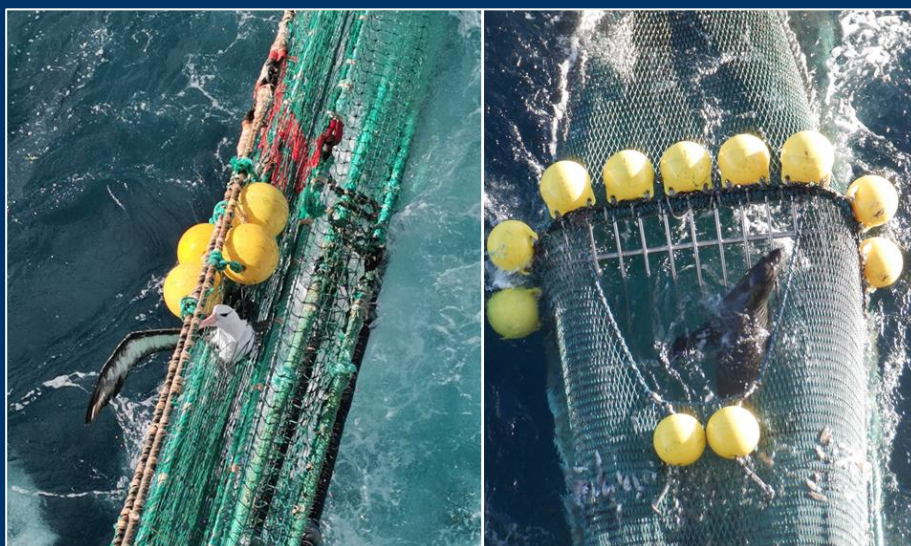


LOL 2023-C MMO Monitoring Program Report



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Directorate of Natural Resources
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LOL 2023-C



Participating/Contributing Scientific Staff

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Table of Contents

1. Introduction.....	1
2. Objectives.....	1
3. Methods.....	1
3.1 Manoeuvre monitoring.....	1
3.2 Bird scaring lines monitoring.....	1
3.3 Seabird and marine mammal bycatch mitigation measures.....	1
3.4 Mortalities and necropsies.....	2
3.5 Data reporting.....	2
4. Results.....	2
4.1 Manoeuvre monitoring.....	2
4.2 Pinniped sightings.....	3
4.2.1 Pinniped attendance to vessels and behaviour.....	4
4.3 Pinniped bycatch.....	5
4.3.1 Incidental mortalities.....	5
4.3.2 SED escapes and live deck releases	7
4.4 Seabird bycatch.....	7
4.4.1 Live interactions.....	10
4.4.2 Incidental mortalities.....	10
5. Conclusions.....	13

1. Introduction

The Marine Mammal Observer Program in the Patagonian longfin squid (*Doryteuthis gahi*) fishery is funded by the Falkland Islands Government (FIG), and it is managed by FIFD's Fishery Manager. In addition to vessel compliance monitoring, MMO record pinniped [i.e. South American sea lion (*Otaria flavescens*, hereafter OTB) and South American fur seal (*Arctocephalus australis*, hereafter ARA),] abundance, behaviour, net interactions, live deck releases, live seal exclusion device (SED) escapes and incidental mortalities in at least three trawls per day. Regarding seabirds, MMO monitor bird scaring lines (BSL) efficiency, record seabird interactions with the fishing gear, mortalities, and carry out seabird carcass collection. In addition, MMO collect data regarding the functioning of the discard management plan aboard.

The LOL 2023-C season started on 26 February 2023, with the 16 vessels with an MMO aboard and using a trawl fitted with a SED. The 16 MMOs were supplied by MRAG (UK) and as part of a general training provided by the Falkland Islands Fisheries Department (FIFD), were briefed on seabird and marine mammal data collection by the Bycatch Mitigation officer.

2. Objectives

The objective of this report is to present all the data collected during the 2023-C season regarding marine mammal and seabird interactions with the LOL fleet. Information includes data collected by the MMO and collated by the Bycatch Mitigation Officer.

3. Methods

3.1 *Manoeuvre monitoring*

For a comprehensive description of MMO monitoring, see MMO report LOL 2022-C.

3.2 *Bird scaring lines monitoring*

For a comprehensive description of MMO monitoring, see MMO report LOL 2022-C.

3.3 *Seabird and marine mammal bycatch mitigation measures*

As overall compliance to best practice is a key factor to protected species bycatch mitigation efficiency, best practice aboard is also monitored by the MMO and reported to FishOps (see MMO report LOL 2022-C).

3.4 *Mortalities & necropsies*

Pinniped mortalities are immediately reported to FishOps; carcasses should be marked (partially cut/complete removal of the left pectoral fin) before dumping them overboard.

Following cases of avian influenza in South America, the Directorate of Natural Resources instructed observers not to collect the carcasses of incidentally killed seabirds, so for the present season no necropsies were carried out.

3.5 *Data reporting*

Data collected by the observers (pinniped and seabird interactions described above) are received by FIFD's Data Manager and then uploaded into the Fisheries database by the Fisheries Data Analyst.

4. Results

4.1 *Manoeuvre monitoring*

A total of 2,283 trawls were reported, of which 2,280 (99.8%) shoots and 100% of the hauls were monitored. Of the former, 1,172 (78%) were monitored from the gantry, 491 (21%) from the bridge/bridge wings, and 17 from the stern/upper deck (1 %) (Fig.1). Regarding the hauls, 2,025 (89%) were monitored from the gantry, 244 (11%) from the bridge/bridge wings, and 14 (1 %) from the stern/upper deck (Fig.1).

Fifty-four percent of the fishing effort took place north of 52° S and 46% south (Fig.2). XNAQ was the most visited grid square (328 shoots; 392 hauls), followed by XVAK (302 shoots; 297 hauls), XPAP (309 shoots; 202 hauls), XVAJ (252 shoots; 205 hauls) and XMAQ (203 shoots; 247 hauls) (Fig.3).

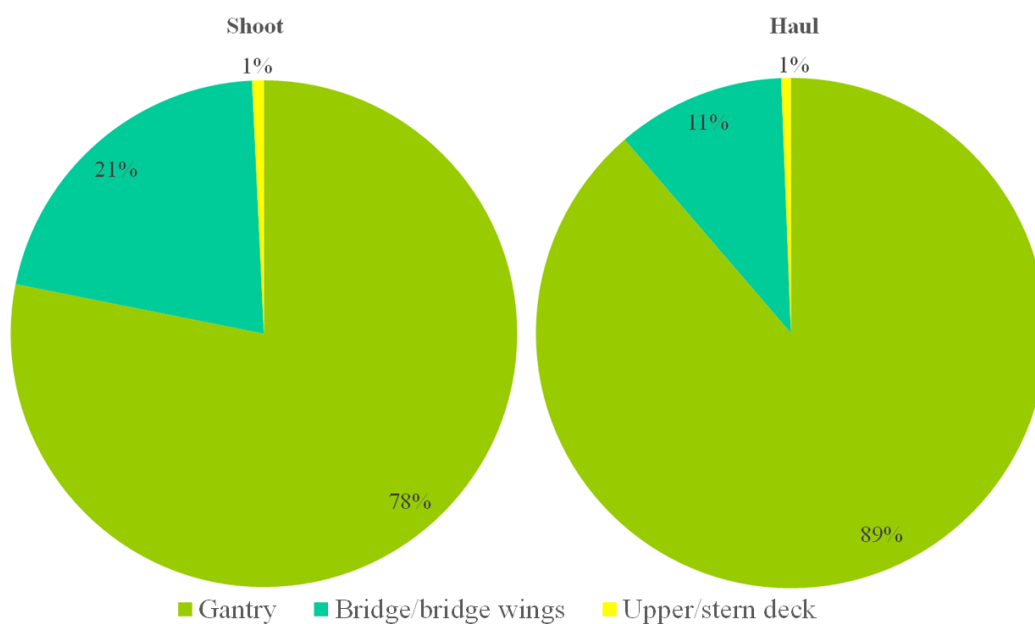


Fig.1. MMO position in manoeuvres.

