

## Supplement

**Title:** Marine mammal hotspots in the Greenland and Barents Seas

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### MATERIALS AND METHODS

#### Tagging information

Ringed seals *Pusa hispida* in Northeast Greenland were captured with nets set from shore and equipped with tags manufactured by Wildlife Computers (n=10; Redmond, WA, USA) and Sea Mammal Research Unit Instrumentation (n=10; SMRU, St Andrews, Scotland).

Walruses *Odobenus rosmarus* in Svalbard were captured as in Lowther et al. (2015). They were equipped with custom-made GPS loggers (n=33; SirTrack, Havelock North, Hawkes Bay, New Zealand) attached to one of the tusks. Walruses in East Greenland were captured and tagged as in Dietz et al. (2014), with 18 tags manufactured by Wildlife Computers.

Harp seals *Pagophilus groenlandicus* pups were captured using methods described in Folkow et al. (2004). They were equipped with tags manufactured by Wildlife Computers (n=10) and SMRU (n=10).

Biotelemetry tags were deployed on blue whales *Balaenoptera musculus* (n=10), fin whales *Balaenoptera physalus* (n=6) and humpback whales *Megaptera novaeangliae* (n=10) using the same methods as described in Heide-Jørgensen et al. (2001) and Kovacs et al. (2020a).

### LITERATURE CITED

- Dietz R, Born EW, Stewart REA, Heide-Jørgensen MP and others (2014) Movements of walruses (*Odobenus rosmarus*) between central west Greenland and southeast Baffin Island, 2005-2008. NAMMCO Sci Publ 9: 53-74 <https://doi.org/10.7557/3.2605>
- Folkow LP, Nordøy ES, Blix AS (2004) Distribution and diving behaviour of harp seals (*Pagophilus groenlandicus*) from the Greenland Sea stock. Polar Biol 27: 281-298 <https://doi.org/10.1007/s00300-004-0591-7>
- Heide-Jørgensen MP, Kleivane L, Øien N, Laidre KL, Jensen MV (2001) A new technique for deploying satellite transmitters on baleen whales: tracking a blue whale (*Balaenoptera musculus*) in the North Atlantic. Mar Mamm Sci 17: 949-954 <https://doi.org/10.1111/j.1748-7692.2001.tb01309.x>
- Lowther AD, Kovacs KM, Griffiths D, Lydersen C (2015) Identification of motivational state in adult male Atlantic walruses inferred from changes in diving and movement behaviour. Mar Mamm Sci 31: 1291-1313. <https://doi.org/10.1111/mms.12224>

Table S1. Maximum speed ( $v_{\max}$ ;  $\text{ms}^{-1}$ ) used for the Douglas-Argos filter (walruses from East Greenland) and the SDA filter (all other species) for each of the 13 marine mammal species tagged around Svalbard and eastern Greenland between 2005 and 2019

Species	$v_{\max}$ ( $\text{ms}^{-1}$ )
Ringed seals	2
Bearded seals	2
Harbour seals	2
Walruses	2.8 <sup>a</sup>
Harp seals	5
Hooded seals	5
Polar bears	3
Bowhead whales	- <sup>b</sup>
Narwhals	15
White whales	8
Blue whales	- <sup>b</sup>
Fin whales	- <sup>b</sup>
Humpback whales	10

<sup>a</sup>The SDA filter was not used for walruses from Svalbard because their tags reported GPS locations

<sup>b</sup>The SDA filter was not used due to overly conservative results

Table S2. Distance where the global Getis-Ord  $G_i^*$  statistic was maximized for each, and all species, for the 13 marine mammal species tagged around Svalbard and Northeast Greenland between 2005 and 2019

Species	Annual	Summer (Jun-Dec)	Winter (Jan-May)
Ringed seals	30 km	30 km	40 km
Bearded seals	30 km	20 km	30 km
Harbour seals	30 km	20 km	30 km
Walruses	20 km	30 km	30 km
Harp seals	30 km	30 km	40 km
Hooded seals	30 km	30 km	30 km
Polar bears	40 km	30 km	30 km
Bowhead whales	30 km	30 km	40 km
Narwhals	20 km	20 km	30 km
White whales	20 km	20 km	30 km
Seasonally resident whales	30 km	30 km	NA
All species	40 km	30 km	40 km

Table S3. Amount of overlap (%) between areas of high species richness (4+ species for summer/autumn and annual data and 2+ species for winter/spring data) and high Getis-Ord  $G_i^*$  hotspots levels (95% and 99%)

	<b>Individual hotspots</b>	<b>Location hotspots</b>
Annual	90%	36%
Summer/autumn	83%	30%
Winter/spring	75%	45%

