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Volume 7B Proposed Development (Offshore) Appendices

Appendix 6-1 Offshore Ornithology Baseline Characterisation Report Annex 12 Spatial Distribution Figures (Caledonia OWF)

Caledonia Offshore Wind Farm Ltd

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Volume 7B Appendix 6-1 Annex 12 Spatial Distribution Figures (Caledonia OWF)

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Acronyms and Abbreviations

OWF

Offshore Wind Farm

1 Spatial Distribution Figures

1.1 Introduction

1.1.1.1 This annex presents spatial distribution maps, generated using design-based estimates, throughout the Caledonia Offshore Wind Farm (OWF) (including Caledonia North and Caledonia South) and relevant buffers (2km and 4km).

1.1.1.2 Spatial distribution maps have been generated for the following species:

- Kittiwake, *Rissa tridactyla*;
- Great black-backed gull, *Larus marinus*;
- Herring gull, *Larus argentatus*;
- Lesser black-backed gull, *Larus fuscus*;
- Guillemot, *Uria aalge*;
- Razorbill, *Alca torda*;
- Fulmar, *Fulmarus glacialis*;
- Gannet, *Morus bassanus*;
- Puffin, *Fratercula arctica*;
- Common tern, *Sterna hirundo*;
- Arctic tern, *Stercorarius parasiticus*;
- Great skua, *Stercorarius skua*; and
- Red-throated diver, *Gavia stellata*.

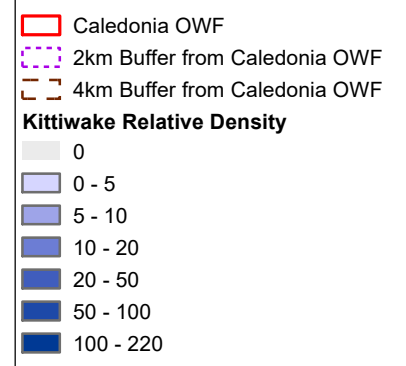
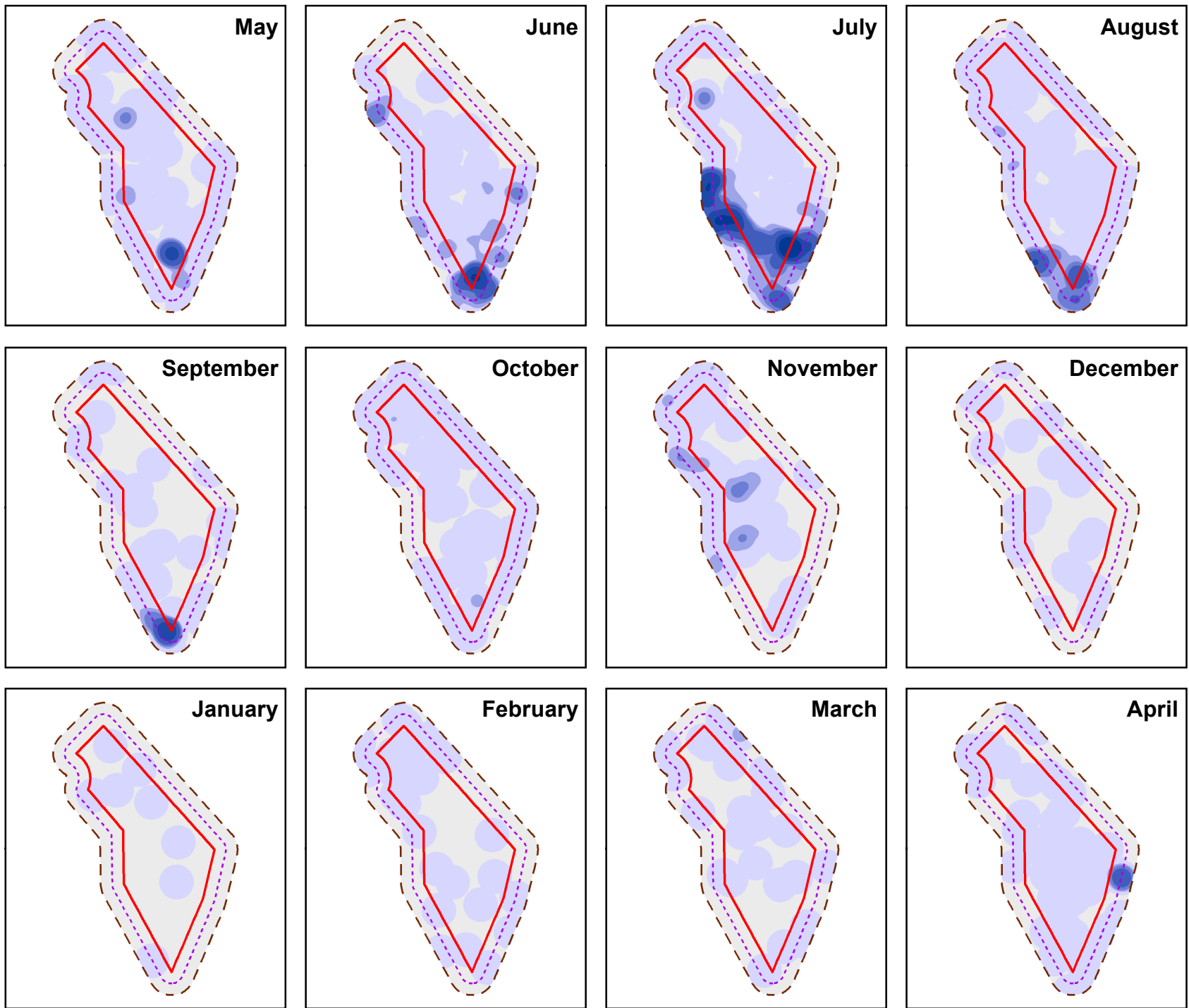
1.1.1.3 For the purposes of this report, the spatial distribution of seabirds within the Caledonia OWF (including Caledonia North and Caledonia South) are presented in the form of heatmaps. The heatmaps present data on a monthly basis in order to account for species-specific spatial and temporal distributions for the purposes of defining the Caledonia OWF ornithological baseline.

1.1.1.4 To create the heatmaps, point shapefiles were loaded into QGIS and the heatmap plugin for QGIS was installed. The shapefiles were then inputted to the heatmap plugin and a kernel radius of 3km was selected, which was determined to provide the most appropriate smoothing between the data points leaving no gaps in the model outputs. The output raster pixel size was set to 30m. All other default settings within the QGIS heatmap plugin were accepted. The heatmap plugin for each species was then run to generate GeoTIFF heatmaps.

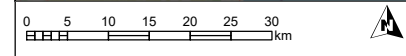
1.1.1.5 For further information see Volume 7B, Appendix 6-1: Offshore Ornithology Baseline Characterisation Report.

1.2 Kittiwake

1.2.1.1 Spatial distribution maps, generated using design-based estimates, for kittiwake throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-1 and Figure 1-2, respectively.



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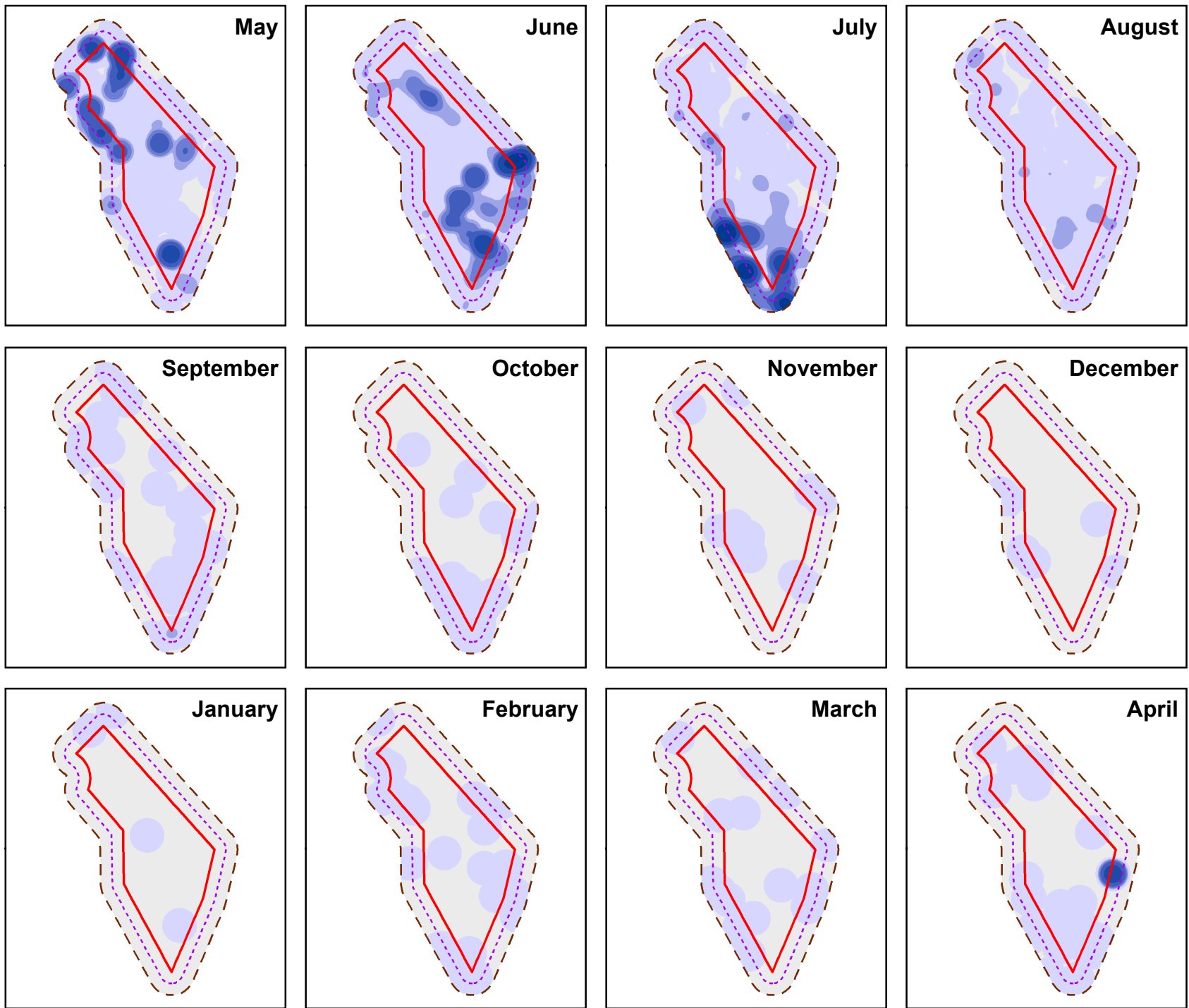
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DRAWING TITLE: Figure 1-1: Distribution of kittiwake between May 2021 and April 2022

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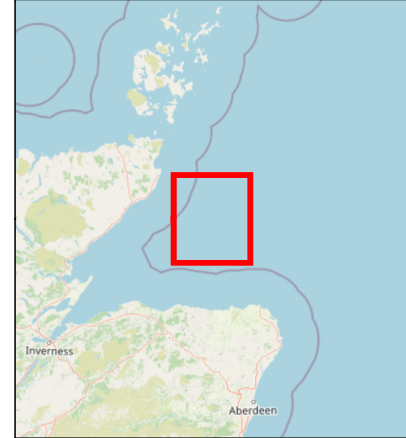
Legend

- Caledonia OWF
- 2km Buffer from Caledonia OWF
- 4km Buffer from Caledonia OWF

Kittiwake Relative Density

- 0
- 0 - 5
- 5 - 10
- 10 - 20
- 20 - 50
- 50 - 100

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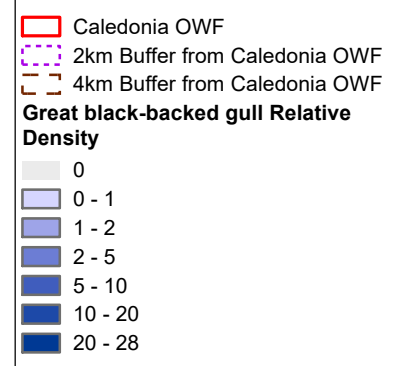
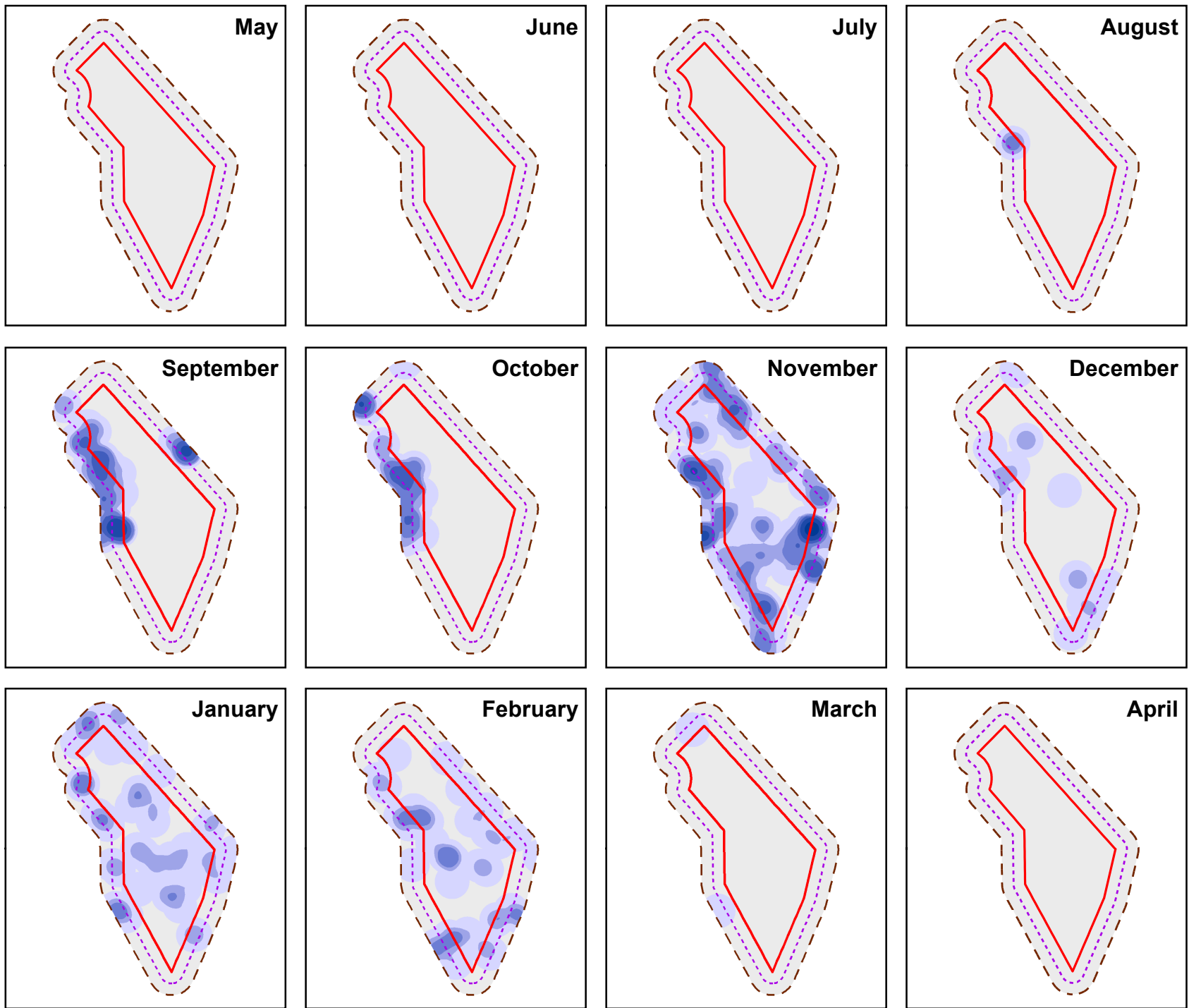
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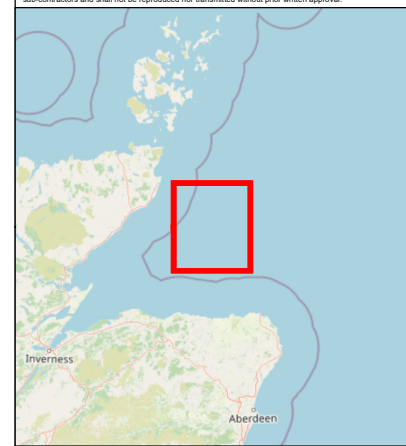
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1.3 Great Black-backed Gull

- 1.3.1.1 Spatial distribution maps, generated using design-based estimates, for great black-backed gull throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-3 and Figure 1-4, respectively.



