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Sub-committees/working group name: HIM

CCAMLR – IWC coordination: Incidents of whale bycatch in the Antarctic krill fishery

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INTERNATIONAL
WHALING COMMISSION

CCAMLR – IWC coordination: Incidents of whale bycatch in the Antarctic krill fishery

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Abstract

The CAMLR Scientific Committee responded to the first ever reported whale bycatch incidents in the krill fishery by reconvening its Working Group on Incidental Mortality Associated with Fishing and requesting coordination with the IWC in providing coordination, feedback, and expertise to better understand and mitigate these situations. This paper provides the background of the incidents, the types of information requested, and proposes a mechanism for the collaboration.

Background

In 2021, three humpback whales (*Megaptera novaeangliae)* were reported as bycatch in the Antarctic krill trawl fishery (Annex 1). This was the first report of whale bycatch in the krill fishery. These incidents were discussed by the Scientific Committee and its Fish Stock Assessment Working Group (Annex 2). The Scientific Committee recommended re-convening the Working Group on Incidental Mortality Associated with Fishing (WG-IMAF) with specific Terms of Reference to coordinate with the IWC HIM Subcommittee to include experts in bycatch mitigation in the subsequent discussions in WG-IMAF.

This paper provides the background information to the IWC for discussion and to progress the coordination between organisations to address this issue. Included is the report from Norway and the United Kingdom as Member and international observer provider (SC-CAMLR-40-BG-27) describing the incidents, along with the relevant report text from the Scientific Committee, and information about the gear configurations used in the krill fishery (Annex 3).

The CCAMLR Scientific Committee seeks to better understand the reasons for these bycatch events and what techniques and technologies could be used to mitigate them in the future. The CCAMLR Scientific Committee therefore would like to collaborate with the IWC Scientific Committee to consider the information provided in the annexes and provide feedback on:

1) Understanding likely causes of trawl – whale interactions
    (i) What factors likely contributed to the incidents (spatial, temporal, operational, behavioural factors of both whales and vessels)?
    (ii) Incident investigation (documenting incidents and specimens, biological sampling)

(iii) Routine data collection to support monitoring (e.g., whale sightings, net monitoring devices)

2) Develop mitigation techniques and technologies

(i) Avoidance techniques

a. management actions

b. vessel actions

Recommendation

As a mechanism to provide this feedback, we recommend two processes. First, the HIM Subcommittee consider the information provided and provide feedback to SC-CAMLR via their report and second, that the HIM and the IWC SC consider nominating people with appropriate expertise in the topics listed above to attend the upcoming CCAMLR WG-IMAF meeting to further discuss these issues with CCAMLR members. At this time, the WG-IMAF-2022 meeting is scheduled for early October in Hobart.

Background paper SC-CAMLR-40-BG/27, released to IWC with permission.

Further information requested by WG-FSA-21 on humpback whale (*Megaptera novaeangliae*) mortality incidents recorded by the krill fishery in Subareas 48.1 and 48.2 during the 2020/2021 season

Delegations of Norway and the United Kingdom

Discussions at WG-FSA-2021, including of WG-FSA-2021/04 Rev. 1, considered incidental mortality associated with fishing activities reported in scientific observer and vessel data during the 2020 and 2021 seasons. Reports included, for the first time ever, three humpback whale (*Megaptera novaeangliae*) incidental mortalities in the Antarctic krill (*Euphausia superba*) fishery in Subareas 48.1 and 48.2.

This paper therefore follows a WG-FSA-21 request (WG-FSA-21, para 6.6) to provide further information to SC-CAMLR-40 on the three whale mortality incidents, including information from the vessel Flag State and the SISO designating Member, Norway and the UK, respectively. Here, Norway has provided an annex which contains a full description of each of the three incidents from the Norwegian fishing company, Aker BioMarine, and the UK has verified and provided the SISO observer report. These include information about weather conditions, trawling conditions and the actions taken at the time.

Based on the information in the CCAMLR SISO observer report, as well as the additional information presented by the fishing company, it is not possible to determine whether the humpback whales were dead prior to becoming entangled, or died as a consequence of becoming entangled in the trawl in any of the three incidents.

During the 15 years that Norwegian vessels have been harvesting krill, the 2020/21 season is the first time that dead whales have been reported from the trawls.

The delegation of Norway and the fishing company, Aker BioMarine, take these incidents very seriously and specific measures have therefore already been taken to prevent such incidents from happening again. These include modification to the marine mammal exclusion nets, replacing the nylon with spectra, which is a far stronger material. Additionally, routine checks of gear and modification to gear are also possible, including through the introduction of mandatory measures. For example, monitoring the opening and closing of trawls using suitable technology, such as stretch sensors, that can detect a sudden change in weight, direct video surveillance, or use of high frequency echo-sounders to detect encounters, might reduce the probability of any future whale entanglements. A programme of future work would help to determine the best solutions.

Fishermen try to avoid entanglement of all marine mammals with the trawl gear. These concerns are from an animal welfare perspective, and for operational reasons. For example, marine mammal interactions could result in serious logistical challenges, potentially leading to equipment damage and / or the need to cease harvesting and processing operations. Entanglements could halt operations by physically blocking the catch flow. Further, there is increased risk of contaminating the onboard processing technology and final product. Other stakeholders are also concerned about

marine mammal bycatch, including scientific researchers, managers, and civil society, because of animal welfare concerns, but also because of wider ecosystem effects.

The delegation of Norway would like to open a transparent discussion about: 1) Mitigation measures that may help prevent whales and other marine mammals from entering trawls, or adversely interacting with fishing gear; 2) Developing mechanisms whereby additional information on marine mammal by-catch can be collected in a standardized format, including by vessels and CCAMLR SISO observers. We suggest that WG-EMM be tasked with this.

Appendix 1: Short summary table of three humpback whale mortality observations on the Antarctic Sea in Subareas 48.1 and 48.2 during the 2020/21 season

Haul ID	Subarea	Trawl set (UTC)	Trawl hauled (UTC)	Interval between hauling	Net haul position	Reason for hauling	Short summary of observations
1726	48.2	Trawl 1644: 15:15 on 28/02/21	Trawl 1726: 04:20 on 04/03/21	3 days, 13 hours, 5 minutes	-60 32.30 -045 11.29	Net hauled to repair damaged section of hose	One dead humpback whale observed in the trawl net; estimated to be 8 – 10 m in length. The body was bloated, leaking blood into the water, gave off a very strong smell and floated free once released.
2609	48.1	Trawl 2371: 17:45 on 10/04/21	Trawl 2609: 19:35 on 20/04/21	10 days, 1 hour, 50 minutes	-63 33.10 -059 24.99	Routine net hauling	One dead humpback whale observed in the trawl net; estimated to be 7 – 8 m in length. The body was bloated, leaking blood into the water, gave off a very strong smell and floated free once released.
2797	48.1	Trawl 2612: 18:20 on 21/04/21	Trawl 2797: 15:45 on 29/04/21	7 days, 21 hours, 25 minutes	-64 17.85 -061 20.43	Routine net hauling	One dead humpback whale observed in the trawl net; estimated to be 8 – 10 m in length. The body was bloated, leaking blood into the water, gave off a very strong smell and floated free once released.

Appendix 2: CCAMLR Scientific Observer Trawl Vessel Cruise Report on the Antarctic Sea in Subareas 48.1 and 48.2 from 27/01/21 to 17/06/21

CCAMLR Scientific Observer Trawl Vessel Cruise Report

Observer Name(s)	[redacted]
Vessel Name	Antarctic Sea
Vessel Type (Finfish Trawl, Conventional Krill Trawl, Continuous Trawl)	Krill continuous trawl
CCAMLR Area/Subarea/Division(s)	48.1 and 48.2
Cruise Dates (boarding to disembarkation)	From: 27/01/2021 to: 17/06/2021

1. Trip Summary

[redacted] was designated by the UK as the CCAMLR Scientific Observer, under the CCAMLR Scheme of International Scientific Observation, on board the Norwegian registered factory trawler Antarctic Sea. This vessel fished for Antarctic krill (*Euphausia superba*) within CCAMLR statistical Subareas 48.1 and 48.2 between 27/01/2021 and 17/06/2021.

All vessel and observer times were recorded in UTC.

2. Cruise Interruption Details

First section of the cruise		Second section of the cruise	
Port of departure:	At sea, 48.2	Port of departure:	N/A
Date of departure:	20/01/2021	Date of departure:	N/A
Arrival on fishing grounds:	27/01/2021	Arrival on fishing grounds:	N/A
Start fishing:	28/01/2021	Start fishing:	N/A
End fishing:	12/06/2021	End fishing:	N/A
Depart fishing grounds:	17/06/2021	Depart fishing grounds:	N/A
Port of return:	Montevideo, Uruguay	Port of return:	N/A
Date of return:	29/06/2021	Date of return:	N/A

3. Fishing Operations

3.1 Operations and Gear

Fishing Method	Method used (Y/N)
Previous established fishing grounds and/or historical knowledge from fishing master	Yes
Test hauls performed to establish favourable areas	No
Shared information from other vessels	Yes
Fishing area determined by survey requirements	No

Comments:

The master and fishing mate used historical knowledge of the fishing grounds in combination with observations from sonar equipment onboard to target krill. The vessel also used shared information from other vessels and knowledge of prevailing weather and currents to target krill.

The observer found no differences to the gear as declared in the vessel notification on boarding. A marine mammal exclusion panel was used on 100% of trawls.

From 5th-6th June, an additional mammal panel was fitted to the mouth, constructed of 8, 10 and 12mm spectra to form a 600 mm mesh to prevent large objects such as ice entering the net.

