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Fisheries New Zealand
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High risk areas discussion paper

New Zealand

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1 Background

The CCSBT Multi-Year Seabird Strategy (MYSS) was adopted at CCSBT 26, with strategic actions adopted at CCSBT 27. The MYSS relies heavily on the use of spatially explicit fisheries risk assessment (SEFRA) to complete the identified actions of the Action Plan and ultimately to meet the objectives of the MYSS. For example:

- **Action 1A** – To agree on a SBT seabird bycatch target for reducing the level of impact of SBT fishing operations on seabird populations, including, but not limited to: (a) targets based on nominal reported seabird bycatch rates, and (b) targets based on SEFRA outputs.

- **Action 1D** – Agree on the list of priority species and corresponding management targets, taking into account the status of seabird population, distributional overlaps with SBT fisheries, and significance of SBT fisheries in their mortality.

- **Action 1E** – Update SEFRA seabird risk assessment to evaluate the progress in seabird bycatch mitigation by SBT fisheries and their impacts on seabird populations from the previous assessment in 2019.

- **Action 1F** – Establish a robust definition of high risk areas that takes into account the precautionary approach - by: a. Establishing a definition of high-risk areas. b. Identifying areas that meet the definition. c. Characterising the nature of the risk in each area. d. Developing tailored measures aimed at reducing those risks.

- **Action 3D** – Assess the cumulative impacts of fishing for SBT on seabirds, particularly threatened albatross and petrel species, across tuna RFMOs including developing methods for extrapolating seabird bycatch levels and seabird bycatch rates to identify total mortalities and total mortality rates.

All these Actions are highly dependent on the application of the SEFRA and the subsequent interpretations of its outputs. However, to enable accurate interpretations of the SEFRA outputs to achieve the identified Actions, specific and robust definitions of various terms within each of these Actions, including ‘priority species’ and ‘high risk areas’, are required. Having an agreed definition of ‘high risk areas’ will also avoid imposing a potentially unnecessary burden on operators. Identifying specific areas of high risk to seabirds would enable management responses to be tailored to the individual drivers of risks.

Discussion of ‘high risk areas’ and risk assessments in past ERSWG meetings:

- During the 11th meeting of the Ecologically Related Species Working Group (ERSWG), members agreed to ‘address the definition of ‘high risk areas’ through discussion of papers presented at ERSWG12’. This task was put forward to reflect both the recognised risk to seabirds posed by this fishery and the need to direct limited resources to areas of greatest need.

- During the 12th meeting of the ERSWG, members agreed to apply ‘option 3A’, using the sum of the risk ratios for all species included, as the preferred method to undertake analysis of ‘high risk areas’ to seabirds.[1] To note, ‘the group agreed that this analysis should not prejudice further discussion surrounding the definition of ‘high risk areas’ or the potential application of remedies.’

[1] CCSBT-ERS/1703/13 or CCSBT-ERS/1905/BGD4.

- During the 13th meeting of the ERSWG, the group agreed that the high-risk areas analysis should be incorporated into the SEFRA analysis. The group tabulated the options for potential high-risk areas and their trade-offs.

- During the 14th meeting of the ERSWG, New Zealand presented the methodology and data inputs for the updated SEFRA. Japan and Australia indicated that collaboration among Members should be continued with the next round of SEFRA, in the areas of data contribution, model development and examination of model robustness. A schedule for intersessional engagement was presented to, and subsequently adopted by, the 29th meeting of the Commission.
- Intersessional ERSWG technical meetings to conduct a Southern Hemisphere SEFRA using CCSBT Member data occurred in June 2023 and February 2024, with two virtual follow-up meetings between March – May 2024 to finalize model inputs and draft the final report.

2 Introduction

This paper builds on the results of previous discussions, including the preferred method (Option 3a – summing risk ratios) agreed to at ERSWG12. Reaching agreement on an appropriate method to use in identifying risk (SEFRA) was a necessary first step towards a definition oh 'high risk areas.' Having agreed on the most appropriate methodology to apply, Members now need to agree on what level of relative mortality identified under the SEFRA can be considered 'high.' This discussion will also naturally contribute to definitions of 'priority species.'

In this paper, key considerations for identifying 'high risk areas' are identified, and then options are proposed for the identification of both 'priority species' and through this, 'high risk areas.' The Options proposed below are essentially different iterations of the same process, using variable parameters to examine the outputs through various lenses. New Zealand invites the group to consider the four proposals in terms of the potential impact on at-risk seabird species and fishing effort.

New Zealand notes there is uncertainty and limitations in the application of the SEFRA model. However, at this stage, the best available information and the most sophisticated methods have been used in the current collaborative assessment in identifying risk to seabirds. The results have shown applicable and relevant outcomes in terms of CCSBT member fishing effort and the potential impact on at-risk species.

Using its own judgement and expertise, the role of the ERSWG membership is to now consider the information presented and make a determination on the appropriate settings to apply in a CCSBT context that would, in turn, define 'high risk areas' and identify 'high priority species'. Any agreed recommendation from this group will need to be considered and endorsed by the Extended Scientific Committee and the Extended Commission. The group should consider the options presented in terms of which option is most appropriate for CCSBT and our shared objective of minimising the southern bluefin fishery's impact on seabirds.

3 Considerations

There were two considerations identified as being fundamental for these proposals. The first consideration is that areas identified as 'high risk' are relevant to CCSBT and the areas/fleets where fishing effort occurs. The second consideration is that areas identified as 'high risk' are beneficial to the most at-risk seabird species.

3.1 CCSBT EFFORT

The application of the SEFRA model considered here includes all surface longline fishing effort from the fleets of CCSBT Members countries and where available observer records of seabird bycatch. Proxies were used where Member observer/electronic monitoring data were unavailable.

Therefore, there may be gaps in the data of risk from other fleets specific risk to seabirds, and where there is significant cumulative risk to species from non-fisheries threats, other countries, Regional Fishery Management Organisations (RFMOs), and fishing methods not considered in the current assessment.

3.2 SEABIRD SPECIES

Any approach to identifying 'high risk areas' needs to consider the impact on the relative mortality for at-risk species to determine potential impacts of the proposed area and where measures may need to be extended so that the impact of CCSBT Members countries' surface longline fisheries are minimised. They also need to be put together in such a way that would not penalise against adding additional species to future assessments. Using a threshold-based approach on cumulative risk could make adding additional species unfavourable as they would increase the amount of risk in the model and potentially increase the size of any 'high risk areas' identified.

Given that management should be able to positively impact species' relative mortality scores within the 'high risk areas', the impact on species' risk scores outside the 'high risk areas' is considered along with their IUCN status.

4 Proposed options for 'high risk' areas

The proposed Options were developed by building on the quantitative risk assessment agreed to at ERSWG12 (Option 3a - summed risk ratio and realised risk). However, the scope was narrowed from previous iterations to focus on those species for which there is sufficient data to include in the model. For this approach, relative mortality was summarised by species and the resulting list was ordered by highest relative mortality, with the top three to five species selected for plotting (depending on the Option – see below) – these are the proposed 'priority species' based on the outcome of the SEFRA. Subsequently, the three to five grid cells with the highest relative mortality per species (i.e. the 'highest impact' grid cells) as identified by the SEFRA were selected. These two variables (top three to five species, and top three to five highest risk grid cells) were plotted together (see Section 4.1 and Appendix 1).

The objective of this proposal is not to identify a single option for all assessments, but instead to put forward a dynamic proposal that can be applied in this and future assessments.

To ensure that this proposed approach to defining 'high risk' areas aligns with the results of the current collaborative SEFRA assessment, Options 5-8 are provided which only consider those species groups where estimates of relative mortality were considered reliable. For the current assessment these were the wandering albatross and royal albatross species groups (see Section 4.2 and Appendix 2).

Further, a test examining the amount of relative mortality for all the species evaluated in the assessment and the effort from CCSBT Member countries' surface longline fisheries in the 'high risk area' was assessed for all Options to determine the impact of any management considerations.

