

Llŷr Marine Ornithological Clarification Note 4 **Further Clarification of HiDef's 'Non-ID Apportioning' Method**

As requested by NRW (A) at the meeting on 9 May, HiDef provides this further clarification on the approach taken to apportion birds that could not be identified to species level. This note is provided in addition to the previous clarification note (note 2) in order to more clearly explain the taxonomic groupings we use for non-ID apportioning (Section 1) and how the method works in practice (Section 2).

1. Non-ID species groupings used by HiDef

Table 1 has been updated to present further detail on the species groupings used by HiDef and the species which may potentially be contained in each, although please note that this varies survey-by-survey (i.e. month by month) and that not all species presented in each group were recorded during the two-year survey programme undertaken for Llŷr.

Figure 1 presents these species groupings in a diagrammatic matrix which provides insight on how they are used by HiDef's specialist ornithologists during the review and ID process, and then subsequently used to inform the non-ID apportioning in the case of those observations not identified to species level.

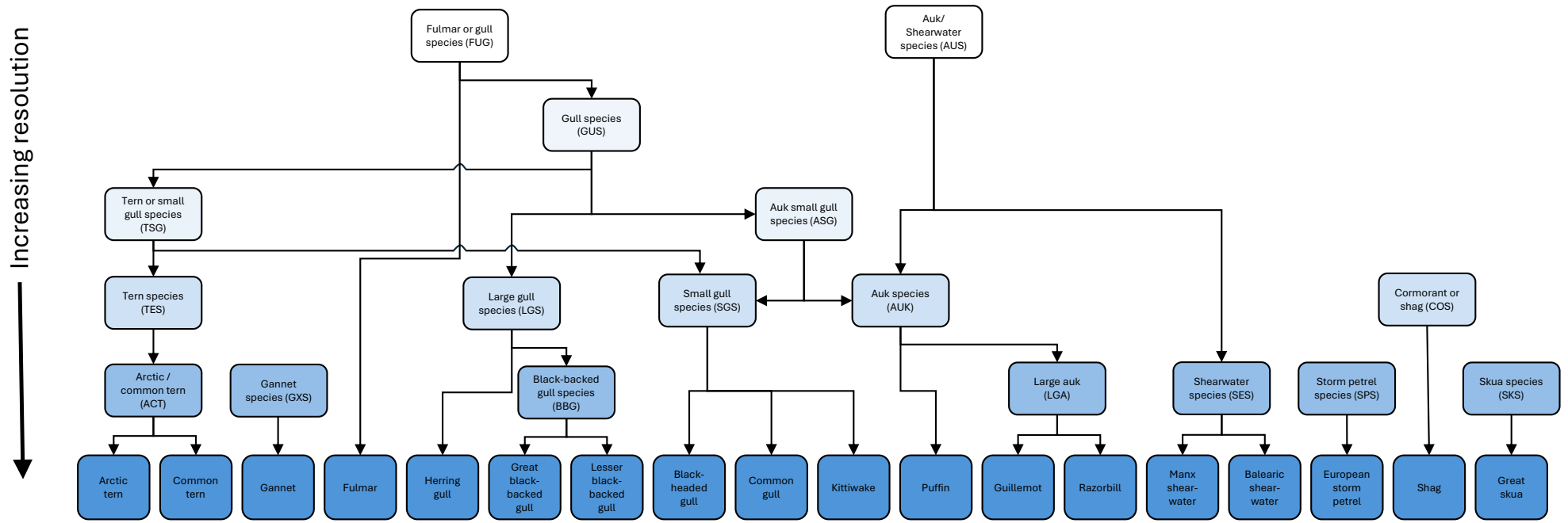
As carried out by HiDef, non-ID apportioning is a computational process applied to the 'observation sheets' of survey data for each transect in each survey month using code written in the R programming language. It is not easy to describe this computation in text; however, the illustrative examples set out in **Table 2** and the supporting explanations aim to enhance transparency of the methodology. These examples in **Section 2** are the same as those provided in the original clarification note.

