

SC/69A/HIM/06

Sub-committees/working group name: HIM

Collaboration on whale incidental mortality in the Antarctic krill fishery

Steve Parker, Isaac Forster, Russell Leaper And Nat Kelly



**INTERNATIONAL
WHALING COMMISSION**

Papers submitted to the IWC are produced to advance discussions within that meeting; they may be preliminary or exploratory.

It is important that if you wish to cite this paper outside the context of an IWC meeting, you notify the author at least six weeks before it is cited to ensure that it has not been superseded or found to contain errors.

Collaboration on whale incidental mortality in the Antarctic krill fishery

Steve Parker¹, Isaac Forster¹, Russell Leaper² and Nat Kelly³

¹CCAMLR Secretariat, Hobart, Tasmania, Australia

²International Fund for Animal Welfare, London, UK

³Australian Antarctic Division, Department of Climate Change, Energy, the Environment and Water, Kington, Tasmania, 7050, Australia

Abstract

In response to a report of the incidental mortality of three juvenile humpback whales in the Antarctic krill trawl fishery in Subareas 48.1 and 48.2 during the 2021 calendar year, SC-CAMLR reconvened the Working Group on Incidental Mortality Associated with Fishing (WG-IMAF). This was the first time that the incidental mortality of a whale was reported in the krill fishery. With the intent for SC-CAMLR to better understand potential reasons for these bycatch events and to avoid them in the future it approached IWC-SC with a request to provide scientific feedback on these circumstances associated with these incidents and to nominate scientists to attend the WG-IMAF meeting. To facilitate scientific feedback, an IWC-SC intersessional group on whale entanglement/entrapment in the krill fishery was formed, and subsequently developed a report detailing advice on a range of topics, from data collection needs when whale entrapments occur through to several recommendations regarding mitigation, including avoidance of whales by fishing vessels, technologies such as excluder devices, and management measures such as ‘move-on’ rules. This report was reviewed by WG-IMAF which requested further assistance from IWC-SC, in particular for refining additional data to be collected by observers and crew when whale entrapments occur and, in the longer term, provision of advice for krill trawling operators to minimise whale entrapments (including development of technology to study how whales are interacting with krill trawling nets, move-on rules, etc), and on refining designs of the marine mammal exclusion device, considering a convex shape to the exclusion mesh to deflect whales (and seals) away from the net mouth.

Background

In response to a report of the incidental mortality of three juvenile humpback whales in the Antarctic krill trawl fishery in Subareas 48.1 and 48.2 (*Figure 1*) during the 2021 calendar year the Scientific Committee for the Conservation of Antarctic Marine Living Resources (SC-CAMLR) reconvened the Working Group on Incidental Mortality Associated with Fishing, which last met in 2011 (WG-IMAF; SC-CAMLR 2021, para 3.120), chaired by Nathan Walker and Marco Favero. Broadly speaking, the purpose of WG-IMAF is to provide advice to SC-CAMLR, its Members, and its working groups on: impacts of interactions and incidental mortality of marine mammals and seabirds associated with fishing; effectiveness of mitigation/avoidance measures, and data collection requirements. WG-IMAF also seeks to collaborate/coordinate with relevant organisations, including invited experts as required. (For more details on the terms of reference of WG-IMAF, see SC-CAMLR (2022; Annex 11).) Another humpback whale was recorded as an incidental mortality in krill fisheries operating in Subarea 48.2 in 2022 (WG-IMAF 2022, para 3.1). The reports from 2021 and 2022 were the first reports of whale mortality associated with the krill fishery and all incidental mortalities were from vessels using the continuous trawling system.

