	60	180	31	26.61

Table 64   Apportioned abundance estimates of species in the Morecambe survey area during Survey 8 on 06 October 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.09	60	0	172	54	90.51
Snipe	0.01	10	0	28	10	98.91
Kittiwake	0.18	116	63	175	30	25.78
Common gull	0.04	29	9	54	12	40.18
Great black-backed gull	0.01	5	0	14	5	99.54
Herring gull	0.1	64	0	186	56	86.62
Lesser black-backed gull	0.01	5	0	14	5	99.57
Sandwich tern	0.02	14	0	42	13	95.14
Guillemot	11.93	7769	5527	10037	1161	14.93
Razorbill	2.13	1389	1029	1788	199	14.30
Gannet	0.05	33	10	56	13	38.03
Grey seal	0.01	5	0	14	5	95.90
Harbour porpoise	0.18	117	65	179	30	25.52

Table 65   Abundance estimates of species groups in the Morecambe survey area during Survey 9 on 17 November 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	18.68	12169	8629	16736	2150	17.67
All non-avian animals	0.17	112	52	184	34	30.32
Species group						
Duck species	0.02	13	0	37	12	94.01
Small gull species	2.99	1948	1287	2925	433	22.21
Black-backed gull species	0.02	13	0	25	7	51.24
Large gull species	0.28	180	66	338	76	41.72
Gull species	0.04	29	8	55	12	40.31
Large auk	14.56	9485	6762	13061	1663	17.53
Auk species	0.28	180	113	263	38	21.13
Auk / small gull	0.03	21	0	49	13	61.67
Auk / shearwater species	0.13	88	0	254	85	96.48
Diver species	0.01	8	0	20	6	67.30
Fulmar / gull species	0.01	9	0	20	6	66.67
Gannet species	0.08	49	9	96	23	45.68
Seal species	0.01	9	0	20	6	67.91
Cetacean species	0.16	105	44	166	33	31.29

Table 66 Unapportioned abundance estimates of species in the Morecambe survey area during Survey 9 on 17 November 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.02	12	0	37	12	96.78
Kittiwake	2.83	1841	1148	2730	429	23.27
Little gull	0.05	33	8	65	15	43.75
Common gull	0.17	113	60	173	30	25.77
Great black-backed gull	0.04	24	4	52	13	52.10
Herring gull	0.23	152	44	326	74	48.73
Lesser black-backed gull	0.01	5	0	13	4	92.99
Guillemot	11.91	7759	5687	10350	1221	15.74
Razorbill	1.71	1114	618	1753	290	26.01
Puffin	0.01	5	0	13	4	96.79
Red-throated diver	0.01	9	0	20	6	66.71
Gannet	0.07	49	9	97	23	47.58
Grey seal	0.01	9	0	20	6	64.22
Harbour porpoise	0.16	106	48	175	33	30.78

Table 67   Apportioned abundance estimates of species in the Morecambe survey area during Survey 9 on 17 November 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.02	13	0	37	12	95.69
Kittiwake	2.9	1887	1151	2903	456	24.16
Little gull	0.05	33	9	64	14	43.12
Common gull	0.18	117	68	178	30	25.03
Great black-backed gull	0.04	27	6	57	14	52.19
Herring gull	0.25	162	54	324	72	44.36
Lesser black-backed gull	0.01	5	0	13	4	95.51
Guillemot	12.99	8460	6193	11268	1333	15.75
Razorbill	1.98	1288	754	1919	304	23.56
Puffin	0.03	18	10	29	6	29.25
Red-throated diver	0.01	8	0	21	6	70.94
Gannet	0.07	48	12	96	22	45.92
Grey seal	0.01	9	0	20	6	67.28
Harbour porpoise	0.16	105	48	173	33	31.02

Table 68   Abundance estimates of species groups in the Morecambe survey area during Survey 10 on 05 December 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	2.81	1830	1488	2221	194	10.57
All non-avian animals	0.07	45	24	71	13	27.72
Species group						
Small gull species	0.76	493	385	608	59	11.84
Black-backed gull species	0.01	9	0	24	9	94.73
Large gull species	0.12	79	32	131	27	33.61
Gull species	0.07	48	16	88	19	38.31
Large auk	1.62	1053	798	1337	137	12.95
Auk species	0.06	36	12	68	14	37.67
Auk / small gull	0.03	7	4	36	9	40.50
Large auk / diver species	0.02	13	0	28	7	56.85
Diver species	0.13	86	35	149	29	33.43
Fulmar / gull species	0.01	4	0	12	4	98.60
Seal species	0.01	9	0	20	6	68.16
Cetacean species	0.06	36	16	63	13	33.84

Table 69   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 10 on 05 December 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.53	344	225	481	65	18.66
Little gull	0.01	9	0	20	6	68.17
Common gull	0.23	152	88	218	35	22.53
Great black-backed gull	0.01	8	0	24	8	94.80
Herring gull	0.13	85	35	146	29	34.02
Guillemot	0.93	608	405	850	113	18.48
Razorbill	0.58	378	247	525	72	18.85
Red-throated diver	0.13	85	36	147	28	33.05
Grey seal	0.01	9	0	20	6	66.46
Harbour porpoise	0.06	36	16	62	12	33.23

Table 70 **Apportioned abundance estimates of species in the Morecambe survey area during Survey 10 on 05 December 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.55	359	257	497	63	17.46
Little gull	0.01	10	1	21	6	56.81
Common gull	0.26	169	100	238	35	20.61
Great black-backed gull	0.01	8	0	24	8	95.07
Herring gull	0.13	87	36	146	28	32.48
Guillemot	1	650	462	878	108	16.52
Razorbill	0.67	440	304	599	77	17.32
Red-throated diver	0.13	85	32	148	30	34.64
Grey seal	0.01	9	0	20	6	68.05
Harbour porpoise	0.05	36	16	63	12	32.95

Table 71   Abundance estimates of species groups in the Morecambe survey area during Survey 11 on 13 January 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	6.62	4316	3355	5295	523	12.12
All non-avian animals	0.13	85	50	123	20	23.08
Species group						
Duck species	0.28	181	43	353	81	44.78
Small gull species	0.4	261	186	345	41	15.43
Large gull species	0.13	88	36	154	31	34.52
Gull species	0.09	61	32	92	17	26.68
Large auk	5.64	3677	2740	4626	480	13.04
Auk species	0.08	52	16	96	22	40.96
Auk / small gull	0.01	8	0	20	6	67.23
Fulmar / gull species	0.01	4	0	12	4	95.19
Seal species	0.01	8	0	20	6	66.97
Cetacean species	0.12	76	43	113	20	25.13

Table 72   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 11 on 13 January 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.26	172	32	357	83	48.29
Kittiwake	0.15	99	56	150	24	24.23
Little gull	0.04	25	8	47	11	42.68
Common gull	0.25	162	108	223	30	18.42
Great black-backed gull	0.01	8	0	20	6	67.28
Herring gull	0.12	76	32	132	27	35.02
Lesser black-backed gull	0.01	4	0	12	4	96.58
Guillemot	5.02	3268	2383	4114	426	13.03
Razorbill	0.46	301	166	462	77	25.47
Fulmar	0.01	5	0	12	4	95.38
Harbour porpoise	0.12	76	43	113	19	24.34

Table 73   Apportioned abundance estimates of species in the Morecambe survey area during Survey 11 on 13 January 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.27	176	44	359	82	46.59
Kittiwake	0.18	118	66	183	30	25.54
Little gull	0.04	24	8	48	11	43.81
Common gull	0.27	177	120	241	32	17.66
Great black-backed gull	0.01	9	0	20	6	66.04
Herring gull	0.12	78	32	141	29	36.84
Lesser black-backed gull	0.01	5	0	12	4	97.72
Guillemot	5.23	3406	2552	4301	460	13.49
Razorbill	0.5	328	180	497	82	24.87
Fulmar	0.01	5	0	16	5	98.67
Harbour porpoise	0.12	77	43	115	19	24.26

Table 74   Abundance estimates of species groups in the Morecambe survey area during Survey 12 on 11 February 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	7.32	4766	3619	5981	604	12.66
All non-avian animals	0.13	88	48	137	24	26.90
Species group						
Duck species	0.11	71	0	180	48	66.67
Small gull species	0.42	275	147	439	73	26.57
Black-backed gull species	0.04	29	8	52	11	38.66
Large gull species	0.11	69	35	108	20	28.24
Gull species	0.03	20	8	36	8	38.54
Large auk	6.5	4236	3152	5426	575	13.57
Auk species	0.1	66	28	113	22	33.60
Auk / small gull	0.02	16	4	32	8	46.59
Diver species	0.01	8	0	20	6	67.66
Seal species	0.01	4	0	12	4	100.87
Cetacean species	0.13	85	48	127	21	24.81

Table 75 Unapportioned abundance estimates of species in the Morecambe survey area during Survey 12 on 11 February 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.11	72	4	187	50	68.69
Kittiwake	0.23	149	75	236	42	27.99
Black-headed gull	0.01	4	0	12	4	97.02
Little gull	0.11	73	12	156	38	51.80
Common gull	0.1	68	32	112	21	30.12
Great black-backed gull	0.01	9	0	20	6	67.10
Herring gull	0.11	72	36	113	20	27.01
Lesser black-backed gull	0.03	21	4	36	8	39.47
Guillemot	5.1	3320	2488	4283	457	13.75
Razorbill	1.27	826	590	1047	118	14.22
Red-throated diver	0.01	8	0	20	6	67.68
Grey seal	0.01	4	0	12	4	97.40
Harbour porpoise	0.13	85	47	131	22	25.17

Table 76 **Apportioned abundance estimates of species in the Morecambe survey area during Survey 12 on 11 February 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.11	74	0	187	50	67.92
Kittiwake	0.23	148	75	234	42	27.81
Black-headed gull	0.01	5	0	12	4	93.07
Little gull	0.11	71	16	156	37	51.82
Common gull	0.1	68	32	112	21	30.48
Great black-backed gull	0.01	9	0	20	6	66.51
Herring gull	0.11	72	36	109	19	26.30
Lesser black-backed gull	0.03	20	8	36	9	41.66
Guillemot	5.25	3421	2472	4381	491	14.34
Razorbill	1.34	876	635	1106	122	13.91
Red-throated diver	0.01	8	0	20	6	69.56
Grey seal	0.01	4	0	12	4	96.36
Harbour porpoise	0.13	85	44	131	22	25.84

Table 77   Abundance estimates of species groups in the Morecambe survey area during Survey 13 on 09 March 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	4.85	3158	2561	3788	319	10.09
All non-avian animals	0.19	125	74	186	29	22.88
Species group						
Duck species	0.01	4	0	12	4	97.67
Small gull species	1.33	864	732	998	68	7.87
Black-backed gull species	0.01	5	0	12	4	95.22
Large gull species	0.15	96	44	156	28	29.27
Large auk	3.10	2017	1529	2477	244	12.10
Auk species	0.02	16	0	36	10	58.99
Diver species	0.12	81	32	144	29	35.63
Fulmar / gull species	0.02	17	4	32	8	48.34
Gannet species	0.06	37	4	79	20	51.53
Seal species	0.04	24	8	40	9	37.59
Cetacean species	0.16	102	51	160	29	27.73

Table 78   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 13 on 09 March 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.01	5	0	16	5	101.03
Kittiwake	1.26	821	689	951	69	8.29
Black-headed gull	0.01	4	0	12	4	100.46
Little gull	0.05	32	12	55	11	32.09
Common gull	0.01	9	0	20	6	68.31
Great black-backed gull	0.01	4	0	12	4	101.16
Herring gull	0.10	64	28	112	23	34.87
Lesser black-backed gull	0.05	33	12	55	12	34.33
Guillemot	1.88	1225	757	1750	245	19.93
Razorbill	1.13	736	544	945	104	14.07
Red-throated diver	0.12	81	32	140	29	35.72
Fulmar	0.01	8	0	20	6	68.94
Gannet	0.06	36	8	79	19	52.53
Grey seal	0.03	17	4	32	8	45.63
Harbour porpoise	0.15	100	52	156	28	27.29

Table 79   Apportioned abundance estimates of species in the Morecambe survey area during Survey 13 on 09 March 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.01	4	0	12	4	99.59
Kittiwake	1.26	819	685	958	70	8.52
Black-headed gull	0.01	5	0	12	4	96.18
Little gull	0.05	33	16	52	10	30.05
Common gull	0.01	9	0	20	6	66.04
Great black-backed gull	0.01	4	0	12	4	99.87
Herring gull	0.10	65	24	115	24	35.68
Lesser black-backed gull	0.05	33	12	56	12	35.23
Guillemot	1.93	1259	792	1750	250	19.82
Razorbill	1.18	771	579	977	101	13.07
Red-throated diver	0.12	79	32	139	29	35.72
Fulmar	0.01	9	0	20	6	66.25
Gannet	0.06	36	8	75	18	49.91
Grey seal	0.04	24	8	43	9	35.70
Harbour porpoise	0.15	101	52	159	28	27.66

Table 80   Abundance estimates of species groups in the Morecambe survey area during Survey 14 on 01 April 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	8.82	5740	4504	7299	720	12.54
All non-avian animals	0.13	85	48	124	20	23.35
Species group						
Duck species	0.03	21	0	48	13	61.11
Small gull species	2.46	1603	921	2905	533	33.22
Black-backed gull species	0.04	25	8	41	9	35.07
Large gull species	0.14	89	36	150	30	32.99
Gull species	0.03	20	0	44	12	55.72
Arctic / common tern	0.01	5	0	12	4	97.69
Tern species	0.01	9	0	20	6	65.40
Large auk	5.75	3746	2945	4633	443	11.81
Auk species	0.16	102	51	163	30	28.99
Auk / small gull	0.05	33	8	64	16	46.30
Large auk / diver species	0.01	4	0	12	4	103.43
Auk / shearwater species	0.04	29	8	55	12	41.51
Fulmar / gull species	0.04	25	4	48	12	48.18
Shearwater species	0.02	16	4	32	8	45.30

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Gannet species	0.09	57	20	113	25	43.31
Seal species	0.02	13	0	28	7	55.54
Cetacean species	0.11	74	36	115	21	27.51

Table 81   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 14 on 01 April 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.03	21	0	48	13	61.65
Kittiwake	2.33	1519	864	2669	522	34.34
Black-headed gull	0.01	5	0	12	5	97.17
Little gull	0.09	57	32	85	15	25.06
Common gull	0.02	12	0	28	7	56.63
Great black-backed gull	0.04	29	8	60	14	46.74
Herring gull	0.12	81	39	132	24	28.93
Lesser black-backed gull	0.01	8	0	20	6	69.35
Sandwich tern	0.01	9	0	20	6	66.52
Common tern	0.01	5	0	16	5	101.35
Guillemot	4.80	3123	2410	3982	403	12.90
Razorbill	0.86	563	381	774	101	17.85
Puffin	0.02	12	0	32	9	73.00
Fulmar	0.03	20	4	40	10	50.03
Manx shearwater	0.04	28	8	53	12	42.38
Gannet	0.09	56	16	113	25	44.03

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Grey seal	0.01	9	0	20	6	65.31
Harbour porpoise	0.11	73	36	112	20	26.33

Table 82   Apportioned abundance estimates of species in the Morecambe survey area during Survey 14 on 01 April 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.03	21	0	48	13	60.63
Kittiwake	2.41	1572	865	2746	532	33.85
Black-headed gull	0.01	5	0	12	4	95.58
Little gull	0.09	56	28	87	15	26.51
Common gull	0.02	12	0	28	7	55.74
Great black-backed gull	0.04	28	5	56	14	46.87
Herring gull	0.13	84	39	130	23	27.48
Lesser black-backed gull	0.01	8	0	20	6	68.53
Sandwich tern	0.01	8	0	20	6	69.26
Common tern	0.01	4	0	12	4	98.81
Guillemot	5.03	3272	2589	4122	392	11.98
Razorbill	0.92	596	408	811	105	17.48
Puffin	0.02	17	3	35	9	52.25
Fulmar	0.04	24	4	48	12	50.19
Manx shearwater	0.05	33	11	60	13	38.19
Gannet	0.08	56	16	108	25	44.79

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Grey seal	0.02	12	0	28	7	56.75
Harbour porpoise	0.11	73	36	113	20	27.50

Table 83   Abundance estimates of species groups in the Morecambe survey area during Survey 15 on 02 May 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	33.04	21508	15051	29388	3663	17.03
All non-avian animals	1.13	734	421	1134	191	26.04
Species group						
Wader species	0.05	33	4	71	19	56.86
Small gull species	2.30	1501	803	2667	522	34.78
Black-backed gull species	0.11	69	24	128	29	41.01
Large gull species	0.41	268	71	538	119	44.13
Gull species	0.06	39	4	87	22	54.97
Arctic / common tern	0.43	278	113	497	99	35.47
Tern species	0.07	47	16	87	18	37.74
Large auk	16.45	10705	8395	13918	1427	13.32
Auk species	0.16	105	60	153	25	23.01
Auk / small gull	0.04	25	8	40	9	34.51
Auk / shearwater species	0.88	571	386	788	102	17.77
Diver species	0.02	16	0	36	10	56.94
Fulmar / gull species	0.23	153	51	317	73	47.24
Shearwater species	10.87	7078	4224	10699	1634	23.08

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Gannet species	1.02	663	315	1118	213	31.99
Corvid species	0.01	5	0	12	4	94.50
Passerine species	0.02	16	0	40	11	68.76
Jellyfish	0.01	5	0	13	4	95.81
Seal species	0.01	9	0	21	6	69.99
Cetacean species	1.12	729	403	1128	192	26.34

Table 84 **Unapportioned abundance estimates of species in the Morecambe survey area during Survey 15 on 02 May 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Dunlin	0.03	17	0	48	17	96.11
Kittiwake	2.32	1513	804	2716	532	35.14
Common gull	0.01	5	0	12	4	97.37
Great black-backed gull	0.14	91	12	211	55	59.82
Herring gull	0.29	191	40	433	112	58.37
Lesser black-backed gull	0.11	73	16	152	36	49.68
Common tern	0.03	21	4	41	11	50.17
Arctic tern	0.30	197	99	324	59	29.79
Guillemot	15.68	10208	7836	13222	1438	14.09
Razorbill	0.63	412	258	605	90	21.74
Puffin	0.05	33	8	64	14	42.82
Red-throated diver	0.02	17	0	39	10	58.49
Fulmar	0.18	119	35	244	55	45.79
Manx shearwater	11.03	7178	4115	10744	1652	23.01
Gannet	0.99	642	287	1105	213	33.15
Carrion crow	0.01	5	0	12	4	96.61

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Barrel jellyfish	0.01	4	0	12	4	99.36
Grey seal	0.01	5	0	13	5	94.74
Harbour porpoise	1.10	717	381	1178	196	27.25

Table 85   Apportioned abundance estimates of species in the Morecambe survey area during Survey 15 on 02 May 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Dunlin	0.05	33	4	68	18	53.02
Kittiwake	2.29	1493	806	2619	513	34.31
Common gull	0.01	5	0	12	4	91.58
Great black-backed gull	0.15	99	16	231	58	58.61
Herring gull	0.33	212	50	475	115	53.85
Lesser black-backed gull	0.11	74	17	154	36	47.76
Common tern	0.03	23	7	43	10	43.75
Arctic tern	0.36	234	124	355	63	26.58
Guillemot	15.97	10393	7847	13616	1465	14.10
Razorbill	0.70	455	295	644	89	19.58
Puffin	0.09	62	33	95	17	26.18
Red-throated diver	0.03	17	0	36	10	56.81
Fulmar	0.20	131	44	260	58	43.65
Manx shearwater	11.68	7605	4716	11292	1657	21.78
Gannet	0.99	645	288	1170	223	34.54
Carrion crow	0.01	5	0	13	4	93.95

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Barrel jellyfish	0.01	4	0	12	4	100.00
Grey seal	0.01	8	0	20	6	70.70
Harbour porpoise	1.11	721	390	1151	196	27.09

Table 86   Abundance estimates of species groups in the Morecambe survey area during Survey 16 on 07 June 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	14.9	9700	6574	13662	1858	19.15
All non-avian animals	0.41	265	176	359	46	17.38
Species group						
Wader species	0.18	121	0	360	115	95.67
Small gull species	1.37	891	664	1146	125	14.00
Black-backed gull species	0.02	17	0	45	13	80.03
Large gull species	0.05	36	12	64	14	38.44
Gull species	0.02	13	0	28	7	53.89
Arctic / common tern	0.11	74	4	190	52	70.92
Tern species	0.01	4	0	12	4	99.14
Large auk	7.97	5190	3765	7058	848	16.33
Auk species	0.04	29	8	55	13	43.59
Auk / small gull	0.02	13	0	28	7	53.12
Auk / shearwater species	0.36	238	103	425	87	36.54
Fulmar / gull species	0.01	4	0	12	4	100.70
Shearwater species	4.37	2847	1176	5135	1013	35.56
Gannet species	0.20	133	90	182	25	18.39

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Jellyfish	0.04	28	4	64	16	57.99
Seal species	0.04	28	8	55	13	44.61
Cetacean species	0.32	207	119	309	50	23.91

Table 87   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 16 on 07 June 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Grey plover	0.19	124	0	359	119	95.70
Kittiwake	1.40	909	653	1154	130	14.25
Herring gull	0.06	37	12	67	15	41.26
Lesser black-backed gull	0.03	20	0	48	13	61.81
Sandwich tern	0.01	4	0	12	4	94.96
Arctic tern	0.01	4	0	12	4	98.29
Guillemot	7.67	4995	3661	6648	777	15.54
Razorbill	0.34	223	40	564	160	71.51
Puffin	0.01	9	0	25	8	91.94
Fulmar	0.01	5	0	12	4	94.00
Manx shearwater	4.56	2969	1151	5270	1046	35.23
Gannet	0.20	133	84	183	26	19.03
Lion's mane jellyfish	0.04	29	4	63	16	56.37
Grey seal	0.01	4	0	12	4	99.80
Harbour porpoise	0.32	209	128	312	49	23.28

Table 88   **Apportioned abundance estimates of species in the Morecambe survey area during Survey 16 on 07 June 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Grey plover	0.19	123	0	360	122	99.38
Kittiwake	1.39	908	674	1196	131	14.36
Herring gull	0.06	41	12	76	17	40.07
Lesser black-backed gull	0.03	21	0	52	13	63.38
Sandwich tern	0.01	4	0	13	4	99.80
Arctic tern	0.03	21	0	51	13	62.75
Guillemot	7.80	5079	3680	6865	804	15.83
Razorbill	0.36	236	49	562	154	64.99
Puffin	0.02	14	0	33	9	65.24
Fulmar	0.01	5	0	12	4	92.87
Manx shearwater	4.63	3017	1198	5254	1101	36.49
Gannet	0.20	132	87	181	25	18.92
Lion's mane jellyfish	0.04	27	4	60	16	58.83
Grey seal	0.04	28	8	55	13	43.46
Harbour porpoise	0.32	210	122	316	49	23.36

Table 89   Abundance estimates of species groups in the Morecambe survey area during Survey 17 on 14 July 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	36.56	23796	17765	30082	3098	13.02
All non-avian animals	0.06	41	20	64	12	28.64
Species group						
Small gull species	2.91	1895	1095	2969	469	24.74
Black-backed gull species	0.08	53	28	84	15	27.49
Large gull species	0.28	186	91	314	59	31.33
Gull species	0.02	13	0	32	9	70.21
Arctic / common tern	0.02	12	0	24	7	53.78
Tern species	0.04	25	0	52	14	57.90
Large auk	24.19	15748	12446	19087	1726	10.96
Auk species	0.23	152	92	222	34	21.87
Auk / small gull	0.03	17	4	32	8	45.81
Auk / shearwater species	0.71	466	311	651	90	19.29
Fulmar / gull species	0.06	37	12	68	15	40.82
Shearwater species	7.41	4826	2345	8419	1614	33.44
Gannet species	0.64	417	235	628	104	24.88
Jellyfish	0.01	9	0	20	6	67.23

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Seal species	0.01	4	0	12	4	104.06
Cetacean species	0.04	28	12	52	11	37.83

Table 90   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 17 on 14 July 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	2.90	1890	1113	2922	466	24.62
Common gull	0.01	4	0	12	4	100.30
Herring gull	0.15	96	24	202	47	48.10
Lesser black-backed gull	0.23	147	76	244	43	29.14
Sandwich tern	0.01	5	0	12	4	98.19
Guillemot	23.94	15581	12194	19059	1756	11.27
Razorbill	0.05	33	8	65	16	49.10
Fulmar	0.04	25	8	48	11	42.71
Manx shearwater	7.75	5044	2405	8651	1632	32.35
Gannet	0.64	415	219	642	108	25.99
Lion's mane jellyfish	0.01	8	0	20	6	67.29
Harbour porpoise	0.04	25	8	47	11	42.12

Table 91   Apportioned abundance estimates of species in the Morecambe survey area during Survey 17 on 14 July 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	2.96	1925	1115	2926	469	24.32
Common gull	0.01	4	0	12	4	99.71
Herring gull	0.15	101	30	204	46	45.14
Lesser black-backed gull	0.23	152	84	239	42	27.12
Sandwich tern	0.04	25	0	56	14	57.53
Guillemot	24.45	15919	12580	19425	1784	11.21
Razorbill	0.05	33	8	65	15	46.74
Fulmar	0.05	30	8	59	14	45.93
Manx shearwater	7.89	5138	2520	8772	1682	32.72
Gannet	0.63	409	221	639	108	26.23
Lion's mane jellyfish	0.01	8	0	20	6	64.53
Harbour porpoise	0.04	28	8	48	11	36.70

Table 92   Abundance estimates of species groups in the Morecambe survey area during Survey 18 on 09 August 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	36.99	24076	20576	28162	1934	8.03
All non-avian animals	0.62	406	203	720	148	36.39
Species group						
Small gull species	2.70	1761	1234	2365	291	16.48
Black-backed gull species	0.16	104	60	155	26	24.10
Large gull species	0.23	148	44	291	64	43.22
Gull species	0.01	8	0	24	9	101.97
Arctic / common tern	0.01	9	0	20	6	70.02
Tern species	0.01	9	0	20	6	68.56
Large auk	25.06	16315	14651	18291	910	5.58
Auk species	0.02	16	4	32	8	44.82
Auk / small gull	0.04	25	8	48	11	42.95
Auk / shearwater species	1.29	838	465	1347	217	25.86
Shearwater species	7.10	4622	2626	7097	1172	25.35
Gannet species	0.36	235	168	311	39	16.19
Cormorant / shag	0.01	9	0	24	8	96.97
Jellyfish	0.06	40	12	72	16	40.21

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Seal species	0.06	40	16	68	14	32.97
Dolphin species	0.20	129	0	384	130	100.91
Cetacean species	0.30	197	126	275	38	19.06
Seal / small cetacean species	0.01	5	0	12	5	100.23

Table 93   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 18 on 09 August 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	2.71	1767	1195	2362	303	17.15
Common gull	0.01	5	0	12	4	96.32
Great black-backed gull	0.01	5	0	12	5	97.65
Herring gull	0.10	63	0	144	37	58.76
Lesser black-backed gull	0.24	154	88	224	36	22.86
Sandwich tern	0.01	4	0	12	4	104.59
Guillemot	25.26	16441	14733	18448	985	5.99
Manx shearwater	7.59	4940	2854	7445	1201	24.30
Gannet	0.36	237	168	305	36	15.15
Shag	0.01	9	0	24	8	96.58
Grey seal	0.02	16	4	32	8	46.44
Common dolphin	0.19	127	0	383	119	93.79
Harbour porpoise	0.30	199	126	278	37	18.43

Table 94   Apportioned abundance estimates of species in the Morecambe survey area during Survey 18 on 09 August 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	2.78	1808	1229	2487	313	17.29
Common gull	0.01	9	0	25	9	96.68
Great black-backed gull	0.01	4	0	13	4	102.45
Herring gull	0.13	86	12	194	48	54.83
Lesser black-backed gull	0.25	163	93	238	37	22.54
Sandwich tern	0.01	4	0	12	4	96.99
Guillemot	25.48	16585	14794	18673	980	5.91
Manx shearwater	7.92	5155	2934	7689	1225	23.76
Gannet	0.37	238	166	314	39	16.18
Shag	0.01	8	0	24	9	104.76
Grey seal	0.06	41	20	66	13	30.43
Common dolphin	0.20	129	0	382	124	96.03
Harbour porpoise	0.30	197	128	274	37	18.72

Table 95   Abundance estimates of species groups in the Morecambe survey area during Survey 19 on 02 September 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	28.89	18805	15548	22630	1839	9.78
All non-avian animals	0.32	208	132	291	41	19.45
Species group						
Small gull species	3.69	2402	1556	3378	466	19.40
Black-backed gull species	0.04	25	8	49	11	44.46
Large gull species	0.14	91	39	157	32	34.50
Gull species	0.02	12	0	25	7	54.08
Arctic / common tern	0.02	13	0	32	9	71.84
Tern species	0.05	33	12	56	13	38.02
Skua species	0.01	9	0	20	6	66.45
Large auk	21.55	14031	12062	16493	1104	7.86
Auk species	0.05	36	16	59	12	32.70
Auk / small gull	0.04	24	8	43	9	36.28
Auk / shearwater species	0.28	181	109	265	39	21.17
Shearwater species	2.63	1715	553	3274	718	41.83
Gannet species	0.27	179	60	363	82	45.79
Jellyfish	0.13	82	28	160	34	41.43

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Seal species	0.03	21	8	40	9	40.31
Cetacean species	0.17	108	59	167	28	25.41

Table 96   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 19 on 02 September 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	3.73	2426	1565	3466	477	19.66
Great black-backed gull	0.01	9	0	20	6	67.47
Herring gull	0.03	20	4	40	10	49.27
Lesser black-backed gull	0.13	85	36	145	29	33.62
Sandwich tern	0.05	33	12	59	13	37.75
Common tern	0.01	8	0	20	6	70.46
Arctic skua	0.01	4	0	12	4	98.40
Guillemot	21.67	14105	12229	16443	1079	7.65
Razorbill	0.02	17	0	36	10	58.92
Puffin	0.01	4	0	12	4	100.60
Manx shearwater	2.76	1797	586	3422	730	40.59
Gannet	0.28	183	63	381	86	46.68
Barrel jellyfish	0.12	80	20	154	35	42.61
Grey seal	0.01	9	0	21	6	69.37
Harbour porpoise	0.17	109	56	173	29	26.79

Table 97   Apportioned abundance estimates of species in the Morecambe survey area during Survey 19 on 02 September 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	3.73	2432	1551	3433	485	19.93
Great black-backed gull	0.01	9	0	21	6	67.39
Herring gull	0.03	20	4	41	10	48.11
Lesser black-backed gull	0.13	88	36	149	30	34.07
Sandwich tern	0.05	33	12	59	13	38.16
Common tern	0.01	8	0	20	6	67.99
Arctic skua	0.01	5	0	12	4	96.12
Guillemot	21.74	14149	12273	16655	1122	7.93
Razorbill	0.03	17	1	39	10	60.26
Puffin	0.01	10	2	20	5	49.13
Manx shearwater	2.77	1800	675	3209	671	37.25
Gannet	0.28	181	66	360	82	45.45
Barrel jellyfish	0.12	80	24	150	33	40.49
Grey seal	0.03	21	4	39	9	42.44
Harbour porpoise	0.17	109	55	173	30	27.42

Table 98   Abundance estimates of species groups in the Morecambe survey area during Survey 20 on 03 October 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	20.36	13256	11448	15267	991	7.48
All non-avian animals	0.68	440	276	669	99	22.41
Small gull species	0.64	419	237	660	108	25.82
Large gull species	0.09	57	20	105	22	39.07
Gull species	0.10	66	0	190	60	89.42
Large auk	18.93	12322	10632	14022	884	7.17
Auk species	0.29	192	108	290	47	24.38
Auk / small gull	0.08	52	20	95	20	37.54
Auk / shearwater species	0.10	67	8	161	41	61.12
Fulmar / gull species	0.05	33	0	88	25	75.96
Gannet species	0.07	45	20	72	14	29.85
Jellyfish	0.43	277	105	500	100	35.78
Seal species	0.01	8	0	20	6	67.63
Cetacean species	0.24	156	111	202	24	15.35

Table 99   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 20 on 03 October 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.67	434	230	696	118	27.10
Little gull	0.01	4	0	12	4	98.71
Common gull	0.02	13	0	32	9	67.49
Great black-backed gull	0.04	25	4	52	13	51.57
Herring gull	0.11	70	12	156	38	54.19
Lesser black-backed gull	0.02	16	0	44	13	75.91
Guillemot	16.64	10830	9434	12262	723	6.67
Razorbill	1.44	940	593	1354	193	20.53
Puffin	0.02	12	0	28	7	56.28
Gannet	0.07	44	20	72	14	31.15
Barrel jellyfish	0.39	252	87	440	92	36.54
Harbour porpoise	0.24	156	111	201	24	14.94

Table 100   Apportioned abundance estimates of species in the Morecambe survey area during Survey 20 on 03 October 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.74	482	278	731	119	24.53
Little gull	0.01	5	0	12	4	93.54
Common gull	0.02	13	0	32	9	67.70
Great black-backed gull	0.04	24	4	52	13	54.57
Herring gull	0.12	76	12	177	44	57.44
Lesser black-backed gull	0.03	18	0	51	15	79.66
Guillemot	17.72	11532	10115	12982	735	6.37
Razorbill	1.59	1032	659	1508	218	21.08
Puffin	0.04	29	15	47	9	28.62
Gannet	0.07	45	20	70	14	29.41
Barrel jellyfish	0.43	278	108	500	103	36.81
Harbour porpoise	0.24	156	111	202	24	15.20

Table 101   Abundance estimates of species groups in the Morecambe survey area during Survey 21 on 22 November 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	15.47	10073	7080	14071	1766	17.53
All non-avian animals	1.57	1023	556	1676	287	27.99
Duck species	0.25	164	56	298	63	38.21
Small gull species	1.86	1214	981	1452	120	9.84
Black-backed gull species	0.01	4	0	13	4	103.76
Large gull species	0.40	259	169	356	49	18.93
Gull species	0.09	57	20	97	20	34.76
Large auk	12.34	8032	5198	11602	1651	20.55
Auk species	0.34	221	125	341	57	25.42
Auk / small gull	0.13	85	44	129	22	26.06
Large auk / diver species	0.01	4	0	13	4	97.68
Auk / shearwater species	0.02	13	0	33	9	71.47
Diver species	0.01	5	0	13	5	98.48
Fulmar / gull species	0.04	25	8	47	11	43.77
Gannet species	0.03	21	4	44	11	47.89
Cormorant / shag	0.02	16	0	49	16	96.69

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Jellyfish	0.98	642	201	1206	254	39.56
Seal species	0.05	33	16	53	10	30.12
Cetacean species	0.50	328	233	421	48	14.45
Seal / small cetacean species	0.01	5	0	13	4	95.11

Table 102   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 21 on 22 November 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.25	164	53	293	63	38.26
Kittiwake	1.28	834	659	1005	87	10.42
Black-headed gull	0.01	4	0	13	4	93.81
Little gull	0.21	140	85	197	28	19.86
Common gull	0.39	257	169	358	49	18.92
Great black-backed gull	0.06	40	16	69	15	35.96
Herring gull	0.34	223	130	324	50	22.37
Lesser black-backed gull	0.03	21	4	44	11	48.97
Guillemot	11.21	7298	4707	10676	1610	22.05
Razorbill	0.96	624	432	863	114	18.20
Puffin	0.04	28	8	55	13	46.39
Red-throated diver	0.01	5	0	13	4	95.60
Fulmar	0.03	21	4	44	11	51.57
Gannet	0.03	20	4	40	10	47.25
Shag	0.02	16	0	49	16	100.26
Barrel jellyfish	0.99	643	207	1216	265	41.24

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Grey seal	0.02	13	0	28	7	54.24
Harbour porpoise	0.49	322	240	411	43	13.26

Table 103   Apportioned abundance estimates of species in the Morecambe survey area during Survey 21 on 22 November 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.25	166	52	292	64	38.57
Kittiwake	1.32	862	689	1043	92	10.59
Black-headed gull	0.01	4	0	13	4	98.51
Little gull	0.21	138	86	197	28	19.77
Common gull	0.40	261	167	358	50	19.12
Great black-backed gull	0.06	43	17	74	15	35.36
Herring gull	0.37	241	142	350	54	22.17
Lesser black-backed gull	0.03	21	4	42	11	49.25
Guillemot	11.60	7549	4785	11151	1654	21.91
Razorbill	1.02	662	448	916	117	17.55
Puffin	0.17	112	60	180	31	27.55
Red-throated diver	0.01	5	0	13	5	100.07
Fulmar	0.04	25	8	51	11	44.68
Gannet	0.03	21	4	40	10	46.38
Shag	0.02	17	0	49	16	97.73
Barrel jellyfish	1.00	650	221	1217	261	40.17