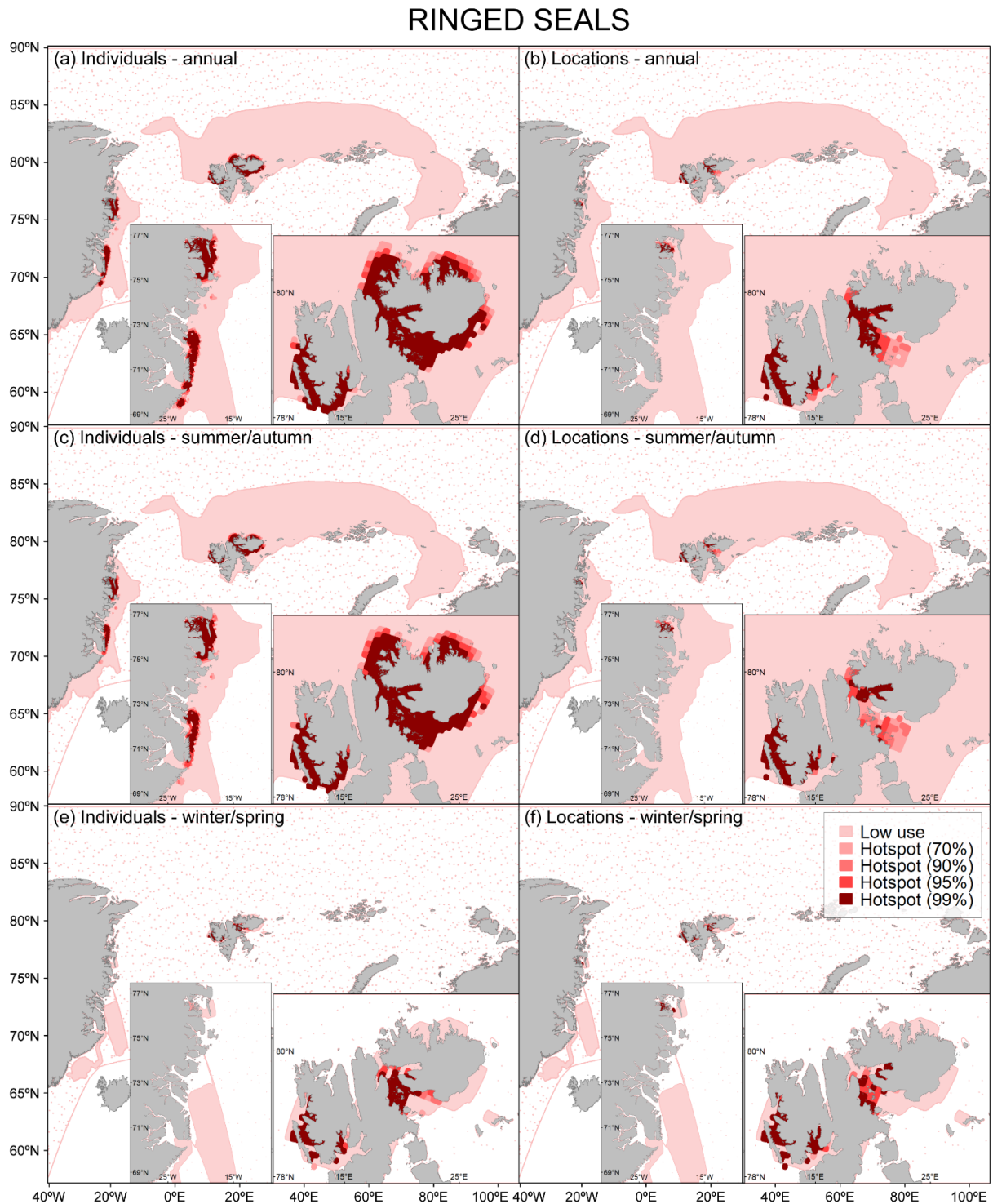


Fig. S1. Getis-Ord  $G_i^*$  hotspots for 73 ringed seals tagged around Svalbard and Northeast Greenland when the analyses are run for both regions combined instead of for each region separately (see Fig. 3). Individual hotspots are shown in a, c, e and location hotspots are shown in b, d, f over (a, b) the entire year, (c, d) during the summer/autumn and (e, f) during the winter/spring. Inset maps show hotspots in eastern Greenland (left) and northern Svalbard (right). Increasing intensities of red indicate hotspots of different levels of statistical significance; the red dotted polygon shows the species' range