6. Seabird Interactions with Vessel

6.1 Mitigation Devices – Streamer Line Details

Was a streamer line used during shooting of the trawl or towing of the net?	1 of 2
What was the percentage of shots/tows where the streamer line was used?	100%
Was a streamer line used during hauling of the net?	1 of 2
Did the streamer line meet the minimum CCAMLR specifications?	Yes
Was there a spare line or the ability to make a spare streamer line?	Yes
How many streamer lines were regularly used?	2
Did all streamers reach the sea surface in the absence of wind and swell?	No

Comments:

The streamer lines were composed of a curtain of seven or eight sections of yellow material, one fore and one aft of the towing point on each side. The aft streamer lines on both port and starboard sides were deployed after shooting and retracted before hauling to remove the risk of tangling the hose, net or drift lines with the streamer lines. A more in-depth report on the trials and data from all the AKER fleet will be submitted by Norway to WG-FSA.

6.2 Mitigation Devices

Was the net cleaned before each shot?	Yes
If net was cleaned did this occur always/often/rarely?	Always
Net binding used during net shooting (always/often/rarely)?	Never
Net binding material used?	N/A
Distance between net bindings (m)?	N/A
Range of mesh sizes being bound (e.g. 120 to 800)	N/A
Was net weighting used (always/often/rarely)?	Always
Describe location of net weights (e.g. codend, wings, belly).	Bottom corner of each wing
Total mass of net weights used in each location	3,000 kg
Was an acoustic scarer used (always/often/rarely)?	Never

Comments:

Net weighting was used in accordance with the declared gear in the vessel notification. The observer found the net to be very clean after every haul. Any required cleaning of the net or deck was minimal. No krill or other bycatch was available to birds or mammals during or after shooting. Any remaining krill at the codend, typically less than 100 kg, was retained in the codend until subsequent shooting (Figure 1).

Figure 1 Residual krill in the codend

6.3 Offal Management

Was the vessel configured to hold offal during the shooting/hauling of the trawl?	Yes
On what percentage of shooting events was offal discarded?	0%
On what percentage of hauling events was offal discarded?	0%
Was offal discarded at times other than during shooting/hauling?	No
Was all or most of the offal retained for disposal on shore?	No
Was all or most of the offal retained and processed (e.g. mealed)?	No

No offal was produced by the factory, only stick water, and no discharge of offal or discards were observed during shooting or hauling during the trip. Small amounts of factory cleaning wastes or uncooked krill meal were incinerated onboard. Large bycatch (>5cm) was separated from the catch either on a screen at the dewatering unit (Figure 2) or from the conveyor. Bycatch was either retained onboard for disposal outside the convention area, incinerated or consumed onboard after being identified and recorded by the vessel's factory crew.

During several trawls, large volumes (>500 kg) of *Pseudochaenichthys georgianus, Chaenocephalus aceratus* and *Champsocephalus gunnari* were separated from the catch, placed in 500 kg meal bags, weighed, and number estimated from a sub-sample of individual weights.

Figure 2 Large bycatch caught in the dewatering grid

6.4 Seabird Entanglements

Date	Set/haul number	Species	Number observed caught by gear				Number of collisions with vessel		Comments (entanglement method, when release took place etc.)
			By observer		By crew				
			Dead	Alive	Dead	Alive	Dead	Alive	
26/02/21	1641	PYN	1						Entangled in the net intermediate. Seen falling out of the net during the subsequent shot (1642)
20/04/21	2609	DAC	5	2					Entangled in the mouth of the net.
29/04/21	2797	DAC	5	2					Entangled in the mouth of the net.
29/04/21	2797	FUG	1						Entangled in the mouth of the net.
04/05/21	2828	DAC	2	1					Entangled in the mouth of the net.
19/05/21	3159	PWP	1						Entangled in the mouth of the net.
08/06/21	3425	PWP	2						Entangled in the mouth of the net.

Comments:

22 seabirds were observed to become entangled during the trip. During the shooting of trawl 1642, a dead Chinstrap penguin was seen to fall out of the starboard net (Fig. 3). It is unclear how the penguin came to be in the net, but a potential cause is that during hauling of the driftline, the net collapsed around the bird and entangled it. Two penguins were observed standing on the port net during the preceding haul but moved off the net before it was retrieved. No penguins were observed on the starboard net during the preceding haul.

Figure 3 Dead penguin observed during hauling of trawl 1642

During hauling of trawl 2609, very large numbers of birds (>1000) were present around the vessel, associated with a dead humpback whale (*Megaptera novaeangliae*) in the codend. During hauling, five Cape petrels (*Daption capense*) were seen to become entangled in the mouth of the net and drowned. Two other Cape petrels were seen to become entangled and successfully free themselves from the net. Three of the birds were recovered by the crew and handed to the observer after hauling; one was seen to fall out of the net during the subsequent shoot (2612) and one was not recovered.

Figure 4 Three dead cape petrels retained from trawl 2609

During hauling of trawl 2797, very large numbers of birds (>1000) were present around the vessel, associated with a dead humpback whale in the net intermediate. During hauling, five Cape petrels and one Southern Fulmar (*Fulmarus glacialoides*) were seen to become entangled in the mouth of the net and drowned. Two other Cape petrels were seen to become entangled and successfully free themselves from the net. Four of the Cape petrels and the Southern Fulmar were recovered by the crew and handed to the observer after hauling (Figure 5); one Cape petrel was not recovered.

Figure 5 Four dead cape petrels and one southern fulmar retained from trawl 2797

During hauling of trawl 2828, two Cape petrels were seen to become entangled in the mouth of the net and drowned. One other Cape petrel was seen to become entangled and successfully free itself from the net. Neither bird was recovered and both remain unaccounted for.

During hauling of trawl 3159, one snow petrel (*Pagodroma nivea*) was seen to become entangled in the mouth of the net and drowned. The bird was seen to fall out of the net during the subsequent shot (Figure 6).

Figure 6 Dead Snow Petrel (PWP) caught during hauling of trawl 3159 drifting free of the net during shooting of trawl 3160.

During hauling of trawl 3425, two snow petrels flew directly into the mouth of the net, became entangled and drowned. Neither bird was recovered. During this haul, one snow petrel was also seen to strike one of the towing chains (with the net below the surface), land on the water surface and fly off uninjured. The vessel was hauling with the weather astern to avoid surface ice.

During observation of the shooting of trawl 2610, the observer saw a cape petrel enter the mouth of net at 19:47. The observer lost sight of the bird after it had entered the net and it was not seen escaping the net subsequently. The entry was recorded on onboard CCTV.

No injuries were seen to be caused by contacts with the net monitor cable or warps. Non-fatal warp and net monitor contacts were observed during the trip and are described below:

1. A cape petrel struck the port net monitor cable, landed on the water's surface and swam away uninjured. Very large numbers (>500) of birds were congregating at the stern at the time. This was observed during deck observations on 01/02/2021 (Trawl 1142).
2. A giant petrel (Macronectes spp.) struck the starboard warps and net monitor cable at a moderate pace near the towing block and landed on the water's surface. The bird then flew away uninjured. The vessel was turning to starboard at the time and the warp and net monitor cable were extended beyond the streamer curtain. The bird made attempts to avoid the strike but saw the warps and net monitor cable too late. This was observed during deck observations on 09/02/2021 (Trawl 1337).
3. A cape petrel struck the starboard net monitor cable, landed on the water's surface and swam away uninjured. This was observed on a camera recording at 14:06:20 on 01/02/2021 (Trawl 1138).
4. A southern fulmar struck the starboard net monitor cable, landed on the water's surface and flew away uninjured. The bird was flying low to the water's surface (approx. 30 cm) into the weather coming from the stern. Large numbers (>100) of birds were circling the vessel and heading into the weather at the time. This was observed during deck observations on 26/03/2021 (Trawl 2132).

5. A cape petrel struck the starboard warps, landed on the water's surface and swam away uninjured. Very large numbers (>500) of birds were congregating at the stern at the time. This was observed on a camera recording at 14:00:33 on 27/03/2021 (Trawl 2154).
6. A cape petrel struck the port net monitor cable, landed on the water's surface and flew away uninjured. Very large numbers (>500) of birds were congregating at the stern at the time This was observed during deck observations on 28/03/2021 (Trawl 2175).
7. A cape petrel struck the starboard warps, landed on the water's surface and flew away uninjured. Very large numbers (>500) of birds were congregating at the stern at the time. This was observed during deck observations on 30/03/2021 (Trawl 2222).
8. A cape petrel struck the starboard net monitor cable, landed on the water's surface and flew away uninjured. Very large numbers (>500) of birds were congregating at the stern at the time. This was observed during deck observations on 30/03/2021 (Trawl 2222).
9. A cape petrel struck the port net monitor cable, landed on the water's surface and swam away uninjured. Very large numbers (>500) of birds were congregating at the stern at the time. This was observed during deck observations on 03/04/2021 (Trawl 2327).
10. A cape petrel struck the port warps, landed on the water's surface and flew away uninjured. Very large numbers (>500) of birds were congregating at the stern at the time. This was observed during deck observations on 15/04/2021 (Trawl 2489). During this observation period, one additional light strike was observed when an Antarctic petrel (*Thalassoica antarctica*) clipped the aft bird scarer curtain. A recording and stills were retained from the former event. The latter event was not recorded on video as the towing derrick obstructs the camera's view of the aft bird scarer.
11. An Antarctic petrel clipped both the warps and net monitor cable lightly and landed on the water surface in control of its flight. This was observed during deck observations on 19/04/2021 (Trawl 2579). A recording and stills were retained.
12. During observation of the shooting of trawl 2610, an Antarctic petrel struck one of the towing chains connecting the beam to the trawl block during a turn to port to bring the vessel head to the weather at 20:28. The bird landed on the water surface, was partly submerged and then flew away uninjured. A recording and stills were retained.
13. An Antarctic petrel struck the port net monitor cable, landed on the water's surface and flew away uninjured. The weather was fine at the time and there was a strong glare on the water's surface. This was observed during deck observations on 23/04/2021 (Trawl 2656). A recording and stills were retained.
14. A cape petrel struck both the starboard warps and net monitor cable, landed on the water's surface and flew away uninjured. This was observed during deck observations on 28/04/2021 (Trawl 2777). No recording or stills were retained due to technical issues. The weather was poor at the time with heavy snow and a starboard beam wind.
15. A cape petrel struck the starboard net monitor cable, landed on the water's surface and flew away uninjured. This was observed on a camera recording at 20:04:40 UTC on 06/05/2021 (Trawl 2835)
16. A cape petrel struck the starboard warps and appeared to stick to the grease on the warps briefly before falling into the water and flying off after a few moments. This was observed on a camera recording at 20:05:32 UTC on 06/05/2021 (Trawl 2835)