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Grey seal	0.05	33	16	52	10	29.67
Harbour porpoise	0.51	329	244	427	47	14.08

Table 104   Abundance estimates of species groups in the Morecambe survey area during Survey 22 on 03 December 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	15.41	10029	8894	11326	644	6.42
All non-avian animals	0.20	129	78	188	30	22.54
Duck species	0.38	251	83	448	96	38.14
Small gull species	2.16	1404	1191	1637	115	8.15
Large gull species	0.84	548	300	873	156	28.32
Gull species	0.02	17	4	32	8	44.74
Large auk	11.75	7652	6742	8602	462	6.04
Auk species	0.10	65	28	110	21	31.98
Auk / small gull	0.06	41	16	72	15	35.23
Diver species	0.02	12	0	24	7	53.09
Fulmar / gull species	0.04	28	12	52	11	38.37
Gannet species	0.01	5	0	12	4	97.08
Seal species	0.02	17	4	32	8	45.32
Cetacean species	0.17	114	72	161	24	20.21

Table 105   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 22 on 03 December 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.38	251	90	454	95	37.87
Kittiwake	1.17	763	553	972	102	13.38
Little gull	0.53	349	245	452	54	15.23
Common gull	0.43	280	212	352	37	12.96
Great black-backed gull	0.10	64	28	108	21	32.61
Herring gull	0.72	467	240	779	144	30.66
Guillemot	8.64	5625	5048	6254	314	5.58
Razorbill	2.72	1771	1354	2246	230	12.96
Red-throated diver	0.02	12	0	24	7	53.35
Gannet	0.01	4	0	12	4	97.07
Grey seal	0.01	8	0	20	6	67.62
Harbour porpoise	0.17	113	71	160	23	20.22

Table 106   Apportioned abundance estimates of species in the Morecambe survey area during Survey 22 on 03 December 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.38	246	84	442	93	37.58
Kittiwake	1.23	801	598	1023	111	13.75
Little gull	0.54	351	254	452	52	14.70
Common gull	0.44	285	215	365	37	12.97
Great black-backed gull	0.10	66	25	110	22	33.51
Herring gull	0.75	488	269	790	141	28.88
Guillemot	8.98	5843	5230	6553	328	5.61
Razorbill	2.86	1863	1437	2284	216	11.60
Red-throated diver	0.02	13	0	25	7	52.18
Gannet	0.01	5	0	12	4	91.39
Grey seal	0.03	17	4	32	8	45.56
Harbour porpoise	0.17	113	71	160	23	20.36

Table 107   Abundance estimates of species groups in the Morecambe survey area during Survey 23 on 05 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	5.82	3789	3162	4525	351	9.26
All non-avian animals	0.23	153	84	238	40	25.65
Duck species	0.29	187	56	342	75	40.07
Small gull species	0.80	519	397	640	62	11.89
Large gull species	0.38	245	78	520	123	50.37
Gull species	0.04	28	8	49	11	38.53
Large auk	4.03	2625	2169	3087	236	8.96
Auk species	0.21	138	63	231	45	32.58
Auk / small gull	0.01	9	0	20	6	65.56
Diver species	0.04	25	0	63	17	66.91
Cormorant / shag	0.01	5	0	16	5	98.48
Jellyfish	0.01	5	0	12	4	92.82
Seal species	0.03	20	4	36	8	40.01
Dolphin species	0.02	13	0	32	9	70.38
Cetacean species	0.17	113	48	190	37	31.98
Seal / small cetacean species	0.01	5	0	12	4	93.34

Table 108   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 23 on 05 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.28	185	56	352	75	40.20
Kittiwake	0.45	293	207	378	44	14.92
Little gull	0.28	183	105	277	45	24.58
Common gull	0.09	60	28	96	18	28.91
Great black-backed gull	0.03	20	4	44	11	50.95
Herring gull	0.34	220	51	512	128	57.83
Lesser black-backed gull	0.01	9	0	20	6	68.38
Guillemot	3.02	1967	1663	2306	167	8.49
Razorbill	0.93	608	421	817	104	17.04
Red-throated diver	0.04	24	0	64	17	67.92
Cormorant	0.01	4	0	12	4	100.29
Barrel jellyfish	0.01	4	0	12	4	96.63
Grey seal	0.01	5	0	12	5	99.87
Bottlenose dolphin	0.01	9	0	24	8	97.94
Harbour porpoise	0.18	117	55	200	38	32.37

Table 109   Apportioned abundance estimates of species in the Morecambe survey area during Survey 23 on 05 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.29	187	63	337	73	39.09
Kittiwake	0.46	301	217	386	45	14.83
Little gull	0.29	187	106	280	45	23.97
Common gull	0.09	61	28	99	19	30.88
Great black-backed gull	0.03	21	4	43	11	50.13
Herring gull	0.34	225	52	501	126	56.11
Lesser black-backed gull	0.01	8	0	20	6	69.34
Guillemot	3.30	2148	1794	2555	196	9.09
Razorbill	0.96	627	428	844	111	17.57
Red-throated diver	0.04	25	0	60	17	67.81
Cormorant	0.01	4	0	12	4	104.41
Barrel jellyfish	0.01	5	0	12	4	89.59
Grey seal	0.03	20	4	36	8	40.68
Bottlenose dolphin	0.02	13	0	32	10	75.39
Harbour porpoise	0.18	116	52	196	37	31.99

Table 110   Abundance estimates of species groups in the Morecambe survey area during Survey 24 on 23 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	6.77	4407	3761	5105	345	7.81
All non-avian animals	0.17	110	75	151	20	18
Small gull species	1.72	1120	899	1356	120	10.71
Large gull species	0.21	134	52	248	51	37.71
Gull species	0.01	5	0	13	5	95.30
Large auk	4.74	3084	2644	3562	238	7.69
Auk species	0.03	21	4	41	10	48.71
Auk / small gull	0.01	5	0	13	5	97.39
Diver species	0.04	29	5	62	15	49.25
Fulmar / gull species	0.01	5	0	13	4	92.75
Gannet species	0.01	9	0	21	6	67.49
Jellyfish	0.01	5	0	13	4	95.45
Seal species	0.03	21	5	37	8	37.61
Cetacean species	0.13	87	49	125	20	22.88

Table 111   Unapportioned abundance estimates of species in the Morecambe survey area during Survey 24 on 23 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.71	462	349	588	61	13.22
Little gull	0.80	519	334	736	102	19.61
Common gull	0.20	132	86	186	26	19.05
Great black-backed gull	0.01	5	0	13	5	96.64
Herring gull	0.19	126	49	241	51	40.17
Lesser black-backed gull	0.01	4	0	13	4	100.64
Guillemot	2.96	1925	1608	2275	174	9.04
Razorbill	1.67	1089	850	1356	130	11.87
Red-throated diver	0.04	29	5	58	14	46.18
Gannet	0.01	9	0	21	6	68.43
Barrel jellyfish	0.01	5	0	13	4	96.74
Grey seal	0.01	5	0	13	4	95.84
Harbour porpoise	0.13	87	49	129	21	23.51

Table 112 Apportioned abundance estimates of species in the Morecambe survey area during Survey 24 on 23 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.72	467	345	582	60	12.84
Little gull	0.81	530	355	761	102	19.12
Common gull	0.20	131	88	180	24	18.04
Great black-backed gull	0.01	5	0	13	4	92.91
Herring gull	0.20	128	52	234	49	38.09
Lesser black-backed gull	0.01	5	0	13	4	96.64
Guillemot	3.05	1984	1642	2339	180	9.05
Razorbill	1.71	1116	869	1389	132	11.75
Red-throated diver	0.04	29	5	56	14	46.40
Gannet	0.01	9	0	21	6	68.74
Barrel jellyfish	0.01	4	0	13	4	98.53
Grey seal	0.03	21	5	37	9	40.34
Harbour porpoise	0.13	86	49	128	21	23.76

Appendix II: Absolute population estimates for full survey area

177   Population estimates for four species (guillemot, razorbill, puffin and harbour porpoise) were divided by a correction factor as outlined in section 2.5.3 in order to take account of availability bias and give estimates of absolute abundance.

Table 113 Apportioned and unapportioned absolute monthly density and population estimates for guillemot in the Morecambe survey area between March 2021 and February 2023, accounting for the potential number of birds estimated as being unavailable for detection.

Guillemot	Absolute density estimate (n/km²)	Lower 95% confidence limit of absolute density (n/km²)	Upper 95% confidence limit of absolute density (n/km²)	Absolute population estimate (number)	Lower 95% confidence limit of absolute population (number)	Upper 95% confidence limit of absolute population (number)	Standard deviation of population absolute estimate (number)	CV (%)
Unapportioned								
19 March 2021	14.32	12.24	16.55	9327	7973	10781	741	7.94
07 April 2021	4.47	4.00	4.97	2915	2606	3242	155	5.32
18 May 2021	2.76	2.12	3.49	1797	1386	2273	226	12.58
01 June 2021	3.48	2.64	4.52	2264	1717	2950	326	14.40
09 July 2021	21.26	17.97	24.68	13853	11701	16075	1199	8.66
02 August 2021	40.73	32.27	49.67	26537	21026	32358	3221	12.14
04 September 2021	10.40	4.90	17.09	6772	3194	11136	2306	34.05
06 October 2021	15.17	11.10	19.68	9876	7229	12820	1497	15.16
17 November 2021	15.62	11.53	21.03	10176	7507	13700	1690	16.61
05 December 2021	1.21	0.80	1.74	785	516	1130	158	20.13
13 January 2022	6.65	4.99	8.31	4330	3253	5414	607	14.02
11 February 2022	6.63	4.90	8.67	4323	3185	5647	641	14.83
09 March 2022	2.46	1.54	3.51	1605	1003	2285	344	21.43
01 April 2022	6.25	4.83	7.93	4068	3147	5164	550	13.52
02 May 2022	20.85	15.92	26.78	13573	10362	17434	2024	14.91
07 June 2022	9.92	7.37	13.10	6452	4797	8528	1066	16.52

Guillemot	Absolute density estimate (n/km²)	Lower 95% confidence limit of absolute density (n/km²)	Upper 95% confidence limit of absolute density (n/km²)	Absolute population estimate (number)	Lower 95% confidence limit of absolute population (number)	Upper 95% confidence limit of absolute population (number)	Standard deviation of population absolute estimate (number)	CV (%)
14 July 2022	31.55	24.71	38.01	20535	16083	24747	2448	11.92
09 August 2022	33.16	29.57	36.87	21587	19253	24000	1367	6.33
02 September 2022	28.66	24.71	33.53	18652	16086	21821	1565	8.39
03 October 2022	21.92	19.43	24.58	14269	12643	15998	978	6.85
22 November 2022	14.69	9.23	21.66	9565	6014	14100	2281	23.85
03 December 2022	11.18	9.82	12.54	7275	6399	8172	451	6.20
05 February 2023	3.94	3.24	4.67	2562	2109	3039	231	9.02
23 February 2023	3.90	3.22	4.64	2537	2097	3025	248	9.78
Apportioned								
19 March 2021	14.91	12.80	17.17	9720	8333	11184	783	8.06
07 April 2021	4.61	4.15	5.17	3006	2702	3363	159	5.29
18 May 2021	2.86	2.20	3.50	1864	1434	2282	228	12.23
01 June 2021	3.55	2.67	4.62	2314	1736	3008	339	14.65
09 July 2021	21.60	18.22	24.78	14073	11870	16149	1232	8.75
02 August 2021	40.81	32.13	49.55	26587	20927	32283	3228	12.14
04 September 2021	10.42	4.83	16.83	6788	3147	10963	2207	32.51
06 October 2021	15.86	11.45	20.54	10333	7468	13383	1604	15.52
17 November 2021	17.01	12.55	23.25	11081	8174	15149	1886	17.02
05 December 2021	1.30	0.87	1.82	841	563	1184	153	18.19

Guillemot	Absolute density estimate (n/km²)	Lower 95% confidence limit of absolute density (n/km²)	Upper 95% confidence limit of absolute density (n/km²)	Absolute population estimate (number)	Lower 95% confidence limit of absolute population (number)	Upper 95% confidence limit of absolute population (number)	Standard deviation of population absolute estimate (number)	CV (%)
13 January 2022	6.86	5.15	8.71	4461	3357	5676	650	14.57
11 February 2022	6.89	5.08	8.82	4485	3305	5744	674	15.03
09 March 2022	2.56	1.65	3.55	1669	1076	2310	348	20.85
01 April 2022	6.53	5.02	8.23	4247	3265	5354	554	13.04
02 May 2022	20.76	15.88	27.41	13511	10335	17843	2068	15.31
07 June 2022	10.24	7.44	13.60	6662	4841	8856	1118	16.78
14 July 2022	32.12	24.78	39.94	20908	16133	26001	2561	12.25
09 August 2022	33.57	29.99	37.90	21847	19525	24668	1399	6.40
02 September 2022	28.71	24.57	33.69	18691	15989	21927	1605	8.59
03 October 2022	23.30	20.48	26.26	15162	13333	17091	1042	6.87
22 November 2022	15.00	9.47	21.67	9774	6169	14111	2244	22.96
03 December 2022	11.60	10.27	13.10	7551	6678	8528	470	6.22
05 February 2023	4.28	3.45	5.11	2779	2251	3331	276	9.93
23 February 2023	3.98	3.28	4.71	2590	2133	3069	250	9.65

Table 114 Apportioned and unapportioned absolute monthly density and population estimates for razorbill in the Morecambe survey area between March 2021 and February 2023, accounting for the potential number of birds estimated as being unavailable for detection.

Razorbill	Absolute density estimate (n/km²)	Lower 95% confidence limit of absolute density (n/km²)	Upper 95% confidence limit of absolute density (n/km²)	Absolute population estimate (number)	Lower 95% confidence limit of absolute population (number)	Upper 95% confidence limit of absolute population (number)	Standard deviation of population absolute estimate (number)	CV (%)
Unapportioned								
19 March 2021	1.61	1.00	2.44	1058	648	1590	258	24.39
07 April 2021	1.22	0.74	1.76	796	478	1149	178	22.36
18 May 2021	0.08	0.02	0.14	49	15	98	22	44.90
01 June 2021	0.02	0.00	0.06	15	0	37	9	60.00
09 July 2021	0.08	0.02	0.15	53	20	102	21	39.62
02 August 2021	0.05	0.01	0.09	31	5	60	17	54.84
04 September 2021	0.01	0.00	0.04	9	0	24	10	111.11
06 October 2021	2.47	1.76	3.32	1614	1148	2158	264	16.36
17 November 2021	2.06	1.08	3.41	1341	701	2221	406	30.28
05 December 2021	0.70	0.46	1.01	463	301	659	101	21.81
13 January 2022	0.55	0.29	0.86	362	194	556	110	30.39
11 February 2022	1.52	1.09	2.03	998	713	1321	166	16.63
09 March 2022	1.37	0.99	1.84	898	640	1203	148	16.48
01 April 2022	1.03	0.67	1.45	671	440	944	140	20.86
02 May 2022	0.77	0.48	1.14	500	309	746	127	25.40
07 June 2022	0.43	0.07	1.03	280	49	667	223	79.64

Razorbill	Absolute density estimate (n/km²)	Lower 95% confidence limit of absolute density (n/km²)	Upper 95% confidence limit of absolute density (n/km²)	Absolute population estimate (number)	Lower 95% confidence limit of absolute population (number)	Upper 95% confidence limit of absolute population (number)	Standard deviation of population absolute estimate (number)	CV (%)
14 July 2022	0.06	0.01	0.12	39	10	78	23	58.97
09 August 2022	0.00	0.00	0.00	0	0	0	0	0.00
02 September 2022	0.02	0.00	0.07	21	0	48	14	66.67
03 October 2022	1.72	1.11	2.51	1130	723	1631	265	23.45
22 November 2022	1.16	0.72	1.65	757	471	1070	165	21.80
03 December 2022	3.28	2.41	4.18	2135	1561	2724	320	14.99
05 February 2023	1.12	0.76	1.56	735	495	1010	148	20.14
23 February 2023	2.06	1.59	2.57	1343	1036	1673	185	13.78
Apportioned								
19 March 2021	1.89	1.28	2.64	1237	835	1720	251	20.29
07 April 2021	1.32	0.84	1.88	864	548	1227	182	21.06
18 May 2021	0.08	0.02	0.15	56	21	101	22	39.29
01 June 2021	0.03	0.00	0.07	20	4	43	9	45.00
09 July 2021	0.08	0.04	0.15	55	21	99	20	36.36
02 August 2021	0.05	0.01	0.10	29	5	62	17	58.62
04 September 2021	0.01	0.00	0.04	9	0	24	10	111.11
06 October 2021	2.61	1.82	3.48	1702	1189	2261	277	16.27
17 November 2021	2.35	1.33	3.71	1531	871	2421	424	27.69
05 December 2021	0.83	0.55	1.15	539	361	752	109	20.22

Razorbill	Absolute density estimate (n/km²)	Lower 95% confidence limit of absolute density (n/km²)	Upper 95% confidence limit of absolute density (n/km²)	Absolute population estimate (number)	Lower 95% confidence limit of absolute population (number)	Upper 95% confidence limit of absolute population (number)	Standard deviation of population absolute estimate (number)	CV (%)
13 January 2022	0.60	0.34	0.92	387	222	596	114	29.46
11 February 2022	1.63	1.19	2.10	1058	774	1372	170	16.07
09 March 2022	1.44	1.04	1.87	941	680	1227	142	15.09
01 April 2022	1.10	0.72	1.53	715	471	994	148	20.70
02 May 2022	0.87	0.59	1.24	562	379	810	126	22.42
07 June 2022	0.43	0.09	1.05	281	57	684	215	76.51
14 July 2022	0.06	0.01	0.13	42	11	86	22	52.38
09 August 2022	0.00	0.00	0.00	0	0	0	0	0.00
02 September 2022	0.02	0.00	0.06	21	1	44	14	66.67
03 October 2022	1.92	1.21	2.77	1247	785	1802	300	24.06
22 November 2022	1.24	0.83	1.69	804	540	1093	162	20.15
03 December 2022	3.49	2.64	4.40	2269	1724	2862	308	13.57
05 February 2023	1.16	0.77	1.62	755	502	1049	158	20.93
23 February 2023	2.11	1.63	2.62	1374	1057	1707	189	13.76

Table 115 Apportioned and unapportioned absolute monthly density and population estimates for puffin in the Morecambe survey area between March 2021 and February 2023, accounting for the potential number of birds estimated as being unavailable for detection.

Puffin	Absolute density estimate (n/km²)	Lower 95% confidence limit of absolute density (n/km²)	Upper 95% confidence limit of absolute density (n/km²)	Absolute population estimate (number)	Lower 95% confidence limit of absolute population (number)	Upper 95% confidence limit of absolute population (number)	Standard deviation of population absolute estimate (number)	CV (%)
Unapportioned								
19 March 2021	0.02	0.00	0.07	20	0	45	14	70.00
07 April 2021	0.05	0.01	0.08	28	5	51	16	57.14
18 May 2021	0.00	0.00	0.00	0	0	0	0	0.00
01 June 2021	0.00	0.00	0.00	0	0	0	0	0.00
09 July 2021	0.21	0.13	0.30	139	84	195	35	25.18
02 August 2021	0.07	0.02	0.12	42	14	75	20	47.62
04 September 2021	0.00	0.00	0.00	0	0	0	0	0.00
06 October 2021	0.00	0.00	0.00	0	0	0	0	0.00
17 November 2021	0.01	0.00	0.02	6	0	15	6	100.00
05 December 2021	0.00	0.00	0.00	0	0	0	0	0.00
13 January 2022	0.00	0.00	0.00	0	0	0	0	0.00
11 February 2022	0.00	0.00	0.00	0	0	0	0	0.00
09 March 2022	0.00	0.00	0.00	0	0	0	0	0.00
01 April 2022	0.02	0.00	0.06	15	0	37	13	86.67
02 May 2022	0.06	0.01	0.10	38	9	70	20	52.63
07 June 2022	0.01	0.00	0.05	9	0	28	11	122.22

Puffin	Absolute density estimate (n/km²)	Lower 95% confidence limit of absolute density (n/km²)	Upper 95% confidence limit of absolute density (n/km²)	Absolute population estimate (number)	Lower 95% confidence limit of absolute population (number)	Upper 95% confidence limit of absolute population (number)	Standard deviation of population absolute estimate (number)	CV (%)
14 July 2022	0.00	0.00	0.00	0	0	0	0	0.00
09 August 2022	0.00	0.00	0.00	0	0	0	0	0.00
02 September 2022	0.01	0.00	0.02	6	0	15	6	100.00
03 October 2022	0.02	0.00	0.05	14	0	33	10	71.43
22 November 2022	0.05	0.01	0.10	34	6	65	19	55.88
03 December 2022	0.00	0.00	0.00	0	0	0	0	0.00
05 February 2023	0.00	0.00	0.00	0	0	0	0	0.00
23 February 2023	0.00	0.00	0.00	0	0	0	0	0.00
Apportioned								
19 March 2021	0.05	0.02	0.09	33	13	58	16	48.48
07 April 2021	0.12	0.06	0.19	80	42	121	25	31.25
18 May 2021	0.00	0.00	0.00	0	0	0	0	0.00
01 June 2021	0.00	0.00	0.00	0	0	0	0	0.00
09 July 2021	0.26	0.16	0.35	167	106	231	39	23.35
02 August 2021	0.13	0.07	0.20	82	44	126	27	32.93
04 September 2021	0.00	0.00	0.00	0	0	0	0	0.00
06 October 2021	0.00	0.00	0.00	0	0	0	0	0.00
17 November 2021	0.03	0.01	0.05	21	10	35	8	38.10
05 December 2021	0.00	0.00	0.00	0	0	0	0	0.00

Puffin	Absolute density estimate (n/km²)	Lower 95% confidence limit of absolute density (n/km²)	Upper 95% confidence limit of absolute density (n/km²)	Absolute population estimate (number)	Lower 95% confidence limit of absolute population (number)	Upper 95% confidence limit of absolute population (number)	Standard deviation of population absolute estimate (number)	CV (%)
13 January 2022	0.00	0.00	0.00	0	0	0	0	0.00
11 February 2022	0.00	0.00	0.00	0	0	0	0	0.00
09 March 2022	0.00	0.00	0.00	0	0	0	0	0.00
01 April 2022	0.02	0.00	0.06	19	3	42	13	68.42
02 May 2022	0.12	0.06	0.17	73	38	112	24	32.88
07 June 2022	0.02	0.00	0.06	15	0	35	13	86.67
14 July 2022	0.00	0.00	0.00	0	0	0	0	0.00
09 August 2022	0.00	0.00	0.00	0	0	0	0	0.00
02 September 2022	0.01	0.00	0.03	10	2	22	7	70.00
03 October 2022	0.05	0.02	0.08	34	17	55	13	38.24
22 November 2022	0.20	0.10	0.31	132	70	205	44	33.33
03 December 2022	0.00	0.00	0.00	0	0	0	0	0.00
05 February 2023	0.00	0.00	0.00	0	0	0	0	0.00
23 February 2023	0.00	0.00	0.00	0	0	0	0	0.00

Table 116 Apportioned and unapportioned absolute monthly density and population estimates for harbour porpoise in the Morecambe survey area between March 2021 and February 2023, accounting for the potential number of animals estimated as being unavailable for detection.

Harbour porpoise	Absolute density estimate (n/km²)	Lower 95% confidence limit of absolute density (n/km²)	Upper 95% confidence limit of absolute density (n/km²)	Absolute population estimate (number)	Lower 95% confidence limit of absolute population (number)	Upper 95% confidence limit of absolute population (number)
Unapportioned						
19 March 2021	3.09	1.81	4.38	2008	1185	2861
07 April 2021	0.39	0.20	0.59	260	137	388
18 May 2021	1.63	1.07	2.20	1081	709	1447
01 June 2021	1.71	1.16	2.39	1114	740	1548
09 July 2021	1.54	0.90	2.12	997	611	1402
02 August 2021	1.08	0.54	1.67	694	359	1077
04 September 2021	0.94	0.23	2.11	640	148	1382
06 October 2021	1.38	0.69	2.15	898	461	1382
17 November 2021	1.25	0.55	2.11	828	375	1366
05 December 2021	0.44	0.15	0.74	266	118	458
13 January 2022	0.78	0.45	1.10	492	278	731
11 February 2022	1.04	0.56	1.59	677	374	1043
09 March 2022	0.88	0.47	1.40	584	304	911
01 April 2022	0.54	0.29	0.83	358	177	550
02 May 2022	6.19	3.27	10.19	4037	2145	6633
07 June 2022	1.96	1.22	2.94	1279	783	1909

Harbour porpoise	Absolute density estimate (n/km²)	Lower 95% confidence limit of absolute density (n/km²)	Upper 95% confidence limit of absolute density (n/km²)	Absolute population estimate (number)	Lower 95% confidence limit of absolute population (number)	Upper 95% confidence limit of absolute population (number)
14 July 2022	0.26	0.06	0.45	161	51	302
09 August 2022	1.79	1.14	2.57	1190	754	1663
02 September 2022	1.28	0.68	1.96	823	423	1306
03 October 2022	1.84	1.30	2.38	1197	852	1543
22 November 2022	3.83	2.89	4.92	2514	1874	3209
03 December 2022	1.26	0.81	1.77	835	525	1182
05 February 2023	1.43	0.64	2.47	932	438	1593
23 February 2023	1.04	0.56	1.59	693	390	1027
Apportioned						
19 March 2021	3.09	1.87	4.61	2026	1220	3018
07 April 2021	0.39	0.20	0.59	255	137	388
18 May 2021	1.63	1.13	2.25	1081	732	1458
01 June 2021	1.71	1.16	2.33	1108	747	1499
09 July 2021	1.54	0.96	2.19	1010	643	1427
02 August 2021	1.08	0.54	1.67	718	371	1101
04 September 2021	1.02	0.23	2.11	648	148	1359
06 October 2021	1.38	0.77	2.07	898	499	1374
17 November 2021	1.25	0.55	2.11	820	375	1351
05 December 2021	0.37	0.15	0.74	266	118	466

Harbour porpoise	Absolute density estimate (n/km²)	Lower 95% confidence limit of absolute density (n/km²)	Upper 95% confidence limit of absolute density (n/km²)	Absolute population estimate (number)	Lower 95% confidence limit of absolute population (number)	Upper 95% confidence limit of absolute population (number)
13 January 2022	0.78	0.45	1.16	498	278	744
11 February 2022	1.04	0.56	1.59	677	350	1043
09 March 2022	0.88	0.47	1.40	590	304	928
01 April 2022	0.54	0.29	0.83	358	177	555
02 May 2022	6.25	3.38	9.97	4060	2196	6481
07 June 2022	1.96	1.16	2.94	1285	747	1934
14 July 2022	0.26	0.06	0.45	180	51	309
09 August 2022	1.79	1.20	2.51	1178	766	1639
02 September 2022	1.28	0.60	1.96	823	415	1306
03 October 2022	1.84	1.30	2.38	1197	852	1550
22 November 2022	3.98	2.89	5.15	2569	1905	3334
03 December 2022	1.26	0.81	1.77	835	525	1182
05 February 2023	1.43	0.64	2.39	924	414	1561
23 February 2023	1.04	0.64	1.59	685	390	1019

Appendix III: Density and population estimates for revised development area

178   See separate accompanying document with this title.

Appendix IV: Density and population estimates for revised development area with 2km buffer

179   See separate accompanying document with this title.

Appendix V: Density and population estimates for revised development area with 4km buffer

180   See separate accompanying document with this title.

Appendix VI: Density and population estimates for Red throated diver custom buffer

181   See separate accompanying document with this title.

Appendix VII: Species ID confidence levels graphs

182   See separate accompanying document with this title.

Annex III: Density and population estimates for revised development area

1   The density, total estimated population, upper and lower 95% CLs, standard deviation and CV for each species and species group have been calculated using strip transect analysis and are presented here for each of the surveys undertaken.

Table 1   **Abundance estimates of species groups in the Morecambe development area during Survey 1 on 19 March 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	18.61	1618	1140	2185	279	17.23
All non-avian animals	0.60	53	12	108	25	47.42
Species group						
Small gull species	1.45	127	95	161	17	13.02
Large gull species	0.36	32	0	83	22	68.93
Gull species	0.05	5	0	12	4	92.08
Large auk	15.47	1345	894	1867	253	18.81
Auk species	0.69	61	15	132	33	53.95
Auk / small gull	0.13	12	0	28	8	65.10
Auk / shearwater species	0.09	8	0	24	8	101.13
Fulmar / gull species	0.28	25	0	72	23	92.30
Jellyfish	0.54	47	8	101	26	53.66
Seal / small cetacean species	0.04	4	0	12	4	100.33

Table 2   Apportioned abundance estimates of animals in the Morecambe development area during Survey 1 on 19 March 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.60	139	102	176	20	13.97
Little gull	0.00	1	0	1	1	95.32
Common gull	0.05	5	0	12	4	89.79
Herring gull	0.60	53	0	137	40	74.91
Guillemot	14.77	1284	819	1861	264	20.50
Razorbill	1.38	120	57	186	34	27.75
Puffin	0.07	6	1	14	4	62.58
Fulmar	0.05	5	0	12	4	89.83
Barrel jellyfish	0.54	47	8	106	27	55.92
Harbour porpoise	0.04	4	0	12	4	95.79

Table 3 **Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 1 on 19 March 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.69	60	31	87	15	23.79
Little gull	0.00	1	0	1	1	93.66
Common gull	0.00	1	0	1	1	88.72
Herring gull	0.51	45	0	131	42	92.85
Guillemot	14.41	1253	796	1761	249	19.86
Razorbill	1.28	112	52	170	30	26.79
Puffin	0.06	6	0	14	4	66.37
Fulmar	0.05	4	0	12	4	89.20

Table 4   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 1 on 19 March 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.92	80	50	113	17	21.22
Common gull	0.04	4	0	12	4	94.56
Herring gull	0.09	8	0	20	6	68.07
Guillemot	0.55	48	15	89	20	40.36
Razorbill	0.09	8	0	24	8	96.76

Table 5   Abundance estimates of species groups in the Morecambe development area during Survey 2 on 07 April 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	4.72	410	317	517	52	12.46
All non-avian animals	0.18	16	4	32	8	50.79
Species group						
Small gull species	0.37	33	8	56	12	36.85
Large auk	4.30	374	277	476	52	13.67
Fulmar / gull species	0.04	4	0	12	4	89.86
Seal species	0.09	9	0	20	5	61.39
Cetacean species	0.05	5	0	12	4	90.30
Seal / small cetacean species	0.05	5	0	12	4	88.26

Table 6 **Apportioned abundance estimates of animals in the Morecambe development area during Survey 2 on 07 April 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.37	32	12	55	12	36.55
Guillemot	3.13	272	217	330	29	10.50
Razorbill	1.16	101	36	174	37	35.81
Fulmar	0.05	5	0	12	4	90.60
Grey seal	0.09	8	0	19	5	60.44
Harbour porpoise	0.10	9	0	20	5	57.98

Table 7   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 2 on 07 April 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.28	25	8	48	11	43.82
Guillemot	3.01	262	213	313	26	9.93
Razorbill	0.94	82	22	159	36	43.89
Fulmar	0.05	5	0	12	4	89.54

Table 8 **Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 2 on 07 April 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.09	8	0	20	5	62.66
Guillemot	0.09	9	0	19	5	59.26
Razorbill	0.23	21	4	40	10	48.00

Table 9   Abundance estimates of species groups in the Morecambe development area during Survey 3 on 18 May 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	5.74	499	251	873	173	34.60
All non-avian animals	0.26	23	4	49	12	52.21
Species group						
Small gull species	2.51	219	50	489	127	57.97
Large gull species	0.05	4	0	12	4	89.48
Large auk	2.63	229	131	347	58	25.29
Auk / shearwater species	0.09	8	0	19	5	60.08
Gannet species	0.36	32	4	66	16	50.35
Jellyfish	0.14	12	0	35	12	93.16
Cetacean species	0.13	12	0	28	8	66.03

Table 10   Apportioned abundance estimates of animals in the Morecambe development area during Survey 3 on 18 May 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	2.52	220	48	485	126	57.23
Lesser black-backed gull	0.05	5	0	12	4	89.39
Guillemot	2.58	224	126	342	57	25.28
Razorbill	0.15	13	4	24	6	42.54
Manx shearwater	0.04	4	0	11	4	91.40
Gannet	0.35	31	4	66	16	51.22
Barrel jellyfish	0.14	12	0	35	11	92.19
Harbour porpoise	0.13	12	0	28	8	66.24

Table 11   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 3 on 18 May April 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.52	133	4	356	106	79.51
Guillemot	2.44	212	112	322	54	25.05
Razorbill	0.14	13	2	24	6	42.45
Manx shearwater	0.04	4	0	11	4	90.36
Gannet	0.37	33	8	69	17	50.38

Table 12   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 3 on 18 May 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.00	88	35	156	33	37.74
Lesser black-backed gull	0.04	4	0	12	4	93.66
Guillemot	0.14	12	4	24	6	48.73

Table 13   Abundance estimates of species groups in the Morecambe development area during Survey 4 on 01 June 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	3.54	308	187	476	78	25.28
All non-avian animals	0.60	52	16	99	22	42.10
Species group						
Small gull species	1.05	91	32	175	40	43.08
Gull species	0.19	17	0	48	15	86.84
Large auk	2.26	197	128	270	38	19.05
Auk species	0.05	5	0	15	5	95.86
Gannet species	0.05	5	0	12	4	89.01
Seal species	0.14	12	0	29	8	65.76
Cetacean species	0.46	40	12	72	16	38.51

Table 14 Apportioned abundance estimates of animals in the Morecambe development area during Survey 4 on 01 June 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.23	107	31	225	55	50.63
Guillemot	2.28	199	128	270	37	18.17
Razorbill	0.00	1	0	1	1	89.96
Gannet	0.04	4	0	12	4	91.41
Grey seal	0.14	12	0	30	8	65.03
Harbour porpoise	0.45	40	12	71	16	38.21

Table 15 **Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 4 on 01 June 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.45	40	0	108	33	82.92
Guillemot	2.04	177	119	245	32	17.79
Razorbill	0.00	1	0	1	1	89.72
Gannet	0.04	4	0	12	4	93.97

Table 16   **Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 4 on 01 June 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.78	69	27	124	26	37.09
Guillemot	0.22	20	0	59	19	96.49

Table 17   **Abundance estimates of species groups in the Morecambe development area during Survey 5 on 09 July 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	75.48	6558	4173	9054	1266	19.30
All non-avian animals	0.09	8	0	19	5	61.11
Species group						
Small gull species	0.42	37	19	55	10	24.81
Large gull species	0.09	9	0	24	8	91.21
Large auk	20.84	1811	1367	2228	229	12.61
Auk species	2.54	221	151	296	39	17.37
Auk / shearwater species	3.08	268	58	575	140	52.19
Shearwater species	48.11	4180	2150	6839	1196	28.59
Gannet species	0.87	76	44	116	19	24.59
Cetacean species	0.09	8	0	19	5	60.29

Table 18   Apportioned abundance estimates of animals in the Morecambe development area during Survey 5 on 09 July 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.41	36	19	52	9	23.56
Herring gull	0.05	5	0	12	4	86.16
Lesser black-backed gull	0.05	5	0	12	4	92.02
Guillemot	23.03	2002	1497	2487	257	12.80
Razorbill	0.05	5	1	12	4	86.25
Puffin	0.22	20	3	40	10	51.35
Manx shearwater	51.39	4465	2313	6976	1184	26.50
Gannet	0.87	76	44	112	18	22.89
Harbour porpoise	0.09	8	0	19	5	60.65

Table 19   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 5 on 09 July 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Guillemot	22.88	1988	1465	2452	254	12.74
Razorbill	0.05	5	1	13	4	87.27
Puffin	0.22	20	3	40	10	49.47
Manx shearwater	37.87	3290	1328	5761	1146	34.81
Gannet	0.83	72	44	101	15	20.59

Table 20   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 5 on 09 July 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.41	36	19	53	9	24.87
Herring gull	0.05	4	0	15	4	95.14
Lesser black-backed gull	0.05	5	0	12	4	89.54
Guillemot	0.18	16	4	34	8	50.25
Manx shearwater	12.81	1114	708	1593	225	20.14