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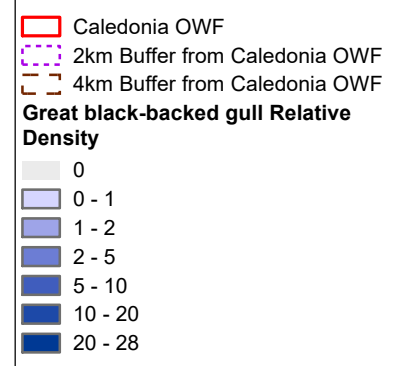
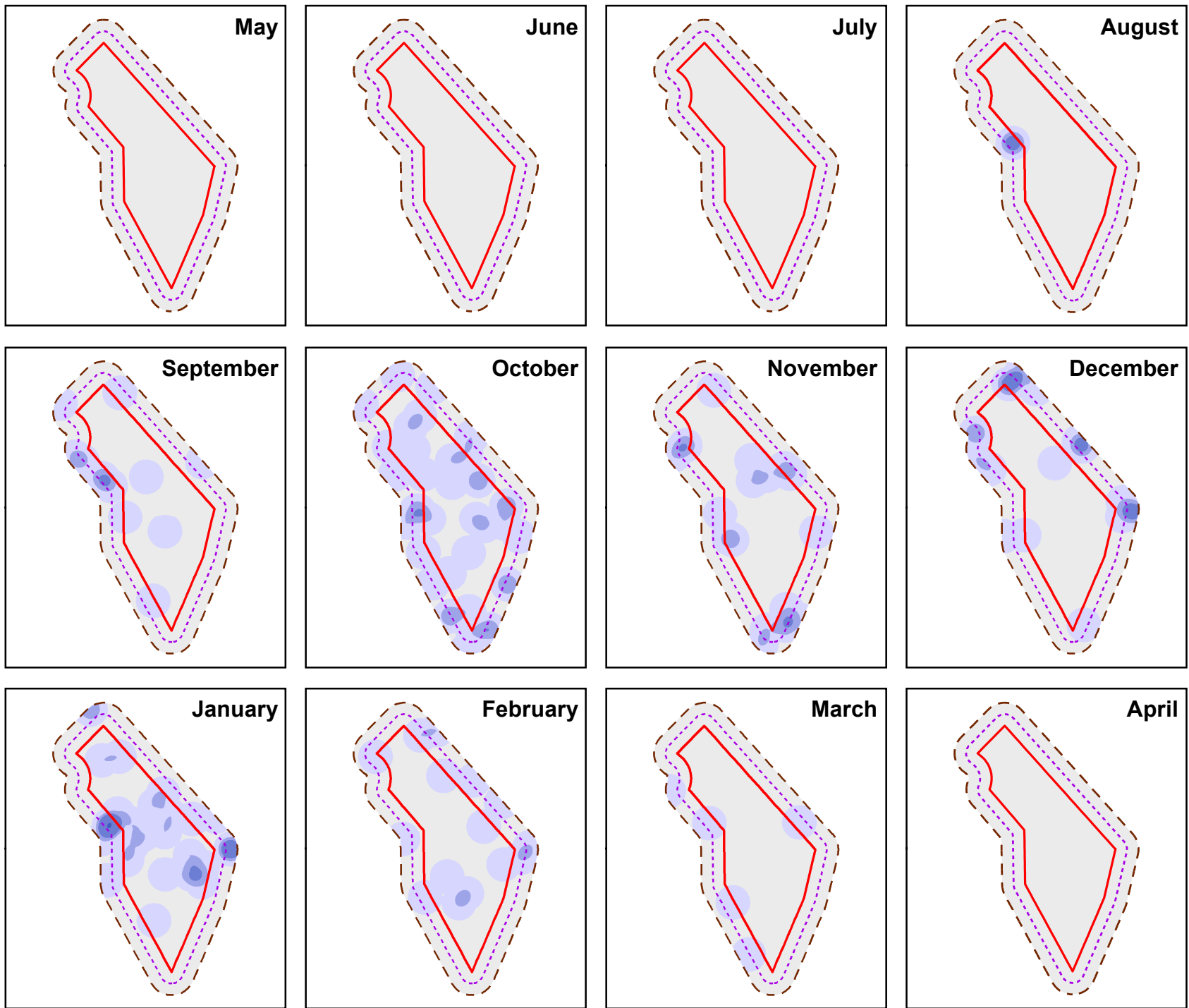
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Figure 1-3: Distribution of great black-backed gull between May 2021 and April 2022

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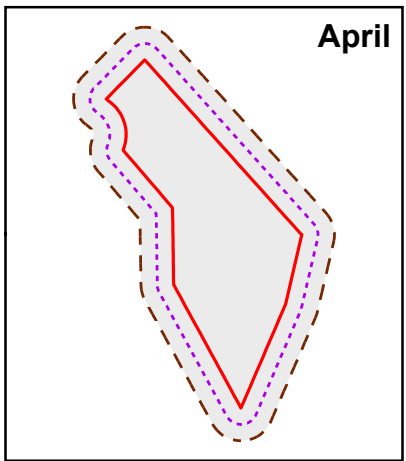
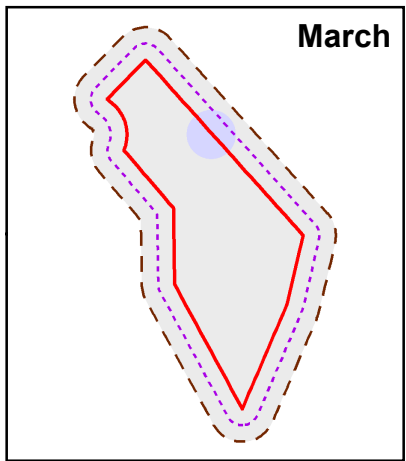
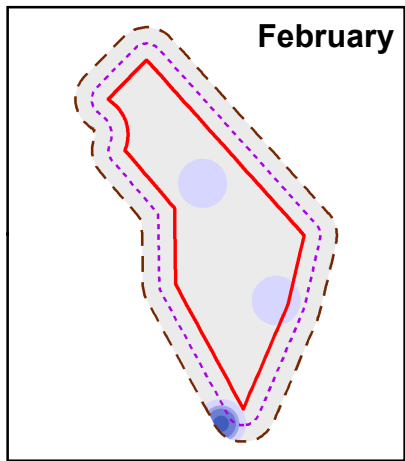
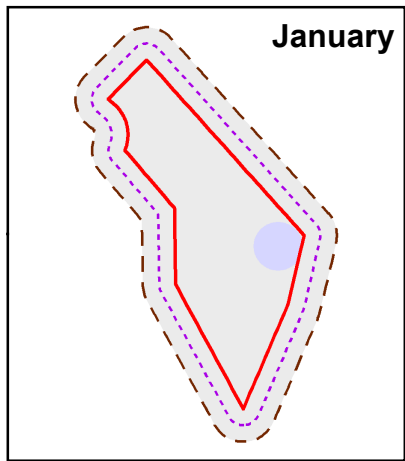
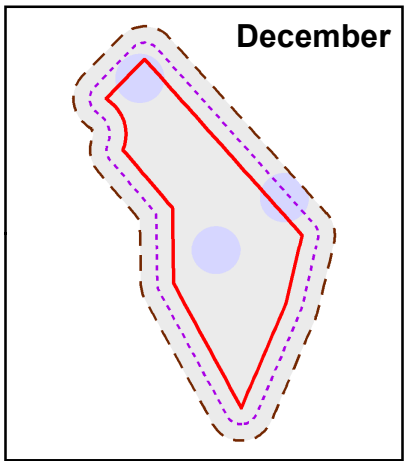
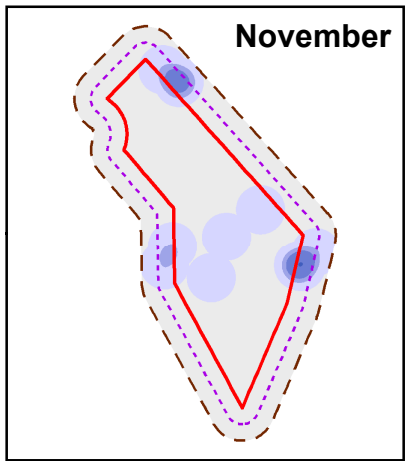
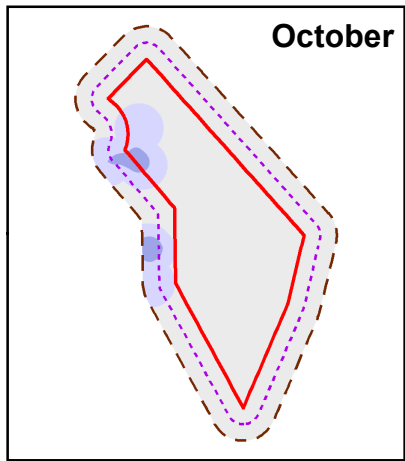
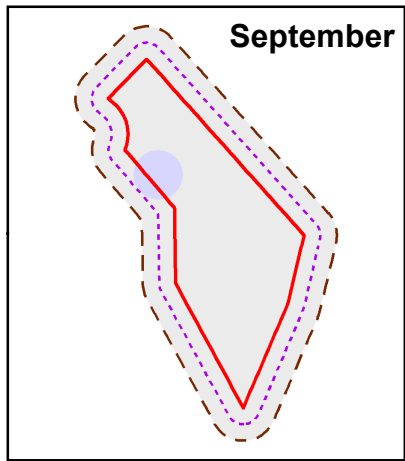
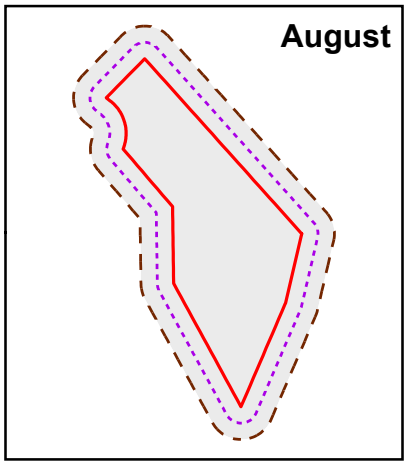
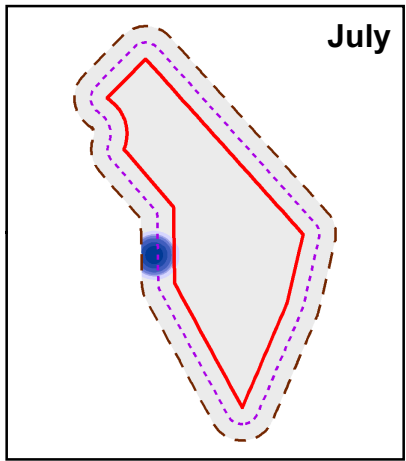
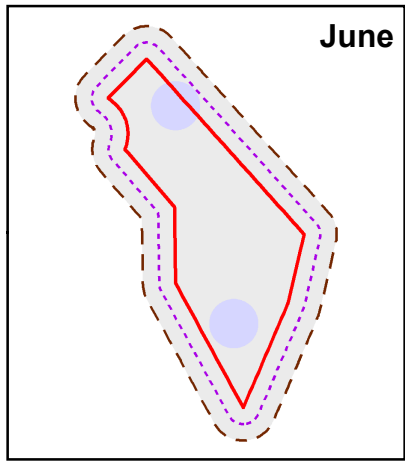
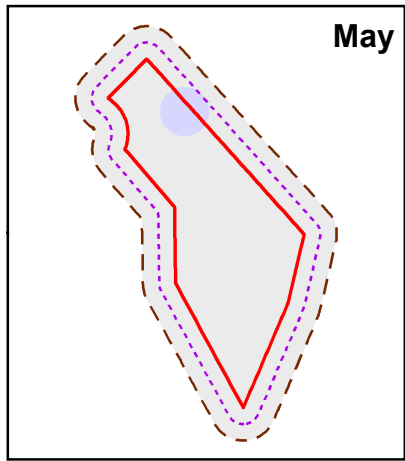
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Figure 1-4: Distribution of great black-backed gull between May 2022 and April 2023

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1.4 Herring Gull

- 1.4.1.1 Spatial distribution maps, generated using design-based estimates, for herring gull throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-5 and Figure 1-6, respectively.



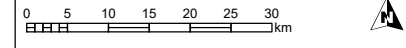
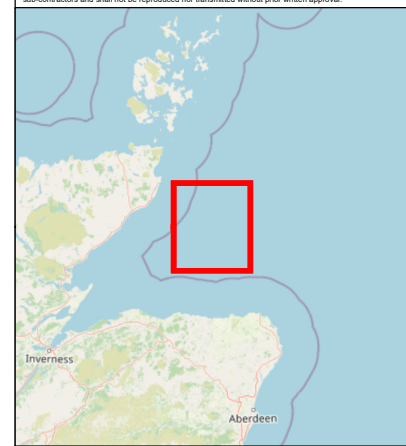
Legend

- Caledonia OWF
- 2km Buffer from Caledonia OWF
- 4km Buffer from Caledonia OWF

Herring gull Relative Density

- 0
- 0 - 1
- 1 - 2
- 2 - 4
- 4 - 8
- 8 - 12
- 12 - 16

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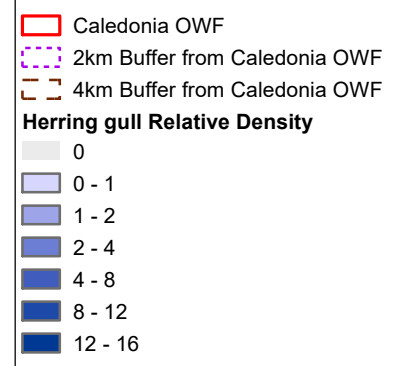
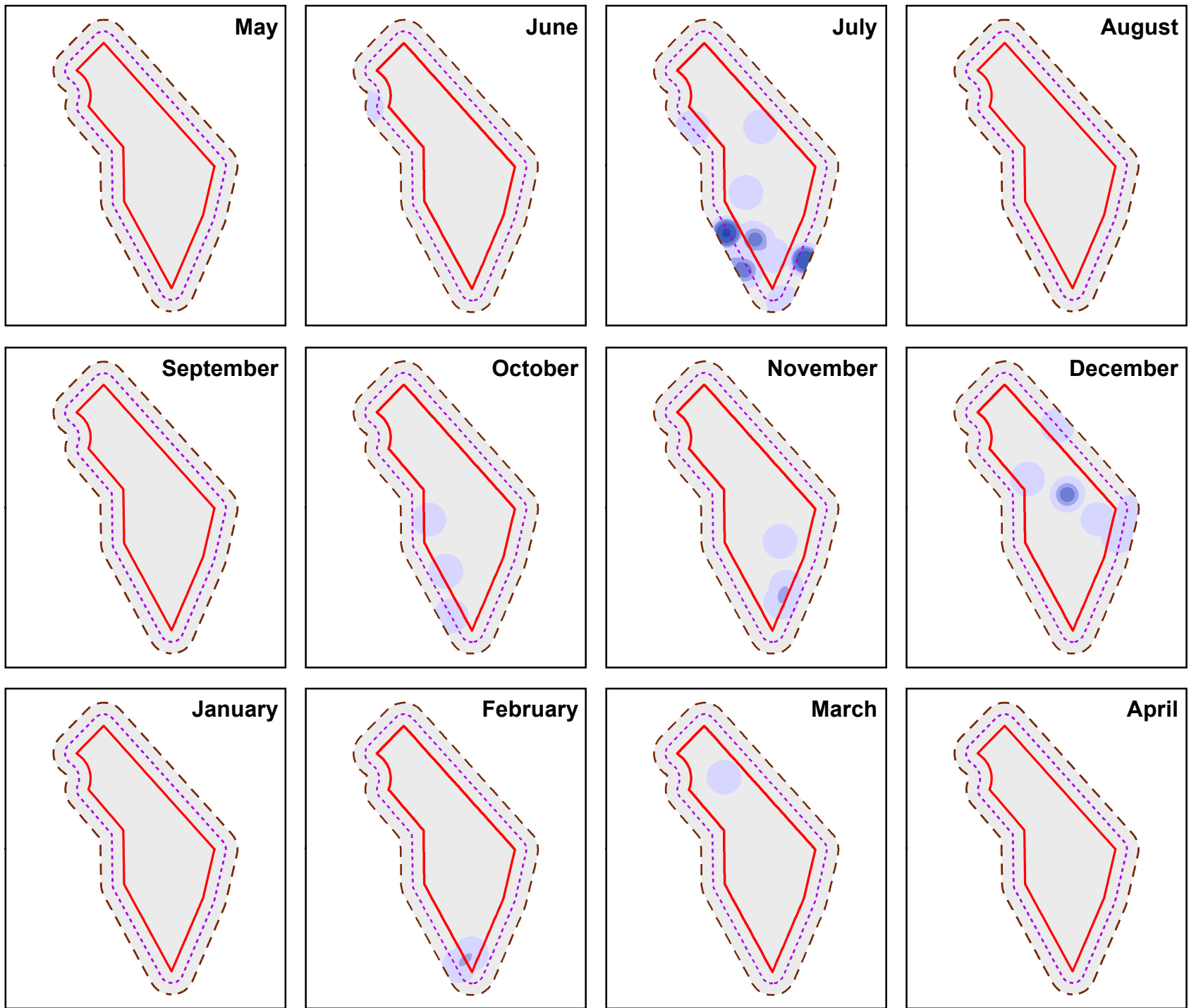
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Figure 1-5: Distribution of herring gull between May 2021 and April 2022

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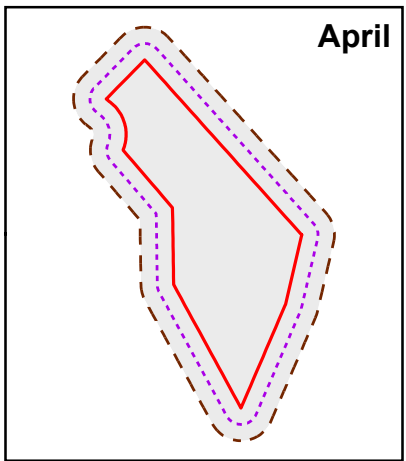
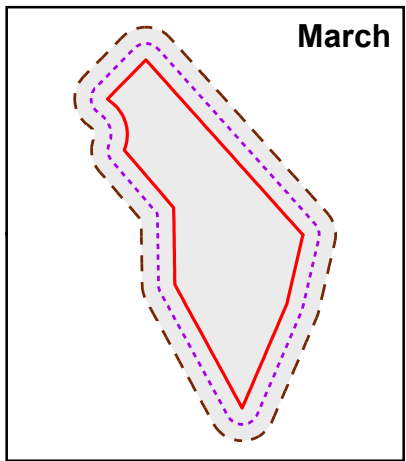
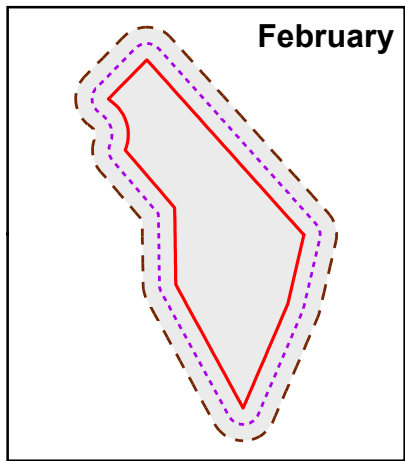
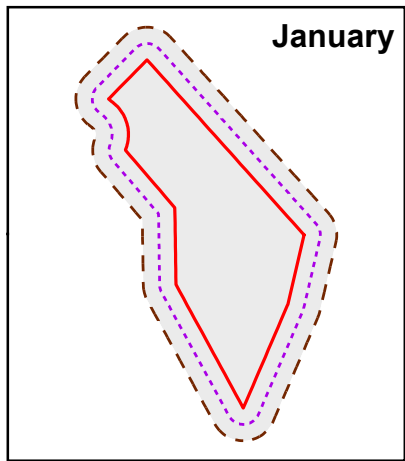
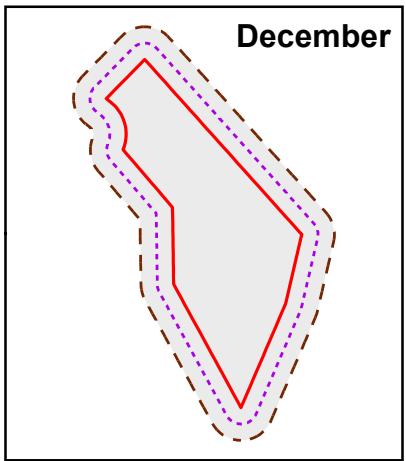
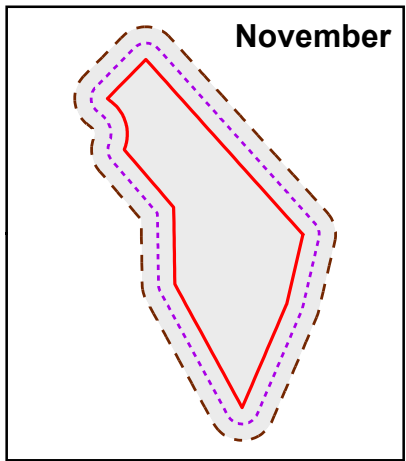
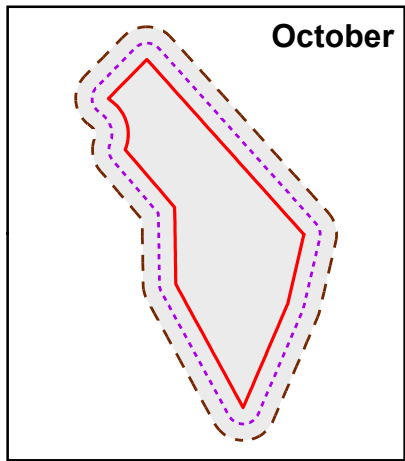
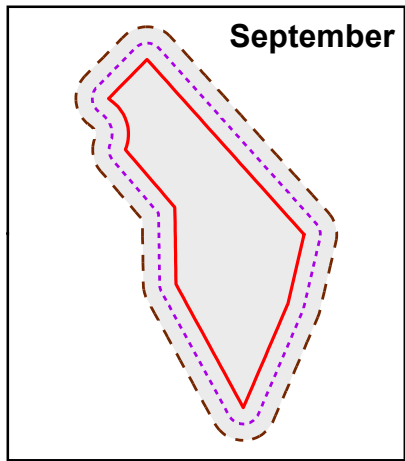
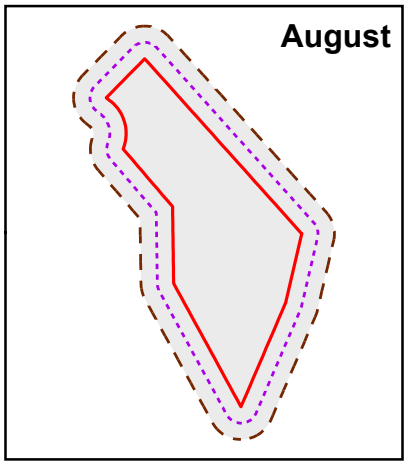
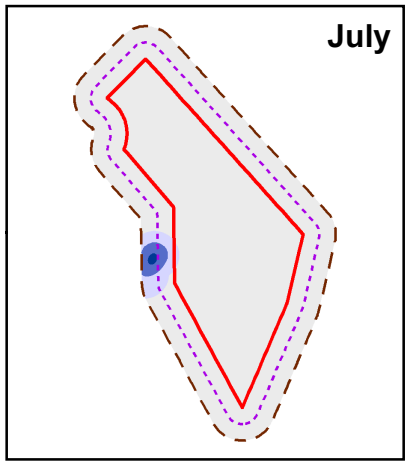
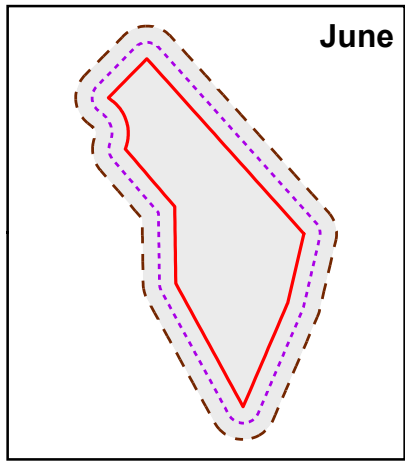
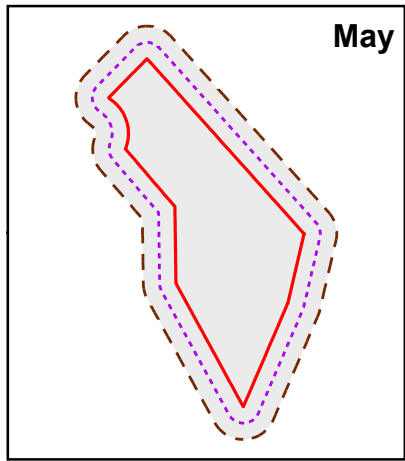
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Figure 1-6: Distribution of herring gull between May 2022 and April 2023