## WALRUSES

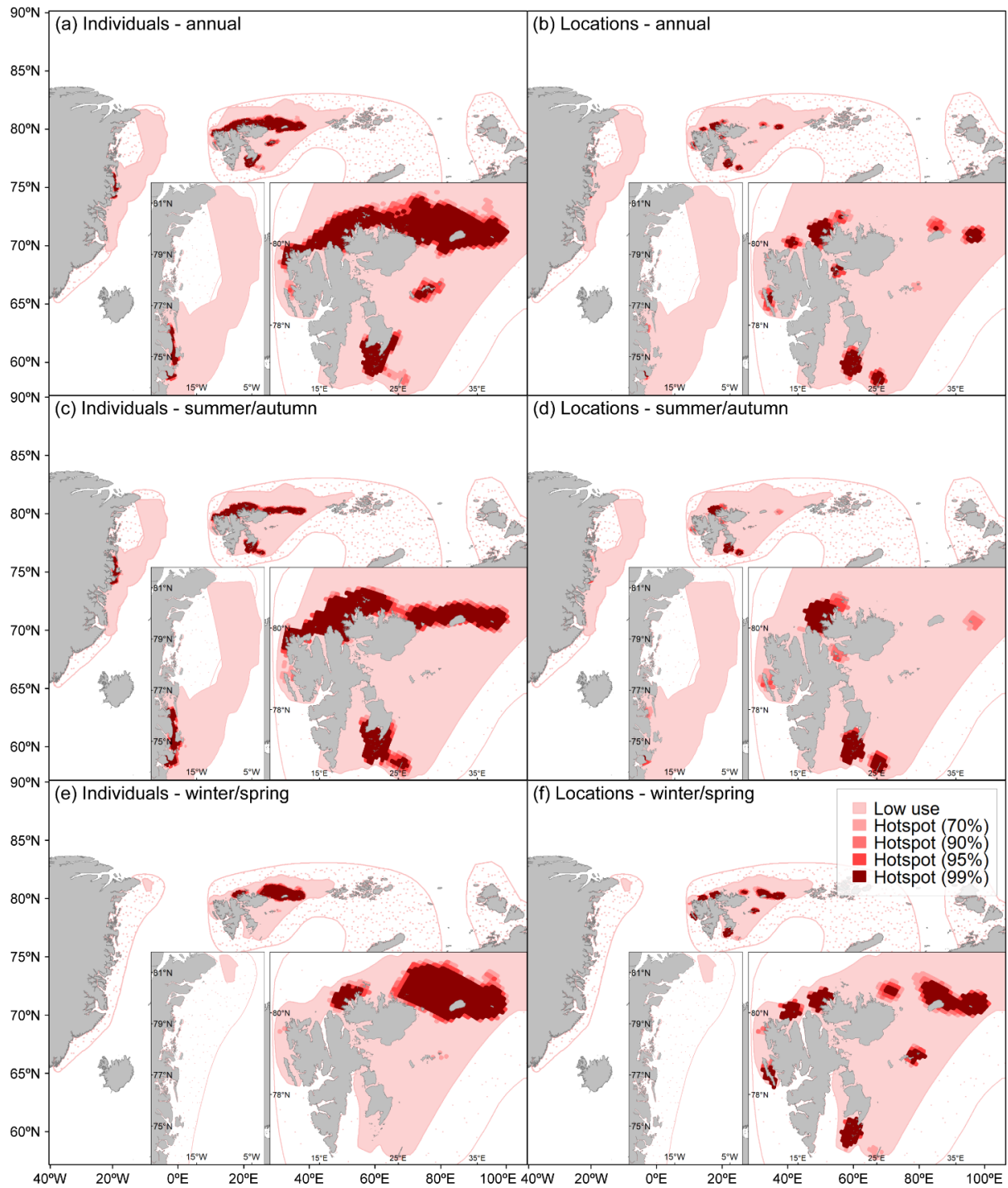


Fig. S2. Getis-Ord  $G_i^*$  hotspots for 51 walruses tagged around Svalbard and Northeast Greenland when the analyses are run for both regions combined instead of for each region separately (see Fig. 6). Individual hotspots are shown in a, c, e and location hotspots are shown in b, d, f over (a, b) the entire year, (c, d) during the summer/autumn and (e, f) during the winter/spring. Increasing intensities of red indicate hotspots of different levels of statistical significance; the red dotted polygon shows the species' range