Table 21 **Abundance estimates of species groups in the Morecambe development area during Survey 6 on 02 August 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	75.92	6596	5173	7939	736	11.15
All non-avian animals	0.09	8	0	20	6	66.07
Species group						
Small gull species	4.45	387	19	1081	320	82.75
Black-backed gull species	0.13	12	0	28	8	63.54
Large gull species	0.14	12	0	24	6	46.56
Large auk	50.32	4372	3088	5883	701	16.03
Auk species	0.32	29	8	59	13	45.72
Auk / shearwater species	1.79	156	93	229	35	22.39
Fulmar / gull species	0.09	9	0	19	5	61.12
Shearwater species	14.07	1223	735	1809	272	22.18
Gannet species	4.94	430	326	547	58	13.51
Seal species	0.04	4	0	12	4	89.93
Cetacean species	0.05	4	0	12	4	99.32

Table 22   Apportioned abundance estimates of animals in the Morecambe development area during Survey 6 on 02 August 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	4.77	415	16	1091	335	80.87
Great black-backed gull	0.05	4	0	12	4	94.01
Lesser black-backed gull	0.23	21	5	38	9	40.87
Guillemot	49.97	4342	3043	5972	733	16.87
Razorbill	0.10	9	1	24	8	88.63
Puffin	0.19	17	3	35	9	54.31
Fulmar	0.08	8	0	17	5	61.41
Manx shearwater	16.15	1404	901	1983	281	19.97
Gannet	4.91	427	320	551	58	13.55
Grey seal	0.04	4	0	12	4	93.34
Harbour porpoise	0.04	4	0	12	4	94.18

Table 23   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 6 on 02 August 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	3.80	331	0	970	297	89.91
Great black-backed gull	0.05	5	0	12	4	90.81
Lesser black-backed gull	0.14	13	0	25	7	48.96
Guillemot	50.32	4373	3086	5855	707	16.16
Razorbill	0.09	9	1	24	8	92.12
Puffin	0.19	17	0	38	10	56.76
Fulmar	0.08	8	0	18	5	61.07
Manx shearwater	8.42	732	396	1144	197	26.94
Gannet	2.82	245	198	290	24	9.78

Table 24   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 6 on 02 August 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.55	49	8	111	29	59.82
Lesser black-backed gull	0.09	9	0	19	5	59.01
Manx shearwater	7.27	632	435	835	100	15.79
Gannet	2.02	176	95	275	47	26.61

Table 25   Abundance estimates of species groups in the Morecambe development area during Survey 7 on 04 September 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	24.90	2164	379	4924	1212	55.98
All non-avian animals	-	-	-	-	-	-
Species group						
Small gull species	22.17	1927	250	4516	1121	58.17
Large gull species	0.32	28	0	67	19	64.68
Gull species	0.08	7	0	21	7	97.13
Arctic / common tern	0.33	29	0	66	17	58.11
Tern species	0.40	35	0	78	21	58.52
Tern / small gull species	0.08	7	0	20	6	79.22
Large auk	0.87	76	0	175	48	62.50
Gannet species	0.32	28	7	59	14	48.56

Table 26   Apportioned abundance estimates of animals in the Morecambe development area during Survey 7 on 04 September 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	21.92	1904	236	4444	1133	59.47
Lesser black-backed gull	0.32	29	0	63	18	62.49
Sandwich tern	0.40	35	0	76	20	55.38
Common tern	0.27	24	0	50	13	54.71
Arctic tern	0.06	6	0	13	4	67.74
Guillemot	0.87	76	0	170	47	61.17
Gannet	0.32	28	7	56	14	48.95

Table 27   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 7 on 04 September 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	20.00	1738	8	4323	1145	65.90
Guillemot	0.92	81	0	177	49	60.74
Gannet	0.08	8	0	22	7	96.84

Table 28   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 7 on 04 September 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	2.99	260	159	365	52	19.84
Lesser black-backed gull	0.32	28	0	66	18	60.87
Sandwich tern	0.41	36	0	84	22	60.12
Common tern	0.26	23	0	49	13	55.95
Arctic tern	0.06	6	0	13	4	69.62
Gannet	0.25	22	0	51	13	60.88

Table 29   Abundance estimates of species groups in the Morecambe development area during Survey 8 on 06 October 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	16.63	1445	1051	1889	219	15.11
All non-avian animals	0.32	28	8	51	12	42.38
Species group						
Small gull species	0.18	16	4	32	8	47.22
Large auk	16.23	1410	1021	1892	225	15.93
Auk species	0.28	25	4	48	12	46.38
Cetacean species	0.32	28	8	55	13	43.34

Table 30   Apportioned abundance estimates of animals in the Morecambe development area during Survey 8 on 06 October 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.19	17	0	34	8	49.32
Guillemot	11.83	1028	710	1396	175	16.96
Razorbill	4.55	395	251	578	86	21.56
Harbour porpoise	0.32	28	8	56	13	43.32

Table 31 Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 8 on 06 October 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.09	8	0	19	6	63.51
Guillemot	11.51	1001	690	1388	175	17.44
Razorbill	3.96	345	219	489	72	20.69

Table 32   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 8 on 06 October 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.09	8	0	19	5	60.65
Guillemot	0.41	36	0	96	26	71.88
Razorbill	0.50	44	8	84	20	45.79

Table 33   Abundance estimates of species groups in the Morecambe development area during Survey 9 on 17 November 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	8.68	755	641	891	64	8.38
All non-avian animals	0.14	13	0	35	11	87.64
Species group						
Small gull species	0.73	64	39	95	15	22.73
Black-backed gull species	0.05	5	0	12	4	86.77
Large gull species	0.05	4	0	12	4	95.41
Gull species	0.14	13	0	31	9	67.01
Large auk	7.54	656	573	761	49	7.35
Auk species	0.14	13	0	30	8	64.67
Seal species	0.05	5	0	12	4	89.92
Cetacean species	0.09	8	0	24	8	91.27

Table 34   **Apportioned abundance estimates of animals in the Morecambe development area during Survey 9 on 17 November 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.77	67	27	109	22	31.62
Common gull	0.09	9	0	24	8	91.60
Great black-backed gull	0.05	5	0	13	4	75.45
Herring gull	0.04	4	0	11	4	95.22
Guillemot	6.77	588	501	710	53	8.99
Razorbill	0.92	80	49	116	18	21.92
Puffin	0.01	2	0	3	1	63.50
Grey seal	0.05	4	0	12	4	89.48
Harbour porpoise	0.09	8	0	24	8	90.83

Table 35   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 9 on 17 November 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.46	40	15	68	14	34.30
Great black-backed gull	0.01	1	0	2	1	90.16
Herring gull	0.04	4	0	11	4	92.95
Guillemot	6.63	577	488	690	53	9.03
Razorbill	0.84	73	39	111	20	26.19
Puffin	0.01	2	0	3	1	65.39

Table 36 **Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 9 on 17 November 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.32	28	8	55	13	44.06
Common gull	0.09	8	0	24	8	92.60
Great black-backed gull	0.05	5	0	12	4	92.54
Guillemot	0.13	12	0	28	8	65.82
Razorbill	0.09	8	0	24	8	91.10

Table 37   Abundance estimates of species groups in the Morecambe development area during Survey 10 on 05 December 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	1.43	124	63	194	35	27.64
All non-avian animals	-	-	-	-	-	-
Species group						
Small gull species	0.60	52	24	86	16	30.12
Large auk	0.78	68	22	134	32	46.53
Diver species	0.04	4	0	12	4	99.10

Table 38   Apportioned abundance estimates of animals in the Morecambe development area during Survey 10 on 05 December 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.41	36	16	59	11	30.47
Little gull	0.04	4	0	12	4	97.07
Common gull	0.13	12	0	24	6	50.99
Guillemot	0.57	50	13	109	26	50.24
Razorbill	0.21	19	3	39	10	48.81
Red-throated diver	0.04	4	0	12	4	91.05

Table 39   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 10 on 05 December 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.04	4	0	12	4	95.54
Little gull	0.04	4	0	12	4	94.69
Guillemot	0.52	46	9	102	25	54.20
Razorbill	0.20	18	2	39	10	56.26
Red-throated diver	0.05	4	0	12	4	92.55

Table 40   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 10 on 05 December 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.36	32	12	58	12	36.02
Common gull	0.14	12	4	24	6	49.02
Guillemot	0.03	3	0	9	3	93.44
Razorbill	0.01	2	0	4	2	93.51

Table 41   Abundance estimates of species groups in the Morecambe development area during Survey 11 on 13 January 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	7.54	655	342	1019	173	26.39
All non-avian animals	0.13	12	0	28	8	63.39
Species group						
Small gull species	0.14	12	0	31	8	66.38
Gull species	0.13	12	0	23	6	46.39
Large auk	7.21	627	309	963	171	27.26
Cetacean species	0.14	12	0	30	8	66.42

Table 42   Apportioned abundance estimates of animals in the Morecambe development area during Survey 11 on 13 January 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.04	4	0	12	4	93.06
Common gull	0.23	20	4	37	9	42.12
Guillemot	7.10	618	325	951	165	26.70
Razorbill	0.12	11	1	30	9	82.71
Harbour porpoise	0.14	12	0	30	8	66.84

Table 43 **Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 11 on 13 January 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Guillemot	7.06	614	341	924	155	25.11
Razorbill	0.12	11	1	30	9	82.74

Table 44   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 11 on 13 January 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.05	4	0	12	4	89.15
Common gull	0.23	20	4	37	9	41.28

Table 45   Abundance estimates of species groups in the Morecambe development area during Survey 12 on 11 February 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	9.91	861	624	1096	124	14.33
All non-avian animals	0.24	21	4	40	10	46.43
Species group						
Small gull species	0.23	21	4	39	9	41.88
Black-backed gull species	0.04	4	0	15	5	103.64
Large gull species	0.19	17	4	37	10	56.23
Large auk	9.16	797	547	1039	123	15.37
Auk species	0.18	16	0	36	9	56.11
Auk / small gull	0.05	5	0	12	4	91.23
Cetacean species	0.23	21	4	43	11	50.02

Table 46 **Apportioned abundance estimates of animals in the Morecambe development area during Survey 12 on 11 February 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.14	12	0	31	9	68.94
Black-headed gull	0.05	5	0	12	4	87.86
Common gull	0.04	4	0	12	4	100.05
Herring gull	0.19	17	0	37	9	55.13
Lesser black-backed gull	0.05	4	0	12	4	93.78
Guillemot	7.81	679	472	907	112	16.38
Razorbill	1.64	143	78	218	37	25.54
Harbour porpoise	0.23	20	4	41	11	50.27

Table 47   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 12 on 11 February 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Herring gull	0.14	13	0	33	9	71.00
Guillemot	7.73	672	472	893	111	16.44
Razorbill	1.62	141	72	217	38	26.77

Table 48   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 12 on 11 February 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.14	12	0	28	8	65.18
Black-headed gull	0.05	5	0	12	4	87.22
Common gull	0.05	5	0	12	4	97.19
Herring gull	0.05	4	0	12	4	90.95
Lesser black-backed gull	0.05	5	0	12	4	94.77
Guillemot	0.14	13	0	24	6	46.13

Table 49   Abundance estimates of species groups in the Morecambe development area during Survey 13 on 09 March 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	6.61	575	437	718	73	12.59
All non-avian animals	0.23	21	8	37	8	38.24
Species group						
Small gull species	2.12	184	144	225	21	11.12
Large gull species	0.09	9	0	19	5	60.56
Large auk	4.37	380	247	521	69	18.14
Diver species	0.05	4	0	12	4	90.97
Fulmar / gull species	0.05	4	0	12	4	92.11
Cetacean species	0.23	21	8	36	8	38.22

Table 50   Apportioned abundance estimates of animals in the Morecambe development area during Survey 13 on 09 March 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	2.01	175	138	211	19	10.53
Black-headed gull	0.05	5	0	12	4	90.04
Little gull	0.05	5	0	15	4	97.76
Herring gull	0.04	4	0	12	4	93.84
Lesser black-backed gull	0.04	4	0	12	4	94.98
Guillemot	2.78	242	122	379	65	26.79
Razorbill	1.52	133	76	202	33	24.83
Red-throated diver	0.05	4	0	12	4	95.60
Harbour porpoise	0.23	20	8	37	8	39.27

Table 51 Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 13 on 09 March 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.87	76	52	100	13	15.98
Black-headed gull	0.05	4	0	12	4	95.89
Guillemot	2.83	246	130	382	65	26.17
Razorbill	1.44	126	66	193	34	26.90
Red-throated diver	0.05	5	0	12	4	89.26

Table 52   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 13 on 09 March 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.10	96	62	127	17	17.33
Little gull	0.05	4	0	13	4	100.42
Herring gull	0.05	5	0	15	4	95.85
Lesser black-backed gull	0.04	4	0	12	4	96.35
Guillemot	0.01	1	0	3	1	89.79
Razorbill	0.08	7	0	17	5	64.23

Table 53   Abundance estimates of species groups in the Morecambe development area during Survey 14 on 01 April 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	5.36	466	389	546	41	8.77
All non-avian animals	0.23	20	4	36	8	40.87
Species group						
Small gull species	1.74	152	73	240	43	27.92
Black-backed gull species	0.05	4	0	12	4	89.54
Large gull species	0.14	13	0	28	8	64.59
Large auk	3.20	279	202	356	41	14.38
Auk species	0.05	5	0	12	4	89.83
Large auk / diver species	0.04	4	0	12	4	93.33
Shearwater species	0.04	4	0	12	4	92.66
Gannet species	0.09	9	0	19	6	62.77
Seal species	0.04	4	0	12	4	97.24
Cetacean species	0.18	16	0	35	9	52.88

Table 54   Apportioned abundance estimates of animals in the Morecambe development area during Survey 14 on 01 April 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.75	153	79	239	43	27.94
Great black-backed gull	0.04	4	0	12	4	97.29
Herring gull	0.14	13	0	28	8	62.75
Guillemot	2.64	230	182	279	25	10.82
Razorbill	0.62	54	17	97	21	38.16
Puffin	0.01	1	0	3	1	90.20
Manx shearwater	0.04	4	0	12	4	95.82
Gannet	0.09	8	0	19	5	61.16
Grey seal	0.05	4	0	12	4	96.80
Harbour porpoise	0.18	16	4	32	9	51.32

Table 55   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 14 on 01 April 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.87	76	8	170	42	54.17
Herring gull	0.09	9	0	20	6	61.15
Guillemot	2.62	228	180	277	25	10.86
Razorbill	0.64	56	16	100	22	39.58
Puffin	0.01	1	0	3	1	94.01

Table 56   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 14 on 01 April 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.87	76	39	110	19	24.04
Great black-backed gull	0.05	5	0	12	4	94.14
Herring gull	0.05	4	0	12	4	92.35
Manx shearwater	0.05	5	0	12	4	92.64
Gannet	0.09	8	0	19	5	63.16

Table 57   Abundance estimates of species groups in the Morecambe development area during Survey 15 on 02 May 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	57.35	4983	2987	7244	1164	23.35
All non-avian animals	4.14	360	197	548	91	25.26
Species group						
Wader species	0.05	4	0	12	4	91.69
Small gull species	3.38	294	200	405	52	17.57
Black-backed gull species	0.40	35	4	85	23	64.00
Large gull species	0.68	59	12	118	29	48.34
Gull species	0.33	29	0	56	14	46.47
Arctic / common tern	1.19	104	33	187	39	37.34
Tern species	0.23	21	0	51	14	66.60
Large auk	21.67	1883	1367	2436	274	14.53
Auk species	0.27	24	8	48	12	46.53
Auk / small gull	0.05	5	0	12	4	91.53
Auk / shearwater species	1.35	118	47	207	41	34.24
Fulmar / gull species	0.50	44	12	88	20	44.81
Shearwater species	24.28	2110	923	3691	711	33.70
Gannet species	3.61	314	101	620	140	44.37

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Jellyfish	0.05	5	0	12	4	90.62
Cetacean species	4.17	363	196	561	93	25.50

Table 58   Apportioned abundance estimates of animals in the Morecambe development area during Survey 15 on 02 May 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Dunlin	0.05	5	0	12	4	88.63
Kittiwake	3.36	293	191	404	54	18.27
Common gull	0.00	1	0	1	1	57.64
Great black-backed gull	0.35	31	4	71	18	57.67
Herring gull	0.75	66	15	135	32	47.93
Lesser black-backed gull	0.34	30	4	65	16	53.32
Common tern	0.10	10	1	25	8	79.56
Arctic tern	1.02	89	30	170	36	40.65
Guillemot	21.39	1859	1367	2461	277	14.90
Razorbill	0.53	47	20	76	15	31.16
Puffin	0.14	12	3	24	6	47.17
Fulmar	0.51	45	12	88	20	44.83
Manx shearwater	25.31	2199	885	3773	754	34.28
Gannet	3.71	322	99	633	142	43.80
Barrel jellyfish	0.05	5	0	12	4	93.23
Harbour porpoise	4.21	366	203	564	93	25.34

Table 59 **Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 15 on 02 May 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.84	160	82	254	44	27.08
Common gull	0.00	1	0	1	1	61.62
Great black-backed gull	0.26	23	4	45	11	48.80
Herring gull	0.68	60	8	120	29	48.84
Lesser black-backed gull	0.29	26	4	61	17	64.99
Guillemot	21.25	1847	1364	2352	262	14.16
Razorbill	0.52	46	19	76	15	32.50
Puffin	0.14	13	3	25	6	47.43
Fulmar	0.52	45	12	88	20	43.51
Manx shearwater	23.00	1998	777	3486	708	35.40
Gannet	3.41	297	92	610	134	45.12

Table 60   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 15 on 02 May 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Dunlin	0.05	5	0	12	4	94.70
Kittiwake	1.50	131	64	218	42	31.47
Great black-backed gull	0.09	9	0	25	8	95.10
Herring gull	0.08	7	0	17	5	62.58
Lesser black-backed gull	0.05	5	0	15	4	84.65
Common tern	0.10	10	1	25	8	81.16
Arctic tern	1.02	89	31	168	36	40.38
Guillemot	0.23	21	4	43	11	50.34
Manx shearwater	2.34	204	114	314	52	25.23
Gannet	0.29	25	8	45	10	39.15

Table 61   Abundance estimates of species groups in the Morecambe development area during Survey 16 on 07 June 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	32.29	2805	1596	4440	726	25.86
All non-avian animals	0.54	48	20	81	17	35.24
Species group						
Small gull species	1.78	155	112	202	24	14.90
Large gull species	0.05	5	0	12	4	91.34
Large auk	13.17	1145	607	1844	317	27.66
Auk species	0.05	5	0	12	4	86.42
Auk / shearwater species	0.80	70	19	139	32	45.46
Shearwater species	16.14	1403	366	2929	677	48.25
Gannet species	0.28	25	8	42	9	35.79
Jellyfish	0.04	4	0	12	4	95.20
Cetacean species	0.50	44	15	80	18	40.61

Table 62   **Apportioned abundance estimates of animals in the Morecambe development area during Survey 16 on 07 June 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.80	157	115	206	24	14.84
Herring gull	0.05	4	0	12	4	94.51
Guillemot	13.42	1166	635	1858	323	27.69
Razorbill	0.17	15	5	26	6	39.59
Puffin	0.02	2	0	5	2	88.64
Manx shearwater	16.30	1417	370	2993	716	50.52
Gannet	0.28	24	8	43	9	37.00
Lion's mane jellyfish	0.05	5	0	12	4	89.34
Harbour porpoise	0.51	45	16	80	17	37.99

Table 63   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 16 on 07 June 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.36	32	16	49	9	28.38
Guillemot	13.10	1139	606	1796	304	26.69
Razorbill	0.17	15	5	27	6	38.02
Puffin	0.02	2	0	5	2	90.51
Manx shearwater	14.85	1290	291	2823	667	51.69
Gannet	0.22	20	4	39	9	44.47

Table 64   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 16 on 07 June 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.41	123	82	170	23	18.16
Herring gull	0.04	4	0	12	4	94.85
Guillemot	0.02	2	0	6	2	95.02
Manx shearwater	1.46	127	35	247	55	43.25
Gannet	0.04	4	0	12	4	92.45

Table 65   Abundance estimates of species groups in the Morecambe development area during Survey 17 on 14 July 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	52.34	4548	3320	5902	662	14.55
All non-avian animals	0.09	8	0	19	5	63.97
Species group						
Small gull species	3.25	283	137	440	80	28.26
Large gull species	0.14	13	0	24	6	46.53
Arctic / common tern	0.05	5	0	12	4	91.48
Large auk	38.05	3306	2393	4388	518	15.66
Auk species	0.52	46	15	84	18	38.92
Auk / small gull	0.05	4	0	13	4	95.71
Auk / shearwater species	0.96	84	40	131	24	28.30
Fulmar / gull species	0.05	5	0	13	4	93.62
Shearwater species	9.10	791	429	1140	187	23.56
Gannet species	0.32	28	8	53	13	43.96
Jellyfish	0.04	4	0	12	4	94.79
Cetacean species	0.05	4	0	12	4	93.76

Table 66   Apportioned abundance estimates of animals in the Morecambe development area during Survey 17 on 14 July 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	3.25	282	136	440	78	27.48
Herring gull	0.02	2	0	6	2	91.02
Lesser black-backed gull	0.12	11	2	21	6	48.95
Guillemot	38.45	3341	2394	4360	506	15.14
Razorbill	0.10	9	1	25	8	92.69
Fulmar	0.05	4	0	12	4	92.89
Manx shearwater	9.78	850	488	1189	190	22.28
Gannet	0.33	29	8	56	13	42.96
Lion's mane jellyfish	0.05	5	0	12	4	91.93
Harbour porpoise	0.05	5	0	12	4	91.59

Table 67   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 17 on 14 July 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.88	77	26	133	28	36.07
Lesser black-backed gull	0.05	4	0	12	4	88.18
Guillemot	38.40	3337	2438	4370	500	14.97
Razorbill	0.09	9	1	24	8	91.47
Fulmar	0.05	4	0	15	4	97.84
Manx shearwater	8.11	705	356	1085	193	27.30
Gannet	0.14	13	4	24	6	47.66

Table 68   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 17 on 14 July 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	2.38	207	102	331	60	28.93
Herring gull	0.02	2	0	6	2	92.06
Lesser black-backed gull	0.07	6	0	15	4	67.02
Guillemot	0.28	24	4	48	11	45.71
Manx shearwater	1.44	125	12	300	86	68.04
Gannet	0.18	16	0	39	11	63.45

Table 69 **Abundance estimates of species groups in the Morecambe development area during Survey 18 on 09 August 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	50.11	4354	3521	5100	415	9.52
All non-avian animals	0.50	44	19	71	14	32.17
Species group						
Small gull species	2.54	221	151	296	38	16.99
Black-backed gull species	0.23	20	0	40	10	50.31
Large gull species	0.14	12	0	29	8	63.71
Tern species	0.04	4	0	12	4	94.44
Large auk	30.61	2660	2091	3192	284	10.64
Auk species	0.04	4	0	12	4	93.82
Auk / small gull	0.05	5	0	12	4	92.01
Auk / shearwater species	0.77	67	44	95	13	19.22
Shearwater species	14.91	1296	535	2220	436	33.62
Gannet species	0.41	36	16	58	11	29.94
Jellyfish	0.09	8	0	24	8	91.35
Seal species	0.05	4	0	12	4	88.99
Cetacean species	0.37	32	8	61	15	44.64

Table 70 **Apportioned abundance estimates of animals in the Morecambe development area during Survey 18 on 09 August 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	2.60	226	154	300	38	16.83
Herring gull	0.11	10	0	23	6	59.84
Lesser black-backed gull	0.26	23	6	43	10	42.55
Guillemot	31.07	2700	2159	3259	281	10.38
Manx shearwater	15.63	1358	586	2281	427	31.40
Gannet	0.41	36	16	56	11	30.21
Grey seal	0.04	4	0	12	4	88.65
Harbour porpoise	0.37	33	8	62	15	44.43

Table 71   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 18 on 09 August 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.82	72	30	119	23	32.08
Herring gull	0.07	6	0	17	6	91.29
Lesser black-backed gull	0.02	3	0	7	2	92.22
Guillemot	30.90	2685	2127	3199	274	10.20
Manx shearwater	14.02	1219	526	1946	362	29.70
Gannet	0.27	24	8	45	10	40.96

Table 72   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 18 on 09 August 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.77	154	95	227	35	22.48
Herring gull	0.04	4	0	12	4	99.05
Lesser black-backed gull	0.23	20	0	40	10	49.96
Manx shearwater	1.05	91	48	142	24	26.15
Gannet	0.09	8	0	19	5	61.38

Table 73   Abundance estimates of species groups in the Morecambe development area during Survey 19 on 02 September 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	30.51	2651	2218	3065	222	8.35
All non-avian animals	0.05	5	0	12	4	85.92
Species group						
Small gull species	1.47	128	92	172	21	15.79
Black-backed gull species	0.05	5	0	12	4	89.92
Tern species	0.13	12	0	28	8	64.48
Large auk	28.44	2472	2065	2904	206	8.31
Auk / small gull	0.05	5	0	12	4	95.50
Auk / shearwater species	0.24	21	4	51	13	59.66
Shearwater species	0.14	13	4	24	6	47.01
Gannet species	0.05	4	0	12	4	88.38
Cetacean species	0.05	5	0	12	4	87.62

Table 74 **Apportioned abundance estimates of animals in the Morecambe development area during Survey 19 on 02 September 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.52	133	97	174	21	15.20
Lesser black-backed gull	0.05	5	0	12	4	89.55
Sandwich tern	0.13	12	0	28	8	65.58
Guillemot	28.53	2479	2066	2882	205	8.23
Razorbill	0.00	1	0	1	1	98.28
Manx shearwater	0.21	19	0	40	11	55.23
Gannet	0.05	4	0	12	4	94.37
Harbour porpoise	0.05	4	0	12	4	94.83

Table 75 **Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 19 on 02 September 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.45	39	24	55	9	21.07
Guillemot	28.47	2474	2070	2884	210	8.46
Razorbill	0.00	1	0	1	1	92.69
Manx shearwater	0.17	15	0	39	11	73.33

Table 76   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 19 on 02 September 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.06	92	57	129	19	20.32
Lesser black-backed gull	0.05	4	0	12	4	89.13
Sandwich tern	0.13	12	0	28	8	65.96
Manx shearwater	0.04	4	0	12	4	95.80
Gannet	0.05	4	0	12	4	95.91

Table 77 Abundance estimates of species groups in the Morecambe development area during Survey 20 on 03 October 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	27.91	2425	1746	3462	473	19.48
All non-avian animals	0.23	20	8	31	6	29.80
Species group						
Small gull species	0.90	79	15	187	50	63.18
Large gull species	0.09	9	0	19	5	59.51
Gull species	0.68	60	0	167	51	85.32
Large auk	25.10	2181	1673	2866	321	14.70
Auk species	0.27	24	0	59	15	63.17
Auk / small gull	0.18	16	4	33	9	52.21
Auk / shearwater species	0.50	44	0	121	35	81.10
Fulmar / gull species	0.05	4	0	12	4	90.46
Gannet species	0.04	4	0	12	4	92.00
Jellyfish	0.04	4	0	12	4	94.64
Seal species	0.05	5	0	12	4	91.64
Cetacean species	0.14	13	4	24	6	45.09

Table 78   Apportioned abundance estimates of animals in the Morecambe development area during Survey 20 on 03 October 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.03	90	16	204	53	58.39
Common gull	0.05	4	0	12	4	89.58
Great black-backed gull	0.04	4	0	12	4	90.37
Herring gull	0.63	55	0	149	43	78.22
Lesser black-backed gull	0.11	10	0	31	10	94.60
Guillemot	22.83	1984	1599	2491	235	11.80
Razorbill	2.94	256	75	549	137	53.39
Puffin	0.03	3	0	6	2	69.66
Gannet	0.04	4	0	12	4	89.97
Barrel jellyfish	0.05	5	0	12	4	90.51
Harbour porpoise	0.14	13	4	24	6	45.06

Table 79   **Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 20 on 03 October 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.87	76	11	180	48	63.67
Great black-backed gull	0.05	5	0	12	4	90.53
Herring gull	0.46	41	0	121	38	93.34
Lesser black-backed gull	0.12	11	0	31	10	89.63
Guillemot	22.84	1985	1586	2496	234	11.75
Razorbill	2.77	242	62	540	137	56.74
Puffin	0.03	3	0	6	2	70.88
Gannet	0.04	4	0	12	4	91.33

Table 80   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 20 on 03 October 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.18	16	4	28	7	39.77
Common gull	0.05	5	0	12	4	90.72
Herring gull	0.14	12	0	31	9	67.18
Guillemot	0.05	4	0	12	4	96.48
Razorbill	0.09	8	0	19	5	60.78

Table 81   Abundance estimates of species groups in the Morecambe development area during Survey 21 on 22 November 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	8.57	745	621	865	65	8.68
All non-avian animals	0.99	86	36	142	27	30.54
Species group						
Small gull species	1.54	135	88	178	23	16.86
Large gull species	0.09	9	0	30	8	95.24
Large auk	6.28	546	427	696	69	12.51
Auk species	0.41	36	12	65	15	40.29
Auk / small gull	0.09	8	0	24	8	96.80
Large auk / diver species	0.05	5	0	12	4	94.04
Gannet species	0.05	4	0	12	4	93.56
Jellyfish	0.28	25	0	59	16	61.83
Seal species	0.09	9	0	20	5	62.08
Cetacean species	0.64	56	29	85	15	26.02

Table 82   Apportioned abundance estimates of animals in the Morecambe development area during Survey 21 on 22 November 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.36	119	78	158	22	17.98
Little gull	0.05	5	0	12	4	89.94
Common gull	0.18	16	4	32	8	48.67
Great black-backed gull	0.04	4	0	15	4	100.99
Herring gull	0.04	4	0	12	4	100.95
Guillemot	5.73	499	404	630	56	11.20
Razorbill	0.87	76	38	115	20	25.28
Puffin	0.18	16	6	29	6	37.42
Gannet	0.04	4	0	12	4	95.66
Barrel jellyfish	0.27	24	0	56	16	66.44
Grey seal	0.09	8	0	19	5	62.02
Harbour porpoise	0.64	56	30	88	15	26.28

Table 83   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 21 on 22 November 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.28	25	4	51	12	49.01
Herring gull	0.05	5	0	12	4	94.34
Guillemot	5.79	503	403	624	58	11.49
Razorbill	0.88	77	40	113	20	24.90
Puffin	0.18	16	6	28	6	36.60

Table 84 Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 21 on 22 November 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.09	95	62	132	19	19.18
Little gull	0.05	5	0	12	4	92.47
Common gull	0.18	16	4	34	8	50.58
Great black-backed gull	0.05	5	0	12	4	93.50
Gannet	0.05	5	0	12	4	85.13

Table 85   Abundance estimates of species groups in the Morecambe development area during Survey 22 on 03 December 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	26.12	2270	1965	2570	156	6.85
All non-avian animals	0.19	17	0	35	9	53.00
Species group						
Duck species	0.33	29	0	83	26	88.16
Small gull species	3.56	310	233	388	40	12.78
Large gull species	0.55	48	22	82	16	33.30
Gull species	0.09	8	0	19	5	60.43
Large auk	21.32	1853	1566	2170	152	8.20
Auk species	0.14	12	0	29	8	65.67
Auk / small gull	0.14	12	4	23	6	45.61
Diver species	0.05	4	0	12	4	93.96
Fulmar / gull species	0.05	4	0	12	4	93.30
Cetacean species	0.19	17	4	35	9	50.69

Table 86   Apportioned abundance estimates of animals in the Morecambe development area during Survey 22 on 03 December 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.32	28	0	82	26	94.65
Kittiwake	1.11	97	52	154	26	26.87
Little gull	1.97	172	111	238	33	19.15
Common gull	0.64	56	24	93	18	32.17
Great black-backed gull	0.13	12	0	36	12	97.42
Herring gull	0.50	44	20	74	14	31.75
Guillemot	15.69	1363	1154	1573	110	8.02
Razorbill	5.83	507	306	751	116	22.83
Red-throated diver	0.05	4	0	12	4	93.64
Harbour porpoise	0.18	16	4	34	9	54.20

Table 87   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 22 on 03 December 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.33	29	0	82	26	88.58
Kittiwake	0.45	40	19	64	12	30.50
Little gull	0.14	12	4	23	6	45.47
Herring gull	0.27	24	4	55	15	59.27
Guillemot	14.74	1281	1045	1538	130	10.12
Razorbill	5.28	459	250	698	114	24.82

Table 88   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 22 on 03 December 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.64	56	24	99	20	35.16
Little gull	1.82	159	89	228	36	22.50
Common gull	0.64	56	26	97	19	32.62
Great black-backed gull	0.13	12	0	35	11	95.59
Herring gull	0.23	20	8	37	8	39.61
Guillemot	0.82	72	38	107	19	25.49
Razorbill	0.52	46	11	93	22	48.15
Red-throated diver	0.04	4	0	12	4	94.20

Table 89   Abundance estimates of species groups in the Morecambe development area during Survey 23 on 05 February 2023

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	4.41	383	237	541	78	20.33
All non-avian animals	0.05	5	0	12	4	90.01
Species group						
Duck species	0.05	5	0	12	4	90.01
Small gull species	0.97	85	27	156	33	38.89
Large gull species	0.09	9	0	24	8	95.91
Large auk	3.29	286	180	407	60	20.95
Dolphin species	0.05	5	0	12	4	89.29

Table 90   **Apportioned abundance estimates of animals in the Morecambe development area during Survey 23 on 05 February 2023**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.05	5	0	12	4	88.23
Kittiwake	0.32	28	11	48	10	34.20
Little gull	0.63	56	15	104	24	42.79
Herring gull	0.09	9	0	24	8	88.49
Guillemot	2.40	209	137	281	39	18.35
Razorbill	0.89	77	23	141	30	38.74
Bottlenose dolphin	0.05	4	0	12	4	89.15

Table 91   **Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 23 on 05 February 2023**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.05	5	0	12	4	86.85
Kittiwake	0.23	21	8	35	7	33.89
Little gull	0.33	29	8	58	15	49.80
Guillemot	2.34	203	131	283	38	18.64
Razorbill	0.83	73	20	135	30	40.58

Table 92   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 23 on 05 February 2023

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.09	9	0	20	6	64.38
Little gull	0.32	28	12	49	10	35.98
Herring gull	0.09	8	0	24	8	93.52
Guillemot	0.09	8	0	19	5	60.99

Table 93   Abundance estimates of species groups in the Morecambe development area during Survey 24 on 25 February 2023

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	6.27	546	411	703	76	13.87
All non-avian animals	0.23	21	0	46	12	56.58
Species group						
Small gull species	2.21	193	122	276	41	21.01
Large gull species	0.04	4	0	12	4	100.90
Large auk	4.07	354	244	477	62	17.53
Jellyfish	0.05	4	0	12	4	89.12
Cetacean species	0.19	17	0	39	11	67.47

Table 94   Apportioned abundance estimates of animals in the Morecambe development area during Survey 24 on 25 February 2023

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.69	61	37	84	13	19.96
Little gull	1.46	128	58	221	40	31.03
Common gull	0.10	9	0	25	8	89.26
Herring gull	0.05	4	0	12	4	97.11
Guillemot	2.19	191	127	254	33	17.23
Razorbill	1.86	162	90	230	36	21.87
Barrel jellyfish	0.04	4	0	12	4	96.25
Harbour porpoise	0.18	16	0	39	11	68.06

Table 95   Apportioned abundance estimates of sitting birds in the Morecambe development area during Survey 24 on 25 February 2023

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.45	40	20	62	12	28.05
Little gull	0.71	62	22	115	25	39.59
Common gull	0.01	1	0	2	1	60.40
Guillemot	2.10	183	117	252	37	19.80
Razorbill	1.87	163	97	239	37	22.60

Table 96   Apportioned abundance estimates of flying birds in the Morecambe development area during Survey 24 on 25 February 2023

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.23	21	8	32	7	31.03
Little gull	0.68	60	23	105	22	36.67
Common gull	0.09	9	0	24	8	88.55
Herring gull	0.05	5	0	12	4	91.62
Guillemot	0.09	8	0	24	8	92.34

Annex IV: Density and population estimates for revised development area with 2km buffer

1   The density, total estimated population, upper and lower 95% CLs, standard deviation and CV for each species and species group have been calculated using strip transect analysis and are presented here for each of the surveys undertaken.

