Arctic Tern *Sterna paradisaea*

Summary

Arctic Tern is projected to decline considerably in population size in the INTERREG VA area from 1998-2002 to 2050 under climate change, particularly in the south. Overall, Arctic Tern is projected (with moderate confidence) to have high vulnerability under climate change in the INTERREG VA area.

Table 1. Current (observed) and future (projected) Arctic Tern population size (breeding pairs) in GB & Ireland, INTERREG VA area and MarPAMM management areas.

Area	1998-2002	Projection for 2050	
GB & Ireland	48469	12170	↓-75%
INTERREG VA area	7131	1524	↓-79%
Argyll	1851	313	↓-83%
Co. Down – Co. Louth	764	69	↓-91%
N Coast Ireland – N Channel	61	8	↓-87%
Outer Hebrides	4125	1041	↓-75%

Under climate change, Arctic Tern **population size** is projected to **decline** considerably in the INTERREG VA area between 1998-2002 and 2050, at a slightly higher rate than across Britain and Ireland as a whole (Table 1, Fig. 2a).

Arctic Tern is projected to **decline** in **abundance** everywhere across the INTERREG VA area, but at a greater rate in the south (Fig. 2a). Some new sites may become slightly more suitable for Arctic Tern under climate change (Fig. 2b); therefore this projected decline in abundance may be partially compensated for by colonisation.

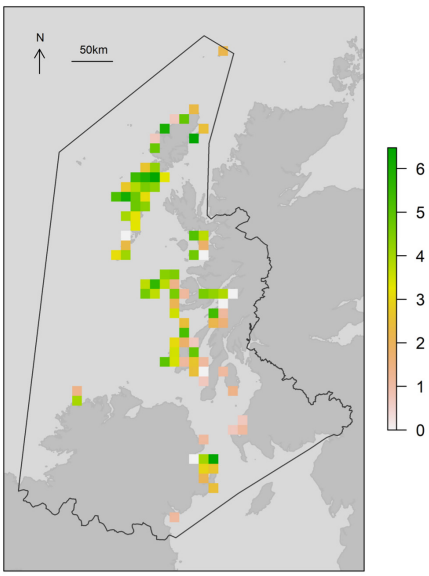

Figure 1. Observed Arctic Tern abundance (log breeding pairs), 1998-2002. Black polygon = INTERREG VA area.

This work was produced as part of the Marine Protected Area Management and Monitoring (MarPAMM) project. MarPAMM has been supported by the European Union's INTERREG VA Programme, managed by the Special EU Programmes Body.