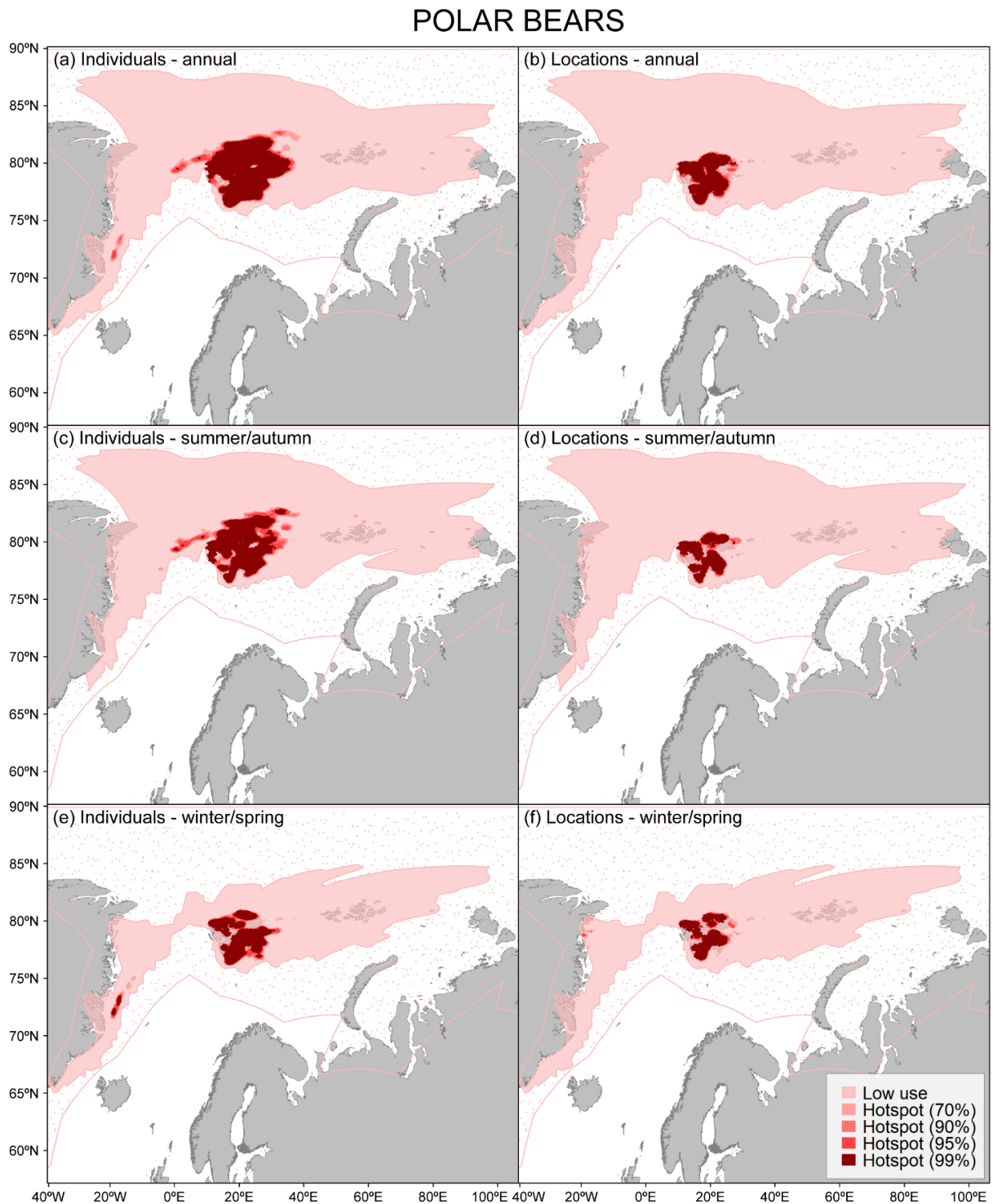


Fig. S3. Getis-Ord  $G_i^*$  hotspots for 235 polar bears tagged around Svalbard and Northeast Greenland when the analyses are run for both regions combined instead of for each region separately (see Fig. 9). Individual hotspots are shown in a, c, e and location hotspots are shown in b, d, f over (a, b) the entire year, (c, d) during the summer/autumn and (e, f) during the winter/spring. Increasing intensities of red indicate hotspots of different levels of statistical significance; the red dotted polygon shows the species' range