17. A cape petrel struck the starboard net monitor cable, landed on the water's surface and flew away uninjured. This was observed on a camera recording at 20:04:40 UTC on 06/05/2021 (Trawl 2835)
18. A cape petrel struck the starboard warps and appeared to stick to the grease on the warps briefly before falling into the water and flying off after a few moments. This was observed on a camera recording at 20:05:32 UTC on 06/05/2021 (Trawl 2835)
19. An Antarctic petrel struck the starboard warps, landed on the water's surface and swam away uninjured. This was observed during deck observations on 10/05/2021 (Trawl 2952). A recording and stills were retained.
20. A cape petrel struck the starboard warps, landed on the water's surface and flew away uninjured. This was observed during deck observations on 11/05/2021 (Trawl 2975). A recording and stills were retained.
21. A snow petrel struck the starboard net monitor cable, landed on surface ice and flew away uninjured. This was observed during deck observations on 03/06/2021 (Trawl 3370). A recording and stills were retained.
22. During observation of hose repairs on trawl 3481, the observer saw a snow petrel strike one of the towing chains connecting the beam to the trawl block at 19:20:23. The bird landed on the water surface and flew away uninjured. This event was not recorded in the net monitor logbook as it was not a warp or net monitor cable strikes. A recording and stills were retained.
23. A snow petrel struck the port warps, landed on the water's surface and flew away uninjured. This was observed on a camera recording at 01:43:41 UTC on 12/06/2021 (Trawl 3511)

In some cases, large numbers of birds congregating at the stern of the vessel coincided with shallow fishing depths. And the presence of krill in surface (<20 m).

During hauling trawls 1640 and 1641 (between 01:00 and 02:00 26/02/21), poor weather and heavy snow caused a number of birds to land on the vessel. No strikes on the fishing gear were observed during this time. The observer and crew released a number of birds (*D. capense*, *Oceanites oceanicus*, *Pagodroma nivea*) overboard without injury and the observer conducted checks the following morning to see if any birds remained onboard. No birds were found during these checks. During the course of the trip, several birds (*D. capense*, *O. oceanicus*, *P. nivea, Fulmarus glacialoides, T. antarctica, Chionus albus*) were released alive, uninjured and without bands by the observer where they had landed on the vessel during periods of poor weather or heavy snow.

During anchoring in Cumberland Bay on 15th June, the crew discovered a dead diving petrel (Procellaria spp.) on the forecastle. The bird was handed to the observer and transferred to KEP staff on 15th June.

6.5 Seabird Samples Retained

Species	Type of sample (whole/head/leg)	Number of samples collected	Contact details of where the samples were sent
DAC	Whole	7	Scientist at KEP. Samples were stored in -18^{o}C freezer and transferred to KEP staff on 15/06/2021.
FUG	Whole	1	
PTZ	Whole	1	

6.6 Bird Bands

No bird bands were observed during the trip.

7. Marine Mammal Interactions with Vessel

7.1 Mitigation Measures

An exclusion panel with a 16mm inner mesh and 144mm outer mesh was located at the mouth of the trawl (Figure 7). The net was observed to be clean on all hauls. There was no noticeable loss of krill during hauls. Any potential residual krill in the codend was inaccessible to marine mammals due to the exclusion panel. Humpback whales (*Megaptera novaeangliae*) were seen to follow the net during several hauls (Figure 8).

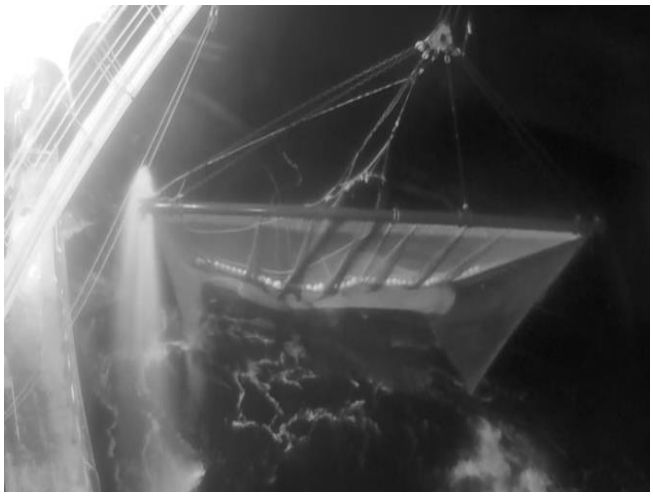


Figure 7 Marine mammal exclusion panel at the mouth of the net

Figure 8 Humpback whale following the net

7.2 Marine Mammal Entanglements

Date	Set or haul number	Species	Number observed entangled in fishing gear		
			Dead	Alive	Comments
04/03/21	1726	HUW	1		Comments below
20/04/21	2609	HUW	1		Comments below
29/04/21	2797	HUW	1		Comments below

Three humpback whales were hauled dead during the deployment. In each case the carcass was in poor condition and produced a strong smell. It is possible they entered the net already dead.

At 03:20 on 04/03/2021 (position -60° 32, -45° 11), whilst hauling the net to repair a damaged section of hose, a dead humpback (estimated 8-10m in length) was caught in the mouth of the net, against the marine mammal exclusion panel. The carcass was bloated and blood was seen leaking into the water. After one hour, the carcass was released and floated free. A 1m rip was found in the upper mouth of the net, consistent with the location of the carcass. The observer was on watch throughout; no other IMAF or warp strikes associated with this event were observed.

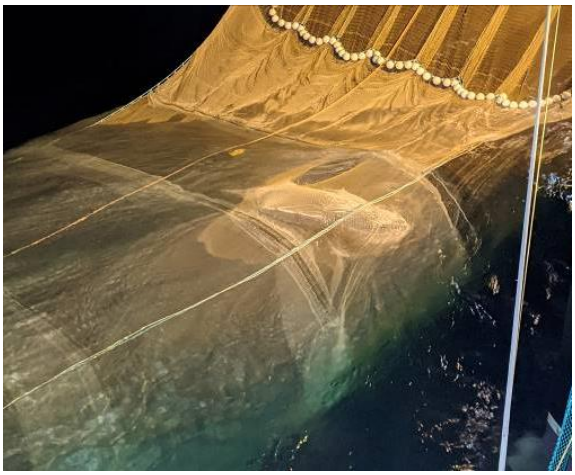


Figure 9 Whale caught inside net on 04/03/2021

Figure 10 Whale carcass floating free after release on 04/03/2021

At 18:30 on 20/04/2021 (position –63° 33, -59° 24) a dead humpback (estimated length of 7-8m) was found in the codend during hauling. The carcass was bloated and blood was seen leaking into the water. One hour later, most of the net was hauled and the codend opened to release the carcass. Very large numbers of birds (>1000) were present throughout this event and five cape petrels were seen to become entangled in the mouth of the net and drowned. Two other birds were seen to become entangled and successfully free themselves from the net. Three of the birds were recovered by the crew and handed to the observer after hauling; one was seen to fall out of the net during the subsequent shoot (2612) and one was not recovered.

Figure 11 Whale caught inside net on 20/04/2021

Figure 12 Whale carcass floating free after release on 20/04/2021

At 14:43 on 29/04/2021 (position –64° 18, -61° 20) a dead humpback (estimated length of 8-10m) was found in near the centre of the net during hauling. The carcass was bloated and blood was seen leaking into the water. One hour later, most of the net was hauled and the codend opened to release the carcass. Very large numbers of birds (>1000) were present throughout this event and five cape petrels and one southern fulmar were seen to become entangled in the mouth of the net and drowned. Two other cape petrels were seen to become entangled and successfully free themselves from the net. Four of the cape petrels and the southern fulmar were recovered by the crew and handed to the observer after hauling. One cape petrel was not recovered.

Figure 13 Whale caught inside net on 29/04/2021

Figure 14 Whale carcass floating free soon after release on 29/04/2021

7.3 Fish Loss Due to Marine Mammals

No loss of fish to marine mammals was observed or attributed during the trip.