Table 1   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 1 on 19 March 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	21.92	3807	3009	4652	423	11.11
All non-avian animals	1.31	229	87	409	85	36.85
Species group						
Small gull species	2.10	366	259	489	59	16.13
Large gull species	0.43	76	20	146	32	41.49
Gull species	0.16	28	9	48	10	35.78
Large auk	18.18	3157	2423	3972	399	12.63
Auk species	0.62	108	36	227	55	50.70
Auk / small gull	0.12	21	4	39	9	42.60
Auk / shearwater species	0.07	13	0	32	9	69.83
Fulmar / gull species	0.14	25	0	72	23	93.46
Gannet species	0.05	9	0	20	6	64.12
Jellyfish	1.12	196	65	364	77	39.12
Cetacean species	0.18	32	12	58	13	38.32
Seal / small cetacean species	0.02	5	0	12	4	91.46

Table 2 **Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 1 on 19 March 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.97	343	245	449	52	15.11
Little gull	0.10	17	0	36	9	51.85
Common gull	0.19	34	8	68	16	46.52
Herring gull	0.68	119	40	219	46	38.15
Guillemot	16.97	2948	2261	3640	369	12.52
Razorbill	1.68	293	163	456	79	26.71
Puffin	0.05	8	1	17	5	53.13
Fulmar	0.02	5	0	12	4	96.74
Gannet	0.05	9	0	20	6	63.95
Barrel jellyfish	1.15	200	69	358	73	36.46
Harbour porpoise	0.21	36	16	60	12	32.42

Table 3   **Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 1 on 19 March 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.99	172	111	236	32	18.55
Little gull	0.02	5	0	13	4	94.26
Common gull	0.00	1	0	3	1	86.94
Herring gull	0.47	82	23	174	41	49.51
Guillemot	16.65	2891	2263	3654	359	12.40
Razorbill	1.61	279	155	435	75	26.53
Puffin	0.04	8	1	16	5	52.24
Fulmar	0.02	5	0	12	4	91.66
Gannet	0.02	4	0	12	4	99.49

Table 4   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 1 on 19 March 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.98	171	113	230	31	17.81
Little gull	0.07	13	0	32	9	66.46
Common gull	0.19	33	4	68	16	48.77
Herring gull	0.21	37	8	79	20	54.47
Guillemot	0.44	77	23	141	31	39.96
Razorbill	0.07	13	0	32	9	68.92
Gannet	0.02	5	0	12	4	94.04

Table 5   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 2 on 07 April 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	4.42	767	592	946	94	12.17
All non-avian animals	0.14	25	8	43	10	38.48
Species group						
Small gull species	0.51	89	44	146	27	30.55
Large gull species	0.05	9	0	25	8	93.72
Large auk	3.70	643	502	791	75	11.61
Auk species	0.02	5	0	12	4	89.97
Auk / shearwater species	0.09	17	0	40	11	64.11
Fulmar / gull species	0.02	5	0	12	4	92.62
Shearwater species	0.02	5	0	12	4	97.92
Gannet species	0.02	5	0	13	4	93.88
Jellyfish	0.02	5	0	12	4	94.48
Seal species	0.04	8	0	20	5	63.15
Cetacean species	0.05	9	0	20	6	66.65
Seal / small cetacean species	0.02	5	0	12	4	93.62

Table 6   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 2 on 07 April 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.51	89	44	151	28	30.73
Herring gull	0.05	9	0	24	8	95.35
Guillemot	2.43	423	351	484	35	8.10
Razorbill	1.30	226	115	361	64	28.23
Puffin	0.02	4	0	12	4	92.80
Fulmar	0.02	5	0	12	4	92.82
Manx shearwater	0.07	13	0	36	12	94.26
Gannet	0.02	4	0	12	4	94.53
Barrel jellyfish	0.02	4	0	12	4	98.57
Grey seal	0.05	9	0	20	6	63.68
Harbour porpoise	0.07	12	0	24	7	52.56

Table 7   **Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 2 on 07 April 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.29	50	13	97	22	43.47
Herring gull	0.02	5	0	12	4	92.12
Guillemot	2.32	404	335	461	33	8.12
Razorbill	1.18	206	94	344	67	32.23
Puffin	0.02	4	0	12	4	92.79
Fulmar	0.02	5	0	12	4	94.92
Manx shearwater	0.05	9	0	24	8	89.37

Table 8   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 2 on 07 April 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.23	41	23	60	11	24.70
Herring gull	0.02	5	0	13	4	99.16
Guillemot	0.09	16	4	29	7	39.61
Razorbill	0.12	21	0	43	11	51.34
Manx shearwater	0.02	4	0	12	4	96.62
Gannet	0.02	4	0	12	4	99.68

Table 9   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 3 on 18 May 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	4.09	711	445	1143	181	25.41
All non-avian animals	0.32	56	24	89	17	30.53
Species group						
Small gull species	1.67	290	110	593	141	48.46
Large gull species	0.02	4	0	12	4	93.67
Large auk	2.07	361	244	491	64	17.76
Auk / shearwater species	0.05	8	0	20	6	65.16
Gannet species	0.35	61	27	106	21	34.71
Jellyfish	0.09	17	0	43	12	70.74
Cetacean species	0.23	41	12	75	16	39.34

Table 10   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 3 on 18 May 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.59	276	102	578	138	50.05
Common gull	0.02	4	0	12	4	91.67
Lesser black-backed gull	0.02	5	0	12	4	91.97
Guillemot	2.02	352	225	494	69	19.56
Razorbill	0.07	13	3	25	6	45.56
Manx shearwater	0.02	4	0	11	4	88.41
Gannet	0.35	60	24	102	21	33.45
Barrel jellyfish	0.09	17	0	43	12	69.35
Harbour porpoise	0.23	41	12	74	17	39.93

Table 11   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 3 on 18 May April 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.77	134	8	364	102	75.93
Guillemot	1.88	327	202	452	66	19.95
Razorbill	0.07	13	2	24	6	45.30
Manx shearwater	0.02	4	0	11	4	90.66
Gannet	0.32	56	24	95	19	33.12

Table 12   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 3 on 18 May 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.82	143	79	230	39	27.10
Common gull	0.02	4	0	12	4	92.37
Lesser black-backed gull	0.02	4	0	12	4	96.45
Guillemot	0.14	24	8	43	10	39.10
Gannet	0.02	4	0	12	4	97.02

Table 13   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 4 on 01 June 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	4.78	831	397	1451	299	35.90
All non-avian animals	0.34	60	23	106	23	37.10
Species group						
Small gull species	1.95	340	99	732	181	53.33
Large gull species	0.05	9	0	24	8	90.73
Gull species	0.09	17	0	48	16	93.72
Large auk	2.57	447	267	716	114	25.42
Auk species	0.02	4	0	12	4	94.04
Gannet species	0.02	5	0	12	4	90.89
Seal species	0.07	13	0	32	9	69.80
Cetacean species	0.28	49	20	84	17	33.23
Small gull species	1.95	340	99	732	181	53.33
Large gull species	0.05	9	0	24	8	90.73
Gull species	0.09	17	0	48	16	93.72
Large auk	2.57	447	267	716	114	25.42

Table 14   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 4 on 01 June 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	2.03	354	101	757	179	50.42
Herring gull	0.05	9	0	24	8	94.96
Guillemot	2.61	453	277	710	112	24.72
Razorbill	0.02	4	0	12	4	93.95
Gannet	0.02	5	0	12	4	92.67
Grey seal	0.07	13	0	31	9	68.00
Harbour porpoise	0.28	48	20	83	16	32.72

Table 15   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 4 on 01 June 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.82	143	8	359	93	65.17
Herring gull	0.02	5	0	12	4	97.30
Guillemot	2.51	436	258	691	110	25.09
Razorbill	0.02	4	0	12	4	92.42
Gannet	0.02	4	0	12	4	94.47

Table 16   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 4 on 01 June 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.26	219	88	444	100	45.48
Herring gull	0.02	4	0	12	4	96.76
Guillemot	0.12	21	0	60	20	97.03

Table 17   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 5 on 09 July 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	64.82	11256	7973	14989	1816	16.13
All non-avian animals	0.16	28	12	47	10	33.43
Species group						
Small gull species	0.66	114	42	238	55	47.55
Black-backed gull species	0.07	12	0	32	9	71.17
Large gull species	0.09	17	0	36	9	53.65
Gull species	0.35	60	0	179	59	97.02
Large auk	19.41	3371	2728	3981	329	9.73
Auk species	2.13	371	245	503	66	17.65
Auk / shearwater species	3.10	538	198	938	186	34.57
Shearwater species	37.52	6515	3401	10024	1737	26.65
Gannet species	0.96	167	112	230	31	18.14
Cetacean species	0.17	29	12	47	10	32.12

Table 18   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 5 on 09 July 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.02	178	41	416	113	63.31
Great black-backed gull	0.07	13	0	24	6	48.56
Herring gull	0.02	5	0	12	4	91.45
Lesser black-backed gull	0.07	12	4	24	6	48.34
Guillemot	21.17	3676	2930	4405	386	10.48
Razorbill	0.09	17	5	29	7	38.45
Puffin	0.27	47	24	74	14	28.27
Manx shearwater	40.86	7096	3986	10698	1698	23.92
Gannet	0.97	169	109	234	32	18.75
Harbour porpoise	0.16	29	12	48	10	33.30

Table 19   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 5 on 09 July 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.16	29	0	83	27	91.94
Great black-backed gull	0.02	4	0	12	4	93.73
Guillemot	21.12	3668	2974	4320	363	9.9
Razorbill	0.07	12	1	24	6	48.53
Puffin	0.27	48	24	75	14	28.03
Manx shearwater	30.41	5280	2373	8689	1622	30.72
Gannet	0.75	131	89	181	25	18.37

Table 20 Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 5 on 09 July 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.86	150	43	328	84	56.18
Great black-backed gull	0.05	9	0	20	6	66.74
Herring gull	0.02	4	0	12	4	99.04
Lesser black-backed gull	0.07	12	0	24	7	52.74
Guillemot	0.09	16	0	35	9	55.33
Razorbill	0.02	4	0	12	4	96.41
Manx shearwater	10.31	1792	1345	2271	240	13.36
Gannet	0.18	32	8	63	15	45.67

Table 21   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 6 on 02 August 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	79.66	13832	11162	16356	1320	9.54
All non-avian animals	0.12	21	0	43	11	51.70
Species group						
Small gull species	15.12	2625	771	5202	1120	42.65
Black-backed gull species	0.07	12	0	30	8	67.49
Large gull species	0.55	96	4	254	76	78.63
Gull species	0.11	20	0	49	13	63.27
Arctic / common tern	0.05	8	0	24	8	91.92
Skua species	0.02	4	0	12	4	96.44
Large auk	41.54	7213	5203	9476	1125	15.60
Auk species	0.31	55	31	82	14	24.19
Auk / small gull	0.05	8	0	24	8	92.29
Auk / shearwater species	1.27	222	128	330	53	23.86
Fulmar / gull species	0.18	32	8	65	16	50.40
Shearwater species	16.87	2930	1671	4493	725	24.72
Gannet species	3.59	624	484	786	76	12.17
Seal species	0.02	5	0	12	4	88.63

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Cetacean species	0.09	16	0	35	9	54.48

Table 22 **Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 6 on 02 August 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	14.83	2576	666	4802	1108	43.01
Great black-backed gull	0.02	4	0	12	4	93.24
Herring gull	0.19	34	0	119	32	93.69
Lesser black-backed gull	0.57	100	15	246	61	61.30
Great skua	0.02	4	0	12	4	97.68
Guillemot	42.19	7326	5273	9505	1084	14.79
Razorbill	0.05	9	1	30	8	95.71
Puffin	0.14	25	10	45	10	38.15
Fulmar	0.13	24	4	49	12	49.28
Manx shearwater	18.16	3154	1920	4720	751	23.79
Gannet	3.60	625	493	773	73	11.60
Grey seal	0.02	5	0	12	4	87.78
Harbour porpoise	0.09	16	4	35	9	53.04

Table 23   **Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 6 on 02 August 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	12.28	2134	429	4243	995	46.63
Great black-backed gull	0.02	4	0	12	4	94.38
Herring gull	0.09	17	0	48	16	94.06
Lesser black-backed gull	0.50	87	8	209	57	65.91
Great skua	0.02	4	0	12	4	93.92
Guillemot	41.90	7276	5347	9494	1041	14.30
Razorbill	0.05	9	1	24	8	93.13
Puffin	0.14	24	8	44	10	38.48
Fulmar	0.13	23	4	49	12	52.04
Manx shearwater	11.52	2000	1053	3267	594	29.67
Gannet	2.11	367	297	433	34	9.02

Table 24   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 6 on 02 August 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	3.00	521	86	1249	351	67.32
Herring gull	0.09	16	0	47	16	94.72
Lesser black-backed gull	0.07	13	4	26	6	48.74
Manx shearwater	6.45	1121	751	1520	200	17.80
Gannet	1.50	260	148	394	62	23.51

Table 25   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 7 on 04 September 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	20.92	3634	1605	6573	1314	36.15
Species group						
Small gull species	16.80	2918	825	5659	1268	43.44
Black-backed gull species	0.08	15	0	43	14	94.64
Large gull species	1.48	258	49	596	153	59.12
Gull species	0.08	14	0	34	9	60.93
Arctic / common tern	0.16	28	0	62	16	57.91
Tern species	0.24	43	0	100	26	60.27
Tern / small gull species	0.12	22	7	42	11	47.62
Large auk	1.29	225	68	409	90	39.98
Shearwater species	0.04	8	0	21	7	87.09
Gannet species	0.72	126	61	201	38	29.82

Table 26 **Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 7 on 04 September 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	16.57	2878	884	5386	1187	41.23
Common gull	0.04	8	0	21	7	89.11
Great black-backed gull	0.05	10	0	29	10	97.26
Herring gull	0.93	162	0	444	140	86.28
Lesser black-backed gull	0.62	108	29	196	44	40.10
Sandwich tern	0.24	42	0	98	26	60.70
Common tern	0.13	24	0	51	13	55.81
Arctic tern	0.03	6	0	14	4	68.61
Guillemot	1.24	215	62	393	87	40.09
Manx shearwater	0.04	7	0	21	7	91.34
Gannet	0.72	126	59	206	39	30.56
Large gull species	0.04	8	0	21	7	95.47
Large gull species	0.04	7	0	21	7	96.29

Table 27   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 7 on 04 September 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	13.74	2386	448	5208	1215	50.93
Great black-backed gull	0.00	1	0	1	1	95.98
Herring gull	0.76	133	0	381	123	92.45
Lesser black-backed gull	0.23	41	0	111	33	78.94
Guillemot	1.34	234	66	427	93	39.75
Gannet	0.12	22	0	44	12	51.16

Table 28   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 7 on 04 September 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	3.14	545	329	752	104	19.04
Common gull	0.04	7	0	21	7	94.45
Herring gull	0.08	14	0	35	10	68.59
Lesser black-backed gull	0.41	72	21	143	32	44.32
Sandwich tern	0.24	42	0	98	24	58.28
Common tern	0.13	23	0	54	14	59.78
Arctic tern	0.03	6	0	14	4	71.46
Manx shearwater	0.04	8	0	21	7	94.80
Gannet	0.60	104	40	175	35	33.79

Table 29   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 8 on 06 October 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	17.48	3036	2297	3865	389	12.79
All non-avian animals	0.25	44	16	80	18	39.15
Species group						
Small gull species	0.35	61	20	109	24	38.27
Black-backed gull species	0.02	5	0	12	4	94.41
Large gull species	0.29	51	0	153	47	91.59
Gull species	0.02	4	0	12	4	97.88
Tern species	0.07	12	0	36	12	96.24
Large auk	16.28	2827	2168	3472	335	11.85
Auk species	0.23	41	12	77	17	40.55
Gannet species	0.02	5	0	12	4	89.94
Cetacean species	0.25	44	16	78	17	37.75

Table 30 **Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 8 on 06 October 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.34	60	16	107	24	39.32
Common gull	0.02	5	0	13	4	89.88
Great black-backed gull	0.02	4	0	12	4	98.07
Herring gull	0.28	49	0	144	47	94.69
Lesser black-backed gull	0.02	4	0	13	4	96.59
Sandwich tern	0.07	13	0	36	12	99.23
Guillemot	13.02	2261	1661	2909	327	14.45
Razorbill	3.65	634	417	870	117	18.36
Gannet	0.02	4	0	12	4	96.72
Harbour porpoise	0.26	46	16	80	17	35.43

Table 31   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 8 on 06 October 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.26	45	8	92	21	46.36
Great black-backed gull	0.02	5	0	12	4	93.84
Herring gull	0.28	49	0	144	47	97.17
Lesser black-backed gull	0.02	5	0	12	4	91.85
Guillemot	12.70	2205	1640	2840	323	14.64
Razorbill	3.35	583	385	793	106	18.05

Table 32   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 8 on 06 October 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.09	16	0	35	9	53.63
Common gull	0.02	4	0	12	4	96.25
Sandwich tern	0.07	13	0	37	12	94.61
Guillemot	0.25	44	4	106	27	61.46
Razorbill	0.32	56	16	103	23	41.45
Gannet	0.02	4	0	12	4	97.47

Table 33   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 9 on 17 November 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	10.18	1768	1428	2233	215	12.13
All non-avian animals	0.12	21	0	51	14	64.58
Species group						
Small gull species	1.38	240	121	417	77	31.99
Black-backed gull species	0.02	5	0	13	4	91.81
Large gull species	0.17	30	4	63	15	51.01
Gull species	0.12	21	4	40	10	44.88
Large auk	8.33	1447	1192	1753	146	10.05
Auk species	0.16	29	9	51	11	38.26
Auk / small gull	0.02	5	0	13	4	94.99
Seal species	0.05	8	0	20	6	63.93
Cetacean species	0.07	12	0	31	9	69.13

Table 34   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 9 on 17 November 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.39	242	130	431	80	32.81
Little gull	0.02	5	0	13	4	93.98
Common gull	0.09	17	0	37	9	54.15
Great black-backed gull	0.03	6	0	14	4	75.61
Herring gull	0.15	27	4	58	15	53.49
Guillemot	7.13	1239	1059	1434	100	8.04
Razorbill	1.31	227	119	367	68	29.84
Puffin	0.02	3	1	6	2	37.88
Grey seal	0.05	9	0	20	5	61.16
Harbour porpoise	0.07	13	0	29	9	65.00

Table 35   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 9 on 17 November 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.65	114	31	241	59	51.49
Great black-backed gull	0.01	2	0	3	1	62.61
Herring gull	0.14	24	4	53	14	56.28
Guillemot	7.03	1221	1042	1402	93	7.61
Razorbill	1.29	224	107	381	71	31.44
Puffin	0.02	3	2	6	2	37.51

Table 36   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 9 on 17 November 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.72	125	70	182	29	23.05
Little gull	0.02	4	0	12	4	98.68
Common gull	0.09	17	0	36	9	52.02
Great black-backed gull	0.02	5	0	12	4	92.55
Herring gull	0.02	4	0	12	4	90.29
Guillemot	0.12	21	0	44	11	52.00
Razorbill	0.05	9	0	25	8	93.13

Table 37   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 10 on 05 December 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	1.53	267	164	376	56	20.68
All non-avian animals	0.07	12	0	31	9	71.00
Species group						
Small gull species	0.67	117	67	180	28	23.88
Large gull species	0.04	8	0	24	8	95.49
Gull species	0.02	4	0	12	4	97.99
Large auk	0.78	136	74	221	39	28.38
Diver species	0.02	4	0	12	4	91.26
Seal species	0.02	4	0	12	5	101.90
Cetacean species	0.05	8	0	24	8	98.30

Table 38   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 10 on 05 December 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.44	76	50	109	16	19.75
Little gull	0.02	5	0	13	4	88.89
Common gull	0.21	37	8	71	17	43.96
Herring gull	0.07	13	0	31	9	65.99
Guillemot	0.56	98	50	156	29	29.09
Razorbill	0.22	39	13	68	15	36.41
Red-throated diver	0.02	5	0	12	4	91.20
Grey seal	0.02	4	0	12	4	95.45
Harbour porpoise	0.05	9	0	24	8	92.08

Table 39 **Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 10 on 05 December 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.04	8	0	19	5	66.23
Little gull	0.02	5	0	13	4	83.14
Common gull	0.00	1	0	2	1	96.20
Herring gull	0.02	4	0	12	4	97.28
Guillemot	0.52	91	40	158	29	32.11
Razorbill	0.21	38	12	66	15	37.66
Red-throated diver	0.02	5	0	12	4	88.10

Table 40 **Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 10 on 05 December 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.39	68	39	103	16	23.35
Common gull	0.21	37	8	75	17	46.22
Herring gull	0.05	8	0	20	6	64.96
Guillemot	0.04	7	0	17	5	65.74
Razorbill	0.01	2	0	4	2	98.61

Table 41   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 11 on 13 January 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	6.11	1061	650	1515	229	21.53
All non-avian animals	0.09	16	0	36	9	54.86
Species group						
Small gull species	0.16	28	4	57	14	47.57
Large gull species	0.09	16	0	43	12	71.76
Gull species	0.14	25	8	43	10	37.6
Large auk	5.79	1005	548	1457	231	22.99
Auk species	0.05	9	0	20	6	63.32
Cetacean species	0.09	17	0	36	9	54.96

Table 42   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 11 on 13 January 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.02	5	0	12	4	90.80
Common gull	0.28	48	24	73	13	26.77
Great black-backed gull	0.02	4	0	12	4	94.08
Herring gull	0.07	13	0	36	12	94.11
Guillemot	5.51	957	564	1424	221	23.05
Razorbill	0.27	47	12	87	20	41.02
Harbour porpoise	0.09	17	0	36	9	54.56

Table 43   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 11 on 13 January 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common gull	0.02	5	0	12	4	93.65
Guillemot	5.49	954	563	1398	216	22.63
Razorbill	0.27	47	14	83	18	38.56

Table 44   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 11 on 13 January 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.02	5	0	12	4	90.40
Common gull	0.25	45	21	69	13	28.38
Great black-backed gull	0.02	5	0	12	4	93.82
Herring gull	0.07	13	0	36	12	92.46

Table 45   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 12 on 11 February 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	9.75	1694	1250	2129	227	13.37
All non-avian animals	0.18	32	12	52	11	32.31
Species group						
Small gull species	0.34	60	24	104	21	34.90
Black-backed gull species	0.04	8	0	20	6	67.41
Large gull species	0.16	29	12	50	10	34.68
Large auk	9.05	1572	1146	2031	231	14.68
Auk species	0.16	28	4	59	15	51.10
Auk / small gull	0.02	4	0	12	4	97.71
Diver species	0.02	5	0	12	4	93.15
Seal species	0.02	5	0	12	4	94.43
Cetacean species	0.16	29	8	50	11	36.85

Table 46   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 12 on 11 February 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.14	24	4	49	12	49.22
Black-headed gull	0.02	4	0	12	4	95.74
Little gull	0.02	5	0	12	4	97.21
Common gull	0.16	28	8	57	13	43.72
Herring gull	0.16	28	12	48	10	34.27
Lesser black-backed gull	0.04	8	0	20	6	67.79
Guillemot	7.69	1335	946	1753	204	15.25
Razorbill	1.56	271	177	373	53	19.23
Red-throated diver	0.02	4	0	12	4	94.36
Grey seal	0.02	4	0	12	4	91.86
Harbour porpoise	0.16	29	12	50	11	35.59

Table 47   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 12 on 11 February 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common gull	0.07	12	0	32	9	74.52
Herring gull	0.07	13	0	32	9	66.89
Guillemot	7.45	1294	920	1697	198	15.24
Razorbill	1.52	265	169	361	50	18.60
Red-throated diver	0.02	5	0	12	4	92.87

Table 48   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 12 on 11 February 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.13	24	4	48	12	49.37
Black-headed gull	0.02	5	0	12	4	93.86
Little gull	0.02	5	0	12	4	95.52
Common gull	0.09	17	4	32	7	43.27
Herring gull	0.09	17	4	31	7	42.51
Lesser black-backed gull	0.05	9	0	20	6	64.90
Guillemot	0.21	37	12	67	14	38.62
Razorbill	0.02	4	0	12	4	98.03

Table 49   **Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 13 on 09 March 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	5.92	1029	800	1282	125	12.14
All non-avian animals	0.25	44	19	71	14	30.20
Species group						
Small gull species	1.84	320	251	389	36	11.19
Black-backed gull species	0.02	4	0	12	4	95.88
Large gull species	0.11	20	0	49	12	58.42
Large auk	3.90	678	479	872	101	14.80
Auk species	0.02	5	0	12	4	93.34
Diver species	0.02	5	0	12	4	93.10
Fulmar / gull species	0.02	4	0	12	4	97.84
Seal species	0.02	4	0	12	4	96.29
Cetacean species	0.23	40	19	63	12	28.23

Table 50   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 13 on 09 March 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.76	305	237	383	38	12.22
Black-headed gull	0.02	4	0	12	4	98.37
Little gull	0.02	4	0	12	4	94.71
Common gull	0.02	5	0	12	4	92.21
Herring gull	0.05	9	0	20	6	62.47
Lesser black-backed gull	0.09	17	4	36	9	51.70
Guillemot	2.45	425	244	631	103	24.01
Razorbill	1.46	253	160	359	53	20.59
Red-throated diver	0.02	4	0	12	4	96.50
Grey seal	0.02	4	0	12	4	98.26
Harbour porpoise	0.23	40	19	64	12	29.28

Table 51   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 13 on 09 March 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.91	159	111	220	29	17.88
Black-headed gull	0.02	5	0	15	5	95.00
Common gull	0.02	4	0	12	4	99.26
Herring gull	0.02	4	0	12	4	100.17
Lesser black-backed gull	0.05	9	0	20	5	59.21
Guillemot	2.41	419	223	634	104	24.83
Razorbill	1.41	244	141	357	54	22.12
Red-throated diver	0.02	4	0	12	4	95.41

Table 52   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 13 on 09 March 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.82	144	106	180	19	13.26
Little gull	0.02	4	0	12	4	95.35
Herring gull	0.02	5	0	12	4	92.35
Lesser black-backed gull	0.04	8	0	20	5	63.81
Guillemot	0.00	1	0	3	1	100.42
Razorbill	0.06	12	0	23	6	50.33

Table 53   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 14 on 01 April 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	9.46	1643	969	2729	496	30.15
All non-avian animals	0.16	28	8	52	12	42.49
Species group						
Small gull species	4.70	817	215	1846	482	58.98
Black-backed gull species	0.05	8	0	20	6	63.94
Large gull species	0.14	24	8	43	10	37.94
Gull species	0.02	5	0	12	4	93.40
Large auk	4.20	730	559	907	90	12.27
Auk species	0.04	8	0	20	6	70.79
Auk / small gull	0.09	16	0	35	9	54.74
Large auk / diver species	0.02	4	0	12	4	94.63
Auk / shearwater species	0.07	12	0	31	9	69.28
Fulmar / gull species	0.02	4	0	12	4	97.99
Shearwater species	0.02	4	0	12	4	96.96
Gannet species	0.13	24	0	65	19	79.23
Seal species	0.02	5	0	12	5	97.19
Cetacean species	0.14	24	4	49	12	50.13

Table 54   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 14 on 01 April 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	4.44	771	221	1851	484	62.82
Black-headed gull	0.02	4	0	12	4	94.35
Little gull	0.02	4	0	12	4	95.17
Common gull	0.02	4	0	12	4	96.02
Great black-backed gull	0.05	8	0	19	5	61.39
Herring gull	0.13	22	4	42	10	42.83
Lesser black-backed gull	0.02	4	0	12	4	94.79
Guillemot	3.37	586	459	732	71	12.07
Razorbill	0.91	158	73	252	46	29.04
Puffin	0.00	1	0	3	1	92.81
Fulmar	0.02	4	0	12	4	97.02
Manx shearwater	0.08	14	0	32	9	60.54
Gannet	0.14	24	0	64	19	79.53
Grey seal	0.02	4	0	12	4	96.24
Harbour porpoise	0.14	25	4	51	12	48.41

Table 55   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 14 on 01 April 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.14	198	88	332	63	31.88
Black-headed gull	0.02	5	0	12	4	89.93
Common gull	0.02	4	0	12	4	94.30
Herring gull	0.10	19	4	35	8	41.44
Guillemot	3.37	585	458	733	71	12.02
Razorbill	0.91	158	73	254	47	29.57
Puffin	0.00	1	0	3	1	96.67
Fulmar	0.02	4	0	12	4	98.39
Manx shearwater	0.06	11	0	29	8	73.62
Gannet	0.09	16	0	48	16	98.43

Table 56   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 14 on 01 April 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	3.66	637	102	1592	470	73.79
Little gull	0.02	4	0	12	4	92.53
Great black-backed gull	0.05	8	0	20	5	62.89
Herring gull	0.02	5	0	12	4	93.23
Lesser black-backed gull	0.02	4	0	12	4	95.85
Guillemot	0.02	5	0	12	4	94.38
Manx shearwater	0.02	4	0	12	4	99.11
Gannet	0.05	8	0	20	5	62.90

Table 57   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 15 on 02 May 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	56.69	9844	5877	15493	2600	26.41
All non-avian animals	2.6	451	242	707	119	26.38
Species group						
Wader species	0.12	21	0	64	18	83.66
Small gull species	4.86	844	340	1800	433	51.26
Black-backed gull species	0.32	57	13	112	26	46.21
Large gull species	1.42	248	66	490	110	44.22
Gull species	0.22	38	8	85	21	54.95
Arctic / common tern	0.75	130	57	213	42	31.75
Tern species	0.14	24	0	52	14	55.91
Large auk	26.60	4620	2974	7049	1064	23.02
Auk species	0.21	37	16	64	14	35.16
Auk / small gull	0.02	5	0	13	4	91.05
Auk / shearwater species	1.40	244	144	363	57	23.34
Fulmar / gull species	0.64	112	23	253	66	59.16
Shearwater species	17.47	3034	1583	4794	817	26.91
Gannet species	2.55	444	112	880	195	43.85

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Corvid species	0.02	5	0	13	4	94.74
Jellyfish	0.02	4	0	12	4	101.17
Seal species	0.02	5	0	12	4	92.08
Cetacean species	2.52	438	217	698	124	28.22

Table 58   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 15 on 02 May 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Dunlin	0.12	21	0	59	17	81.82
Kittiwake	5.07	881	338	1835	459	52.07
Common gull	0.00	1	0	1	1	61.91
Great black-backed gull	0.54	95	12	218	56	59.43
Herring gull	1.16	201	40	438	111	55.16
Lesser black-backed gull	0.38	66	14	141	33	49.78
Common tern	0.08	14	2	33	9	60.34
Arctic tern	0.64	112	49	190	39	34.03
Guillemot	26.24	4556	2940	7025	1070	23.47
Razorbill	0.64	112	69	164	25	21.76
Puffin	0.12	21	4	38	9	43.81
Fulmar	0.55	96	23	218	56	57.87
Manx shearwater	18.57	3225	1758	5047	841	26.07
Gannet	2.64	458	120	851	192	41.86
Carrion crow	0.02	5	0	13	4	92.37
Barrel jellyfish	0.02	5	0	13	4	93.76

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Grey seal	0.02	5	0	13	4	95.83
Harbour porpoise	2.56	445	222	703	124	27.77

Table 59   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 15 on 02 May 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.52	265	166	389	58	21.70
Common gull	0.00	1	0	1	1	64.04
Great black-backed gull	0.45	79	9	186	50	63.69
Herring gull	0.93	161	31	366	90	55.42
Lesser black-backed gull	0.34	59	6	130	34	58.23
Guillemot	25.75	4472	2881	6854	1020	22.80
Razorbill	0.64	111	68	165	25	22.03
Puffin	0.12	21	5	38	9	42.67
Fulmar	0.56	98	23	232	56	56.93
Manx shearwater	16.42	2852	1435	4554	789	27.65
Gannet	2.27	395	105	744	173	43.74

Table 60   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 15 on 02 May 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Dunlin	0.12	22	0	60	17	78.91
Kittiwake	3.47	603	132	1477	412	68.26
Great black-backed gull	0.07	13	0	34	9	69.92
Herring gull	0.21	37	8	78	20	52.42
Lesser black-backed gull	0.05	9	0	21	6	58.94
Common tern	0.08	14	2	34	9	63.29
Arctic tern	0.65	113	45	195	39	34.11
Guillemot	0.26	45	21	67	12	25.96
Manx shearwater	1.99	346	197	501	79	22.58
Gannet	0.24	42	8	87	21	50.10
Carrion crow	0.02	4	0	13	4	96.02

Table 61 Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 16 on 07 June 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	29.54	5130	2763	8758	1498	29.20
All non-avian animals	0.64	112	68	162	25	21.87
Species group						
Small gull species	2.33	405	293	523	59	14.55
Large gull species	0.09	17	4	31	7	42.04
Gull species	0.02	4	0	12	4	96.49
Arctic / common tern	0.32	57	0	168	55	96.19
Large auk	12.85	2231	1243	3711	625	28.01
Auk species	0.05	8	0	20	5	62.20
Auk / small gull	0.05	9	0	20	6	61.40
Auk / shearwater species	0.95	165	40	370	86	52.18
Shearwater species	12.51	2173	563	4179	930	42.80
Gannet species	0.25	44	16	74	15	33.05
Jellyfish	0.02	5	0	12	4	94.84
Seal species	0.05	8	0	20	6	63.75
Cetacean species	0.58	101	50	151	28	27.10

Table 62   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 16 on 07 June 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	2.37	413	299	541	63	15.11
Herring gull	0.09	16	0	35	9	53.75
Lesser black-backed gull	0.02	5	0	12	4	94.32
Guillemot	11.99	2083	1254	3141	500	23.98
Razorbill	1.08	188	14	520	152	80.85
Puffin	0.01	2	0	5	2	97.29
Manx shearwater	13.35	2319	645	4400	1026	44.23
Gannet	0.25	44	19	73	15	32.52
Lion's mane jellyfish	0.02	5	0	12	4	97.61
Grey seal	0.05	9	0	20	6	62.50
Harbour porpoise	0.58	100	48	153	28	27.60

Table 63   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 16 on 07 June 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.57	100	68	134	17	16.93
Herring gull	0.05	9	0	20	6	61.69
Lesser black-backed gull	0.02	5	0	12	4	95.80
Guillemot	11.97	2079	1224	3250	511	24.56
Razorbill	1.13	196	14	532	161	82.30
Puffin	0.01	2	0	5	2	96.04
Manx shearwater	12.24	2125	471	4349	998	46.96
Gannet	0.21	37	16	63	13	33.84

Table 64   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 16 on 07 June 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.79	312	213	414	53	16.86
Herring gull	0.05	8	0	20	6	64.79
Guillemot	0.15	27	8	51	12	42.85
Manx shearwater	0.87	151	44	280	61	40.17
Gannet	0.05	9	0	20	5	60.69

Table 65   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 17 on 14 July 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	49.47	8591	6488	10695	1091	12.69
All non-avian animals	0.07	12	0	24	6	49.85
Species group						
Small gull species	4.47	776	356	1395	274	35.27
Black-backed gull species	0.16	29	8	55	12	41.64
Large gull species	0.37	64	24	110	22	34.19
Gull species	0.02	4	0	12	4	93.39
Arctic / common tern	0.02	5	0	12	4	98.25
Tern species	0.05	9	0	24	8	94.16
Large auk	34.3	5957	4492	7453	767	12.88
Auk species	0.39	68	28	117	23	33.37
Auk / small gull	0.05	9	0	20	6	65.15
Auk / shearwater species	0.93	162	86	260	46	27.92
Fulmar / gull species	0.07	12	0	27	7	53.36
Shearwater species	7.90	1372	754	2056	340	24.75
Gannet species	0.55	97	50	145	25	25.95
Jellyfish	0.02	4	0	12	4	96.33

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Cetacean species	0.05	8	0	20	6	64.55

Table 66   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 17 on 14 July 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	4.36	758	336	1357	274	36.09
Herring gull	0.24	41	6	98	24	57.26
Lesser black-backed gull	0.31	54	24	88	17	30.88
Sandwich tern	0.05	8	0	24	8	93.97
Guillemot	34.68	6022	4552	7413	740	12.28
Razorbill	0.16	29	8	52	12	42.03
Fulmar	0.07	12	0	24	7	52.20
Manx shearwater	8.71	1513	874	2250	353	23.32
Gannet	0.55	96	50	149	26	26.41
Lion's mane jellyfish	0.02	4	0	12	4	94.85
Harbour porpoise	0.05	9	0	19	5	61.04

Table 67   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 17 on 14 July 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.75	130	63	204	38	28.63
Herring gull	0.07	13	0	32	9	71.54
Lesser black-backed gull	0.07	12	0	24	7	52.77
Guillemot	34.5	5991	4451	7633	808	13.47
Razorbill	0.16	29	8	54	13	43.48
Fulmar	0.05	9	0	20	6	65.38
Manx shearwater	7.37	1280	617	1995	344	26.84
Gannet	0.25	44	16	86	19	42.28