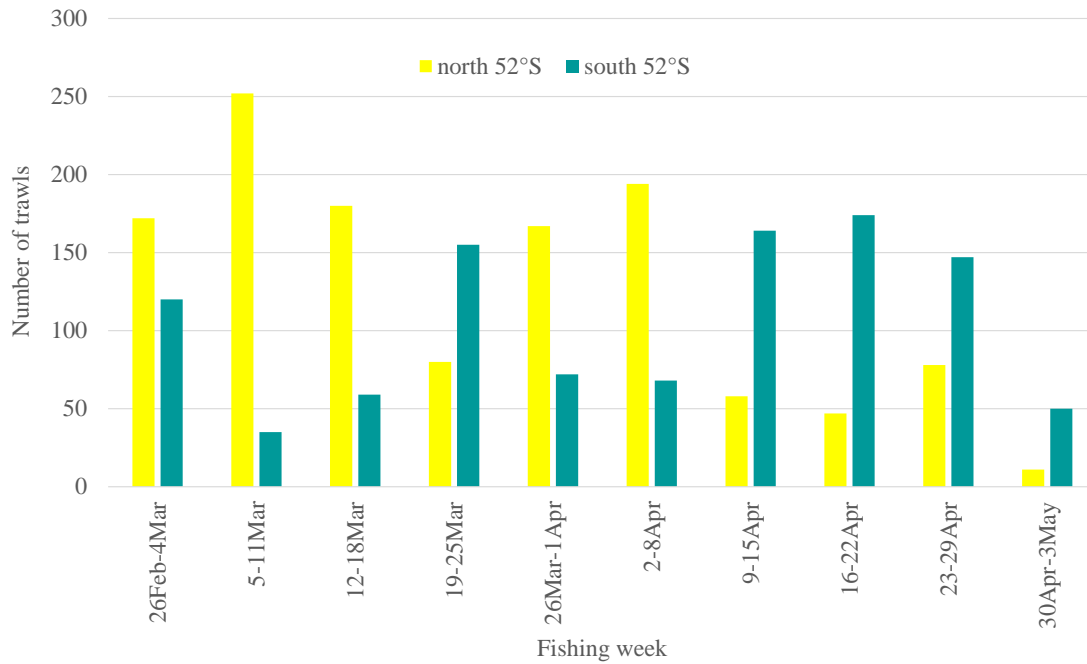


Fig.2. Fishing effort north and south of parallel 52°S.

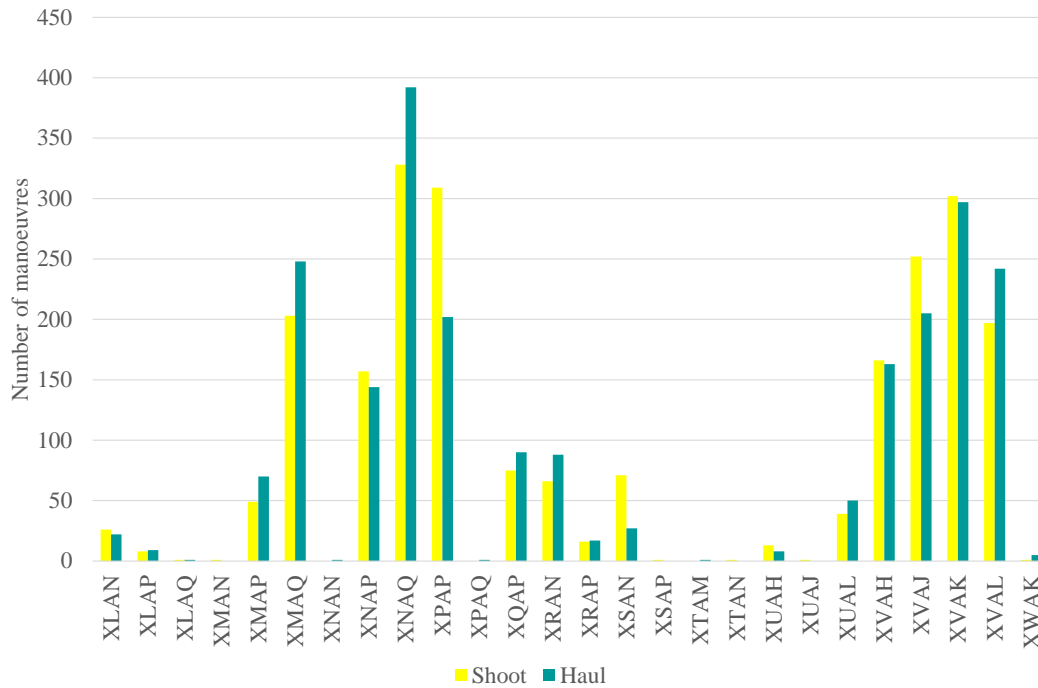


Fig.3. Fishing effort per grid square.

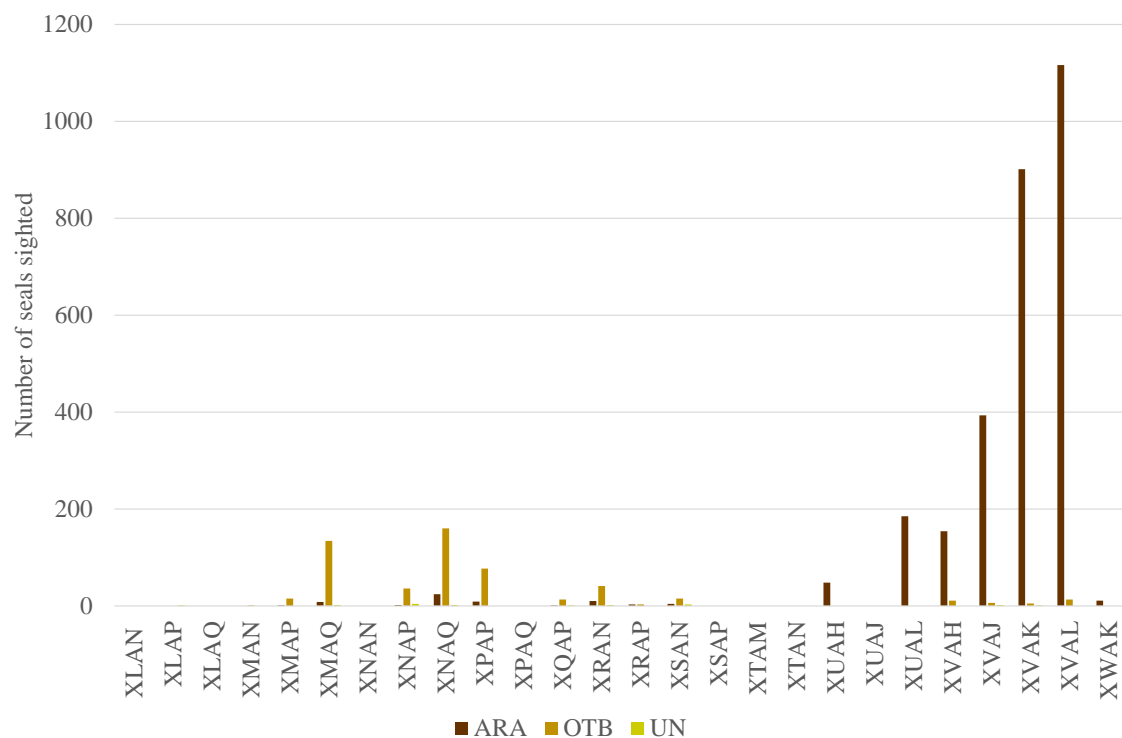
4.2 Pinniped sightings

A total of 4,042 seals [3,390 ARA, 626 OTB, 26 unknown species (UN)] were seen attending vessels. Eighty-four percent of the interactions were recorded south of 52°S (Table 1), particularly in grid squares XVAL (33%), XVAK (27%), XVAJ (12%) (Fig.4), with ARA representing 84% of the sightings (Table 1).

