

 <p>Agreement on the Conservation of Albatrosses and Petrels</p>	<p style="text-align: center;"><b>Joint Twelfth Meeting of the Seabird Bycatch Working Group and Eighth Meeting of the Population and Conservation Status Working Group</b></p> <p style="text-align: right;"><i>Lima, Peru, 8 August 2024</i></p> <p style="text-align: center;"><b>What goes thump at night: managing bird- strike in South Georgia and the South Sandwich Islands</b></p> <p style="text-align: center;"><b><i>Megan Tierney, Matt Parsons, Hannah Wheatley, Elinor Grant, Susan Gregory, Jennifer Black, Mark Belchier, Amanda Lynnes, Peter Thomson</i></b></p>
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### SUMMARY

South Georgia and the South Sandwich Islands (SGSSI), has a rich environment which sustains globally important populations of seabirds. Despite conservation efforts, some of these populations are showing continuous, declining trends. Population declines may be attributed to a range of factors from both within and outside SGSSI national boundaries, including bird-strike: *the collision of birds in flight with vessels resulting in physical injury or death.*

Basic bird-strike reporting protocols for SGSSI do exist, but data collection is not standardised, making robust analysis challenging. Consequently, factors leading to bird-strike events and the magnitude of the problem in SGSSI waters are poorly understood. To address this issue, a project was conceived which aimed to develop bird-strike reporting systems for use by all vessels (research, patrol, fishing, tourism) operating in the SGSSI Maritime Zone, with the overall aim to ensure practical, standardised data collection and robust analysis to inform management practices. In parallel, handling and care guidelines were to be revised to improve the survival of landed birds. By reviewing factors that lead to bird-strikes, plus existing mitigation techniques to reduce strike rates, the project also aimed to provide a foundation for further research, which will enable GSGSSI and its partners to implement best-practice. This paper summarises the steps taken to produce the following outputs:

Noting Article XIII(1)(c) of the Agreement on the Conservation of Albatrosses and Petrels, the references included in the present document are made exclusively for academic/scientific purposes and have no implications whatsoever for recognition of territorial sovereignty or the legal status of a state, territory, area, or their authorities, where relevant.

'This paper is presented for consideration by ACAP and may contain unpublished data, analyses, and/or conclusions subject to change. Data in this paper shall not be cited or used for purposes other than the work of the ACAP Secretariat, ACAP Meeting of the Parties, ACAP Advisory Committee or their subsidiary Working Groups without the permission of the original data holders.'

1. Bird-strike reporting forms which: i) contain data fields necessary to enable robust analysis of bird-strike events; and ii) are in format to ensure they are practical for use in real-world situations.
2. Confirmation that data returned in the new reporting forms are compatible with the existing GSGSSI data management system.
3. Bird-handling guidelines which show clear step-by-step instructions for how to handle, care-for and release seabirds which may strike a vessel. Instructions show techniques for seabirds of different size categories, equipment required and health and safety considerations. As well as English, the bird-handling guidelines have been translated into the following languages: Chinese, Spanish, German, French, Korean and Tagalog.

The reporting forms can be easily adapted for use in other regions, and the bird-handling guidelines are also widely applicable to most seabirds.

## 1. INTRODUCTION

The UK Overseas Territory (UKOT) of South Georgia and the South Sandwich Islands (SGSSI), and which lies in the remote and wild South Atlantic Ocean, has a rich environment which sustains globally important populations of seabirds. Despite conservation efforts, some of these populations are showing continuous, declining trends.

Population declines may be attributed to a range of factors from both within and outside SGSSI national boundaries, including bird-strike: *the collision of birds in flight with vessels resulting in physical injury or death*. For example, published reports document 900 birds striking a vessel in a single night (Black, 2005). Reports (e.g. Gregory, 2021) also detail that over 25 different species of birds have struck vessels, including petrels (large and small), prions, shearwaters and albatrosses. It is thought that vessel lighting attracts birds towards a ship and poor visibility conditions, e.g. fog or snow, can exacerbate incidents of bird-strike. Given the relatively substantial volume and wide variety of vessel traffic within SGSSI waters, bird-strike could act as an additional pressure on already vulnerable seabird populations.

Basic bird-strike reporting protocols for SGSSI do exist, but data collection is not standardised, making robust analysis challenging. Consequently, factors leading to bird-strike events and the magnitude of the problem in SGSSI waters are poorly understood.