Table 68 **Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 17 on 14 July 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	3.72	646	248	1279	282	43.54
Herring gull	0.17	31	2	71	19	61.58
Lesser black-backed gull	0.24	42	16	73	15	35.32
Sandwich tern	0.04	8	0	24	8	94.07
Guillemot	0.14	25	8	49	11	44.51
Fulmar	0.02	5	0	12	4	93.83
Manx shearwater	1.16	202	66	392	87	42.80
Gannet	0.30	53	23	94	19	36.42

Table 69   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 18 on 09 August 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	46.85	8135	6861	9348	651	7.99
All non-avian animals	0.46	80	48	115	18	22.51
Species group						
Small gull species	2.70	470	340	615	71	15.08
Black-backed gull species	0.14	25	4	47	11	44.37
Large gull species	0.43	75	8	190	49	65.52
Gull species	0.05	9	0	24	8	95.64
Tern species	0.02	5	0	15	4	93.85
Large auk	30.19	5244	4533	6048	402	7.65
Auk species	0.04	8	0	20	6	67.46
Auk / small gull	0.05	9	0	20	6	63.22
Auk / shearwater species	1.04	182	108	292	51	28.05
Shearwater species	11.67	2026	1140	2994	476	23.45
Gannet species	0.37	65	38	92	14	21.60
Cormorant / shag	0.05	8	0	24	8	93.62
Jellyfish	0.05	8	0	24	8	94.32
Seal species	0.05	9	0	20	5	61.19

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Cetacean species	0.37	64	24	107	21	32.41

Table 70   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 18 on 09 August 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	2.71	471	342	616	72	15.13
Common gull	0.05	9	0	24	8	94.81
Great black-backed gull	0.02	5	0	12	4	92.75
Herring gull	0.28	49	0	136	42	84.67
Lesser black-backed gull	0.24	43	12	81	18	41.95
Guillemot	30.70	5331	4507	6135	410	7.68
Manx shearwater	12.38	2150	1197	3098	478	22.23
Gannet	0.37	65	39	93	14	21.66
Shag	0.05	8	0	24	8	92.91
Grey seal	0.05	8	0	20	6	64.80
Harbour porpoise	0.37	64	27	106	21	32.57

Table 71   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 18 on 09 August 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.80	139	52	263	56	40.31
Common gull	0.04	8	0	24	8	92.00
Herring gull	0.24	42	0	119	35	83.04
Lesser black-backed gull	0.06	11	0	29	9	76.41
Guillemot	30.53	5301	4524	6090	411	7.74
Manx shearwater	10.01	1739	1017	2528	395	22.67
Gannet	0.25	44	23	70	13	28.38
Shag	0.05	9	0	24	8	93.69

Table 72 Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 18 on 09 August 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.91	332	256	424	43	12.95
Great black-backed gull	0.02	5	0	12	4	96.11
Herring gull	0.04	8	0	24	8	97.04
Lesser black-backed gull	0.19	33	8	63	15	43.80
Guillemot	0.02	4	0	12	4	97.28
Manx shearwater	1.90	331	111	689	161	48.53
Gannet	0.09	16	4	31	7	41.90

Table 73 **Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 19 on 02 September 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	36.1	6268	5065	8074	815	12.99
All non-avian animals	0.18	32	12	61	13	38.88
Species group						
Small gull species	3.20	556	272	994	191	34.22
Black-backed gull species	0.02	4	0	12	4	93.68
Large gull species	0.21	36	4	88	24	65.08
Gull species	0.02	5	0	12	4	94.00
Arctic / common tern	0.05	8	0	24	8	99.13
Tern species	0.07	12	0	31	9	68.59
Large auk	27.94	4853	4349	5338	252	5.19
Auk species	0.05	9	0	20	6	64.02
Auk / small gull	0.07	12	0	27	7	55.21
Auk / shearwater species	0.47	82	36	140	27	32.11
Shearwater species	4.00	695	31	1805	516	74.18
Gannet species	0.19	33	8	65	15	44.11
Cetacean species	0.19	33	12	60	13	38.30

Table 74   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 19 on 02 September 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	3.20	556	284	1016	199	35.62
Great black-backed gull	0.00	1	0	1	1	99.12
Herring gull	0.02	5	0	13	4	87.51
Lesser black-backed gull	0.22	39	8	85	22	55.63
Sandwich tern	0.07	12	0	31	8	66.79
Common tern	0.02	5	0	12	4	97.59
Guillemot	28.13	4885	4384	5330	246	5.02
Razorbill	0.00	1	0	1	1	96.22
Puffin	0.01	2	0	3	1	97.72
Manx shearwater	4.28	744	73	1905	551	74.01
Gannet	0.18	33	8	64	15	44.86
Harbour porpoise	0.19	33	12	61	13	38.07

Table 75 **Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 19 on 02 September 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.71	298	94	620	139	46.52
Great black-backed gull	0.00	1	0	1	1	100.83
Herring gull	0.00	1	0	1	1	94.10
Lesser black-backed gull	0.15	27	0	75	23	85.01
Guillemot	28.14	4886	4362	5355	247	5.04
Razorbill	0.00	1	0	1	1	94.14
Puffin	0.01	2	0	4	2	99.71
Manx shearwater	3.94	685	52	1856	536	78.12
Gannet	0.07	12	0	32	9	76.14

Table 76 **Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 19 on 02 September 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.48	258	149	397	64	24.60
Herring gull	0.02	4	0	12	4	96.01
Lesser black-backed gull	0.07	12	0	24	7	51.82
Sandwich tern	0.07	12	0	31	9	68.75
Common tern	0.02	5	0	16	5	101.40
Manx shearwater	0.12	21	0	43	12	55.10
Gannet	0.12	21	4	40	9	44.26

Table 77   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 20 on 03 October 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	27.37	4753	3832	5852	550	11.56
All non-avian animals	0.30	52	23	85	17	31.28
Species group						
Small gull species	1.17	203	63	369	80	38.97
Large gull species	0.11	20	0	44	12	58.61
Gull species	0.34	60	0	168	51	84.92
Large auk	24.71	4291	3572	5099	406	9.45
Auk species	0.35	62	20	114	25	40.42
Auk / small gull	0.19	34	4	71	17	50.53
Auk / shearwater species	0.26	45	0	124	38	85.34
Fulmar / gull species	0.02	5	0	12	4	95.39
Gannet species	0.14	25	8	45	10	40.91
Jellyfish	0.09	17	0	36	9	52.90
Seal species	0.02	4	0	12	4	96.89
Cetacean species	0.18	33	8	60	14	42.76

Table 78   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 20 on 03 October 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.30	227	76	399	88	38.59
Little gull	0.02	4	0	12	4	91.94
Common gull	0.02	5	0	12	4	89.77
Great black-backed gull	0.07	12	0	31	9	69.11
Herring gull	0.33	58	0	149	42	72.39
Lesser black-backed gull	0.06	11	0	31	10	92.31
Guillemot	22.29	3872	3384	4435	274	7.07
Razorbill	2.91	506	236	884	168	33.11
Puffin	0.03	6	1	13	4	51.55
Gannet	0.14	24	8	44	10	39.66
Barrel jellyfish	0.09	17	0	36	9	54.27
Harbour porpoise	0.18	32	12	60	14	40.92

Table 79   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 20 on 03 October 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.92	160	47	288	63	39.10
Great black-backed gull	0.07	13	0	31	9	67.12
Herring gull	0.23	41	0	124	39	94.69
Lesser black-backed gull	0.06	11	0	31	10	94.73
Guillemot	22.11	3840	3332	4479	291	7.57
Razorbill	2.89	501	222	869	166	33.11
Puffin	0.03	6	1	14	4	54.65
Gannet	0.05	8	0	20	6	64.59

Table 80   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 20 on 03 October 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.42	73	12	172	45	61.30
Little gull	0.02	4	0	13	4	101.67
Common gull	0.02	5	0	12	4	92.16
Herring gull	0.09	16	0	35	9	55.42
Guillemot	0.05	9	0	24	8	94.15
Razorbill	0.04	8	0	20	5	64.14
Gannet	0.09	16	4	31	8	44.61

Table 81   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 21 on 22 November 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	9.48	1647	1393	1928	140	8.49
All non-avian animals	0.87	151	76	233	42	27.36
Species group						
Small gull species	1.67	290	198	401	53	18.09
Large gull species	0.34	60	12	129	31	50.33
Gull species	0.02	5	0	16	5	99.76
Large auk	7.01	1218	1022	1446	107	8.74
Auk species	0.29	52	16	93	20	38.19
Auk / small gull	0.09	16	0	36	9	55.18
Large auk / diver species	0.02	4	0	12	4	94.21
Auk / shearwater species	0.02	4	0	12	4	103.04
Fulmar / gull species	0.02	4	0	12	4	93.13
Gannet species	0.02	5	0	12	4	96.45
Jellyfish	0.30	52	8	105	25	47.74
Seal species	0.07	13	0	27	7	51.00
Cetacean species	0.50	88	53	129	20	22.64

Table 82   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 21 on 22 November 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.49	258	173	359	46	17.74
Black-headed gull	0.02	5	0	12	4	93.46
Little gull	0.09	16	4	35	9	53.05
Common gull	0.12	21	4	40	10	44.86
Great black-backed gull	0.03	5	0	13	4	79.44
Herring gull	0.31	55	11	122	31	55.57
Lesser black-backed gull	0.02	5	0	13	4	89.77
Guillemot	6.49	1128	960	1348	100	8.87
Razorbill	0.75	131	65	209	38	28.43
Puffin	0.15	26	9	47	11	39.07
Fulmar	0.02	5	0	12	4	94.52
Gannet	0.02	4	0	12	4	98.22
Barrel jellyfish	0.30	52	8	101	24	46.10
Grey seal	0.07	13	0	24	7	51.66
Harbour porpoise	0.51	89	52	130	20	21.99

Table 83   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 21 on 22 November 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.64	111	54	180	32	28.51
Little gull	0.05	9	0	24	8	95.20
Herring gull	0.12	21	0	50	13	63.88
Guillemot	6.39	1110	924	1309	99	8.85
Razorbill	0.75	131	66	207	38	28.85
Puffin	0.15	26	8	50	11	40.31
Fulmar	0.02	4	0	12	4	97.93

Table 84   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 21 on 22 November 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.85	147	99	203	27	17.97
Black-headed gull	0.02	5	0	12	4	91.54
Little gull	0.05	9	0	20	6	65.39
Common gull	0.12	21	4	39	10	45.15
Great black-backed gull	0.03	6	0	14	4	76.62
Herring gull	0.15	27	7	55	13	45.59
Lesser black-backed gull	0.02	5	0	13	4	88.27
Guillemot	0.09	17	0	35	9	53.48
Gannet	0.02	5	0	12	4	92.94

Table 85   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 22 on 03 December 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	22.06	3832	3430	4237	208	5.42
All non-avian animals	0.14	25	8	46	11	42.31
Species group						
Duck species	0.17	29	0	84	27	91.26
Small gull species	3.13	545	461	628	44	8.06
Large gull species	0.82	143	76	222	38	26.68
Gull species	0.05	9	0	20	6	62.99
Large auk	17.72	3077	2698	3464	198	6.42
Auk species	0.09	16	0	36	9	54.82
Auk / small gull	0.14	25	4	51	13	52.13
Diver species	0.02	4	0	12	4	94.61
Fulmar / gull species	0.05	9	0	20	6	62.83
Cetacean species	0.14	25	8	47	11	44.08

Table 86   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 22 on 03 December 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.16	28	0	83	27	93.25
Kittiwake	1.42	247	164	335	46	18.56
Little gull	1.22	213	146	285	35	16.43
Common gull	0.62	109	74	145	19	17.23
Great black-backed gull	0.10	18	0	44	12	68.13
Herring gull	0.76	133	67	207	35	26.32
Guillemot	12.9	2241	1966	2531	146	6.51
Razorbill	4.87	846	592	1099	134	15.80
Red-throated diver	0.02	4	0	12	4	97.75
Harbour porpoise	0.14	25	5	47	11	43.91

Table 87 **Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 22 on 03 December 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.15	27	0	83	25	93.77
Kittiwake	0.34	59	24	103	21	34.14
Little gull	0.09	16	4	31	7	42.69
Common gull	0.05	8	0	20	6	63.88
Great black-backed gull	0.03	5	0	13	5	88.51
Herring gull	0.43	75	19	146	33	43.82
Guillemot	12.08	2099	1809	2419	156	7.43
Razorbill	4.47	777	529	1055	134	17.23

Table 88   Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 22 on 03 December 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.07	187	124	259	35	18.43
Little gull	1.09	190	122	267	38	20.06
Common gull	0.58	102	70	137	18	16.85
Great black-backed gull	0.07	13	0	37	12	94.57
Herring gull	0.33	57	31	87	15	25.82
Guillemot	0.78	137	89	185	25	18.04
Razorbill	0.43	75	33	124	24	31.34
Red-throated diver	0.02	5	0	12	4	94.43

Table 89   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 23 on 05 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	4.94	858	589	1186	153	17.72
All non-avian animals	0.09	17	4	32	7	42.62
Species group						
Duck species	0.02	5	0	12	4	92.36
Small gull species	1.06	184	93	288	50	27.20
Large gull species	0.71	123	4	336	100	80.79
Gull species	0.02	4	0	12	4	99.57
Large auk	3.06	532	393	709	81	15.09
Auk species	0.07	13	0	32	9	69.55
Seal species	0.02	4	0	12	4	93.94
Dolphin species	0.02	5	0	12	4	92.50
Cetacean species	0.05	9	0	20	6	63.83

Table 90   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 23 on 05 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.02	5	0	12	4	96.64
Kittiwake	0.41	72	35	117	22	29.99
Little gull	0.62	108	43	188	39	35.75
Common gull	0.07	13	0	32	9	70.37
Great black-backed gull	0.02	4	0	12	4	92.47
Herring gull	0.69	121	0	339	106	87.68
Guillemot	2.35	409	288	550	66	15.99
Razorbill	0.75	131	79	188	29	21.98
Grey seal	0.02	4	0	12	4	94.08
Bottlenose dolphin	0.02	4	0	12	4	98.39
Harbour porpoise	0.05	8	0	20	6	64.97

Table 91   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 23 on 05 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.02	5	0	12	4	91.73
Kittiwake	0.32	56	23	99	20	35.22
Little gull	0.28	49	16	85	18	35.28
Herring gull	0.49	85	0	252	82	96.52
Guillemot	2.22	386	272	514	64	16.36
Razorbill	0.73	126	69	186	30	23.71

Table 92 **Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 23 on 05 February 2023**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.09	16	4	31	7	43.84
Little gull	0.32	56	20	101	22	38.92
Common gull	0.07	13	0	31	9	68.67
Great black-backed gull	0.02	5	0	12	4	90.25
Herring gull	0.20	36	0	87	23	63.49
Guillemot	0.16	28	4	68	17	59.32
Kittiwake	0.09	16	4	31	7	43.84

Table 93   Abundance estimates of species groups in the Morecambe development area + 2km buffer during Survey 24 on 25 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	6.95	1208	946	1518	152	12.51
All non-avian animals	0.12	21	0	47	13	59.19
Species group						
Small gull species	2.23	388	273	536	67	17.24
Large gull species	0.26	45	4	114	30	67.54
Large auk	4.50	781	588	980	102	12.95
Jellyfish	0.02	4	0	12	4	93.53
Cetacean species	0.09	17	0	43	12	72.75

Table 94   Apportioned abundance estimates of animals in the Morecambe development area + 2km buffer during Survey 24 on 25 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.74	128	92	170	21	16.44
Little gull	1.38	240	130	371	65	26.78
Common gull	0.10	17	1	36	9	53.72
Herring gull	0.25	44	4	107	30	66.95
Guillemot	2.59	450	345	542	51	11.14
Razorbill	1.90	331	195	476	72	21.53
Barrel jellyfish	0.02	5	0	12	4	88.84
Harbour porpoise	0.09	17	0	40	12	71.62

Table 95   Apportioned abundance estimates of sitting birds in the Morecambe development area + 2km buffer during Survey 24 on 25 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.50	88	48	133	22	24.58
Little gull	0.76	132	49	259	55	41.27
Common gull	0.03	5	0	13	4	81.29
Herring gull	0.12	20	0	60	19	94.54
Guillemot	2.50	435	321	528	54	12.37
Razorbill	1.90	331	198	490	75	22.67

Table 96   **Apportioned abundance estimates of flying birds in the Morecambe development area + 2km buffer during Survey 24 on 25 February 2023**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.23	41	20	66	12	29.32
Little gull	0.60	105	52	163	30	28.04
Common gull	0.07	12	0	30	8	67.02
Herring gull	0.14	24	4	50	13	51.24
Guillemot	0.07	13	0	32	9	70.27

Annex V: Density and population estimates for revised development area with 4km buffer

1   The density, total estimated population, upper and lower 95% CLs, standard deviation and CV for each species and species group have been calculated using strip transect analysis and are presented here for each of the surveys undertaken.

Table 1   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 1 on 19 March 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	20.27	5787	4820	6779	510	8.81
All non-avian animals	1.66	475	204	784	157	32.89
Species group						
Small gull species	2.32	663	460	911	115	17.21
Large gull species	0.29	83	27	153	33	39.12
Gull species	0.17	49	28	71	12	22.97
Tern / small gull species	0.01	5	0	12	4	93.42
Large auk	16.34	4665	3685	5638	476	10.20
Auk species	0.71	202	107	327	59	29.03
Auk / small gull	0.07	21	4	40	10	46.61
Auk / shearwater species	0.04	12	0	31	9	67.72
Fulmar / gull species	0.10	28	0	79	23	82.04
Gannet species	0.09	27	4	60	16	56.17
Jellyfish	1.27	363	150	620	121	33.24
Seal species	0.03	8	0	20	6	69.19
Cetacean species	0.35	101	44	164	33	32.09
Seal / small cetacean species	0.03	8	0	20	6	65.36

Table 2   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 1 on 19 March 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	2.14	611	419	839	107	17.50
Little gull	0.12	36	12	60	13	35.65
Common gull	0.20	57	12	109	25	43.71
Herring gull	0.47	134	55	236	47	35.19
Lesser black-backed gull	0.01	5	0	12	4	92.55
Guillemot	14.93	4262	3467	5112	414	9.69
Razorbill	2.14	612	330	1010	175	28.56
Puffin	0.03	10	3	19	5	42.56
Fulmar	0.03	9	0	20	6	63.08
Gannet	0.10	29	4	63	17	56.64
Barrel jellyfish	1.24	354	134	597	125	35.22
Harbour porpoise	0.37	107	50	177	33	30.42

Table 3   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 1 on 19 March 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.32	379	255	519	72	18.94
Little gull	0.04	13	0	31	9	67.58
Common gull	0.02	6	0	14	4	76.12
Herring gull	0.30	86	23	177	42	48.45
Lesser black-backed gull	0.01	5	0	12	4	94.49
Guillemot	14.54	4153	3377	4929	397	9.56
Razorbill	2.05	586	330	921	157	26.72
Puffin	0.03	10	3	19	5	44.86
Fulmar	0.03	8	0	20	5	63.40
Gannet	0.08	25	0	59	16	65.18

Table 4   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 1 on 19 March 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.80	229	159	305	38	16.36
Little gull	0.08	25	4	48	12	46.52
Common gull	0.18	53	12	103	24	44.41
Herring gull	0.17	48	16	91	20	41.53
Guillemot	0.31	89	32	154	33	36.40
Razorbill	0.07	20	0	55	17	81.41
Gannet	0.01	4	0	12	4	91.31

Table 5   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 2 on 07 April 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	4.76	1359	1143	1615	119	8.70
All non-avian animals	0.15	44	24	67	11	24.62
Species group						
Small gull species	0.78	223	146	310	43	19.22
Large gull species	0.04	13	0	32	9	71.12
Large auk	3.67	1049	890	1226	87	8.21
Small auk	0.03	8	0	20	6	69.37
Auk species	0.06	16	0	35	9	54.82
Auk / shearwater species	0.09	25	0	63	18	68.81
Fulmar / gull species	0.02	5	0	12	4	89.95
Shearwater species	0.06	17	0	44	13	70.94
Gannet species	0.04	12	0	24	7	50.58
Jellyfish	0.01	4	0	12	4	98.94
Seal species	0.04	12	0	24	7	51.09
Cetacean species	0.08	24	8	44	10	39.08
Seal / small cetacean species	0.01	4	0	12	4	96.49

Table 6   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 2 on 07 April 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.77	221	142	308	43	19.44
Herring gull	0.04	13	0	31	8	65.59
Guillemot	2.72	778	669	886	57	7.29
Razorbill	1.01	287	145	460	81	28.10
Puffin	0.08	25	4	48	12	47.59
Fulmar	0.01	4	0	12	4	95.80
Manx shearwater	0.08	25	0	60	17	66.10
Gannet	0.04	13	0	28	7	53.68
Barrel jellyfish	0.01	5	0	12	4	92.91
Grey seal	0.04	13	0	24	7	51.16
Harbour porpoise	0.10	28	12	48	10	34.85

Table 7   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 2 on 07 April 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.45	128	63	206	37	28.48
Herring gull	0.01	5	0	12	4	92.62
Guillemot	2.58	737	639	828	49	6.55
Razorbill	0.93	267	123	451	84	31.48
Puffin	0.09	25	4	50	12	48.61
Fulmar	0.01	4	0	12	4	96.85
Manx shearwater	0.03	9	0	24	8	93.21
Gannet	0.01	5	0	12	4	92.08

Table 8   **Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 2 on 07 April 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.32	93	68	119	14	14.57
Herring gull	0.03	9	0	20	6	66.66
Guillemot	0.14	41	20	64	12	28.22
Razorbill	0.08	24	0	55	14	57.22
Manx shearwater	0.06	17	0	43	12	74.53
Gannet	0.03	8	0	20	6	66.85

Table 9 Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 3 on 18 May 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	3.90	1114	776	1560	205	18.33
All non-avian animals	0.29	84	51	119	18	21.25
Species group						
Small gull species	1.51	432	179	782	161	37.12
Large gull species	0.03	8	0	20	6	65.92
Gull species	0.03	8	0	24	8	93.06
Skua species	0.01	4	0	12	4	98.22
Large auk	1.97	562	377	778	103	18.23
Auk species	0.03	8	0	20	6	65.17
Auk / shearwater species	0.13	37	8	79	20	53.66
Shearwater species	0.04	12	0	27	7	53.13
Gannet species	0.24	68	27	117	23	33.34
Jellyfish	0.07	21	0	48	13	62.99
Cetacean species	0.23	65	35	99	17	25.76

Table 10   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 3 on 18 May 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.48	423	181	765	157	36.98
Common gull	0.01	5	0	16	4	94.97
Great black-backed gull	0.01	5	0	12	4	93.16
Lesser black-backed gull	0.01	4	0	12	4	91.89
Great skua	0.01	4	0	12	4	99.34
Guillemot	1.89	539	350	735	101	18.63
Razorbill	0.09	26	13	42	8	30.43
Manx shearwater	0.15	43	8	92	21	48.72
Gannet	0.24	68	28	117	23	33.29
Barrel jellyfish	0.07	20	0	48	13	62.93
Harbour porpoise	0.22	65	34	99	17	26.11

Table 11   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 3 on 18 May April 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.79	225	46	499	123	54.44
Guillemot	1.82	521	341	744	105	20.11
Razorbill	0.08	22	9	38	8	34.41
Manx shearwater	0.12	35	4	80	20	58.58
Gannet	0.22	64	31	103	19	29.34

Table 12   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 3 on 18 May 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.70	201	122	300	46	22.53
Common gull	0.01	4	0	12	4	91.52
Great black-backed gull	0.01	4	0	12	4	94.71
Lesser black-backed gull	0.01	4	0	12	4	95.83
Great skua	0.01	4	0	12	4	96.17
Guillemot	0.10	29	12	48	10	34.27
Razorbill	0.01	5	0	16	5	99.99
Manx shearwater	0.03	8	0	20	6	65.97
Gannet	0.01	4	0	12	4	95.31

Table 13   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 4 on 01 June 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	3.99	1141	669	1895	329	28.83
All non-avian animals	0.33	94	45	159	30	31.96
Species group						
Small gull species	1.39	398	152	817	192	48.24
Large gull species	0.03	8	0	24	8	97.12
Gull species	0.06	17	0	48	16	93.90
Large auk	2.35	672	440	947	127	18.80
Auk species	0.08	25	8	46	10	40.73
Gannet species	0.03	9	0	20	6	66.40
Seal species	0.04	13	0	32	9	69.81
Cetacean species	0.28	82	44	132	23	27.38

Table 14   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 4 on 01 June 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.46	417	155	860	200	47.75
Herring gull	0.03	9	0	25	8	94.50
Guillemot	2.44	697	477	996	134	19.16
Razorbill	0.03	10	1	21	6	58.82
Gannet	0.03	9	0	20	6	61.68
Grey seal	0.04	12	0	31	9	71.59
Harbour porpoise	0.28	80	44	124	22	26.73

Table 15   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 4 on 01 June 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.50	144	8	362	96	66.22
Herring gull	0.01	4	0	13	4	98.71
Guillemot	2.28	652	438	914	123	18.88
Razorbill	0.02	6	0	14	4	77.50
Gannet	0.03	9	0	20	6	66.61

Table 16   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 4 on 01 June 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.96	273	137	485	99	36.09
Herring gull	0.01	5	0	12	4	94.64
Guillemot	0.13	37	4	78	20	55.00
Razorbill	0.01	5	0	12	4	92.94

Table 17   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 5 on 09 July 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	52.06	14865	10535	20092	2464	16.57
All non-avian animals	0.27	76	42	112	19	23.87
Species group						
Small gull species	0.54	154	71	275	55	35.16
Black-backed gull species	0.13	37	16	60	12	32.75
Large gull species	0.08	24	8	43	10	40.03
Gull species	0.20	59	0	177	55	93.98
Large auk	17.63	5033	4177	5861	416	8.25
Auk species	2.12	607	436	781	88	14.40
Auk / shearwater species	2.29	655	290	1106	212	32.35
Shearwater species	28.29	8077	4293	12621	2169	26.84
Gannet species	0.99	283	210	381	44	15.32
Jellyfish	0.01	4	0	12	4	97.75
Seal species	0.03	9	0	20	6	70.08
Cetacean species	0.22	64	32	98	17	26.62

Table 18   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 5 on 09 July 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.76	217	75	463	109	50.22
Great black-backed gull	0.05	16	4	31	8	45.03
Herring gull	0.04	12	0	28	7	56.09
Lesser black-backed gull	0.11	33	12	56	12	34.12
Guillemot	19.31	5514	4610	6416	465	8.43
Razorbill	0.11	33	13	55	11	32.26
Puffin	0.25	71	41	107	17	23.75
Manx shearwater	30.47	8699	4654	13401	2230	25.63
Gannet	1.01	288	215	384	44	15.30
Barrel jellyfish	0.01	5	0	12	5	94.55
Grey seal	0.03	9	0	20	6	66.38
Harbour porpoise	0.22	63	34	96	17	26.02

Table 19   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 5 on 09 July 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.11	33	0	88	27	83.49
Great black-backed gull	0.01	5	0	12	4	88.98
Herring gull	0.01	4	0	12	4	97.70
Guillemot	19.24	5492	4562	6395	469	8.52
Razorbill	0.10	29	12	50	11	35.14
Puffin	0.25	73	43	106	17	22.50
Manx shearwater	22.33	6376	2692	10775	2054	32.21
Gannet	0.70	202	142	269	32	15.88

Table 20 Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 5 on 09 July 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.64	183	72	367	84	45.70
Great black-backed gull	0.04	12	0	27	7	54.57
Herring gull	0.03	8	0	20	6	72.04
Lesser black-backed gull	0.11	33	12	55	11	34.23
Guillemot	0.10	29	4	59	14	47.32
Razorbill	0.01	5	0	12	4	95.78
Manx shearwater	8.21	2344	1757	3026	328	13.99
Gannet	0.28	81	43	126	22	26.27

Table 21 **Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 6 on 02 August 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	62.85	17946	14220	21758	1978	11.02
All non-avian animals	0.11	32	8	58	13	39.46
Species group						
Small gull species	10.15	2898	705	5689	1257	43.38
Black-backed gull species	0.06	16	4	35	9	53.83
Large gull species	0.47	136	12	333	90	66.51
Gull species	0.08	25	4	53	13	51.53
Arctic / common tern	0.10	29	0	64	16	54.89
Skua species	0.01	4	0	12	4	99.64
Large auk	34.87	9957	6857	13046	1565	15.71
Auk species	0.28	80	38	124	22	27.23
Auk / small gull	0.03	8	0	24	8	96.88
Auk / shearwater species	0.93	267	150	397	62	23.09
Fulmar / gull species	0.14	40	16	75	17	41.00
Shearwater species	13.03	3720	2226	5423	828	22.25
Gannet species	3.05	871	610	1180	147	16.79
Seal species	0.01	5	0	12	4	94.28

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Cetacean species	0.10	28	8	50	11	38.36

Table 22 Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 6 on 02 August 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	10.14	2895	681	5772	1266	43.72
Great black-backed gull	0.01	4	0	12	4	95.75
Herring gull	0.17	48	0	137	43	90.16
Lesser black-backed gull	0.45	129	23	280	69	53.78
Common tern	0.03	8	0	24	8	98.92
Arctic tern	0.04	13	0	36	12	90.82
Great skua	0.01	5	0	16	5	98.85
Guillemot	35.21	10052	7013	13171	1596	15.87
Razorbill	0.06	16	1	39	11	65.15
Puffin	0.14	39	17	64	13	31.49
Fulmar	0.11	31	12	57	13	39.16
Manx shearwater	13.75	3926	2463	5760	828	21.07
Gannet	3.02	864	621	1160	143	16.52
Grey seal	0.01	5	0	12	4	93.23
Harbour porpoise	0.10	29	8	51	11	39.14

Table 23 Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 6 on 02 August 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	7.88	2251	428	4610	1077	47.81
Great black-backed gull	0.01	4	0	12	4	96.46
Herring gull	0.05	16	0	48	15	97.72
Lesser black-backed gull	0.34	98	16	231	60	60.81
Great skua	0.01	4	0	12	4	97.16
Guillemot	34.87	9957	7082	13026	1546	15.52
Razorbill	0.06	17	1	40	11	64.63
Puffin	0.14	39	16	66	13	33.22
Fulmar	0.11	32	12	59	13	40.49
Manx shearwater	8.44	2410	1352	3807	627	26.01
Gannet	1.72	493	379	614	61	12.33

Table 24   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 6 on 02 August 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	2.07	590	126	1369	358	60.61
Herring gull	0.11	33	0	87	27	82.30
Lesser black-backed gull	0.10	28	4	64	16	57.25
Common tern	0.03	8	0	24	8	97.06
Arctic tern	0.04	13	0	36	12	93.00
Manx shearwater	5.28	1507	1001	2021	269	17.80
Gannet	1.26	360	201	568	97	26.83

Table 25 **Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 7 on 04 September 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	15.19	4337	1952	7276	1349	31.09
Species group						
Small gull species	11.31	3229	1171	5911	1232	38.14
Black-backed gull species	0.05	15	0	42	14	95.86
Large gull species	1.10	314	68	682	165	52.51
Gull species	0.07	21	7	41	11	48.91
Arctic / common tern	0.12	35	7	73	18	50.65
Tern species	0.15	42	0	98	26	60.71
Tern / small gull species	0.07	21	7	41	10	48.01
Large auk	1.69	482	272	701	113	23.28
Shearwater species	0.02	8	0	21	7	92.66
Gannet species	0.57	163	83	246	43	26.34

Table 26   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 7 on 04 September 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	11.37	3247	1122	5937	1250	38.48
Common gull	0.02	7	0	21	7	96.98
Great black-backed gull	0.06	17	0	43	12	68.03
Herring gull	0.62	178	10	469	138	77.32
Lesser black-backed gull	0.48	136	37	264	60	43.70
Sandwich tern	0.15	43	0	99	26	58.70
Common tern	0.09	27	5	57	14	51.40
Arctic tern	0.03	9	0	18	5	53.15
Guillemot	1.67	479	272	711	111	23.18
Manx shearwater	0.03	8	0	21	7	90.12
Gannet	0.55	158	78	245	42	26.31

Table 27 **Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 7 on 04 September 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	8.69	2480	532	5245	1254	50.55
Great black-backed gull	0.03	8	0	23	8	98.54
Herring gull	0.48	138	0	386	120	87.19
Lesser black-backed gull	0.17	50	4	128	33	65.19
Guillemot	1.70	486	258	725	121	24.85
Gannet	0.08	22	7	43	11	51.01

Table 28   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 7 on 04 September 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	2.95	844	553	1198	160	18.93
Common gull	0.02	8	0	21	7	93.63
Herring gull	0.08	24	0	57	15	63.09
Lesser black-backed gull	0.31	90	20	199	51	55.84
Sandwich tern	0.15	43	0	101	26	60.11
Common tern	0.10	29	5	59	15	50.11
Arctic tern	0.03	8	0	18	5	53.48
Manx shearwater	0.02	8	0	21	7	95.72
Gannet	0.50	143	70	216	39	27.10

Table 29   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 8 on 06 October 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	14.88	4249	3293	5283	510	12.00
All non-avian animals	0.20	57	24	99	20	33.85
Species group						
Wader species	0.03	8	0	24	8	99.55
Small gull species	0.32	93	40	149	29	30.53
Black-backed gull species	0.01	4	0	12	4	99.00
Large gull species	0.18	52	0	155	51	98.13
Gull species	0.03	8	0	20	6	63.57
Tern species	0.04	12	0	36	12	100.28
Large auk	13.97	3989	3056	4897	478	11.96
Auk species	0.20	57	24	102	20	34.10
Gannet species	0.04	13	0	27	7	50.80
Cetacean species	0.19	56	23	98	20	34.86

Table 30   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 8 on 06 October 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Snipe	0.03	8	0	24	8	100.02
Kittiwake	0.30	85	40	135	25	28.66
Common gull	0.06	16	0	35	9	52.91
Great black-backed gull	0.01	4	0	12	4	97.88
Herring gull	0.17	49	0	144	47	97.53
Lesser black-backed gull	0.01	5	0	12	4	92.94
Sandwich tern	0.04	13	0	36	12	95.63
Guillemot	11.35	3240	2375	4156	446	13.77
Razorbill	2.71	774	493	1085	151	19.44
Gannet	0.04	13	0	25	7	50.87
Harbour porpoise	0.20	56	24	96	20	33.97

Table 31 **Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 8 on 06 October 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.17	48	16	93	21	43.71
Great black-backed gull	0.01	4	0	12	4	97.41
Herring gull	0.16	46	0	144	46	99.16
Lesser black-backed gull	0.01	5	0	12	4	95.06
Guillemot	11.29	3222	2324	4204	458	14.20
Razorbill	2.47	707	438	1011	144	20.37
Gannet	0.01	5	0	12	4	92.11

Table 32 **Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 8 on 06 October 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Snipe	0.03	9	0	24	8	95.41
Kittiwake	0.13	37	13	62	13	33.34
Common gull	0.06	17	0	36	9	55.49
Sandwich tern	0.04	12	0	36	12	97.60
Guillemot	0.15	44	4	115	29	64.42
Razorbill	0.21	60	20	108	24	39.19
Gannet	0.03	9	0	20	6	66.63

Table 33   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 9 on 17 November 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	11.75	3355	2460	4470	528	15.74
All non-avian animals	0.11	32	0	68	17	50.52
Species group						
Small gull species	1.36	388	233	567	85	21.76
Black-backed gull species	0.01	4	0	12	4	96.31
Large gull species	0.10	28	4	60	15	50.98
Gull species	0.07	20	4	41	10	49.03
Large auk	9.91	2831	2126	3869	449	15.86
Auk species	0.17	49	20	86	18	35.81
Auk / small gull	0.03	9	0	20	6	65.37
Diver species	0.01	5	0	12	4	92.25
Gannet species	0.04	13	0	37	12	96.43
Seal species	0.03	9	0	20	6	62.51
Cetacean species	0.08	24	0	54	14	56.06

Table 34   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 9 on 17 November 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.35	385	243	563	86	22.26
Little gull	0.04	13	0	32	9	68.57
Common gull	0.06	17	0	36	9	54.24
Great black-backed gull	0.02	6	0	14	4	72.84
Herring gull	0.10	28	4	57	14	50.46
Guillemot	8.72	2490	1880	3364	391	15.69
Razorbill	1.33	380	235	552	82	21.58
Puffin	0.03	9	3	18	4	49.47
Red-throated diver	0.01	5	0	12	4	92.19
Gannet	0.04	13	0	37	12	95.77
Grey seal	0.03	9	0	20	6	63.68
Harbour porpoise	0.09	25	0	56	14	55.85

