Falkland Islands KBA analysis for coastal marine birds

Summary for Stakeholders

July 2021

(For detailed of overview of data and analyses presented in this document, please see the associated Technical Report)

Darwin Plus Project Reference No: DPLUS115: Unlocking Falkland Islands Marine Management: Key Biodiversity Areas for seabirds.

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Introduction

Context

The Falkland Islands support internationally important seabird populations. Spatial use of the Falklands marine environment by seabirds has been repeatedly assessed; however, outputs from these studies have been specific to the respective projects and have not directly aligned to specific global frameworks.

One global framework is Key Biodiversity Areas (KBAs). These are internationally recognised sites that are assessed against a global standard and that contribute significantly to the global persistence of biodiversity. KBAs are manageable units with delineated boundaries. KBAs come with no legal standing unless implemented by the governing body with jurisdiction for the site. They are fundamentally an information tool which should inform data-led terrestrial or marine management.

KBAs have already been identified in the Falklands for terrestrial locations (based predominantly on bird and plant data) and in the nearshore/inshore environment for sei whales; however this is the first project to specifically assess a number of seabird species within the nearshore marine environment. All the species assessed are breeding coastally in the Islands and are central placed foragers during that time i.e. they repeatedly return to the colony in order to breed and rear young. With the exception of albatrosses and petrels which can forage more widely, all these species forage almost exclusively in the nearshore environment during breeding. Knowledge of key areas for seabirds, particularly those of global significance is critical to inform the Falklands Marine Management Areas process and future MSP.

Assessment

For an area to be classed as a global KBA, it must meet one of eleven quantitative criteria in which all levels of ecological organisation, including genetic diversity, species and ecosystems, are covered.

For this KBA project three of the KBA criteria were assessed against. These criteria were A1, B1and D1a

- A1: is triggered when a site regularly holds a threshold population of a threatened species (as recognised on the IUCN Red List)
- B1: is triggered when a site regularly holds greater than 10% of the global population of a restricted range species.
- D1a: is triggered when an area predictably holds more than 1% of the global population during one or more life history stages, i.e. breeding season.

This project focuses on the nearshore environment of the Falkland Islands assessing for globallyrecognised marine KBAs for several seabird species. Population estimates and distribution data were drawn together from a number of sources for 28 species. From this a key suite of 11 seabird species were identified and then analysed against KBA criteria for marine KBAs in the inshore environment.

This document outlines proposed marine KBAs for eight seabird species that had areas at-sea that meet KBA criteria in the Falklands. If accepted, these single species KBAs would be aggregated into a single KBA and further integrated into the existing sei whale KBA, as KBA guidelines prevent KBA overlap.

For a detailed overview of all species data considered and the analysis please see the associated Technical Report

Method principles

The methods employed in this assessment are precautionary in that they utilise only positive records of abundance and distribution with relatively little assumption or modelling. The use of colony locations and counts inevitably means that the most predictable KBAs are proposed i.e. those areas immediately close to larger colonies (which are generally well known), where highest number of seabirds occur. These areas are typically used by the birds for rafting, preening, bathing, foraging or as necessary arrival and departure corridors.

This approach means that other areas in the future may be assessed to see whether they meet KBA criteria. These areas could include where birds congregate away from colonies for activities such as foraging on shallow reefs or other areas with relevant features.

Proposed KBAs for coastal marine birds

Overall areas to be considered as inshore KBAs for Falklands coastal marine birds are outlined in the figure below (Figure. 1).



Figure 1: Overlapping KBA element layers for coastal marine birds in the inshore environment of the Falkland Islands. KBA element layers refer to the individual species distribution layers which had areas that met KBA criteria at the species level. Eight species had distribution layers that met global KBA criteria (associated criteria indicated in brackets), these are: Blackbrowed Albatross (D1a), Slender-billed Prion (D1a), Southern Giant Petrel (D1a), Gentoo Penguin (D1a), Southern-Rockhopper Penguin (A1b, A1d, D1a), Brown Skua (D1a), Dolphin Gull (D1a), Falklands Steamer Duck (B1). KBA criteria refer to globally threatened biodiversity (Crit. A), geographically restricted biodiversity (Crit. B), biological processes such as demographic aggregations (Crit. D).