Similar to C seasons 2021 and 2022, overall pinniped attendance to vessels increased throughout the season, reaching a peak during week 9 (23-29 Apr) (Fig.5), while fishing effort concentrated south of 52°S (Fig.2).

Table 1. Pinniped interactions per region.

Region	Species	N° sighted	SED escapes	Deck releases	Mortalities
North 52° S	OTB	560	2	0	0
	ARA	70	1	0	0
	UN	18	0	0	0
Sub-total north		648	3	0	0
South 52° S	OTB	66	0	0	0
	ARA	3320	14	3	2
	UN	8	0	0	0
Sub-total south		3394	14	3	2
TOTAL		4042	17	3	2

**Fig.4.** Pinniped sightings per grid square.

4.2.1 Pinniped attendance to vessels and behaviour

Of the 4,042 seals sighted, 2,781 (2,306 ARA, 460 OTB, 15 UN) were observed during hauling, comprising 69% of the individuals recorded. The remaining individuals (1,261) were seen during shooting (16%), trawling (8%), turning (4%) and steaming (3%). In 94% of the hauling attendance, seal behaviour was strictly related to foraging, with both ARA and OTB directly targeting lost catch around the fishing gear (71%), eating from the net (10%) and eating from the net and climbing on the net (12%) (Fig.6). In the remaining vessel manoeuvres, the most common pinniped behaviour was to follow the vessel (39%), forage around the net (24%), and to swim astern (24%) (Fig.7).

4.3 Pinniped bycatch

Eighty-six percent of the pinnipeds were caught south of 52°S, specifically around Beauchêne Island, in grid squares XVAK (36%) and XVAL (50%) (Fig.8). A total of 22 seals were bycaught, of which 17 were seen escaping through the SED during hauling (15 ARA, 2 OTB), three ARA were safely released from deck, while two ARA comprised incidental mortalities (Fig.8; Table 2).

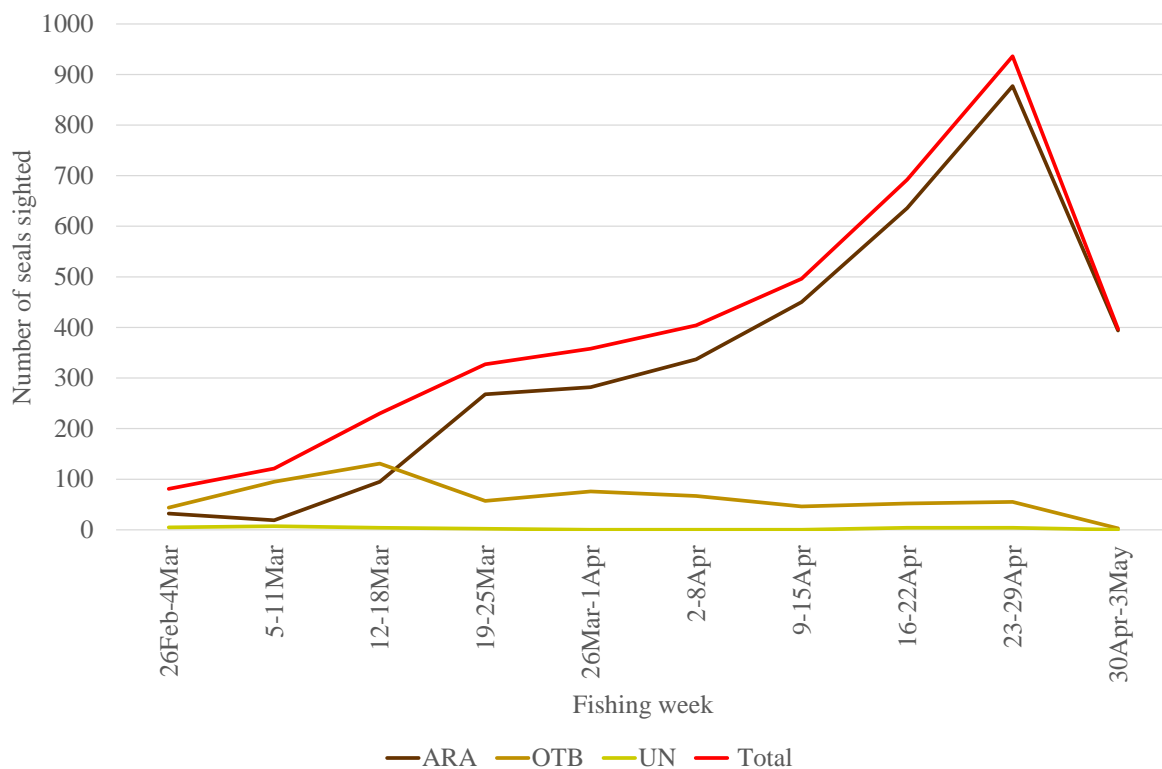


Fig.5. Cumulative pinniped sightings per fishing week.

4.3.1 Incidental mortalities

The ARA mortalities recorded comprised drownings after the escape path towards the SED was being blocked by a twisted net during a haul (mortality #1) and due to a turn carried out in an area with high pinniped concentration (mortality #2) (Table 2; Fig.8). It is important to mention that during turns the fishing gear loses tension, which blocks the escape path towards the SED.