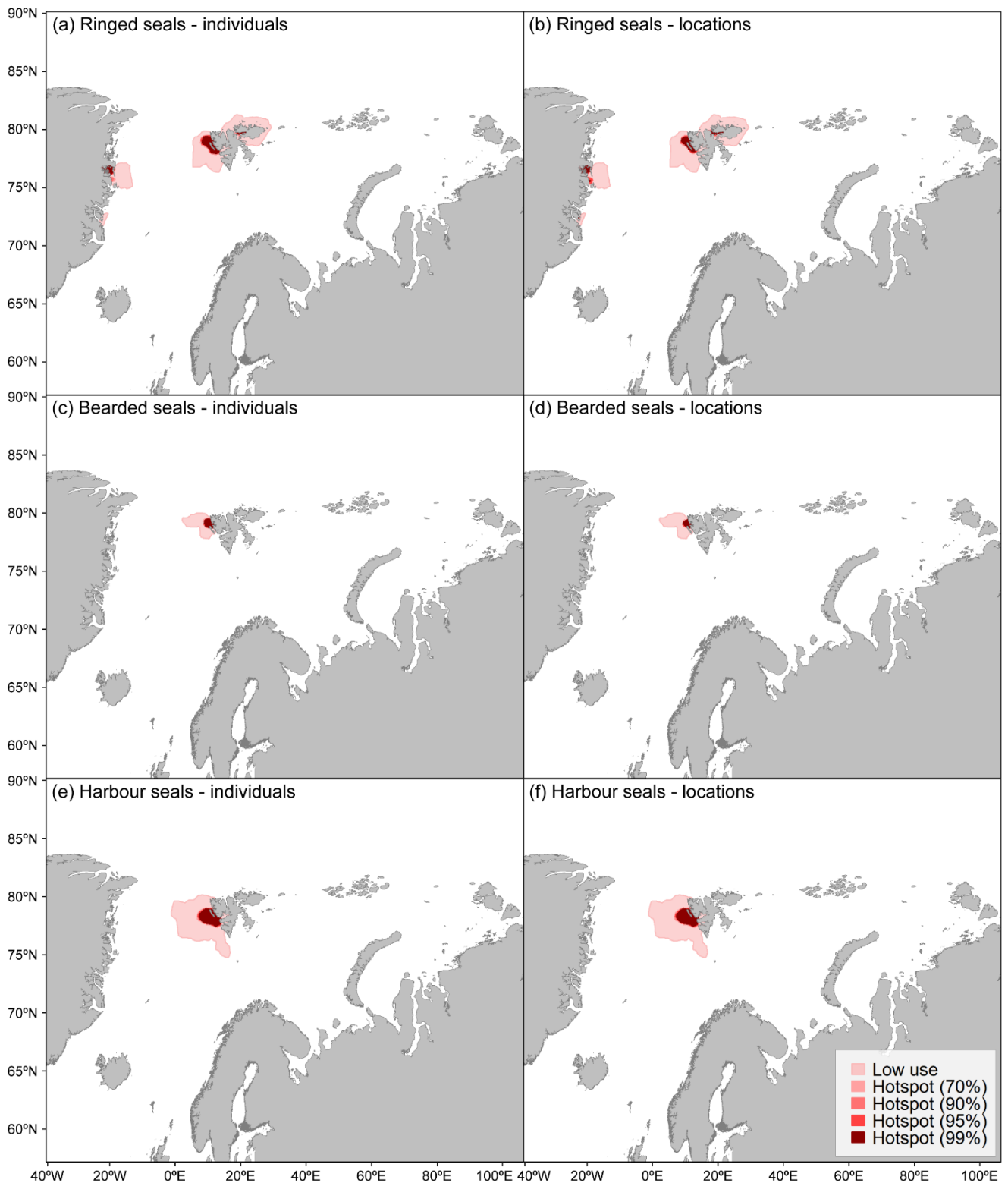


Fig. S4. Null models for Getis-Ord  $G_i^*$  (a, c, e) individual hotspots and (b, d, f) location hotspots for (a, b) ringed seals, (c, d) bearded seals and (e, f) harbour seals based on simulated correlated random walks for each species. Increasing intensities of red indicate hotspots of different levels of statistical significance