Projected change in breeding pairs

Projected change in presence probability

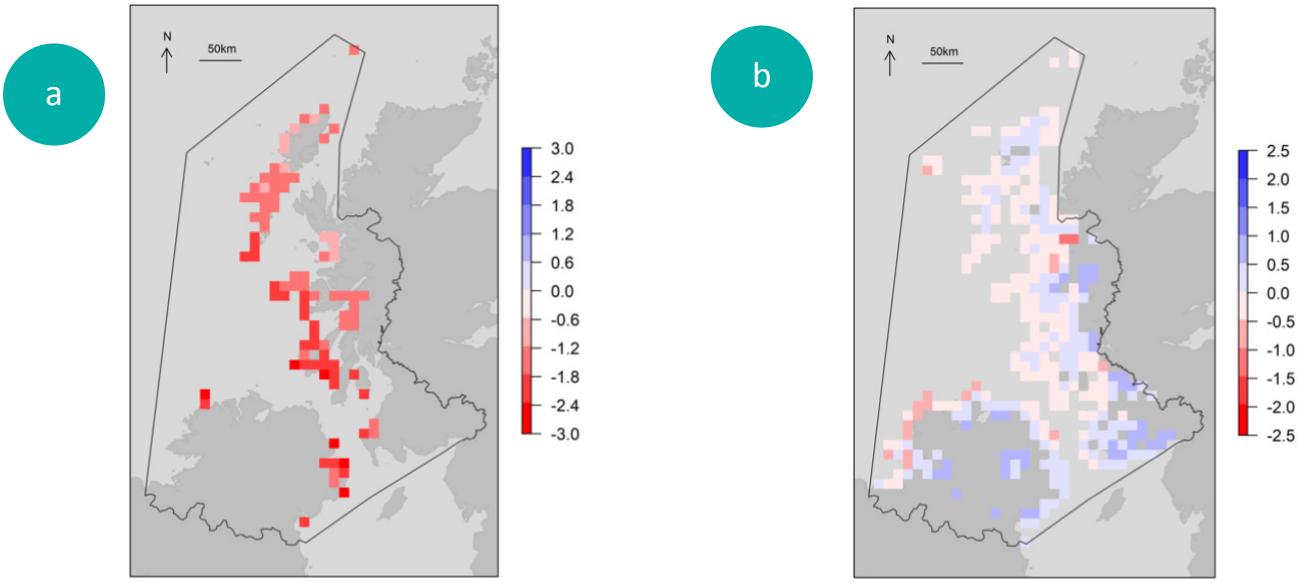

Figure 2. Projected change (1998-2002 to 2050; log proportional change) in: a) Arctic Tern breeding pairs, for all cells where Arctic Tern was present in 1998-2002; (b) Arctic Tern presence probability for all squares where any seabird was censused in 1985-1988 or 1998-2002. White/blue = increase, red = decrease. Black polygon = INTERREG VA area.

Model predictive power was excellent for the presence/absence component of the model, and moderate for the abundance component*. Arctic Tern presence/absence and abundance had significant relationships with terrestrial climate, oceanographic and nuisance variables (Table 2).

Table 2. Effect on presence and abundance for significant variables in model*. Variables included in table if significant in at least one model component; field left blank if variable not significant in that model component. Variables shown in parentheses represent quadratic terms. Projections made using full model (i.e. not just significant variables).

Variable	Presence	Abundance
Breeding season maximum temperature		-
Winter precipitation		-
(Winter precipitation)^2	-	+
Breeding season potential energy anomaly	+	
(Breeding season potential energy anomaly)^2		-
Bathymetry	-	
Bathymetry)^2		-
Distance inside coast	-	
Small islands area		+

Table 3. Projected change for Arctic Tern at the ten sites with the most breeding pairs in 1998-2002. Sites are as defined in Seabird 2000 census. Superscript denotes MarPAMM management region, where applicable: [A], Argyll; [B], Co. Down - Co. Louth; [C], North Coast Ireland - North Channel; [D], Outer Hebrides.

Site	Breeding pairs, 1998-2002 (count)	Projected breeding pairs, 2050 (median & 95% CI*)	Projected % change in breeding pairs (median & 95% CI*)
Copeland Island, Light House Island and Mew Islands[B]	650	53 (3, 490)	-91.9 (-99.6, -24.6)
Melbost – Lewis[D]	650	147 (12, 1120)	-77.4 (-98.2, +72.3)
North Uist[D]	624	158 (15, 1488)	-74.7 (-97.6, +138.4)
Monach Islands[D]	618	140 (7, 1542)	-77.3 (-98.9, +149.6)
Tiree[A]	491	80 (3, 904)	-83.7 (-99.4, +84.2)
Geile Sgeir – Lewis[D]	293	100 (6, 868)	-65.8 (-98.1, +196.2)
Islay – East (Port Askaig to Bowmore)[A]	238	23 (2, 207)	-90.5 (-99, -13.1)
South Uist[D]	223	55 (13, 309)	-75.5 (-94.3, +38.5)
Sound of Luing[A]	210	46 (2, 382)	-78 (-98.9, +81.9)
Coll[D]	178	35 (1, 342)	-80.1 (-99.2, +91.9)

* See main report for details of modelling, variables, categories of model predictive power and derivation of confidence intervals for projections.

Climate Change Mechanisms

The review of climate change mechanisms affecting seabirds (Johnston et al. 2021) identified largely indirect effects of climate on the demographic parameters of terns as a group. For Arctic Tern in particular, breeding phenology and its variation are related to both spring NAO and spring air temperatures.

Overall, climate change is projected (with **moderate confidence**) to present Arctic Tern with **very high risk** and **low opportunity** in the INTERREG VA area.

Citation: Arctic Tern species factsheet. From Davies, J.G., Humphreys, E.M. & Pearce-Higgins, J.W. 2021. Projected future vulnerability of seabirds within the INTERREG VA area to climate change. Report to Agri-Food and Biosciences Institute and Marine Scotland Science as part of the MarPAMM Project. BTO, Thetford

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www.mpa-management.eu