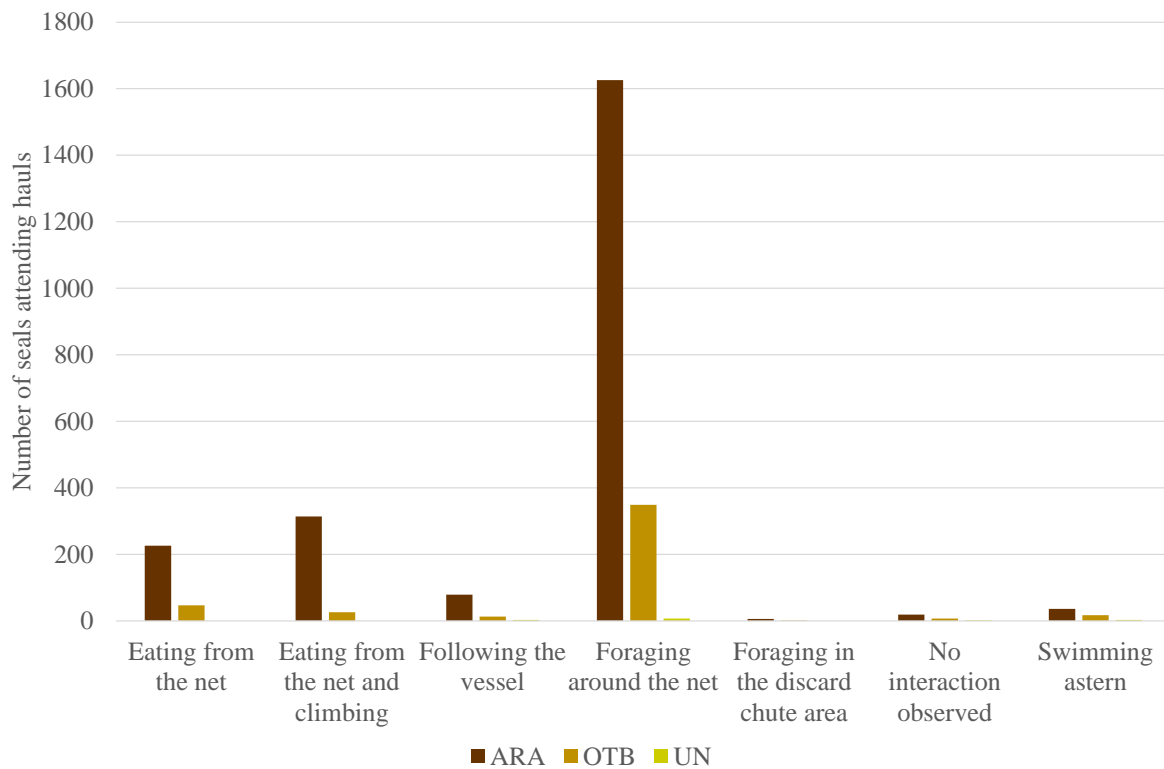


Fig.6. Pinniped behaviour exhibited during hauling.

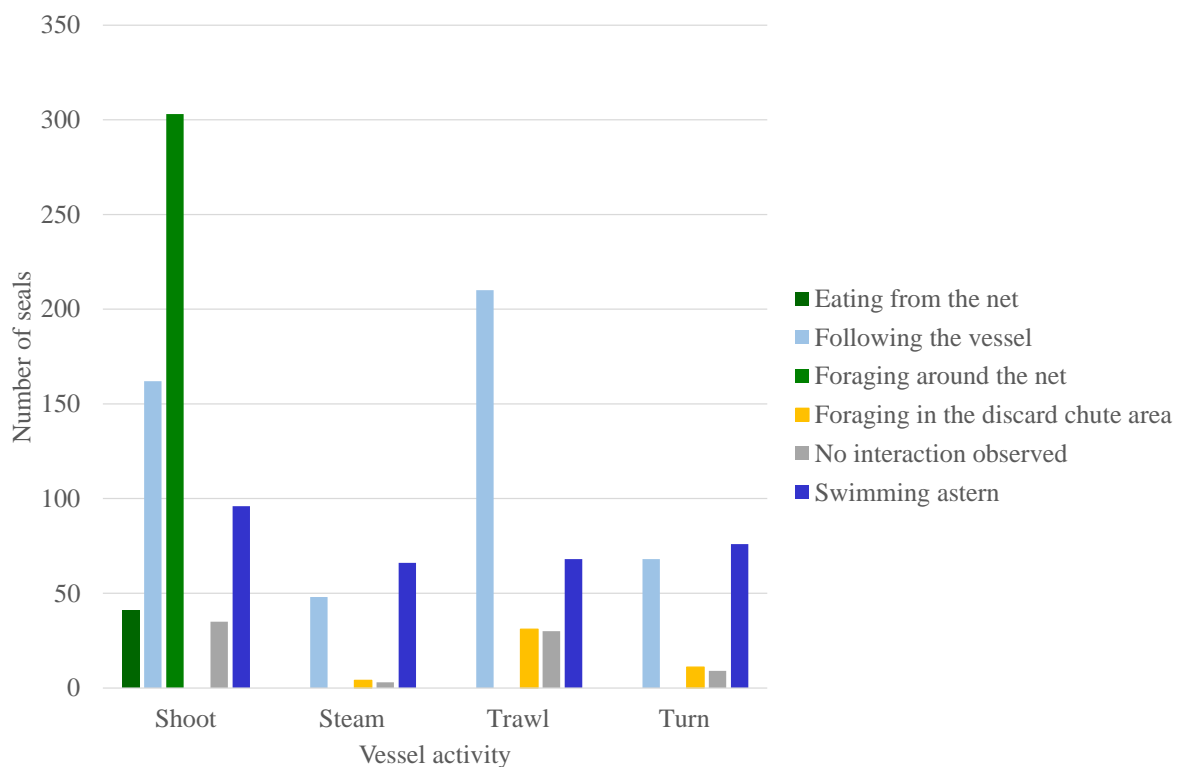


Fig.7. Pinniped behaviour exhibited during vessel manoeuvres.

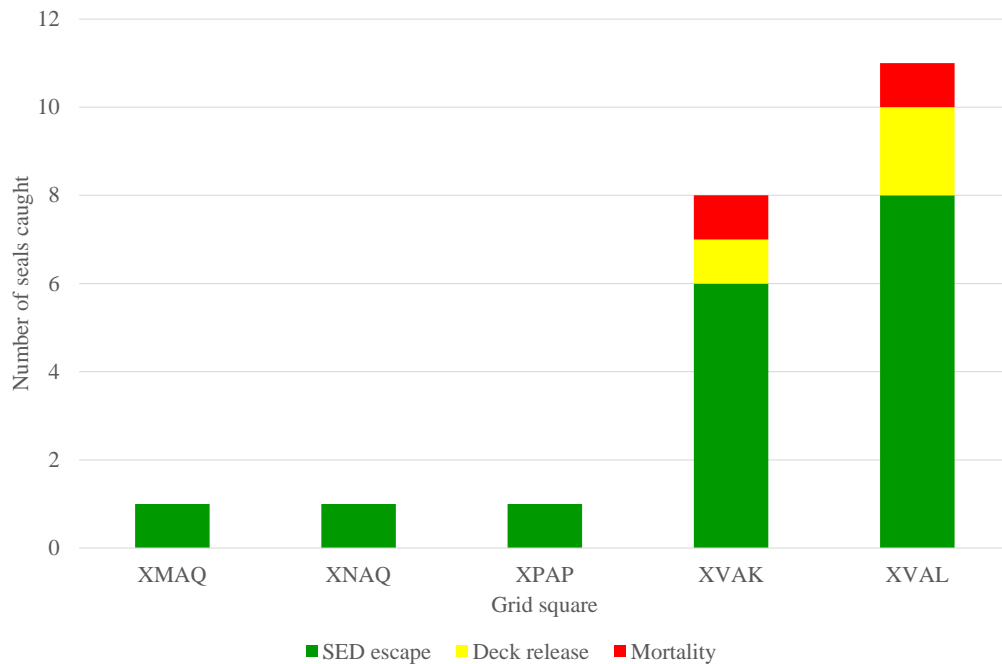


Fig.8. Pinniped bycatch per grid square.

Table 2. Pinniped incidental mortalities

Date	SED	Grid	Beauf.	Trawl (min)	#Turns	Spp.	#Mort.	Cause mort.	Comments
17/03/23	B	XVAL	5	50	0	ARA	1	D	JM; FC; D; TN
27/04/23	B	XVAK	2	135	1	ARA	1	D	AM; FC; D

JM=juvenile male; FC=fresh carcass; D=drowned; TN=twisted net; AM=adult male

4.3.2 SED escapes and live deck releases

During hauling 15 ARA and two OTB were seen escaping from the trawl through the SED hatch. The number of individuals that escaped when the SED was below the surface during both shooting and hauling remains unknown.