Proposed species specific KBA element layers

For detailed overview of the analyses leading to the identification of the species specific KBA element layers, please see the associated Technical Report.

Falklands Steamer Duck (FLSD)

Red List Status: LC

KBA Criteria for assessment: B1 (Geographically restricted species)

Limited monitoring of Falkland Steamer Duck breeding locations has been conducted across the Falkland Islands. Given these birds typically nest as territorial pairs and are endemic to the Falkland Islands (a key factor for assessing species against KBA criteria B1) we included all records for assessment of KBAs.

Delineation type: Island Buffer

Given Falkland Steamer Ducks typically nest as territorial pairs and are endemic to the Falkland Islands, we delineated conservative 5km buffers around all islands with known breeding pairs. This estimate is based on expert knowledge (Sally Poncet, Paulo Catry). The buffer is conservative and is in alignment with the 5km buffer used to delineate marine KBA boundaries for procellariiformes (see below). We note that (White et al. 2002) report observing Falkland Steamer Ducks up to 8km from the coastline during at-sea surveys.

Within the 5km buffer and based on the records from (Woods & Woods 1997), there are an estimated 12,500 breeding pairs (25,000 mature individuals) across the Falkland Islands.

KBA extent

We propose this area (in blue) as a KBA for Falklands Steamer Ducks under criterion B1 (Geographically restricted species), given this area is critical marine habitat for 100% of this endemic species year-round.



Black-browed Albatross (BBAL)

Red List Status: LC

KBA Criteria for assessment: D1a (Demographic aggregations)

For all records for Black-browed albatrosses, abundance records where present from all major breeding locations.

As this species typically forages over distances where certain area-based management tools may not always be feasible (Oppel et al. 2018), delineation of marine KBAs must be considered accordingly.

Delineation type: Preening and washing area buffers

A recent tracking study for Black-browed Albatrosses at the Falkland Islands found that 98% of birds utilise marine areas within 5km of their breeding colony (Granadeiro et al. 2017). The authors recognised that the close marine areas around seabird colonies are potentially highly sensitive areas and should be considered when carrying out risk assessments or during marine spatial planning exercises.

Given this species reliance on at sea areas adjacent to colonies and a recognised distance threshold based on tracking studies from the Falkland Islands, we delineated 5km buffers around key islands or breeding locations. Abundance estimates within buffer areas from each colony were summed, providing a Falklands-wide estimate of at-sea abundance within key buffer areas for the species.

Based on the collated records and estimates of distribution within buffer areas from all key colonies, the estimated maximum number of mature individuals for a given cell is 385,965 mature individuals (breeding pairs x 2).

Given the global population estimate for this species is 1,400,000 mature individuals, and the KBA criterion we are assessing cells against is KBA criterion D1a, cells that would meet the criterion are those with \geq 14,000 mature individuals (i.e. \geq 1% of the global population)

KBA extent

We propose these areas (in blue) as a KBA for Black-browed Albatrosses under criterion D1a (Demographic aggregations), given these areas are estimated to have a minimum abundance estimate of ≥1% of the global population (≥ 14,000 mature individuals for BBAL) during the breeding period.



Southern Giant Petrel (SGPE)

Red List Status: LC

KBA Criteria for assessment: D1a (Demographic aggregations)

For all breeding records for Southern Giant Petrels, there are certain sites with presence only data, or sites where the species are now absent. For the identification of KBAs, we only utilised information from sites with abundance records.

Similarly to Black-browed Albatrosses this species may forage over distances where certain areabased management tools may not always be feasible (Oppel et al. 2018); especially when accounting for sex-specific foraging strategies (González-Solís et al. 2002). Therefore, delineation of marine KBAs must be considered accordingly.