Table 35   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 9 on 17 November 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.60	172	49	338	75	43.48
Great black-backed gull	0.00	2	0	3	1	65.88
Herring gull	0.08	23	4	53	13	55.75
Guillemot	8.47	2419	1835	3231	371	15.30
Razorbill	1.29	370	219	550	85	22.99
Puffin	0.03	8	2	17	4	50.13
Red-throated diver	0.01	5	0	12	4	96.30
Gannet	0.04	12	0	37	12	99.82

Table 36   **Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 9 on 17 November 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.73	209	148	269	31	14.78
Little gull	0.04	13	0	32	9	71.87
Common gull	0.06	16	0	36	9	56.05
Great black-backed gull	0.01	5	0	13	4	92.63
Herring gull	0.01	4	0	13	4	94.92
Guillemot	0.25	72	23	154	35	48.23
Razorbill	0.07	19	4	38	9	47.32

Table 37 **Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 10 on 05 December 2021**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	1.66	475	353	627	69	14.35
All non-avian animals	0.08	24	8	44	10	39.50
Species group						
Small gull species	0.60	173	119	231	29	16.61
Large gull species	0.04	12	0	32	9	69.83
Gull species	0.03	9	0	20	6	68.52
Large auk	0.92	263	186	354	44	16.50
Auk species	0.01	4	0	12	4	99.72
Diver species	0.04	12	0	32	9	74.72
Fulmar / gull species	0.01	5	0	13	5	97.93
Seal species	0.01	4	0	12	4	96.26
Cetacean species	0.07	21	4	40	10	45.12

Table 38   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 10 on 05 December 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.39	111	76	144	18	15.60
Little gull	0.03	9	0	21	6	61.93
Common gull	0.20	57	20	100	21	36.52
Herring gull	0.06	17	0	36	10	56.51
Guillemot	0.57	163	98	247	38	23.27
Razorbill	0.36	103	62	151	23	21.83
Red-throated diver	0.04	12	0	28	8	70.78
Grey seal	0.01	4	0	12	4	97.22
Harbour porpoise	0.07	21	4	40	10	44.96

Table 39   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 10 on 05 December 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.08	24	8	40	9	34.99
Little gull	0.02	5	0	13	4	84.72
Common gull	0.00	1	0	2	1	93.71
Herring gull	0.01	5	0	12	4	94.12
Guillemot	0.56	159	97	240	37	22.93
Razorbill	0.34	98	57	145	24	24.04
Red-throated diver	0.04	13	0	32	9	71.86

Table 40   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 10 on 05 December 2021

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.31	88	59	120	17	18.41
Little gull	0.01	4	0	12	4	98.32
Common gull	0.19	56	20	98	20	35.74
Herring gull	0.04	12	0	27	7	54.91
Guillemot	0.02	7	0	17	5	66.44
Razorbill	0.02	6	0	15	4	78.19

Table 41   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 11 on 13 January 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	6.14	1754	1161	2427	321	18.29
All non-avian animals	0.10	28	8	51	12	39.46
Species group						
Duck species	0.13	37	0	108	36	98.56
Small gull species	0.25	72	39	114	20	26.61
Large gull species	0.20	57	12	116	27	47.01
Gull species	0.13	36	12	64	14	36.31
Large auk	5.43	1551	999	2137	288	18.54
Auk species	0.04	13	0	27	7	52.63
Auk / small gull	0.01	4	0	16	5	105.73
Cetacean species	0.10	28	8	52	12	40.86

Table 42   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 11 on 13 January 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.12	36	0	108	37	103.31
Kittiwake	0.09	27	7	55	13	48.30
Little gull	0.04	12	0	24	7	52.46
Common gull	0.24	70	36	109	19	26.44
Great black-backed gull	0.03	8	0	20	6	65.99
Herring gull	0.15	43	4	101	26	59.11
Lesser black-backed gull	0.01	5	0	12	4	94.83
Guillemot	4.92	1406	904	1949	268	19.04
Razorbill	0.47	134	49	236	50	37.19
Harbour porpoise	0.10	29	8	53	12	39.96

Table 43 **Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 11 on 13 January 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.12	34	0	107	35	101.90
Kittiwake	0.08	24	4	52	13	55.66
Common gull	0.02	5	0	14	4	85.79
Herring gull	0.07	20	0	51	14	70.66
Lesser black-backed gull	0.01	5	0	12	4	93.05
Guillemot	4.97	1420	905	1995	277	19.47
Razorbill	0.47	134	52	245	48	35.93

Table 44   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 11 on 13 January 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.01	4	0	12	4	97.77
Little gull	0.04	13	0	27	7	52.20
Common gull	0.22	64	31	99	18	27.72
Great black-backed gull	0.03	8	0	20	5	62.89
Herring gull	0.08	25	0	62	16	65.86

Table 45   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 12 on 11 February 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	8.94	2553	1908	3255	339	13.26
All non-avian animals	0.18	53	24	84	16	28.69
Species group						
Small gull species	0.34	97	47	151	28	28.39
Black-backed gull species	0.07	21	8	36	8	39.63
Large gull species	0.11	33	16	52	10	30.75
Gull species	0.03	8	0	20	6	66.44
Large auk	8.27	2362	1731	2980	319	13.50
Auk species	0.11	32	8	64	15	47.38
Auk / small gull	0.03	9	0	20	6	63.16
Diver species	0.01	4	0	12	4	95.91
Seal species	0.02	5	0	16	5	92.25
Cetacean species	0.17	48	24	73	13	26.96

Table 46   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 12 on 11 February 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.18	53	16	95	20	37.78
Black-headed gull	0.01	4	0	12	4	95.88
Little gull	0.04	13	0	28	7	55.60
Common gull	0.13	37	16	63	13	34.11
Great black-backed gull	0.01	4	0	12	4	100.09
Herring gull	0.11	33	16	52	10	30.62
Lesser black-backed gull	0.06	17	4	32	8	46.57
Guillemot	6.81	1945	1391	2534	291	14.93
Razorbill	1.51	433	320	558	62	14.15
Red-throated diver	0.01	4	0	12	4	93.63
Grey seal	0.01	5	0	12	4	94.66
Harbour porpoise	0.17	49	24	75	14	27.13

Table 47   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 12 on 11 February 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.06	17	0	40	12	68.68
Little gull	0.01	4	0	12	4	95.63
Common gull	0.04	13	0	32	9	66.93
Great black-backed gull	0.01	5	0	12	4	92.49
Herring gull	0.04	12	0	32	9	72.03
Guillemot	6.69	1912	1376	2512	292	15.23
Razorbill	1.49	425	300	549	65	15.24
Red-throated diver	0.01	5	0	12	4	94.50

Table 48 **Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 12 on 11 February 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.13	37	12	67	15	39.36
Black-headed gull	0.01	4	0	12	4	95.18
Little gull	0.03	9	0	20	6	67.22
Common gull	0.09	25	8	43	10	38.03
Herring gull	0.07	20	8	36	8	38.66
Lesser black-backed gull	0.06	17	4	32	8	46.28
Guillemot	0.20	58	27	94	18	30.03
Razorbill	0.01	5	0	12	4	97.76

Table 49   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 13 on 09 March 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	5.74	1638	1351	1902	142	8.66
All non-avian animals	0.20	56	31	88	16	27.44
Species group						
Duck species	0.01	5	0	12	4	93.48
Small gull species	1.82	520	431	603	44	8.37
Black-backed gull species	0.01	5	0	12	4	97.99
Large gull species	0.13	37	12	65	14	38.01
Large auk	3.67	1050	814	1287	124	11.73
Auk species	0.01	4	0	12	4	96.50
Diver species	0.03	9	0	20	6	63.93
Fulmar / gull species	0.01	4	0	12	4	100.34
Seal species	0.01	4	0	12	4	94.42
Cetacean species	0.18	53	27	83	15	27.99

Table 50   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 13 on 09 March 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.01	5	0	12	4	94.48
Kittiwake	1.79	511	423	601	46	8.87
Black-headed gull	0.01	4	0	12	4	95.17
Little gull	0.01	4	0	12	4	96.27
Common gull	0.01	4	0	12	4	93.27
Herring gull	0.08	24	8	44	10	40.27
Lesser black-backed gull	0.06	17	0	36	10	56.33
Guillemot	2.16	618	380	862	127	20.42
Razorbill	1.51	431	291	569	72	16.66
Red-throated diver	0.03	8	0	20	6	64.99
Grey seal	0.01	4	0	12	4	99.33
Harbour porpoise	0.19	54	28	82	15	26.76

Table 51   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 13 on 09 March 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.96	275	206	340	34	12.26
Black-headed gull	0.01	5	0	12	4	91.74
Common gull	0.01	4	0	12	4	95.84
Herring gull	0.04	12	0	29	9	68.92
Lesser black-backed gull	0.03	9	0	20	6	66.01
Guillemot	2.17	620	376	887	130	20.86
Razorbill	1.47	420	290	558	68	16.17
Red-throated diver	0.03	9	0	20	6	65.01

Table 52   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 13 on 09 March 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.01	4	0	12	4	100.90
Kittiwake	0.82	234	185	289	26	11.06
Little gull	0.01	5	0	12	4	96.37
Herring gull	0.04	12	0	24	6	50.46
Lesser black-backed gull	0.03	9	0	20	6	65.49
Guillemot	0.00	1	0	3	1	94.12
Razorbill	0.04	12	0	24	6	52.46

Table 53 **Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 14 on 01 April 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	9.01	2574	1766	3804	556	21.58
All non-avian animals	0.16	45	19	78	16	35.22
Species group						
Duck species	0.01	4	0	12	4	96.34
Small gull species	3.59	1026	399	2103	508	49.53
Black-backed gull species	0.04	12	0	25	7	52.10
Large gull species	0.20	58	20	103	21	36.14
Gull species	0.03	8	0	20	6	68.37
Large auk	4.78	1365	1029	1729	181	13.25
Auk species	0.15	44	16	79	17	37.74
Auk / small gull	0.07	21	0	44	11	54.15
Large auk / diver species	0.01	4	0	12	4	94.16
Auk / shearwater species	0.04	12	0	29	9	71.70
Fulmar / gull species	0.03	9	0	24	8	94.40
Shearwater species	0.01	4	0	12	4	98.46
Gannet species	0.13	37	4	87	24	63.83
Seal species	0.03	8	0	20	6	66.70

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Cetacean species	0.13	37	8	73	17	44.62

Table 54   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 14 on 01 April 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.01	5	0	12	4	94.99
Kittiwake	3.49	998	398	2060	489	48.92
Black-headed gull	0.01	5	0	12	4	92.21
Little gull	0.07	21	8	36	8	37.74
Common gull	0.01	4	0	12	4	99.61
Great black-backed gull	0.06	17	0	44	13	74.64
Herring gull	0.17	49	18	84	17	34.51
Lesser black-backed gull	0.03	9	0	20	6	65.86
Guillemot	4.13	1179	864	1605	189	15.97
Razorbill	0.76	217	123	319	52	23.94
Puffin	0.05	15	2	34	9	62.62
Fulmar	0.03	8	0	24	8	96.85
Manx shearwater	0.05	15	0	33	9	59.00
Gannet	0.12	36	4	88	23	63.30
Grey seal	0.03	9	0	20	6	64.26
Harbour porpoise	0.13	37	8	70	16	42.84

Table 55   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 14 on 01 April 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.01	4	0	12	4	95.77
Kittiwake	0.97	277	153	422	71	25.37
Black-headed gull	0.01	4	0	12	4	93.62
Little gull	0.03	9	0	20	6	65.12
Common gull	0.01	5	0	12	4	95.13
Herring gull	0.07	21	6	38	9	40.15
Guillemot	4.05	1157	842	1535	176	15.18
Razorbill	0.76	217	120	321	53	24.20
Puffin	0.05	14	2	33	9	58.85
Fulmar	0.03	9	0	24	8	95.52
Manx shearwater	0.04	11	0	27	8	73.11
Gannet	0.07	21	0	55	16	76.28

Table 56   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 14 on 01 April 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	2.49	711	202	1675	437	61.42
Little gull	0.04	13	0	27	7	52.48
Great black-backed gull	0.06	16	0	43	12	73.57
Herring gull	0.10	28	8	52	12	39.71
Lesser black-backed gull	0.03	8	0	20	6	65.73
Guillemot	0.07	20	4	36	8	38.98
Manx shearwater	0.01	5	0	12	4	96.55
Gannet	0.05	16	0	36	9	55.43

Table 57   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 15 on 02 May 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	41.92	11969	7699	18992	2940	24.56
All non-avian animals	1.77	507	272	795	136	26.77
Species group						
Wader species	0.09	25	0	62	16	65.46
Small gull species	3.58	1022	458	2004	468	45.75
Black-backed gull species	0.20	57	12	120	28	49.29
Large gull species	0.85	243	54	482	112	46.10
Gull species	0.14	40	8	87	22	53.30
Arctic / common tern	0.50	142	60	235	45	31.72
Tern species	0.10	28	4	60	14	50.04
Large auk	20.32	5803	3964	8561	1181	20.35
Auk species	0.17	49	20	82	16	32.84
Auk / small gull	0.03	8	0	20	6	64.48
Auk / shearwater species	0.98	281	158	431	70	24.75
Fulmar / gull species	0.39	113	24	255	65	57.38
Shearwater species	12.18	3477	2037	5239	843	24.23
Gannet species	1.61	459	128	883	198	43.14

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Corvid species	0.01	5	0	12	4	90.78
Jellyfish	0.01	4	0	12	4	91.80
Seal species	0.01	5	0	16	4	94.38
Cetacean species	1.78	508	269	797	138	27.01

Table 58 **Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 15 on 02 May 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Dunlin	0.09	26	0	67	18	68.40
Kittiwake	3.55	1015	450	1968	456	44.90
Common gull	0.00	1	0	1	1	66.70
Great black-backed gull	0.31	88	8	216	54	61.26
Herring gull	0.69	198	44	460	110	55.68
Lesser black-backed gull	0.23	67	13	148	35	52.38
Common tern	0.05	14	2	32	9	60.31
Arctic tern	0.44	127	57	200	38	29.23
Guillemot	20.03	5720	3934	8454	1168	20.42
Razorbill	0.49	142	88	197	28	19.28
Puffin	0.10	28	9	50	11	38.06
Fulmar	0.34	97	23	210	53	54.88
Manx shearwater	12.95	3697	2183	5499	860	23.26
Gannet	1.63	467	136	908	201	43.00
Carrion crow	0.01	5	0	12	4	96.09
Barrel jellyfish	0.01	5	0	12	4	92.49

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Grey seal	0.01	5	0	12	4	94.32
Harbour porpoise	1.80	515	263	827	143	27.67

Table 59 **Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 15 on 02 May 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.17	336	223	470	66	19.64
Common gull	0	1	0	1	1	65.4
Great black-backed gull	0.27	78	8	192	52	66.86
Herring gull	0.56	161	23	361	92	56.86
Lesser black-backed gull	0.2	58	5	135	34	58.01
Guillemot	20.14	5750	3924	8455	1194	20.75
Razorbill	0.5	143	91	198	28	19.37
Puffin	0.1	28	10	48	10	36.13
Fulmar	0.35	100	27	226	55	54.18
Manx shearwater	11.27	3218	1766	5122	861	26.74
Gannet	1.41	402	100	801	185	46.02

Table 60   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 15 on 02 May 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Dunlin	0.09	25	0	60	16	64.19
Kittiwake	2.34	669	192	1545	417	62.22
Great black-backed gull	0.04	13	0	32	9	68.97
Herring gull	0.12	36	8	78	19	53.41
Lesser black-backed gull	0.03	9	0	21	6	59.79
Common tern	0.05	14	2	33	9	62.21
Arctic tern	0.44	127	54	208	40	30.97
Guillemot	0.24	68	40	96	15	20.87
Manx shearwater	1.47	421	256	610	90	21.30
Gannet	0.19	55	23	98	20	35.50
Carrion crow	0.01	4	0	12	4	94.00

Table 61   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 16 on 07 June 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	21.11	6027	3423	9380	1509	25.04
All non-avian animals	0.62	178	125	234	29	16.2
Species group						
Small gull species	1.72	491	361	640	72	14.57
Large gull species	0.07	21	8	36	8	36.31
Gull species	0.01	4	0	12	4	95.62
Arctic / common tern	0.20	57	0	169	55	95.55
Tern species	0.01	5	0	13	4	95.35
Large auk	9.97	2846	1850	4172	596	20.93
Auk species	0.06	17	0	35	9	53.95
Auk / small gull	0.03	9	0	20	6	66.49
Auk / shearwater species	0.67	191	64	387	86	44.90
Shearwater species	8.24	2352	696	4539	988	42.01
Gannet species	0.18	53	24	85	16	29.76
Jellyfish	0.06	17	0	36	10	53.94
Seal species	0.06	16	0	36	10	57.06
Cetacean species	0.50	144	77	215	36	24.58

Table 62   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 16 on 07 June 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.74	497	362	633	70	14.05
Herring gull	0.07	21	4	40	10	45.44
Lesser black-backed gull	0.01	5	0	12	4	92.00
Sandwich tern	0.01	4	0	12	4	101.96
Guillemot	9.52	2719	1858	3809	493	18.11
Razorbill	0.71	204	27	524	149	73.05
Puffin	0.03	10	0	27	8	76.94
Manx shearwater	8.41	2403	711	4549	1017	42.30
Gannet	0.18	53	24	88	16	30.19
Lion's mane jellyfish	0.06	17	0	39	10	55.52
Grey seal	0.06	17	0	36	10	56.19
Harbour porpoise	0.50	144	80	215	35	23.98

Table 63 **Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 16 on 07 June 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.42	120	79	159	21	17.02
Herring gull	0.04	13	0	27	7	50.96
Lesser black-backed gull	0.01	4	0	12	4	94.51
Guillemot	9.34	2668	1783	3658	492	18.44
Razorbill	0.73	209	25	540	155	74.25
Puffin	0.03	10	0	26	8	77.37
Manx shearwater	7.91	2259	616	4443	982	43.46
Gannet	0.14	40	16	70	15	35.33

Table 64   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 16 on 07 June 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.32	378	264	504	64	16.70
Herring gull	0.03	9	0	20	6	67.31
Sandwich tern	0.01	4	0	12	4	95.59
Guillemot	0.12	34	12	66	14	39.86
Manx shearwater	0.54	155	47	287	63	40.16
Gannet	0.04	13	0	27	7	52.53

Table 65   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 17 on 14 July 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	41.46	11837	8772	14934	1554	13.12
All non-avian animals	0.07	20	4	40	10	47.89
Species group						
Small gull species	4.53	1294	705	1998	339	26.19
Black-backed gull species	0.10	29	8	52	12	39.99
Large gull species	0.29	84	36	138	26	31.22
Gull species	0.03	8	0	20	6	64.57
Arctic / common tern	0.03	9	0	20	6	64.71
Tern species	0.03	8	0	24	8	99.11
Large auk	28.49	8133	6039	10466	1135	13.95
Auk species	0.31	88	47	140	24	26.79
Auk / small gull	0.06	17	4	32	8	45.46
Auk / shearwater species	0.81	231	134	339	55	23.47
Fulmar / gull species	0.04	13	0	25	7	52.10
Shearwater species	6.10	1743	947	2596	425	24.33
Gannet species	0.66	189	107	281	45	23.63
Jellyfish	0.01	4	0	12	4	96.93

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Cetacean species	0.06	17	0	39	10	59.69

Table 66   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 17 on 14 July 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	4.52	1290	737	1987	330	25.55
Herring gull	0.17	49	12	104	25	49.11
Lesser black-backed gull	0.25	71	34	115	21	29.93
Sandwich tern	0.03	9	0	31	8	93.16
Guillemot	28.63	8175	5948	10492	1191	14.56
Razorbill	0.10	28	8	55	13	44.76
Fulmar	0.04	12	0	27	7	52.51
Manx shearwater	6.82	1948	1088	2921	463	23.75
Gannet	0.66	188	111	280	45	23.69
Lion's mane jellyfish	0.01	4	0	12	4	96.04
Harbour porpoise	0.06	17	0	36	10	56.53

Table 67   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 17 on 14 July 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.98	280	158	411	65	23.14
Herring gull	0.04	13	0	32	9	69.78
Lesser black-backed gull	0.04	13	0	27	7	50.58
Guillemot	28.93	8261	6028	10670	1149	13.90
Razorbill	0.10	29	8	53	12	42.61
Fulmar	0.03	8	0	20	5	63.22
Manx shearwater	5.85	1672	886	2545	421	25.17
Gannet	0.23	65	31	110	21	31.86

Table 68   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 17 on 14 July 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	3.45	984	460	1743	323	32.77
Herring gull	0.13	39	8	84	20	52.47
Lesser black-backed gull	0.20	57	22	101	21	35.24
Sandwich tern	0.03	8	0	24	8	95.23
Guillemot	0.18	52	20	91	19	36.26
Fulmar	0.01	4	0	12	4	97.08
Manx shearwater	0.84	240	100	424	89	36.85
Gannet	0.42	120	62	204	36	29.50

Table 69   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 18 on 09 August 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	45.03	12856	11006	15039	1076	8.37
All non-avian animals	0.42	120	76	168	25	20.12
Species group						
Small gull species	2.24	639	458	846	97	15.14
Black-backed gull species	0.11	33	12	58	12	36.65
Large gull species	0.26	74	12	187	50	66.92
Gull species	0.03	9	0	24	9	98.95
Tern species	0.01	4	0	12	4	95.51
Large auk	30.01	8569	7704	9668	506	5.90
Auk species	0.03	9	0	20	6	63.66
Auk / small gull	0.04	13	0	24	6	48.98
Auk / shearwater species	1.12	320	180	481	76	23.75
Shearwater species	10.84	3094	1752	4538	714	23.05
Gannet species	0.46	132	85	182	25	18.65
Cormorant / shag	0.03	9	0	24	8	94.32
Jellyfish	0.07	21	4	42	10	48.27
Seal species	0.04	13	0	28	7	54.70

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Cetacean species	0.31	88	40	143	26	29.38

Table 70   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 18 on 09 August 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	2.27	649	473	850	97	14.88
Common gull	0.03	9	0	24	8	94.64
Great black-backed gull	0.01	5	0	12	4	95.81
Herring gull	0.17	50	0	142	44	88.05
Lesser black-backed gull	0.19	55	20	97	20	35.88
Guillemot	30.3	8652	7727	9775	525	6.06
Manx shearwater	11.71	3344	2004	4847	741	22.16
Gannet	0.47	133	87	182	25	18.39
Shag	0.03	8	0	24	8	100.59
Grey seal	0.04	13	0	28	7	55.09
Harbour porpoise	0.31	88	44	140	25	28.41

Table 71   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 18 on 09 August 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.58	166	71	292	58	34.91
Common gull	0.03	8	0	24	8	95.09
Herring gull	0.15	43	0	117	35	81.98
Lesser black-backed gull	0.04	11	0	29	9	75.89
Guillemot	30.35	8666	7718	9803	529	6.10
Manx shearwater	9.78	2793	1587	4173	669	23.93
Gannet	0.35	101	61	142	21	20.59
Shag	0.03	9	0	24	8	93.37

Table 72   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 18 on 09 August 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.66	476	351	599	63	13.09
Great black-backed gull	0.01	5	0	12	4	92.99
Herring gull	0.03	9	0	24	8	95.84
Lesser black-backed gull	0.15	45	16	77	16	34.53
Guillemot	0.01	5	0	12	4	91.43
Manx shearwater	1.55	444	191	811	169	38.00
Gannet	0.10	28	12	44	9	29.79

Table 73   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 19 on 02 September 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	29.85	8524	7156	10464	877	10.28
All non-avian animals	0.26	76	33	130	25	32.08
Species group						
Small gull species	2.98	850	546	1260	191	22.43
Black-backed gull species	0.04	12	0	32	9	72.24
Large gull species	0.20	56	8	120	30	52.18
Gull species	0.03	9	0	20	6	64.67
Arctic / common tern	0.03	8	0	25	9	102.99
Tern species	0.06	17	0	36	9	54.13
Skua species	0.01	5	0	12	4	97.57
Large auk	23.62	6745	6122	7391	327	4.85
Auk species	0.07	21	4	44	10	46.89
Auk / small gull	0.04	13	0	24	7	52.26
Auk / shearwater species	0.32	91	40	147	28	30.82
Shearwater species	2.41	688	46	1822	506	73.59
Gannet species	0.14	39	12	68	15	37.07
Jellyfish	0.03	8	0	24	8	99.57

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Cetacean species	0.24	69	28	121	24	34.71

Table 74   **Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 19 on 02 September 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	3.06	874	564	1358	202	23.06
Great black-backed gull	0.01	5	0	13	4	89.31
Herring gull	0.06	17	4	32	8	43.37
Lesser black-backed gull	0.19	55	8	119	29	51.70
Sandwich tern	0.06	16	0	36	9	54.12
Common tern	0.01	4	0	12	4	100.29
Arctic skua	0.01	4	0	12	4	98.15
Guillemot	23.82	6802	6196	7423	320	4.70
Razorbill	0.00	1	0	1	1	50.40
Puffin	0.01	2	0	5	2	66.01
Manx shearwater	2.75	786	98	2087	578	73.49
Gannet	0.14	40	16	68	15	36.08
Barrel jellyfish	0.03	9	0	25	8	96.92
Harbour porpoise	0.24	69	27	118	24	34.36

Table 75   **Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 19 on 02 September 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.72	490	226	813	158	32.07
Great black-backed gull	0.02	5	0	13	4	89.18
Herring gull	0.03	9	0	20	6	63.46
Lesser black-backed gull	0.14	41	0	100	27	65.99
Guillemot	23.83	6803	6179	7455	320	4.69
Razorbill	0.00	1	1	1	1	48.44
Puffin	0.01	3	0	5	2	67.35
Manx shearwater	2.42	693	67	1880	530	76.51
Gannet	0.06	16	0	36	9	55.03

Table 76   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 19 on 02 September 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.29	369	255	509	68	18.39
Herring gull	0.03	8	0	20	6	66.87
Lesser black-backed gull	0.06	17	4	31	7	40.55
Sandwich tern	0.06	17	0	36	9	55.12
Common tern	0.01	5	0	12	4	95.50
Arctic skua	0.01	4	0	12	4	95.75
Manx shearwater	0.08	24	4	50	12	47.22
Gannet	0.08	24	8	44	10	40.21

Table 77   Abundance estimates of species groups in the Morecambe development area + 4km buffer during **Survey 20 on 03 October 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	24.77	7072	5930	8446	656	9.27
All non-avian animals	0.46	130	74	190	30	22.43
Species group						
Small gull species	0.99	283	108	523	104	36.66
Large gull species	0.11	32	12	59	13	39.33
Gull species	0.21	60	0	175	55	92.50
Large auk	22.51	6428	5527	7510	492	7.65
Auk species	0.40	115	47	192	39	34.00
Auk / small gull	0.15	45	16	82	18	38.59
Auk / shearwater species	0.21	61	8	144	40	65.35
Fulmar / gull species	0.01	4	0	12	4	93.55
Gannet species	0.10	28	12	48	10	34.44
Jellyfish	0.18	51	16	93	21	39.87
Seal species	0.01	4	0	12	4	97.82
Cetacean species	0.25	72	36	112	21	28.35

Table 78   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 20 on 03 October 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.11	317	131	535	108	34.07
Little gull	0.01	5	0	13	4	96.05
Common gull	0.03	8	0	20	6	64.55
Great black-backed gull	0.07	21	4	40	10	45.59
Herring gull	0.20	57	0	151	44	77.58
Lesser black-backed gull	0.05	15	0	40	11	75.05
Guillemot	20.77	5932	5236	6677	375	6.32
Razorbill	2.31	659	359	1092	190	28.73
Puffin	0.04	13	4	24	6	41.21
Gannet	0.10	28	8	49	10	35.59
Barrel jellyfish	0.18	52	16	98	22	41.57
Harbour porpoise	0.25	73	36	113	21	28.57

Table 79   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 20 on 03 October 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.70	201	76	364	74	36.69
Great black-backed gull	0.07	21	4	43	10	47.22
Herring gull	0.15	43	0	124	41	95.72
Lesser black-backed gull	0.04	11	0	32	10	95.76
Guillemot	20.62	5888	5228	6625	369	6.27
Razorbill	2.23	636	353	1010	175	27.41
Puffin	0.05	14	4	25	6	40.32
Gannet	0.03	9	0	20	6	66.74

Table 80   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 20 on 03 October 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.37	107	28	211	48	45.12
Little gull	0.01	5	0	13	5	98.70
Common gull	0.03	8	0	20	6	63.55
Herring gull	0.06	16	0	36	9	55.52
Lesser black-backed gull	0.01	5	0	12	4	94.10
Guillemot	0.08	23	7	43	10	41.95
Razorbill	0.08	22	4	41	10	42.32
Gannet	0.06	16	4	31	7	42.91

Table 81   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 21 on 22 November 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	10.54	3009	2450	3616	303	10.07
All non-avian animals	0.90	257	160	366	54	20.87
Species group						
Small gull species	1.80	514	367	681	80	15.55
Large gull species	0.47	134	63	218	40	29.79
Gull species	0.06	17	0	43	12	73.21
Large auk	7.89	2253	1840	2755	233	10.34
Auk species	0.23	65	28	108	21	32.50
Auk / small gull	0.07	21	4	39	9	44.17
Large auk / diver species	0.01	4	0	12	4	101.08
Auk / shearwater species	0.03	9	0	24	8	95.17
Fulmar / gull species	0.04	12	0	25	7	52.70
Gannet species	0.03	9	0	20	6	68.30
Jellyfish	0.33	94	28	172	39	40.58
Seal species	0.04	13	0	24	7	51.36
Cetacean species	0.52	150	99	201	26	17.35

Table 82   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 21 on 22 November 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	1.51	433	317	568	65	14.93
Black-headed gull	0.01	4	0	12	4	98.24
Little gull	0.08	24	4	49	12	46.72
Common gull	0.22	64	27	108	22	33.04
Great black-backed gull	0.03	9	0	20	6	60.58
Herring gull	0.46	132	52	232	47	35.18
Lesser black-backed gull	0.03	9	0	20	6	68.18
Guillemot	7.31	2088	1701	2557	219	10.48
Razorbill	0.70	201	121	291	44	21.97
Puffin	0.12	35	16	58	12	32.61
Fulmar	0.04	12	0	24	7	51.03
Gannet	0.03	9	0	20	6	69.71
Barrel jellyfish	0.34	97	32	177	39	39.66
Grey seal	0.04	12	0	27	7	54.38
Harbour porpoise	0.52	148	100	200	26	17.21

Table 83   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 21 on 22 November 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.62	178	102	266	44	24.32
Little gull	0.03	8	0	24	8	92.39
Common gull	0.00	1	0	1	1	98.04
Great black-backed gull	0.01	4	0	12	4	101.13
Herring gull	0.25	72	24	128	28	38.90
Lesser black-backed gull	0.01	4	0	12	4	97.40
Guillemot	7.21	2060	1678	2524	220	10.67
Razorbill	0.68	193	104	289	48	24.58
Puffin	0.12	35	14	58	12	32.63
Fulmar	0.04	12	0	25	7	53.97
Gannet	0.01	5	0	12	4	96.32

Table 84 **Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 21 on 22 November 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.90	258	190	330	37	14.06
Black-headed gull	0.01	4	0	12	4	95.53
Little gull	0.06	16	0	35	9	55.66
Common gull	0.23	65	28	107	21	31.69
Great black-backed gull	0.02	5	0	13	4	79.29
Herring gull	0.18	52	22	87	17	31.61
Lesser black-backed gull	0.02	5	0	13	4	88.78
Guillemot	0.08	25	8	44	10	41.53
Razorbill	0.03	8	0	20	6	67.62
Gannet	0.01	4	0	12	4	96.92

Table 85   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 22 on 03 December 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	17.60	5025	4534	5550	259	5.14
All non-avian animals	0.14	41	19	66	13	29.99
Species group						
Duck species	0.18	51	0	130	36	70.98
Small gull species	2.54	726	611	831	57	7.80
Large gull species	0.61	174	103	260	41	23.49
Gull species	0.03	9	0	20	6	65.25
Large auk	14.02	4003	3562	4470	232	5.78
Auk species	0.08	24	8	44	10	38.96
Auk / small gull	0.08	24	4	52	13	53.33
Diver species	0.04	13	0	28	7	55.13
Fulmar / gull species	0.06	17	0	38	10	57.49
Seal species	0.01	5	0	16	5	94.88
Cetacean species	0.13	37	16	63	13	33.70

Table 86 **Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 22 on 03 December 2022**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.18	51	0	133	36	69.11
Kittiwake	1.35	386	265	516	67	17.23
Little gull	0.84	239	170	308	37	15.29
Common gull	0.46	132	93	171	21	15.60
Great black-backed gull	0.06	17	0	41	12	68.86
Herring gull	0.57	162	97	246	38	23.11
Guillemot	10.41	2972	2658	3300	164	5.50
Razorbill	3.69	1055	765	1388	160	15.09
Red-throated diver	0.04	12	0	27	7	54.78
Grey seal	0.01	4	0	16	4	101.05
Harbour porpoise	0.12	36	16	60	12	33.78

Table 87   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 22 on 03 December 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.17	49	0	124	33	67.46
Kittiwake	0.32	93	47	142	24	25.70
Little gull	0.07	20	4	36	8	39.64
Common gull	0.03	8	0	20	6	63.20
Great black-backed gull	0.02	5	0	14	5	87.51
Herring gull	0.27	79	20	152	34	42.98
Guillemot	9.70	2770	2481	3104	164	5.89
Razorbill	3.45	987	680	1287	160	16.13
Red-throated diver	0.03	8	0	20	6	69.56

Table 88   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 22 on 03 December 2022

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.01	4	0	12	4	101.03
Kittiwake	0.99	284	191	397	54	18.81
Little gull	0.75	214	138	302	41	19.17
Common gull	0.44	126	89	166	19	15.14
Great black-backed gull	0.04	12	0	36	12	95.41
Herring gull	0.30	85	48	126	21	23.81
Guillemot	0.66	189	129	251	32	16.57
Razorbill	0.26	76	37	129	24	30.68
Red-throated diver	0.01	4	0	12	4	96.45

Table 89   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 23 on 05 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	4.87	1390	1089	1693	160	11.46
All non-avian animals	0.18	53	16	100	22	40.22
Species group						
Duck species	0.03	8	0	20	6	66.25
Small gull species	0.79	225	141	319	46	20.40
Large gull species	0.51	146	24	363	101	68.88
Gull species	0.01	4	0	12	4	95.44
Large auk	3.33	953	766	1157	103	10.78
Auk species	0.17	50	8	100	25	48.84
Cormorant / shag	0.01	5	0	12	4	92.50
Seal species	0.01	4	0	12	4	96.45
Dolphin species	0.04	12	0	31	9	70.06
Cetacean species	0.13	37	8	77	18	48.91

Table 90   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 23 on 05 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.03	9	0	20	6	66.85
Kittiwake	0.37	105	61	153	24	22.85
Little gull	0.38	108	43	185	37	34.09
Common gull	0.06	16	0	36	9	55.51
Great black-backed gull	0.03	9	0	24	8	92.64
Herring gull	0.47	134	12	350	102	75.95
Lesser black-backed gull	0.01	4	0	12	4	100.77
Guillemot	2.55	729	570	894	83	11.30
Razorbill	0.97	278	180	391	55	19.70
Cormorant	0.01	5	0	13	5	100.19
Grey seal	0.01	5	0	12	4	95.88
Bottlenose dolphin	0.04	12	0	31	9	70.48
Harbour porpoise	0.13	38	8	76	18	47.32

Table 91 **Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 23 on 05 February 2023**

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Common scoter	0.03	9	0	20	6	62.53
Kittiwake	0.28	81	44	124	21	25.62
Little gull	0.17	48	20	80	16	32.98
Common gull	0.01	4	0	12	4	95.24
Herring gull	0.32	92	0	255	80	87.38
Guillemot	2.29	654	493	804	79	11.99
Razorbill	0.92	263	161	375	55	20.90
Cormorant	0.01	4	0	12	4	98.72

Table 92   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 23 on 05 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.08	24	8	44	11	42.21
Little gull	0.21	60	24	107	22	36.18
Common gull	0.04	12	0	31	9	71.82
Great black-backed gull	0.03	8	0	24	8	95.01
Herring gull	0.17	48	8	102	25	50.64
Lesser black-backed gull	0.01	4	0	12	4	96.57
Guillemot	0.27	78	28	136	28	36.27
Razorbill	0.03	9	0	24	8	96.98

Table 93   Abundance estimates of species groups in the Morecambe development area + 4km buffer during Survey 24 on 25 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Broad category						
All birds	7.42	2120	1618	2651	263	12.37
All non-avian animals	0.20	57	27	89	16	28.49
Species group						
Small gull species	2.18	622	447	820	99	15.81
Large gull species	0.21	61	16	135	33	54.09
Large auk	5.03	1436	1113	1768	171	11.88
Auk species	0.01	5	0	13	5	98.74
Jellyfish	0.01	5	0	12	4	91.85
Seal species	0.01	4	0	12	4	95.37
Cetacean species	0.17	49	20	81	17	33.50

Table 94   Apportioned abundance estimates of animals in the Morecambe development area + 4km buffer during Survey 24 on 25 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.83	236	172	300	34	14.27
Little gull	1.27	363	196	554	93	25.57
Common gull	0.10	30	9	58	13	43.26
Herring gull	0.21	60	16	130	32	52.38
Guillemot	2.78	795	635	980	87	10.88
Razorbill	2.26	647	446	849	108	16.58
Barrel jellyfish	0.01	4	0	13	4	98.53
Grey seal	0.01	5	0	16	5	96.00
Harbour porpoise	0.17	49	20	84	17	34.25

Table 95   Apportioned abundance estimates of sitting birds in the Morecambe development area + 4km buffer during Survey 24 on 25 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.52	0.71	150	105	202	26
Little gull	0.70	1.18	201	97	338	64
Common gull	0.04	0.09	13	2	25	7
Herring gull	0.08	0.23	25	0	66	20
Guillemot	2.71	3.33	774	596	951	92
Razorbill	2.23	3.01	638	444	859	106

Table 96   Apportioned abundance estimates of flying birds in the Morecambe development area + 4km buffer during Survey 24 on 25 February 2023

Category	Density estimate (n/km²)	Population estimate (number)	Lower 95% confidence limit of population (number)	Upper 95% confidence limit of population (number)	Standard deviation of population estimate (number)	CV (%)
Species						
Kittiwake	0.30	86	50	124	19	21.95
Little gull	0.55	156	84	248	43	27.58
Common gull	0.05	16	0	40	12	72.93
Herring gull	0.13	38	12	69	15	38.47
Guillemot	0.04	12	0	28	9	67.40

Annex VI: Density and population estimates for red-throated diver custom buffer

1. The density, total estimated population, upper and lower 95% CLs, standard deviation and CV for each species and species group have been calculated using strip transect analysis and are presented here for each of the surveys undertaken. Diver species groups and red-throated divers have been highlighted in bold in the following tables.

