FISHERIES COMMITTEE

8:30,16th February 2016
Venue: Fisheries Department

AGENDA

PART 1

1. **Apologies for absence:**

2. **Declarations of interest:**

3. **Confirmation of the Minutes of the meeting held on 3rd December 2015.**

4. **Matters arising from the Minutes of the meeting held on 3rd December 2015.**

5. **Fishery Update** Paper

6. **Fisheries Protection & Boarding's 2015** Paper

7. **The Illex fishery: new access arrangements** Paper

8. **Assessment of Seabird Bycatch-Trawlers** Paper & Annex

9. **Date of next meeting: 16th June 2016**

10. **Exclusion of Press & Public**

    The public are likely to be excluded from the meeting for this/these item(s) of business by virtue of paragraph 17 being Budgetary Information of Schedule 3 of the Committees (Public Access) Ordinance 2012.

    The Chairman to move as follows:
    "I move that the press and public be now excluded on the ground that the next items of business to be considered are likely to disclose exempt information under paragraph 17 of Schedule 3 of the Committees *(Public Access) Ordinance 2012."*

PART 2

11. **Confirmation of exempt minutes 3rd December 2015**

12. **Matters arising from exempt minutes 3rd December 2015**

13. **Fisheries Budget 2016/17** Paper & Annex

Not for publication by virtue of paragraph 17 of Schedule 3 of the Committees (Public Access) Ordinance 2012, relating to the preparation of budgets.

14. **Budget Proposal-Catch Verification** Paper

FISHERIES COMMITTEE

OPEN MINUTES

Fisheries Department
Thursday 3rd December 2015
9.00am

These minutes are draft minutes until confirmed by resolutions at the next meeting of this committee

Present:	The Honourable Phyl Rendell - Chairperson	PR
	The Honourable Ian Hansen	IH
	Director of Natural Resources – John Barton	DNR
	Captain Chris Locke – Marine Officer	CL
	Dr Sasha Arkhipkin	SA
	Mrs Cheryl Roberts	CR
	Mr Drew Irvine	DI
	Mr Tom Blake	TB
	Mr Hamish Wylie	HW

Minute Taker: Mrs Katrina Stephenson

Public: **1**

1 Apologies for Absence **ACTION**

1.1 There were no apologies for absence.

2 Declarations of Interest

2.1 FIFCA members declared an interest in the whole agenda.

3 Confirmation of the Minutes of the Meeting held on 17th September 2015

3.1 The Minutes of the 17th September were confirmed without amendment.

4 Matters Arising from the Minutes of the Meeting held on 17th September 2015

4.1 Matters arising from the Minutes held on the 17th September 2015 Item 4.1 – refers – FIFCA are dealing with the letter to be sent to the Treasury. **FIFCA**

4.2 Matters arising from the Minutes held on the 17th September 2015 – Item 4.5 refers – CR & AP have

met with Joost Pompert to discuss the National Plan of Action – Seabirds – Trawl Fisheries. In the New Year FIFD will be putting out a tender for the further trials on another vessel. CR said that she wouldn't like to see this being imposed on all vessels until further trials have taken place.

4.3 Matters arising from the Minutes held on the 17th September 2015 Item 7.1 refers – Presentations need to be given in schools at the right levels to get pupils interested in job opportunities in the Fisheries Department and the Fishing Industry. The Chair said that we need to be more proactive and perhaps someone from the Fisheries Department could be tasked with talking to students. CR commented that there is a Careers Adviser in the School and they work closely with Emma Brooks at the Training Centre. FIFCA will follow up with Emma about talking to students and promoting the range of career opportunities in Fisheries & FIFCA. It would be good to have a long term plan in place for young people. FIFCA and the Fisheries Dept plan to hold an annual presentation. **FIFCA/DNR**

4.4 Matters arising from the Minutes held on the 17th September 2015 Item 8.2 refers – The Fisheries amendment bill has been gazetted as an Ordinance.

5. Fisheries Update

5.1 CL informed members that after the successful rescue of the Le Boreal she is now under tow and has left the Islands. At the time of the incident he said he had to decide what to do with the ship, should she go to Port William or FIPASS but with only one anchor the only solution was Mare Harbour. CL said he now needs to look to the future and the possibility of placing a buoy in Port William or Berkley Sound. The incident has generated significant paperwork. The Chair thanked CL and all the Fishops team for their involvement in the incident.

5.2 The north west barge on FIPASS is in a worse state than previously thought. CL said that some areas are very thin so they are looking at getting those patched. The funding process to carry out phase 2 of the FIPASS capital programme is underway.

5.3 CL has met with the legal department to discuss the updating of the marine and harbour legislation. In the long term it needs to be kept Falkand based and in the

future updating may be for the Harbour Authority. This will require extra resources. When the legislation has been finalised CL will take it to the Fisheries Committee for feedback and comments.

5.4 SA informed members that during the first week of the cruise to look at locating juvenile fish, toothfish and fish eggs they encountered very bad weather. He said that no toothfish larvae was found but on a positive note they carried out a plankton survey which was important to see how the larvae is distributed in Falkland waters. The next survey will take place in February 2017.

5.5 SA recently attended the CIAC meeting in Japan where there were 250 attendees. He said it was a very interesting meeting with presentations starting at 8.30am and the last at 7.00pm. SA presented 2 papers. Next year SA intends to give a series of public talks locally.

6. Marine Spatial Planning Presentation (0930)

6.1 Amelie Auge from SAERI joined the meeting to give a presentation on Marine Spatial Planning. She explained to members the benefits it could bring to the Islands and that the implementation of the plan should sit with the government. The plan is looking into the future. A copy of the presentation is attached.

6.2 After the presentation Amelie asked for feedback from members. HW said that it was a good idea and it will be good to see how it goes, it is positive and holistic. Amelie said that a workshop will be held in April and the person that runs the same programme in the Shetlands will be coming down for it. Shipping traffic in Port William and Berkley Sound is more than the Shetlands and shipping traffic passing the Falkland Islands is increasing. There are steps which could be taken to reduce risks. It was commented that whilst the maps show a lot of activity over the period of one year shown, passing traffic on any one day might be say 5 vessels in transit which is much lower intensity when compared to the area involved.

6.2.1 TB said that FIG has so many plans and he doesn't see this one as being a priority. The Fisheries Dept should be able to manage most aspects and vessel traffic management is more of a priority. The Marine Officer can deal with oil tankers going past the Jason Islands and Beauchene. If they are straying into an

area the AIS should identify them and action taken to intervene as necessary.

6.2.2 CR commented that vessels need shelter points and if areas are restricted it becomes a problem, consideration needs to be taken for the human aspect. DNR indicated that the outputs form the MSP project were relevant to demonstrating achievements and progress in relation to the Blue Belt initiative.

6.3 The Chair thanked Amelie for coming and giving the presentation to members.

7. Port Welfare Committee

7.1 CR informed members that a poster outlining the main points of the code of practice for fishing crew has been done but not all members of the committee have seen it yet. The Terms of Reference for the Port Welfare Committee have been sent around and Customs, Police, FIC & Sulivan will be involved when needed. An article will be going into the Penguin News stating that FIFCA or the Director of Fisheries should be contacted in the first instance if an issue arises. The article needs to make clear what a welfare issue is and the public should have one point of contact. The Port Welfare Committee has a very important role. They will meet 4 times a year, before the *Illex* season begins and straight after it finishes so the season can be reviewed. It is important to have entities like this in place to help with any issues and work closely with FIG.

7.2 Membership of the Port Welfare Committee consists of:
Vessel Owners
Fishing Companies (including a representative fishing for *Illex*)
Seafarers Organisations
Port Authorities
Health Authorities
Ships Agencies, Customs & Police (invited when deemed appropriate)

8. Date of next meeting

8.1 Dates for 2016 meetings will be organised in conjunction with Gilbert House.

9. Exclusion of Press & Public

The Chairman moved as follows:

"*I move that the press and public be now excluded on the ground that the next items of business to be considered are likely to disclose exempt information under Not for publication by virtue".*

10. Confirmation of the Exempt Minutes held on the 17th September 2015

Not for publication by virtue of paragraphs 3 & 4 of Part 1 of Schedule 3 of the Committees (Public Access) Ordinance 2012, relating to Economic interests & international relations

10.1 The Exempt Minutes of the 17th September 2015 were confirmed without amendment.

11. Matters arising from the Exempt Minutes hold on the 17th September 2015

11.1 *Not for publication by virtue of paragraphs 3 & 4 of Part 1 of Schedule 3 of the Committees (Public Access) Ordinance 2012, relating to Economic interest & international relations*

11.2 Matters Arising from the Exempt Minutes of the meeting held on 17th September 2015 – Item 14 Fishing access fees 2016 refers FIFCA thanked ExCo for taking into account the letter that was submitted by them to accompany the ExCo paper.

12 *Illex* Fishery 2016 – Vessel Standards & Operation practices

Not for publication by virtue of paragraphs 3 & 4 of Part 1 of Schedule 3 of the Committees (Public Access) Ordinance 2012, relating to Economic interest & International relations

12.1 The DNR advised members that the paper was a development of previous work and updates and extends the paper considered in September on conditions for the 2016 *Illex* Fishery. The DNR outlined the changes in the paper and accompanying documents to members.

Minutes confirmed this day of 2015.

Chairman Secretary

Fisheries Committee Paper

Part: I

Title: Fishery Update

Agenda Item: 5

Date: 16th February 2016

Report of: Director of Natural Resources

Paper for information only

Brief update on fishery issues:

- Royal visit; HRH The Princess Royal visited the department meeting staff and discussing aspects of Fisheries science and protection.

- Catches: 2015 concluded with what was a record annual catch largely due to the Illex fishery also producing a new record in terms of catch. 2016 has started with high trawler activity in Falkland zones. Catches for January have been relatively high with Southern Blue Whiting showing the highest catches in the last 5 years. Part of the reason for activity in FI waters appears to be due to the low catches on the high seas and the slow start to the high seas Illex fishery.

- FIPASS: Phase 1 works are continuing, having involved the RoRo barge, causeway and other areas. Phase 2 works are being defined and designed in preparation for tender. The department needs to respond to the outcomes of the UTM survey and also consider whether more urgent works are undertaken on the Nortwest Barge.

- The *Castelo* is currently undertaking a finfish survey with 7 scientists embarked. The main focus is to assess the state of the rock cod stock. A lot of data will be gathered on other species as well.

- The *Sil* is undertaking the Falkland Calamari pre-recruit survey with 4 scientists embarked. As well as looking for squid this will also be evaluating the latest aerial array bird scaring lines; the purpose being to mitigate against seabirds interacting and conflicting with the vessel and fishing gear.

- Work has been ongoing in relation to preparations for the 2016 Illex season with 105 jiggers. Posters have been designed seeking to deter crew from swimming to shore and these have been translated into the main languages. Posters drawing attention to the risk of frostbite are also being distributed.

- The 2016/17 budget has been submitted (and is on the agenda).

- 4 Observers have joined the department so there is a full complement of observers. The Fisheries biologist post has also been filled with an early April start envisaged.

- A rare occurrence of retrieving a tagged toothfish was achieved thanks to a sharp eyed fisherman on the CFL Gambler and the help of CFL.

Fisheries Committee Paper

Part: 1

Title: Fishery Protection & Boardings 2015

Agenda Item: 6

Date: 16 February 2016

Report of: Alan Henry, Fishery Officer

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1. Introduction

This paper sets out information on the use of the Fishery Protection Vessel in 2015, together with the number of boardings/inspections. It provides the data for 2015 in a similar format to that for 2011 – 2014 which was considered as agenda item 6 of the Fisheries Committee meeting of 12th February 2015, and it may be helpful to refer back to previous papers. Numbers in brackets below refer to 2014.

2. Recommendations

The paper is for information and discussion and no particular recommendations are made.

3. Background

In 2015 the FPV *Protegat* patrolled a total of 280 (267) days with 55.5 (30) days unavailable due to weather or used on other tasks: meteorological buoy deployment, TV film project and retrieval of an Argentine yacht. The FPV's first patrol of the year was 4th of January and her last patrol finished on 24th December. The FPV also used 18 maintenance days from the 7th – 25th Nov. The FPV steamed 41,708 (45,244) nautical miles. 107 (113) vessels were boarded and inspected last year, 34 (47) with A, W, G and F licenses, 70 (54) with B licenses and 3 (11) with C/X licenses.