4.1 ALL SPECIES

4.1.1 Option 1 – 'three by three'

'High risk areas' as identified using top three species and top three high risk grid cells are identified in **Figure 1**. The relative mortality for each of the 25 species considered is provided in **Table 1**. The top three species identified under this Option are Gibson's, Tristan, and sooty albatrosses, and their relative mortalities are 0.688, 0.440, and 0.414 respectively. The highest risk areas identified include areas in the Tasman Sea and areas to the west of South Africa. The 'high risk area' from this option would include 65%, 59% and 45% of the total risk to the top three species respectively, and 44% of the total risk to seabirds from CCSBT Members countries' surface longline fisheries. However, this option does not include any of the risk to Amsterdam albatross which has the fourth highest relative mortality score and is classified as endangered by the IUCN.

Effort in this 'high risk area' accounts for 1.2% of average yearly CCSBT Member countries' surface longline fisheries effort from 2019, with the three CCSBT Members countries with the highest effort in this area being Japan, Korea and Australia.

4.1.2 Option 2 – 'three by five'

'High risk areas' as identified using top three species and top five high risk grid cells are identified in **Figure** 1**2**. The relative mortality for each of the 25 species considered is provided in **Table 2**. Like Option 1, the top three species identified under Option 2 are Gibson's, Tristan, and sooty albatross, but their relative mortalities are 0.688, 0.440, and 0.414 respectively. The highest risk areas identified include areas in the Tasman Sea, areas north-east of New Zealand, and various areas off of the east and west of South Africa. The 'high risk area' from this option would include 73%, 69% and 55% of the total risk to the top three species respectively, and 52% of the total risk to seabirds from CCSBT Members countries' surface longline fisheries. However, this option does not include any of the risk to Amsterdam albatross which has the fourth highest relative mortality score and is classified as endangered by the IUCN.

Effort in this 'high risk area' accounts for 2.6% of average yearly CCSBT Member countries' surface longline fisheries effort from 2019, with the three CCSBT Members countries with the highest effort in this area being Japan, the Fishing Entity of Taiwan, and Korea.

4.1.3 Option 3 – 'five by three'

'High risk areas' as identified using top five species and top three high risk grid cells are identified in **Figure** 1**3**. The relative mortality for each of the 25 species considered is provided in **Table 3**. The top five species identified under Option 3 are Gibson's, Tristan, sooty, and Amsterdam albatrosses, and wandering albatross. Their relative mortalities are 0.688, 0.440, 0.414, 0.294, and 0.1524 respectively. The highest risk areas identified include areas in the Tasman Sea, various areas off of the east and west of South Africa, and areas in the south-central Indian Ocean. The 'high risk area' from this option would include 65%, 60%, 56%, 29% and 37% of the total risk to the top five species respectively, and 52% of the total risk to seabirds from CCSBT Members countries' surface longline fisheries. There are no species with a relative mortality in the top 10 or with an endangered or higher IUCN classification not included in the 'high risk area'.

Effort in this 'high risk area' accounts for 3.6% of average yearly CCSBT Member countries' surface longline fisheries effort from 2019, with the three CCSBT Members countries with the highest effort in this area being the Fishing Entity of Taiwan, Japan and Korea.

4.1.4 Option 4 – 'five by five'

'High risk areas' as identified using top five species and top five high risk grid cells are identified in **Figure** 1**4**. The relative mortality for each of the 25 species considered is provided in **Table 4**. The top five species identified under Option 4 are Gibson's, Tristan, sooty, Amsterdam, and wandering albatrosses, and their relative mortalities are 0.688, 0.440, 0.414, 0.294, and 0.152 respectively. The highest risk areas identified include areas in the Tasman Sea, areas north-east of New Zealand, various areas off of the east and west of South Africa, and areas in the south-central Indian Ocean. The 'high risk area' from this option would include 73%, 69%, 66%, 42% and 49% of the total risk to the top five species respectively, and 52% of the total risk to seabirds from CCSBT Members countries' surface longline fisheries. There are no species with a relative mortality in the top 10 or with an endangered or higher IUCN classification not included in the 'high risk area'.

Effort in this 'high risk area' accounts for 6.4% of average yearly CCSBT Member countries' surface longline fisheries effort from 2019, with the three CCSBT Member countries with the highest effort in this area being the Fishing Entity of Taiwan, Japan and Australia.

4.2 WANDERING AND ROYAL ALBATROSSES

Considering only species from the wandering albatross and royal albatross species groups still provides a basis for implementing this approach for defining 'high risk' areas. These two groups consist of only seven species but contribute 63% of the estimated cumulative relative mortality from all 25 species.

4.2.1 Option 5 – 'three by three'

'High risk areas' as identified using top three species and top three high risk grid cells are identified in **Figure 5**. The relative mortality for each of the 7 species considered is provided in **Table 5**. The top three species identified under this Option are Gibson's, Tristan, and Amsterdam albatrosses, and their relative mortalities are 0.688, 0.440, and 0.294 respectively. The highest risk areas identified include areas in the Tasman Sea, Indian ocean and areas to the west of South Africa. The 'high risk area' from this option would include 65%, 59% and 24% of the total risk to the top three species respectively, and 48% of the total risk to wandering and royal albatrosses from CCSBT Members countries' surface longline fisheries.

Effort in this 'high risk area' accounts for 2.1% of average yearly CCSBT Member countries' surface longline fisheries effort from 2019, with the three CCSBT Members countries with the highest effort in this area being Taiwan, Japan and Korea.

4.2.2 Option 6 – 'three by five'

'High risk areas' as identified using top three species and top three high risk grid cells are identified in **Figure 6**. The relative mortality for each of the 7 species considered is provided in **Table 6**. The top three species identified under this Option are Gibson's, Tristan, and Amsterdam albatrosses, and their relative mortalities are 0.688, 0.440, and 0.294 respectively. The highest risk areas identified include areas in north of New Zealand, the Tasman Sea, Indian ocean and areas to the west of South Africa. The 'high risk area' from this option would include 73%, 67% and 37% of the total risk to the top three species respectively, and 57% of the total risk to wandering and royal albatrosses from CCSBT Members countries' surface longline fisheries.

Effort in this 'high risk area' accounts for 3.2% of average yearly CCSBT Member countries' surface longline fisheries effort from 2019, with the three CCSBT Members countries with the highest effort in this area being Taiwan, Japan and Korea.

4.2.3 Option 7 – 'five by three'

'High risk areas' as identified using top five species and top three high risk grid cells are identified in **Figure 7**. The relative mortality for each of the 7 species considered is provided in **Table 7**. The top five species identified under this Option are Gibson's, Tristan, Amsterdam, wandering and Antipodean albatrosses, with relative mortalities of 0.688, 0.440, 0.294, 0.152 and 0.111 respectively. The highest risk areas identified include areas in northern New Zealand, the Tasman Sea, Indian ocean and areas to the west of South Africa. The 'high risk area' from this option would include 71%, 60%, 29%, 38% and 50% of the total risk to the top five species respectively, and 56% of the total risk to wandering and royal albatrosses from CCSBT Members countries' surface longline fisheries.

Effort in this 'high risk area' accounts for 3.8% of average yearly CCSBT Member countries' surface longline fisheries effort from 2019, with the three CCSBT Members countries with the highest effort in this area being Taiwan, Japan and Korea.

4.2.4 Option 8 – 'five by five'

'High risk areas' as identified using top five species and top five high risk grid cells are identified in **Figure 8**. The relative mortality for each of the 7 species considered is provided in **Table 8**. The top five species identified under this Option are Gibson's, Tristan, Amsterdam, wandering and Antipodean albatrosses, with relative mortalities of 0.688, 0.440, 0.294, 0.152 and 0.111 respectively. The highest risk areas identified include areas around New Zealand, the Tasman Sea, Indian ocean and areas to the east and west of South Africa. The 'high risk area' from this option would include 78%, 69%, 42%, 50% and 57% of the total risk to the top five species respectively, and 66% of the total risk to wandering and royal albatrosses from CCSBT Members countries' surface longline fisheries.

