Antarctic Krill: Past and future

To consider how scientific understanding of the South Georgia Maritime Zone has developed since 2013.

To provide any initial evidence-based assessment of the effectiveness of current management measures and advice on the degree to which evidence might support any revisions to management measures.


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Sardine cycles, krill declines, and locust plagues: revisiting ‘wasp-waist’ food webs

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Key:
- Red: Antarctic krill
- Green: Desert locust
- Black: Key copepod species
- Blue: Japanese sardine

Log₁₀ (abundance)

Year

TRENDS in Ecology & Evolution
Is current management of the Antarctic krill fishery in the Atlantic sector of the Southern Ocean precautionary?

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Conservative biomass estimate
Subarea catch limit

1000,000 tonnes


Catch


48.3

1000,000 tonnes
Potential Climate Change Effects on the Habitat of Antarctic Krill in the Weddell Quadrant of the Southern Ocean

Simeon L. Hill¹, Tony Phillips¹, Angus Atkinson²

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![Graph showing SST anomaly (°C) over time from 2000 to 2100.](image)

![Maps showing CMIP5 experiment RCP26 mean Jan-Mar SST difference between 2070-2099 and 1991-2020.](image)

![Maps showing CMIP5 experiment RCP85 mean Jan-Mar SST difference between 2070-2099 and 1991-2020.](image)
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![Graph showing SST anomaly (°C) from 2000 to 2100 for RCP2.6, RCP4.5, and RCP8.5]

![Maps showing observed chlorophyll at 50%, 50% reduction, and 50% increase for each RCP scenario]

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[Images of Antarctic regions with color gradients indicating SST anomaly and chlorophyll change]
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Impacts of rising sea temperature on krill increase risks for predators in the Scotia Sea

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Impacts of rising sea temperature on krill increase risks for predators in the Scotia Sea

Krill

Penguins

Seals

Proportion of biomass (A) and abundance (B, C) in reference scenario

Small-scale management unit (SSMU)

Antarctic Peninsula  S. Scotia Sea  N. Scotia Sea

% initial individual krill weight

RCP 2.0  RCP 8.5
Can reducing **regional catch limits** help to alleviate the effects of climate change?
The paper examines the combined risks of climate change and fishing at the catch limit, at the regional scale (subareas 48.1 to 48.3).

It does not evaluate any specific proposals about the management of the SGSSI MPA.

But the model could be adapted to evaluate such proposals.

This would need:

Inclusion of the SSI (48.4),
Alignment of seasons,
(model winter = April-Sept, krill fishery open April-Oct).
Realistic representation of current catches.

<table>
<thead>
<tr>
<th>SSMU</th>
<th>Summer (t)</th>
<th>Winter (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>SGW</td>
<td>572</td>
</tr>
<tr>
<td>15</td>
<td>SGE</td>
<td>2,005</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To consider how scientific understanding of the South Georgia Maritime Zone has developed since 2013.

Increased understanding of vulnerability to climate change: SG in particular is in an area of significant projected warming, which is likely to stress cold water organisms such as krill and, consequently, their predators.

Past dynamics show that significant changes can occur on decadal timescales.

To provide any initial evidence-based assessment of the effectiveness of current management measures and advice on the degree to which evidence might support any revisions to management measures.

Krill catch limits and realised catches remain low relative to conservative estimates of krill stock size.

Reducing krill catch limits at the regional scale will not offset the potential effects of climate change (RCP 8.5). Targeted measures to protect vulnerable populations might help. Evaluation of proposed measures is feasible.