Patrol	Duration of Patrol	Days devoted to: CTDs	Obs	Down time Weather	Other	Not on Patrol	Inspections per license A, F, W,G	B	L	C/X
04 - 16 Jan	12		1			0				
18 - 30 Jan	12			1.5		1.5				
01 - 13 Feb	12					0				
15 - 27 Feb	13	2				0	1	10		
01 - 14 Mar	13		1			0		20		
15 - 28 Mar	13		2			0		18		
29 Mar - 31Mar	12					0				
01 - 10 Apr		2		4		4	4	7		
12 - 24 Apr	12		1.5	2		2	2	4		
26 Apr- 09 May	13	3	2	1		1				
10 - 21 May	12		0.5	3.5		3.5		3		
24 May 06 Jun	13	2		1		1	7	6		
07 - 19 Jun	12	1	0.5	5		5		2		
21 - 30 Jun	9	2				0	1			
05 - 17 Jul	12		2	2		2				
19 - 28 Jul	9		2	3		3	2			
02 - 13 Aug	11	2	4	2	1	3	1			
16 - 28 Aug	12			5	1	6	2			3
30 Aug - 11 Sept	12	2	1.5	3	1	4	1			
13 - 25 Sept	12			6.5		6.5	3			
27 - 30 Sept	12	1	1			0	1			
01 - 09 Oct						0	2			
11 - 23 Oct	12	1	1	1.5	0.5	2	4			
25 -26	2				2	2				
27 Oct - 05 Nov	9		1	5		5				
07 - 25 Nov	0				18	18				
26 Nov - 04 Dec	8	2	2	1		1	2			
06 - 18 Dec	11		2	4		4	1			
20 - 24 Dec	4	2								
Totals	**280**	**22**	**25**	**51**	**25.5**	**74.5**	**34**	**70**	**0**	**3**

Targets set for FIG financial year 2014-2015	
Annually 30% at sea inspections in Illex fishery	70 Inspections, 67% Achieved
Annually 10% at sea inspections Loligo fishery	3 Inspections, 18.5% Achieved
Annually 80% at sea inspection Finfish fishery	51 Inspections, 170% Achieved

Fisheries Committee Paper

Part: I

Title: Illex fishery: new access arrangements

Agenda Item: 7

Date: 16 February 2016

Report of: Director of Natural Resources

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1. Introduction

This paper sets out and considers issues relevant to moving the Illex fishery from current short term licensing arrangements into the Individual Transferable Quota (ITQ) system.

2. Recommendations

At this stage the paper is largely for information and discussion around the issues. A paper is also being submitted to Executive Council to set out the issues and to seek confirmation of the broad direction on the consultation and the process.

3. Background

3.1 The Illex fishery is the one major fishery not currently in the Individual Transferable Quota System. There are several reasons why the switch to ITQ has not been made. The more substantive reasons include:

a) At the time the other fisheries entered the ITQ system, the level of engagement by Falkland companies in the Illex fishery was not so strong. In the ITQ system the FI Company should be heavily engaged in the fishery and in control of how their ITQ rights are utilised. Partnerships and business relationships have been building up over the intervening period.

b) Low competition for licences in some years. The development of joint ventures and business arrangements in other fisheries was done not on the basis that you must have a Falklands partner to enter the fishery, but that you improve your chances if you do. In most fisheries that level of competition escalated which serves to increase FI company involvement and development. In the Illex fishery there have been years where the number of licences available exceeds the application by a wide margin; so no real competition. Interest in licences is currently high on the back of several good seasons.

3.2 The obvious option for changing the management system for the Illex would be to introduce it to the ITQ system. The main obvious alternative is to retain some form of

licence system. So the main choice is between a licence regime or an ITQ or "fishery rights" type system. There are a lot of the aspects to any fisheries management system:

- Who is eligible to access the fishery
- How is access granted
- Longevity of access
- Aggregation limits on access rights
- Access fees
- Conservation control measures

Such aspects are not specific to any particular system, they arise for consideration in a licencing system or an ITQ system.

3.3 The main advantages of the ITQ system are those set out when ITQ were first introduced to the Falklands. The positive attributes of ITQ are largely; security, flexibility, transferability and exclusivity. The system enables participants to invest in a comparatively secure environment. It gives them a stake in the fishery so in theory they become more engaged in long-term sustainability, and seek to add value to maximise returns. They stand to benefit from such added value. The review of the FI ITQ system undertaken by the Policy Unit in 2015, shows that some of the aspirations for the ITQ system have been happening, but at a pace which was slower than anticipated. There have been significant investments in marketing operations, one new vessel is under construction, and another company is seeking to build a new trawler. It is difficult to know how many of the developments and the findings of the policy review would have happened had the licencing system continued instead of ITQ. It is clearly more difficult to contemplate a significant investment on the basis of a 1-5 year licence period compared to 25 year ITQ.

3.4 Short duration licencing systems have their place and in the case of the Illex fishery have operated for almost 30 years. The disadvantages of such systems are that by and large they don't have the advantages set out for the ITQ system. If there is a risk to a company that it will lose one or all its licences in the next licence application and allocation round, then there is less incentive to invest or add value. The company doing the investment, research and innovation may not be the company to reap the benefits. To some extent that scenario describes the Illex fishery. In almost 30 years little has been built on the back of it, and apart from FIG revenue, and some unsavoury incidents, it can be quite invisible. Arguably a similar charge might be said of some other fisheries. However, whilst other fisheries often have a low profile there are joint ventures, investment in vessels, outright vessel ownership, investment in marketing and development of business both within and outside the fisheries sector. There are some signs of the Illex fishery developing and several companies have significant business relationships in the Illex fishery with significant turnover and increasing corporation tax payments. It might seem a low risk but if a fishing operation or fleet has no roots in the coastal state it is very easy for it to 'up anchor' and leave. This is exactly what happened when the Japanese fleet left for Argentina almost overnight. This marked one of the early reductions in FI Illex revenue. They had little at stake here apart from 2 rented houses. Exactly the same happened to New Zealand when the Illex fleet moved here. By contrast the Falkland Calamari fleet is less likely to decamp as it is partially owned here and flagged here for the most part.

3.5 One of the benefits of the licensing system is that it can be more effective in achieving policy objectives, which by and large might be government objectives. There are more levers to pull. That has benefits for government and equally it is one of the criticisms which industry would levy at such systems, they have expressed the view that the objectives set do not necessarily make business or commercial sense. For example the strategy to develop use of marine infrastructure in the Falklands, increasing economic activity through the use of FIPASS and containerisation has had partial success. In the old "points system" used with the licensing system if "X" points had been given for transhipping at FIPASS the achievement of that strategy would probably be very different.

3.6 The impetus for considering extending the ITQ system to Illex includes:

a) The Falklands fishing industry, particularly those already engaged with Illex, would welcome that development.
b) The 2015 review by the Policy Unit of the ITQ system advocated developing proposals for moving other fisheries including Illex into the ITQ system.
c) The current request from Executive Council. This does not specifically refer to ITQ, however in general the alternatives seem to fall between variations of licence systems or variations of "fishing right" systems.
d) Having greater engagement and involvement by Falkland Island companies should assist in improving some of the operating conditions in the fishery.

3.7 The question has arisen as to whether the case for Illex entering the ITQ system has to be made as a matter of new policy. Whilst the issue can certainly be considered afresh the original policy decision to move to ITQ effectively included Illex. The ExCo papers and decisions at the time recognised that fisheries would enter the ITQ system at different times and the different conditions would apply, for example whether provisional quota could be granted in a particular fishery. Illex has always been listed as an established fishery under S16 of the Ordinance. This falls in Chapter 2 of the ordinance; Division A-Individual Transferable Quota and Provisional Quotas. As such Illex has always has always been listed on Schedule 2 to the ordinance and it has been indicated that Provisional Quota (a precursor to ITQ) may be granted. Despite that this is an opportunity to consider whether Illex should become part of the ITQ system and on what terms.

3.8 The Illex fishery does have some specific characteristics which is one of the reasons it has been delayed in entering the ITQ system. By comparison with other fisheries it is very seasonal; usually about 4 months in Falkland zones at best. The fishing gear and operation is very specific; most fishing masters and key personnel are from the Far East unlike trawling which has been adopted in most regions. It is quite volatile. Some years see high volumes of Illex, but there can be years with almost no Illex and years where the catch levels are uneconomic. The market tends to be in the Far East although significant quantities do go to the EU as well. The market can be quite difficult due to high variation in volumes. It can be feast or famine in terms of catches and squid prices.

3.9 The main impediment to Illex entering the ITQ system is the occasional lack of competition for licences. As indicated the growth of the Falklands fishery industry has for the most part happened on the back of a policy which indicates that success in licence applications has a higher probability where there are business arrangements

with FI companies to develop the fishery and add to the FI economy. The conclusion on Articles 61 & 62 of LoS is that it is inappropriate to withhold allocating surplus effort (or catch) but that a wide range of access arrangements are feasible. For a period the risk has been that a foreign company might choose to ignore doing business with any local companies and simply apply direct to FIG. If the number of applications is less than the number of licences available then a direct application is likely to succeed. That won't necessarily undermine all the other arrangements but it might have that impact, and it will certainly serve to limit the progress which local companies might be hoping for. It remains to be seen how Illex fares in 2016. Even with a poor season there is likely to be reasonable interest in FI licences as we have just had 2 very large years. The fishery can be good and better than most alternatives. So it is likely that there is scope to move to ITQ, possibly using the transitional step of Provisional Quota.

3.10 The earliest that the Illex fishery could enter the ITQ system would be for 2017. In order to achieve that there would need to be a period of consultation followed by firm proposals to ExCo, followed by the detailed process of allocating PQ/ITQ. The issues to consult on include:

A. Eligibility for holding ITQ in Illex:
This is defined in the ordinance for any ITQ fishery and it seems likely that the definition will hold good for the Illex fishery.

B. Allocation policy on ITQ in Illex fishery:
Allocation of ITQ in other fisheries going into ITQ was based on track record. This approach has been used in many fisheries but there could be other approaches or variations in approach.

C. Financial aspects:
Should the allocation of ITQ be charged for and if so would that also be a factor in allocation policy? There was no charge for the allocation of ITQ in other fisheries already in that system.

D. Duration

It is considered that if ITQ is granted in the Illex fishery that a duration of 15 ½ years and a common expiry date with other fisheries of 30 June 2031 is appropriate. At some point there will need to be a view taken as to what happens after 2031 if the benefits of ITQ are not to become increasingly diluted as the deadline for expiry approaches. There is already some demand for this to be clarified. It ideally might be clarified with 10 years remaining on current ITQ, and certainly by the 5 year point. The progress and benefits of ITQ may be clearer by those anniversaries than was apparent from the recent review.

E. Aggregation limits

In the original policy discussions on ITQ it was anticipated that different aggregation limits would apply depending on the scale or volume of catch in the fishery. The policy document envisaged:

Annual catches	**Maximum share of ITQ**	**Maximum share of Annual Catch Entitlement ***
<2,000mt	100%	100%
2,000-20,000mt	40%	60%
>20,000mt	30%	50%

*Annual catch entitlement is generated by ITQ and exists in the year or season in which it is generated. It may be traded and the trade only exists in the year of trade. Unlike ITQ which if traded is almost certainly a permanent transaction.

There is scope for discussion on whether the original policy approach should apply with Illex simply being viewed as a >20K mt fishery. Or, whether it should be viewed as a potential 200K mt fishery with a specific set of aggregation limits.

F. Provisional Quota (PQ)

Schedule 2 to the Fisheries Ordinance lists the established fisheries, Illex is listed and the schedule indicates that this is a fishery in which Provisional Quota may be allocated. There is the opportunity to consider afresh whether PQ should continue to be an option or not. PQ is a transitional arrangement. It can be granted for a maximum of 5 years in which time it can be converted to ITQ or it expires. It is intended for use where the Falklands company is not immediately structured to allow the award of ITQ, or does not have the level of business arrangements to merit the award of ITQ.