Effort in this 'high risk area' accounts for 6.5% of average yearly CCSBT Member countries' surface longline fisheries effort from 2019, with the three CCSBT Members countries with the highest effort in this area being Taiwan, Japan and Australia.

5 Defining 'high priority species'

The method described above intrinsically defines 'high priority species' as those species which are used to define the outputs of the model (i.e. the top three or five species used in each Option). These species were identified through summing of relative mortality by species and the resulting list was ordered by highest relative mortality, with the top three to five species selected for plotting. IUCN listing status was included in the tables to ensure transparency in consideration of the outputs and to ensure that the additional pressures on seabird species are also considered when deciding on the number of species and grid cells to use.

6 Discussion

New Zealand invites the group to consider the proposed Options and discuss which level of risk would be appropriate for CCSBT and our objectives in terms of minimising the SBT fishery's effect on ecologically related species.

New Zealand suggests only exploring those options in relation to the wandering and royal albatrosses given the outcomes from the current SEFRA. Additionally, New Zealand suggests Option 6 'three by five' as the preferred option as a starting point for discussion. This option accommodates the top three most at-risk species as well as the top five most high-risk grid cells for each species. This selection strikes a balance between including the

most impacted seabirds identified from the assessment while impacting only 3.2% percent of CCSBT Members countries' surface longline fisheries effort.

7 Next steps

Once an Option is selected, ERSWG Members may wish to discuss potential management actions to recommend to the ESC and ultimately to the Commission, for example, additional monitoring or requiring additional mitigation measures be used in high risk areas.

Additionally, New Zealand notes the importance of defining bycatch reduction targets under the goals and actions of the MYSS which the ERSWG may also wish to discuss and recommend next steps in the context of this discussion.

8 Appendix 1 – All species figures and tables

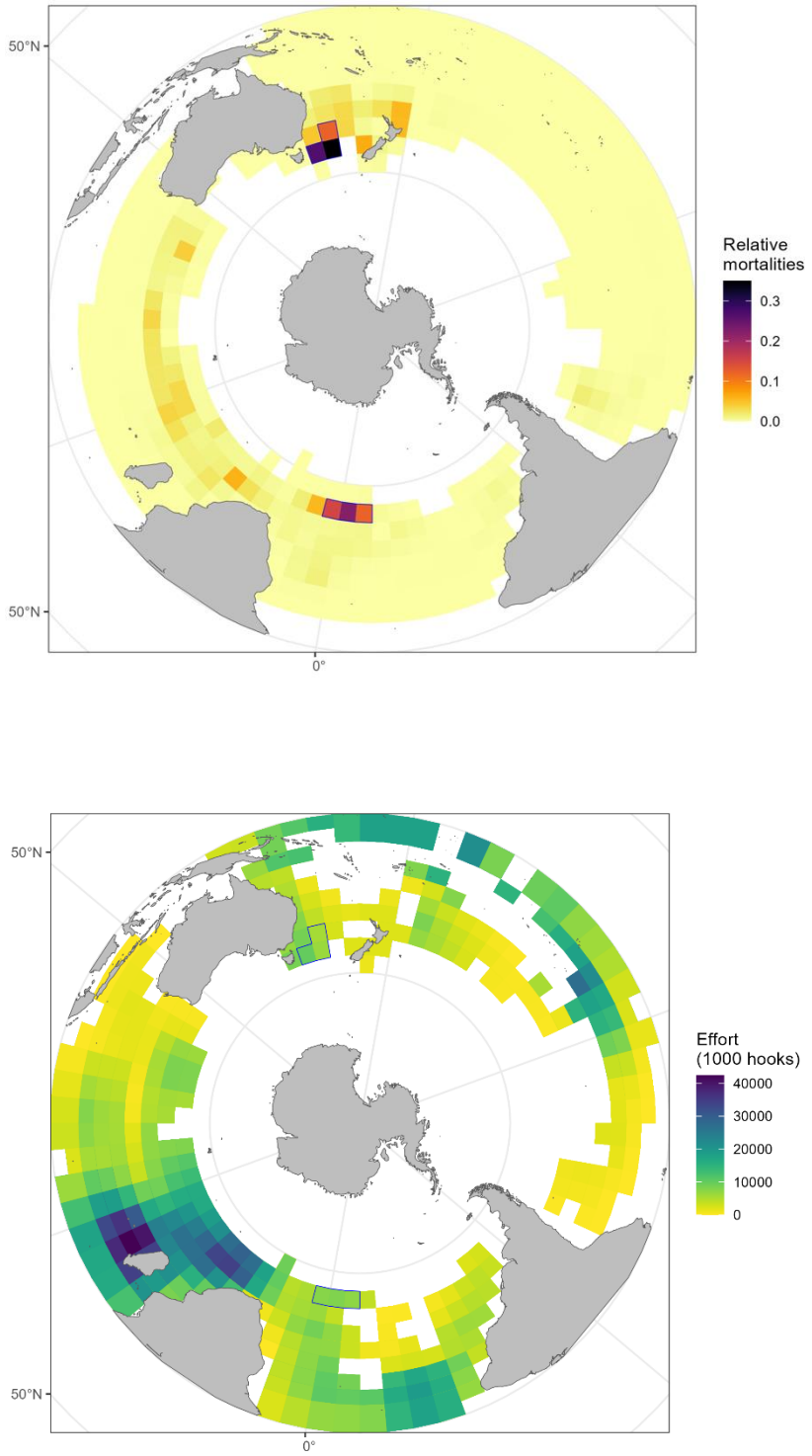


Figure 1. Option 1 'three by three' – **[top figure]** cumulative relative mortality with 'high risk' area defined as the three species with highest relative mortality and the respective three grid cells which contribute the most to their relative mortality. **[bottom figure]** CCSBT Member countries' surface longline fisheries effort in 2019. Blue borders illustrate the 'high-risk' area for both figures.