Table 1: Groupings used for birds with no species identification – ‘no-ID birds’ and potential species they could be apportioned to

Species group	Code	Potential species included in the group
Large auk	LGA	Guillemot, razorbill
Auk species	AUK	Guillemot, razorbill, Atlantic puffin
Small gull species	SGS	Kittiwake, common gull, black-headed gull
Auk / shearwater species	AUS	Guillemot, razorbill, Atlantic puffin, Manx shearwater
Shearwater species	SES	Manx shearwater, Balearic shearwater
Auk / small gull species	ASG	Kittiwake, common gull, black-headed gull, guillemot, razorbill, Atlantic puffin
Large gull species	LGS	Great black-backed gull, lesser black-backed gull, herring gull
Black-backed gull species	BBG	Great black-backed gull, lesser black-backed gull
Gull species	GUS	Kittiwake, common gull, black-headed gull, great black-backed gull, lesser black-backed gull, herring gull
Fulmar / gull species	FUG	Fulmar, kittiwake, common gull, black-headed gull, great black-backed gull, lesser black-backed gull, herring gull
Arctic / common tern species	ACT	Arctic tern, common tern
Tern species	TES	Sandwich tern, Arctic tern, common tern
Tern / small gull species	TSG	Sandwich tern, Arctic tern, common tern, kittiwake, common gull, black-headed gull
Skua species	SKS	Arctic skua, great skua, pomarine skua, long-tailed skua
Storm petrel species	SPS	Storm petrel, leach’s petrel
Cormorant / shag	COS	Cormorant, shag
Gannet species	GXS	Gannet

During the review and ID process, it may seem counterintuitive that a positively identified species, such as a razorbill, would be assigned to a broader, less certain group like 'auk species' or 'auk / shearwater species', rather than the more specific 'large auk'. This can happen when the observer is confident enough to assign a species (e.g. razorbill), but not confident enough to entirely rule out similar species such as puffin or Manx shearwater. In these instances, assigning the sighting to a species group with an indication of the likely species reflects the observer’s judgement and the associated uncertainty. This approach works for apportioning purposes, as it means the unidentified observations are interpreted in the context of the species group composition and the specific uncertainties present within each survey.

Figure 1: Groupings used for birds with no species identification – ‘no-ID birds’ and potential species they could be apportioned to; colours denote hierarchical level from lowest (white) to highest (blue) granularity



2. HiDef Method for Non-ID Apportioning

Table 2 has been updated to include records from the Survey Area (i.e. untrimmed data) from which the non-ID apportioning weightings are calculated (Column E). These are from the full Llŷr survey area and not the sub-sample for the Array Area, as explained during the meeting with NRW (A) held on 9 May. This supporting information is now presented in **column E** of **Table 2** and is the key information missing from the original note. We hope **Table 2** aids understanding by providing a clearer representation of no-ID apportioning. We have also included equations for how these values are calculated below.

All unidentified birds, as compiled from the taxonomic groupings in **Table 1 / Figure 1**, are assigned to species-level using a weighting that correlates to the overall proportions of birds recorded for each species per survey month but does not always include each species within each species group listed above. Depending on the numbers of each species encountered in a particular survey, this weighting varies month-to-month. The total number of unidentified birds recorded during two years of Llŷr surveys was between two and four per cent of the total number of birds recorded. Therefore, the number of unidentified birds that required apportioning is relatively small.

We provide detailed description of three representative examples recorded during the Llŷr surveys:

- **June 2020 (S01-20)**

In this survey, 9 unidentified 'Auk species' were recorded. Because there were instances in that survey where puffin and Manx shearwater had been assigned to the group category 'Auk species', these 9 individuals were apportioned between these two species, using ratios of occurrence from the wider Survey Area. Of those 9 unidentified 'Auk species', 0.2 and 8.8 birds were apportioned to the unapportioned 12 puffin and 1,069 Manx shearwater respectively, giving apportioned totals of 13.2 and 1,077.8 birds.

- **September 2020**

In this survey, 18 unidentified 'Auk species' were recorded. Because no other identified species were labelled by the reviewer as 'Auk species' beside puffin (based on observations from the total survey area for that month), all 18 records were apportioned solely to the existing 9 records of puffin, providing a total apportioned count of 27 birds.