Table 1   Abundance estimates of species groups in the Morecambe custom red throated diver buffer during Survey 2 on 07 April 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	7.38	1847	1426	2479	260	14.05
All non-avian animals	0.16	41	20	65	12	29.87
Species group						
Duck species	0.06	16	0	40	11	67.41
Small gull species	1.60	400	139	854	210	52.44
Tern species	0.03	8	0	20	6	64.18
Large auk	5.06	1268	1046	1502	117	9.17
Small auk	0.03	9	0	20	6	61.33
Auk species	0.10	25	8	46	11	41.02
Large auk / diver species	**0.02**	**5**	**0**	**12**	**4**	**91.80**
Auk / shearwater species	0.28	72	24	125	27	37.12
Diver species	**0.03**	**8**	**0**	**20**	**6**	**65.87**
Shearwater species	0.03	8	0	20	6	66.39
Gannet species	0.11	29	12	47	9	30.17
Jellyfish	0.02	4	0	12	4	100.41
Seal species	0.03	8	0	20	6	63.98
Cetacean species	0.11	29	12	50	10	35.10

Table 2   **Apportioned abundance estimates of animals in the Morecambe custom red throated diver buffer during Survey 2 on 07 April 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.06	16	0	40	11	63.58
Kittiwake	1.58	397	135	837	210	52.92
Little gull	0.03	9	0	24	8	93.32
Sandwich tern	0.03	9	0	20	6	63.13
Guillemot	3.43	859	706	1014	80	9.26
Razorbill	1.82	456	313	610	77	16.78
Puffin	0.13	33	12	56	12	35.14
Red-throated diver	**0.03**	**8**	**0**	**20**	**6**	**65.80**
Manx shearwater	0.13	32	11	59	13	38.28
Gannet	0.11	29	12	47	10	32.04
Barrel jellyfish	0.02	5	0	12	4	95.88
Grey seal	0.03	9	0	20	6	67.14
Harbour porpoise	0.11	28	8	50	11	36.93

Table 3 **Apportioned abundance estimates of sitting birds in the Morecambe custom red throated diver buffer during Survey 2 on 07 April 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.07	17	0	40	11	62.79
Kittiwake	1.06	265	39	682	186	70.03
Guillemot	3.16	792	634	969	87	10.87
Razorbill	1.80	450	310	607	76	16.89
Puffin	0.13	33	12	58	12	36.29
Red-throated diver	**0.03**	**9**	**0**	**20**	**6**	**61.58**
Manx shearwater	0.10	24	8	47	11	42.55
Gannet	0.03	8	0	20	6	68.34

Table 4 **Apportioned abundance estimates of flying birds in the Morecambe custom red throated diver buffer during Survey 2 on 07 April 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.46	115	72	158	23	19.20
Little gull	0.03	9	0	24	8	90.37
Sandwich tern	0.03	9	0	20	6	63.27
Guillemot	0.27	67	35	108	20	29.35
Razorbill	0.02	4	0	12	4	96.40
Manx shearwater	0.03	9	0	20	6	63.53
Gannet	0.08	20	8	36	8	38.96

Table 5   **Abundance estimates of species groups in the Morecambe custom red throated diver buffer during Survey 9 on 17 November 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	15.85	3969	2577	5948	897	22.59
All non-avian animals	0.22	56	20	97	20	36.13
Species group						
Small gull species	2.94	737	352	1304	260	35.25
Black-backed gull species	0.02	4	0	13	5	102.86
Large gull species	0.32	80	0	237	72	89.46
Gull species	0.02	4	0	12	4	96.00
Large auk	12.23	3063	2023	4674	685	22.34
Auk species	0.44	110	56	177	31	28.11
Diver species	**0.03**	**9**	**0**	**20**	**6**	**66.79**
Fulmar / gull species	0.02	4	0	12	4	96.53
Cetacean species	0.22	57	17	99	21	35.94

Table 6 **Apportioned abundance estimates of animals in the Morecambe custom red throated diver buffer during Survey 9 on 17 November 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	2.56	641	273	1330	273	42.47
Little gull	0.06	16	0	36	10	59.51
Common gull	0.30	77	35	130	25	32.72
Herring gull	0.32	80	0	261	71	89.17
Lesser black-backed gull	0.02	4	0	13	5	102.00
Guillemot	10.97	2746	1863	4111	577	21.01
Razorbill	1.47	370	163	654	129	34.79
Puffin	0.03	8	4	13	3	28.32
Red-throated diver	**0.03**	**8**	**0**	**20**	**6**	**66.54**
Harbour porpoise	0.23	57	20	97	20	34.84

Table 7   Apportioned abundance estimates of sitting birds in the Morecambe custom red throated diver buffer during Survey 9 on 17 November 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.10	276	12	800	254	92.00
Herring gull	0.26	67	0	205	68	102.33
Lesser black-backed gull	0.01	4	0	12	4	102.87
Guillemot	10.82	2709	1763	4116	606	22.36
Razorbill	1.43	358	154	665	136	37.92
Puffin	0.03	8	4	13	3	27.94
Red-throated diver	**0.03**	**9**	**0**	**20**	**6**	**65.83**

Table 8 **Apportioned abundance estimates of flying birds in the Morecambe custom red throated diver buffer during Survey 9 on 17 November 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	1.43	358	224	506	72	19.95
Little gull	0.06	17	0	36	10	56.63
Common gull	0.31	77	36	129	25	32.02
Herring gull	0.02	5	0	13	4	91.45
Guillemot	0.24	60	20	113	24	40.03
Razorbill	0.03	8	0	25	9	103.71

Table 9 **Abundance estimates of species groups in the Morecambe custom red throated diver buffer during Survey 10 on 05 December 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	3.32	831	586	1132	141	16.98
All non-avian animals	0.05	12	0	28	7	56.13
Species group						
Small gull species	0.59	148	112	187	20	13.41
Large gull species	0.21	52	16	97	21	38.96
Gull species	0.14	36	16	56	11	29.71
Large auk	2.00	502	319	726	105	20.95
Auk species	0.09	24	4	47	11	46.23
Auk / small gull	0.03	9	0	20	6	66.53
Large auk / diver species	**0.02**	**4**	**0**	**12**	**4**	**93.23**
Diver species	**0.21**	**53**	**16**	**99**	**21**	**40.03**
Fulmar / gull species	0.02	4	0	12	4	96.38
Cetacean species	0.05	13	0	28	7	53.15

Table 10   Apportioned abundance estimates of animals in the Morecambe custom red throated diver buffer during Survey 10 on 05 December 2021

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.24	61	36	89	15	23.15
Little gull	0.02	6	0	16	4	70.08
Common gull	0.45	112	72	154	22	19.01
Herring gull	0.23	59	22	101	21	35.84
Guillemot	1.46	365	216	536	84	22.99
Razorbill	0.65	163	79	270	50	30.30
Red-throated diver	**0.20**	**51**	**16**	**90**	**20**	**38.03**
Harbour porpoise	0.05	13	0	28	7	54.26

Table 11 **Apportioned abundance estimates of sitting birds in the Morecambe custom red throated diver buffer during Survey 10 on 05 December 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.08	21	4	45	11	49.55
Little gull	0.01	2	0	5	2	77.62
Common gull	0.02	6	0	15	4	70.35
Guillemot	1.40	352	200	538	87	24.59
Razorbill	0.64	161	79	269	50	30.68
Red-throated diver	**0.21**	**53**	**16**	**97**	**21**	**39.40**

Table 12 **Apportioned abundance estimates of flying birds in the Morecambe custom red throated diver buffer during Survey 10 on 05 December 2021**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.16	41	20	64	12	28.88
Little gull	0.02	5	0	12	4	91.64
Common gull	0.42	107	70	145	20	18.37
Herring gull	0.21	54	18	96	21	38.08
Guillemot	0.05	12	0	35	9	76.02
Razorbill	0.02	5	0	12	4	94.83

Table 13   Abundance estimates of species groups in the Morecambe custom red throated diver buffer during Survey 12 on 11 February 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	3.57	894	604	1269	167	18.62
All non-avian animals	0.19	48	16	90	19	39.01
Species group						
Duck species	0.28	72	0	178	47	65.18
Small gull species	0.26	66	20	140	31	47.33
Black-backed gull species	0.03	8	0	20	6	65.57
Large gull species	0.16	41	16	75	16	37.32
Gull species	0.02	5	0	12	4	91.05
Large auk	2.73	683	404	1091	178	26.00
Auk species	0.03	9	0	20	6	64.42
Auk / small gull	0.03	8	0	20	6	64.46
Diver species	**0.03**	**9**	**0**	**20**	**6**	**67.54**
Cetacean species	0.19	49	16	92	20	39.53

Table 14 **Apportioned abundance estimates of animals in the Morecambe custom red throated diver buffer during Survey 12 on 11 February 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.29	72	0	172	47	65.22
Kittiwake	0.05	12	0	31	9	72.28
Little gull	0.08	20	0	60	19	96.32
Common gull	0.15	37	16	61	12	31.40
Herring gull	0.16	41	16	76	15	36.17
Lesser black-backed gull	0.03	9	0	20	6	63.41
Guillemot	1.90	475	288	725	113	23.73
Razorbill	0.85	214	90	380	74	34.34
Red-throated diver	**0.03**	**9**	**0**	**20**	**6**	**68.45**
Harbour porpoise	0.19	49	16	91	19	39.07

Table 15 Apportioned abundance estimates of sitting birds in the Morecambe custom red throated diver buffer during Survey 12 on 11 February 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.28	71	0	181	48	67.43
Kittiwake	0.03	9	0	24	9	96.11
Little gull	0.03	8	0	24	8	96.54
Common gull	0.05	12	0	24	7	53.35
Herring gull	0.08	21	0	50	13	63.64
Guillemot	1.88	471	281	703	112	23.71
Razorbill	0.87	218	92	366	70	32.21
Red-throated diver	**0.03**	**8**	**0**	**20**	**6**	**65.75**

Table 16 **Apportioned abundance estimates of flying birds in the Morecambe custom red throated diver buffer during Survey 12 on 11 February 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.02	5	0	12	4	94.04
Little gull	0.05	12	0	36	13	102.05
Common gull	0.10	25	8	40	8	31.65
Herring gull	0.08	20	4	40	10	46.10
Lesser black-backed gull	0.03	8	0	20	6	65.20
Guillemot	0.05	13	0	28	7	53.58

Table 17   Abundance estimates of species groups in the Morecambe custom red throated diver buffer during Survey 13 on 09 March 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	2.82	706	536	885	90	12.74
All non-avian animals	0.10	24	8	40	8	32.80
Species group						
Small gull species	0.85	214	141	292	39	18.09
Black-backed gull species	0.02	5	0	12	4	96.28
Large gull species	0.08	20	4	36	8	39.40
Large auk	1.55	389	272	515	64	16.33
Auk species	0.05	13	0	32	9	68.16
Diver species	**0.26**	**65**	**27**	**120**	**24**	**36.38**
Fulmar / gull species	0.02	5	0	12	4	94.33
Seal species	0.05	12	0	24	7	51.37
Cetacean species	0.05	13	0	27	7	51.90

Table 18   Apportioned abundance estimates of animals in the Morecambe custom red throated diver buffer during Survey 13 on 09 March 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.77	194	127	271	38	19.22
Little gull	0.08	20	8	35	7	34.74
Common gull	0.02	5	0	12	4	94.33
Herring gull	0.05	13	0	27	7	52.47
Lesser black-backed gull	0.05	12	0	25	7	55.13
Guillemot	0.45	113	64	176	29	25.81
Razorbill	1.14	286	186	400	54	18.90
Red-throated diver	**0.26**	**64**	**24**	**116**	**24**	**36.21**
Fulmar	0.02	4	0	12	4	95.28
Grey seal	0.05	13	0	24	7	52.20
Harbour porpoise	0.05	13	0	28	7	52.30

Table 19   Apportioned abundance estimates of sitting birds in the Morecambe custom red throated diver buffer during Survey 13 on 09 March 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.46	115	64	168	27	23.39
Little gull	0.05	13	4	24	6	47.41
Lesser black-backed gull	0.02	5	0	12	5	90.49
Guillemot	0.44	110	64	169	29	25.93
Razorbill	1.09	273	186	376	50	18.16
Red-throated diver	**0.25**	**64**	**27**	**116**	**23**	**35.74**

Table 20   Apportioned abundance estimates of flying birds in the Morecambe custom red throated diver buffer during Survey 13 on 09 March 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.30	76	31	135	28	36.05
Little gull	0.03	8	0	20	6	64.52
Common gull	0.02	5	0	12	4	95.83
Herring gull	0.05	13	0	27	7	52.35
Lesser black-backed gull	0.03	8	0	20	6	69.28
Razorbill	0.06	16	0	43	12	72.92
Fulmar	0.02	4	0	12	4	95.56

Table 21   **Abundance estimates of species groups in the Morecambe custom red throated diver buffer during Survey 15 on 02 May 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	36.14	9048	6595	12084	1409	15.57
All non-avian animals	0.93	234	110	404	76	32.32
Species group						
Wader species	0.07	17	0	48	16	93.25
Small gull species	1.64	410	273	555	73	17.69
Black-backed gull species	0.02	4	0	12	4	101.12
Large gull species	0.03	9	0	20	6	70.70
Gull species	0.02	5	0	12	4	92.55
Arctic / common tern	0.50	126	24	289	72	57.11
Tern species	0.11	29	8	51	11	38.60
Large auk	19.19	4803	3862	5896	523	10.87
Auk species	0.19	47	20	80	16	33.93
Auk / small gull	0.03	8	0	20	6	66.57
Auk / shearwater species	1.11	279	171	417	65	23.06
Diver species	**0.02**	**4**	**0**	**13**	**5**	**103.13**
Fulmar / gull species	0.02	4	0	12	4	96.08
Shearwater species	12.90	3230	1728	5451	980	30.34

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Gannet species	0.28	70	19	132	31	43.89
Corvid species	0.02	4	0	12	4	96.78
Cetacean species	0.93	234	107	401	77	32.77

Table 22   Apportioned abundance estimates of animals in the Morecambe custom red throated diver buffer during Survey 15 on 02 May 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Dunlin	0.07	17	0	48	16	95.59
Kittiwake	1.62	405	273	533	70	17.17
Common gull	0.02	5	0	12	4	93.28
Herring gull	0.02	5	0	16	5	93.44
Lesser black-backed gull	0.03	9	0	20	6	66.67
Common tern	0.04	10	1	21	6	57.27
Arctic tern	0.41	103	38	189	39	37.86
Guillemot	18.19	4555	3674	5568	491	10.76
Razorbill	1.27	317	200	449	65	20.25
Puffin	0.11	28	9	52	11	38.95
Red-throated diver	**0.02**	**5**	**0**	**13**	**5**	**102.73**
Fulmar	0.01	4	0	11	4	93.32
Manx shearwater	13.72	3435	1828	5618	991	28.84
Gannet	0.29	73	20	147	34	45.68
Carrion crow	0.02	4	0	16	5	100.46
Harbour porpoise	0.92	231	110	393	74	32.02

Table 23   Apportioned abundance estimates of sitting birds in the Morecambe custom red throated diver buffer during Survey 15 on 02 May 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.76	190	104	301	49	25.52
Common gull	0.02	4	0	12	4	96.17
Herring gull	0.00	1	0	1	1	95.67
Lesser black-backed gull	0.02	5	0	13	4	95.51
Guillemot	17.98	4502	3620	5554	504	11.20
Razorbill	1.27	317	199	464	69	21.54
Puffin	0.11	28	8	52	12	41.18
Red-throated diver	**0.02**	**5**	**0**	**12**	**4**	**95.46**
Fulmar	0.01	4	0	11	4	97.07
Manx shearwater	12.68	3175	1596	5527	987	31.09
Gannet	0.27	68	16	133	31	44.64

Table 24   Apportioned abundance estimates of flying birds in the Morecambe custom red throated diver buffer during Survey 15 on 02 May 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Dunlin	0.06	16	0	48	16	95.71
Kittiwake	0.88	220	136	308	45	20.37
Herring gull	0.02	4	0	12	4	104.23
Lesser black-backed gull	0.02	5	0	16	5	101.02
Common tern	0.04	10	1	21	6	57.87
Arctic tern	0.40	101	38	179	39	38.59
Guillemot	0.16	40	16	67	13	32.50
Razorbill	0.02	5	0	12	4	94.47
Manx shearwater	1.04	260	169	356	49	18.77
Gannet	0.02	4	0	12	4	96.14
Carrion crow	0.02	5	0	12	4	93.97

Table 25 **Abundance estimates of species groups in the Morecambe custom red throated diver buffer during Survey 21 on 22 November 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	28.88	7230	4744	10485	1482	20.49
All non-avian animals	1.81	453	308	646	89	19.59
Species group						
Duck species	0.56	141	53	244	50	35.18
Small gull species	2.53	635	517	755	59	9.23
Black-backed gull species	0.02	5	0	13	5	101.77
Large gull species	0.55	139	80	202	31	21.92
Gull species	0.08	21	5	41	10	47.16
Large auk	24.00	6008	3665	9115	1415	23.54
Auk species	0.68	171	90	276	47	27.26
Auk / small gull	0.23	58	29	90	16	26.80
Auk / shearwater species	0.02	5	0	16	5	101.38
Diver species	**0.02**	**4**	**0**	**13**	**4**	**94.50**
Fulmar / gull species	0.08	21	4	41	10	47.13
Cormorant / shag	0.07	17	0	49	17	94.92
Jellyfish	0.98	246	101	431	86	35.04
Seal species	0.05	12	0	25	7	51.28

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Cetacean species	0.78	196	134	269	36	18.38
Seal / small cetacean species	0.02	5	0	16	5	92.36

Table 26   **Apportioned abundance estimates of animals in the Morecambe custom red throated diver buffer during Survey 21 on 22 November 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.58	145	49	261	52	35.99
Kittiwake	1.70	426	335	527	51	11.74
Black-headed gull	0.01	4	0	13	4	103.64
Little gull	0.36	90	45	138	25	26.86
Common gull	0.59	148	96	202	27	18.16
Great black-backed gull	0.07	17	0	36	9	53.49
Herring gull	0.54	135	73	204	34	24.97
Lesser black-backed gull	0.03	9	0	25	8	96.94
Guillemot	22.61	5660	3064	8797	1463	25.84
Razorbill	1.94	487	325	662	86	17.60
Puffin	0.36	90	45	148	28	30.41
Red-throated diver	**0.02**	**5**	**0**	**13**	**4**	**94.96**
Fulmar	0.08	21	5	41	10	47.87
Shag	0.07	17	0	49	17	98.27
Barrel jellyfish	0.99	248	97	443	90	36.10
Grey seal	0.05	13	4	25	6	46.74
Harbour porpoise	0.78	197	133	270	36	17.89

Table 27 **Apportioned abundance estimates of sitting birds in the Morecambe custom red throated diver buffer during Survey 21 on 22 November 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.56	140	48	246	52	37.11
Kittiwake	0.85	212	153	282	34	15.66
Little gull	0.02	5	0	13	4	89.26
Common gull	0.03	9	1	21	6	61.59
Herring gull	0.26	66	32	110	20	30.49
Guillemot	22.45	5620	3085	8676	1438	25.58
Razorbill	1.91	479	321	652	87	17.96
Puffin	0.36	90	45	150	27	29.64
Fulmar	0.08	21	4	41	10	48.25
Shag	0.07	17	0	49	16	96.64

Table 28   Apportioned abundance estimates of flying birds in the Morecambe custom red throated diver buffer during Survey 21 on 22 November 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.02	5	0	13	4	97.02
Kittiwake	0.86	215	147	284	37	16.89
Black-headed gull	0.02	5	0	13	4	94.21
Little gull	0.34	87	41	137	25	28.50
Common gull	0.56	140	94	192	26	18.62
Great black-backed gull	0.07	17	0	36	10	54.31
Herring gull	0.24	61	32	93	17	26.64
Lesser black-backed gull	0.03	9	0	32	9	97.43
Guillemot	0.08	21	5	40	9	42.24
Razorbill	0.02	5	0	13	5	101.41
Red-throated diver	**0.02**	**5**	**0**	**13**	**4**	**94.50**

Table 29   Abundance estimates of species groups in the Morecambe custom red throated diver buffer during Survey 22 on 03 December 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	12.89	3228	2617	3895	322	9.96
All non-avian animals	0.13	33	8	60	14	40.47
Species group						
Duck species	0.79	199	58	377	82	41.15
Small gull species	1.86	465	341	632	74	15.83
Large gull species	0.53	134	68	212	39	28.76
Gull species	0.02	5	0	16	5	94.86
Large auk	9.53	2385	1907	2934	257	10.75
Auk species	0.11	28	8	58	13	45.91
Auk / small gull	0.10	25	4	54	13	52.79
Diver species	**0.02**	**4**	**0**	**12**	**4**	**98.42**
Fulmar / gull species	0.03	8	0	24	8	97.53
Seal species	0.01	4	0	12	4	96.18
Cetacean species	0.11	28	12	48	10	34.99

Table 30   Apportioned abundance estimates of animals in the Morecambe custom red throated diver buffer during Survey 22 on 03 December 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.78	197	56	368	81	41.04
Kittiwake	1.16	290	196	394	51	17.29
Little gull	0.39	98	66	133	18	17.43
Common gull	0.40	100	60	144	22	21.86
Great black-backed gull	0.07	17	1	37	10	56.37
Herring gull	0.46	117	56	186	34	28.89
Guillemot	7.55	1891	1524	2365	215	11.37
Razorbill	2.06	517	321	750	110	21.26
Red-throated diver	**0.02**	**5**	**0**	**12**	**4**	**95.78**
Grey seal	0.02	4	0	12	4	97.46
Harbour porpoise	0.11	28	8	50	11	36.68

Table 31 **Apportioned abundance estimates of sitting birds in the Morecambe custom red throated diver buffer during Survey 22 on 03 December 2022**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.76	191	51	375	85	44.11
Kittiwake	0.25	63	32	98	17	26.51
Little gull	0.04	10	0	22	6	60.02
Common gull	0.00	1	0	1	1	90.61
Great black-backed gull	0.03	9	0	21	6	69.00
Herring gull	0.06	16	4	31	8	44.16
Guillemot	6.79	1701	1346	2153	207	12.15
Razorbill	1.92	482	287	694	105	21.65
Red-throated diver	**0.02**	**5**	**0**	**12**	**4**	**92.60**

Table 32   Apportioned abundance estimates of flying birds in the Morecambe custom red throated diver buffer during Survey 22 on 03 December 2022

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.02	4	0	12	4	103.12
Kittiwake	0.90	226	131	332	52	22.65
Little gull	0.34	86	56	116	16	17.87
Common gull	0.39	97	53	140	23	23.47
Great black-backed gull	0.03	9	0	20	6	65.37
Herring gull	0.40	100	47	165	31	30.22
Guillemot	0.69	173	115	240	32	18.51
Razorbill	0.12	31	8	60	14	43.72

Table 33 Abundance estimates of species groups in the Morecambe custom red throated diver buffer during Survey 23 on 05 February 2023

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	6.85	1715	1291	2172	228	13.26
All non-avian animals	0.24	61	24	103	20	32.63
Species group						
Duck species	0.63	158	51	279	60	37.89
Small gull species	0.79	199	132	270	36	17.76
Large gull species	0.38	96	31	181	39	40.74
Gull species	0.06	17	0	35	9	53.95
Large auk	4.65	1165	824	1538	184	15.71
Auk species	0.20	50	20	87	17	33.69
Auk / small gull	0.03	9	0	20	6	65.45
Diver species	**0.10**	**24**	**0**	**59**	**16**	**63.56**
Jellyfish	0.02	5	0	12	4	92.74
Seal species	0.03	9	0	20	6	61.56
Cetacean species	0.18	45	12	84	19	42.65
Seal / small cetacean species	0.02	5	0	12	4	93.78

Table 34 **Apportioned abundance estimates of animals in the Morecambe custom red throated diver buffer during Survey 23 on 05 February 2023**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.64	160	46	294	63	39.02
Kittiwake	0.47	118	70	167	27	22.21
Little gull	0.28	70	27	118	25	34.99
Common gull	0.13	32	9	60	13	40.61
Great black-backed gull	0.05	12	0	31	9	68.64
Herring gull	0.34	86	20	171	40	46.25
Lesser black-backed gull	0.02	5	0	12	4	94.71
Guillemot	3.61	905	650	1174	137	15.08
Razorbill	1.25	313	189	467	72	22.70
Red-throated diver	**0.09**	**24**	**0**	**57**	**16**	**65.36**
Barrel jellyfish	0.02	4	0	12	4	98.62
Grey seal	0.03	8	0	20	5	63.80
Harbour porpoise	0.19	48	16	87	18	37.23

Table 35 **Apportioned abundance estimates of sitting birds in the Morecambe custom red throated diver buffer during Survey 23 on 05 February 2023**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Common scoter	0.63	158	44	284	61	38.74
Kittiwake	0.32	81	43	123	21	24.76
Little gull	0.09	22	6	43	10	43.61
Common gull	0.02	5	0	13	4	93.46
Herring gull	0.19	49	0	114	31	61.67
Guillemot	3.44	862	587	1153	145	16.72
Razorbill	1.23	309	191	463	71	22.97
Red-throated diver	**0.09**	**24**	**0**	**60**	**16**	**64.35**

Table 36 **Apportioned abundance estimates of flying birds in the Morecambe custom red throated diver buffer during Survey 23 on 05 February 2023**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.14	36	12	65	14	38.41
Little gull	0.19	48	16	87	19	38.40
Common gull	0.11	28	8	53	12	42.78
Great black-backed gull	0.05	13	0	32	9	72.49
Herring gull	0.13	32	8	58	13	38.76
Lesser black-backed gull	0.02	5	0	12	4	94.45
Guillemot	0.18	46	16	83	18	39.38

Table 37   Abundance estimates of species groups in the Morecambe custom red throated diver buffer during Survey 24 on 25 February 2023

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Broad category						
All birds	6.10	1527	1147	1949	209	13.69
All non-avian animals	0.18	45	21	69	13	27.54
Species group						
Small gull species	1.38	345	241	447	54	15.57
Large gull species	0.21	53	16	105	25	45.57
Large auk	4.33	1085	794	1392	155	14.22
Auk species	0.03	9	0	20	6	63.58
Diver species	**0.10**	**24**	**4**	**51**	**12**	**48.27**
Fulmar / gull species	0.02	5	0	16	5	99.46
Gannet species	0.02	5	0	13	4	93.15
Seal species	0.05	13	0	25	6	48.12
Cetacean species	0.13	33	12	59	12	35.14

Table 38 **Apportioned abundance estimates of animals in the Morecambe custom red throated diver buffer during Survey 24 on 25 February 2023**

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.32	80	40	129	23	28.38
Little gull	0.81	202	111	293	48	23.43
Common gull	0.26	65	36	100	17	25.65
Herring gull	0.21	53	12	107	25	46.22
Guillemot	2.70	677	487	886	106	15.57
Razorbill	1.62	406	262	566	80	19.54
Red-throated diver	**0.10**	**24**	**4**	**49**	**12**	**49.40**
Gannet	0.01	4	0	13	4	98.43
Grey seal	0.05	13	0	25	7	50.65
Harbour porpoise	0.13	33	12	57	12	35.05

Table 39   Apportioned abundance estimates of sitting birds in the Morecambe custom red throated diver buffer during Survey 24 on 25 February 2023

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.22	56	23	98	19	33.84
Little gull	0.32	81	29	150	33	39.73
Common gull	0.08	21	8	38	8	38.26
Herring gull	0.16	42	4	93	25	58.66
Guillemot	2.70	677	479	890	105	15.45
Razorbill	1.63	407	254	590	85	20.67
Red-throated diver	**0.09**	**24**	**4**	**49**	**12**	**49.36**

Table 40   Apportioned abundance estimates of flying birds in the Morecambe custom red throated diver buffer during Survey 24 on 25 February 2023

Category	Density Estimate (n/km²)	Population Estimate (number)	Lower 95% Confidence Limit of Population Estimate (number)	Upper 95% Confidence Limit of Population Estimate (number)	Standard Deviation of Population Estimate (number)	CV (%)
Species						
Kittiwake	0.10	25	8	43	9	35.88
Little gull	0.48	119	61	184	32	26.68
Common gull	0.18	46	21	73	14	29.31
Herring gull	0.05	13	0	28	7	55.03
Gannet	0.02	5	0	13	4	92.19

Annex VII: Species ID confidence levels graphs

1   The confidence levels are presented for each key species recorded across the survey period in the survey area.

Figure 1   **Confidence levels of common scoter between March 2021 and February 2023 in the Morecambe survey area**

Common scoter
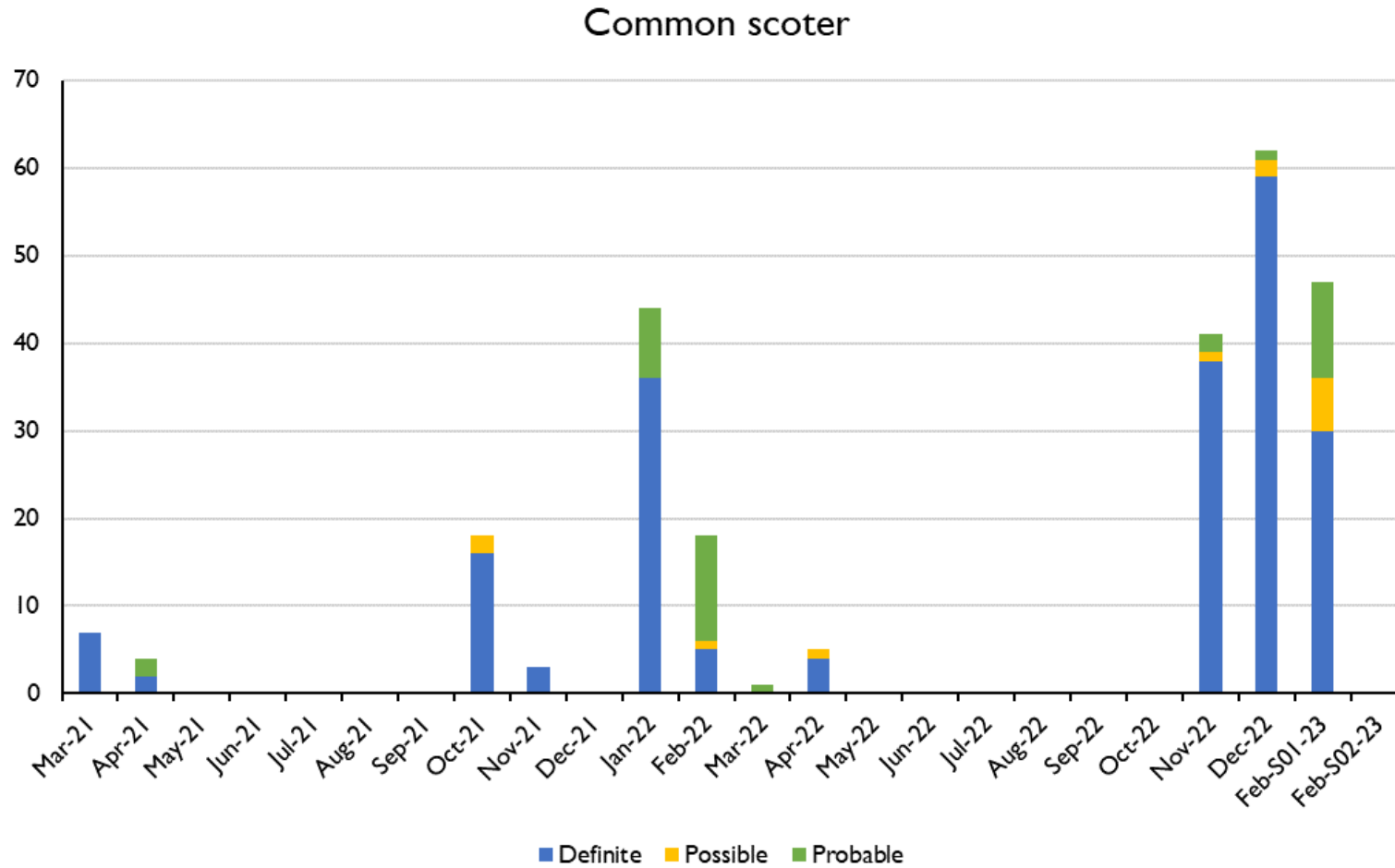
Figure 2 Confidence levels of kittiwake between March 2021 and February 2023 in the Morecambe survey area

Kittiwake
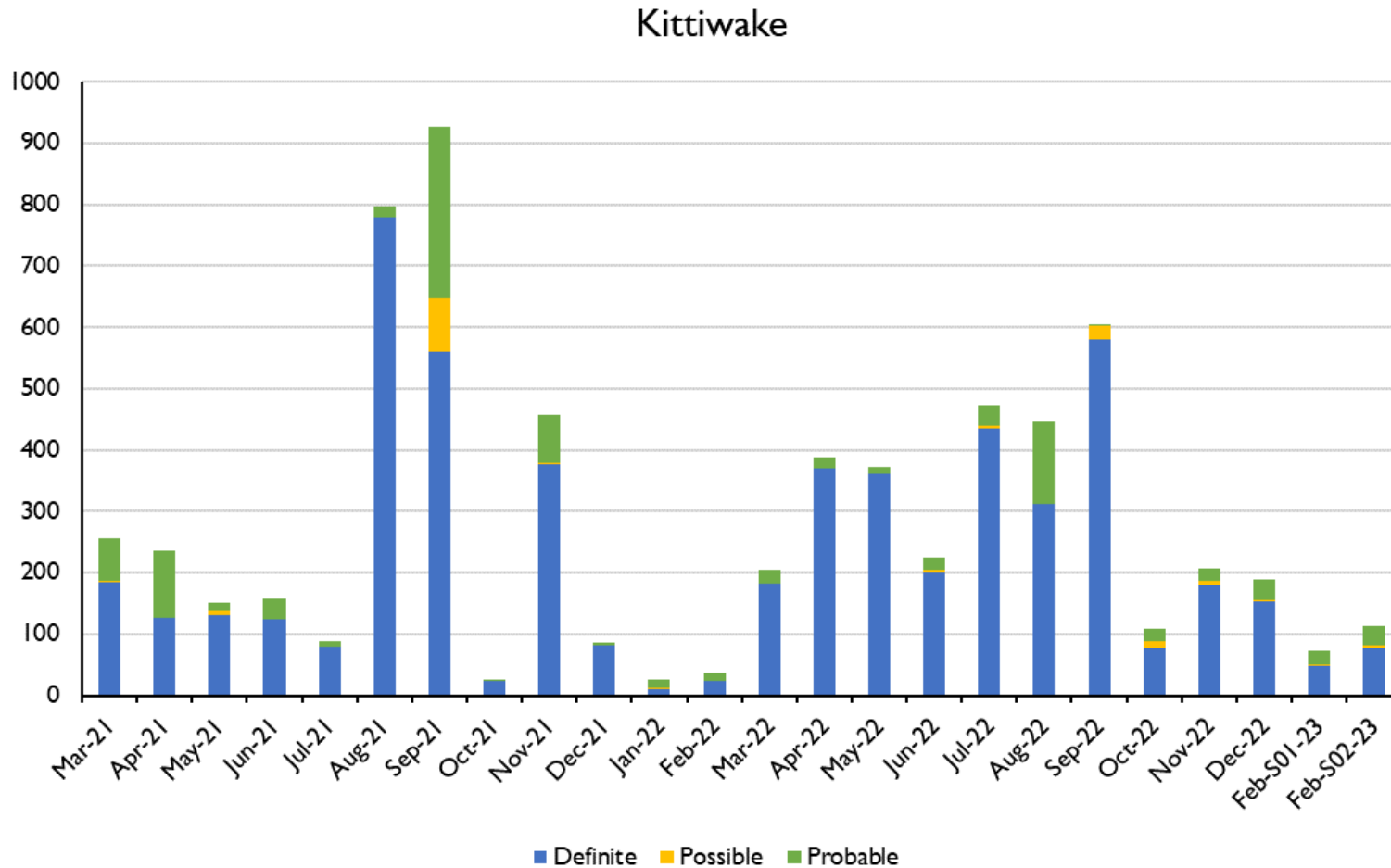
Figure 3   **Confidence levels of little gull between March 2021 and February 2023 in the Morecambe survey area**