The Government of South Georgia & South Sandwich Islands (GSGSSI) is committed to protecting its globally important seabird populations, as evidenced through their MPA Management Plan, Biodiversity Action Plan, Wildlife and Protected Area Ordinance, and signatory status to international conventions, including the Agreement on the Conservation of Albatrosses and Petrels (ACAP). GSGSSI and its operational partners are also committed to working together to ensure measures are based on robust evidence, and are practical and fit-for-purpose.

Through a partnership between the Joint Nature Conservation Committee ([JNCC](#)), [GSGSSI](#), the International Association of Antarctica Tour Operators ([IAATO](#)), and the fishing company Argos Froyanes Limited ([AFL](#)), a Darwin Plus funded project (DPLUS143) was conceived which aimed to develop bird-strike reporting systems for use by all vessels (research, patrol, fishing, tourism) operating in the SGSSI Maritime Zone (MZ), with the overall aim to ensure

practical, standardised data collection and robust analysis to inform management practices. In parallel, handling and care guidelines were to be revised to improve the survival of landed birds. By undertaking a review of factors that lead to bird-strikes, plus existing mitigation techniques to reduce strike rates, the project also aimed to provide a foundation for further research, which will enable GSGSSI and its partners to implement best-practice, and share these techniques across other UKOTs and/or international regulators.

The project was delivered through the following four integrated Work Packages:

1. **Work Package 1 (WP1): Literature review** – this entailed a critical review and assessment of bird-strike incidence and mitigation measures, not only from SGSSI but also other regions. This: i) aided development of reporting forms (Work Package 2) and bird-handling guidelines (Work Package 4); ii) helped to identify potential factors leading to bird-strikes that could be considered in future analyses of magnitude and cause; and iii) provided an indication of the effectiveness of existing mitigation techniques and which could then be used to aid future development and trials of mitigation measures in SGSSI.
2. **Work Package 2 (WP2): Development of bird-strike reporting forms** – building upon pre-existing forms, standardised reporting forms were developed in consultation with stakeholders that captured information required to assess the magnitude and causes of bird-strike across the fleets that operate in SGSSI waters (patrol, research, fishing, tourism). Forms were tested for practicality and capability via field-trials aboard the breadth of vessels operating in the SGSSI MZ.
3. **Work Package 3 (WP3): Data Management System** – a standardised data management system for collating and storing information from bird-strike reporting forms was to be identified or developed. It needed to be compatible with the system currently used by GSGSSI.
4. **Work Package 4 (WP4): Development of bird-handling guidelines** – straightforward instructions for non-bird specialists on handling and caring for birds found on vessels were developed through review and adaptation of existing guidelines, utilising technical expertise from within the project team and other key stakeholders. Guidelines were tested for a variety of aspects including clarity of understanding and use, and whether they capture sufficient examples of expected situations/conditions in which birds could be found. Testing was undertaken via field trials as in Work Package 2. Final guidelines were to be translated into six of the common languages used by crew/staff on vessels operating in the SGSSI MZ.

The DPLUS143 project addresses priority actions in the GSGSSI ACAP Implementation Plan and the SGSSI Marine Protected Area (MPA) Research and Monitoring Plan; and now provides GSGSSI and its partners the capability to collect standardised data on bird-strike. This will now also provide the opportunity, in time, for this information to be fed into wider studies of seabird population changes, assess effectiveness of mitigation techniques, and enhance conservation management decisions.

This report details the approach taken to develop new bird-strike reporting forms and bird-handling guidelines for use by vessels operating in the SGSSI MZ, and showcases the final products which could be adapted for use by other regulatory bodies.

## **2. APPROACH**

The following activities were taken to develop the bird-strike reporting forms and bird-handling guidelines:

### **2.1. Literature review and SWOT analysis**

First, a review of the current evidence on the incidence and causes of bird-strike, together with a review of mitigation methods that can be used to reduce risk to seabirds was undertaken. The literature review was carried out by performing searches of relevant terms in Google Scholar. Related existing guidelines were accessed via the websites of institutions. Based on the evidence gathered in the literature review, a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was carried out to critically assess the effectiveness of bird-strike mitigation measures.

### **2.2. Stakeholder Workshop**

Existing bird-strike reporting forms which are used by vessels in the SGSSI MZ, and existing bird-handling and identification guidelines were collated. These formed the basis for discussions with stakeholders around format, usability and/or enhancement of the reporting forms and handling guidelines to be developed by this project at an online workshop held in May 2022. A total of 26 participants, which included representatives with expertise or experience in seabird ecology, seabird/fisheries observers and operators, ships' crew and expedition leaders, attended the workshop.