10. Additional Information

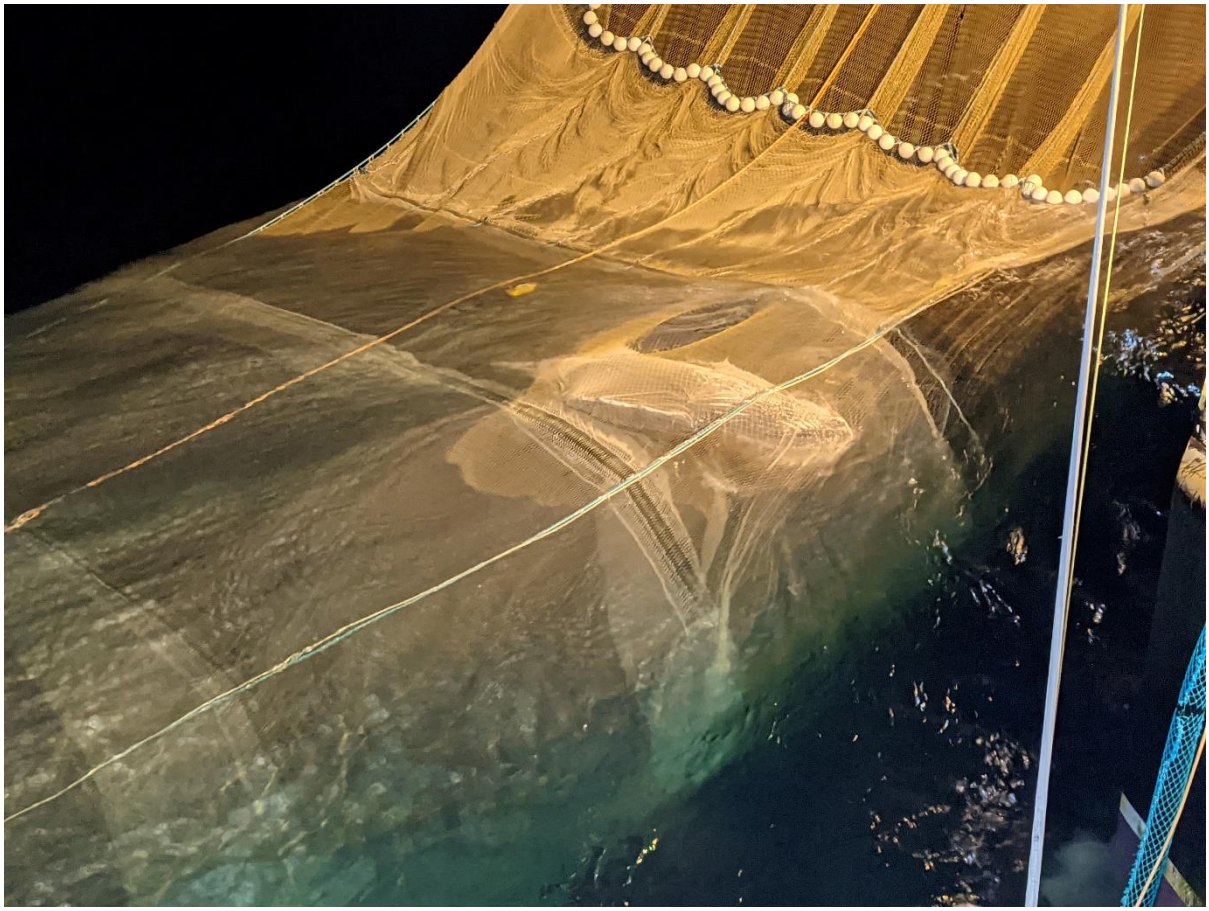
10.1 Operational Issues

The observer encountered no difficulties with access to any part of the vessel, logbooks, information or communication equipment. The officers and crew were courteous and very helpful to the observer throughout the trip.

Appendix 3: Additional CCAMLR SISO observer photographs of the three humpback whale mortalies recorded on the Antarctic Sea in Subareas 48.1 and 48.2 during the 2020/21 season

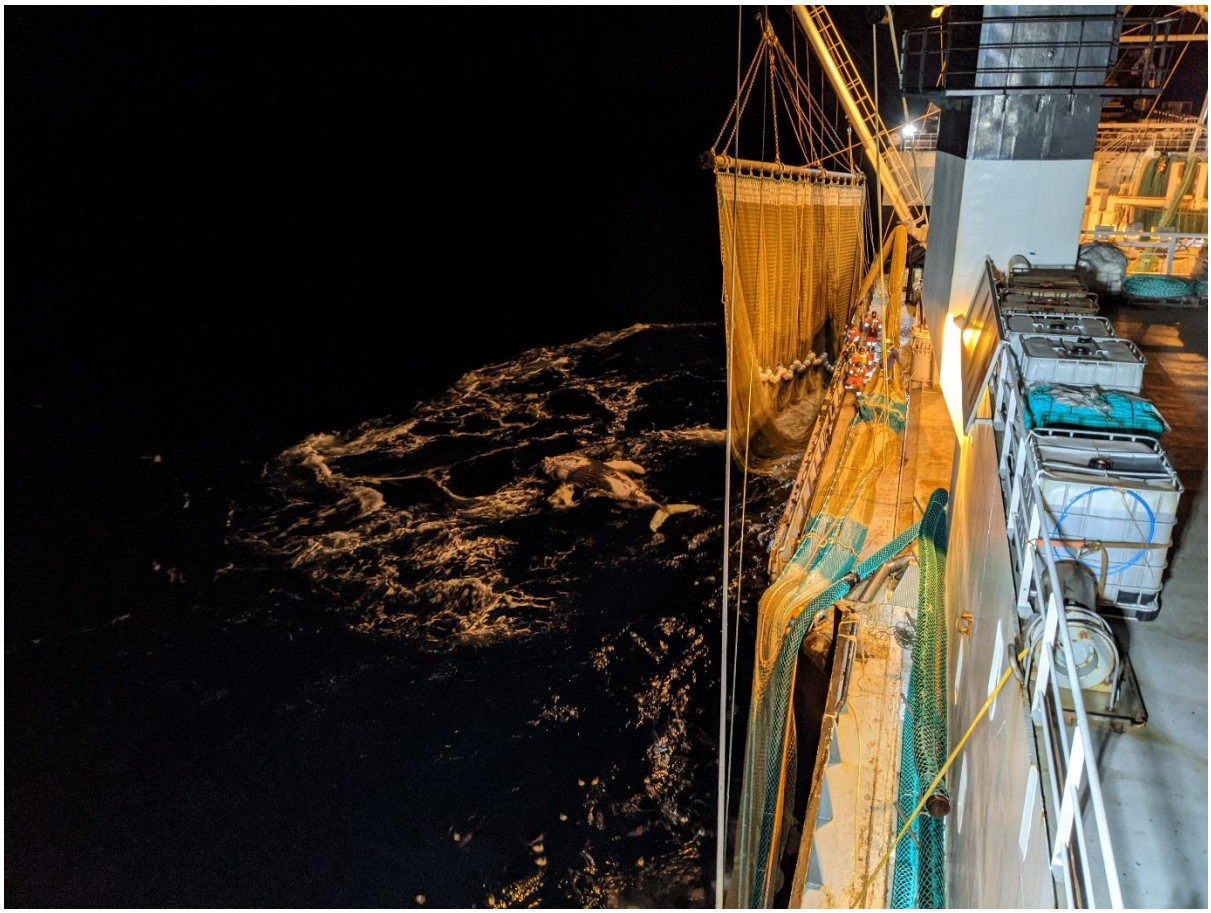
All photographs were taken by the CCAMLR SISO observer on board the Antarctic Sea during the 2020/21 season, and provided by MRAG.

Incident 1: Haul 1726 (MRAG ref: 04032021_1726_HUW_1)



Haul 1726 (MRAG ref: 04032021_1726_HUW_2)

Haul 1726 (MRAG ref: 04032021_1726_HUW_3)



Haul 1726 (MRAG ref: 04032021_1726_HUW_4)

Incident 2: Haul 2609 (MRAG ref: 20042021_2609_HUW_1)

Haul 2609 (MRAG ref: 20042021_2609_HUW_2)

Haul 2609 (MRAG ref: 20042021_2609_HUW_3)

Haul 2797 (MRAG ref: 29042021_2797_HUW_2)

Haul 2797 (MRAG ref: 29042021_2797_HUW_3)

Incident 3: Haul 2797 (MRAG ref: 29042021_2797_HUW_4)

Appendix 4: Report from Aker BioMarine AS on the three humpback whale mortalites recorded in Subareas 48.1 and 48.2 during the 2020/21 season

REPORT: HUMPBACK WHALE CARCASSES IN 2020/21 SEASON

We refer to data presented on bycatch in FSA September 2021, followed by discussion (ref. FSA meeting report point 6.3 – 6.7). SC/BG-23

Please see the below report from Aker BioMarine (AKBM) regarding the incidents of humpback whale carcasses in the 2020/21 season.

Attachment 1 contains fishery set/haul specific data
Attachment 2 contains maps with location of incidents

Background

Confirmation of three carcass incidents

- AKBM confirms that we in the 2020/21 season have experienced three (3) instances of humpback whale carcass in fishing gear from our vessel Antarctic Sea within a period of two (2) months in 48.1 and 48.2.
- Incident 1 took place 4 March in subarea 48.2. Incident 2 took place 20 April in subarea 48.1 and Incident 3 on 29 April in subarea 48.1.
- All three incidents were reported to CCAMLR through on-board independent observer from MRAG Management of Natural Resources in accordance with CCAMLR protocol.
- All instances were by the observer described in report as carcasses: *"very bloated, blood was seen leaking into the water and a strong odour was evident on deck".*

General points for all instances

- All of the three instances of carcass were discovered at hauling and released before coming up on vessel deck.
- There was nothing about the fishery operations surrounding the three carcass incidents that can be described as unnormal or deviant from normal operations.
- At no point before hauling was there any indication of carcass or live whale in contact with vessel, trawl or trawl opening. Trawl opening is continuously monitored with FS70 (acoustic trawl sonar) during fishery.
- No sign of restricted pumping or reduced flow of krill into factory was detected on vessel prior to hauling.
- As can be confirmed by historical CCAMLR records and Observer reports, AKBM has not during our 15 years of operations in the krill fishery ever experienced catching a whale carcass or live whale.

<u>Incident 1</u>: 4 March 2021

Case specific information

- Date/Time: 04/03/2021, 03:20,
- Location: -60 32.30 -045 11.29, Area 48.2 (see map Attachment 2a) and b))
- A humpback carcass ca 8-10 meter was discovered at the mouth of the net against the outside of mammal exclusion device when hauled
- Carcass was released as described by observer

Assessment of incident

- The circumstances around the incident and later inspection of gear indicate that the carcass had never been inside the trawl.
    - Carcass was found at the mouth of trawl outside of the mammal exclusion device.
    - Mammal exclusion device was found to be intact upon inspection

Conclusion

- To the best of AKBMs knowledge this was a carcass at time of contact with vessel. We find it unlikely that a live humpback whale can get entangled outside the trawl opening or in the exclusion device itself, especially considering the trawl speed of less than 2 knots.

Action taken by vessel

- 1m rip in mouth of net from where the carcass had come to rest was repaired
- No more action taken, fishery resumed

<u>Incident 2</u>: 20 April 2021

Case specific information

- Date: 20/04/2021, 18:30,
- Location: -63 33.10 -059 24.99 Area 48.1 (see map Attachment 2a) and c))
- A humpback whale carcass ca 7-8 meter was discovered in codend during hauling of trawl
- Codend opened and carcass released as described by observer

Assessment of incident

- Upon inspection of the trawl after release of carcass the mammal exclusion device was discovered to be ripped
- AKBM sees two possible explanations:
    - Mammal exclusion device was ripped by carcass during hauling of trawl when weight of carcass became heavy as more of trawl surfaced from water.
    - Mammal exclusion device was ripped by live whale trying to enter trawl opening during operation. If this was the case, we find it hard to explain how any intrusion into trawl during fishery was not picked up by the acoustic monitoring of trawl opening, any disruption to pumping or flow of krill into factory detected during production.