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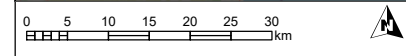
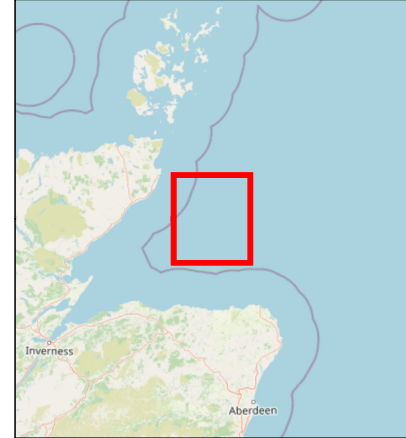
1.5 Lesser Black-backed Gull

- 1.5.1.1 Spatial distribution maps, generated using design-based estimates, for lesser black-backed gull throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-7 and Figure 1-8, respectively.



Caledonia OWF
 2km Buffer from Caledonia OWF
 4km Buffer from Caledonia OWF
Lesser black-backed gull Relative Density
 0
 0 - 1
 1 - 2
 2 - 3

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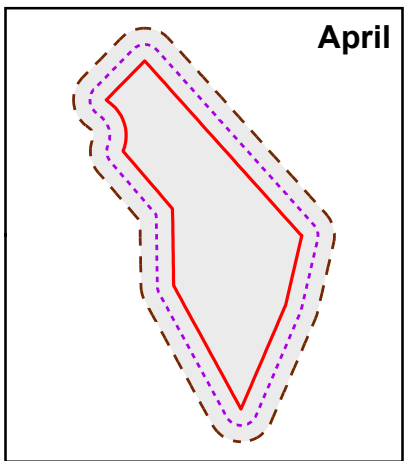
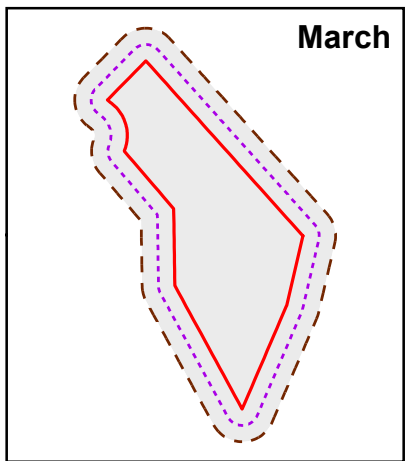
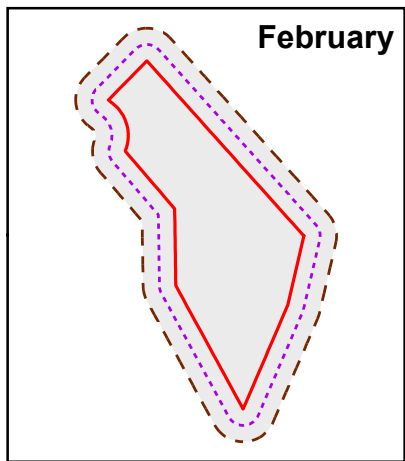
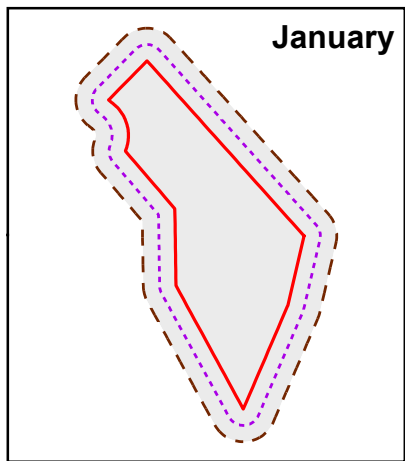
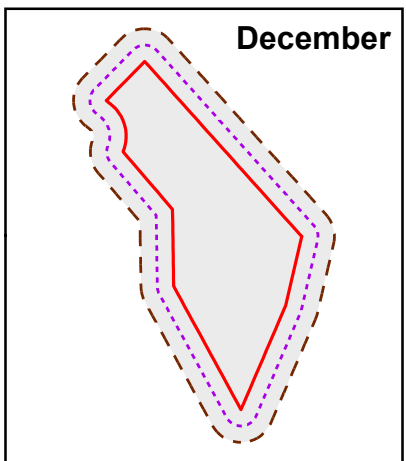
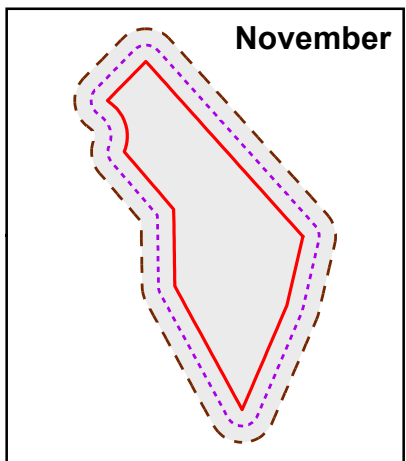
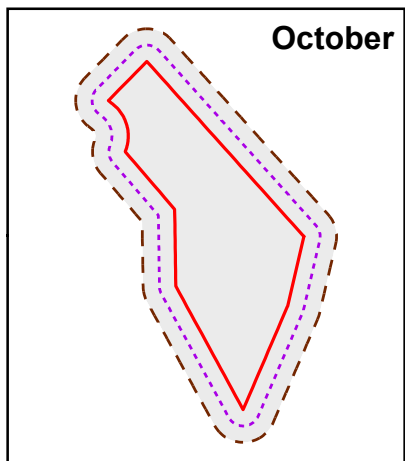
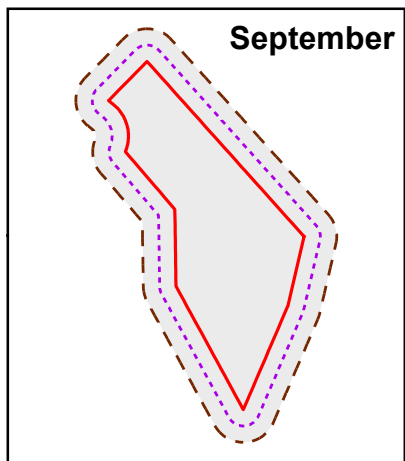
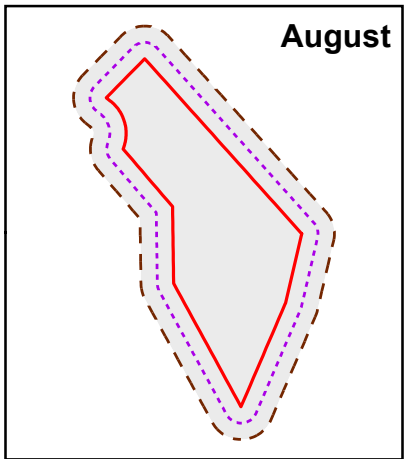
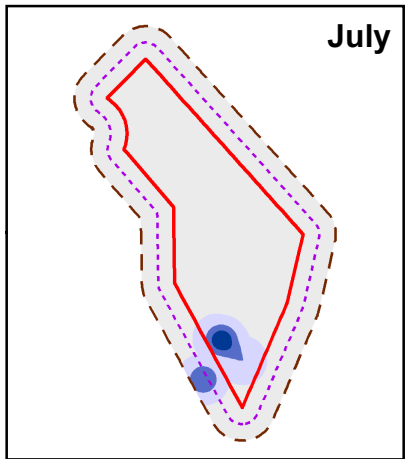
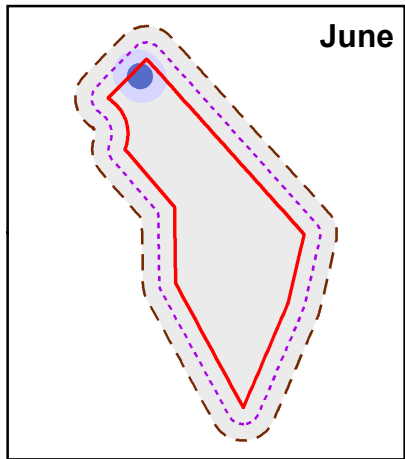
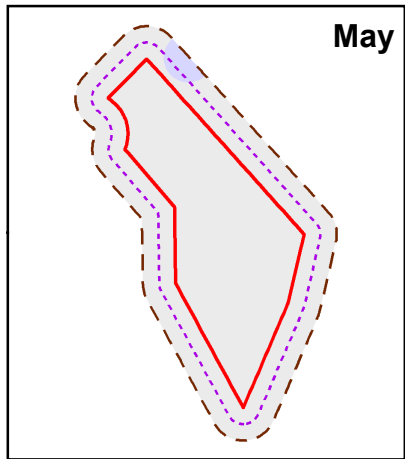


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 GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)
 DRAWING TITLE:

Figure 1-7: Distribution of lesser black-backed gull between May 2021 and April 2022

STATUS: Approved	SCALE: 1:925,000
DRAWING NUMBER: N/A	SHEET NO: 01 of 01
	REV: N/A



Caledonia OWF
 2km Buffer from Caledonia OWF
 4km Buffer from Caledonia OWF
Lesser black-backed gull Relative Density
 0
 0 - 1
 1 - 2
 2 - 3

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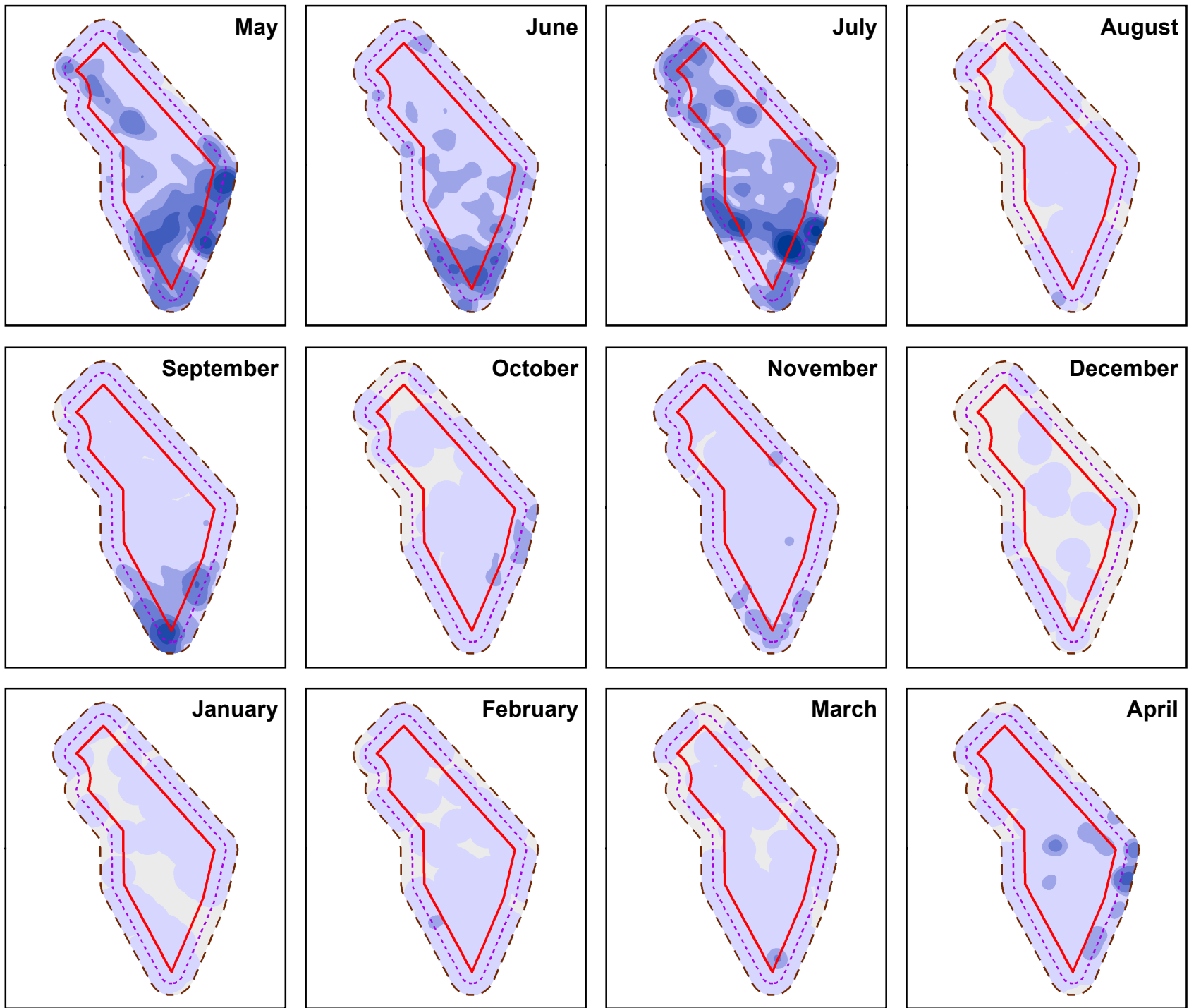
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 GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)
 DRAWING TITLE:

Figure 1-8: Distribution of lesser black-backed gull between May 2022 and April 2023

STATUS: Approved	SCALE: 1:925,000
DRAWING NUMBER: N/A	SHEET NO: 01 of 01
	REV: N/A

1.6 Guillemot

- 1.6.1.1 Spatial distribution maps, generated using design-based estimates, for guillemot throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-9 and Figure 1-10, respectively.