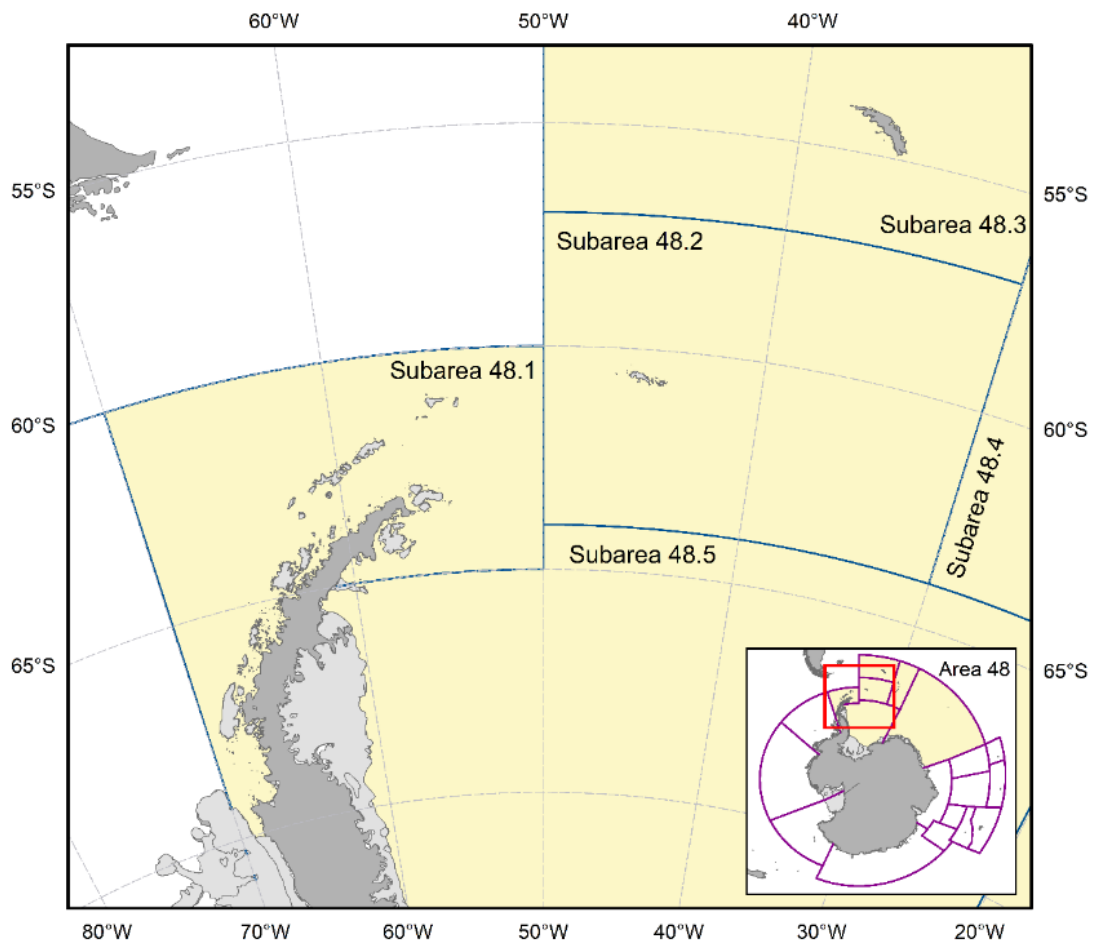


Figure 1 CCAMLR Statistical Subareas 48.1 and 48.2 where whale incidental mortality occurred in the Antarctic krill fishery during the 2020/21 and 2021/22 fishing seasons.

Given the recognised expertise on whale incidental mortality within the Scientific Committee of the International Whaling Commission (IWC-SC), particularly the Sub-Committee on Non-deliberate Human-Induced Mortality of Cetaceans (HIM), representatives of SC-CAMLR (Welsford, Parker and Walker) were invited to IWC-SC 68D (2022) to present a paper by Welsford et al. (2022) with details of the humpback whale mortalities in the krill fishery. A summary of that presentation and subsequent discussion is given in IWC (2023; item 12.2.2). With the intent for SC-CAMLR to better understand potential reasons for these mortality events, and to avoid them in the future, it approached IWC-SC with a request to provide scientific feedback on these incidents and to nominate scientists to attend the WG-IMAF meeting.

To facilitate scientific feedback, an IWC-SC intersessional group on whale entanglement in Southern Ocean krill fishery was formed (convened by Leaper, with other members: Parker, Favero and Walker (CCAMLR), Biuw, Hines, Söffker, Heinemann, Stimmelmayer, Landry, S. Reeves, Mattila, Meyer and Johnson; Kelly joined later) was tasked with providing advice on:

- (1) Understanding likely causes of trawl – whale interactions
 - a) What factors likely contributed to the incidents (spatial, temporal, operational, behavioural factors of both whales and vessels)?
 - b) How should future incidents be investigated and what information should be recorded? (e.g. documenting incidents and specimens, biological sampling, crew and/or observer roles)
 - c) Routine data collection to put bycatch incidents into context (e.g. whale sightings, net monitoring devices)

- (2) Considerations for developing effective mitigation, including:
 - a) Vessel actions such as avoidance of whales
 - b) Technologies such as exclusion devices
 - c) Management measures such as move-on rules

The IWC-SC intersession group developed a paper submitted to WG-IMAF responding to these issues and providing additional context to whale interactions with trawl fisheries in other areas (Leaper et al. 2022).