Conclusion

- Undetermined whether whale was a carcass at time of contact with vessel or if whale managed to break through mammal exclusion device and later died of entanglement in trawl.

Action taken by vessel:

- Codend and mammal exclusion device inspected and repaired
- Fishery operation continued in another area after 22 hours

Incident 3: 29 April 2021

Case information

- Date: 29/04/2021, 14:35,
- Location: -64 17.85 -061 20.43, Area 48.1 (see map Attachment 2a) and d))
- A humpback whale carcass ca 8-10 meter was discovered in the net intermediate during hauling of trawl.
- During hauling the carcass was drawn into codend and released

Assessment of incident

- We see two possible explanations:
    - Mammal exclusion device was ripped by carcass during hauling of trawl when weight of carcass became heavy as more of trawl surfaced from water.
    - Mammal exclusion device was ripped by live whale trying to enter trawl opening during operation. If this was the case, we find it hard to explain how any intrusion into trawl during fishery was not picked up by the acoustic monitoring of trawl opening, any disruption to pumping or flow of krill into factory detected during operations

Conclusion

- Undetermined whether whale was a carcass at time of contact with vessel or if whale managed to break through mammal exclusion device and later died of entanglement in trawl.

Action taken by vessel:

- Fishery operations discontinued
- Vessel moved and resumed fishing after 4 days in a different area towards South and later moved North East
- AKBM made a decision to strengthen the material of the mammal exclusion device on all three vessels in operation.
- As a precautionary measure, spectra material (see point 5.2) was air freighted from Ålesund (Norway) to Montevideo, loaded on carrier vessel and installed on mammal exclusion device on all three krill harvesting vessels by the end of May.

Mammal exclusion device and other measures

Current mammal exclusion device

- It is AKBMs opinion that the company's strong bycatch record over 15 years can be attributed to the use of a solid and correctly fitted mammal exclusion device together with a towing speed of less than 2 knots during operations.
- Mammal exclusion device is installed at mouth of trawl with the purpose to avoid any mammal bycatch, and is a regulatory requirement by CCAMLR.
- Aker BioMarine was the first company to use mammal exclusion device on trawls. Device was first deployed on vessels in 2006, initially as voluntary gear measure before it became a CCAMLR regulatory requirement.

Reinforcement of mammal exclusion device implemented

- With the incidents in mind AKBM has as a precautionary measure fitted a reinforced mammal exclusion device made by 8, 10 and 12 mm spectra material on all of our 3 krill harvesting vessels

- 12 mm spectra, as a single string, has a breaking strength of approximately 10 tons according to supplier.
- Interweaved into mammal exclusion device (as per precautionary measure on AKBM vessels per end of May 2021) will have increased breaking strength at least 5 times compared to original device.

Possible regulatory measures to consider for CCAMLR

- Mandatory fitting of mammal exclusion device made from material (e.g. spectra) in a dimension which significantly increases breaking strength compared to current gear regulation.
- Clear guidelines for action on crew or observer if unfortunate instances happen.
- Vessel monitoring of trawl opening (optical or acoustic) and/or possible sensory installations which alert bridge to any contact with mammal exclusion device during operation.

Conclusion

- We cannot with certainty determine the cause of each incident but have to the best of our knowledge given an account of the incidents and possible influencing factors
- As have been outlined to the extent possible by both company and observer there were differing circumstances around the whale carcass incidents we have experienced
- Regardless of cause, we find the incidents very regrettable and not something AKBM or vessel crew want to ever experience again
- The incidents this season underline that mammal exclusion device is ever important in the krill fishery:
    - The devices must continue to be inspected before every haul
    - It is recommendable to have a stronger regulation of the use of mammal exclusion device e.g. detailing the material, design and breaking strength.
    - AKBM has as a precautionary measure since the incidents fitted new and stronger 8, 10 and 12 mm Spectra mammal exclusion devices on all vessels. Devices will be further studied and improved during shipyard before next season.
- The incidents also indicate the significance of monitoring of the mouth of the trawl during trawling which enables the bridge to see and assess any interference with gear and avoid future incidents.
- Our vessels have had 100% independent observer coverage through all of operations in the krill fishery, also before full observer coverage became a mandatory requirement

These incidents confirm that the role of the independent observer onboard vessel is crucial to reporting, data collection and transparency in the CCAMLR fishery.

Sincerely Yours

Webjørn Barstad
EVP Offshore Supply Chain

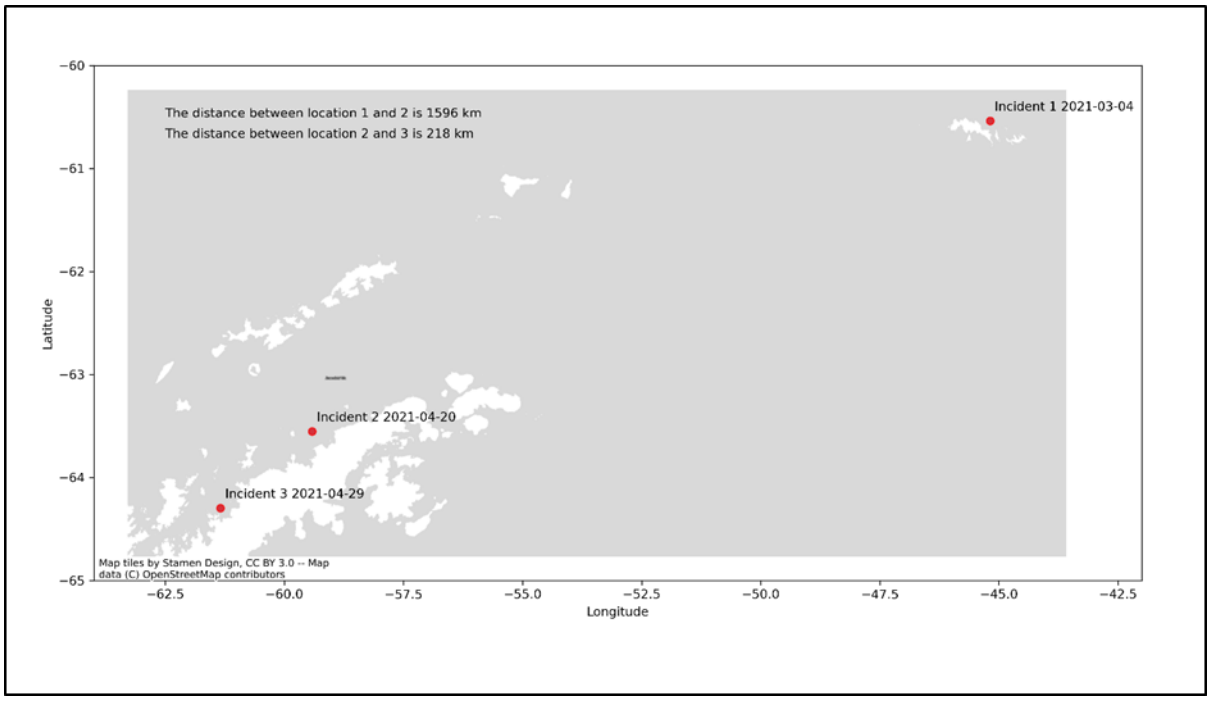
<u>Attachment 1</u>: Fishery set/haul specific data

Date			**Incident 1 04.03.2021**	**Incident 2 20.04.2021**	**Incident 3 29.04.2021**
Set or haul number			1726	2609	2797
Trawl shoot	**Net 1**		28.02.2021	10.04.2021	21.04.2021
			14:25	17:45	16:30
	Net 2		28.02.2021	10.04.2021	21.04.2021
			15:15	18:55	18:20
Trawl duration	**Days**		5	10	8
Fishing depth	**Average**		94	31	77
	Min		50	10	10
	Max		140	80	260
	Median		100	30	30
Weather conditions	**BaricPressure HPa**	average	993	982	986
		min	980	952	974
		max	1005	1002	1001
		median	994	980	983
	WaterTemp C	average	0,1	-1,0	-1,3
		min	0	-1,2	-3
		max	0,1	-0,8	-0,7
		median	0,1	-1,0	-1
	WindSpeed Kn	average	29	15	7
		min	15	3	2