### **2.3. Development of beta versions of bird-strike reporting form and bird-handling guidelines**

Feedback and outcomes from the workshop were used to develop a 'Beta-version' of the bird-strike reporting form and bird-handling guidelines, with the format and content of both being agreed by the project team. Note, a graphic designer ([Mindfully Wired Communications](#)) were contracted to design the bird-handling guidelines and worked with JNCC (as Project lead) to develop the Beta-version of the guidelines.

### **2.4. Testing the beta-versions of the bird-strike reporting form and bird-handling guidelines**

The beta-version of the reporting form and bird-handling guidelines were trialled by expedition staff and/or crew on 16 vessels to further inform their development and ensure they were fit-for-purpose and use across the range of vessels that operate in the SGSSI MZ. Full details of the trials are reported in Wheatly et al. (2023). In total, eight toothfish and krill fishing vessels operating in South Georgia waters were invited to take part in the field-trials for the period covering the last two months of the austral winter fishing season (August – September 2022). Six tourist operators who are members of IAATO also signed up to partake in field-trials over the austral summer tourist season (October 2022 – March 2023). Other vessels invited to participate included the British Antarctic Survey's Royal Research Ship *Sir David Attenborough* and the GSGSSI fisheries patrol vessel *Pharos SG*.

All trial participants were sent a copy of the beta reporting form and the beta bird-handling guidelines, a cover note explaining the background of the project and how to undertake the trials, and a questionnaire through which to provide feedback. The feedback questionnaire was sent as an Excel spreadsheet and a link was also provided to a version in a web-based Google

form. Trial participants were asked to trial the beta versions of the reporting form and bird-handling guidelines and to provide feedback and recommendations for improvement (including ease of data entry) via the questionnaires. In the event that there were no incidents of bird-strike, participants were requested to trial the form using dummy data.

Note, an outbreak of the H5N1 strain of Highly Pathogenic Avian Influenza (HPAI) in 2020-21, initially in the Northern Hemisphere, the south of Africa and around the Atlantic and Pacific Oceans, had caused high mortality in wild seabird and marine mammal populations in those regions. It was anticipated that this outbreak could spread to Southern Ocean seabird/marine mammal populations in the 2022-23 and/or in the 2023-24 austral summers. In readiness for this, and as this strain of 'bird-flu' can be passed to humans, and where there is only a 50% chance of survival if it is contracted, GSGSSI developed a set of guidance on HPAI risk and response in the Territory. The guidance described what enhanced biosecurity procedures would be put in place, signs to be vigilant for, how to report these to the GSGSSI and what action the government would take on receiving that report – see full details in the [GSGSSI Biosecurity Handbook](#). The guidelines cover actions/response to a bird-strike event. As it may not be possible to determine if a bird has signs of HPAI or not, the version of the guidelines available at the time this project was being conducted, stated that a precautionary approach should be adopted, including releasing live birds as soon as practical in order to minimise time personnel are in contact/exposed – as opposed to more standard practice of potentially housing a bird for a period of time to allow recovery and then release at a time when there would be minimal risk of predation. Given these revised protocols, in the event of a bird-strike event occurring on vessels during the 2022-23 season, when the in-depth 'hands-on' trials of the bird-handling guidelines were planned to be conducted, it was not going to be possible/permissible for people to handle birds. Although HPAI was not detected in SGSSI in 2022-23, participants in the trial, were therefore only able to review and comment on the guidelines without necessarily putting proposed procedures into practice.

## **2.5. Data management considerations**

Prior to this project commencing, GSGSSI utilised the [UK Polar Data Centre](#) to curate and manage their environmental data, including that which had been returned on bird-strikes on the pre-existing forms. During the early stages of the project, discussions were held with the Head of the UK Polar Data Centre to identify aspects which needed to be considered in the design of the new reporting form to ensure conformity with the capabilities of the Data Centre to continue to receive and curate bird-strike data. An informative 2-way session on data flow was also included at the stakeholder workshop to enhance understanding of: i) end-users as to how bird-strike data is curated and managed; and ii) data managers as to how end-users may wish to access/use data in the future. Testing of the existing data management system used by GSGSSI to store and manage bird-strike data (i.e. the UK Polar Data Centre) was undertaken with both dummy and real data returned from the trials of the bird-strike reporting forms.