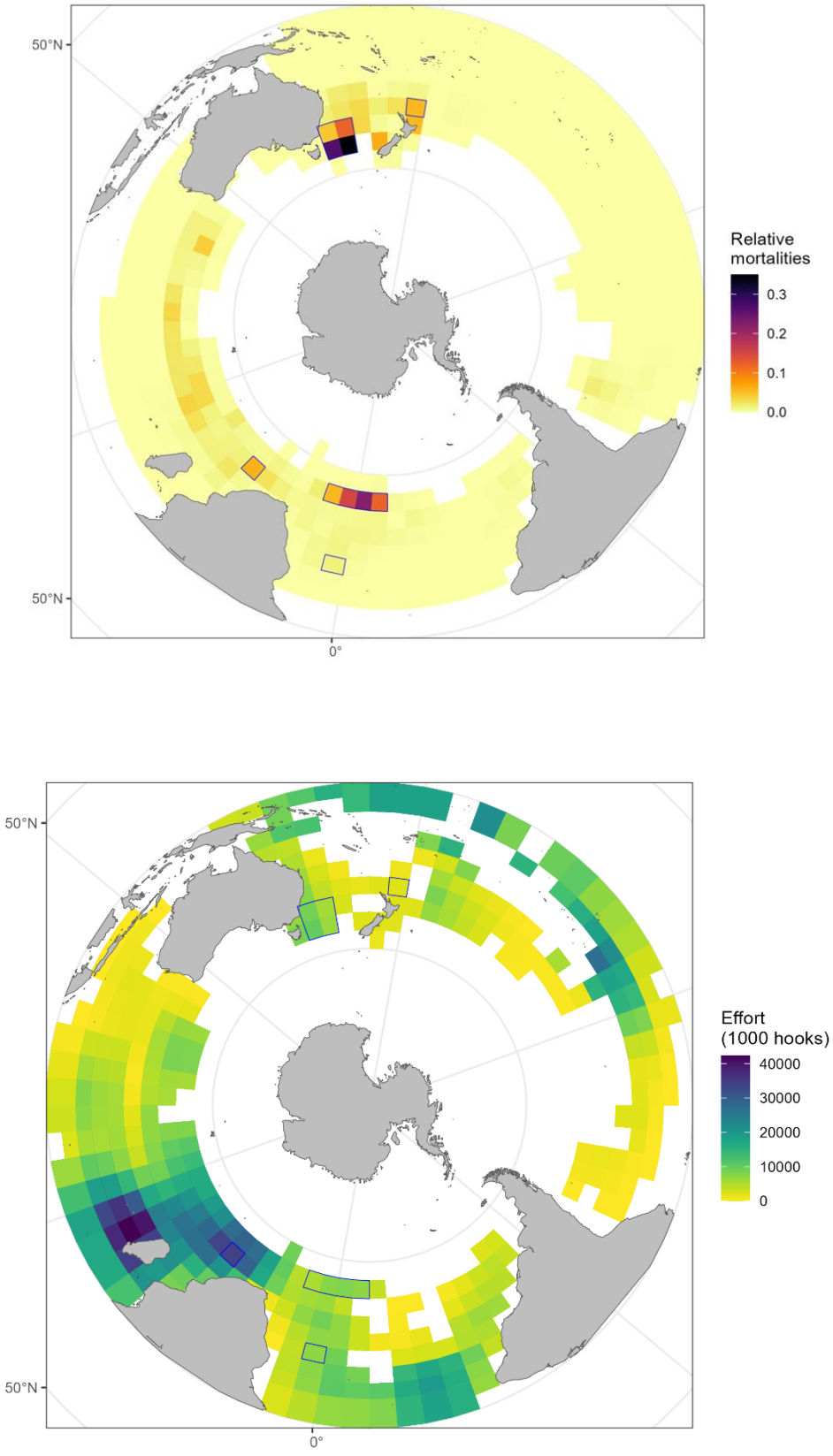


Figure 2. **Option 2 'three by five'** – **[top figure]** cumulative relative mortality with the 'high risk' area defined as the three seabird species with highest relative mortality and the respective five grid cells which contribute the most to their relative mortality. **[bottom figure]** CCSBT Member countries' surface longline fisheries effort in 2019. Blue borders illustrate the 'high-risk' area for both figures.

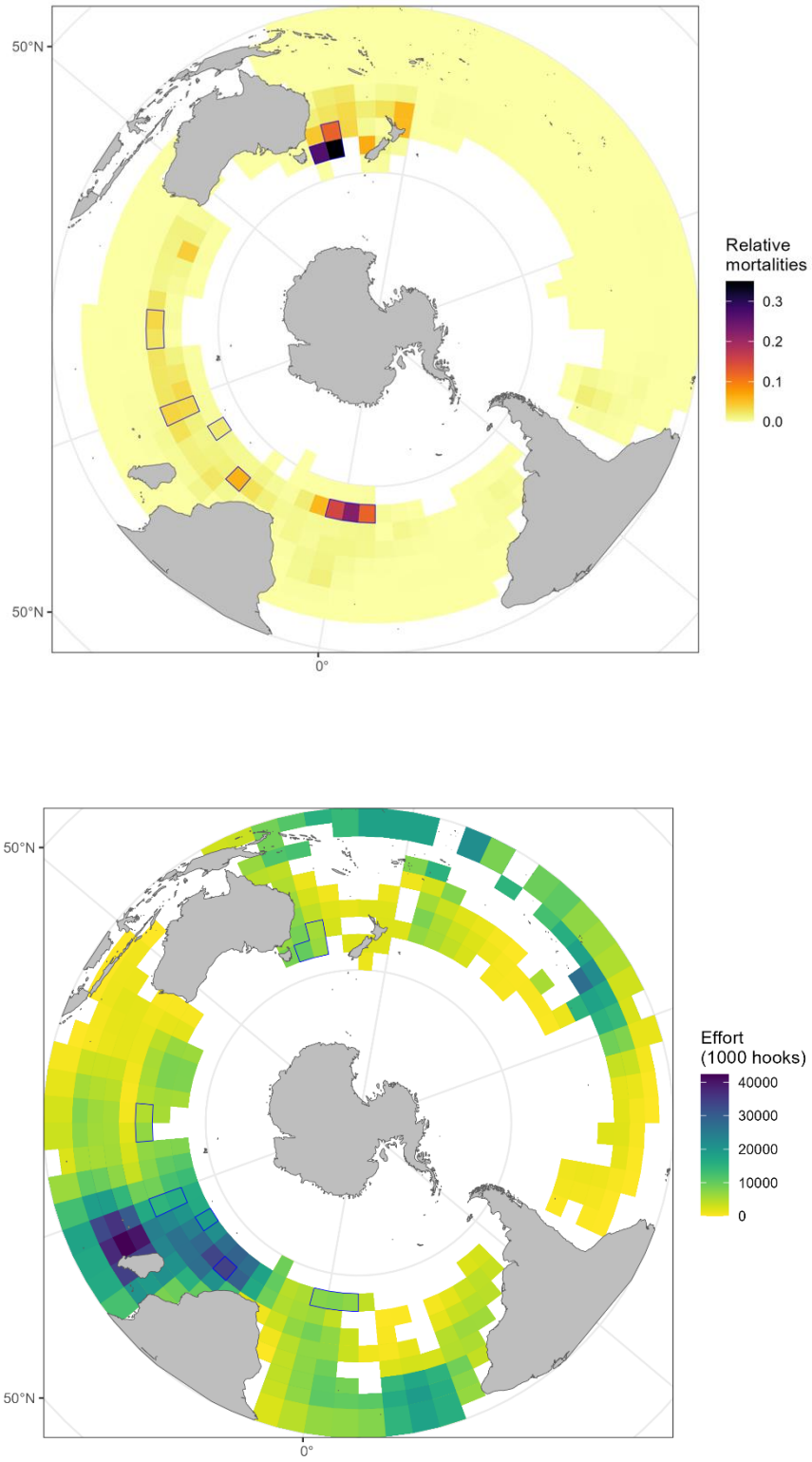


Figure 3. **Option 3 'five by three'** – **[top figure]** cumulative relative mortality with 'high risk' area defined as the five species with highest relative mortality and the respective three grid cells contributing the most to their relative mortality. **[bottom figure]** CCSBT Member countries' surface longline fisheries effort in 2019. Blue borders illustrate the 'high-risk' area for both figures.