Little gull
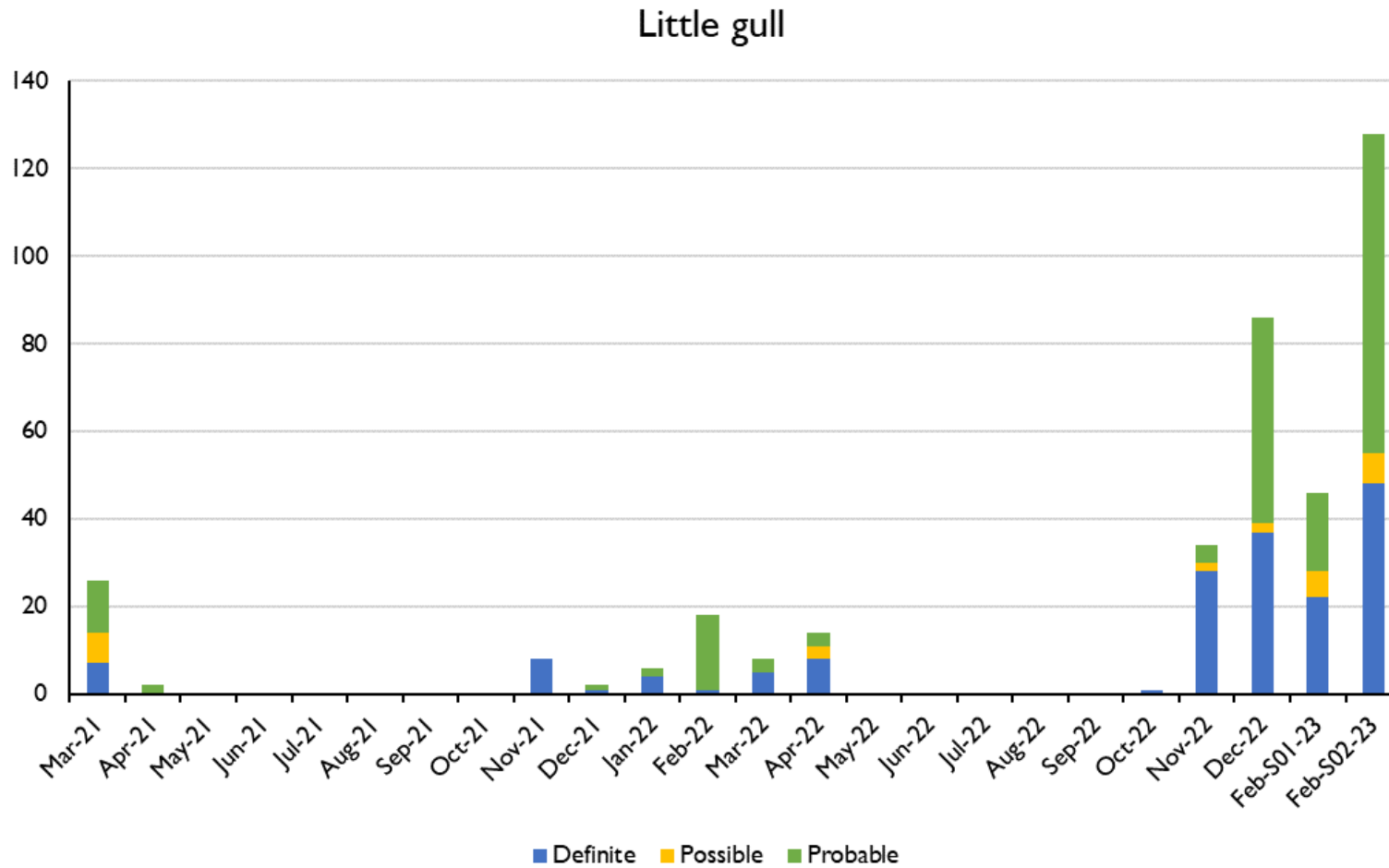
Figure 4   Confidence levels of common gull between March 2021 and February 2023 in the Morecambe survey area

Common gull
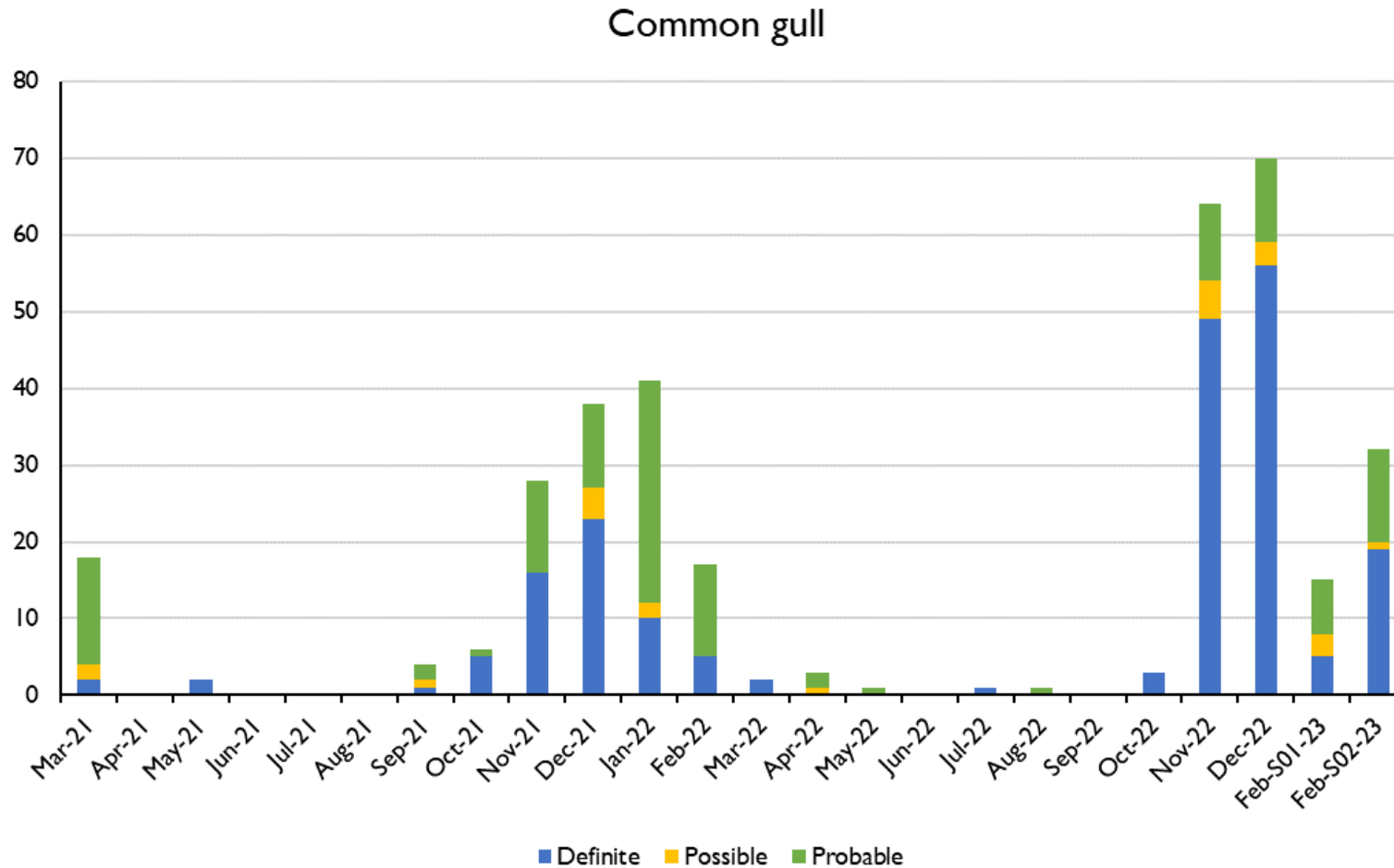
Figure 5 Confidence levels of herring gull between March 2021 and February 2023 in the Morecambe survey area

Herring gull
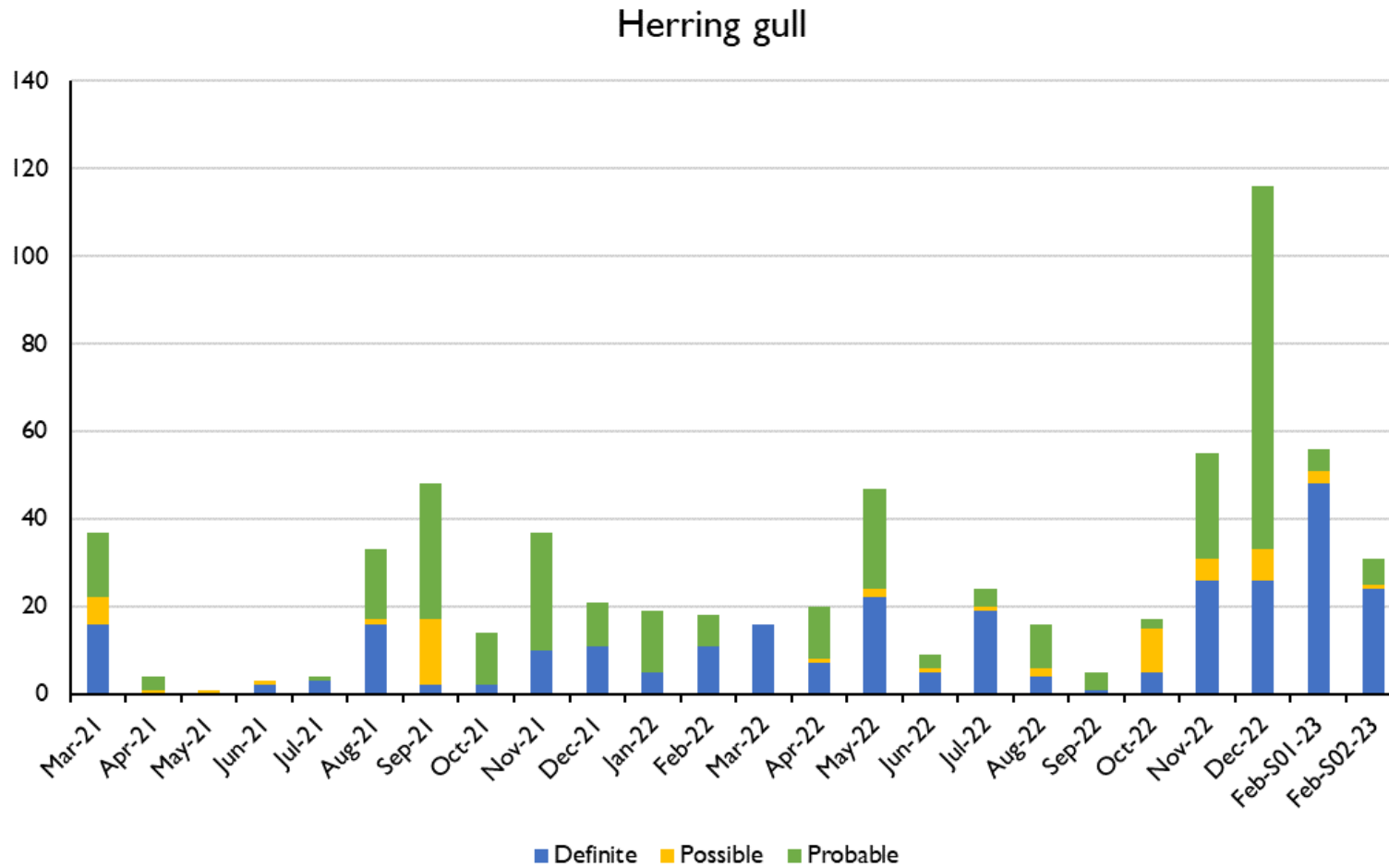
Figure 6 **Confidence levels of lesser black-backed gull between March 2021 and February 2023 in the Morecambe survey area**

Lesser black-backed gull
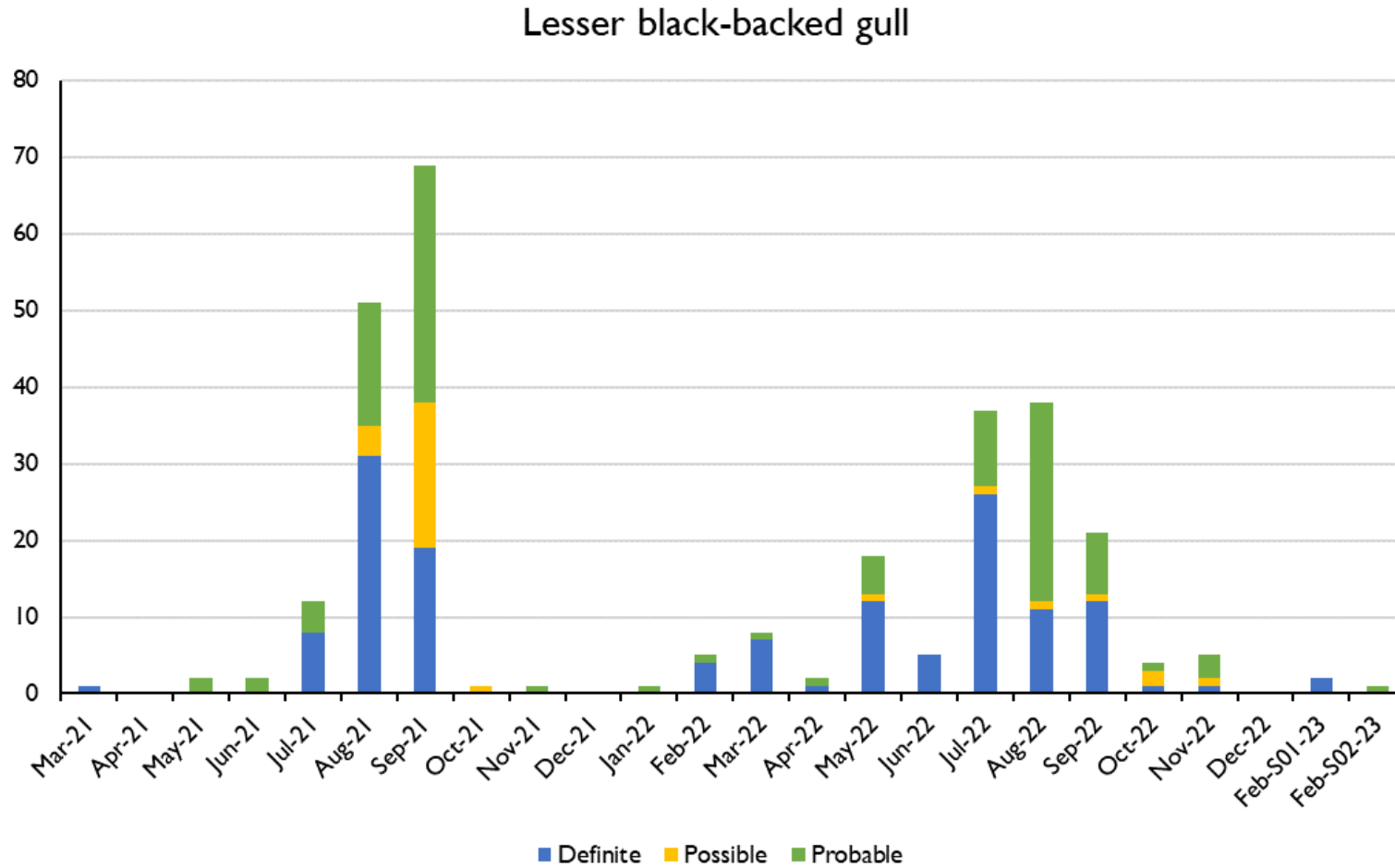
Figure 7   **Confidence levels of guillemot between March 2021 and February 2023 in the Morecambe survey area**
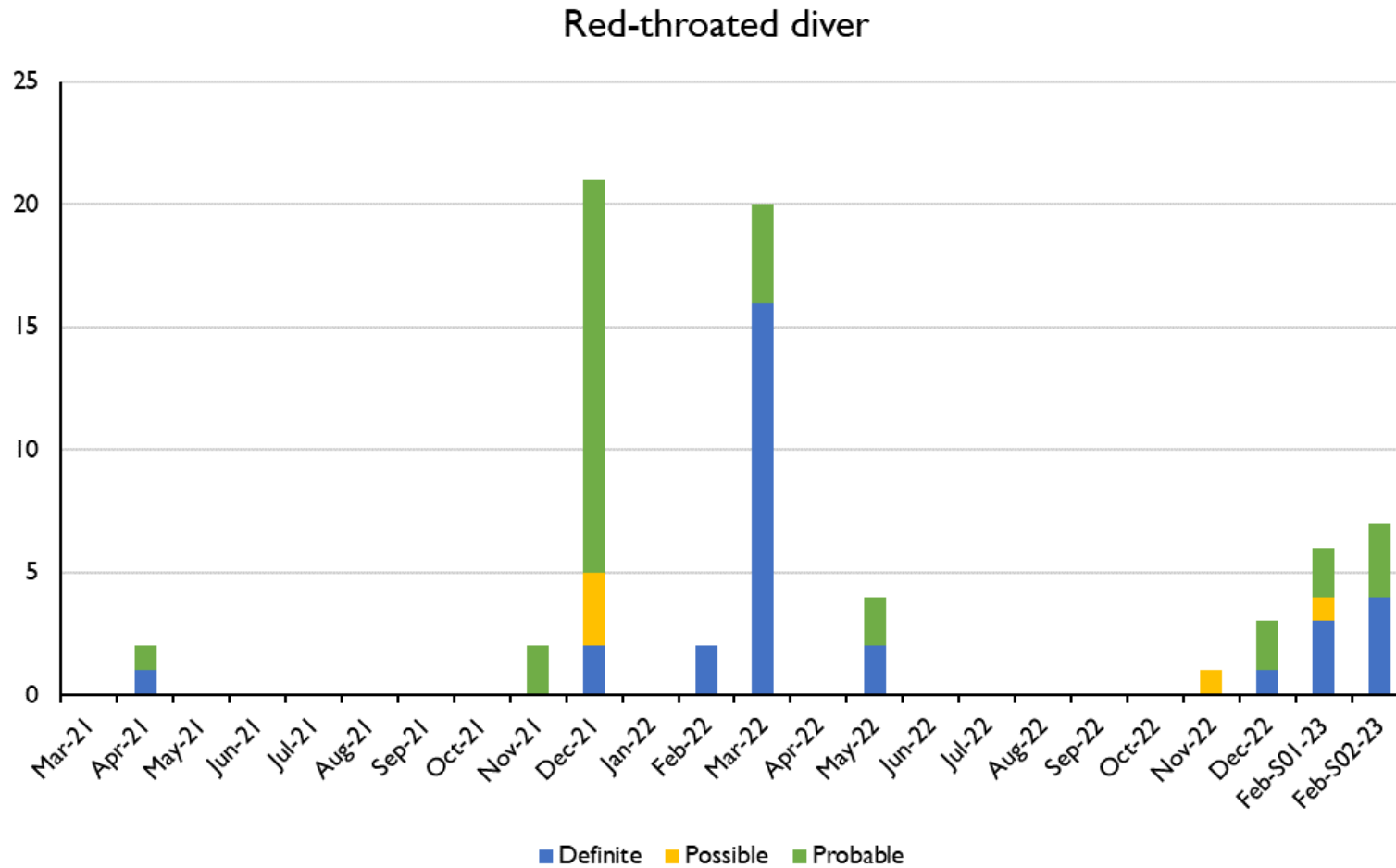

Guillemot
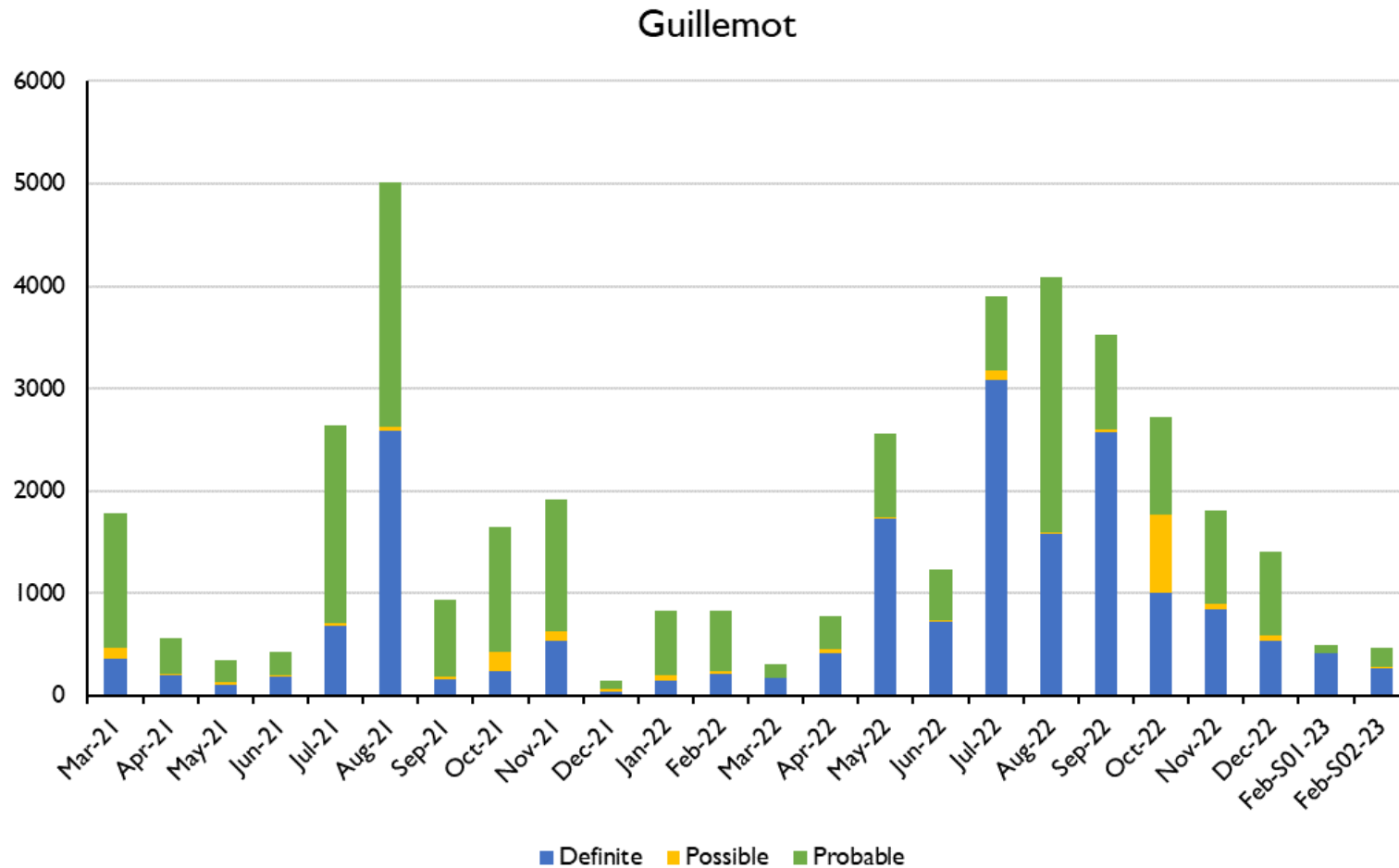
Figure 8   Confidence levels of razorbill between March 2021 and February 2023 in the Morecambe survey area
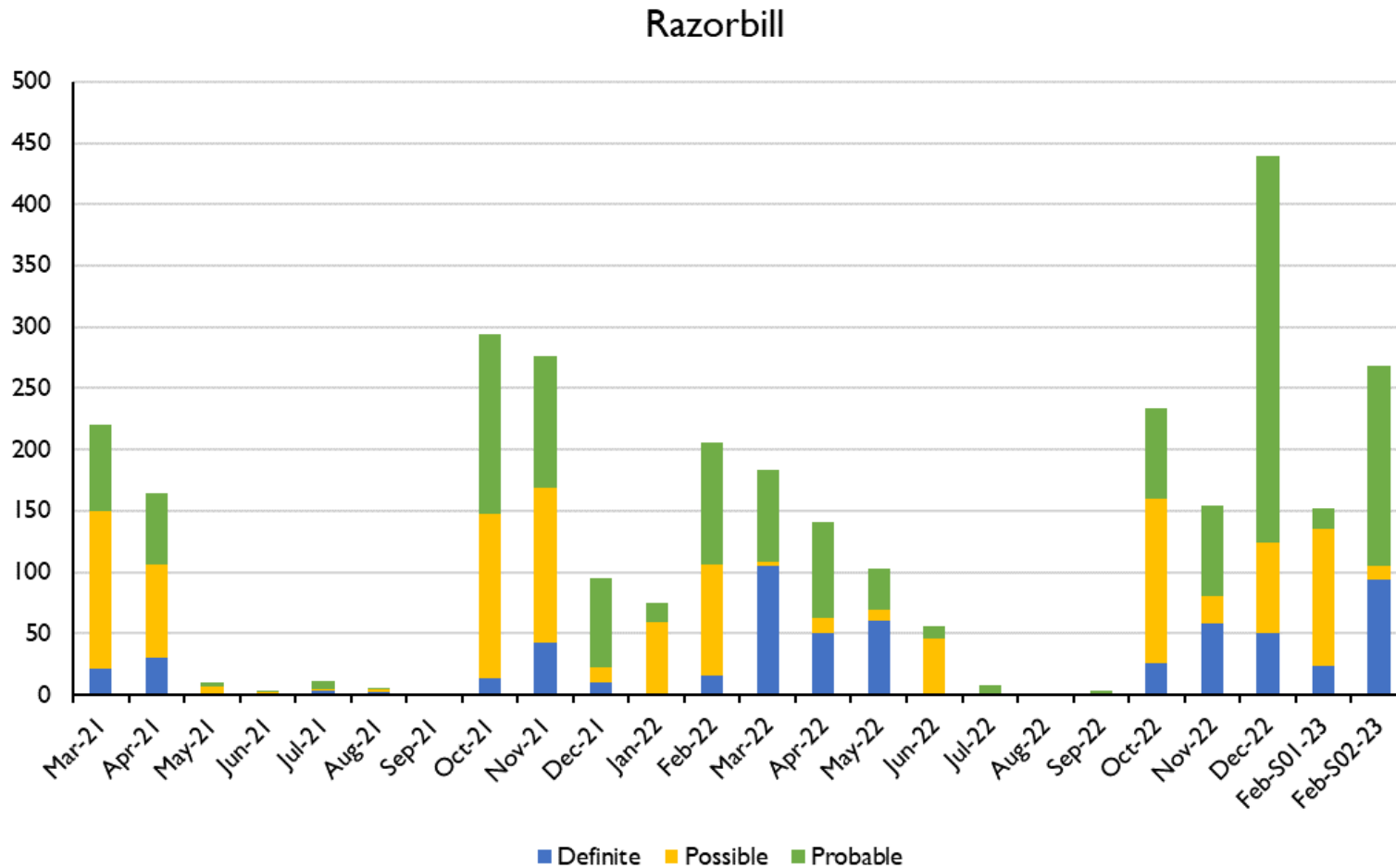
Figure 9   **Confidence levels of red-throated diver between March 2021 and February 2023 in the Morecambe survey area**

Red-throated diver

Figure 10   Confidence levels of Manx shearwater between March 2021 and February 2023 in the Morecambe survey area
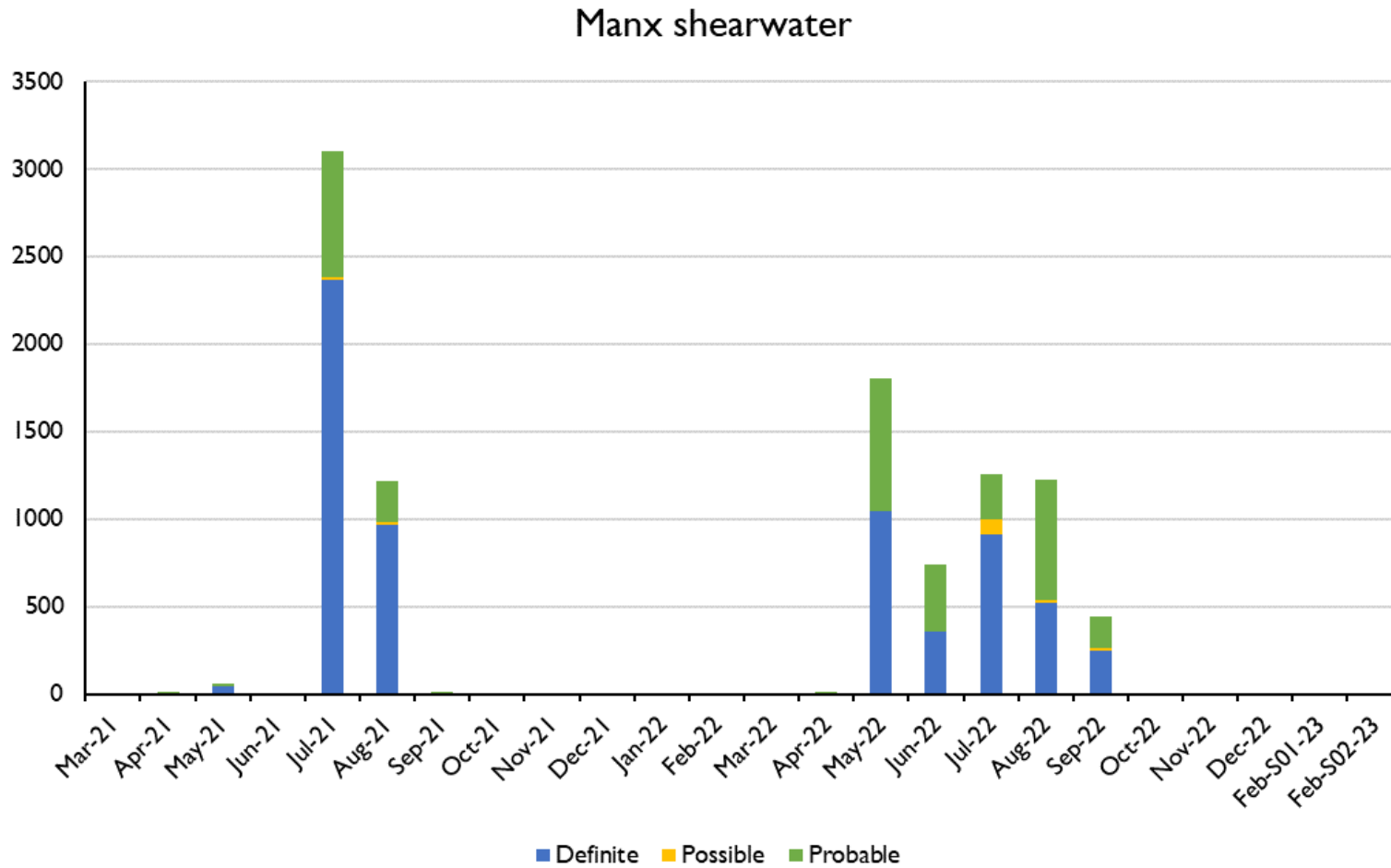

Manx shearwater

Figure 11   Confidence levels of gannet between March 2021 and February 2023 in the Morecambe survey area
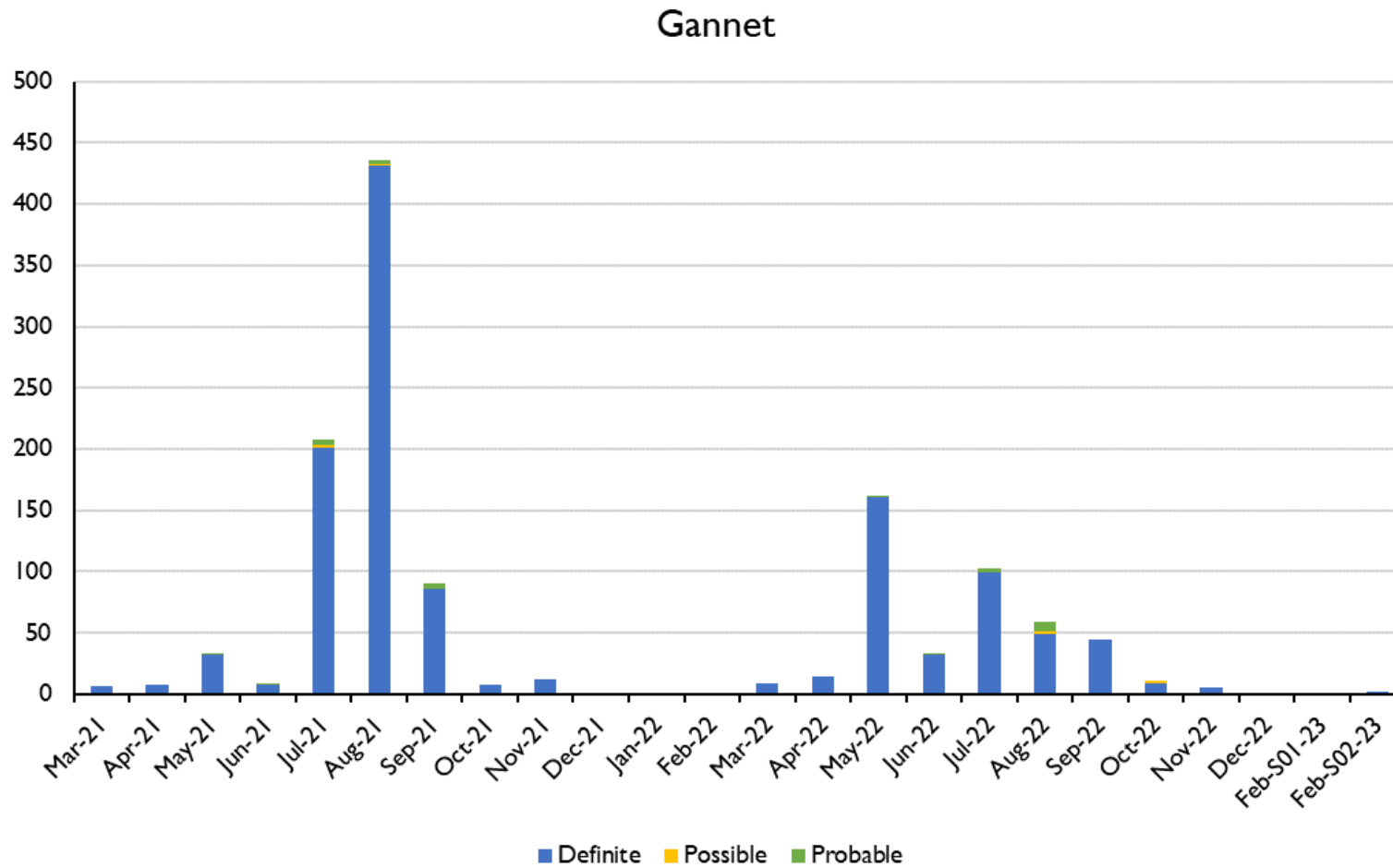

Gannet

Figure 12   Confidence levels of harbour porpoise between March 2021 and February 2023 in the Morecambe survey area

Harbour porpoise