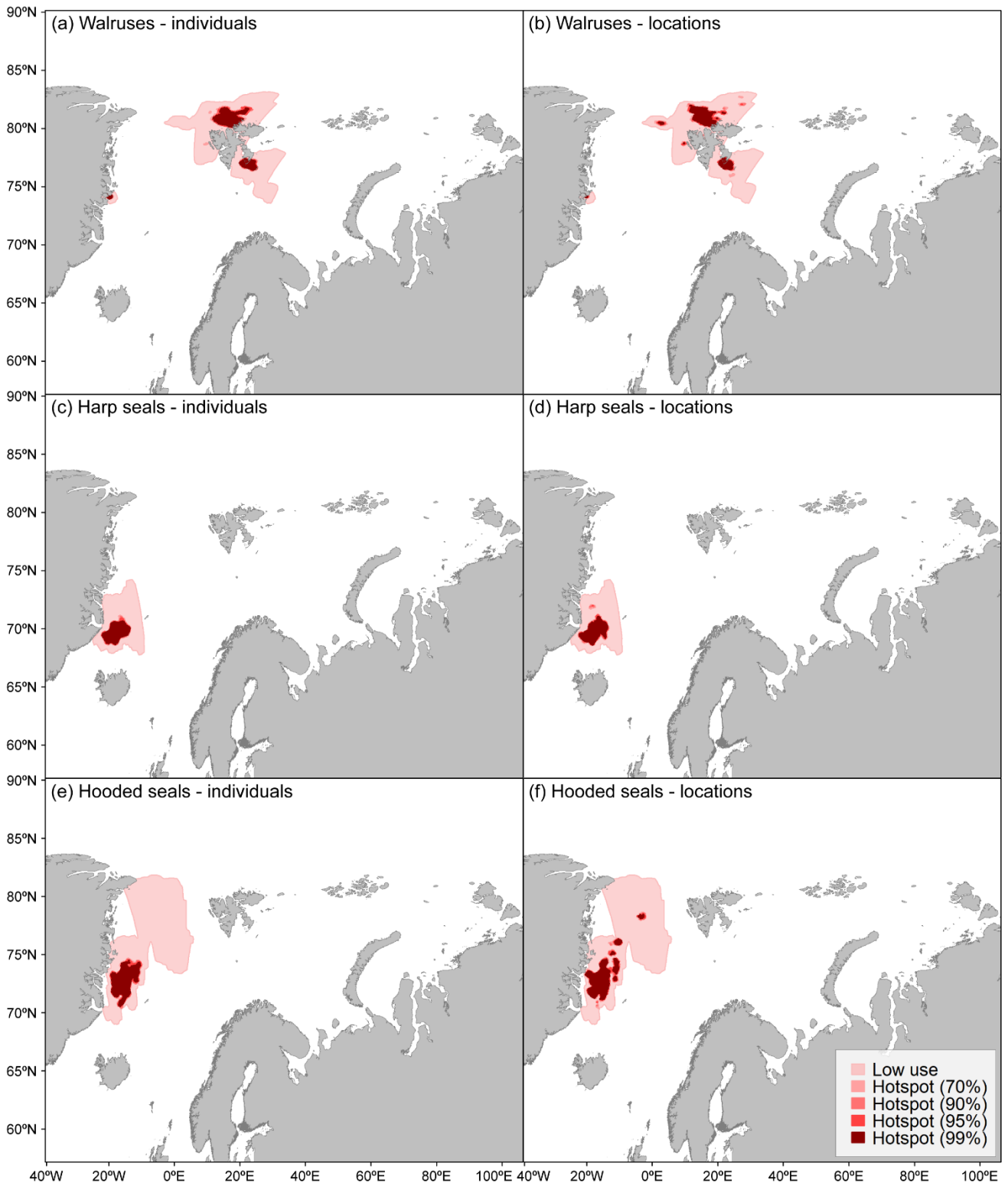


Fig. S5. Null models for Getis-Ord  $G_i^*$  (a, c, e) individual hotspots and (b, d, f) and location hotspots for (a, b) walrus, (c, d) harp seals and (e, f) hooded seals based on simulated correlated random walks for each species. Increasing intensities of red indicate hotspots of different levels of statistical significance