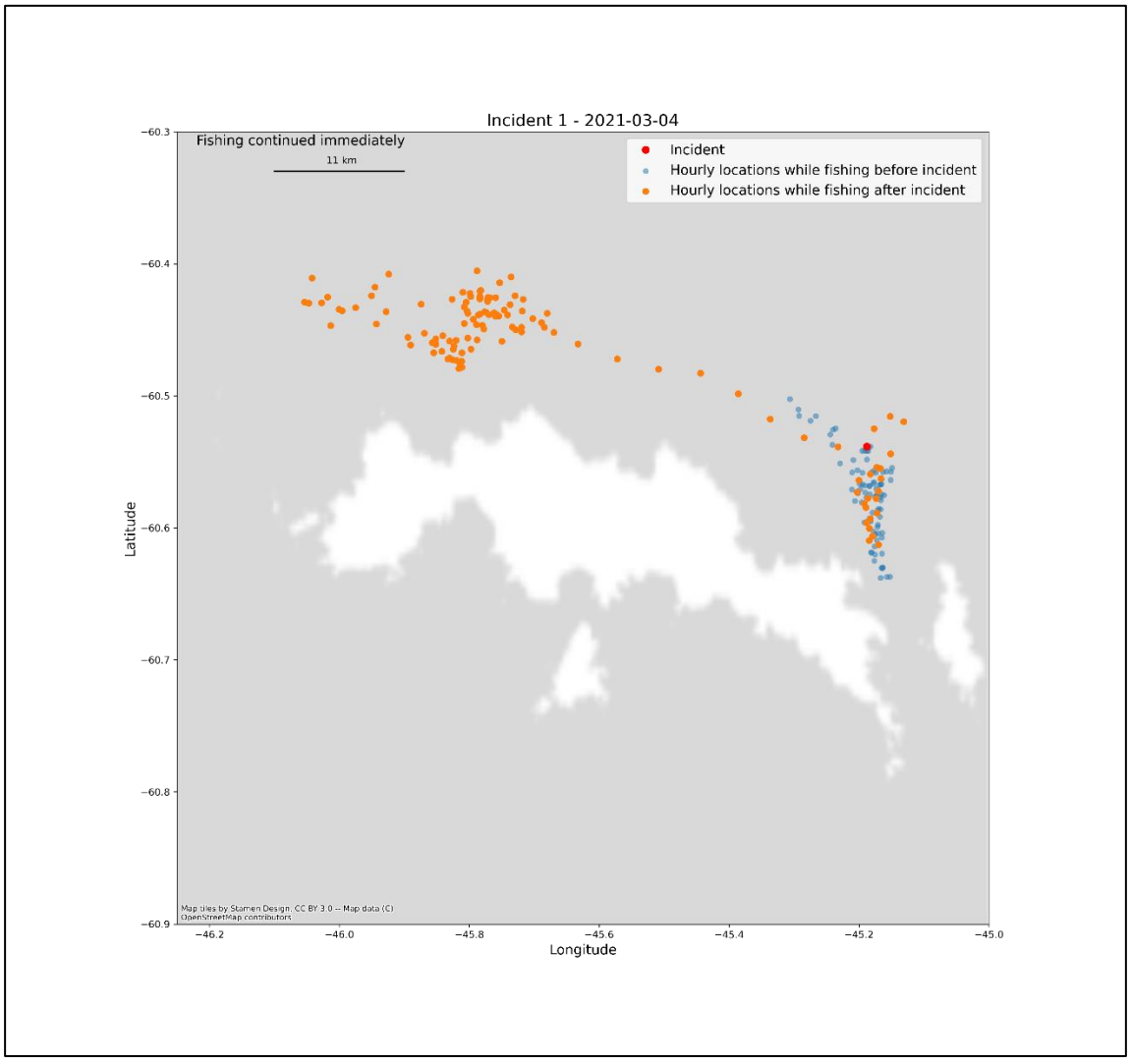
		max	40	28	22
		median	30	11	5
Trawl speed		average	1,59	1,50	1,47
		min	1,04	0,53	1,11
		max	1,92	1,88	1,77
Seabed depth	**Specific trawls**	average	277	497	340
		min	160	180	150
		max	360	780	475
	Entire season	average	907		
		min	94		
		max	3600		

Attachment 2: Maps with location of incidents

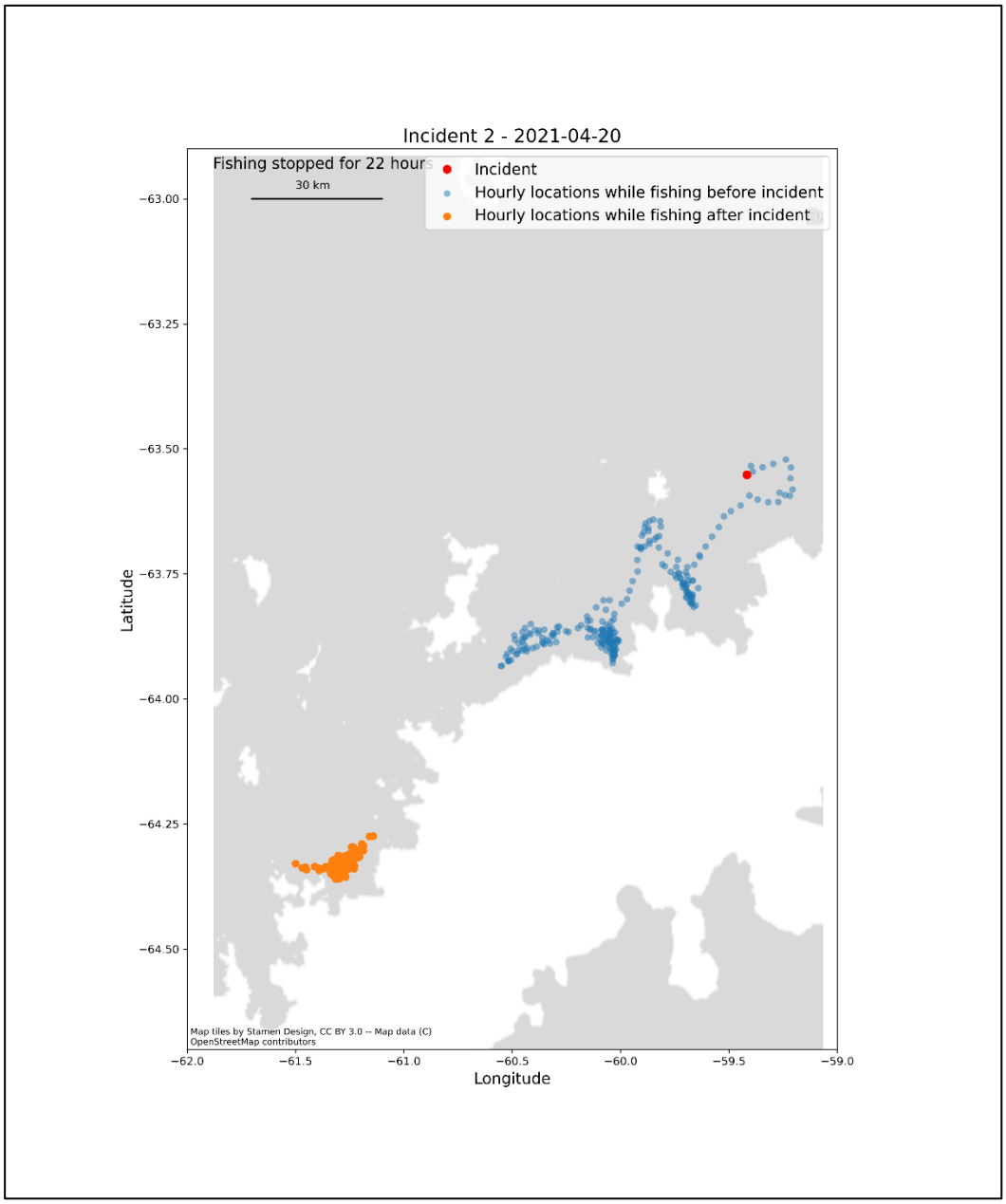
a) Location/time incidents



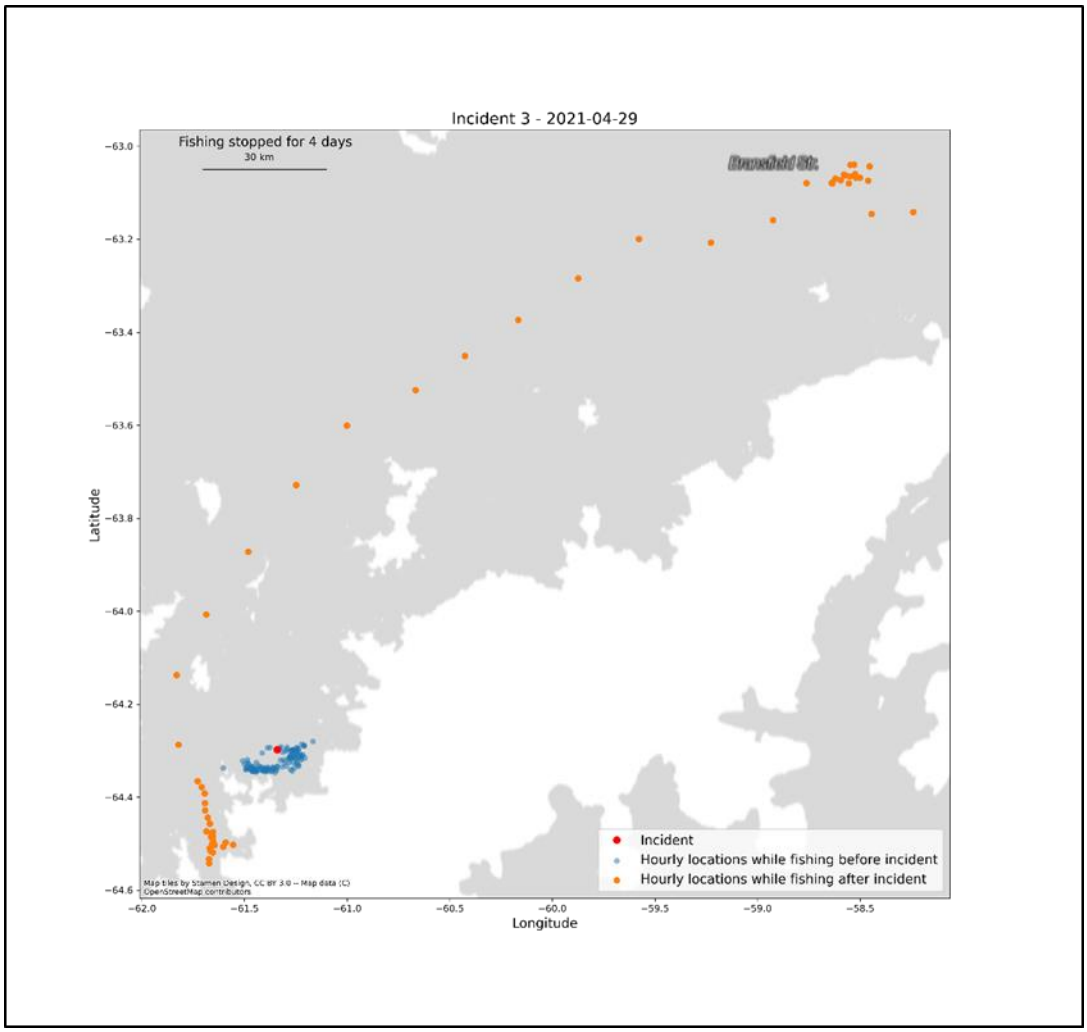
b) Map Incident 1, activity before and after



c) Map Incident 2, activity before and after



d) Map Incident 3, activity before and after



Annex 2

Excerpts from CAMLR-40 reports

Full text of the reports are available on the CCAMLR website.