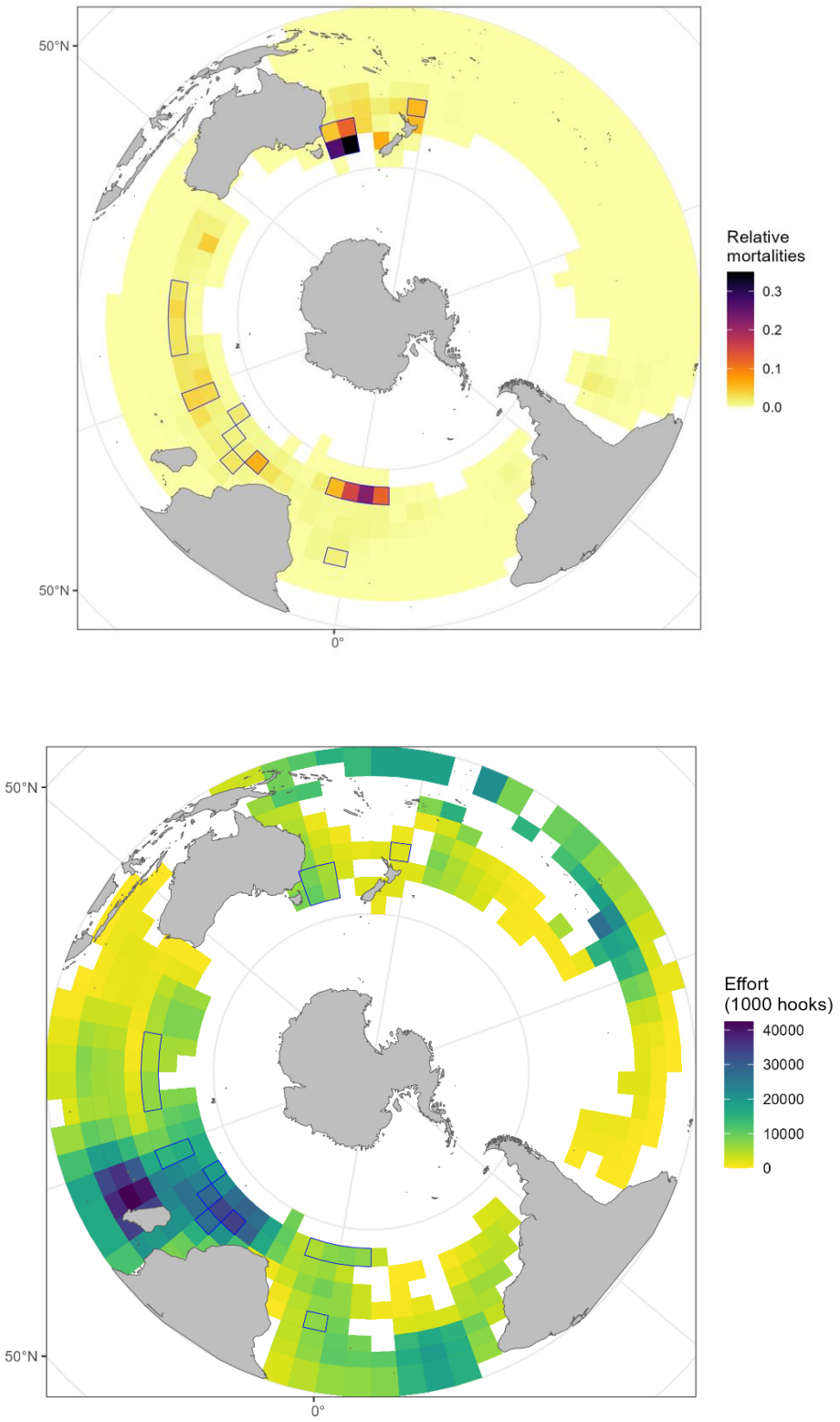


Figure 4. **Option 4 'five by five'** – **[top figure]** cumulative relative mortality with 'high risk' area defined as the five species with highest relative mortality and the respective five grid cells which contribute the most to their relative mortality. **[bottom figure]** CCSBT Members countries' surface longline fisheries effort in 2019. Blue borders illustrate the 'high-risk' area for both figures.

Table 1. Option 1 'three by three' - relative mortality (RM) for each of the 25 species considered in the all species approach to defining 'high risk' areas, and their respective IUCN listing (CR – critical, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern). Red text indicates species selected for consideration under this Option.

Rank	Name	Genus	HRA RM	Total RM	Percent RM	IUCN
1	Gibson's albatross	*Diomedea*	0.448	0.688	65%	EN
2	Tristan albatross	*Diomedea*	0.259	0.440	59%	CR
3	sooty albatross	*Phoebetria*	0.186	0.414	45%	EN
4	southern Buller's albatross	*Thalassarche*	0.063	0.094	67%	NT
5	white-capped albatross	*Thalassarche*	0.047	0.078	60%	NT
6	shy albatross	*Thalassarche*	0.046	0.056	82%	NT
7	southern royal albatross	*Diomedea*	0.030	0.065	46%	VU
8	Antipodean albatross	*Diomedea*	0.027	0.111	25%	EN
9	northern Buller's albatross	*Thalassarche*	0.023	0.046	50%	NT
10	light-mantled sooty albatross	*Phoebetria*	0.022	0.065	33%	NT
11	black-browed albatross	*Thalassarche*	0.017	0.024	73%	LC
12	grey-headed albatross	*Thalassarche*	0.014	0.036	40%	EN
13	wandering albatross	*Diomedea*	0.013	0.152	9%	VU
14	Westland petrel	*Procellaria*	0.012	0.031	40%	EN
15	Indian yellow-nosed albatross	*Thalassarche*	0.009	0.072	13%	EN
16	Atlantic yellow-nosed albatross	*Thalassarche*	0.004	0.019	21%	EN
17	grey petrel	*Procellaria*	0.004	0.008	49%	NT
18	Campbell black-browed albatross	*Thalassarche*	0.004	0.005	76%	VU/LC
19	Salvin's albatross	*Thalassarche*	0.001	0.019	6%	VU
20	white-chinned petrel	*Procellaria*	0.001	0.013	9%	VU
21	black petrel	*Procellaria*	0.001	0.018	4%	VU
22	northern royal albatross	*Diomedea*	0.000	0.020	1%	EN
23	Amsterdam albatross	*Diomedea*	0.000	0.294	0%	EN
24	Chatham Island albatross	*Thalassarche*	0.000	0.018	0%	VU
25	spectacled petrel	*Procellaria*	0.000	0.009	0%	VU

Table 2. Option 2 'three by five' - relative mortality (RM) for each of the 25 species considered in the all species approach to defining 'high risk' areas, and their respective IUCN listing (CR – critical, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern). Red text indicates species selected for consideration under this Option.

Rank	Name	Genus	HRA RM	Total RM	Percent	IUCN
1	Gibson's albatross	*Diomedea*	0.500	0.688	73%	EN
2	Tristan albatross	*Diomedea*	0.302	0.440	69%	CR
3	sooty albatross	*Phoebetria*	0.228	0.414	55%	EN
4	southern Buller's albatross	*Thalassarche*	0.068	0.094	73%	NT
5	shy albatross	*Thalassarche*	0.056	0.056	99%	NT
6	white-capped albatross	*Thalassarche*	0.053	0.078	67%	NT
7	Antipodean albatross	*Diomedea*	0.045	0.111	41%	EN
8	southern royal albatross	*Diomedea*	0.034	0.065	53%	VU
9	light-mantled sooty albatross	*Phoebetria*	0.033	0.065	51%	NT
10	wandering albatross	*Diomedea*	0.033	0.152	21%	VU
11	northern Buller's albatross	*Thalassarche*	0.025	0.046	55%	NT
12	grey-headed albatross	*Thalassarche*	0.022	0.036	60%	EN
13	black-browed albatross	*Thalassarche*	0.019	0.024	79%	LC
14	Westland petrel	*Procellaria*	0.014	0.031	45%	EN
15	Indian yellow-nosed albatross	*Thalassarche*	0.012	0.072	17%	EN
16	grey petrel	*Procellaria*	0.004	0.008	56%	NT
17	Atlantic yellow-nosed albatross	*Thalassarche*	0.004	0.019	21%	EN
18	Campbell black-browed albatross	*Thalassarche*	0.004	0.005	76%	VU/LC
19	Salvin's albatross	*Thalassarche*	0.003	0.019	15%	VU
20	white-chinned petrel	*Procellaria*	0.003	0.013	22%	VU
21	northern royal albatross	*Diomedea*	0.001	0.020	6%	EN
22	black petrel	*Procellaria*	0.001	0.018	5%	VU
23	Chatham Island albatross	*Thalassarche*	0.000	0.018	2%	VU
24	Amsterdam albatross	*Diomedea*	0.000	0.294	0%	EN
25	spectacled petrel	*Procellaria*	0.000	0.009	0%	VU

Table 3. Option 3 'five by three' - relative mortality (RM) for each of the 25 species considered in the all species approach to defining 'high risk' areas, and their respective IUCN listing (CR – critical, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern). Red text indicates species selected for consideration under this Option.