Caledonia OWF
 2km Buffer from Caledonia OWF
 4km Buffer from Caledonia OWF

Guillemot Relative Density

- 0
- 0 - 10
- 10 - 20
- 20 - 50
- 50 - 100
- 100 - 250

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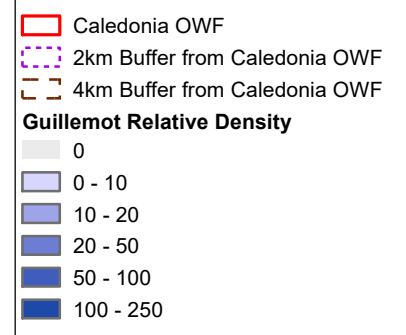
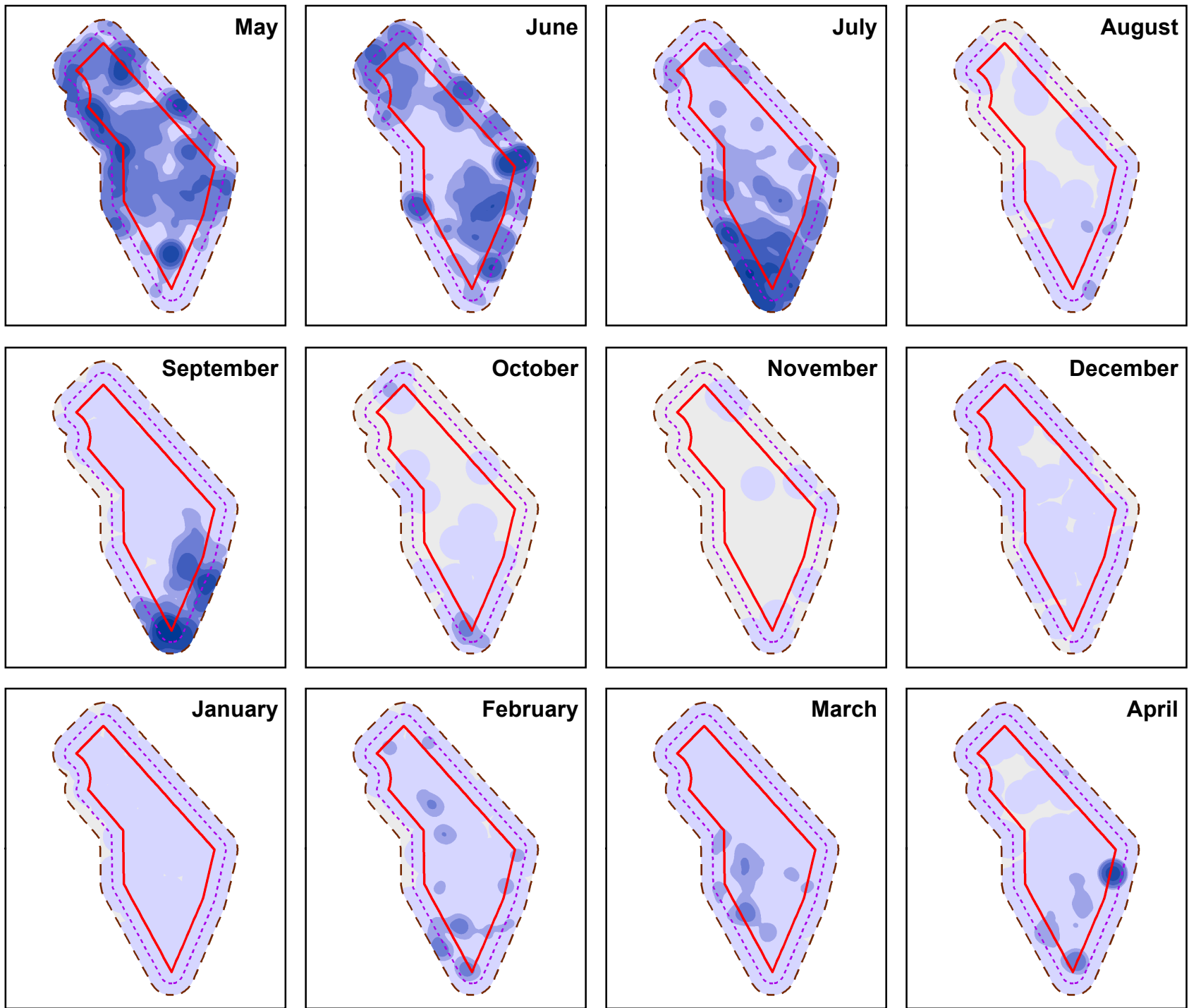
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REV	DATE	DOC STATUS	ORGIN	REVIEW	APP



CONTRACTOR DRAWING NO: UKCAL1_GO_WNF_ORN_MAP_0035f
 CONTRACTOR REV: 01
 GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)

Figure 1-9: Distribution of guillemot between May 2021 and April 2022

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	REV: N/A



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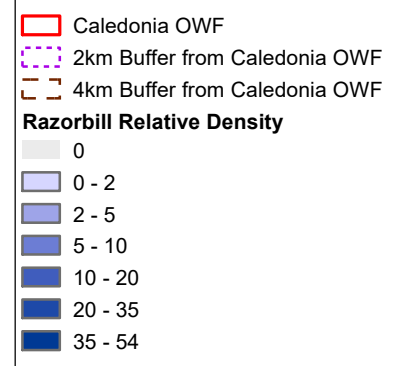
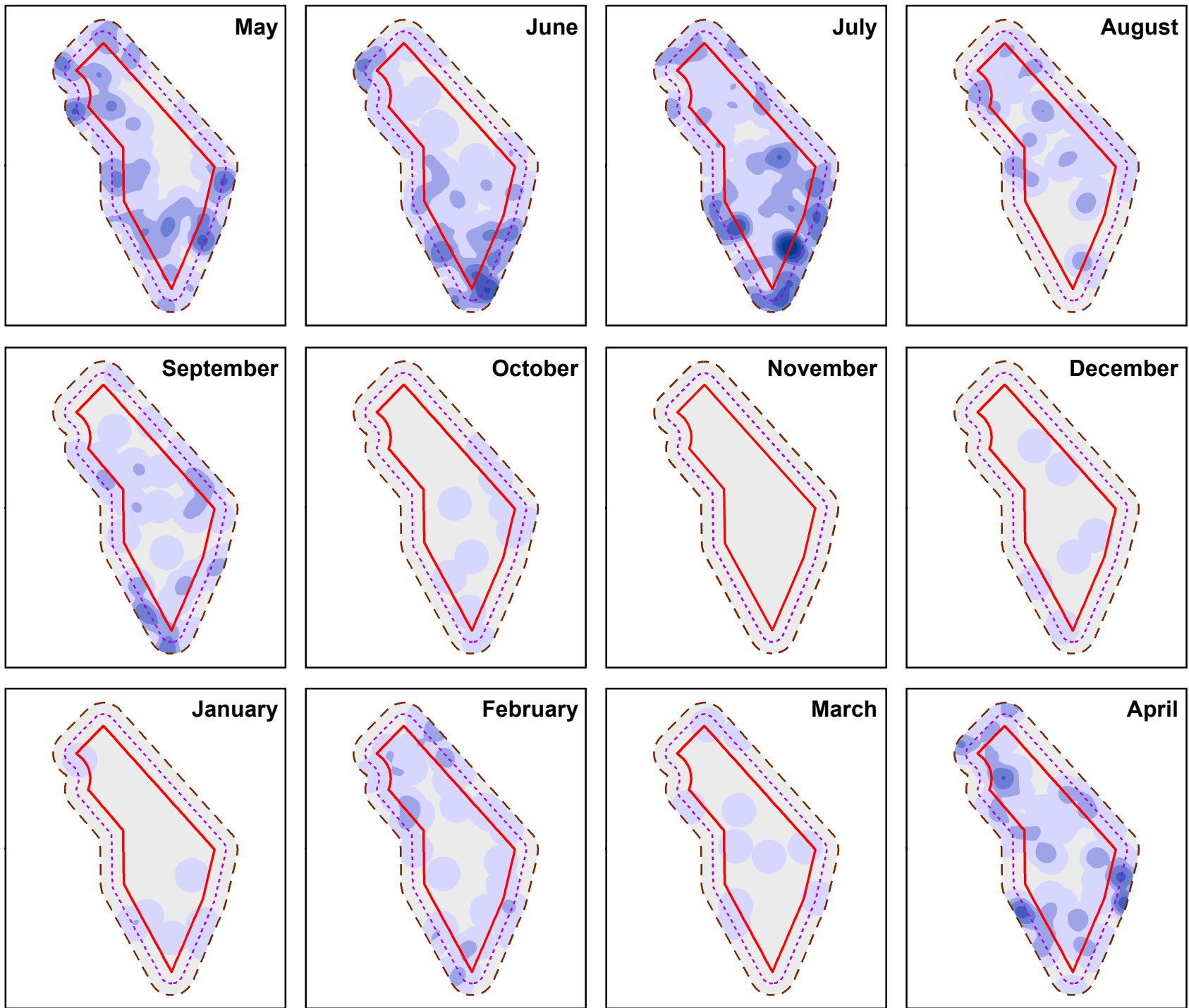
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 CONTRACTOR REV: 01
 GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE: Figure 1-10: Distribution of guillemot between May 2022 and April 2023

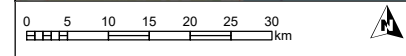
STATUS: Approved	SCALE: 1:925,000
DRAWING NUMBER: N/A	SHEET NO: 01 of 01
	REV: N/A

1.7 **Razorbill**

1.7.1.1 Spatial distribution maps, generated using design-based estimates, for razorbill throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-11 and Figure 1-12, respectively.



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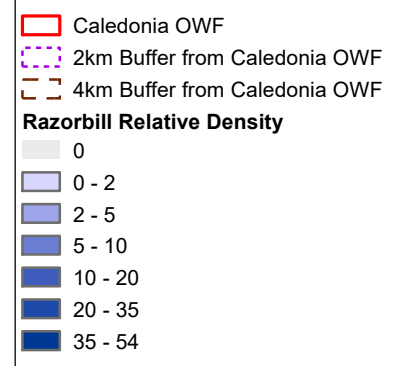
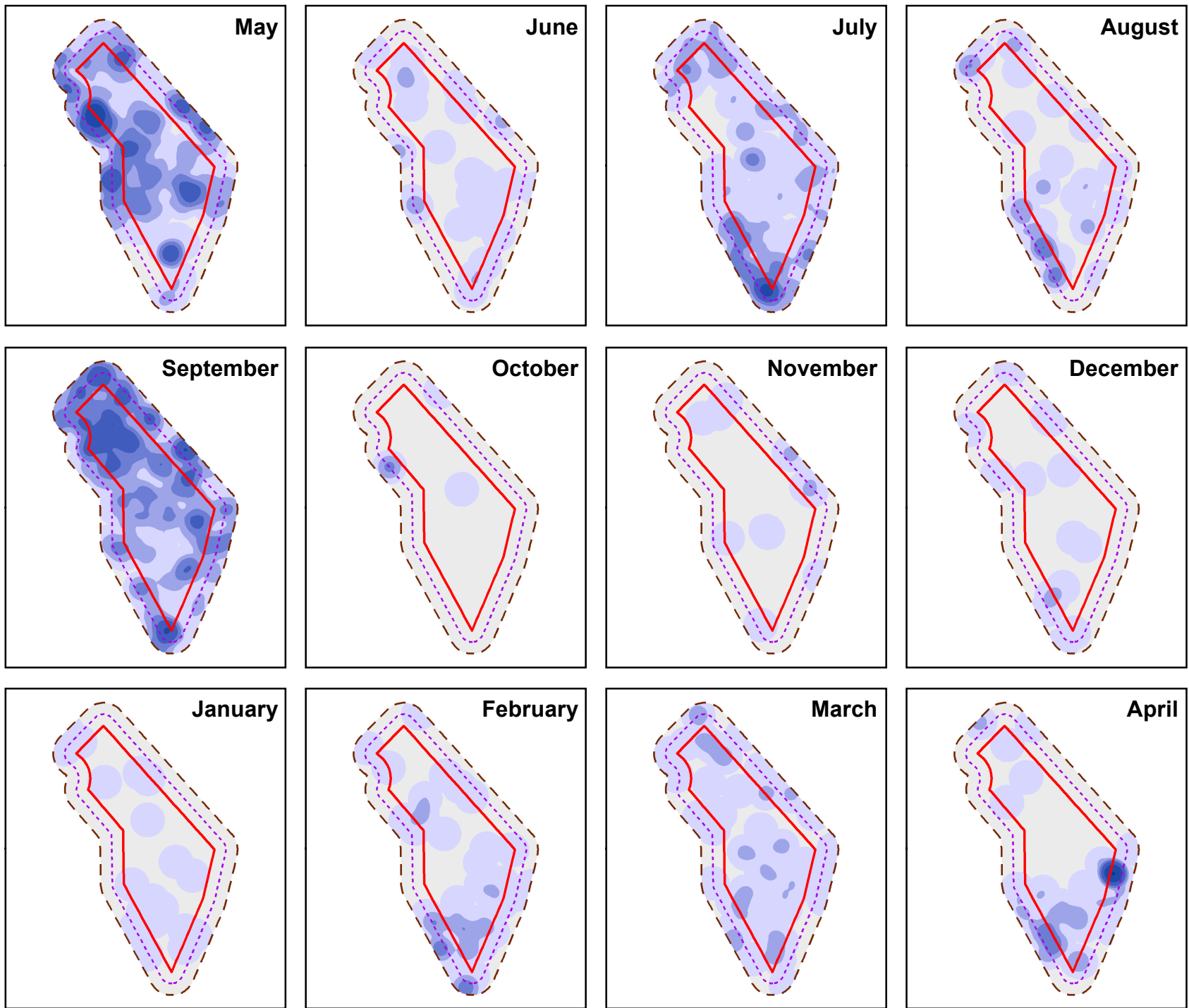
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REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP



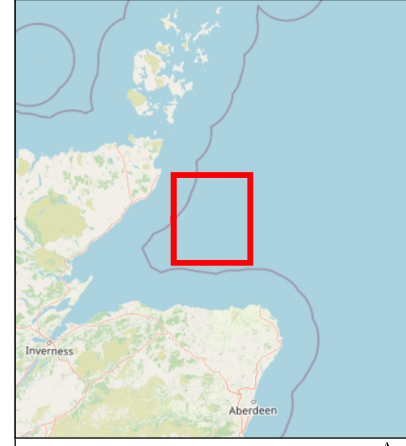
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 CONTRACTOR REV: 01
 GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE: Figure 1-11: Distribution of razorbill between May 2021 and April 2022

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	REV: N/A



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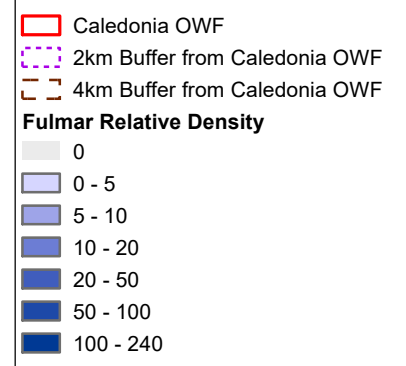
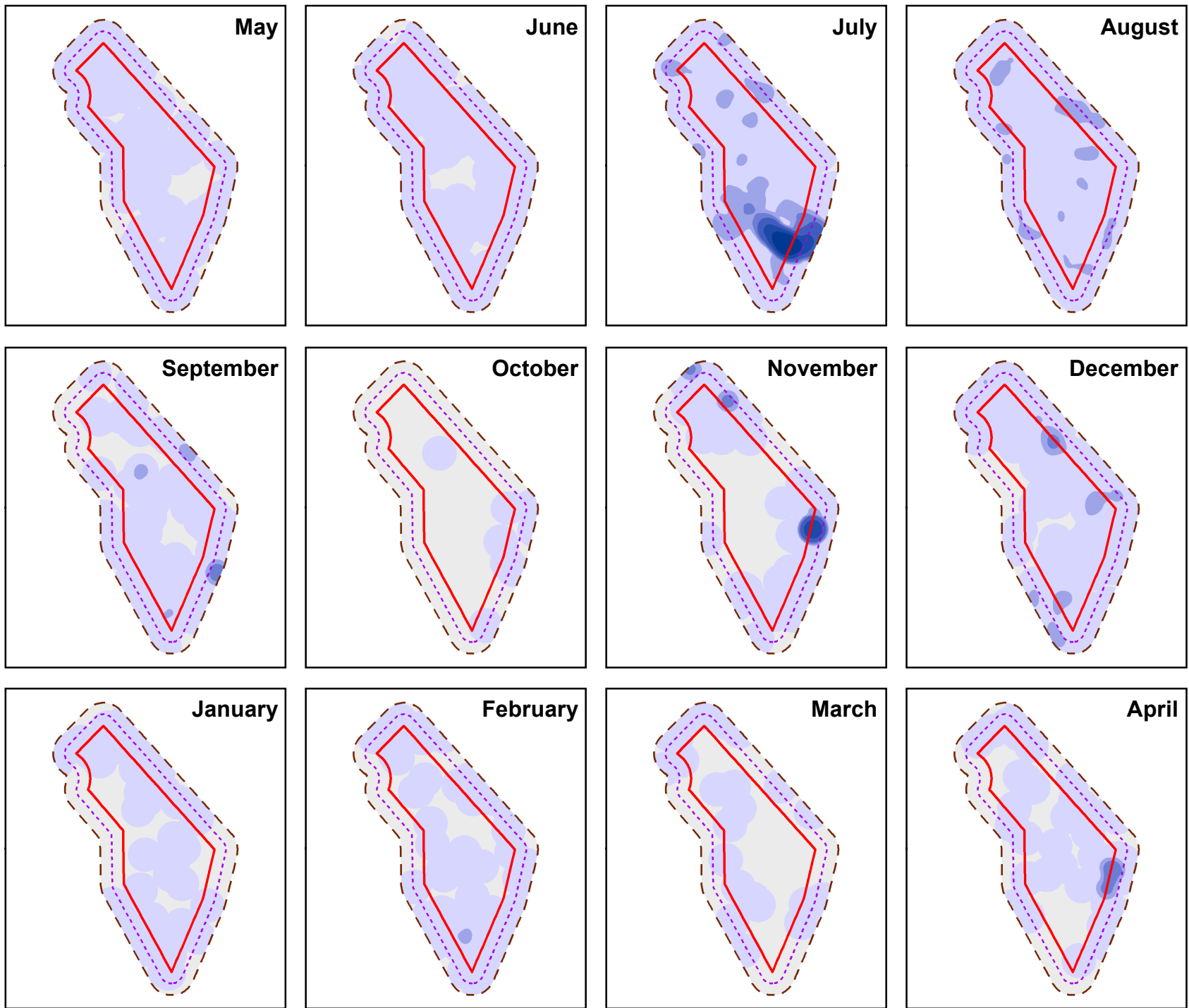
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 CONTRACTOR REV: 01
 GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE
 Figure 1-12: Distribution of razorbill between May 2022 and April 2023

STATUS: Approved	SCALE: 1:925,000
DRAWING NUMBER: N/A	SHEET NO: 01 of 01
	REV: N/A

1.8 Fulmar

- 1.8.1.1 Spatial distribution maps, generated using design-based estimates, for fulmar throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-13 and Figure 1-14, respectively.