Delineation type: Preening and washing area buffers

Although no Southern Giant Petrels have been tracked from the Falkland Islands, elsewhere in their range birds always showed periods on the sea surface immediately after departure and just before arrival, indicating that all birds started and finished foraging trips by bathing at sea (González-Solís et al. 2002).

Given this species reliance on at sea areas adjacent to colonies and a recognised distance threshold based on tracking studies from similar species at the Falkland Islands (Black-browed Albatross, see above), we delineated 5km buffers around all islands or breeding locations. Abundance estimates within buffer areas from each colony were summed; providing a Falklands-wide estimate of at-sea abundance within key buffer areas for the species.

Based on the collated records and estimates of distribution within buffer areas from all key colonies, the estimated maximum number of mature individuals for a given cell is 23,870 mature individuals (breeding pairs x 2).

Given the global population estimate for this species is 101,800 mature individuals, and the KBA criterion we are assessing cells against is KBA criterion D1a, cells that would meet the criterion are those with \geq 1,018 mature individuals (i.e. \geq 1% of the global population)

KBA extent

We propose these areas (in blue) as a KBA for Southern Giant Petrels under criterion D1a (Demographic aggregations), given these areas are estimated to have a minimum abundance estimate of ≥1% of the global population (≥ 1,018 mature individuals for SGPE) during the breeding period.



Slender-billed Prion (SBPR)

Red List Status: LC

KBA Criteria for assessment: D1a (Demographic aggregations)

For all records for Slender-billed Prions, there are certain sites with presence only data. For the identification of KBAs, we only utilised information from sites with abundance records.

Given this species nests in burrows as opposed to tightly clustered colonies, we selected only those Island Regions with abundance estimates $\geq 1\%$ of the global population given this species is being assessed against KBA Criterion D1a (Demographic aggregations).

As this species typically forages over distances where certain area-based management tools may not always be feasible (Oppel et al. 2018), delineation of marine KBAs must be considered accordingly.

Delineation type: Preening and washing area buffers

Similarly to other procellariiformes (Black-browed Albatross and Southern Giant Petrels), this species relies on at sea areas adjacent to colonies. Therefore, using a recognised distance threshold based on tracking studies from similar species at the Falkland Islands (Black-browed Albatross, see above), we delineated 5km buffers around key breeding locations.

Based on the collated records and estimates of distribution within buffer areas from all key colonies, the estimated maximum number of mature individuals for a given cell is 4,000,000 mature individuals (breeding pairs x 2).

Given the global population estimate for this species is 7,000,000 mature individuals, and the KBA criterion we are assessing cells against is KBA criterion D1a, cells that would meet the criterion are those with \geq 70,000 mature individuals (i.e. \geq 1% of the global population)

KBA extent

We propose these areas (in blue) as a KBA for Slender-billed Prions under criterion D1a (Demographic aggregations), given these areas are estimated to have a minimum abundance estimate of ≥1% of the global population (≥ 70,000 mature individuals for SBPR) during the breeding period.



Southern Rockhopper Penguin (SRPE)

Red List Status: VU (A2, A3, A4)

KBA Criteria for assessment: A1b and A1D (Threatened Biodiversity), D1a (Demographic aggregations)

Southern Rockhopper Penguins are well monitored across the Falkland Islands, hence nearly all records are Abundance records. We used these abundance records for further analyses.

Delineation type: Preening and washing area buffers (and transit areas for foraging trips)

While a mean-maximum foraging radius approach has been applied for penguins and other seabirds elsewhere (Grecian et al. 2012, Critchley et al. 2018, 2019, Handley et al. 2021), we favour the approach of considering preening and washing area buffers only for assessment of potential KBA areas for Southern Rockhopper Penguins. The mean-maximum foraging radius for Southern Rockhopper Penguins at the Falklands Islands is approximately 139km. Rather than using this buffer of 139km, we use a buffer of 5km only around Southern Rockhopper Penguin Colonies in alignment with the areas being proposed for Procellariiformes (see above). In the context of the inshore environment of the Falkland Islands, these areas are better suited to the definitions of "management unit" and "aggregation" as defined in the KBA standards; particularly as the key KBA criterion for assessment was KBA criterion A1d, meaning that areas with only ≥ 0.02% of the global population should be considered as a KBA. Abundance estimates within buffer areas from each colony were summed, providing a Falklands-wide estimate of at-sea abundance within key buffer areas for the species.