SC-CAMLR-40 report

Incidental mortality of seabirds and marine mammals associated with fisheries

3.113 The Scientific Committee noted the discussions of WG-FSA on incidental mortality of seabirds and marine mammals (WG-FSA-2021, paragraphs 6.1 to 6.13), including the recommendation on the investigation of mitigation measures and potential move-on rules in the krill fishery (WG-FSA-2021, paragraph 6.4).

3.114 The Scientific Committee considered SC-CAMLR-40/BG/27, which presented further information, provided by a Norwegian-flagged vessel and the UK SISO observers, on the incidental mortality of three humpback whales (all potentially juvenile based on estimated body length), as requested by WG-FSA (WG-FSA-2021, paragraph 6.6). The paper indicated that the three fishing operations were conducted as normal, that the whales were only discovered when the nets were hauled and that there was no significant by-catch of finfish associated with these three hauls. The paper concluded that it was not possible to determine whether the humpback whales were dead prior to becoming entangled, or if they died as a consequence of becoming entangled in the trawl in any of the three incidents. The authors noted that they were taking these regrettable incidents very seriously and that they highlighted the need for reinforcement of marine mammal exclusion measures.

3.115 The Scientific Committee noted that the three recorded humpback whale by-catch events occurred within the area of the proposed D1MPA (CCAMLR-39/08 Rev. 1). It considered whether these incidents reflected an increasing overlap between the krill fishery and krill predators. Some Members expressed concern about the krill fishery moving further into the Gerlache Strait where an increasing number of whales are reported, and noted that this highlighted the importance of the D1MPA proposal as a measure to prevent and mitigate the potential ecosystem impacts of the fishery.

3.116 The Scientific Committee thanked the authors for the detailed report, the SISO observers for providing additional information, and noted the usefulness of observer reports for clarifying the circumstances surrounding these incidents.

3.117 The Scientific Committee noted that SISO observer cruise reports provide valuable scientific information in addition to data reported in both observer and vessel data forms, and requested the Commission consider whether SISO observer cruise reports could be made available to Scientific Committee Representatives upon request, without the necessity to seek permission from designating and receiving Members.

3.118 The Scientific Committee reflected on the likelihood of catching dead whales on three separate occasions, considering that dead whales are more likely to float to the surface or sink to the bottom than to remain at midwater depths where trawling occurs. Some Members questioned: (i) the utility of net monitoring systems (that require the use of net monitoring cables) as they did not appear to detect these events, and (ii) whether the marine mammal exclusion devices were sufficient to prevent whale mortalities.

3.119 The Scientific Committee noted that 60 seals were reported as by-catch in the last two seasons in the krill fishery, including 16 mortalities. The Scientific Committee further noted that these unusual events highlighted the need for an assessment of the ecosystem impacts of krill fishing operations using continuous and traditional trawling systems (including a comparison to other CCAMLR trawl fisheries), in addition to the consideration of design and functioning of marine mammal exclusion devices in CCAMLR trawl fisheries (see also paragraph 3.135).

3.120 The Scientific Committee recalled the extensive and successful work undertaken historically by the Working Group on Incidental Mortality Associated with Fishing (WG-IMAF) in reducing incidental mortalities of seabirds associated with CCAMLR longline fisheries. It noted that external expertise on mitigation measures to reduce marine mammal by-catch existed in the International Whaling Commission (IWC) Scientific Subcommittee on Non-deliberate Human-Induced Mortality of Cetaceans (HIM), and on seabird mitigation devices in trawl fisheries through ACAP.

3.121 The Scientific Committee therefore agreed to reconvene WG-IMAF with a focus on addressing issues associated with krill fishing identified above and any other issues from other CCAMLR fisheries (paragraph 3.135 and Annex 9).

3.122 ASOC supported reconvening WG-IMAF, as well as the suggestion to get more historic information on whale by-catch from the Secretariat. ASOC was concerned by these by-catch incidents, noting that, in its view, they highlighted the increasing overlap of the fishery with whale and other predator feeding areas and that this indicated a need for MPAs. Further research on the impact of climate change on krill predator interactions could also be considered. ASOC appreciated the steps taken to improve the marine mammal exclusion devices and suggested that this could be looked at for all vessels operating in the fishery.

3.123 The Scientific Committee noted the discussions of WG-FSA (WG-FSA-2021, paragraph 6.7 to 6.13) and deliberated further on the derogation of the use of net monitoring cables used by continuous trawling krill fishing vessels.

3.124 The Scientific Committee noted SC-CAMLR-40/BG/23, which provided an update to incidental mortalities of seabirds and marine mammals associated with fishing activities in the Convention Area, including details of extrapolated warp strike numbers of seabirds from krill fishing vessels, as requested by WG-FSA (WG-FSA-2021, paragraph 6.5). Total extrapolated warp strike estimates for continuous trawlers were 147 strikes in 2020 and 1 019 strikes in 2021. For traditional trawlers, estimates were 3 318 strikes in 2020 and 157 strikes in 2021.

3.131 The Scientific Committee considered trade-offs in the use of a monitoring cable. Some Members questioned their effectiveness considering that the monitoring devices failed to detect the presence of three juvenile humpback whales (paragraph 3.118). Other Members recalled that if monitoring cables were not used, this could potentially increase the number of high-risk setting and hauling events required to replace the batteries of wireless sensors used instead. The

Scientific Committee noted the potential improvement of mitigation measures to reduce the probability of any future whale entanglements suggested in SC-CAMLR-40/BG/27.

3.135 The Scientific Committee endorsed the re-formation of WG-IMAF co-convened by Mr N. Walker (New Zealand) and Dr M. Favero (Argentina) with terms of references shown in Annex 9, and the following priorities for its next meeting:

(i) consideration of New Zealand's risk assessment for seabirds in the waters surrounding Antarctica, including consideration of CCAMLR bird strike data

(ii) consideration of mitigation measure designs to reduce bird strikes on trawl warps and net monitoring cables

(iii) consideration of bird strike trials and provision of guidance on warp/cable strike counts by observers

(iv) consideration of a standard method for the extrapolation from incidental mortalities and warp/cable strikes observations to estimate total interactions and mortality numbers, accounting for differences between fishing methods, hauling/setting versus trawling period, time of day and season

(v) consideration of the design of marine mammal exclusion devices

(vi) consideration of collection of data and samples from marine mammals, including carcasses if possible, in a standard format

(vii) consideration of move-on rules or avoidance techniques in the krill fishery in relation to IMAF

(viii) coordination with ACAP, IWC, ARK and COLTO.

3.136 The Scientific Committee encouraged Members to send appropriate experts to WG-IMAF, including observers and industry representatives as had occurred in the past.

WG-FSA-2021 report

6.1 WG-FSA-2021/04 Rev. 1 presented a summary of incidental interactions between fishing vessels, seabirds and marine mammals during fishing activities undertaken during the 2020 and 2021 seasons from data collected by SISO observers and vessels. The extrapolated total of 44 seabirds caught in 2020 is the lowest on record for CCAMLR longline fisheries, whilst no extrapolated mortality figure was provided for 2021 due to outstanding observer data related to the timing of the meeting. In the krill fishery, three humpback whales were recorded as incidental mortalities in krill fisheries in 2021, the first mortality records for this species. Seal (60 Antarctic fur seals (Arctocephalus gazella) were caught by six vessels, leading to 16 mortalities in 2020) and seabird mortalities (in 2021) in the krill fishery were noted as higher than in previous seasons and a total of 139 warp strikes by seabirds were reported for 2020 and 2021.

6.3 The Working Group expressed concern at the increased levels of marine mammal mortality in the krill fishery, noting the comments received by the Secretariat that large numbers of icefish had been captured in several hauls in the krill fishery this season, and that they may have provided an additional attractant to marine mammals.

6.4 The Working Group noted that move-on rules exist in toothfish fisheries when large quantities of by-catch taxa are landed, and recommended that the Scientific Committee consider a similar mechanism for krill fisheries. Additionally, the Working Group recommended the Scientific Committee also consider move-on rules for when whales are at risk around krill fishing vessels. The Working Group encouraged Members to investigate marine mammal mitigation measures in other trawl fisheries to ensure CCAMLR's mitigation measures were best practice.

6.5 The Working Group requested that the Secretariat issue an update to WG-FSA-2021/04 Rev. 1 and present it at SC-CAMLR-40. The updated paper should detail mortalities and warp strike numbers by individual krill fishing vessel and gear type, and present an extrapolation of warp strike numbers from observation effort, to provide a more comprehensive assessment of total incidental mortality impacts of the krill fishery.

6.6 The Working Group requested that, where possible, further information on the whale mortality incidents from the vessel Flag State and the SISO designating Member (Norway and the UK respectively) be presented to SC-CAMLR-40. Where possible, information on morphological measurements, samples, additional photographs (which could aid potential identification and the condition of the individual specimens) and by-catch records from the hauls where the whales were recovered should be included in the report to further evaluate potential causes.

6.7 At the time of report adoption, Dr B. Krafft (Norway) informed the Working Group that it may not have been by-catch but those were carcasses of dead whales. More information will be provided for the meeting of the Scientific Committee.

6.8 The Working Group requested the Scientific Committee to consider a mechanism whereby additional information can be collected on marine mammal by-catch by observers in a standard format.

CAMLR-40 Report

6.47 The Commission approved the reconvening of the Working Group on Incidental Mortality Associated with Fishing (WG-IMAF) (SC-CAMLR-40, paragraph 3.135) to address seabird strikes on warps (SC-CAMLR-40, paragraphs 3.124 and 3.125) and net monitoring cables (SC-CAMLR-40, paragraphs 3.128 to 3.130), as well as seal and humpback whale by-catch events (SC-CAMLR-40, paragraphs 3.114 to 3.120) that occurred in the krill fishery.

Information on the gear types used in the krill fishery are available here, and the specific gear configurations used by the Antarctic Sea can be found here.