WG-IMAF (2022)

WG-IMAF met in October 2022 in Hobart, Tasmania; the meeting report (WG-IMAF 2022) can be found [here](#). The following is a summary of the whale incidental mortality topics in the report of the 2022 meeting of WG-IMAF. Russell Leaper (virtual) and Nat Kelly represented the IWC-SC intersessional group on whale entanglement in Southern Ocean krill fishery. In the context of marine mammal incidental mortality, WG-IMAF heard updates on:

- Population status of marine mammals in the CAMLR Convention Area
- Review of whale entrapment information
- Mitigation methods for whales

Population status of marine mammals in the CAMLR Convention Area

WG-IMAF heard a number of studies/reviews (including a brief synthesis by the IWC-SC intersessional group of the status and trends of whale populations (Leaper et al. 2022)) indicating increases in densities of several species of baleen whales in Area 48, and noted the importance of recent cetacean abundance estimates for regions within the CCAMLR Convention Area to assist in providing management advice for the krill fishery.

Review of information on whale deaths

WG-IMAF reviewed details of the four humpback whale deaths in the krill fishery during the 2020/21 and 2021/22 fishing seasons. WG-IMAF also heard that an extra-large exclusion mesh constructed from Spectra rope was placed at the mouth of the trawl after the third incidental mortality of a humpback whale during the 2020/21, in addition to existing pinniped exclusion nets. Despite this addition, a dead humpback whale was discovered in the trawl mouth of the *Saga Sea* during the 2021/22 fishing season, after which the exclusion net was moved further forward, attached to the trawl mouth opening and the tension in the ropes was increased to reduce any slack (see Annex 1 for further details); no subsequent incidents have been recorded.

WG-IMAF also noted:

- the presence of any of the three dead humpback whales during the 2020/21 fishing season were not detected using the net monitoring system connected, and that it was not possible to estimate when the animals became entangled during trawl operations;
- that whilst observed whale by-catch in the krill fishery was considered small at present, it may increase with any increase in whale population size or krill fishing effort, particularly noting that both baleen whales and the krill fishery target krill aggregations;
- that the number of cryptic mortalities as a result of whales interacting with krill trawls would be an important parameter to estimate;
- the importance of further development of devices that would exclude marine mammals from entering the trawl net.

WG-IMAF reviewed the advice of the IWC-SC intersessional group (Leaper et al 2022), including the conclusion that it was highly unlikely that the whales entered the trawls after death, and that the reported lengths of the entangled whales (7–10 m) were consistent with the lengths of dependent, or newly independent, calves. The IWC intersessional group reviewed existing literature on large whale interactions with other trawl fisheries; data collection needs from entangled whales; and collection of relevant data from whale observations. The paper made several recommendations regarding entanglement/by-catch mitigation for continuous trawling in the krill fishery, including avoidance of whales by fishing vessels, technologies such as excluder devices, and management measures such as ‘move-on’ rules. The IWC intersessional group also noted the lack of information to understand whether close encounters of whales with fishing vessels are due to whales feeding on the same swarms of krill that are being fished, the fishing operations using whales as a cue for the location of krill swarms, that whales may be attracted to the trawl vessels, or a combination of these points.

In response, WG-IMAF agreed that data collection efforts at the time a whale is detected in trawl nets be improved, and recommended that an intersessional working group including experts from the IWC-SC intersessional group, be tasked with developing a data collection template and accompanying instructions for vessels to report standardised data in the event of a whale mortality. WG-IMAF recommended that the following data and samples, based on the advice from IWC-SC, be collected (noting two tiers of data collection where i–iv: highest priority and v–vi: moderate priority):

- (i) whale species and length
- (ii) fishing operation (e.g. vessel and fishing gear specifications, time and location where a net was deployed, time and location where the entangled whale was discovered, average trawl depth)
- (iii) photographic records
- (iv) wound details following IWC entanglement response data form (detailed in Table 1 of Leaper et al. 2022)
- (v) blubber thickness
- (vi) tissue samples (e.g. skin, blubber, baleen plates); presence (and collection) of whale lice.