G. Poor Illex seasons

Mechanisms which might apply in the event of no or low Illex seasons. On some occasions in the past such events have been followed by low interest in licences in the following season. This may be less likely as it is reasonably clear that FI zones can produce very good fishing results. Is the current refund policy sufficient to address this or does it require some additional mechanism?

Fisheries Committee Paper

Part: I

Title: Assessment of Seabird Bycatch in Falkland Islands trawl fisheries 2014/15

Agenda Item: 8

Date: 16 February 2016

Report of: Seabird Observer

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1. Introduction

This paper introduces the attached annual report on an updated assessment of seabird bycatch in Falkland Island trawl fisheries for 2014/15. The report has been produced by Amanda Kuepfer – Seabird scientist/observer.

2. Recommendations

The paper is for information and discussion. The Fisheries Department will work with the fishing industry to progress the recommendations in the report.

3. Background

The report provides the latest annual update on seabird bycatch and mortalities in Falkland trawl fisheries.

An assessment of seabird by-catch in Falkland Islands trawl fisheries

July 2014 to June 2015

Falkland Islands Fisheries Department

Amanda Kuepfer

CONTENTS

Glossary of Acronyms

ACAP	Agreement on the Conservation of Albatrosses and Petrels
CV	Coefficient of variation
BSL	Bird Scaring Lines
FC	Falklands Conservation
FCZ	Falkland Conservation Zone
FICZ	Falklands Interim Conservation and Management Zone
FOCZ	Falklands Outer Conservation Zone
FI	Falkland Islands
FIFD	Falkland Islands Fisheries Department
NPOA-S-T	National Plan of Action for Reducing Incidental Catch of Seabirds in Trawl Fisheries

SUMMARY

This report estimates the minimum number of incidental seabird mortalities in the trawl fisheries in Falkland Island waters from 1 July 2014 to 30 June 2015.

Observations of seabird interactions with fishing gears were conducted on 98 days, representing 3.3% of the finfish trawling effort observed over the one year period. Additionally, observations were made on 45 days aboard Falkland calamari trawlers, representing 2.2% of Falkland calamari trawling effort over the same period.

A total of 35 seabird mortalities of long-winged species were recorded from the observed seabird-fishery interactions. In addition, mortalities of one Cape petrel and one Gentoo penguin were recorded, although these are not used in the annual mortality estimates. Of the long-winged species, there were 29 black-browed albatross, two grey-headed albatross and two giant petrel mortalities recorded from the finfish bottom trawl fishery. Two black-browed albatross mortalities were recorded from the Falkland calamari trawl fishery.

The extrapolated number of seabirds estimated to be killed in Falkland Islands waters were:

- 0.34 birds per day for the finfish trawl fishery, equalling a total of 1002.6 long-winged birds over the total of 2996 fishing days (coefficient of variation (CV) = 3.07 (all spp combined; CV = 3.20 black-browed albatross and giant petrel only; CV = grey-headed albatross only)*; black-browed albatrosses n=886.6; giant petrel species n=61.1; grey-headed albatross n=54.9));

- 0.05 birds per day for the Falkland calamari trawl fishery, equalling 95.4 black-browed albatrosses (CV=4.58) over the 2,051 fishing days.

* Note that the seasonal presence of grey-headed albatrosses was taken into account for the mortality estimates analysis.

These mortality estimates are the second highest since the introduction of the tori-lines in 2004, illustrating that further management measures are necessary to reduce seabird mortality in the Falkland Islands trawl fisheries.

The 3.3% (finfish) and 2.1% (Falkland calamari) total observer efforts for the year are identical to the respective efforts in 2012-2013 and are the second highest since the tori-lines were introduced in 2004. This therefore provides higher than average confidence in the mortality estimates. Note, however, that given the methods used, the estimates represent only minimum values.

Whilst greater observer effort, the use of more precise effort data for analysis as well as an improved understanding of the level of cryptic or undetected mortalities would provide more precise estimates, limited resources would be better used investigating ways to further reduce incidental mortality.

There is significant scope to improve mitigation for incidental seabird mortality in the Falkland Islands fishery. Stricter actions for compliance enforcement should be considered and development of appropriate discard management systems or effective alternatives should be pursued.

1. INTRODUCTION

1.1. Background

Worldwide the incidental by-catch of non-target species such as seabirds is a significant problem in fisheries management (Anderson et al. 2011; Løkkeborg 2011). Declines in seabird breeding populations have been correlated with mortality in commercial fisheries particularly for long-lived species with delayed maturity, slow population growth rates, low fecundity, and high adult survival such as albatross and petrels (Brooke 2004; Cuthbert et al. 2004). The Falkland Islands are an important seabird feeding and breeding area with over 70% of the world's breeding populations of black-browed albatross *Thalassarche melanophrys* (Huin & Reid 2007) and 40% of the world's breeding population of Southern giant petrel *Macronectes giganteus* (Shirihai 2007). Discharging waste from onboard fish processing (visceral matter, fish heads and tails) and discarding by-catch of non-commercial species attracts seabirds to fishing vessels for the opportunity to forage on these discards. In the Falkland Islands, high levels of incidental seabird mortality as a result of this interaction was first recorded in the commercial finfish trawl fishing fleet in the early 2000s (Sullivan & Reid 2003). The main two seabird species recorded as by-catch in the Falkland Islands trawl fishery are black-browed albatross and to a lesser extent giant petrel species (Janzen et al. 2011; Sullivan et al. 2006b; Quintin 2014b).

In 2004, the United Kingdom, representing United Kingdom Overseas Territories (including the Falkland Islands), became a signatory to the Agreement for the Conservation of Albatross and Petrels (ACAP) (Wolfaardt et al. 2010). As a signatory to ACAP the Falkland Islands is part of a multilateral agreement which aims to conserve albatrosses and petrels by coordinating international activity to mitigate known threats to albatross and petrel populations. The Falkland Islands Fisheries Department adopted a National Plan of Action-Trawling (NPOA-T) in 2004 when Bird Scaring Lines became mandatory (Sullivan 2004). This was updated in 2009 (Sancho 2009a) and again in 2014 (Quintin & Pompert 2014) with a clear four year strategy to ensure incidental seabird mortality in the trawl fishery remains below a level that will have no deleterious impact on the long term sustainability of seabird populations. In the discussion of this annual report each of the specific objectives of the FI NPOA-T (Quintin & Pompert 2014) will be addressed in context with the annual seabird mortality results.

1.2. Previous mortality assessments

The first incidental seabird mortality assessment in demersal trawlers fishing within the Falkland Islands' Conservation Zones (FICZ) was carried out in 2002 and 2003 estimating a minimum of 1,529 seabirds, predominantly black-browed albatrosses, being killed at a daily rate of 0.47 by warp cables (Sullivan et al. 2006b). This high level of estimated mortality coincided with work by the Falkland Conservation (FC) showing a 20% decline of black-browed albatross at breeding colonies in the Falkland Islands over a five year period (Huin 2001). Due to high seabird mortality estimates, bird scaring lines (BSL's, commonly known as tori-lines) became mandatory in 2004. Following the introduction of tori-lines, between July 2004 and June 2005, a 90% reduction in incidental mortality due to warp strike was recorded with an estimated daily mortality rate of 0.07 birds for the entire Falkland fishing zone (Reid & Edwards 2005) (Table 1).

Further work from a collaborative project between the Falkland Islands Fisheries Department (FIFD) and FC, investigating seabird by-catch over a two year period from 2007-2009 in all Falklands trawl fisheries showed an increase in by-catch since 2005 (Sancho 2009b), to 0.14-0.15 per vessel day. Whilst this was twice the value reported by Reid and Edwards (2005) the two reports are unfortunately not directly comparable, since Sancho (2009b) included mortalities caused by paravane cables and net entanglements, whereas Sullivan et al. (2006b) and Reid and Edwards (2005) only used warp strikes. The 2009-2010 seabird mortality estimates (and all estimates thereafter) were produced from data gathered solely by the FIFD (FIG 2011), using the same criteria as Sancho (2009b) so again not directly comparable to Sullivan et al. (2006b). This work estimated a very low rate of 0.09 birds per vessel day in the finfish trawl fishery. The results were in stark contrast to the 2010-2011 estimation of a by-catch rate of 0.42 birds per day, predominantly black-browed albatrosses (Parker 2012a). The estimated incidental seabird mortality in the finfish trawl fleet in 2010-2011 was 1,447 birds, startlingly similar to the 2002-2003 estimates prior to mitigation being introduced. In contrast again, estimated bird mortalities in the finfish trawl fleet hit an all-time low in 2013-2014 with 103 birds.

Population censuses since the 2000s revealed that the black-browed albatross population has been increasing at a rate of 4% per annum, and this has since led to the down-grading of the IUCN conservation status to Near-Threatened in 2013 (Birdlife International 2016). Whilst this increase may in parts be attributed to improved seabird by-catch mitigation measures, past years of seabird by-catch monitoring have clearly revealed substantial annual variation in seabird mortalities, calling into question both the baseline mortality estimates used before tori-lines were introduced in 2004, as well as the true effectiveness of tori-lines in reducing seabird mortalities.

Table 1 Summary of previous and current seabird mortality estimates from the Falkland Island finfish trawl fishery.

Year	Obs. days	% fishing days obs.	Agency	Recorded mortality	Estimated daily mortality	Estimated annual mortality
2002-2003	157		SAST	73	0.47	1529
2004-2005	88		APP	16	0.07	169
2007-2008	86		APP & FIFD	10	0.14	510
2008-2009	99		FIFD	25	0.15	590
2009-2010	91	2.6	FIFD	8	0.09	311

2010-2011	103	3	FIFD	43	0.42	1447
2011-2012	139	4.3	FIFD	29	0.21	679
2012-2013	102	3.2	FIFD	32	0.31	999
2013-2014	60	1.9	FIFD	7	0.18	103
2014-2015	98	3.3	FIFD	33	0.34	1003

This report follows on from previous annual reports to update the status of incidental seabird mortality in the Falkland Islands trawl fisheries.

2. METHODS

On demersal finfish trawlers, Fisheries Observers dedicate one day in four to bird interaction monitoring, whereas a single Seabird Observer monitors every fishing day. Deviations from the one day in four scheduling are noted and taken into consideration during data analyses. Bird observation monitoring is divided into shooting, trawling, and hauling periods. Observers monitor interactions between seabirds and fishing gear for shooting and hauling periods, and trawling periods mainly when discarding occurs.

On both Falkland calamari and pelagic trawl fishing vessels bird observations are generally conducted during the net haulings only on one day in four. This is with the exception of observations conducted by the Seabird Observer, who applies the standard seabird observation protocol for trawl fisheries. The majority of observation days by the Seabird Observer are conducted on finfish vessels, which have in previous years generally caused the highest level of mortalities (but see 2013-2014).

2.1. Trawling observations

Trawling observations record the number and type of contacts with the fishing gear relative to the environmental and discharge conditions. Observations begin once the net is in the water and continue during the trawl until the observer takes a break or the vessel stops discharging waste. Observation periods are a maximum of 60 minutes long and contacts are summarised by 10 minute periods. If any of the environmental factors or discard volume changes, a new observation period is initiated. The maximum possible period that the factory is processing and discharging waste is observed, but when catches are large this is not always possible.

2.2. Hauling observations

Mortality rates are mostly calculated from the number of dead birds recovered during hauling. However, if a bird is observed wrapped around the cable and drowned during trawling and the observer is absolutely confident the bird was killed this is recorded as mortality also. It is important to understand that an unknown proportion of birds are killed due to warp strike but are not recovered during hauling. The likelihood of recovering dead birds is small and will be influenced by the condition and/or presence of warp splices, weather conditions and the soak time of the trawl.

Importantly, observers report the condition of the warp splices, which influences the likelihood of retaining dead birds. Contacts between seabirds and fishing gear during hauling, and the outcome of those contacts, are recorded during haul observations also.

2.3. Data analysis

The data analysis methods follows that developed by Falklands Conservation's Seabirds at-sea (later to become the Albatross and Petrel Programme), which followed the methods of Wienecke and Robertson (2000).