Regarding deck releases, 3 ARA were brought aboard inside the SED net extension. One individual was safely released from the deck after cutting the net, while in the other two bycatch events poor handling was observed. Crew used the crane to displace the seal from the body of the net to the SED's hatch, manoeuvre which can cause permanent injury to the seal (see LOL 2021-C report).

4.4 Seabird bycatch

A total of 140 seabird interactions were recorded throughout the season, of which 77 (55%) comprised net entanglements, 30 (21%) bird scaring line entanglements, 11 (8%) entanglements in the warp cable, 10 (7%) vessel collisions, eight (6%) landings on deck, 3 SED entanglements (2%), and 1 UN (1%) (Fig. 9). The outcome of these interactions was 46 (33%) live releases, 52 (37%) live escapes, and 42 (30%) mortalities (Fig. 10).

All the 77 net entanglements observed comprised ACAP species: 64 black-browed albatross (*Thalassarche melanophris*, hereafter DIM), 11 white-chinned petrel (*Procellaria aequinoctialis*, hereafter PRO), and two giant petrel (*Macronectes spp.*).

It is important to mention that during the Seabird & Marine Mammal data collection briefing observers were specifically trained to record detailed information on seabird net entanglements. However, in 12 entanglement events (16%) the observer did not collect information on the location of the seabird in the trawl, while in 16 entanglement events (21%) the observer did not collect information on the mesh size. The reason why the observers missed to collect these crucial data is unknown.

Twenty-five percent of the entanglements occurred in 200 mm mesh size located in either the mouth of the net (17%), net wings (4%), or body (4%). These were followed by entanglements in 400 mm mesh (23%) located either in the mouth (14%) or net wings (9%) (Fig.11).

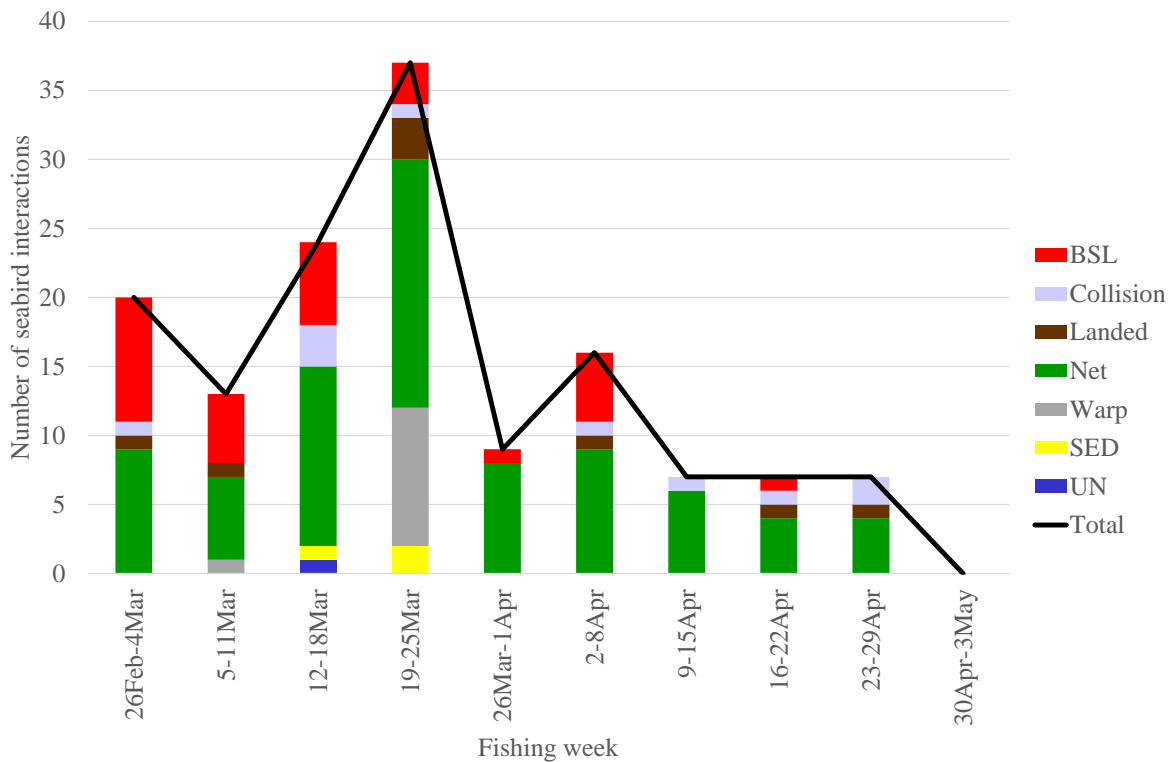


Fig.9. Number and type of seabird interactions recorded per fishing week.

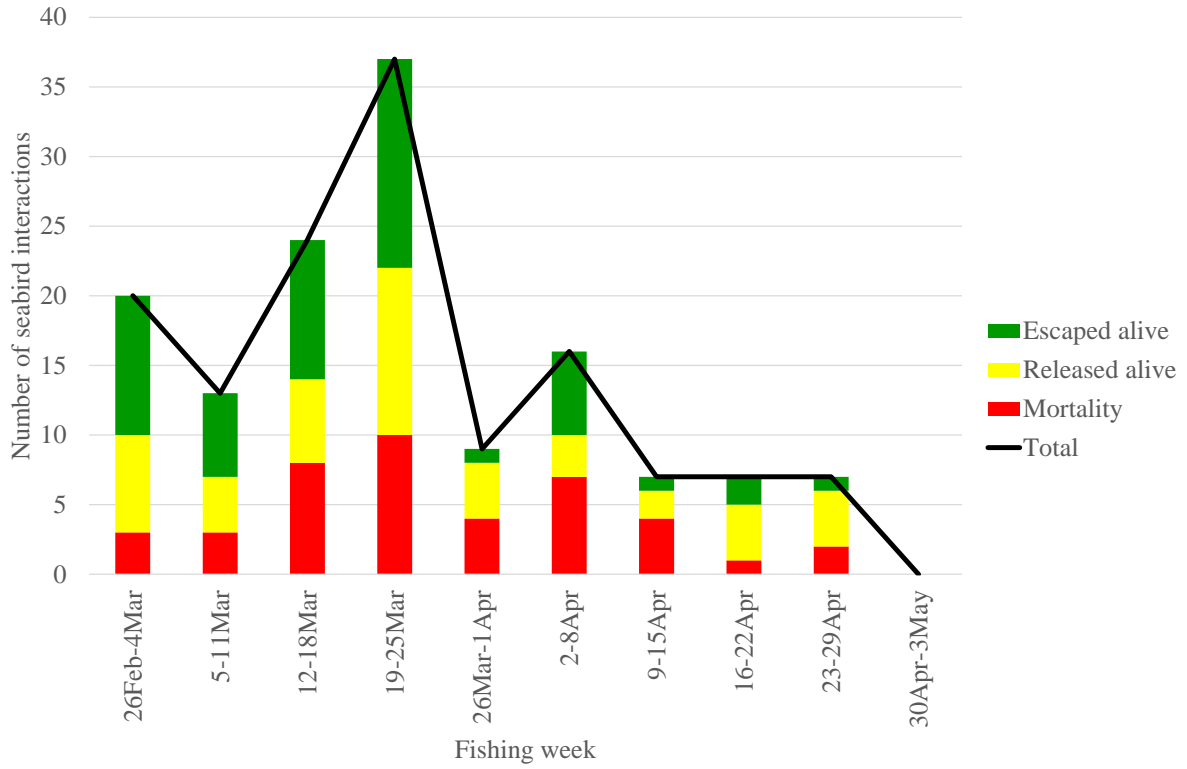


Fig.10. Outcome of the seabird interactions recorded per fishing week.