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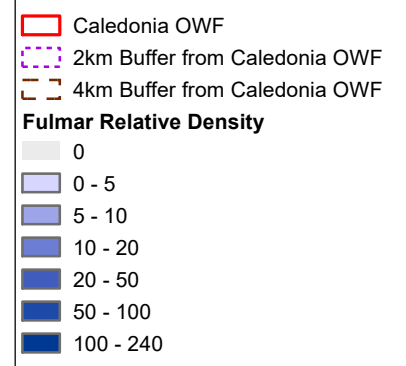
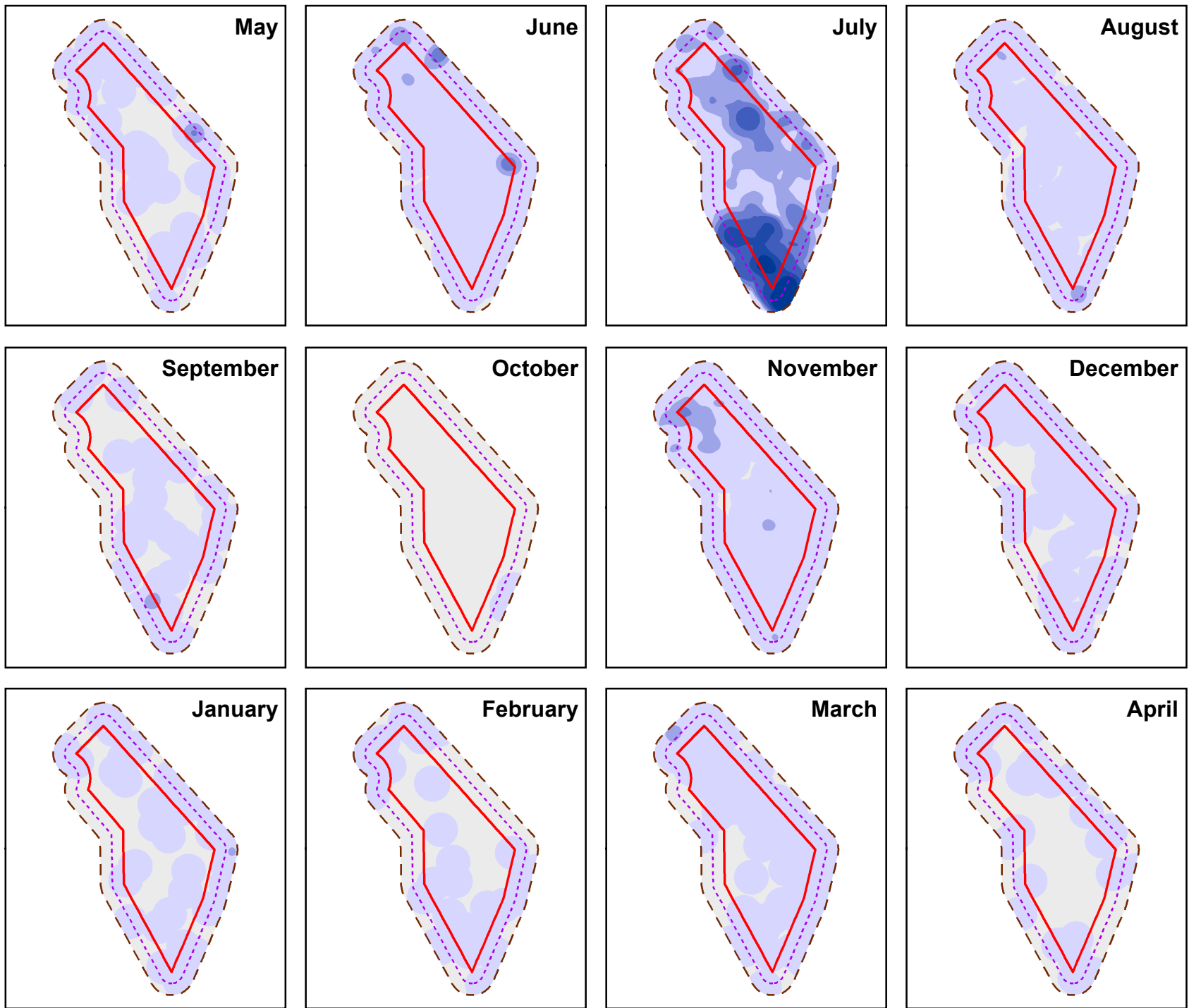
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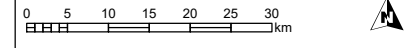
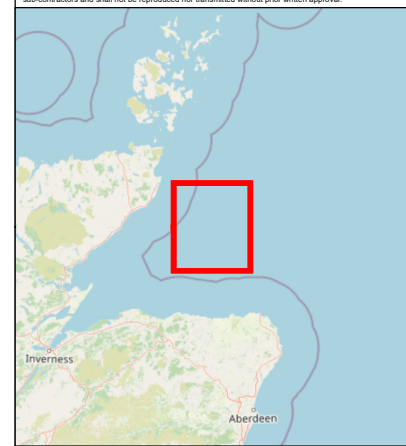
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 GEOREFERENCE PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE
 Figure 1-13: Distribution of fulmar between May 2021 and April 2022

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CONTRACTOR DRAWING NO: UKCAL1_GO_WNF_ORN_MAP_00371 | CONTRACTOR REV: 01
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 DRAWING TITLE:

Figure 1-14: Distribution of fulmar between May 2022 and April 2023

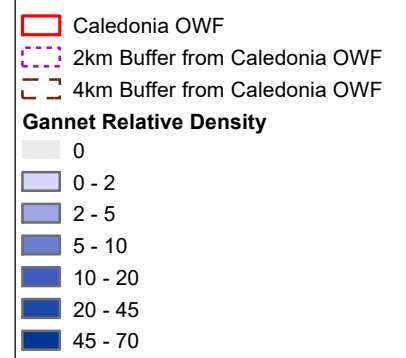
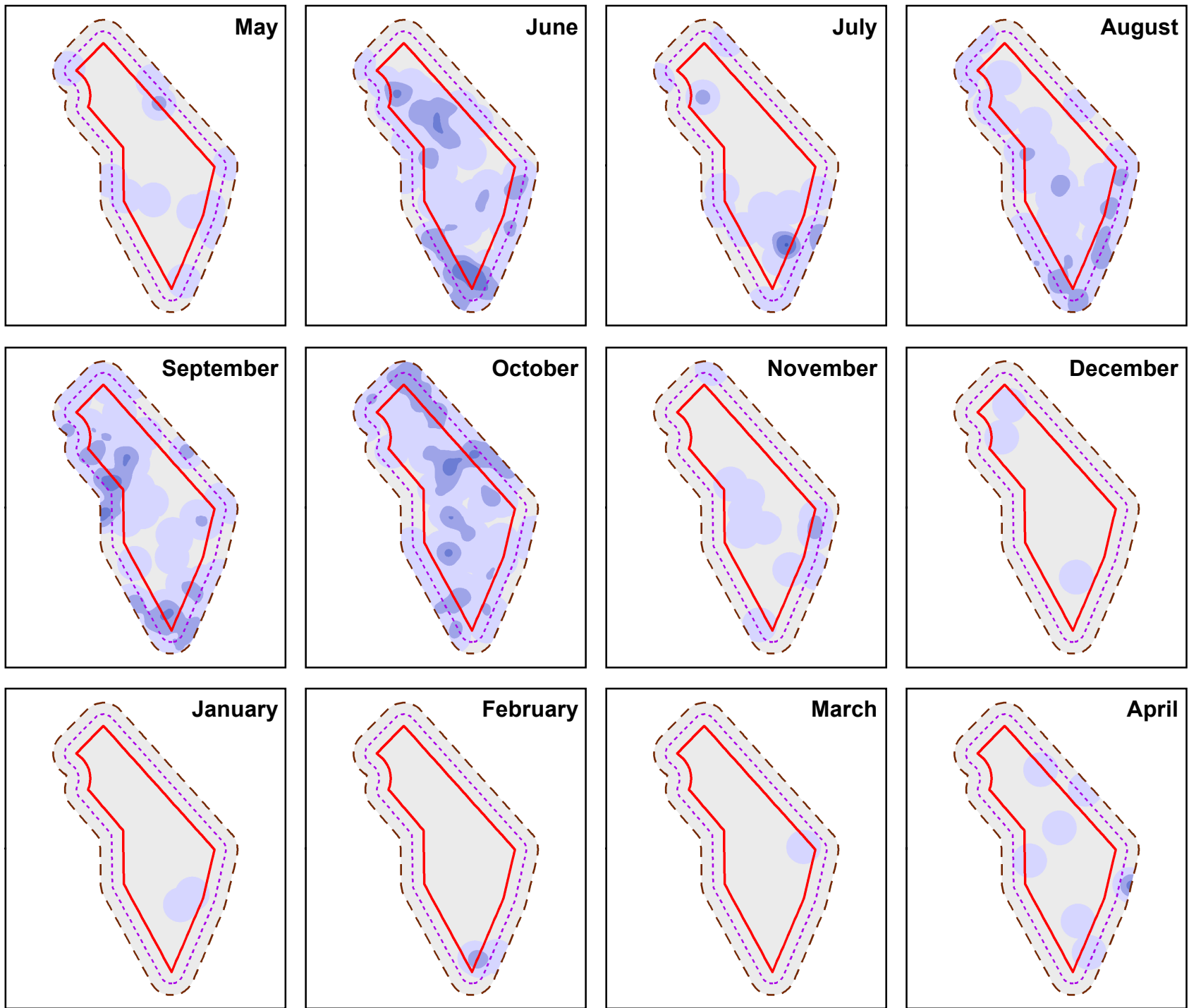
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1.9

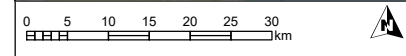
Gannet

1.9.1.1

Spatial distribution maps, generated using design-based estimates, for gannet throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-15 and Figure 1-16, respectively.



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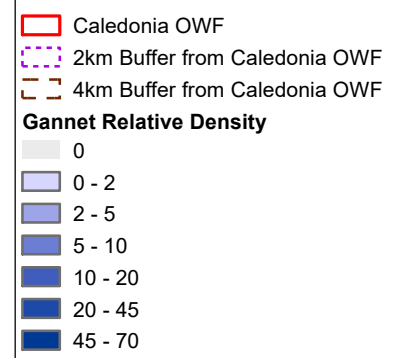
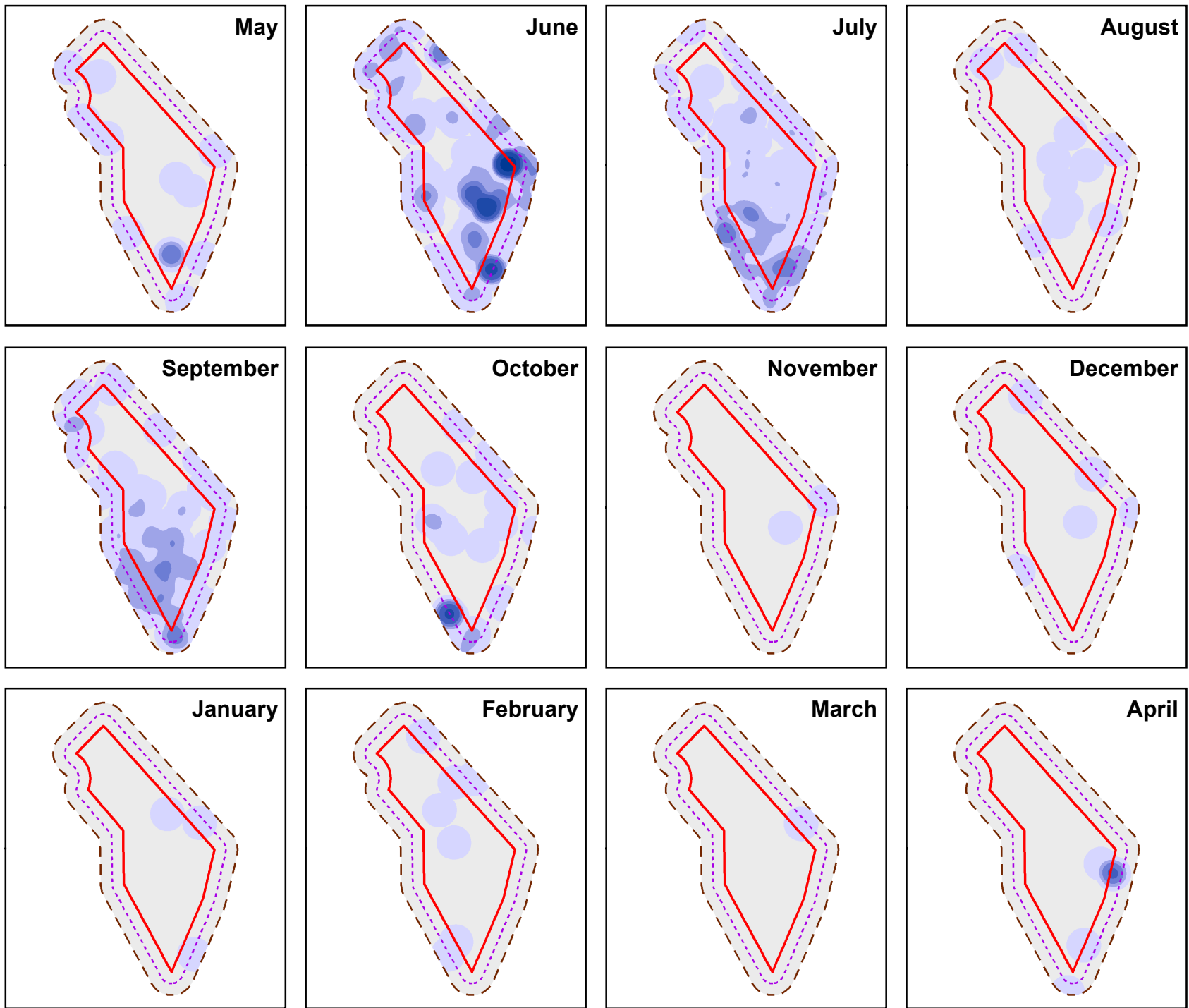
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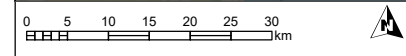
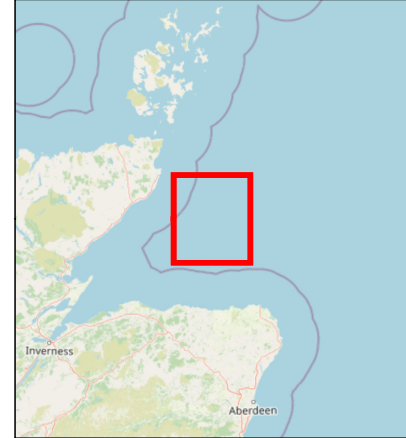
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 GEOREFERENCE PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE: Figure 1-15: Distribution of gannet between May 2021 and April 2022

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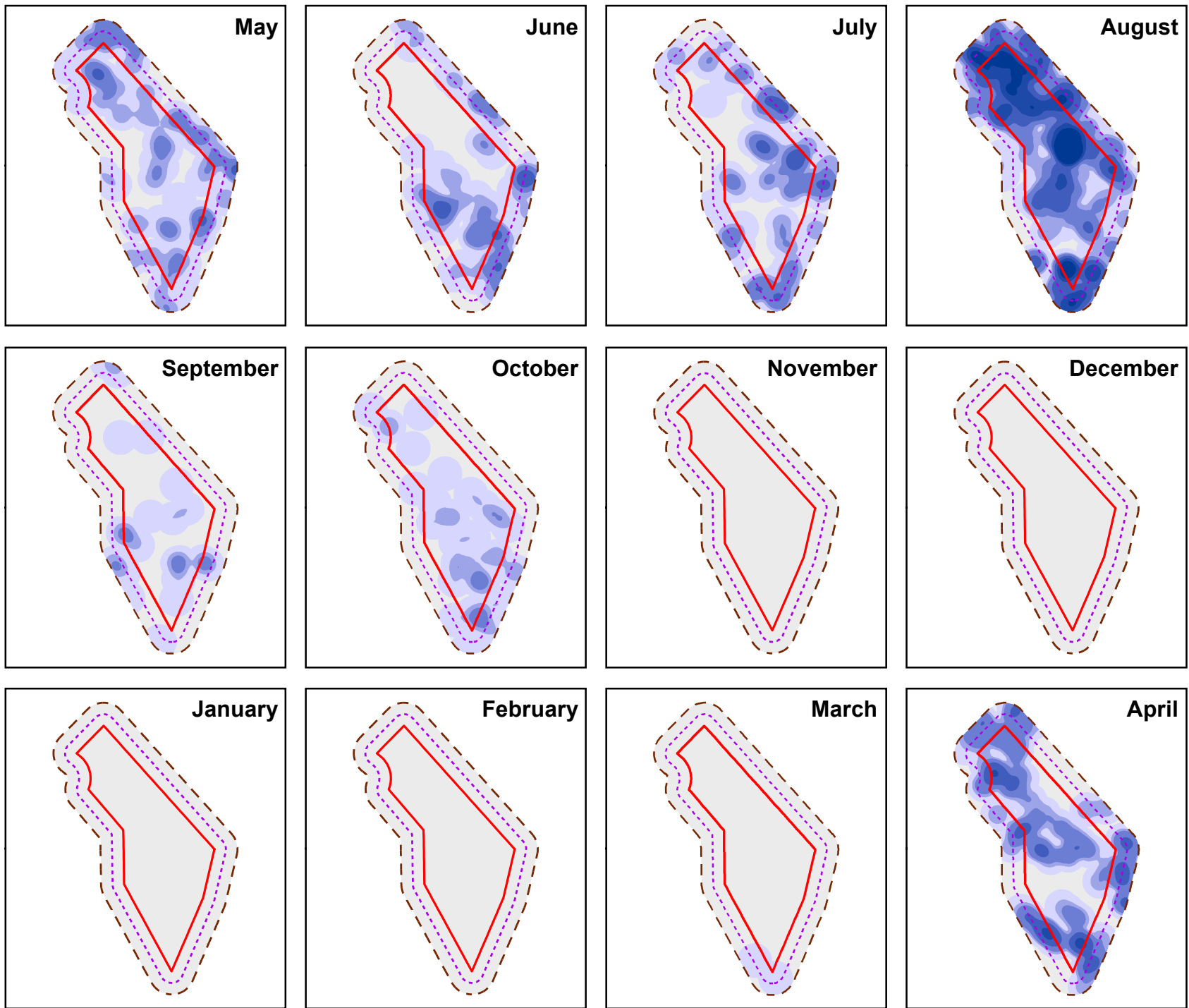
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DRAWING TITLE: Figure 1-16: Distribution of gannet between May 2022 and April 2023

STATUS: Approved	SCALE: 1:925,000
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	REV: N/A

1.10 Puffin

- 1.10.1.1 Spatial distribution maps, generated using design-based estimates, for puffin throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-17 and Figure 1-18, respectively.