Rank	Name	Genus	HRA RM	Total RM	Percent	IUCN
1	Gibson's albatross	*Diomedea*	0.448	0.688	65%	EN
2	Tristan albatross	*Diomedea*	0.266	0.440	60%	CR
3	sooty albatross	*Phoebetria*	0.232	0.414	56%	EN
4	Amsterdam albatross	*Diomedea*	0.084	0.294	29%	EN
5	Southern Buller's albatross	*Thalassarche*	0.063	0.094	67%	NT
6	wandering albatross	*Diomedea*	0.057	0.152	37%	VU
7	white-capped albatross	*Thalassarche*	0.048	0.078	62%	NT
8	shy albatross	*Thalassarche*	0.046	0.056	82%	NT
9	light-mantled sooty albatross	*Phoebetria*	0.032	0.065	50%	NT
10	southern royal albatross	*Diomedea*	0.031	0.065	47%	VU
11	Antipodean albatross	*Diomedea*	0.027	0.111	25%	EN
12	northern Buller's albatross	*Thalassarche*	0.023	0.046	50%	NT
13	grey-headed albatross	*Thalassarche*	0.020	0.036	55%	EN
14	black-browed albatross	*Thalassarche*	0.018	0.024	74%	LC
15	Indian yellow-nosed albatross	*Thalassarche*	0.013	0.072	18%	EN
16	Westland petrel	*Procellaria*	0.012	0.031	40%	EN
17	grey petrel	*Procellaria*	0.004	0.008	55%	EN
18	Atlantic yellow-nosed albatross	*Thalassarche*	0.004	0.019	21%	EN
19	Campbell black-browed albatross	*Thalassarche*	0.004	0.005	76%	VU/LC
20	white-chinned petrel	*Procellaria*	0.002	0.013	13%	VU
21	Salvin's albatross	*Thalassarche*	0.001	0.019	6%	VU
22	northern royal albatross	*Diomedea*	0.001	0.020	5%	EN
23	black petrel	*Procellaria*	0.001	0.018	4%	VU
24	Chatham Island albatross	*Thalassarche*	0.000	0.018	0%	VU
25	spectacled petrel	*Procellaria*	0.000	0.009	0%	VU

Table 4. Option 4 'five by five' - relative mortality (RM) for each of the 25 species considered in the all species approach to defining 'high risk' areas, and their respective IUCN listing (CR – critical, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern). Red text indicates species selected for consideration under this Option.

Rank	Name	Genus	HRA RM	Total RM	Percent	IUCN
1	Gibson's albatross	*Diomedea*	0.500	0.688	73%	EN
2	Tristan albatross	*Diomedea*	0.305	0.440	69%	CR
3	sooty albatross	*Phoebetria*	0.272	0.414	66%	EN
4	Amsterdam albatross	*Diomedea*	0.124	0.294	42%	EN
5	wandering albatross	*Diomedea*	0.074	0.152	49%	VU
6	southern Buller's albatross	*Thalassarche*	0.068	0.094	73%	NT
7	shy albatross	*Thalassarche*	0.056	0.056	99%	NT
8	white-capped albatross	*Thalassarche*	0.054	0.078	68%	NT
9	Antipodean albatross	*Diomedea*	0.045	0.111	41%	EN
10	light-mantled sooty albatross	*Phoebetria*	0.038	0.065	59%	NT
11	southern royal albatross	*Diomedea*	0.035	0.065	53%	VU
12	northern Buller's albatross	*Thalassarche*	0.025	0.046	55%	NT
13	grey-headed albatross	*Thalassarche*	0.023	0.036	65%	EN
14	black-browed albatross	*Thalassarche*	0.019	0.024	79%	LC
15	Indian yellow-nosed albatross	*Thalassarche*	0.016	0.072	23%	EN
16	Westland petrel	*Procellaria*	0.014	0.031	45%	EN
17	grey petrel	*Procellaria*	0.005	0.008	60%	NT
18	Atlantic yellow-nosed albatross	*Thalassarche*	0.004	0.019	21%	EN
19	Campbell black-browed albatross	*Thalassarche*	0.004	0.005	76%	VU/LC
20	white-chinned petrel	*Procellaria*	0.003	0.013	23%	VU
21	Salvin's albatross	*Thalassarche*	0.003	0.019	15%	VU
22	northern royal albatross	*Diomedea*	0.002	0.020	8%	EN
23	black petrel	*Procellaria*	0.001	0.018	5%	VU
24	Chatham Island albatross	*Thalassarche*	0.000	0.018	2%	VU
25	spectacled petrel	*Procellaria*	0.000	0.009	0%	VU

9 Appendix 2 – Wandering royal figures and tables

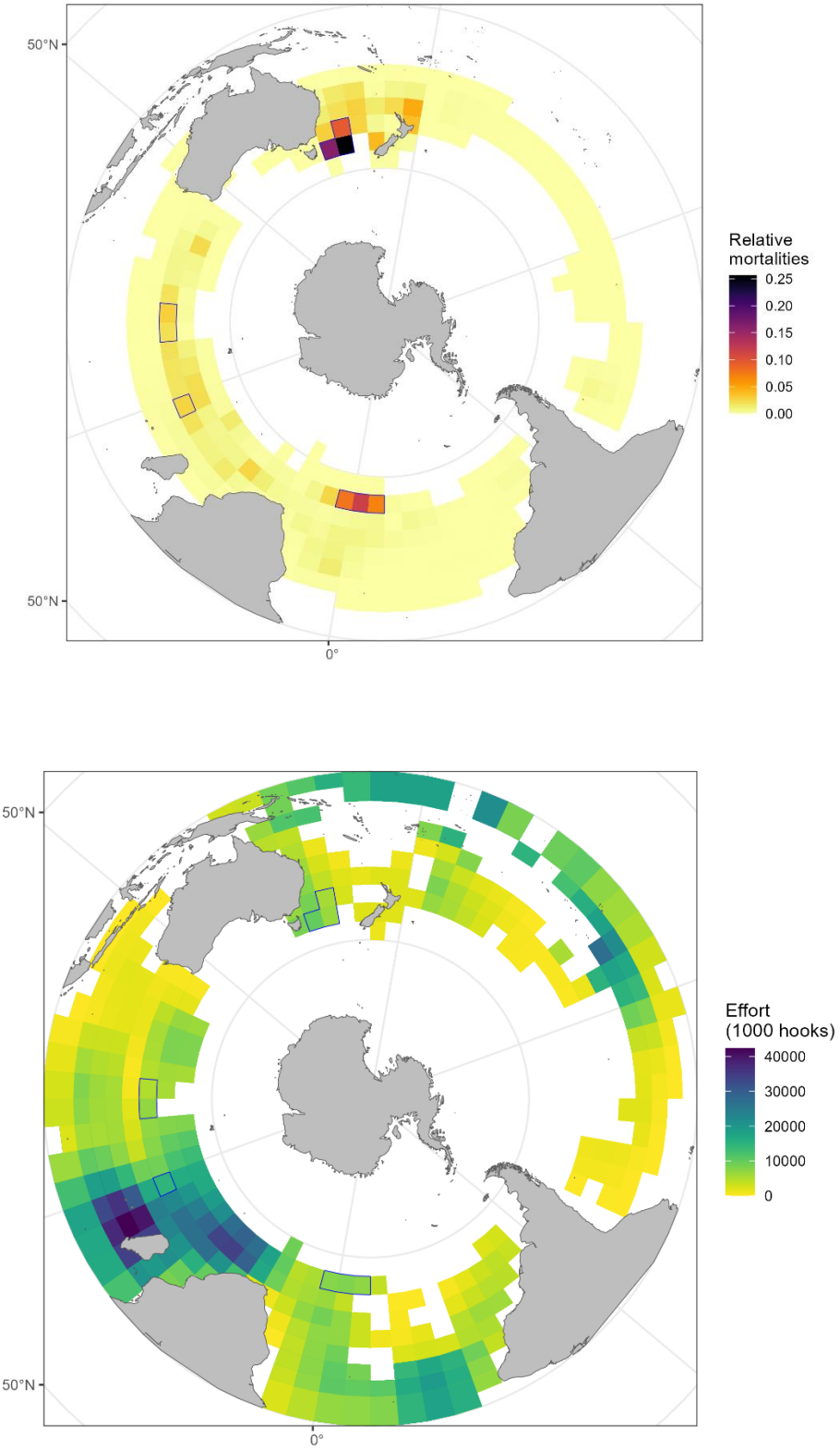


Figure 5. Option 5 'three by three' – **[top figure]** cumulative relative mortality with 'high risk' area defined as the three species with highest relative mortality and the respective three grid cells which contribute the most to their relative mortality. **[bottom figure]** CCSBT Member countries' surface longline fisheries effort in 2019. Blue borders illustrate the 'high-risk' area for both figures.