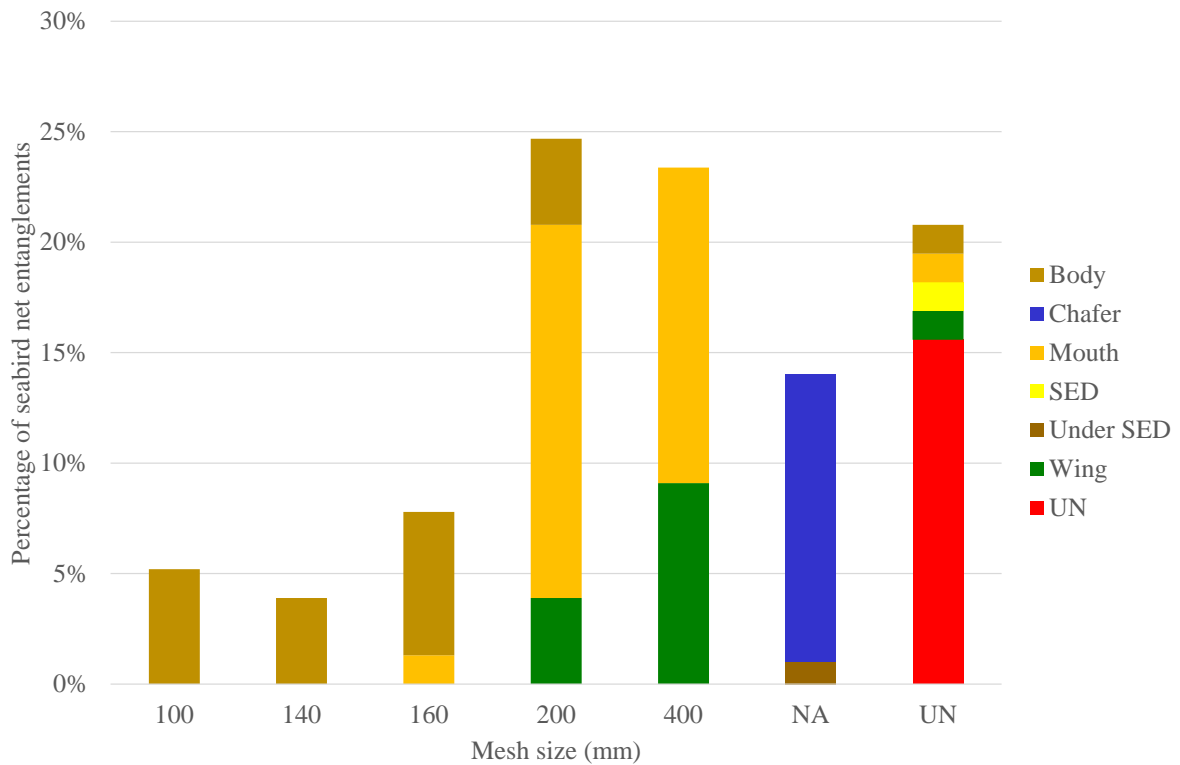


Fig.11. Percentage and trawl location of seabird net entanglements.

Seventy-four percent of the interactions were recorded south of 52°S, particularly around Beauchêne Island, in grid squares XVAK (21%), XVAH (20%), XVAL (15%), XVAJ (14%), XSAN (2%), XUAL (2%) (Fig.12).

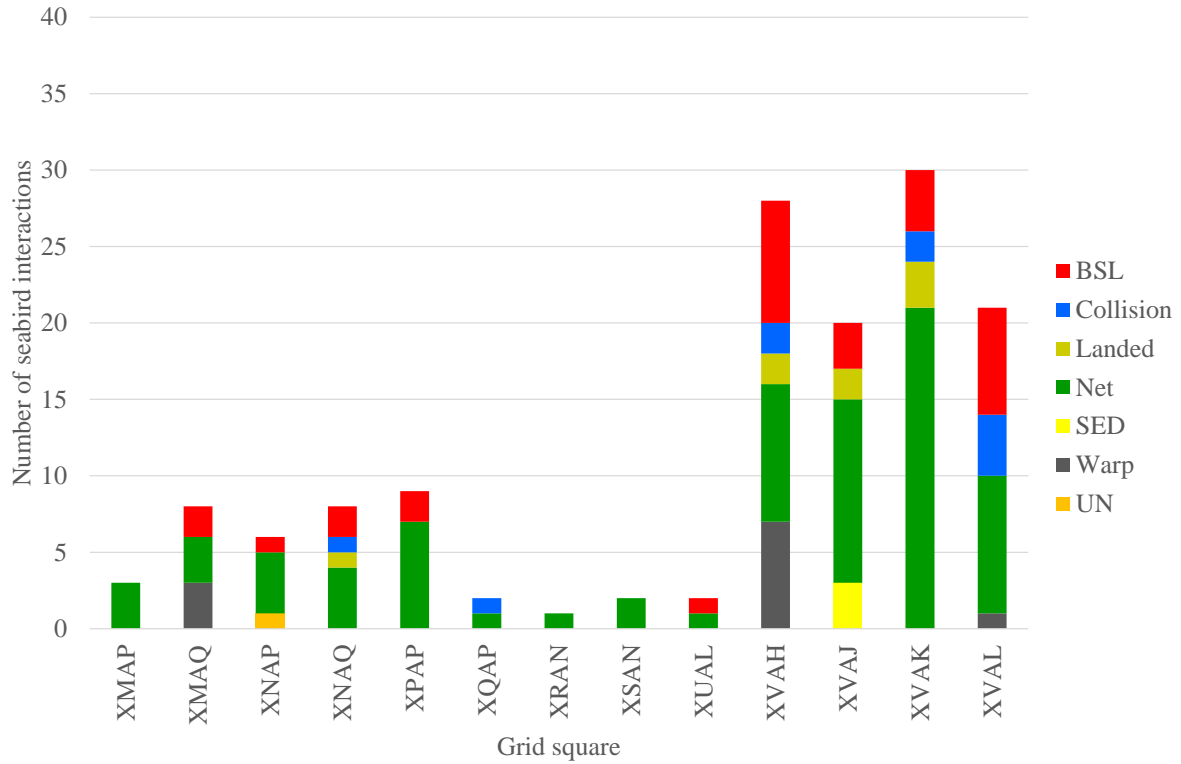


Fig.12. Number and type of seabird interactions recorded per grid square.

4.4.1 Live interactions

Live interactions included 85 DIM, seven PRO, three MAX, two diving petrels (*Pelecanoides urinatrix*, hereafter PEL), and one storm petrel (*Oceanites oceanicus*, hereafter OCO). These interactions were mostly recorded during hauling (76%), trawling (13%), and shooting (11% each) (Fig.13).