To estimate annual seabird mortalities, the observed mortalities are extrapolated from total observation effort (number of days where at least one haul was observed) to the total trawl effort (number of fishing days). The analysis takes into account the seasonal presence of grey-headed albatross by extrapolating grey-headed albatross mortalities separately to only the seasons in which they were present in Falkland Islands waters. The analysis is carried out separately for the finfish and Falkland calamari fleet. In previous years fishing and observed fishing effort had been stratified over 30 combined strata; six seasonal (to coincide with the breeding cycle of the black-browed albatross – the dominant species impacted by trawl fisheries) and five spatial (Table 2 and Figure 1). Stratification is a requirement of the NPOA-T (Sancho 2009a). Although it is unrealistic to expect to be able to balance fishing effort and observer effort for each stratum due to ship movements and available observer coverage, this report repeated the stratified analysis for comparison with past reports, using FIFD data from 01 July 2014 – 30 June 2015.

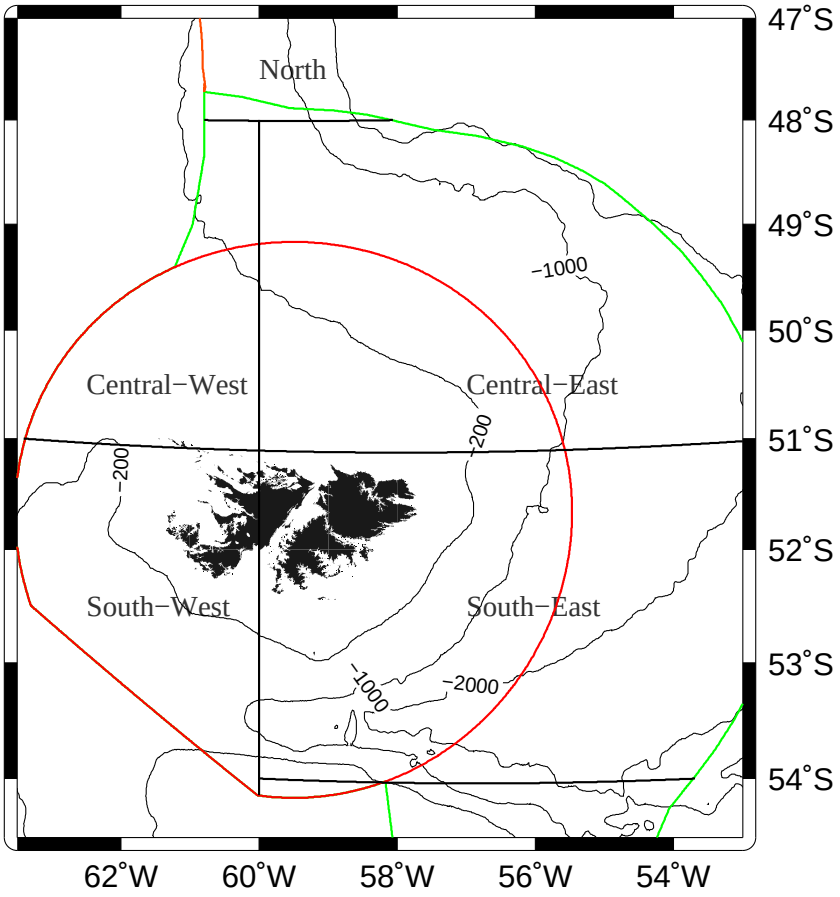

Figure 1 The five areas used for spatial stratification. Note that the inner red line represents the Falkland Islands Interim Conservation and Management Zone (FICZ) and the outer green line the Falkland Islands Outer Conservation Zone (FOCZ).

Table 2 Description of spatial and seasonal strata.

Seasonal		Spatial	
Strata	Description	Strata	Description
Winter	May – 20 Aug	North	<48°S
Prospecting	21 Aug – Sept	Central West	≥48°S<51°S, ≥60°W
Laying	October	Central East	≥48°S<51°S, <60°W
Egg	Nov – Dec	South West	≥51°S<54°S, ≥60°W
Young chick	Jan – Feb	South East	≥51°S<54°S, <60°W
Old chick	Mar – Apr		

3. RESULTS

Nb – all relevant data are included in the results section, and so there is no Appendix to this report. For more detailed data, see the Observer Database.

3.1. Effort: fishing and observed

Finfish trawling

The demersal trawl finfish effort from 1 July 2014 to 30 June 2015 was 2,996 days (Table 3) representing a reduction of 82 days from the previous year effort. Observations of seabird interactions with finfish trawl fishing gears in the Falkland Conservation Zones (FCZ = FICZ and FOCZ) were conducted on 98 days indicating 3.3% seabird specific observer coverage of the finfish fishing effort over the one year period. This observed effort was higher compared to the previous year when a total of 60 days were observed representing 1.9% of observed coverage (Table 1).

A further 23 days of seabird interaction observations with finfish trawl fishing gears were conducted in international waters located north of 47.75° S. It is not possible to calculate the proportion of fishing observed in international waters because the FIFD only collects data for Falkland flagged vessels. Whilst there were 23 trawl fishing days for Falkland flagged vessels in international waters in the period reported here, this represents an unknown proportion of the total trawl fishing effort.

Table 3 Finfish trawl days, Observer days and effort for the period of 01/07/2014-30/06/2015.

Year	Trawling days	Observed days	Observed Effort (%)
2014-2015	2,996	98	3.3

It is worth mentioning that the Argos Vigo (ZDLU1) vessel uses a modified tori-line system (aerial array) (Parker 2013). Observations conducted aboard the vessel using a refined version of this modified tori line system have so far shown very few heavy bird encounters with warp cables (Observer reports 983; 1028), and hence a much reduced risk of seabird mortalities. Over the period analysed, this vessel had 6 days of finfish licence, with a total of 2 days of observations (within FCZ).

Seabird observations were conducted for 196 stations (trawls) by 9 different observers on 13 of the 30 finfish trawl vessels fishing within the Falkland Islands Conservation Zones (Table 4). The number of stations observed per vessel varied greatly and was not consistent; the mean number was 15.1 stations, the median 7 stations, while the range was 3-92 stations. One vessel accounted for 47% of all trawls and the four most sampled vessels accounted for 74 % of all stations observed. Similarly, the observer

coverage was also skewed with the seabird observer accounting for 74% of the observed stations (71% of the observed days).

Table 4 2014-2015 summary of observer effort per vessel and per observer within the FCZ finfish fleet. Vessel callsigns and observer codes were assigned with a number for report purpose only.

Vessel no.	Observed Stations	Observer no.	% Observer effort
1	4	5	2.0
2	19	3	9.7
3	3	1	1.5
4	7	4, 9	3.6
5	17	3	8.7
6	8	5, 6	4.1
7	92	3, 7	46.9
8	12	2, 5	6.1
9	3	6	1.5
10	5	8	2.6
11	4	6	2.0
12	4	2	2.0
13	18	1,3	9.2
Vessels n = 13	**Σ Stations n = 196**	**Observers n = 9**	

NB – Note the high number of stations for vessel 7 (Santa Mariña, EEMX) is due to the discard management study having been conducted on that vessel.

Stratified effort: Spatial

Table 7 summarises the stratified fishing and observation effort in the FCZ over the one year period. There were 2,996 fishing days of which 104 days were observed across the various spatial strata. Note that some vessels cross more than one spatial boundary in a single day, which is reflected in the difference between the observed days (98) and the observed days under stratification (104). The Central West strata had the highest proportion of finfish trawling effort with 63.9%, and received the highest proportion of the stratified observed effort with 4.2% (80 out of 1,913 fishing days). This equates to 76.9% of the total observed effort for the year (80 out of 104 days). In contrast, the North and the South East provided the lowest proportion of finfish trawling effort with each only accounting for 1.1% of the total effort. They each received 0.0% bird observation coverage. The South West and the Central East had similar proportions of fishing effort with 18.9% (449 days) and 15.0% (567 days) of the total fishing effort respectively. Bird observation days were conducted on 3.2% and 1.3% of these days respectively, representing 17.3% and 5.8% of the total observation effort respectively.

Stratified effort: Seasonal

The Winter stratum held the highest proportion of fishing effort (38.2%, 1,144 days), followed by the Old Chick stratum with 20.3% of total fishing effort (607 days). The Laying and Winter strata had the highest proportion of observed effort with 4.1% and 4.0% of the fishing days sampled (Laying: 14 out of 345 fishing days; Winter: 46 out of 1144 fishing days). This respectively represented 13.5% and 44.2% of total observation effort for the year. Old Chick and Prospecting strata also had similarly high proportions of observed effort with 3.6% and 3.4% of the fishing days sampled (Old Chick: 22 out of 607 fishing days; Prospecting: 18 out of 528 fishing days). The Egg stratum received only 1.4%

of observed effort and no observations were carried out during the Young Chick stratum, which held 2.7% (607 days) of the annual fishing effort. This is in contrast to the previous year, where the Young Chick stratum received the highest proportion of observed effort (4.7%, see Quintin 2014b).

Falkland calamari trawling (Licence C/X)

The Falkland calamari trawl effort was 2,051 days. Bird observations were conducted for 95 stations (trawls) by six different observers aboard eight out of the 17 vessels on 43 days (2.1% of total Falkland calamari fishing effort) (Table 5, Table 6). Again, it is worth remembering that the Argos Vigo vessel (ZDLU1) was working with an improved, modified tori-line system which rendered very few bird contacts with warp cables during trials, implying a much reduced mortality risk on that particular vessel (total days of Falkland calamari trawling = 129; days of observation = 5).

Table 5 Falkland calamari trawl days and Observer days and effort 01/07/2014-30/06/2015.

Year	Trawling days	Observed days	Observed Effort (%)
2014-2015	2,051	45	2.2

Table 6 2014-2015 summary of observer effort per vessel and per observer within the FCZ Falkland calamari fleet. Vessel callsigns and observer codes were assigned with a number for report purpose only.

Vessel no.	Observed Stations	Observer no.	% Observer effort
1	11	1	11.6
2	11	2	11.6
3	8	3, 4	8.4
4	11	3	11.6
5	12	4	12.6
6	13	6	13.7
7	28	5	29.5
8	1	3	1.1
Vessel n = 8	**Stations n = 95**	**Observer n = 6**	

Stratified effort: Spatial

Table 8 summarises the distribution of Falkland calamari fishing and observed effort under stratification. There were 2,051 fishing days and 46 observed days across the various spatial strata. Note that some vessels cross more than one spatial boundary in a single day which is reflected in the difference between observed days (43) and the observed days under stratification (46). Fishing effort was concentrated in the South East (1737 days, 84.7% of total fishing days) and, to a lesser extent, in the Central East (243 days, 11.8 % of total fishing effort) and South West (71 days, 3.5% of total fishing days). No Falkland calamari fishing took place in the North or Central West strata. Total Observer coverage was highest in the South East (87.0%, 40 out of 46 days), but this still represented a relatively low proportion of actual fishing days observed (2.3%, 40 out of 1737 days).

Stratified effort: Seasonal

The Old Chick stratum held the highest proportion of total fishing effort (876 days, 42.7% of total fishing effort), followed by the Prospecting stratum (633 days, 30.9%) and the Winter strata (467

days, 22.8%). The Young Chick stratum held the final 3.7% of fishing effort. No fishing effort took place during the Laying and Egg strata. Observer effort was focused on the Old Chick strata (56.5% of total effort), with the remaining observation days equally spread between the Winter and the Prospecting strata (10 days, 21.7% each).

Table 7 Finfish trawling and observed effort under stratification in the FCZ, 01/07/2014-30/06/2015.