Based on the collated records and estimates of distribution from all colonies, the estimated maximum number of mature individuals for a given cell is 230,652 mature individuals (breeding pairs x 2).

Given the global population estimate for this species is 2,500,000 mature individuals, and the key KBA criterion we assessed cells against was KBA criterion A1d, cells that would meet the criterion are those with \geq 5,000 mature individuals (i.e. \geq 0.02 % of the global population).

KBA extent

We propose these areas (in blue) as a KBA for Southern Rockhopper Penguins under criterion A1d (Threatened Biodiversity), given these areas are estimated to have a minimum abundance estimate of \geq 0.02% of the global population (\geq 5,000 mature individuals for SRPE) during the breeding period.



Gentoo Penguins (GEPE)

Red List Status: LC

KBA Criteria for assessment: D1a (Demographic aggregations)

Gentoo penguins are well monitored across the Falkland Islands, hence nearly all records are Abundance records. We used these abundance records only.

Delineation type: Mean-maximum foraging radius buffers

Using the mean-maximum foraging radius approach, as has been recently applied to breeding seabirds in the United Kingdom (Critchley et al. 2018) and Antarctica (Handley et al. 2021) we estimated the distribution of birds from a source colony out to a

- specified buffer distance of 21km,
- where the buffer distance is based on the mean maximum distance travelled by birds based on reported and published literature from other tracking studies at the Falkland Islands.

We preferentially weighted those cells closest to the source colony, which means that these cells represent the areas likely used by a higher percentage of the source population. The density distribution surfaces from each colony were summed; providing a Falklands-wide estimate of at-sea abundance.

Based on the collated records and estimates of distribution from all colonies, the estimated maximum number of mature individuals for a given cell is 20,734 mature individuals (breeding pairs x 2).

Given the global population estimate for this species is 774,000 mature individuals, and the KBA criterion we are assessing cells against is KBA criterion D1a, cells that would meet the criterion are those with \geq 7,740 mature individuals (i.e. \geq 1% of the global population)

KBA extent

We propose these areas (in blue) as a KBA for Gentoo Penguins under criterion D1a (Demographic aggregations), given these areas are estimated to have a minimum abundance estimate of \geq 1% of the global population (\geq 7,740 mature individuals for GEPE) during the breeding period.

Brown Skua (BRSK)

Red List Status: LC

KBA Criteria for assessment: D1a (Demographic aggregations)

Brown Skuas have received less attention in monitoring efforts throughout the years at the Falkland Islands. Hence, several records indicative of breeding birds relate to presence only records. We use only the abundance records for further analysis.

Delineation type: Marine reliance buffers

Given this species nests in loose aggregations over an area as opposed to tightly clustered colonies, we selected only those Island Regions with abundance estimates ≥1% of the global population given this species is being assessed against KBA Criterion D1a (Demographic aggregations).

For each of the selected Island Region locations that hosted ≥1% of the global population, we delineated conservative buffers of 2kms around each island. This conservative buffer was set in alignment with the smallest buffer set for a species in the study where tracking data was available from the Falkland Islands; specifically, based on the 2km buffer set for Rock Shags.

Furthermore, this conservative buffer was set because while birds likely do range further from a respective breeding location, as volant scavengers they generally tend to travel to a particular location (which could also be on land) and forage there, as opposed to searching the surrounding marine area for food. The adjacent marine area that the 2km buffer represents is of the area typically used for preening and bathing. Brown Skuas also engage in mobbing behaviours on other returning seabirds.

Based on the collated records, the estimated maximum number of mature individuals is up to 666 mature individuals (breeding pairs x 2) utilising waters around specific BRSK breeding islands which host $\geq 1\%$ of the global population.