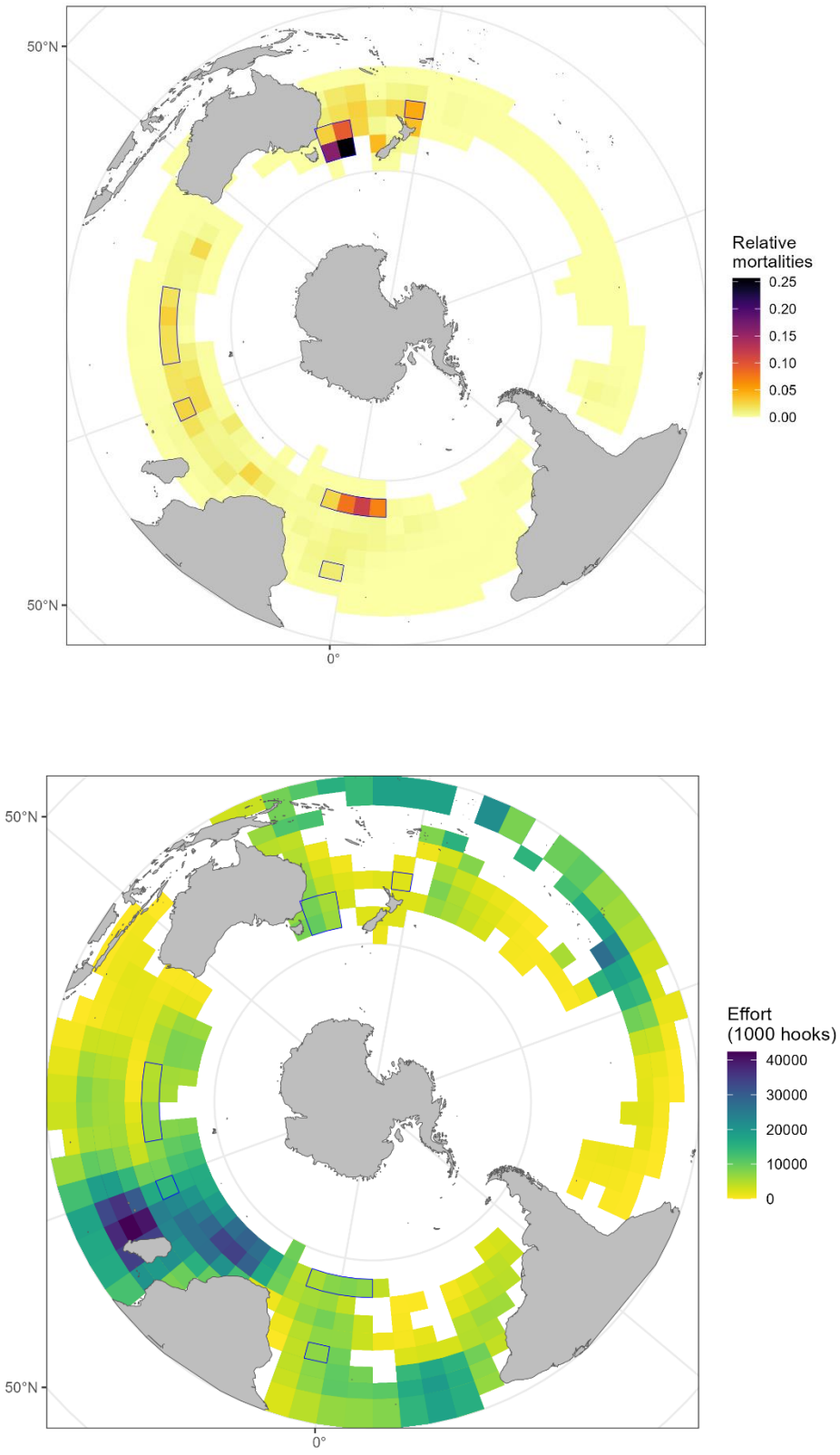


Figure 6. Option 6 'three by five' – **[top figure]** cumulative relative mortality with 'high risk' area defined as the three species with highest relative mortality and the respective five grid cells which contribute the most to their relative mortality. **[bottom figure]** CCSBT Member countries' surface longline fisheries effort in 2019. Blue borders illustrate the 'high-risk' area for both figures.

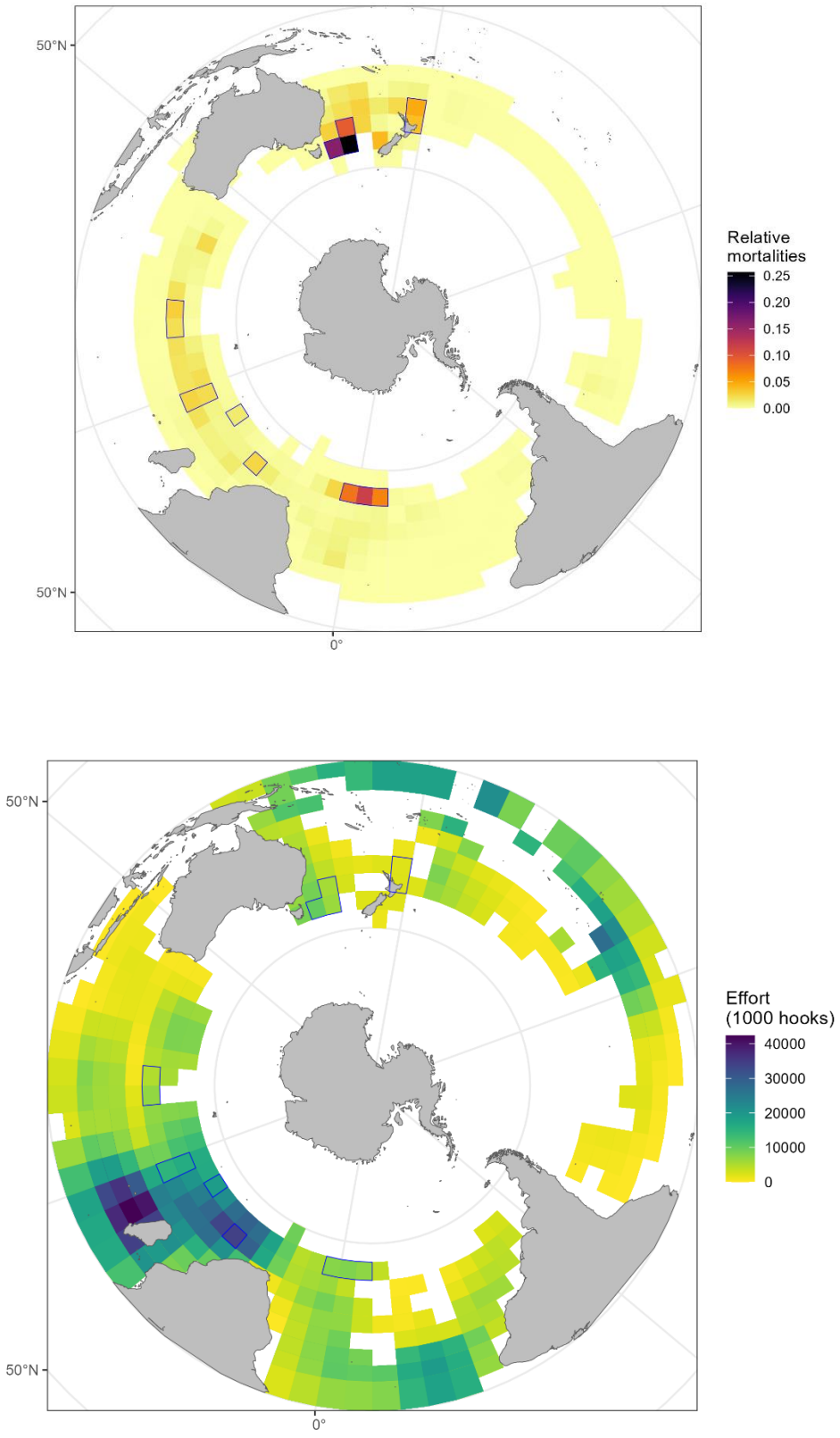


Figure 7. Option 7 'five by three' – **[top figure]** cumulative relative mortality with 'high risk' area defined as the five species with highest relative mortality and the respective three grid cells which contribute the most to their relative mortality. **[bottom figure]** CCSBT Member countries' surface longline fisheries effort in 2019. Blue borders illustrate the 'high-risk' area on both figures.