## **2.6. Finalising the bird-strike reporting forms and bird-handling guidelines**

Feedback in the 10 responses received from trial participants was used to prepare a final version of the reporting form and bird-handling guidelines.

### ***2.6.1. Bird-strike reporting and data management***

A number of changes were made to the bird-strike reporting form, addressing major points raised by trial participants. Additional categories to describe 'vessel activity' were added, as were 'weather condition' descriptors, and some corrections were made to cell formatting and field codes. Concerns were raised about the length of the form and difficulty of gathering some of the necessary information. However, based on the earlier consultation with stakeholders and the literature review, it was felt that all of the information asked for in the form was necessary to get a robust understanding of and to enable mitigation of bird-strike, and so a decision was taken to not reduce the length or number of questions. However, efforts were made to streamline completion of the form by adding additional 'drop-down' boxes and making some questions optional. Furthermore, an additional guidance document will be produced to help improve communication of the value of the requested information.

Upon return of the beta version of the reporting forms from trial participants, the Head of the UK Polar Data Centre trialled inputting some of the data and confirmed that there were no issues with uploading and storing the data submitted in the new forms and so considered them compatible with the existing system.

### ***2.6.2. Bird-handling guidelines***

The main comments from trial participants on the bird-handling guidelines were focused on clarifying or simplifying some of the text so that the instructions/guidance was clear, making sure some of the 'health and safety' features were more evident in the images, suggestions on the colour palette used, and adding contact details if anyone had further questions. All feedback on the actual steps included in the guidance and the layout of the graphics was positive, with no suggestions put forward for any major changes, apart from some minor repositioning of text boxes and images. The project team worked with the graphic designers to implement these changes on the bird-handling guidelines.

## **3. OUTPUTS AND PRODUCTS**

### **3.1. Literature review and SWOT analysis**

The literature review and SWOT analysis (Wheatley et al., 2023) revealed that although bird-strike events appear to be relatively frequent and widespread, there is little quantified information available on their rates of occurrence or impacts. Information that was available on the numbers, species and factors which likely lead to bird-strike, together with results of the analysis of mitigation measures, are detailed in full in the literature review. However, in brief, from the literature it appears that most bird-strike events involve small numbers of birds, but infrequently hundreds of birds may be involved in a single incident. However, it is noted that bird-strike is likely to be under-reported. The majority of birds survive strike incidents so that they can be released (though it is not known how many subsequently survive), with usually small minorities being killed. Species affected are most commonly small, burrow-nesting petrels, including diving-petrels, shearwaters, prions and storm-petrels, as well as some albatrosses, auks and seaducks. Recorded numbers of mortalities represent very small fractions of populations but may have significant population-level impacts on these slow-breeding species.

The main factor likely to increase the risk of bird-strike is vessel lighting, since many seabirds are attracted to artificial light. The colour of light, and more specifically its wavelength spectrum, as well as its intensity may also play a role, however these relationships are not yet fully understood. Given the importance of vessel lighting for bird-strike risk, mitigation measures

that address external vessel lighting are of key importance. Large bird-strike events are more likely to occur during nights when visibility is poor due to overcast skies, fog or light rain, and seem to be more prevalent when there is little wind. They are also more likely to occur close to land and particularly in the vicinity of major burrow-nesting petrel breeding colonies during periods of peak breeding activity and when chicks fledge. Therefore, targeting mitigation measures to the places and/or times with the highest risk of bird-strike may also be effective in reducing the risk of bird-strike whilst avoiding the need to apply mitigation measures in other places or at other times.

The review undertaken as part of the DPLUS143 project has highlighted the requirement for greater quantification of bird-strike to enable an informed assessment of the associated conservation implications. It helped to clarify the parameters that might be important to record to improve understanding of bird-strike frequency, and potential mitigation measures that would benefit from further research. The key data parameters identified have been incorporated into the design of the new reporting forms. As such, it is hoped that, in time, a body of evidence will accrue that can ultimately help to understand whether bird-strike poses a threat to seabirds, and if so, how it can most effectively be addressed.

### **3.2. Bird-strike reporting form**

A screen shot of the final version of the SGSSI Bird-strike Reporting Form is shown in Figure 1. It can be accessed for viewing in full via the embedded link, or requested from GSGSSI. The form consists of two parts on separate worksheets for recording information about a bird-strike event and about the birds affected, respectively.

- Part A includes four sections gathering information about the person filling in the form (Section 1), the vessel (Section 2), the date, time and location of the bird-strike event (Section 3), and the weather conditions and moon phase when it occurred (Section 4).
- Part B gathers information about the numbers of birds involved in the bird-strike event, including species, age, survival and whether any were fitted with a tracking device or ring.