Given the global population estimate for this species is 27,000 mature individuals, and the KBA criterion we are assessing cells against is KBA criterion D1a, cells that would meet the criterion are those with \geq 270 mature individuals (i.e. \geq 1% of the global population)

KBA extent

We propose these areas (in blue) as a KBA for Brown Skuas under criterion D1a (Demographic aggregations), given these areas are estimated to have a minimum abundance estimate of \geq 1% of the global population (\geq 270 mature individuals for BRSK) during the breeding period.

Dolphin Gulls (GOGU)

Red List Status: LC

KBA Criteria for assessment: D1a (Demographic aggregations)

Dolphin Gulls have received less attention in monitoring efforts throughout the years at the Falkland Islands. Hence, several records indicative of breeding birds relate to presence only records. We use only the abundance records for further analysis.

Abundance records for Dolphin Gulls only related to Island Region survey types. We selected only those Island Regions with abundance estimates ≥1% of the global population given this species is being assessed against KBA Criterion D1a (Demographic aggregations).

Delineation type: Marine reliance buffers

For each of the selected Island Region locations that hosted ≥1% of the global population, we delineated conservative buffers of 2kms around each island. This conservative buffer was set in alignment with the smallest buffer set for a species in the study where tracking data was available from the Falkland Islands; specifically, based on the 2km buffer set for Rock Shags (see above). Furthermore, this conservative buffer was set because while birds likely do range further from a respective breeding location (Masello et al. 2013), as volant scavengers they generally tend to travel to a particular location (which could also be on land) and forage there, as opposed to searching the surrounding marine area for food. The adjacent marine area that the 2km buffer represents is of the area typically used for preening and bathing.

Given the global population estimate for this species is 12,900 mature individuals, and the KBA criterion we are assessing cells against is KBA criterion D1a, cells that would meet the criterion are those with \geq 129 mature individuals (i.e. \geq 1% of the global population)

Based on the collated records, the estimated maximum number of mature individuals is up to 460 mature individuals (breeding pairs x 2) utilising waters around specific DOGU breeding islands which host \geq 1% of the global population.

KBA extent

We propose these areas (in blue) as a KBA for Dolphin Gulls under criterion D1a (Demographic aggregations), given these areas are estimated to have a minimum abundance estimate of \geq 1% of the global population (\geq 129 mature individuals for DOGU) during the breeding period.

Key species assessed but not meeting KBA criteria

Data for three additional species were assessed to determine whether marine areas used by the birds would meet KBA criteria.

For Magellanic Penguins, while the Falkland Islands hosts globally important populations, at the scale of the analysis no areas met relative threshold to trigger KBA criteria.

For the shags (Imperial and Rock Shag), we generated estimates of distribution but no suitable global population estimate exists yet; therefore it is currently unfeasible to assess whether these areas could meet thresholds of the KBA criteria. Nevertheless, recent taxonomic evidence, while incomplete, suggests that these populations could warrant renewed status as a unique species. Therefore, for the shags, assessing identified areas in relation to KBA thresholds against Falklands population estimates might be considered in future.

Magellanic Penguins (MGPE)

Red List Status: LC

KBA Criteria for assessment: D1a (Demographic aggregations)

Magellanic Penguins have received less attention in monitoring efforts throughout the years at the Falkland Islands given the difficulty in surveying this burrow nesting species. Hence, several records indicative of breeding birds relate to presence only records. We use only the abundance records for further analysis.

Delineation type: Mean-maximum foraging radius buffers.

Where abundance records were available, these relate to Island Region location type records only; somewhat expected given this species does not form tightly clustered colonies at the Falkland Islands.

Using the mean-maximum foraging radius approach, as has been recently applied to breeding seabirds in the United Kingdom (Critchley et al. 2018) and Antarctica (Handley et al. 2021) we estimated the distribution of birds from a source colony out to a

- specified buffer distance of 298km,
- where the buffer distance is based on the mean maximum distance travelled by birds based on reported and published literature from other tracking studies at the Falkland Islands.

We preferentially weighted those cells closest to the source colony, which means that these cells represent the areas likely used by a higher percentage of the source population. The density distribution surfaces from each colony were summed, providing a Falklands-wide estimate of at-sea abundance.