2014-2015	North		Central West		Central East		South West		South East		GRAND TOTAL		EFFORT (%)		STRAT. EFF (%)
	Trawl	Obs.	Trawl	Obs.	Trawl	Obs.	Trawl	Obs.	Trawl	Obs.	Trawl	Obs.	**Trawl**	**Obs.**	
Winter	17	0	836	42	227	1	47	3	17	0	1144	46	**38.2**	**44.2**	**4.0**
Prospecting	9	0	367	15	133	3	18	0	1	0	528	18	**17.6**	**17.3**	**3.4**
Laying	2	0	277	12	36	2	26	0	4	0	345	14	**11.5**	**13.5**	**4.1**
Egg	1	0	236	2	13	0	37	2	3	0	290	4	**9.7**	**3.8**	**1.4**
Young Chick	1	0	41	0	30	0	8	0	2	0	82	0	**2.7**	**0.0**	**0.0**
Old Chick	3	0	156	9	10	0	431	13	7	0	607	22	**20.3**	**21.2**	**3.6**
GRAND TOTAL	33	0	1913	80	449	6	567	18	34	0	**2996**	**104**			
EFFORT (%)	**1.1**	**0.0**	**63.9**	**76.9**	**15.0**	**5.8**	**18.9**	**17.3**	**1.1**	**0.0**					
STRAT. EFF (%)		**0.0**		**4.2**		**1.3**		**3.2**		**0.0**					

Table 8 Falkland calamari trawling and observed effort under stratification in the FCZ, 01/07/2014-30/06/2015.

2014-2015	North		Central West		Central East		South West		South East		GRAND TOTAL		EFFORT (%)		STRAT. EFF (%)
	Trawl	Obs.	Trawl	Obs.	Trawl	Obs.	Trawl	Obs.	Trawl	Obs.	Trawl	Obs.	**Trawl**	**Obs.**	
Winter	0	0	0	0	78	1	8	0	381	9	467	10	**22.8**	**21.7**	**2.1**
Prospecting	0	0	0	0	158	1	0	0	475	9	633	10	**30.9**	**21.7**	**1.6**
Laying	0	0	0	0	0	0	0	0	0	0	0	0	**0.0**	**0.0**	**NA**
Egg	0	0	0	0	0	0	0	0	0	0	0	0	**0.0**	**0.0**	**NA**
Young Chick	0	0	0	0	0	0	6	0	69	0	75	0	**3.7**	**0.0**	**NA**
Old Chick	0	0	0	0	7	0	57	4	812	22	876	26	**42.7**	**56.5**	**3.0**
GRAND TOTAL	0	0	0	0	243	2	71	4	1737	40	**2051**	**46**			
EFFORT (%)	**0.0**	**0.0**	**0.0**	**0.0**	**11.8**	**4.3**	**3.5**	**8.7**	**84.7**	**87.0**					
STRAT. EFF (%)		**NA**		**NA**		**0.8**		**5.6**		**2.3**					

3.2. Recorded mortality

Finfish trawling

Thirty-three mortalities of high risk seabird species[1] were recorded from the 98 days of observed seabird finfish trawl fishery interactions in the FICZ (black-browed albatross: 85.3%, n=29; grey-headed albatross: 5.9%, n=2; giant petrel: 5.9%, n=2). There was also one mortality of a cape petrel, but this species is not included in the annual mortality estimates. To the author's knowledge, this is the first time mortalities of grey-headed albatross have been recorded in the Falkland Islands.

Mortality by type

Mortalities of long-winged high-risk species occurred from contact with the warp cables (n=29), tori-lines (n=3) and the net (n=1). The mortalities caused by the tori-lines occurred on three separate vessels and in at least two cases the cause of death was entanglement with the line at the buoy end, which led to drowning. This type of mortality has also been reported in previous years. Mortalities caused by the warp cable were either direct (i.e. through drowning after having become snagged on or pushed under by warp cable) or indirect (i.e. through a major injury such as a broken wing caused by contact with the warp). Report details on the net-related mortality suggest that the bird (black-browed albatross) had been drowned during shooting. Mortalities of the two grey-headed albatrosses occurred in the South West strata during the Old Chick season in the week when this species was unusually abundant and represented up to 10-20% of small albatrosses interacting with the vessel at times. One of the birds suffered a broken wing after a heavy warp strike during shooting whilst feeding on deck waste that had entered the water.

Extrapolated mortality

When the observed mortality rate of high-risk species (33 birds from 98 observed days) is extrapolated to the entire year's fishing effort, the total number of seabirds estimated to be killed in Falkland Island waters between 01 July 2014 and 30 June 2015 is 0.34 birds per trawl day, equalling a total of 1008.9 birds (CV= 3.07), of which 887 black-browed albatrosses, 61 grey-headed albatrosses and 61 giant petrels. However, grey-headed albatrosses are generally winter visitors, and were not recorded in October, November or December (Laying and Egg strata) this year. If this is considered in the analysis, then the total number of seabirds killed during the year is estimated to be 1002.6, of which 887 black-browed albatrosses, 55 grey-headed albatrosses and 61 giant petrels (CV = 3.20 for black-browed albatross and giant petrel, only; CV = 6.40 for grey-headed albatross only). Warp cables accounted for 87.9% of all estimated seabird mortalities, estimated to cause a daily mortality of 0.30 seabirds (886.6 per year) (Table 9). This is a substantial increase in seabird by-catch compared to the previous year (Table 1), highlighting the annual variation in seabird mortalities as well as the need for improved mitigation measures. Mortalities were recorded from six of the 13 vessels on which seabird observations were conducted.

[1] High risk species (HR) are defined as long-winged species that are at risk of injury or mortality resulting from heavy contacts with fishing gear, and species that are ACAP (Agreement on the Conservation of Albatrosses and Petrels) listed: http://www.acap.aq/en/acap-species/307-acap-species-list/file. In the Falkland Islands waters, these are predominantly black-browed albatross and giant petrels, as well as grey-headed albatross, royal albatross, wandering albatross and white-chinned petrels.

Table 9 Observed seabird mortality rates of high-risk species* per fishing day and estimated annual seabird mortality in the Falkland Islands finfish trawl fishery (2014-2015). *black-browed albatross, grey-headed albatross and giant petrel.

Cause of mortality	Number	Daily rate	Annual estimate 2014-2015
Warp	29	0.30	886.6
Tori-line	3	0.03	91.7
Net	1	0.01	30.6
Total	**33**	**0.34**	**1008.9**

Stratified mortality

Table 11 summarises observed seabird mortalities and extrapolated mortalities under seasonal and spatial stratification in the Falkland Islands Conservation Zone (FICZ) over the one year period. Two spatial strata (North and South East) and one temporal stratum (Young Chick) were excluded from the table because no observations were conducted in these strata.

The numbers of extrapolated seabird mortalities under stratification 788 (spatial and seasonal). In contrast, the extrapolated observed mortality for the entire year's fishing effort was 1002.6 birds. This difference is related to differences in observation efforts within the various strata.

When the 33 observed mortalities were stratified across the spatial strata, mortalities occurred in the Central West (n=18 in 80 days of observation) and the South West (n=15 in 18 days of observation). Taking into account total fishing effort in these strata this accounts for an extrapolated annual mortality rate of 372 and 482 birds, respectively. No mortalities were observed in the Central East or South East region.

Under seasonal stratification, the Winter and Old Chick strata had the highest observed mortalities (n=12 in 22days of observation and n=15 in 46 days of observation, respectively). When the observed mortality was extrapolated to the total fishing effort in these seasons, the total number of seabirds estimated to have been killed in the Winter and Old Chick season were 239.0 and 481.0, respectively. A single mortality was recorded in the Egg season in 4 days of observation, equating to an annual mortality rate of 18.5 birds. No mortalities were observed during the Prospecting season.

Falkland calamari

Two mortalities of high-risk species were recorded from the total of 43 days observed seabird-Falkland calamari fishery interactions in the FICZ. There was also a mortality of a Gentoo penguin that was caught in the net during hauling, but this species is not used for the annual mortality estimates.

Mortality by type

The two mortalities (both black-browed albatrosses) recorded in the Falkland calamari fishery were both warp-related. Feathers and flesh were found in the warp splices and the warp block.

Extrapolated mortality

When the observed mortality rate (2 birds from 43 observed days) is extrapolated to the entire year's fishing effort, the total number of seabirds estimated to be killed by the Falkland calamari fleet in the Falkland Islands water is 0.05 per day, and 95.4 per year (CV=4.58). This compares with an estimated annual mortality rate of 125 (CV=3.99) in the previous year. Warp strikes accounted for 100% of mortalities this year (Table 10), whereas in the previous year, mortalities were both warp and net related (50% each) (Quintin 2014b).

It should be remembered that Falkland calamari seabird observation days are generally of a lower effort than the finfish observation days, as Fisheries Observers only observe the shooting and hauling, but not the trawls (the trawls aboard Falkland calamari vessels are only observed by the dedicated seabird observer (this year n=10 out of 45 days of observations)). The probability that a dead bird is retained until hauling is generally very small, especially if the vessel has clean warp splices.

Table 10 Observed high-risk seabird species* mortality rates per fishing day and estimated annual seabird mortality in the Falkland calamari trawl fishery (2014-2015). *all black-browed albatrosses.

Cause of mortality	Number	Daily rate	Annual estimate 2014-2015
Warp	2	0.05	95.4
Total	**2**	**0.05**	**95.4**

Stratified mortality

Table 12 summarises seabird mortalities and extrapolated mortalities for the Falkland calamari fishery under stratification in the Falkland Islands Conservation Zones over the one year period. Three temporal strata (Laying, Egg and Young Chick) were excluded from the table because no observations were made in these strata.

Under seasonal and spatial stratification, all of the observed mortalities occurred in the South East stratum during the Prospecting season. The estimated annual mortality was 105.6 birds. In contrast, the extrapolated estimated mortality for the entire year's fishing effort was 91.2 birds. This difference is again related to differing observer coverage across the strata and in relation to observed mortalities.

Table 11 Observed and extrapolated seabird mortality estimates for the Falkland finfish fleet under stratification for the period of 01/07/2014-30/06/2015.

	Black-browed albatross				Giant petrel spp.				Grey-headed albatross			
2014-2015	**CW**		**SW**		**CW**		**SW**		**SW**		**GRAND TOTAL**	
	Obs.	Extrap.	Obs.	Extrap.	Obs.	Extrap.	Obs.	Extrap.	Obs.	Extrap.	**Obs.**	**Extrap.**
Winter	11	218.95	0	0	1	20	0	0	0	0	**12**	**239**
Prospecting	0	0	0	NA	0	0	0	NA	0	NA	**0**	**0**
Laying	5	115.42	0	NA	0	0	0	NA	0	NA	**5**	**115**
Egg	0	0	1	18.5	0	0	0	0	0	NA	**1**	**19**
Old Chick	1	17.333	11	364.692	0	0	1	33	2	66	**15**	**415**
GRAND TOTAL	17	352	12	383	1	20	1	33	2	66	**33**	**788**

Table 12 Observed and extrapolated seabird mortality estimates for the Falkland calamari fleet under stratification for the period of 01/07/2014-30/06/2015.

	Black-browed albatross	
2014-2015	**SE**	
	Obs.	Extrap.
Winter	0	0
Prospecting	2	105.6
Old Chick	0	0
GRAND TOTAL	2	105.6

Illex, skate, and pelagic trawling

One day of bird observations was conducted in the *Illex* fishing fleet between 01 July 2014 and 30 June, 2015 (total *Illex* fishing effort 349 days), representing 0.29% observation effort. No mortalities were recorded.

Two days of bird observations was conducted in the skate fishing fleet between 01 July 2014 and 30 June, 2015 (total skate fishing effort 141 days), representing 1.42% observation effort. No mortalities were recorded.

No observations were conducted aboard pelagic trawlers (total fishing effort 15 days).

*****NOTE: due to seabird observation protocols, the following three sections concern the finfish fleet only. Contacts are not generally observed in the other fisheries. In addition, the seasonal presence of grey-headed albatrosses is not considered in this section, as these birds behave very similarly to black-browed albatrosses. *****

3.3. Unknown fates

Forty-four unknown fates were recorded between 01 July 2014 and 30 June 2015. Forty-three of these were the result of heavy contacts with the warp cable by birds on the water, and one of the records resulted from a heavy contact with the tori-line by a bird on the water. Species involved were black-browed albatross (n=37), giant petrel (n=4) and cape petrel (n=3). The number of unknown fates for 2014-2015 was substantially higher than in the previous year (n=2), although the lower observer effort in the previous year should be taken into consideration (n(days bird obs. 2013-2014) = 60; see Quintin 2014b).

Three of the unknown fates recorded correlated with stations where incidental mortalities occurred. Furthermore, often multiple records of unknown fates were recorded in a single day (n(days with unknown fate records)=25). This suggests that at least a proportion of the unknown fates may have resulted in mortalities. It is hoped that in future years, the corpse catcher device (Figure 3), as well as repeat research surveys (with the PV following a fishing vessel) may shed light on what that proportion may be.