- **January 2021 (S02-21)**

In this survey there were three Auk / small gull species (ASG) all of which were assigned through the non-ID apportioning process to guillemot and kittiwake but not razorbill. This is because the lower resolution 'Auk / small gull species' was selected for the identification of guillemot and kittiwake versus the higher resolution 'auk species' for razorbill.

In Table 2, the column names are defined as follows:

- **A – Species:** the name of the species.
- **B – Array area - unapportioned count:** the total number of each species within the array area before apportioning.
- **C – No ID species group:** the species group assigned to each species by the person identifying the birds, based on confidence of the identification.
- **D – No ID count:** the total number of non-identified birds within the species group.
- **Ei – Unapportioned count** within species group: the total number of each species within the species group, over the whole survey area before apportioning.

- **Eii – Total count in species group:** the total number of birds within the whole survey area for a given species group.
- **Eiii – Apportioning proportion:** this is the unapportioned number within the species group divided by the total count in species group within the whole survey area. It is calculated so that it can be used to determine the proportion of birds apportioned to each species out of the total no ID number.
- **F – Array area - count added:** the apportioning proportion multiplied by the no ID number for each species.
- **G – Array area – total apportioned count:** the unapportioned count for each species plus the number added, based on the species groups and apportioning proportions.

To reiterate the process, the apportioning proportion (**Table 2 Column Eiii**; i.e. weighting) is calculated from the unapportioned count of a said species in said group (**Column Ei**) divided by the total count of all birds of all species in said group (**Column Eii**) over the entire survey area – first equation. This is then multiplied by the no-ID count within the Array Area (**Column D**) to generate the count of apportioned birds that should be added (**Column F**) – second equation. This number is then added to the unapportioned count of a given species (**Column B**) to generate the total count including apportioned birds (**Column G**) – third equation.

$$\frac{Ei}{Eii} = Eiii$$

$$(Eiii \times D) = F$$

$$F + B = G$$

Table 2: Non-ID apportioning – worked examples for Llŷr

A	B	C	D	E			F	G
Species	Array Area – unapportioned count	No ID species group	No ID count	Survey Area (untrimmed data)			Array area - count added	Array Area – total apportioned count
				(i) Unapportioned count within species group	(ii) Total count in species group	(iii) Apportioning proportion		
June 2020 (S01-20)								
Puffin	12	AUK	1	9	9	1	1	13.2069
		AUS	9	2	87	0.022989	0.2069	
Manx shearwater	1,069	AUS	9	85	87	0.977010	8.7931	1,077.7931
Guillemot	100	LGA	2	113	113	1	2	102
September 2020								
Puffin	9	AUK	18	12	12	1	18	27
Manx shearwater	9	AUS	13	4	8	0.5	6.5	15.5000
Razorbill	59	AUS	13	4	8	0.5	6.5	66.6940
		LGA	43	76	2,737	0.027768	1.1940	
Guillemot	1961	LGA	43	2,661	2,737	0.972230	41.8059	2,003.8059
		LGA	1	4	4	1	1	
January 2021 (S02-21)								
Guillemot	1831	ASG	3	1	4	0.25	0.75	1,866.4556
		LGA	37	1,785	1903	0.937990	34.7056	
Kittiwake	254	ASG	3	3	4	0.75	2.25	257.2403
		SGS	1	102	103	0.990290	0.9903	
Razorbill	115	AUK	5	1	1	1	5	122.2943
		LGA	37	118	1903	0.062007	2.2943	

Note that the ‘flying’ and ‘sitting’ behavioural categories previously included for the large auk (LGA) species grouping have now been removed from the table. This was contextual information that gets recorded but does not actually influence the way the apportioning is done.

Apportioning of unidentified birds may theoretically introduce bias towards species which are more readily identifiable, i.e. if a large proportion of birds of one species are difficult to identify while another similar-looking species is easier to distinguish, there is a risk that the unidentified birds will be disproportionately attributed to the more easily identified species. However, due to the very small percentages of non-ID observations involved (between two and four per cent of the total number of birds recorded) this is determined to be a very small and acceptable risk, and preferable to the alternative, i.e. not undertaking any apportioning of the non-ID birds .