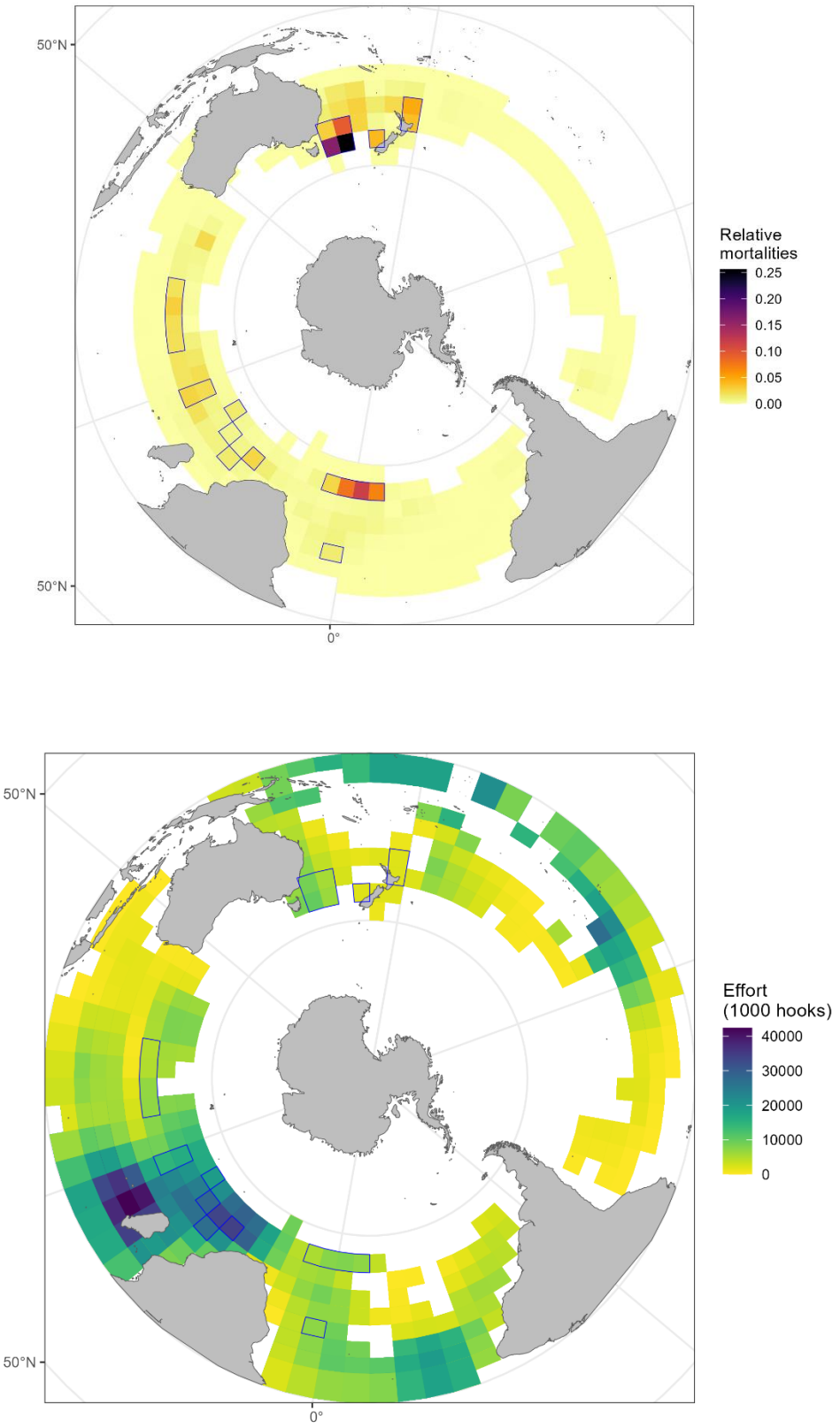


Figure 8. Option 8 'five by five' – **[top figure]** cumulative relative mortality with 'high risk' area defined as the five species with highest relative mortality and the respective five grid cells which contribute the most to their relative mortality. **[bottom figure]** CCSBT Member countries' surface longline fisheries effort in 2019. Blue borders illustrate the 'high-risk' area for both figures.

Table 5. Option 5 'three by three' – relative mortality (RM) for each of the 7 species considered in the wandering and royal albatrosses only approach to defining 'high risk' areas, and their respective IUCN listing (CR – critical, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern). Red text indicates species selected for consideration under this Option.

Rank	Name	Genus	HRA RM	Total RM	Percent RM	IUCN
1	Gibson's albatross	*Diomedea*	0.448	0.688	65%	EN
2	Tristan albatross	*Diomedea*	0.259	0.440	59%	CR
3	Amsterdam albatross	*Diomedea*	0.071	0.294	24%	EN
4	southern royal albatross	*Diomedea*	0.030	0.065	47%	VU
5	Antipodean albatross	*Diomedea*	0.027	0.111	25%	EN
6	wandering albatross	*Diomedea*	0.017	0.152	11%	VU
7	northern royal albatross	*Diomedea*	0.000	0.020	2%	EN

Table 6. Option 6 'three by five' – relative mortality (RM) for each of the 7 species considered in the wandering and royal albatrosses only approach to defining 'high risk' areas, and their respective IUCN listing (CR – critical, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern). Red text indicates species selected for consideration under this Option.

Rank	Name	Genus	HRA RM	Total RM	Percent RM	IUCN
1	Gibson's albatross	*Diomedea*	0.500	0.688	73%	EN
2	Tristan albatross	*Diomedea*	0.295	0.440	67%	CR
3	Amsterdam albatross	*Diomedea*	0.108	0.294	37%	EN
4	Antipodean albatross	*Diomedea*	0.045	0.111	41%	EN
5	southern royal albatross	*Diomedea*	0.035	0.065	53%	VU
6	wandering albatross	*Diomedea*	0.020	0.152	13%	VU
7	northern royal albatross	*Diomedea*	0.001	0.020	6%	EN

Table 7. Option 7 'five by three' – relative mortality (RM) for each of the 7 species considered in the wandering and royal albatrosses only approach to defining 'high risk' areas, and their respective IUCN listing (CR – critical, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern). Red text indicates species selected for consideration under this Option.

Rank	Name	Genus	HRA RM	Total RM	Percent RM	IUCN
1	Gibson's albatross	*Diomedea*	0.489	0.688	71%	EN
2	Tristan albatross	*Diomedea*	0.266	0.440	60%	CR
3	Amsterdam albatross	*Diomedea*	0.084	0.294	29%	EN
4	wandering albatross	*Diomedea*	0.058	0.152	38%	VU
5	Antipodean albatross	*Diomedea*	0.056	0.111	50%	EN
6	southern royal albatross	*Diomedea*	0.037	0.065	57%	VU
7	northern royal albatross	*Diomedea*	0.009	0.020	44%	EN

Table 8. Option 8 'five by five' – relative mortality (RM) for each of the 7 species considered in the wandering and royal albatrosses only approach to defining 'high risk' areas, and their respective IUCN listing (CR – critical, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern). Red text indicates species selected for consideration under this Option.

Rank	Name	Genus	HRA RM	Total RM	Percent RM	IUCN
1	Gibson's albatross	*Diomedea*	0.535	0.688	78%	EN
2	Tristan albatross	*Diomedea*	0.305	0.440	69%	CR
3	Amsterdam albatross	*Diomedea*	0.124	0.294	42%	EN
4	wandering albatross	*Diomedea*	0.076	0.152	50%	VU
5	Antipodean albatross	*Diomedea*	0.063	0.111	57%	EN
6	southern royal albatross	Diomedea	0.049	0.065	75%	VU
7	northern royal albatross	Diomedea	0.010	0.020	51%	EN