Mitigation methods for whales

Following a recommendation from WG-IMAF during its 2022 meeting, the CCAMLR Secretariat is compiling a library of the different exclusion devices used across different krill trawl vessels within the Convention Area (SC-CAMLR-41, Annex 4, Paragraph 4.28)

Furthermore, in the context of mitigation methods for whales, WG-IMAF noted:

- the estimation of cryptic mortality needs to consider the specific characteristics of the fishing operations and gear configuration, and further noted that trawl speed could be a variable affecting the degree of injury to marine mammals such as whales, given the current difficulty in directly observing interactions.
- the use of acoustic pingers during the 2021/22 fishing year, but also concluded there is no clear evidence concerning the efficacy of acoustic pingers to alert baleen whales to the presence of the net, and also that there might be potential harm inflicted by acoustic harassment devices.
- advice from the IWC expert panel that the whale excluder grid installed near the mouth of the continuous trawl net after the humpback whale mortality incident in 2021/22 (which differs from the other seal excluder grid) may still allow a whale to be impinged and trapped against the grid, whereas a modification of this net to pull the grid forward into a conical formation may result in a passive whale being deflected away from the mouth of the net.
- the importance of understanding environmental variation and whale behaviour over multiple spatio-temporal scales to understand how they interact with krill swarms, and with fishing vessels more broadly.
- the likely benefits of video surveillance of trawl nets to study whale interactions and potentially detect cryptic interactions.
- the potential benefit of a system to detect direct contact of whales with krill trawl nets to alert the vessel crew.
- that short-duration suction-cup tags may contribute to quantifying fine-scale movements of whales interacting with trawl nets.
- the likely complexity of move-on rules, given the current lack of understanding of the functional relationship between whale densities and krill trawling activity, and any concomitant relationship with the risk of whale interactions; also noted was that move-on rules form part of CCAMLR management of other fisheries for other issues.

SC-CAMLR Strategic Plan

In 2022, SC-CAMLR developed a strategic plan for 2023-2027 (SC-CAMLR 2022, Annex 4). The strategic plan recognised as ‘high priority’ the need to develop and implement whale sighting protocols for observers onboard fishing vessels with the aim of minimising bycatch and incidental mortality in the CCAMLR management fisheries (as part of a broader recognition of the importance of information regarding the needs of cetaceans within CCAMLR’s ecosystem approach to managing the krill fishery).

Collaboration with relevant organisations

WG-IMAF reflected that the collaboration with invited experts at the meeting had greatly improved the understanding of participants, and also noted that the attendance of invited experts allowed for ongoing feedback through various expert subgroups on outstanding issues (e.g., the Sub-Committee on Non-deliberate Human-Induced Mortality of cetaceans (HIM) within IWC-SC). SC-CAMLR agreed to a standing invitation to IWC experts to WG-IMAF (SC-CAMLR-41 Paragraph 5.36).

WG-IMAF workplan

During its 2022 meeting, WG-IMAF developed a workplan for the short, medium and long term, with several items directly relating to whale incidental mortality; table adapted from Table 1 of WG-IMAF (2022).

Theme	Task	Timeframe
Marine mammals – incidental mortality	1. Refine design of additional data to be collected by observers and crew when whale entanglements occur (see list above)	Short (2023)
	2. Investigate the use of underwater sensor/cameras attached to the net (and AI) to provide information on the occurrence of whale interactions and any subsequent entanglements/capture (continuous)	Medium (3-5 years)
Marine mammals – risk assessment	3. Consider developing risk assessment for seabirds and marine mammals	Medium (3-5 years)
Marine mammals – mitigation	4. Refine design of marine mammal exclusion device, considering a convex shape to the exclusion mesh to deflect whales (and seals) away from the net mouth	Medium-long (3-5+ years)
	5. Develop specifications for MMED in use in CCAMLR trawl fisheries	Short-medium (1-5 years)
	6. Undertake experiments into effectiveness of different MMED designs (for various species)	Medium-long (3-5+ years)

Outcomes

WG-IMAF requested assistance from IWC-SC/carried-over intersessional group on the tasks outlined above, but particularly with Task 1, refining additional data types to be collected by observers and crew when whale interactions occur, prior to the 2023 meeting of WG-IMAF/SC-CAMLR.