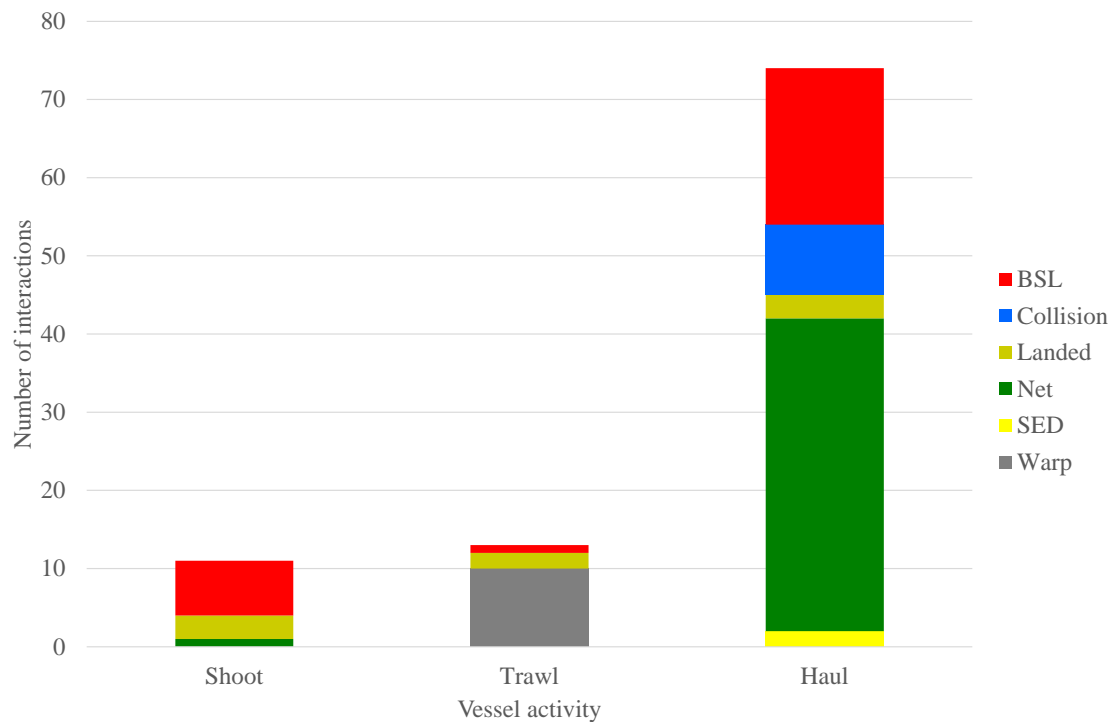


Fig.13. Number and type of seabird live interactions.

Of the 74 interactions observed during hauling, 40 (45%) comprised net entanglements (33 DIM, 5 PRO, 2 MAX) of which 4 DIM escaped by themselves, whilst the rest of seabird species were released alive. The remaining of the live interactions observed during hauling comprised 20 (27%) BSL entanglements, 9 (12%) collisions, 3 landings (4%), and 2 SED entrances (3%). Of these, 6 individuals (3 landed, 2 SED, 1 BSL) were rescued by crew and safely released, whilst the remaining individuals managed to escape by themselves.

4.4.2 Incidental mortalities

A total of 42 seabird mortalities were recorded, all ACAP vulnerable species (36 DIM, 6 PRO). Seventy-two percent of ACAP species mortalities occurred south of 52°S, in grid squares XVAK (31%), XVAH (19%), XVAJ (12%), XSAN (5%), and XVAL (5%) (Fig.14).

Principal seabird cause of mortality was net entanglement (88%), followed by entanglements in FAA streamers (5%) (Fig.15).

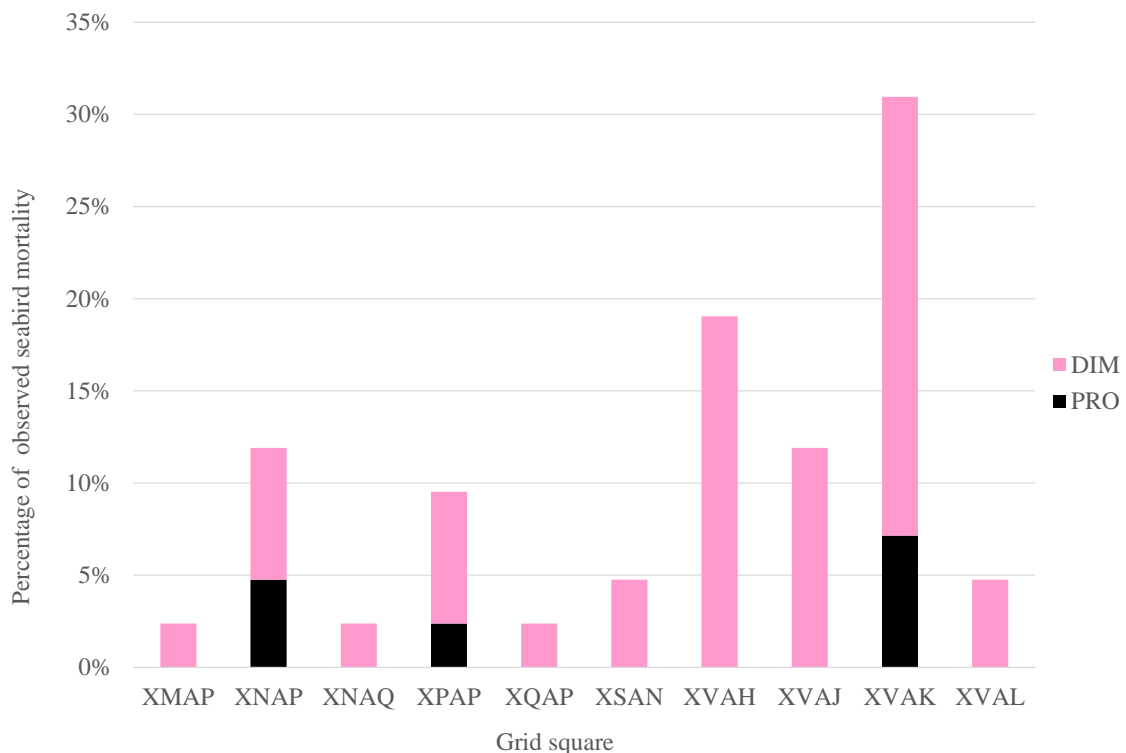


Fig.14. Percentage of seabird incidental mortality observed per grid square.

Net mortality included 37 individuals (31 DIM, 6 PRO) and took place during both shooting (57%) and hauling (31%). Forty-six percent of the mortalities occurred in in the mouth of the trawl in 200/400 mm meshes (Fig.16), whilst for 19% of the mortality events this information is missing due observers did not collect it.

