Black-legged Kittiwake *Rissa tridactyla*

Summary

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

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

Area	1998-2002	Projection for 2050
GB & Ireland	415994	192333 ↓-54%
INTERREG VA area	54388	28475 ↓-48%
Argyll	8974	4326 ↓-52%
Co. Down – Co. Louth	453	298 ↓-34%
N Coast Ireland – N Channel	18335	11804 ↓-36%
Outer Hebrides	21152	9606 ↓-55%

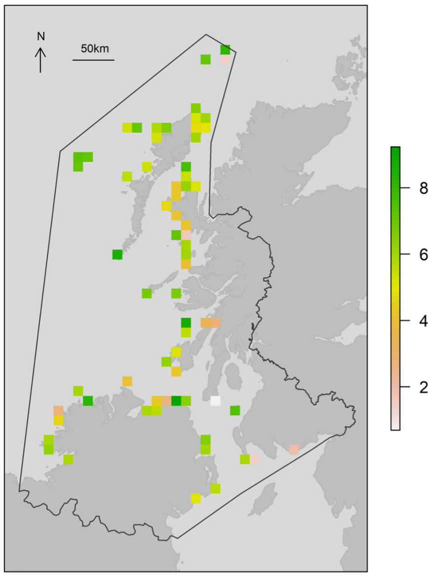

Figure 1. Observed Black-legged Kittiwake abundance (log breeding pairs), 1998-2002. Black polygon = INTERREG VA area.

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

Black-legged Kittiwake is projected to **decline** in **abundance** everywhere across the INTERREG VA area, but at a greater rate in the Inner Hebrides (Fig. 2a). It is unlikely that new sites will become more suitable for Black-legged Kittiwake under climate change (Fig. 2b); therefore this projected decline in abundance is unlikely to be compensated for by colonisation.

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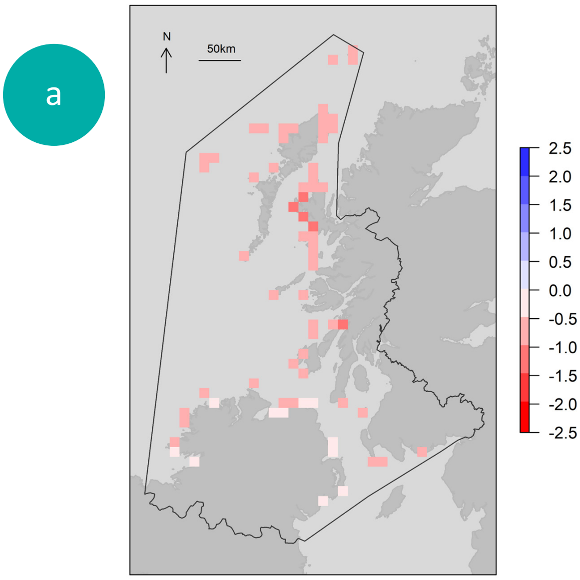
Projected change in breeding pairs



Projected change in presence probability

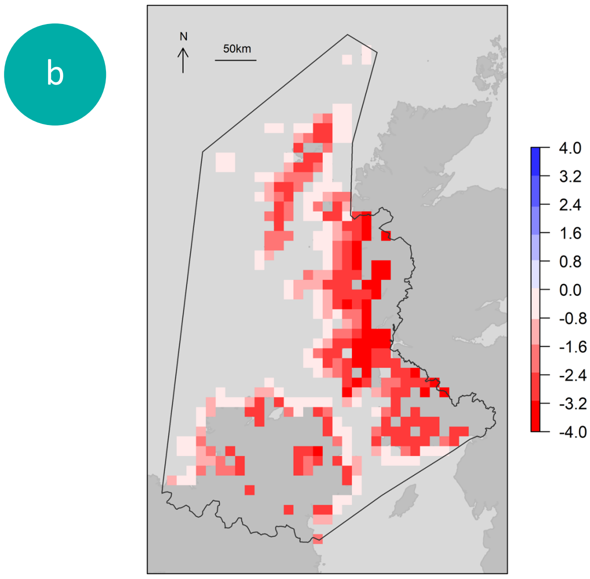


Figure 2. Projected change (1998-2002 to 2050; log proportional change) in: a) Black-legged Kittiwake breeding pairs, for all cells where Black-legged Kittiwake was present in 1998-2002; (b) Black-legged Kittiwake presence probability for all squares where any seabird was censused in 1985-1988 or 1998-2002.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

Model predictive power was good for the presence/absence component of the model, but poor for the abundance component*. Black-legged Kittiwake presence/absence 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	-	
Breeding season precipitation	-	
Breeding season potential energy anomaly	+	
Winter potential energy anomaly	-	
Coast length	+	
Distance inside coast	-	

Table 3. Projected change for Black-legged Kittiwake 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*)
Rathlin Island (whole coastline and stacks)[C]	9917	6363 (1026, 28118)	-35.8 (-89.6, +183.5)
Isle of Colonsay[A]	6485	3127 (399, 15995)	-51.8 (-93.9, +146.6)
Horn Head[C]	3853	2532 (815, 7396)	-34.3 (-78.8, +92)
North Rona[D]	3398	1656 (164, 11984)	-51.3 (-95.2, +252.7)
Mingulay[D]	2898	1308 (147, 7159)	-54.9 (-94.9, +147)
Berneray[D]	2613	1179 (132, 6455)	-54.9 (-94.9, +147)
Shiant Islands[D]	2006	849 (182, 2903)	-57.7 (-91, +44.7)
Ailsa Craig	1675	800 (88, 5316)	-52.2 (-94.7, +217.4)
Flannan Isles[D]	1392	650 (59, 5259)	-53.3 (-95.7, +277.8)
Butt of Lewis to Gress – Lewis[D]	1391	639 (108, 3311)	-54.1 (-92.2, +138)

* 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 both indirect and direct effects of climate on Black-legged Kittiwake productivity, phenology and survival. Many Black-legged Kittiwake populations are highly reliant on sandeel populations, which are affected by SST and winter NAO due to these variables' effects on the spring plankton bloom. However, the effects of SST and NAO on Black-legged Kittiwake breeding success and survival has not always been consistent across colonies, and may be contingent on the availability of alternative prey sources. Black-legged Kittiwake nesting on exposed cliffs are also susceptible to storms washing eggs or chicks from exposed cliffs.

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

Citation: Black-legged Kittiwake 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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