Based on the collated records and estimates of distribution from all colonies, the estimated maximum number of mature individuals for a given cell is 6,731 mature individuals (breeding pairs x 2).

Given the global population estimate for this species is 2,700,000 mature individuals, and the KBA criterion we are assessing cells against is KBA criterion D1a, cells that would meet the criterion are those with \geq 27,000 mature individuals (i.e. \geq 1% of the global population)

KBA extent

Given the global population estimate of mature individuals for Magellanic Penguins, means a minimum of 27,000 mature individuals should be present to trigger a KBA under Criterion D1a ('Demographic aggregations) we do not propose any area as a global KBA for Magellanic Penguins across the inshore area of the Falkland Islands.

Imperial Shag (IMSH)

Red List Status: LC

KBA Criteria for assessment: D1a (Demographic aggregations)

Imperial shags have received less attention in monitoring efforts throughout the years at the Falkland Islands. Hence, several records indicative of breeding birds relate to presence only records. We use only the abundance records for further analysis.

Delineation type: Mean- maximum foraging radius buffers

Using the mean-maximum foraging radius approach, as has been recently applied to breeding seabirds in the United Kingdom (Critchley et al. 2018) and Antarctica (Handley et al. 2021) we estimated the distribution of birds from a source colony out to a

- specified buffer distance of 16km,
- where the buffer distance is based on the mean maximum distance travelled by birds based on reported and published literature from other tracking studies at the Falkland Islands.

We preferentially weighted those cells closest to the source colony, which means that these cells represent the areas likely used by a higher percentage of the source population. The density distribution surfaces from each colony were summed; providing a Falklands-wide estimate of at-sea abundance.

Based on the collated records and estimates of distribution from all colonies, the estimated maximum number of mature individuals for a given cell is 18,004 mature individuals (breeding pairs x 2).

Given there is no global population estimate of mature individuals for Imperial Shags, we were unable to consider which cells might meet KBA Criterion D1a ('Demographic aggregations) for birds during the breeding period.

Rock Shags (ROSH)

Red List Status: LC

KBA Criteria for assessment: D1a (Demographic aggregations)

Rock shags have received less attention in monitoring efforts throughout the years at the Falkland Islands. Hence, several records indicative of breeding birds relate to presence only records. We use only the abundance records for further analysis.

Delineation type: Mean-maximum foraging radius buffers

Similarly to Imperial Shags, where abundance records were available, several different types of survey records were present. To account for these different types of records and to ensure that we avoided double counting, all locations that had an Island Region location AND an Actual Location, were filtered to remove the Island Region location and keep the more specific colony record instead (See Imperial Shag KBA overview for an example).

Using the mean-maximum foraging radius approach, as has been recently applied to breeding seabirds in the United Kingdom (Critchley et al. 2018) and Antarctica (Handley et al. 2021) we estimated the distribution of birds from a source colony out to a

- specified buffer distance of 2km,
- where the buffer distance is based on the mean maximum distance travelled by birds based on reported and published literature from other tracking studies at the Falkland Islands.

We preferentially weighted those cells closest to the source colony, which means that these cells represent the areas likely used by a higher percentage of the source population. The density distribution surfaces from each colony were summed; providing a Falklands-wide estimate of at-sea abundance.

Based on the collated records and estimates of distribution from all colonies, the estimated maximum number of mature individuals for a given cell is 1,020 mature individuals (breeding pairs x 2).

Given there is no global population estimate of mature individuals for Rock Shags, we were unable to consider which cells might meet KBA Criterion D1a ('Demographic aggregations) for birds during the breeding period

Next Steps

The Key Biodiversity Areas being proposed from this project were very heavily based on records of where assessed species have been positively identified as present, and for which abundance records exist. With this type of data we have not attempted to model distribution of species in areas where there is little or no information on the species being assessed. In areas beyond our records, further work will be needed to determine whether a species may actually be absent or presence is unrecorded simply because the coastline is un-surveyed. This means our assessment is conservative and it is worth noting there may be other significant areas for these species which the current data are unable to show. New data are continually becoming available which will need incorporating into further analyses.