3.4. Contact rates

Mortality defined as seabird carcasses witnessed by the observer are a statistically rare event, particularly given the relatively low observer coverage. This makes the robust assessment of the effectiveness of a mitigation tool such as the tori-line difficult. A more useful approach is to use the proxy of (heavy) contacts by seabirds with fishing gear. As such, contact rates are considered more in detail here.

10,361 contacts between high risk seabird species and fishing gear were recorded within the FCZ in the one year period (98 observed days, Table 13). This represents a similar number of contacts per

observation day as in the previous year (2014-2015: 105.7 contacts/day; 2013-2014: 116.3 contacts/day). Black-browed albatrosses incurred by far the highest proportion of contacts (69.4%), both heavy (81.3%) and light (67.1%). This will in part have been a result of their relatively high abundance (particularly in comparison to other albatross species), but also due to their feeding habits (in comparison to giant petrels, for example). Giant petrels incurred 28.6% of all contacts. These values are almost identical to those from the previous year (proportion of total contacts 2013-2014, black-browed albatross n=68%; giant petrel n=28%, Quintin 2014b).

Out of all contacts observed, 16.5% were heavy contacts (HC) (n=1,710, Table 13). Of these, 49.9% represented contacts with the tori-lines (n=854), and 49.1% represented contacts with the warp cables (n=840). Extrapolating these heavy contacts to the total fishing days for the year provides an annual estimated rate of heavy contacts by high-risk species of 52,277.10. Heavy tori-line contacts resulted in no apparent damage in 98.5% of cases, whereas heavy warp-cable contacts resulted in no apparent damage in only 52.14% of cases. (This compares with 100% and 99.6% of no apparent damage resulting from light contacts with tori-lines and warp cables, respectively.) Assuming an estimated annual number of heavy contacts of 26,108 and 25,680 with the tori-lines and warp cables, respectively (Table 14), this equates to 12,284 (with the warp cable) and 391 (with the tori-lines) heavy contacts by high risk species that resulted in damage to the bird during the year.

Table 13 2014-2015 Light and heavy contacts in high risk species within the FCZ.

High Risk species	Heavy contacts	Light contacts	Total contacts
Black-browed albatross	1,391	5,803	7,194
Giant petrel spp.	255	2,710	2,965
Grey-headed albatross	43	43	86
Southern royal albatross	1	2	3
White-chinned petrel	20	93	113
GRAND TOTAL	**1,710**	**8,651**	**10,361**

Table 14 Number and estimated rate of heavy contacts on high risk species within the FCZ (obs. days = 98; fishing days = 2996).

Contact point	Number observed	Daily rate	Annual estimate
Tori-line	854	8.7	26,108.0
Warp wires	840	8.6	25,680.0
Other	16	0.2	489.1
GRAND TOTAL	**1,710**	**17.5**	**52,277.10**

Hourly contact rate

The unit of ‘days of observation’ is very crude and makes it difficult to reliably compare data between years as the method assigns the same effort to e.g. 1 hour of observation per day as it does for 10 hours of observation per day. As such, the observation time for each year was calculated to obtain the hourly contact rates, a unit that is more appropriate for comparative purpose. Those figures should still be considered carefully as one hour of observation does not equal another. Ideally, to accurately assess inter-annual variation in contact rates, mixed-effects models should be run to take into account environmental and operational factors that have been shown to significantly influence seabird

numbers and interaction rate, such as discard level, discard rate, relative wind direction and sea state. Generalised Linear Models (GLMs), as suggested in previous reports, can be used, but they would not take into account the temporally auto-correlated nature of the data. Table 15 summarises the contacts in relation to the total hours of observations conducted over the past six years. Table 16 and Figure 2 show that whilst the total number of contacts per hour for 2014-2015 has been lower than in the previous year, the hourly heavy contacts rates with both the trawl cables as well as with the tori-lines were higher than in the previous 5 years, with a record of 4.51 heavy contacts per hour.

Table 15 Total number of light and heavy contacts in high-risk species observed on the Finfish trawl fishery in the FCZ. Each year comprises data from the 1st of July to the 30th of June.

year	**contact point**				**sub-total**	**all contacts**	**obs. time (hrs)**
contact type	**warp**	**BSL**	**net**	**other**			
2009-2010							314.75
light	943	1664	1587	349	4543	4973	
heavy	289	90	23	28	430		
2010-2011							405.72
light	1293	1205	509	13	3020	3533	
heavy	390	71	43	8	513		
2011-2012							563.48
light	5796	5193	973	7	11969	13306	
heavy	1080	250	4	3	1337		
2012-2013							477.02
light	4157	1850	293	16	6316	7440	
heavy	844	270	7	3	1124		
2013-2014							213.02
light	1209	4282	811	12	6314	6976	
heavy	240	421	2	2	665		
2014-2015							379.32
light	3642	3919	994	96	8651	10361	
heavy	840	854	0	16	1710		

Table 16 Contact rates (per hour) observed on the Finfish trawl fishery in the FICZ. Each year comprises data from the 1st of July to the 30th of June

year	**all contacts**	**light (LC)**	**heavy (HC)**	**HC warp**	**HC BSL**
2009-2010	15.8	14.43	1.37	0.92	0.29
2010-2011	8.71	7.44	1.26	0.96	0.17
2011-2012	23.61	21.24	2.37	1.92	0.44
2012-2013	15.6	13.24	2.36	1.77	0.57
2013-2014	32.76	29.64	3.12	1.13	1.98
2014-2015	27.31	22.81	4.51	2.21	2.25

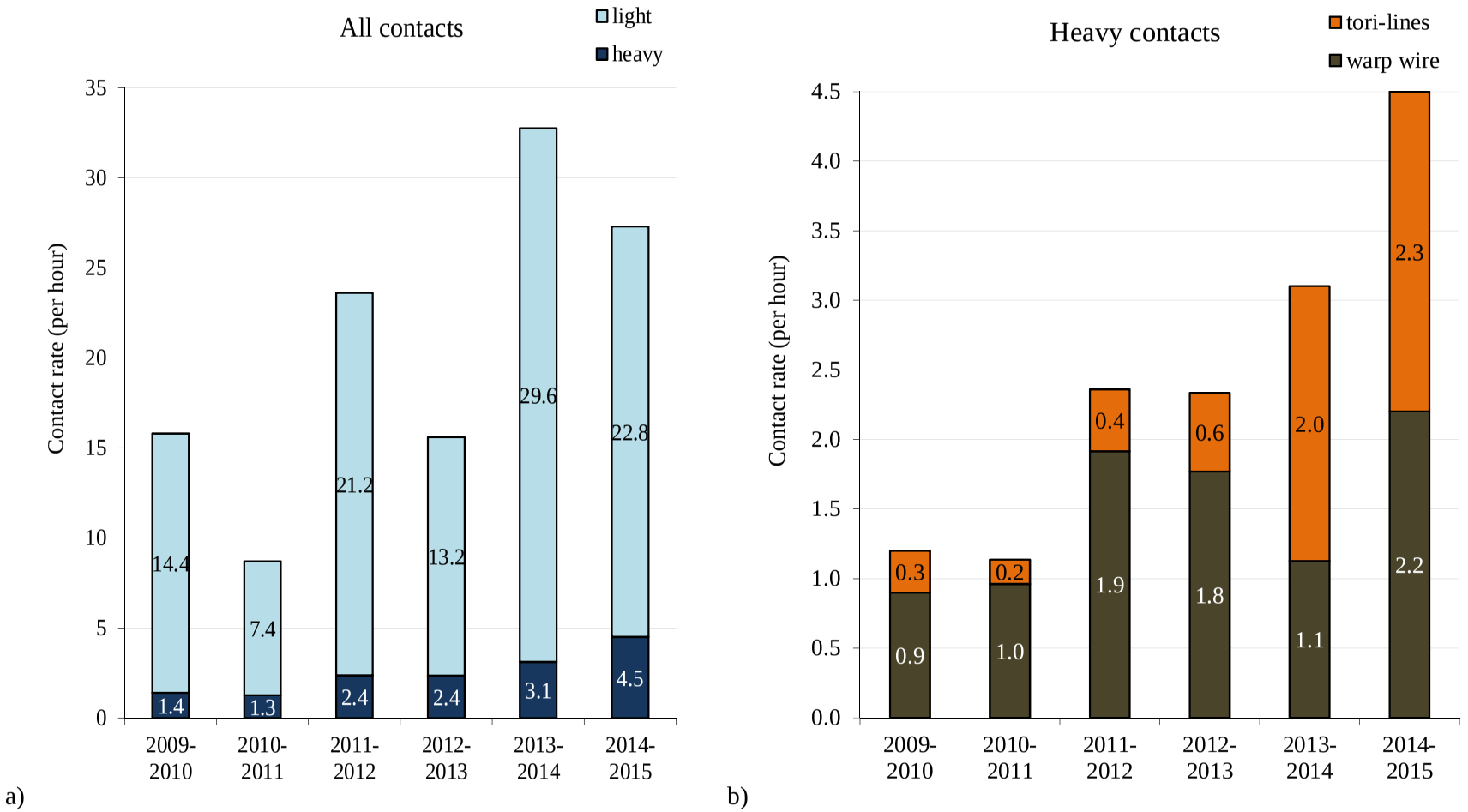

Figure 2 Hourly contact rates observed in the finfish trawling fishery in the FICZ/FOCZ, 2009-2015. Each year comprises data from the 1st of July to the 30th of June. a) all contacts, b) heavy contacts on warp cables and tori-lines only.

4. DISCUSSION

4.1. Seabird mortality

The estimated seabird mortality within the FCZ between 01 July 2014 and 30 June 2015 was 1,002.6 in the finfish fleet and an additional 95.4 in the Falkland calamari fleet. Compared to the previous year, this represents an almost 10 times higher mortality rate in the finfish fleet but a ca. 3 times lower mortality rate in the Falkland calamari fleet. However, observation effort in the previous year was very limited (finfish: 1.9%; Falkland calamari: 1.6% observer coverage), and so the confidence in the 2013-2014 estimates was very low. The achieved observation effort in the current year (2014-2015) was above average in comparison to previous years. Observation effort and mortalities in the finfish fleet were very similar this year for 2014-2015 as they were for 2012-2013.

The black-browed albatross, a species downgraded to Near Threatened on the IUCN red list in 2013, continues to dominate the mortality figures in the Falkland Islands waters, with 887 and 95 mortalities in the finfish and Falkland calamari fleet, respectively, during the year. Of the estimated mortalities, the highest proportion is attributed to interactions with the warp cables (87.9 % of all mortalities). Given the methodology used, the values represent minimum values only, and are likely to be underestimates (see Section 4.2.). With currently little knowledge as to the reasons for the recent population increase and how much of this can be attributed to the introduction of seabird bycatch mitigation measures as opposed to other environmental factors, seabird by-catch of high-risk species in the Falkland Islands fishing fleet continues to be of a conservation concern.

4.2. Data limitations

It is important to consider the limitations of the data and the analytical method used, both when considering the annual mortality estimates, as well as when comparing these estimates between years.

Firstly, for reasons of practicality, effort is currently defined as the number of days observed and fished. This is a relatively crude unit. For example, observation of a single haul is assigned the same amount of effort as 10 hours of contact observations. Equally, a vessel trawling for eight hours is assigned the same effort as a vessel trawling for 16 hours. A much more useful unit for mortality estimates calculations would be to use the proportion of observed hours of discarding during fishing activities. It is a well-known fact that seabird mortalities are only likely to occur during periods of discarding during fishing activities (e.g. Løkkeborg 2011). Most recently, over 40 hours of zero-discard observations in July, August, October and November 2015 by the current seabird observer, have shown a contact rate of 0.00 by high risk species, and 0.00 individuals within the danger area. Information on hours of discarding during fishing activities per fishing day is not currently available, but could in the future be demanded from vessels and observers.