Beyond the 2023 time-frame, WG-IMAF extends an invitation to collaborate on provision of advice for krill trawling operators to minimise whale entrapment/entanglement (including development of technology to study how whales are interacting with krill trawling nets, move-on rules, etc), and on refining design of marine mammal exclusion device, considering a convex shape to the exclusion mesh to deflect whales (and seals) away from the net mouth. Development of Terms of Reference for the IWC intersessional group during SC69A may assist in setting priorities for future collaboration.

References

International Whaling Commission (2023). Report of the Scientific Committee. *J. Cetacean Res. Manage.* (Suppl.) 24:1-190.

Leaper, R. (submitting on behalf of IWC-SC Intersessional Group; 2022). Report of the IWC Scientific Committee intersessional group on whale entanglement in Southern Ocean krill fishery. Paper WG-IMAF-2022/08, 18pp

SC-CAMLR (2022). Report of the Forty-first meeting of the Scientific Committee, Hobart, Australia, 24-28 October 2022.

Welsford, D., N. Walker, M. Favero, B. Krafft, C. Darby and S. Parker (2022). CCAMLR-IWC coordination: incidents of whale by-catch in the Antarctic krill fishery. Paper SC/68D/HIM/04 presented to the Scientific Committee of the International Whaling Commission, 48 pp.

WG-IMAF (2022) Report of the Working Group on Incidental Mortality Associated with Fishing, 10-14 October 2022. CCAMLR.

Annex 1 Details of Marine mammal exclusion device deployed on Norwegian continuous krill trawl nets, with alterations and modifications made in 2021 and 2022

After the third humpback whale entanglement in April 2021, in which the whale broke through the exclusion device, Aker BioMarine added 8, 10 and 12mm spectra ropes to the device to increase the breaking strain. The 12 mm rope has a reported breaking strain of 10 tonnes, which is around five times the strength of the previous material. However, despite this modification, another humpback whale entanglement was recorded in January 2022. Although this animal did not break through the excluder panel, it was concluded that the fastening of this reinforced exclusion net was incomplete and too far away from the mouth of the net at its lower end, which may have created loose bag. Modifications were made by attaching the exclusion device tightly to the mouth opening and stringing it tighter to increase the tension (*Figure A.1*). No whale entanglement incidents have been reported since then.

MARINE MAMMAL EXCLUSION DEVICE (MMED) - ALTERATIONS AND REINFORCEMENTS MADE IN 2021 and 2022:

- MATERIAL: Spectra material (minimum 8mm) for enhanced breaking strength (introduced June 2021 on all AKBM vessels)
- FITTING: MMED moved to outer mouth of trawl to reduce risk of entanglement (introduced February 2022 on all AKBM vessels)

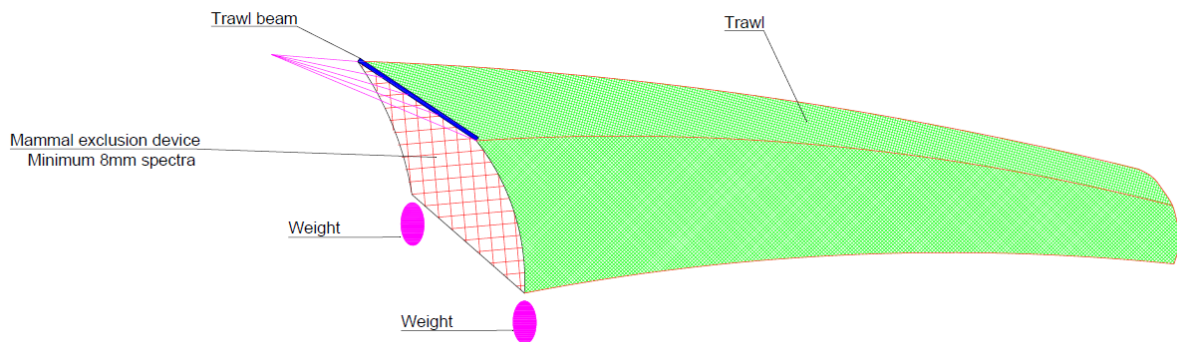


Figure A.1 Marine mammal exclusion device deployed on Norwegian continuous krill trawl nets, with alterations and modifications made in 2021 and 2022. For an indication of scale, the mouth of the net is approximately 20 m × 20 m.