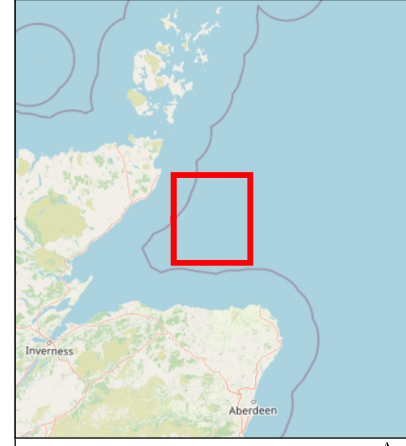


Caledonia OWF
 2km Buffer from Caledonia OWF
 4km Buffer from Caledonia OWF

Puffin Relative Density

- 0
- 0 - 1
- 1 - 2
- 2 - 5
- 5 - 10
- 10 - 15
- 15 - 20

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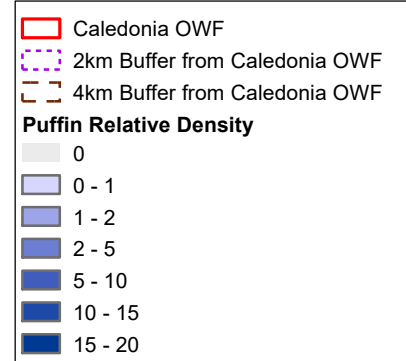
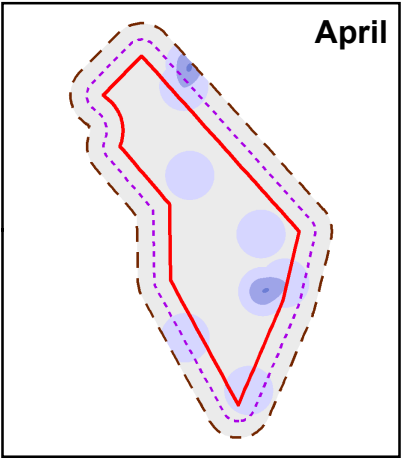
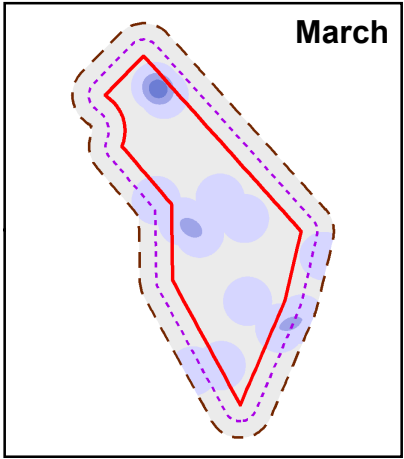
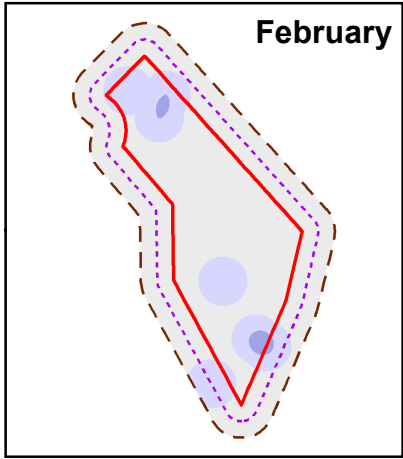
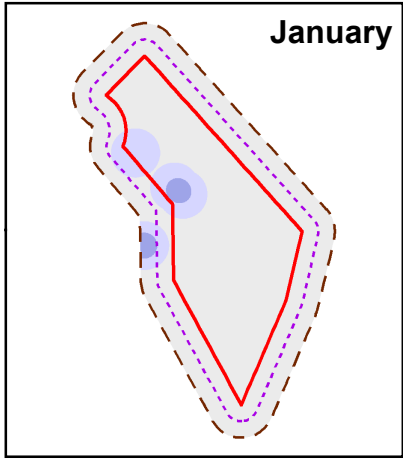
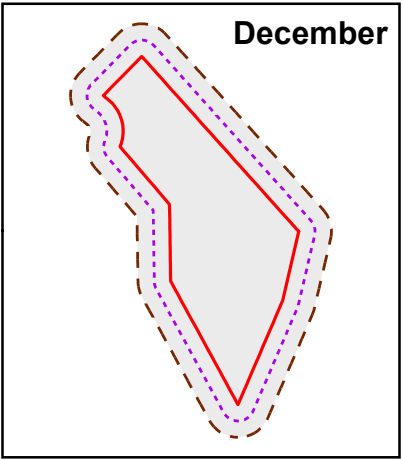
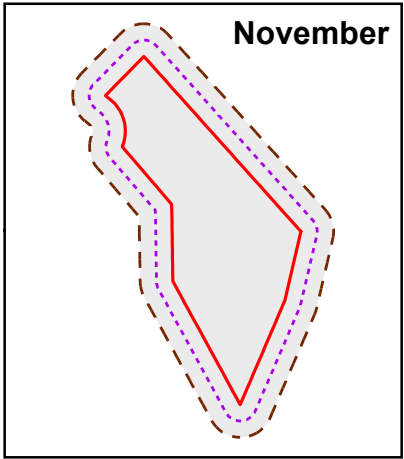
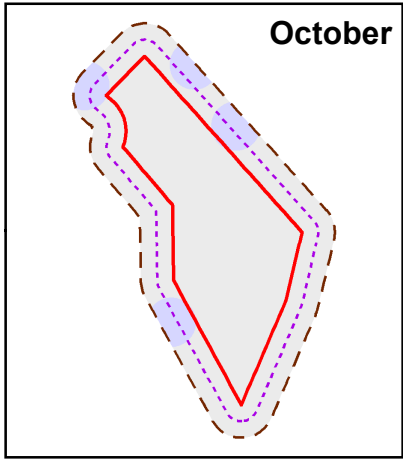
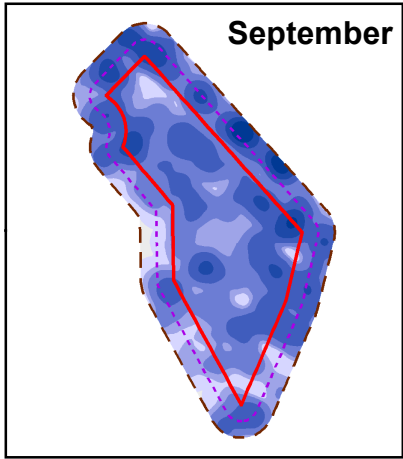
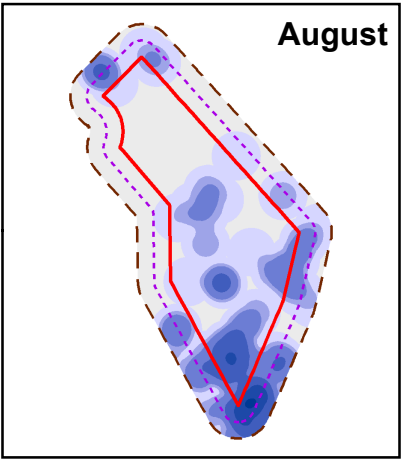
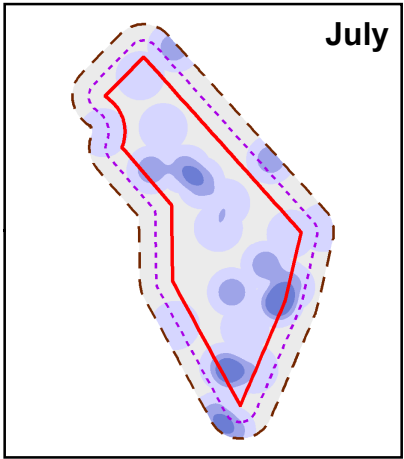
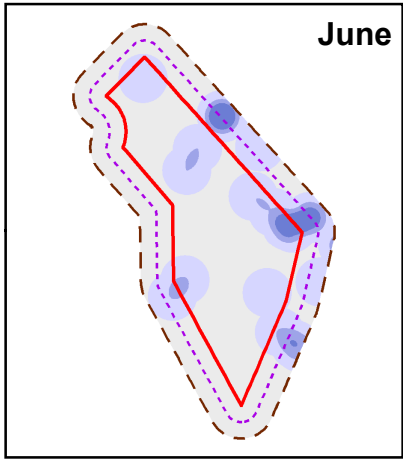
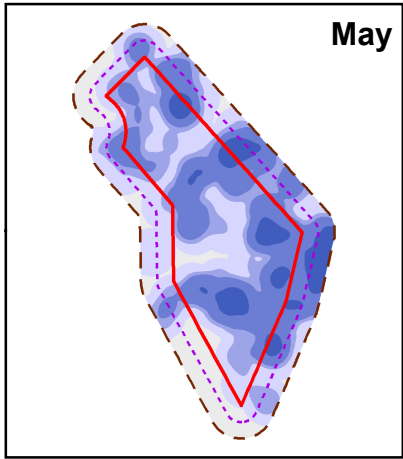


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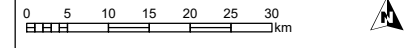
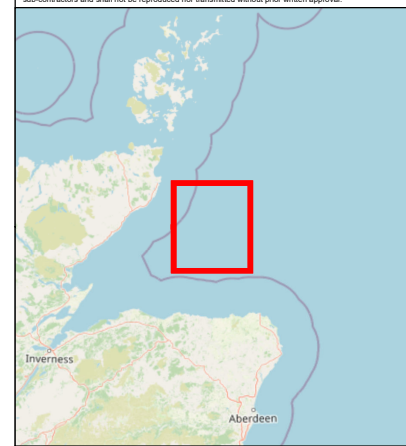
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Figure 1-17: Distribution of puffin between May 2021 and April 2022

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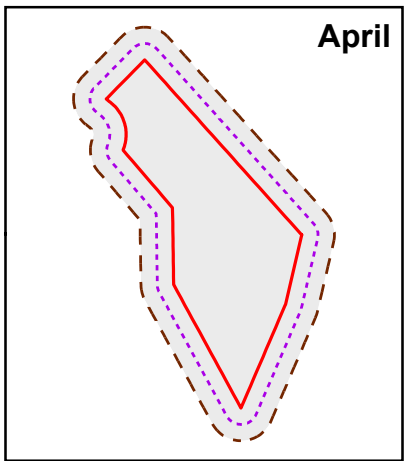
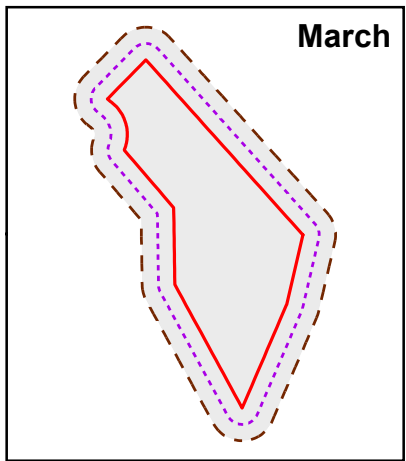
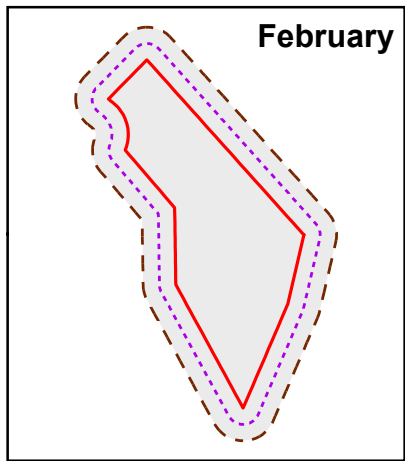
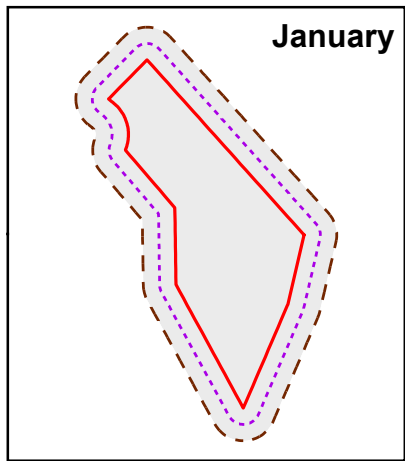
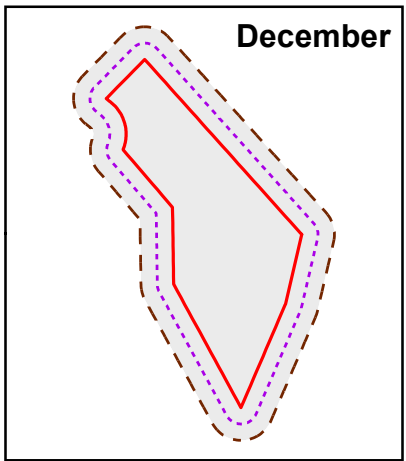
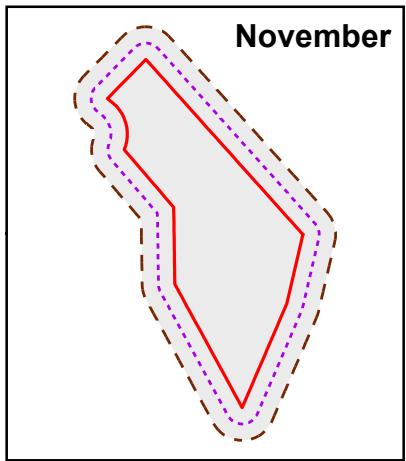
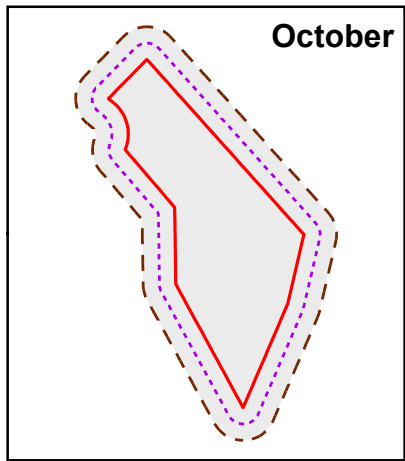
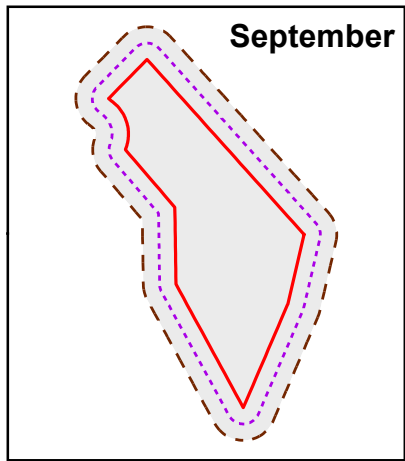
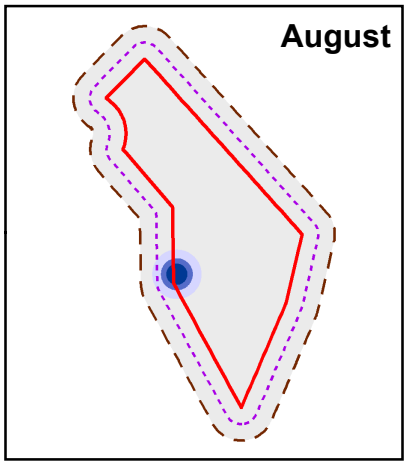
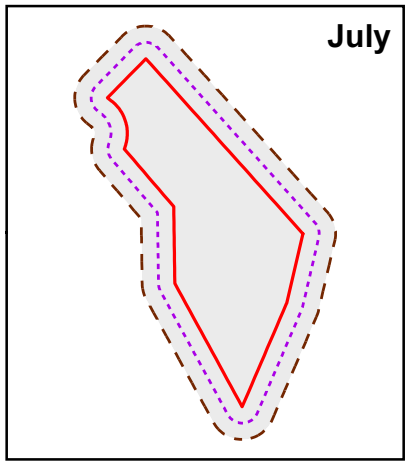
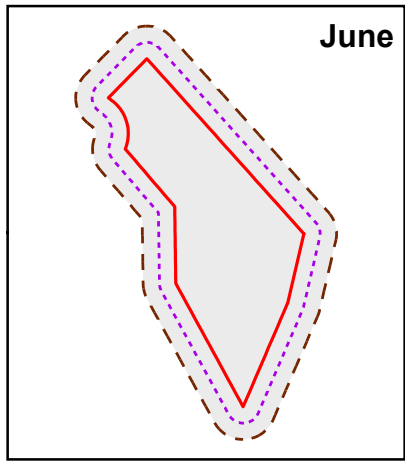
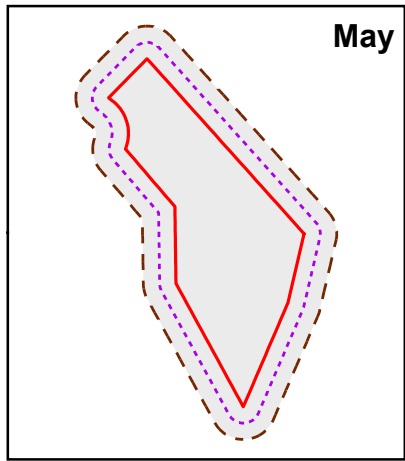
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 GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)

Figure 1-18: Distribution of puffin between May 2022 and April 2023

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DRAWING NUMBER: N/A	SHEET NO: 01 of 01
	REV: N/A

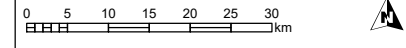
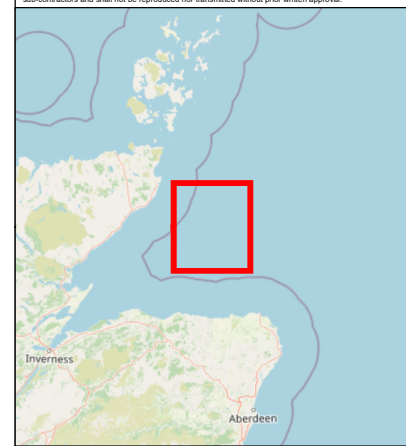
1.11 Common Tern

- 1.11.1.1 Spatial distribution maps, generated using design-based estimates, for common tern throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-19 and Figure 1-20, respectively.