Secondly, mortalities are a statistically rare event, the chance of seeing one being reduced by limited observer effort. This low amount is not sufficient to accurately quantify the overall by-catch within the fishery, nor would it be to accurately assess the effectiveness of mitigation tools such as tori-lines. Low observer effort becomes particularly problematic since clustered mortality events, historically considered as extremely rare, have been shown to occur more often than previously thought (Parker 2012b; Parker 2012c). In the 2012-2013 report (Lopez Gutierrez 2013), 7 out of 19 stations recorded clustered mortality events corroborating previous years' reports. Last year, clustered mortality events

were not recorded which was in parts attributed to the absence of rough warp cable splices on observed vessels. This year, there was one day of observation that yielded 8 mortalities and two further days that yielded three mortalities each. Consequently, a far higher percentage of observer coverage would be required to accurately quantify the current scale of mortality. However, as explained below, limited resources may be better spent on research and development of more effective mitigation measures.

In addition, there is a level of cryptic (or undetected) mortalities, which are not currently accounted for in the analysis. In a dedicated research cruise (7 days of fishing) conducted in October 2012, Parker et al. (2013) found that 23% of the confirmed mortalities (n=13) remained undetected from the observer aboard the trawler, despite the use of a corpse catcher device (Figure 3). Repetitions of this research are required to calculate a more accurate conversion factor that could be used to include cryptic mortality in the estimates.

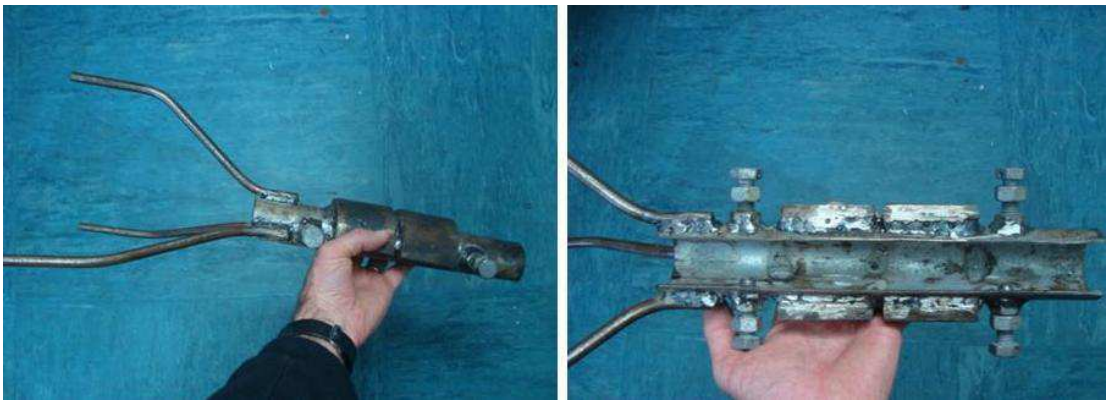

Figure 3: the 'corpse catcher' device trialled in an attempt to increase the probability of retaining drowned birds on the warps until hauling.

Finally, stratifying seabird mortalities into temporal and spatial strata makes biological sense, but it is unrealistic to achieve representative coverage of each stratum given the current level of observed effort available. Efforts are being made to achieve the most representative coverage possible. However, the presence of a seabird observer to cover each stratum is not always possible. In consequence, the distribution of observed effort does not always reflect the distribution of fishing effort. Also, the complicated stratification means that in any one stratum, the data is derived from one or very few vessels and observers, which could lead to biases.

4.2.1. Alternative means of assessing seabird by-catch

For the purpose of assessing the effectiveness of seabird mitigation tools such as the tori-lines or discard management, a recognised proxy for mortality risk should be used, such as contact rate or bird abundance (see e.g. Pierre et al. 2010) to allow for statistically viable sample numbers.

4.3. Tori-line effectiveness

Tori-lines have proven themselves globally to have the potential to significantly reduce the number of warp-related seabird mortalities in fisheries (e.g. review by Løkkeborg 2011), including in the Falkland Islands (e.g. Sullivan et al., 2006a). However, considering annual variation in estimated seabird mortality, results show that seabird by-catch in the Falkland Islands fisheries remain of conservation concern. Since these mortalities are directly related to the presence of discard during

trawling operations (e.g. review by Løkkeborg 2011), the most logical course of action would be discard management to reduce potentially fatal interactions with the wires and tori-lines substantially.

Tori-lines have also shown to present a new set of hazards to the seabirds, with an estimated 91.7 tori-line related mortalities having occurred during the year. Most contacts with the main line are harmless as it is not under much tension. Contacts with the streamers are also harmless, providing the recommended semi-flexible Mazzerpur material (or similar) is used. Streamers made of a more flexible material are dangerous as they can tangle around the bird's wing and cause either major injuries or drowning. Flexible materials also tend to entangle with warp cables, leading to rupture, and hence an increased replacement cost. However, the most lethal component is the net-covered float, as has also been identified in previous reports. The net-covered float is essential for the tori-lines as it provides the drag to hold the line taut. A sagging line would lose efficiency as it hangs under the warp and most of the streamers length drags in the water rather than flying above the warp, deterring seabirds from approaching. However, the float also causes heavy contacts and mortalities as birds become snagged under the line and trapped on the float. The floats have also been seen killing birds by hitting them during tori-line deployment (Quintin 2014b). Some of these issues can be addressed through good practice, for example through careful deployment of floats and the use of the recommended streamer material. It should be noted that despite of some of the inherent risks of tori-lines to seabirds, they are a far less significant source of mortality than the warp strikes the tori-lines have shown to reduce. However, it is a further motivation for the investigation into alternative mitigation tools.

4.4. Recommendations

4.4.1. Recommendations from previous annual assessment reports

This section lists the recommendations from the last annual report with their respective status.

i) Tori-lines

When built and used correctly, tori-line efficiently reduce the number of warp cable interactions. In past years, some issues regarding materials used had come to light.

Streamers

In comparison to previous years, the majority of the vessels now appear to be using adequate material for the streamers, usually the recommended Mazzerpur. However, some uncertainty persists amongst captains as to which rubber to use. Also, for continued supply reasons Mazzerpur can only be recommended by FIFD and it is up to fishing companies to make the effort to use the best material available.

The recommended solution was for licence conditions to stipulate 3-5 specific brands of material to be used so that if one becomes unavailable other options exist. This has not been done. As has been suggested, it is possible that the FIFD could stipulate the exact product and also a list of suppliers from Spain and Uruguay. At least one of the recommended materials should be available in each of the main home ports of the fleet. The list of suppliers could be updated as further information comes to hand. Local supply of material is encouraged, but this should be of one of the recognized brands. The following materials provide a starting point:

1. MAZPROL68RO Rollo Mazzer Pur 6X8 ROJO, 10 mm (*Recommended*), available in Vigo, Montevideo and Stanley
2. K1317200314 – TUBO en P.V.C. – Uso Petroquimico – 05/16" – GYQ – Industria Uruguaya, available in Montevideo
3. Garcia y Quintana I TDA – Uso Petroquimico – 03/8" – Industria Uruguaya, available in Montevideo

Regarding streamer deployment, vessels should continue to ensure that attachment of streamers to the mainline minimises the total weight of the tori-line.

Float

The net-covered float is the most dangerous part of the tori-line to seabirds. To reduce the hazard, netting should be fitted as tightly as possible around the float. Also, if a swivel is used to link attach the float to the main line, it should be a small swivel (~3 cm length), as larger swivels can become a leg trap.

ii) Trawling trajectory

The movements of the vessel have been observed to have a significant influence on birds' interactions intensity. While challenging to enforce, the following criteria had been suggested for consideration by Captains willing to help prevent seabird by-catch.

Turns

Dedicated seabirds observation trips have highlighted a source of increased interactions between seabirds and the fishing gear during turns. Sharp U-turns require partial hauling of the warp cables (usually until the doors come in sight) and the tori-lines are retrieved completely to avoid tangles. The license requirements stipulate that no discarding should occur while fishing gear is in the water and tori-lines are not. However, the wording of this condition is not clear and leads to confusion, particularly for non-native English speakers. This should be addressed to avoid such situations. Moreover, there are wider turns where the warp does not need to be hauled partially and the tori-lines remain deployed. However, the movement of the vessel causes a substantial deviation of the warp cables and bring them outside the protection of the tori-lines. Discarding can legally continue and warp strike rates typically increase until the net aligns again behind the vessel on the new course bearings. To the author's knowledge, trawling trajectories are not being amended in favour of seabird conservation. This may in parts be due to a lack of awareness. The information in this paragraph should be distributed to the Captains by the observers. It was also recommended that discarding should be forbidden during turns, even if the tori-lines remain deployed. No amendments have been made to licence conditions in this respect. It is recommended that this be considered by the FIFD.

iii) Data collection

Mortality assessments

It was recommended that fisheries observers could monitor hauls for mortalities on non-seabird observation days in order to improve the observer effort and, in turn, to increase the accuracy of incidental by-catch estimates. Although this sometimes occurs, this has not yet become standard protocol. The observer coordinator highlights that observers do already have a full role as it is, and are asked to do a variety of tasks. Sticking to the one day in four of quality data would in his view be preferable than having additional opportunistic data as well, of which there may not be measure of

consistency. And of course observers need to collect good quality fisheries data on the three other days.

Contacts

It was recommended to include visual aids in the seabird monitoring protocol to assist with enhanced consistency in data recording amongst observers with varying experience. This has been done in the form of photographs and a PowerPoint presentation available to all observers. The dedicated seabird observer also remains available for clarifications and explanations.

4.4.2. Additional recommendations

i) Data collection and analysis

Currently, annual seabird mortalities are estimated based on number of fishing days and number of observation days. A much more precise estimate could be achieved if we had data on daily discarding periods *during trawling activities**. Whilst mortality rates are influenced by a number of factors, including also wind conditions and seabird abundance, research has consistently shown that discard is the most important factor, and that contacts and mortalities are virtually made redundant in the absence of discard (e.g. Løkkeborg 2011). It should be straight forward to ask both observers as well as vessels to provide this information along with fishing days. For the vessels, these data would not necessarily need to be provided on a trawl-by-trawl basis, but as a daily total. Daily mortality estimates would then be based on the proportion of discarding observed, and this in turn would be extrapolated to the total hours of discarding for the fleet.

For example, observation of a single haul is assigned the same amount of effort as 10 hours of contact observations. Equally, a vessel trawling for eight hours is assigned the same effort as a vessel trawling for 16 hours.

* No gear-related mortalities will occur when a vessel is discarding outwith trawling times.

ii) Cryptic mortality research (also see below FI-NPOA-T-2014 Specific objectives #2)

In order to allow a better understanding of the level of cryptic mortalities, it is recommended that appropriate research be continued. This includes data collection from the corpse catcher device as well as a repeat of the research study conducted in 2012 (See Parker 2013) to investigate the non-detection of warp mortality.

The deployment of a corpse catcher device is scheduled to be resumed in November 2015. The dedicated seabird observer is also working on scheduling a follow up research cruise with the objective of cryptic mortality research.

iii) Investigate discard management options (also see below FI-NPOA-T-2014 Specific objectives #3and #4)

The FI NPOA-T-2014 sets out a provisional time-scale for discard management trials and actions. This time scale needs to be finalised and a Gantt chart drawn up. It should be agreed on and stipulated who is involved in each milestone. Ideally, an internal meeting should be held as soon as possible to

refine this objective and to clarify where we are, what the outstanding issues are, and how we aim to advance. The individual companies should be involved and discussions held on the available options. This will allow a strategic approach to advancing discard management solutions within a set time-frame.

iv) Collaborate with other researchers working on seabird mitigation around the world (also see below FI-NPOA-T-2014 Specific objectives #9)

A problem shared is a problem halved. An active effort should be made to liaise with other researchers working on seabird mitigation around the world to exchange information and ideas. This includes enhanced collaboration with nations where Falkland Islands breeding seabirds migrate to.

The dedicated seabird observer is currently regularly liaising with a researcher from New Zealand with regards to both discard management as well as alternative physical mitigation tools. Contact should also be made and maintained with researchers from other appropriate areas such as South America, Australia, South Africa, Argentina, Chile and Uruguay.