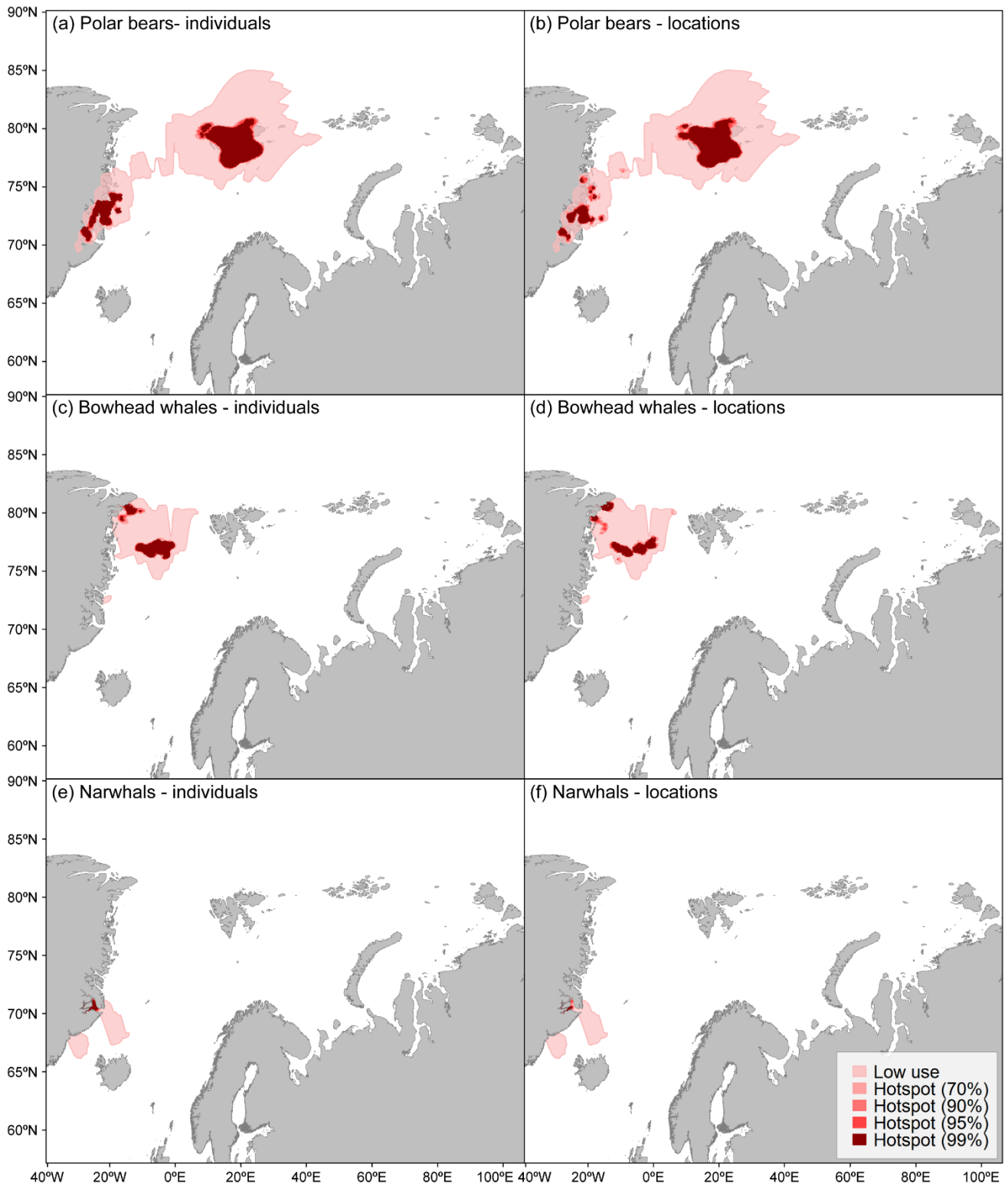


Fig. S6. Null models for Getis-Ord  $G_i^*$  (a, c, e) individual hotspots and (b, d, f) and location hotspots for (a, b) polar bears, (c, d) bowhead whales and (e, f) narwhals based on simulated correlated random walks for each species. Increasing intensities of red indicate hotspots of different levels of statistical significance