CCAMLR
Commission for the Conservation of Antarctic Marine Living Resources

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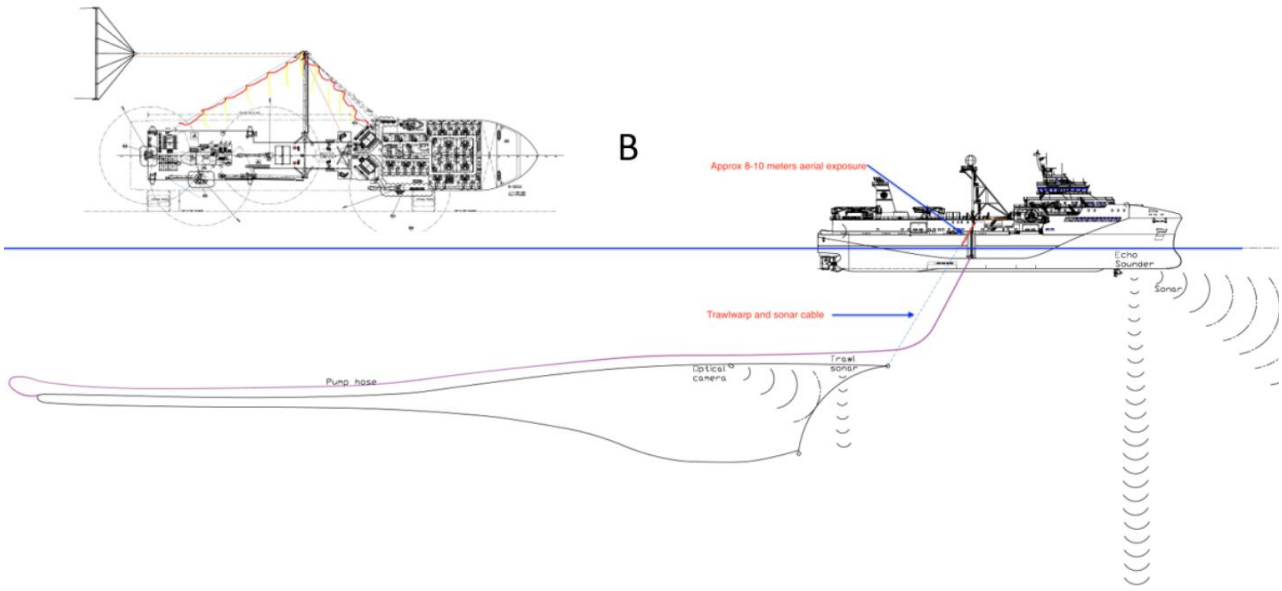
Home / Midwater Beam Trawl

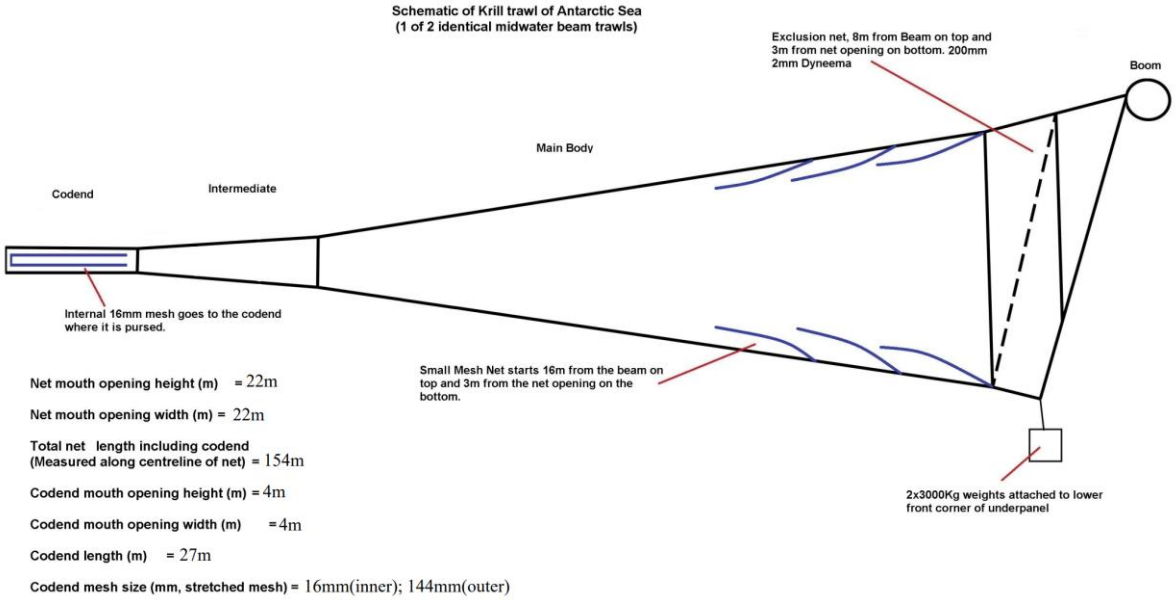
Midwater Beam Trawl

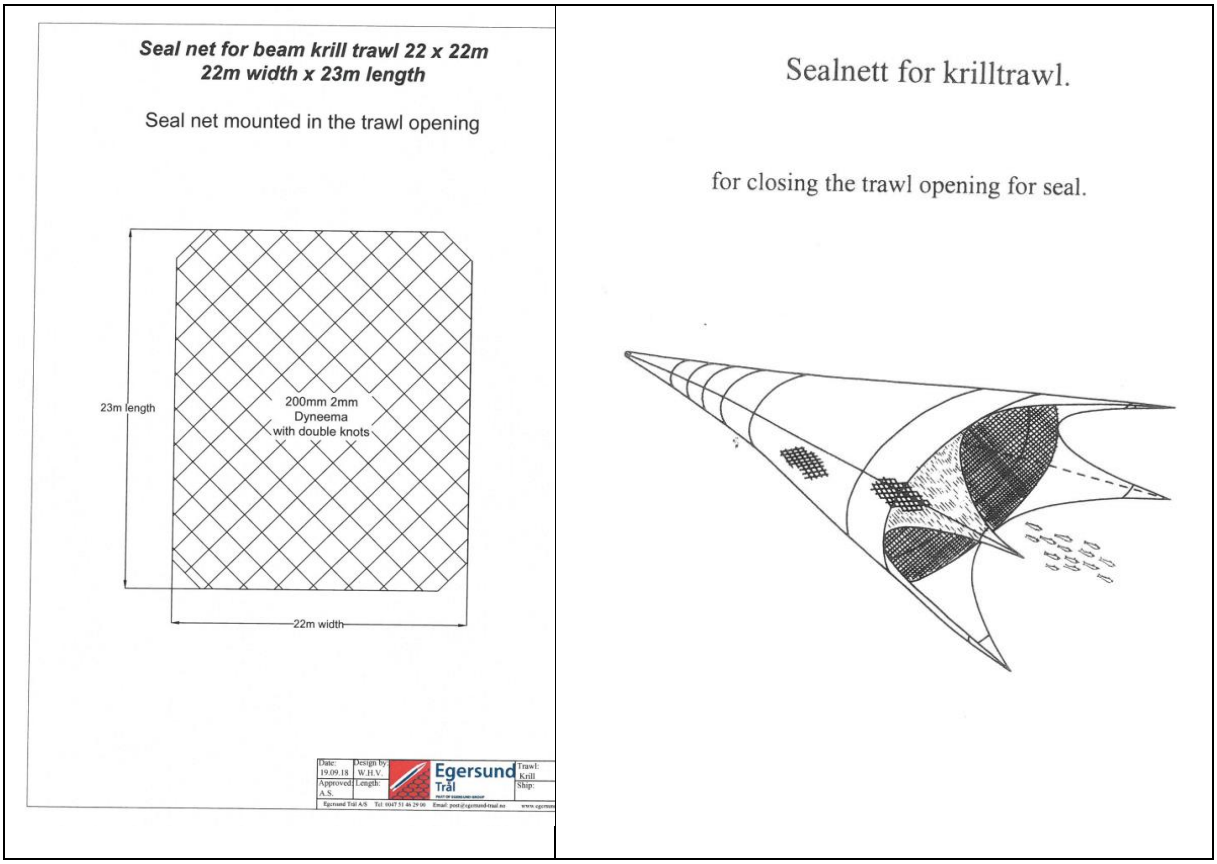
Net-mouth height: 22m
Net-mouth width: 22m
Total net length: 154m
Codend-mouth height: 4m
Codend-mouth width: 4m
Codend length: 27m
Codend mesh size: 16mm
Mammal exclusion device type: Large mesh panel across mouth/first section of net
Mammal exclusion device diagram: 104905-Mammal exclusion device.pdf
Gear diagram: 104905-antarctic-sea-net-diagram.pdf

This page was last modified on 15 May 2019



From WG-FSA-21/13 Figure 1. Modern krill fishing vessel with continuous pumping system with monitoring cable running in parallel with a single main fishing warp, and steel beam to open trawl mouth (B).


Schematic of Krill trawl of Antarctic Sea
(1 of 2 identical midwater beam trawls)
Exclusion net, 8m from Beam on top and 3m from net opening on bottom. 200mm 2mm Dyneema
Boom
Main Body
Codend
Intermediate
Internal 16mm mesh goes to the codend where it is pursed.
Small Mesh Net starts 16m from the beam on top and 3m from the net opening on the bottom.
2x3000Kg weights attached to lower front corner of underpanel
Net mouth opening height (m) = 22m
Net mouth opening width (m) = 22m
Total net length including codend (Measured along centreline of net) = 154m
Codend mouth opening height (m) = 4m
Codend mouth opening width (m) = 4m
Codend length (m) = 27m
Codend mesh size (mm, stretched mesh) = 16mm(inner); 144mm(outer)


Seal net for beam krill trawl 22 x 22m
22m width x 23m length
Seal net mounted in the trawl opening
23m length
200mm 2mm
Dyneema
with double knots
22m width
Egersund
Trål
Sealnett for krilltrawl.
for closing the trawl opening for seal.