4.5. Falkland Islands NPOA-T-2014 – Specific Objectives

To put the annual mortality estimates from this report into context, both historically as well as the future, the logical guide is the Falkland Islands NPOA-T-2014, Section 4.2, Specific Objectives (Quintin & Pompert 2014). The primary objective of the FI NPOA-T-2014 is to strive towards elimination of incidental seabird mortality due to interaction with trawlers. Seabird Interaction Management Strategies will facilitate this process. Nine specific objectives are listed. Each objective is discussed below.

1. *Maintain a suitable level of observer coverage that enables the calculation of a robust annual estimate of seabird mortality in all trawl fisheries.*

As with previous years, the mortality estimates this year are based on extrapolation of observed mortalities to the number of fishing days. The 3.3% total observer effort for the year 2014-2015 was above the average of 3.0% FIFD observer coverage, the highest having been 4.3%. Whilst the employment of a dedicated seabird observer has generally increased the observed effort in recent years (but see 2013-2014) an increasing amount of observer effort is dedicated to other aspects of the seabird observer's duties. Sufficient data has been, and continues to be, collected to illustrate that incidental seabird mortality rates are high. Given limited resources, work priority is being given to trialling, analysing and writing up of proposed novel methods to reduce incidental mortality over collecting further data to perhaps allow more precise annual seabird mortalities estimates.

2. *Further evaluate the use of a robust mortality proxy such as "heavy contacts" and their application in the estimation of seabird mortality and assessment of mitigation measures performance.*

It is clear that research into the level of 'cryptic' mortality, or non-detection rates, is a priority to understanding the relationship between heavy contacts and mortality (Brickle et al. 2011). This is because results from work investigating the relationship may be used to establish correction rates to enable statistical estimation of the actual seabird by-catch in trawls from recorded heavy contacts. In recognition of this the FIFD approved a one week research trip to investigate the relationship between heavy contacts and mortality in 2012. Results from this preliminary trip suggested 17-38% of

mortality may not be apparent to observers based only on the fishing vessel (Parker et al. 2013). Support has been given for further repeats of this work but dates have not yet been confirmed. Whilst the results were well worth the effort and expense, a greater sample size is required before correction factors can be calculated with any confidence.

3. *Experimental device attached to warps*

In 2012, an experimental device was designed in an attempt to increase the probability of killed seabirds to be retained on the warp cables until hauling (Figure 3). An unknown level of undetected, or 'cryptic' mortality, occurs which depends on the condition and locations of splices, the environmental conditions, the number of birds killed and other factors. The device has to date been used on four vessels with no particular deployment or retrieval issues. Preliminary results suggested the device provides evidence that clustered mortalities events occur more frequently than when relying on just the fishing gear (warps and trawl doors) for corpse retention. However a much greater sample of deployments is necessary to enable robust analyses of and conclusions from the results.

Unfortunately, the device was lost at sea in February 2014, which hindered further data collection with the device. However, two new devices have recently been constructed, and will be deployed for further data collection as from November 2015.

4. *Continue to investigate the development of alternative, safe, cost-effective and practical mitigation measures to reduce trawler related incidental seabird mortality.*

The options to effectively mitigate the incidental mortality of seabirds in trawl fisheries are relatively few. Seabird bycatch in trawl fisheries is driven by the foraging opportunities provided through the discard of trawl catch processing waste (visceral matter, fish heads and tails) and/or non-commercial whole fish. Reducing the attractiveness of trawlers to seabirds through discard management is a logical approach, and one that has been embraced by other fisheries globally (e.g. Wienecke & Robertson 2000, Løkkeborg 2011, ACAP 2013). A comprehensive investigation of discard management mitigation measures for the Falkland Islands fleet was conducted in collaboration between the FIFD and FC in 2005 (Munro 2005).

Whilst little concrete actions followed that theoretical study initially, there has been more progress on this front in recent months. The FIFD has officially acknowledged that waste discard management has the strongest potentials as a mitigation tool and has embraced this avenue in the current NPOA-T-2014. Furthermore, the *Santa Mariña* is the first finfish vessel in the Falkland Islands fishing fleet to have recently had a discard storage tank retrofitted in the factory. This has allowed discard management studies to be commenced by the FIFD.

Two key hurdles remain to advancing discard management within the Falkland Islands fishing fleet: compared to BSLs, discard management systems carry a much higher cost and may have some engineering problems on some ships. As such, FIFD aims to provide the industry with compelling evidence that the systems really do work. This includes evidence from both our own studies, as well as evidence from other deep trawl fisheries (e.g. New Zealand). Consistent findings by various appropriate studies further afield in support of discard management, as well as the widely accepted fact that the absence of discard results in the absence of seabird interactions, already exists. As concerns the cost, it is recommended that the FIFD and the industry work closely together to find the

most practical and cost-effective solution. If the department and the industry are serious about seabird mitigation, then appropriate effort and financial investment will be necessary.

With regards to discard management, there are three options:

1. Stop discarding
2. Move the discards away from the warp-water interface zone
3. Discard in batches
4. Render the discard unattractive to seabirds (although this has had mixed results (see Abraham et al. 2009; Pierre et al. 2012a))

Besides discard management, alternative (short-term) options continue to be investigated. Scaring birds away from entering areas they can get killed in is still the cheapest method. As standard tori-lines can be problematic to fishers and have reduced effectiveness in a range of conditions, a very simplistic prototype of an aerially mounted tori-line was trialled in July 2012 on the stern trawler *Argos Vigo* (Figure 4).

Figure 4 Aerially mounted bird scaring lines.

These tori-lines are designed to form a protective curtain around the warp cables which do not deviate in cross-winds. The trial was limited by the materials on board the vessel but nevertheless provided encouraging results in excluding birds from the warp area. Since this initial trial, Argos Ltd. contracted an engineering company and constructed a refined prototype, mounted the prototype on the *Argos Vigo*. Trials were conducted aboard the *Argos Vigo* during a finfish period in early 2013 with mixed results (Parker 2013). Trials were repeated again in early 2014 on High Seas (targeting finfish; Quintin 2014a) with the addition of streamers on the paravane arms. The results were encouraging, as no heavy contacts occurred during the 21 day trial period. A third period of monitoring occurred on the Robin M Lee in August 2015 operating in the Falkland calamari fishery (see report 1068). This vessel had also been fitted with the same system as on the AV, and also showed no seabird contacts. Further data should be collected as to ensure the device operates well in various weather and discarding conditions. In addition, although results to date have been encouraging, it is important to consider that seabirds may become habituated to the presence of the streamers, which would render the physical scares increasingly less effective as time goes on. Furthermore, the structure required to

hold the tori-lines above the warp is of substantial weight and length (12 m) and therefore unpractical for smaller vessels.

5. *Further investigation and trial of discard management measures appropriate for the existing and upcoming fleet.*

Managing discards is the obvious solution to dramatically reduce incidental seabird mortality and the installation of a storage tank on the *Santa Mariña* stern trawler has been a highly encouraging feat and has allowed the FIFD to conduct batch discard trials. Although the tank unfortunately does not also store processing waste of guts, the results are promising and in agreement with batch discard studies conducted in New Zealand (Pierre et al. 2010, 2012b). A tendering process is in development to fund a similar initiative by another vessel.

Solutions will be vessel-specific and as such, close collaboration between the FIFD and the industry is essential to identify the most practical and cost-effective option. Six options were introduced and discussed in the 2010-2011 annual report (Parker 2012a). These are listed below but as all the options are still relevant, refer to Parker (2012a) for the detail of each option.

1) Reduce discard volume by improving fishing gear selectivity
2) Stop discarding and fishmeal all waste
3) Only discard when no fishing gear in the water
4) Move the discard away from the warp-water interface area
5) Discharge waste in batches as opposed to continuously
6) Require newly built fishing vessels to have fish-meal or discard storage capabilities

6. *Evaluate and adopt a process whereby realistic annual indicative by-catch targets are set, based on robust mortality indices and thereafter achieve an annual reduction in trawler related mortalities to meet these targets.*

As discussed in Section 2 of the discussion, two promising threads of research will perhaps contribute to improved mortality estimates and allow targets to be set. Fundamentally, high numbers of seabird mortalities continue with tori-lines in use despite many efforts to refine the tori-line design. For this reason new methods of mitigation must be investigated and invested in to reduce seabird by-catch to a negligible level.

7. *Recognizing the experience and knowledge of fishermen, encourage their involvement in the modification and development of mitigation measures including discard management implementation.*

The dedicated seabird observer places a high priority on liaising with fishermen whilst onboard their vessels. Discussions are aimed at helping to find solutions to problems the crew may have with the mitigation used, discussing why albatrosses and petrels are vulnerable to population declines due to incidental mortality from fisheries, and discussing possible alternative mitigation techniques.

In the past year, three vessels (Argos Vigo, Pesca Vaqueiro, and Robin M Lee) have participated in trials of alternative tori-lines designs, have welcomed observers on board even as they moved to High Seas, and have gone as far as helping observers construct prototypes for further trials. In addition, the Santa Mariña has been very helpful with discard management trials and played a critical role in study implementation.

A bi-annual meeting of the Seabird By-catch Committee has been held on two occasions to date. This is an opportunity to report to industry on progress and issues. The Falkland Islands Fishing Companies Association sends one representative. More comprehensive communication and dissemination back to the fishermen working at sea would likely be gained from having broader FIFCA and fishing industry attendance.

8. *Continue international awareness of mitigation of trawling related mortality in the fishing industry and community at large.*

The research work discussed in Objective #2 is recognised as a priority by the ACAP Seabird By-catch Working Group (SBWG). The preliminary results of the work have been presented at the ACAP SBWG conference in May, 2013. Repetition of this research is discussed and is planned for 2016.

9. *Ensure the dissemination of information and training opportunities for fishers and other stakeholders to work towards practical implementation of the FI NPOA-S-T-2014 and the further development of a seabird conservation culture in fishing companies operating in the Falkland Islands.*

Educational efforts continue to increase fishermen's understanding of why albatross and petrel populations cannot sustain high levels of anthropogenic mortality. Many of the issues discussed above indicate education will not be enough on its own, however. Previous research into fisheries by-catch management has shown that without incentive compliance can be poor (Cox et al. 2007).

10. *Aim to establish collaborative projects between the Falkland Islands and nations where Falkland Island breeding seabirds migrate to, and/or encourage these nations to investigate the scale of seabird mortality caused by their factory trawler fleets. The absence of a Regional Fisheries Management Organization (RFMO) for the Southwest Atlantic hinders furthering strategies that maintain or improve the status of regional seabird populations.*

The lack of any mitigation on the High Seas (primarily at latitudes 42-46^{o}S) is the most apparent international concern for Falkland Island seabirds. A recent European Union (EU) seabird by-catch Plan of Action for EU vessels operating in EU and non-EU waters perhaps provides some hope for the use of mitigation by vessels on the high seas North of the Falklands. Whilst it focuses mainly on long-line fisheries, other gears such as trawls and purse seines are also covered by the plan. Currently, all Falkland flagged vessels are under obligation of using their tori-lines in International waters as well. The other vessels fishing in Falkland Island waters are encouraged to do so when they leave the FCZ. An automated discard management system would ensure seabird mitigation both within as well as outside the FCZ.

In addition, collaborative relationship and exchange of information should be established and maintained with appropriate bodies of nations where Falkland Island breeding seabirds migrate to, including Argentina, Chile, Brazil and Uruguay.

5. CONCLUSION

The Falkland Islands has been recognised as a leader in responsible fishing and its efforts to mitigate incidental seabird mortality. Due to the challenges involved in designing, implementing and monitoring devices used to mitigate incidental mortality in the Falkland Islands trawl fishery it is important to think of the work achieved to date as a continuum of research (Kennelly & Broadhurst 2002). A great deal has been achieved; most significantly, the enforcement of tori-lines, their correct deployment and use of adequate material has shown annual improvements and acceptance amongst the fleet, which in turn has helped to reduce incidental mortalities of seabirds in Falkland waters. However, incidental mortalities of high-risk and protected species continue to be of a conservation concern (over a thousand this year). Research into further tori-line refinement will continue, but this alone will not be sufficient to reduce seabird by-catch to a negligible level as set out in the FI-NPOA-2014. A serious commitment and strategic approach to practical, safe and cost-effective discard management should be a priority if the department is to maintain its reputation as a leader in responsible fishing and seabird by-catch mitigation.

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