Caledonia OWF
 2km Buffer from Caledonia OWF
 4km Buffer from Caledonia OWF
Common tern Relative Density
 0
 0 - 1
 1 - 2
 2 - 3

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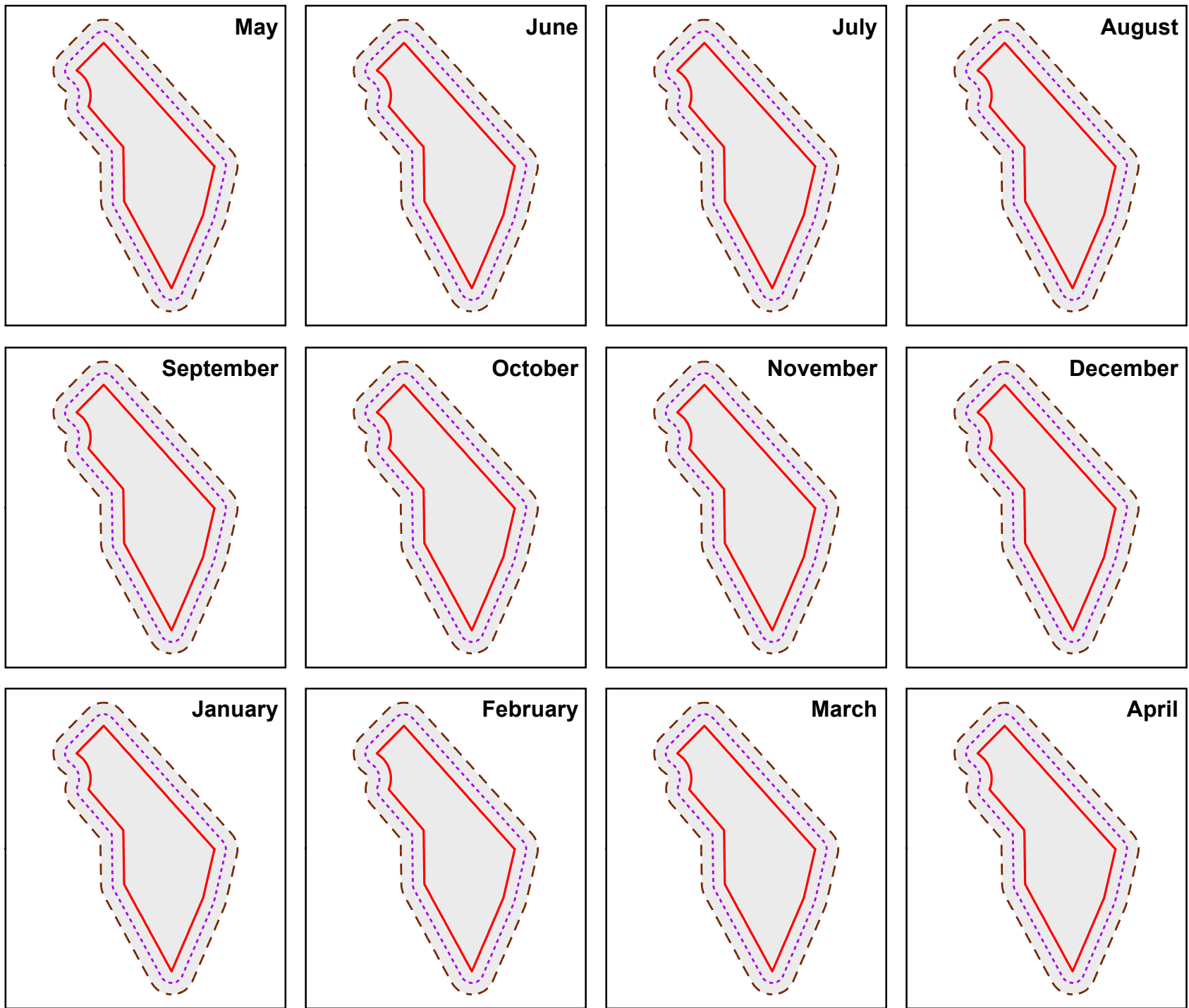


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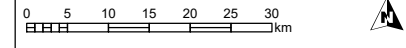
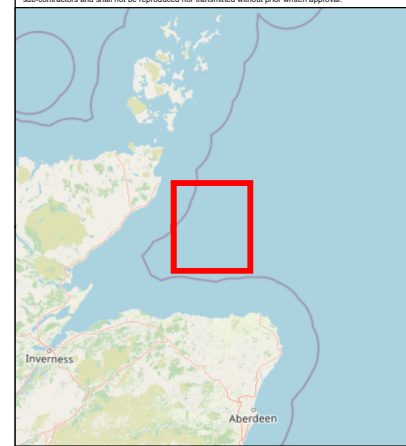
DRAWING TITLE: Figure 1-19: Distribution of common tern between May 2021 and April 2022

STATUS: Approved	SCALE: 1:925,000
DRAWING NUMBER: N/A	SHEET NO: 01 of 01
	REV: N/A



Caledonia OWF
 2km Buffer from Caledonia OWF
 4km Buffer from Caledonia OWF
Common tern Relative Density
 0
 0 - 1
 1 - 2
 2 - 3

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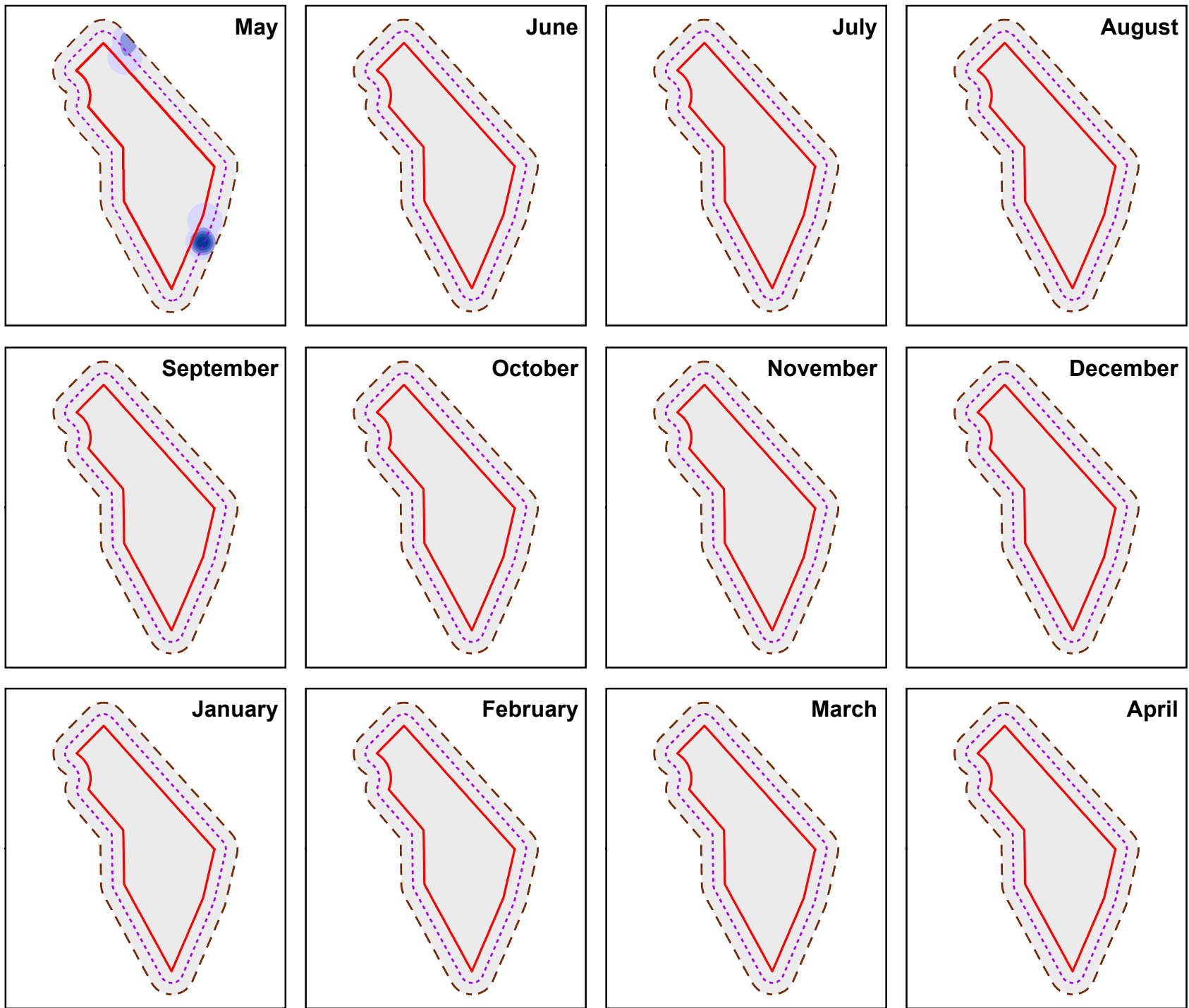
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 GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE
 Figure 1-20: Distribution of common tern between May 2022 and April 2023

STATUS: Approved	SCALE: 1:925,000
DRAWING NUMBER: N/A	SHEET NO: 01 of 01 REV: N/A

1.12 Arctic Tern

- 1.12.1.1 Spatial distribution maps, generated using design-based estimates, for Arctic tern throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-21 and Figure 1-22, respectively.

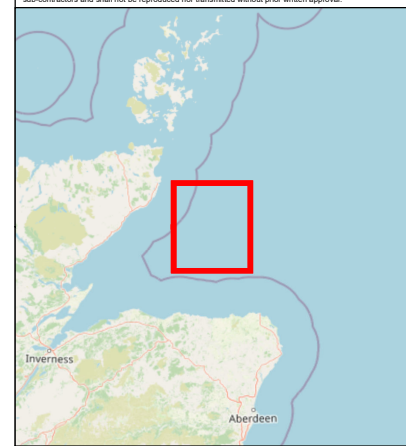


Caledonia OWF
 2km Buffer from Caledonia OWF
 4km Buffer from Caledonia OWF

Arctic tern Relative Density

- 0
- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5

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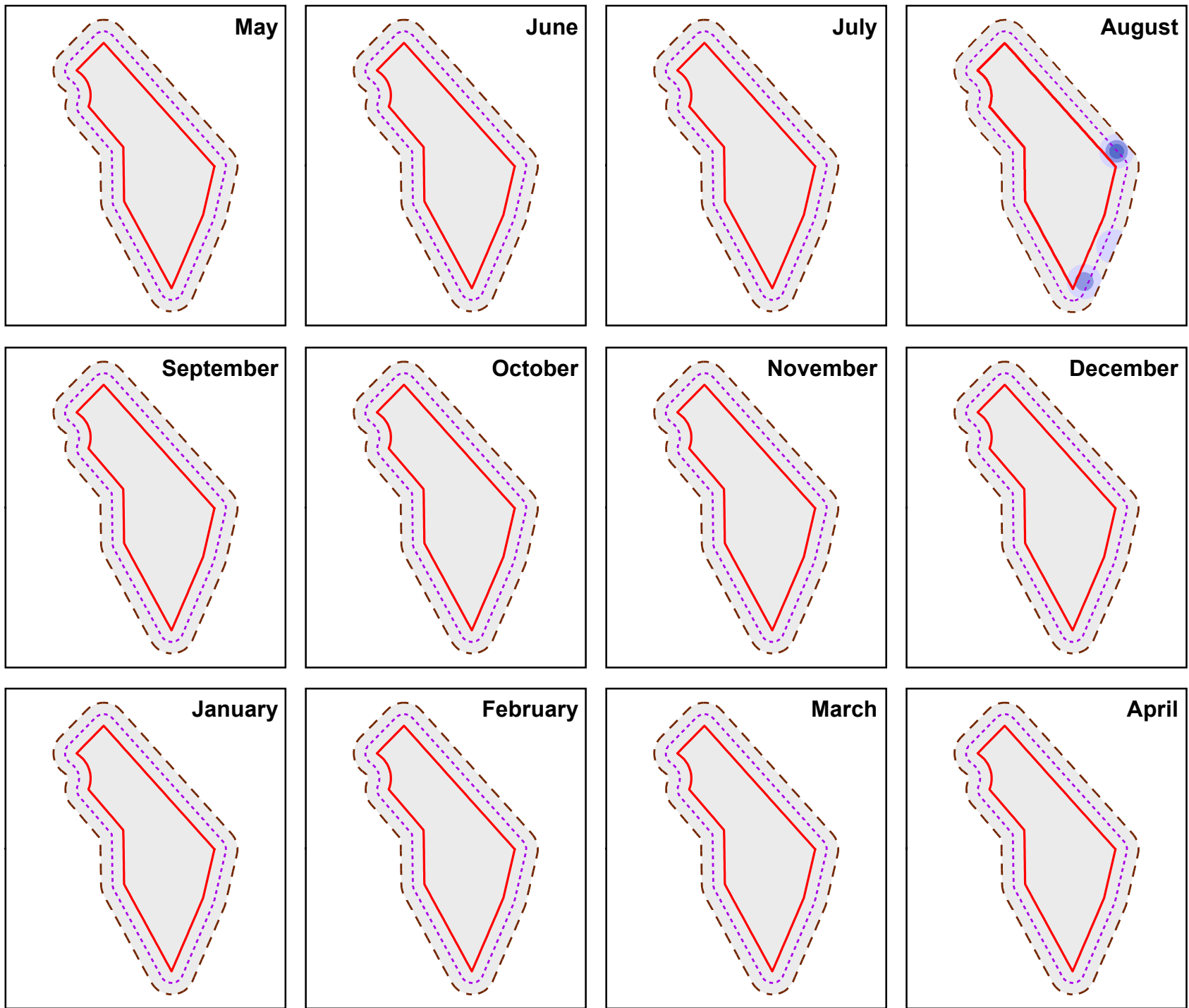
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 GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE

Figure 1-21: Distribution of arctic tern between May 2021 and April 2022

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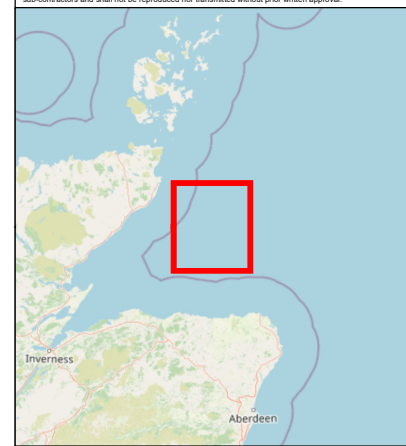


Caledonia OWF
 2km Buffer from Caledonia OWF
 4km Buffer from Caledonia OWF

Arctic tern Relative Density

- 0
- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5

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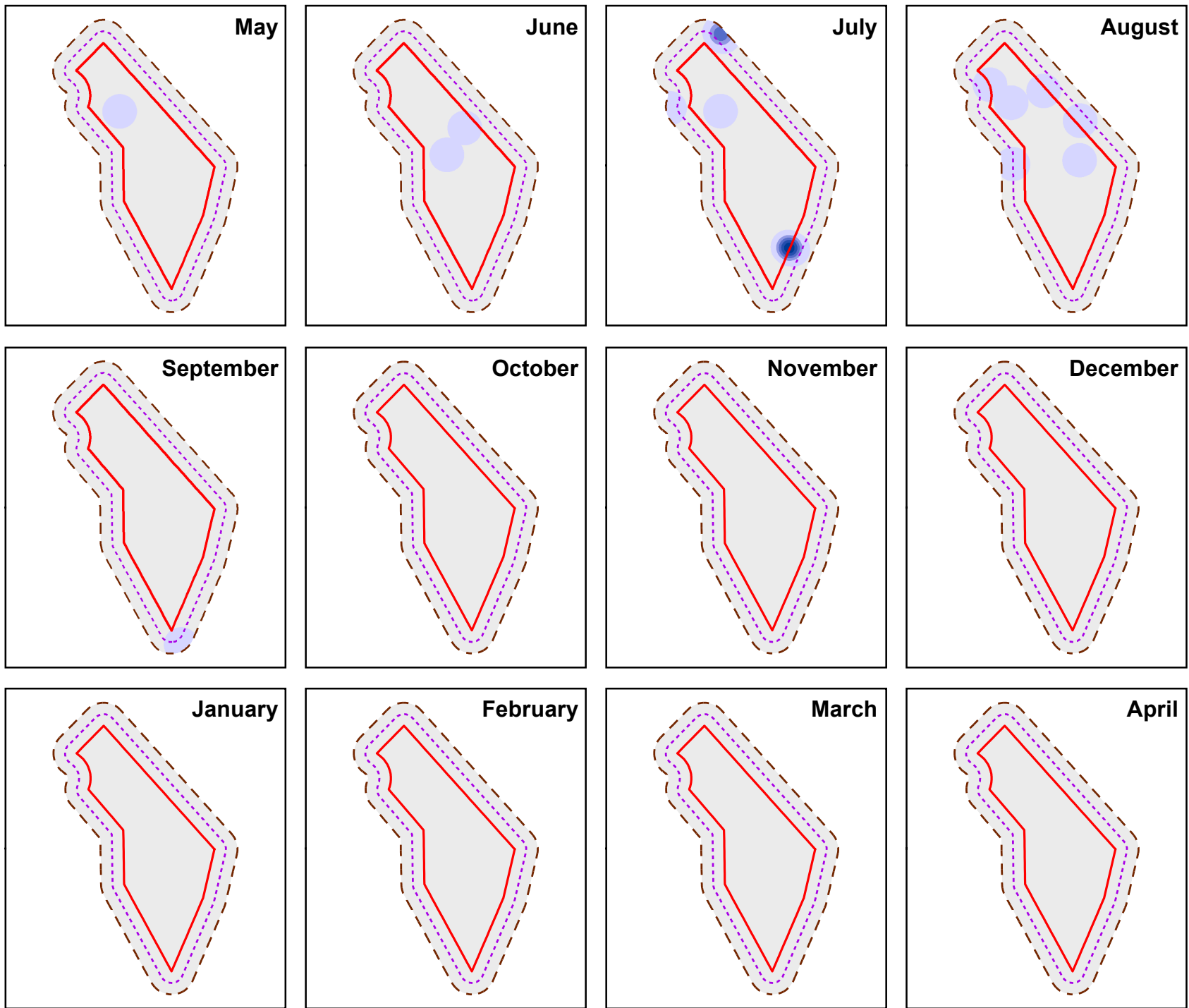
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Figure 1-22: Distribution of arctic tern between May 2022 and April 2023

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1.13 Great Skua

- 1.13.1.1 Spatial distribution maps, generated using design-based estimates, for great skua throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-23 and Figure 1-24, respectively.