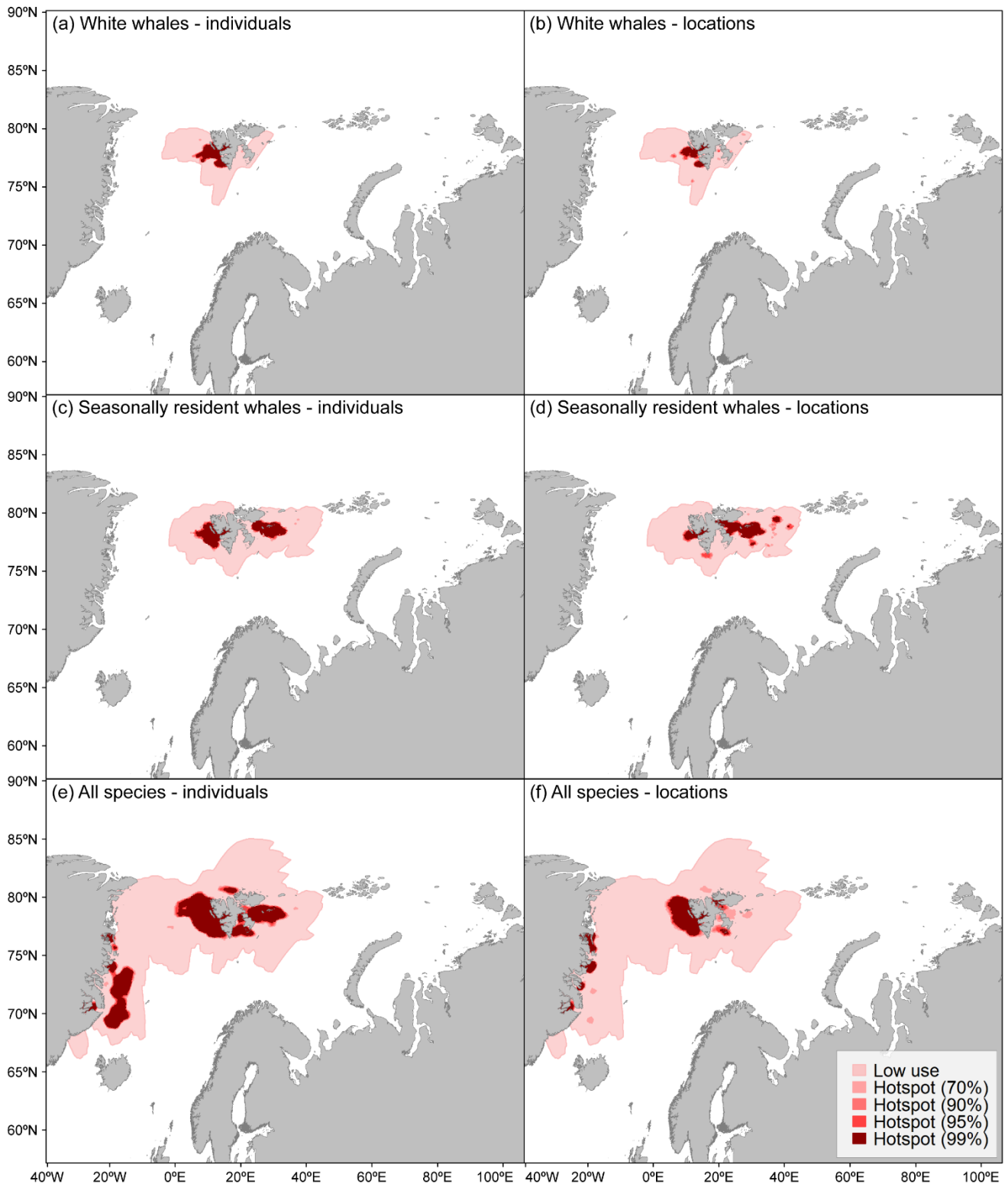


Fig. S7. Null models for Getis-Ord  $G_i^*$  (a, c, e) individual hotspots and (b, d, f) location hotspots for (a, b) white whales, (c, d) seasonally resident whales and (e, f) all species based on simulated correlated random walks for each species. Increasing intensities of red indicate hotspots of different levels of statistical significance

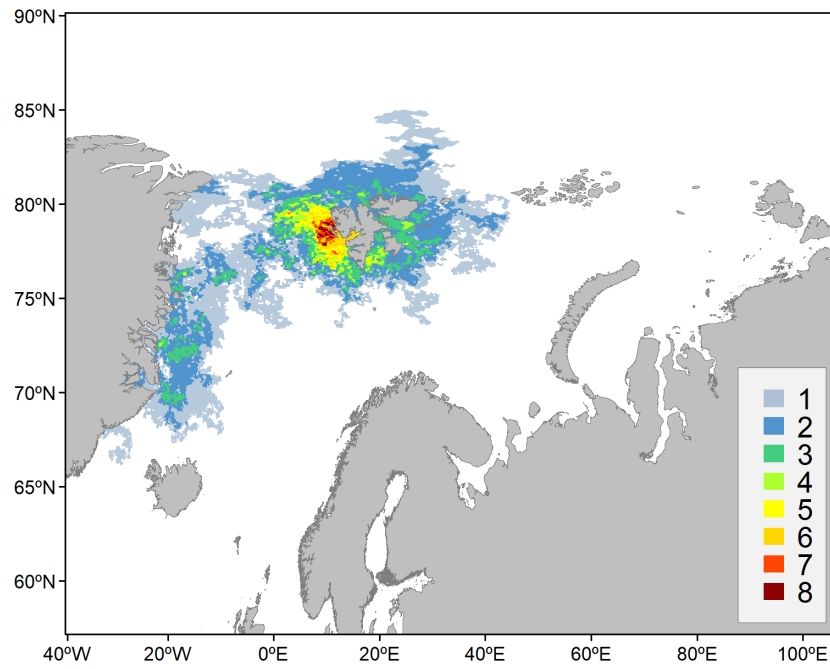


Fig. S8. Null model of species richness for 13 marine mammals in the Greenland and Barents Sea region based on simulated correlated random walks for each species