Next step: forthcoming data should be incorporated into future assessments.

More immediately it will be important to determine if there are any justifications for altering the boundaries of the current proposals to facilitate management/decision-making. This may include alignment with existing management boundaries where this would not compromise the results of the assessment.

Next step: consider proposed overall KBA boundaries for optimising decision-making or management effectiveness

Our conservative approach means that the proposed KBAs are primarily associated with marine areas around breeding locations. Clearly birds may re-congregate at important feeding locations such as on shallow reefs or other areas with relevant oceanographic features. These sites may be equally important for biodiversity, but would require additional data and analyses to support their identification.

Next step: consider how to identify and survey for other important functional areas for seabirds

Although data for Magellanic Penguins did not meet the criteria for globally recognised KBAs, and Rock and Imperial Shags could not be assessed, the data generated can still be used to inform marine management/MSP and areas of significance at a national level. If population estimates eventually become available for Rock and Imperial shags in the future, it is very likely the populations in the Falklands would meet the D1a aggregation criteria.

Next step: consider how to work towards global population estimates for Falklands shag species.

References

- Critchley, E. J., Grecian, W. J., Bennison, A., Kane, A., Wischnewski, S., Cañadas, A., et al. (2019). Assessing the effectiveness of foraging radius models for seabird distributions using biotelemetry and survey data. *Ecography (Cop.).* 42, 1–13. doi:10.1111/ecog.04653.
- Critchley, E. J., Grecian, W. J., Kane, A., Jessopp, M. J., and Quinn, J. L. (2018). Marine protected areas show low overlap with projected distributions of seabird populations in Britain and Ireland. *Biol. Conserv.* 224, 309–317. doi:10.1016/j.biocon.2018.06.007.
- González-Solís, J., Croxall, J. P., and Briggs, D. R. (2002). Activity patterns of giant petrels, Macronectes spp., using different foraging strategies. *Mar. Biol.* 140, 197–204. doi:10.1007/s002270100684.
- Granadeiro, J. P., Campioni, L., and Catry, P. (2017). Albatrosses bathe before departing on a foraging trip: Implications for risk assessments and marine spatial planning. *Bird Conserv. Int.* 28, 208–215. doi:10.1017/S0959270916000459.
- Grecian, W. J., Witt, M. J., Attrill, M. J., Bearhop, S., Godley, B. J., Grémillet, D., et al. (2012). A novel projection technique to identify important at-sea areas for seabird conservation: An example using Northern gannets breeding in the North East Atlantic. *Biol. Conserv.* 156, 43–52. doi:10.1016/j.biocon.2011.12.010.
- Handley, J., Rouyer, M. M., Pearmain, E. J., Warwick-Evans, V., Teschke, K., Hinke, J. T., et al. (2021).
 Marine Important Bird and Biodiversity Areas for Penguins in Antarctica, Targets for
 Conservation Action. *Front. Mar. Sci.* 7. doi:10.3389/fmars.2020.602972.
- Masello, J. F., Wikelski, M., Voigt, C. C., and Quillfeldt, P. (2013). Distribution Patterns Predict Individual Specialization in the Diet of Dolphin Gulls. *PLoS One* 8. doi:10.1371/journal.pone.0067714.
- Oppel, S., Bolton, M., Carneiro, A. P. B., Dias, M. P., Green, J. A., Masello, J. F., et al. (2018). Spatial scales of marine conservation management for breeding seabirds. *Mar. Policy* 98, 37–46. doi:10.1016/j.marpol.2018.08.024.
- White, R. W., Gillon, K. W., Black, A. D., and Reid, J. (2002). The distribution of seabird and marine mammals in Falkland Islands waters. Available at: http://marefateadyan.nashriyat.ir/node/150.
- Woods, R. W., and Woods, A. (1997). *Atlas of breeding birds of the Falkland Islands*. Owestry: Anthony Nelson.