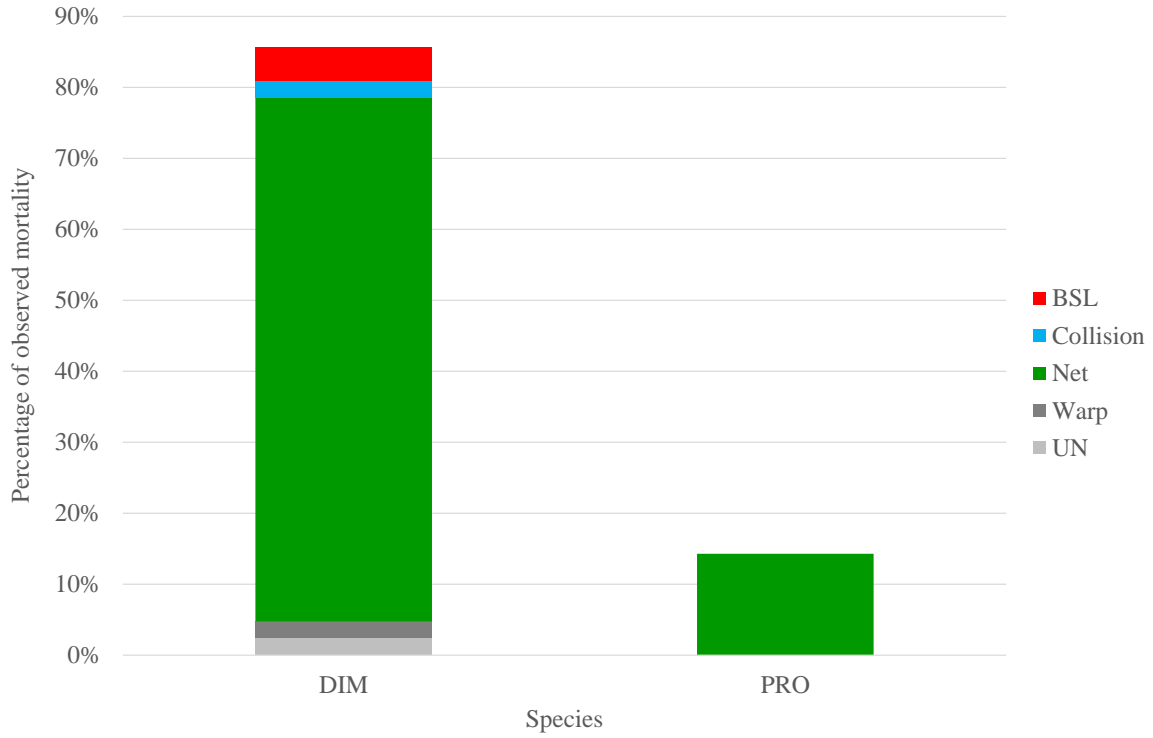


Fig.15. Cause of mortality per seabird species.

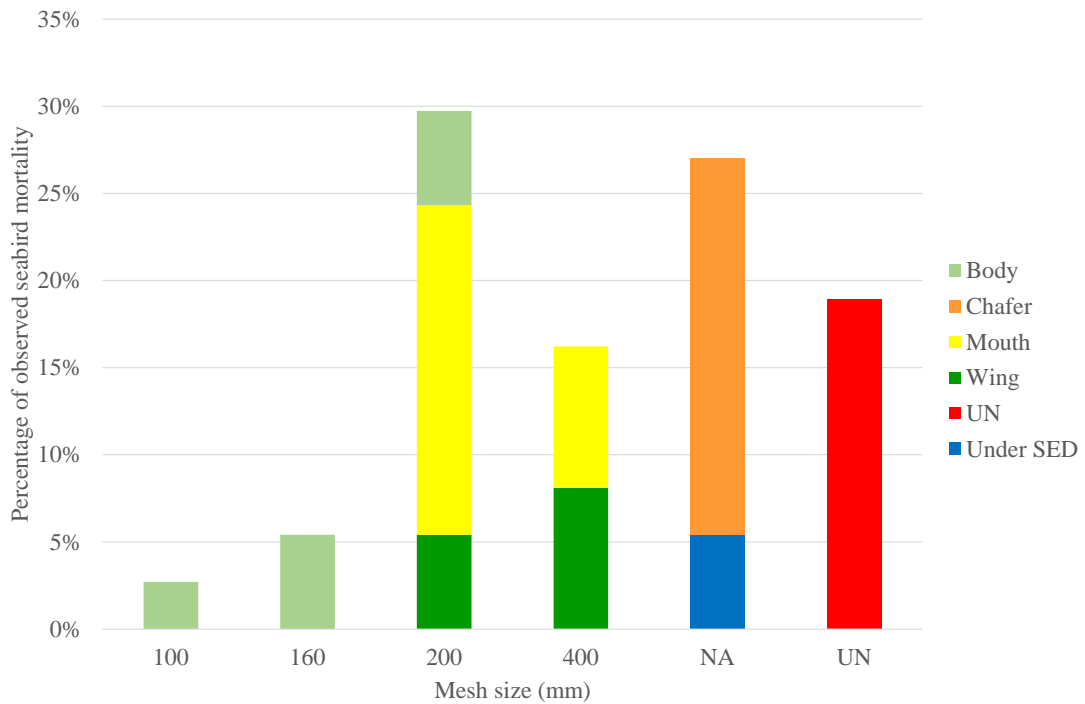


Fig.16. Percentage and location of seabird net mortality.

Forty-three percent of the seabird mortality was recorded in the third and fourth fishing weeks (Fig.17), following an increase in the fishing effort south of 52°S (Fig.2). Seabird mortality was observed during shooting (57%), trawling (5%), and hauling (38%).

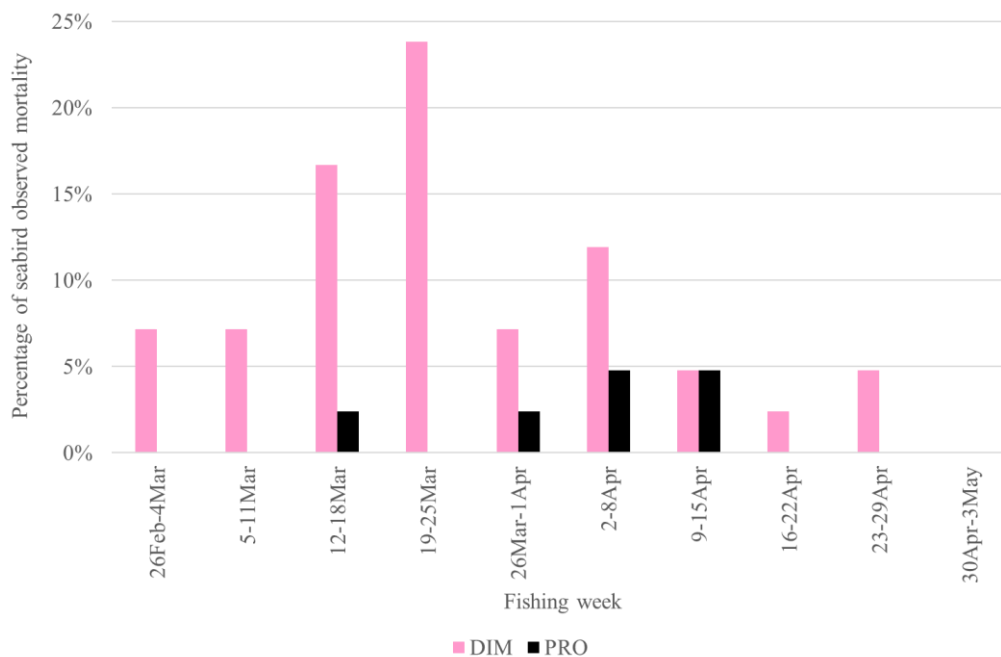


Fig.17. percentage of observed seabird mortality per fishing week.

5. Conclusions

5.1. Following the trend of previous C seasons, interactions of pinnipeds with the fishery slowly increased during the fishing period, while interactions of seabirds peaked in the fourth week of the fishery.

5.2. In comparison to season 2022-C, seal attendance to vessels increased slightly (8%), however the number of bycaught seals was equal. Following a recommendation from the Bycatch Mitigation Officer (see LOL 2022-C report), the 2023-C fishing season began with nets fitted with a SED, management decision that successfully resulted in a 67% reduction of seal incidental mortality.

5.3. In comparison to 2022-C, seabird live interactions diminished by 40%, however mortalities increased by 68%, particularly due a 177% rise in net entanglements.

5.4. Similar to previous seasons, most of the pinniped and seabird bycatch took place south of 52°S, particularly around Beauchêne Island (grid squares XVAK, XVAJ, XVAL), where megafauna occurrence is more prevalent and also where fishing effort usually concentrates.

5.5. Net entanglements in 200-400 mm meshes around the mouth of the trawl continue to be the predominant cause of seabird mortality. It is crucial observers collect complete information regarding net entanglements: location of the seabird in the trawl, mesh size, characteristics of the mesh thread such as material and diameter, and schematic trawl net diagram.