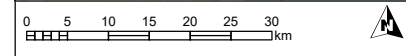
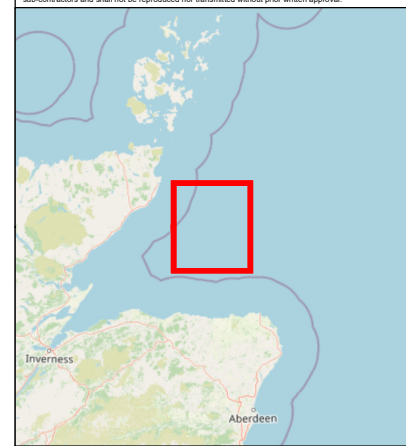


Caledonia OWF
 2km Buffer from Caledonia OWF
 4km Buffer from Caledonia OWF

Great skua Relative Density

- 0
- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5

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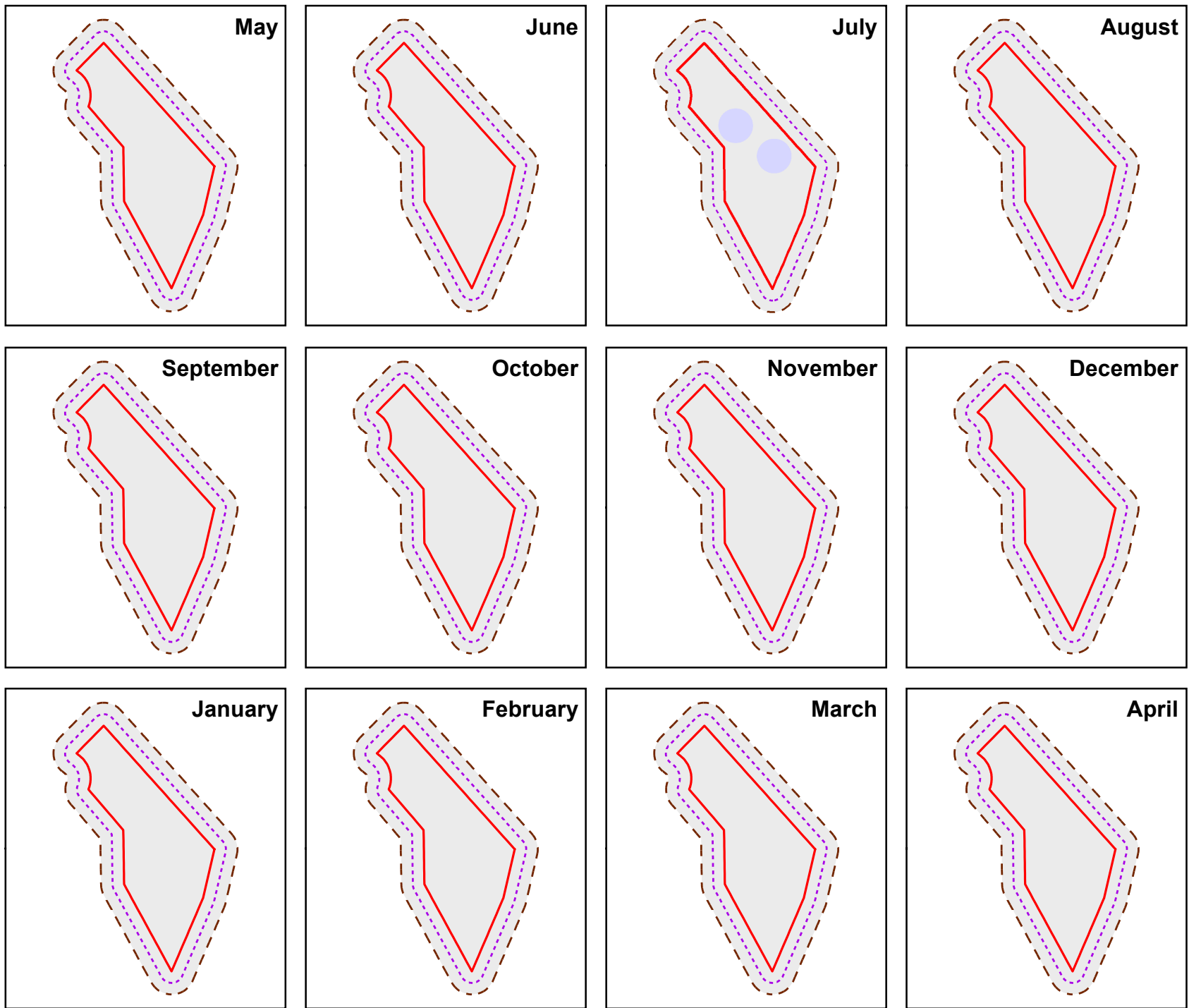
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 CONTRACTOR REV: 01

GEODETIC PARAMETERS
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DRAWING TITLE

Figure 1-23: Distribution of great skua between May 2021 and April 2022

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Caledonia OWF
 2km Buffer from Caledonia OWF
 4km Buffer from Caledonia OWF

Great skua Relative Density

- 0
- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5

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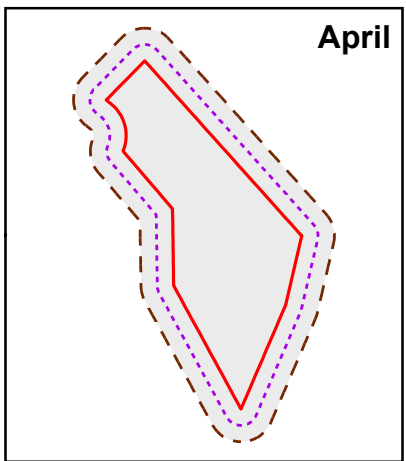
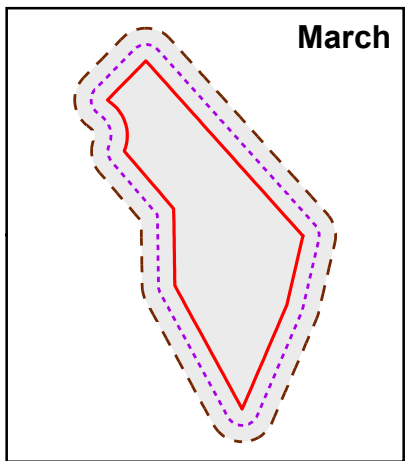
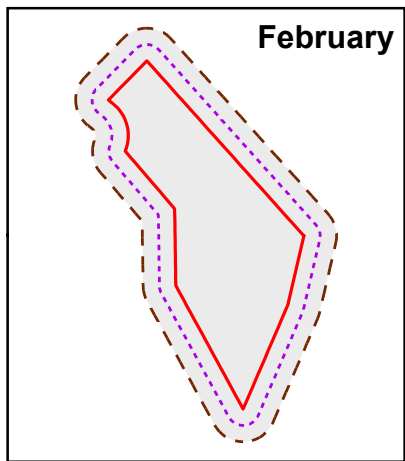
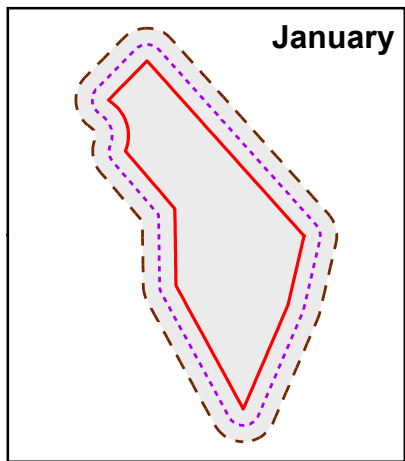
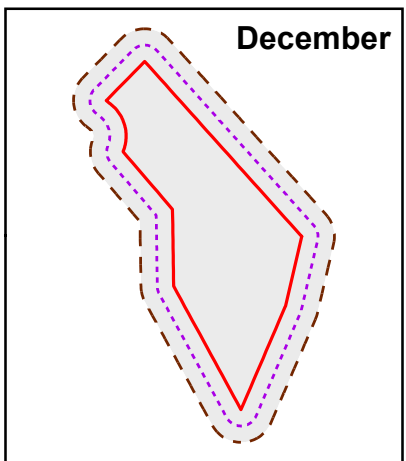
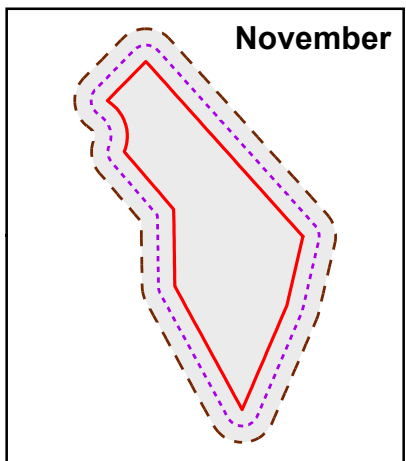
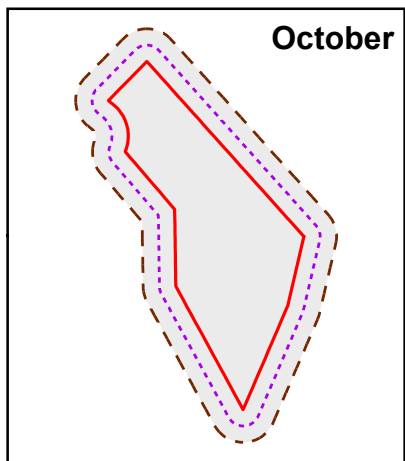
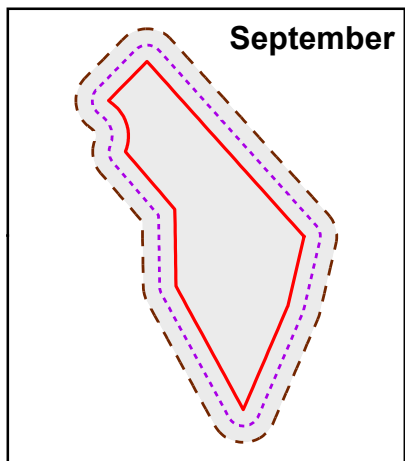
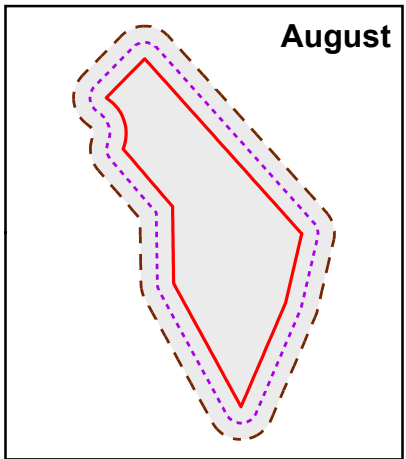
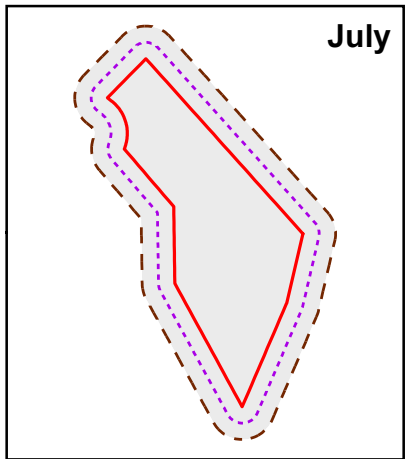
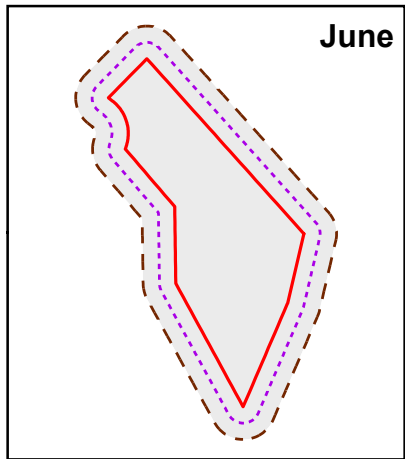
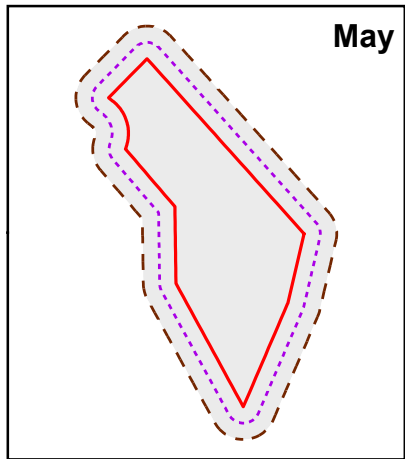
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 Figure 1-24: Distribution of great skua between May 2022 and April 2023

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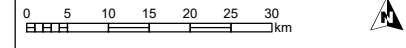
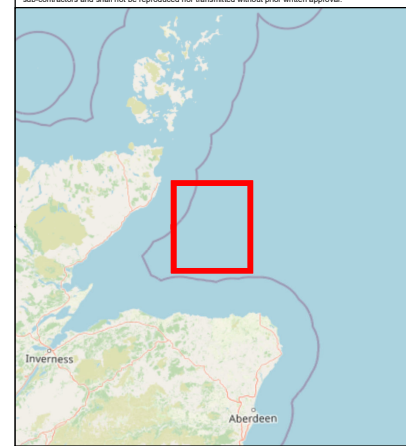
1.14 Red-throated Diver

- 1.14.1.1 Spatial distribution maps, generated using design-based estimates, for red-throated diver throughout the Caledonia OWF (plus 2km and 4km buffers) between May 2021 and April 2022 and May 2022 and April 2023 are provided in Figure 1-25 and Figure 1-26, respectively.



Caledonia OWF
 2km Buffer from Caledonia OWF
 4km Buffer from Caledonia OWF
Red-throated diver Relative Density
 0
 0 - 1

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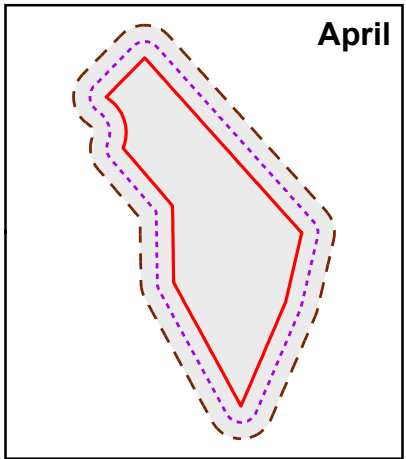
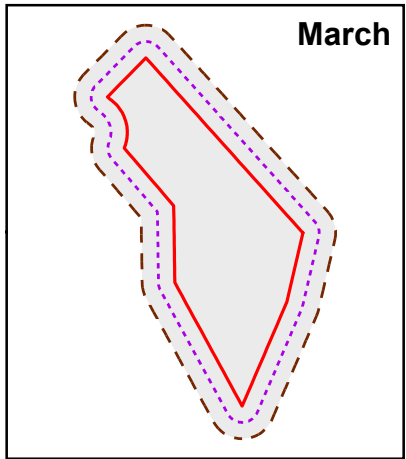
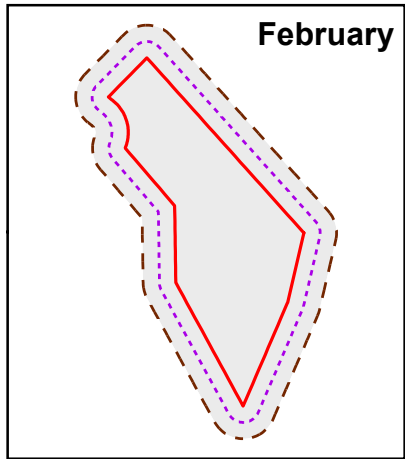
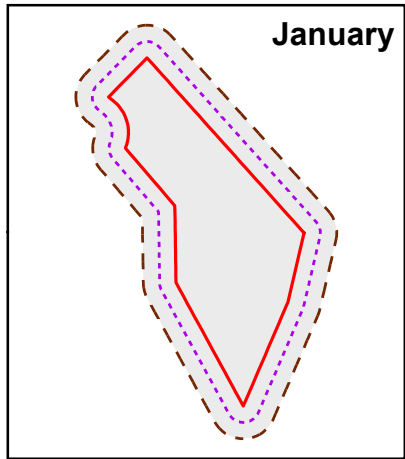
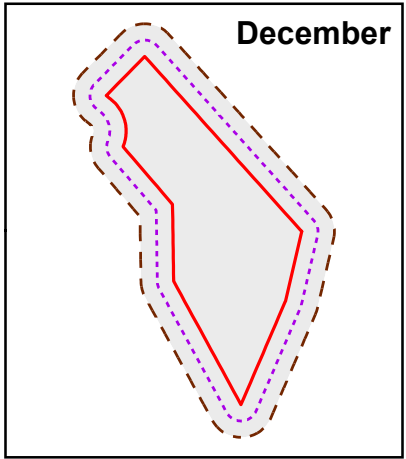
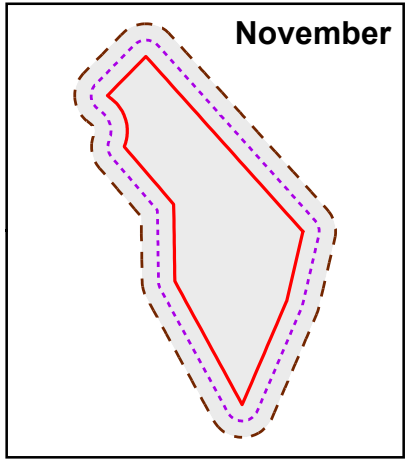
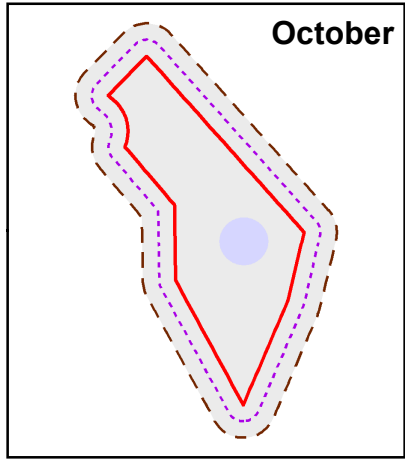
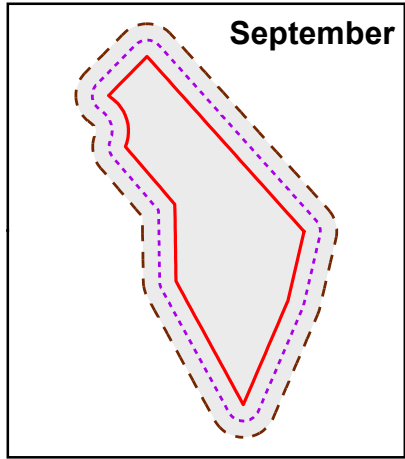
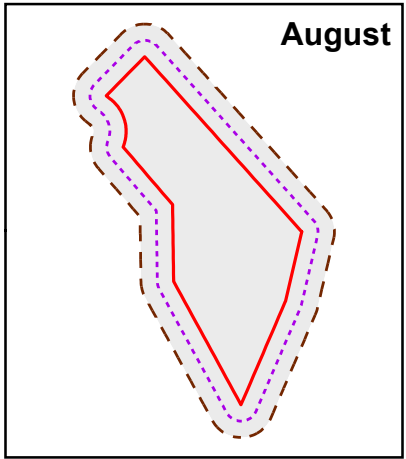
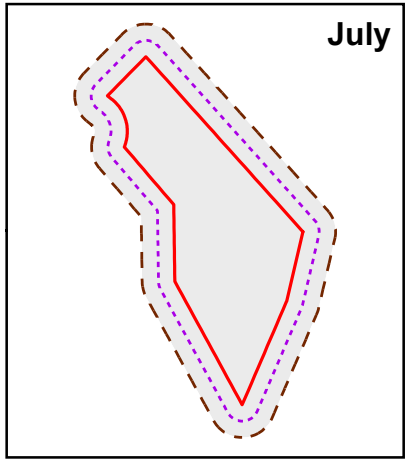
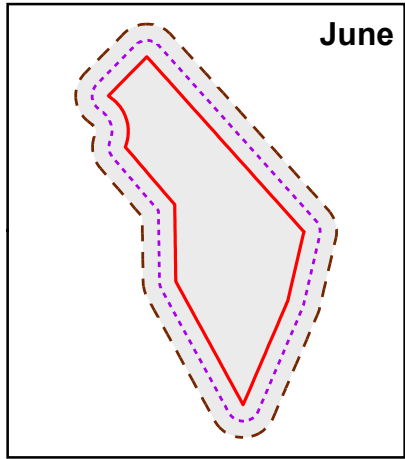
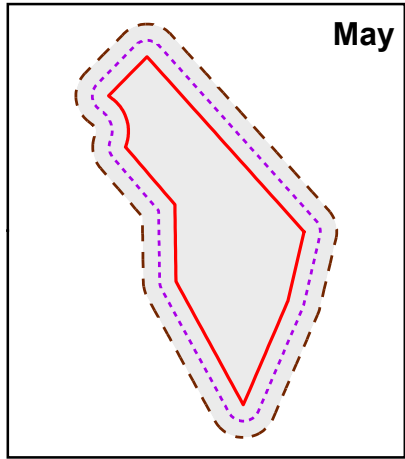


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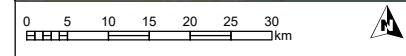
Figure 1-25: Distribution of Red-throated diver between May 2021 and April 2022

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Caledonia OWF
 2km Buffer from Caledonia OWF
 4km Buffer from Caledonia OWF
Red-throated diver Relative Density
 0
 0 - 1

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GEOGRAPHIC PARAMETERS WGS 84 / UTM zone 30N (EPSG: 32630)	
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Figure 1-26: Distribution of Red-throated diver between May 2022 and April 2023

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