This form has now been added to operational updates given by GSGSSI to all vessels operating in the SGSSI MZ. From here, the forms will be used to gather information on the causes of bird-strike, which will help to understand whether it poses a threat to SGSSI seabird populations, as well as to inform further development of mitigation measures. The UK Polar Data Centre will continue to be the repository for SGSSI bird-strike data.



South Georgia & the South Sandwich Islands Bird-strike Reporting Form		
Seabirds may be attracted or disorientated by a ship's lights, and may land on or collide with the vessel during the course of the night or during poor weather conditions - known as a 'bird-strike'. Vessels operating in the waters of South Georgia are requested to use this form to record information about any bird-strike events. This will help GSGSSI to better understand whether bird-strikes have an impact on seabird populations and how we can minimise their occurrence.		
A bird-strike report must be completed and submitted as soon as possible after any event where one or more seabirds land on or collide with the vessel. Please complete and submit a new report for each bird-strike event that occurs. Individual vessels should identify the most appropriate person to complete the form.		
Please email each completed form to: go@gov.gs and copy in admin@gov.gs		
Completed forms will be submitted by GSGSSI to the UK Polar Data Centre for onward data management.		
<b>FIELDS MARKED WITH AN ASTERISK (*) ARE REQUIRED (all others are optional)</b>		
Please make sure you complete both worksheets: Part A - Strike Details and Part B - Bird Details.		
Part A: Details of the strike		
Please use this worksheet to record details of the vessel, location and the conditions when the strike occurred.		
Section 1: About you		
1. Your name*	Enter full name of person filling in the form	
2. Your job title/duties	Enter your job title/duties	
3. Your email address	Enter your email address (if you give permission for someone to contact you about bird-strike)	
Section 2: About the vessel		
4. Vessel name*	Enter the name of the vessel	
5. Vessel call sign*	Enter the call sign of the vessel	
6. Vessel activity*	Select the relevant option in relation to the activity of the vessel when the strike occurred (or is thought to have occurred). Activities apply to all vessel types. (DROPDOWN)	
7. What external lights were switched on when the strike happened? (Compulsory navigation lights do not need to be recorded)*	Deck lights*	(DROPDOWN)
	Ice lights*	(DROPDOWN)
	Other (please specify)	Please enter any other external lights that were switched on when the strike occurred (if none, leave blank)
<b>IF NO EXTERNAL LIGHTS WERE SWITCHED ON, PLEASE SKIP STRAIGHT TO QUESTION 10.</b>		
8. What types of external lighting were switched on when the strike happened?	LED	(DROPDOWN)
	Fluorescent lights	(DROPDOWN)
	Mercury flood lights	(DROPDOWN)
	Halogen bulbs	(DROPDOWN)
	Incandescent lamps	(DROPDOWN)
9. If not all white, what colour external lights were switched on? (Compulsory navigation lights do not need to be recorded)	Other (please specify)	
	Amber/yellow	(DROPDOWN)
	Red	(DROPDOWN)
	Green	(DROPDOWN)
	Blue	(DROPDOWN)

Part B: Details of birds involved in the strike				Vessel call sign	Date of strike				
Please use this sheet to record details of the birds affected in the strike event. Use one row per species.									
Species*	Total number of individuals*	Number of juveniles	Where on the vessel were they found?*	Number released*	Number dead/unlikely to survive*	Does any bird carry a tracking device or ring?*	Were any photos taken?*	Any further comments	
Select the name of the species (DROPDOWN)	Enter the total number of birds that landed on or collided with the vessel	Enter the number of those birds that were juveniles (if possible to identify)	Describe where on the vessel the birds were found.	Enter the number of birds that were released after they landed on the vessel	Enter the number of birds that died or are expected to die.	Please note if a bird carried a tracking device (e.g. satellite/GPS device) or leg ring. If possible, PLEASE RETAIN THE RING/DEVICE from any dead birds and hand to GSGSSI. Please enter details in comments column. (DROPDOWN)	Please indicate whether any photos were taken of this species, e.g. to confirm identification or to record the condition of a bird, or any ring or tracking device. If so, and if possible, please attach the photo(s) when you email this report. (DROPDOWN)	e.g. Injuries, oiled birds, condition of birds, fate of released birds (if known). If a bird had a tracking device or ring, please provide details here - e.g. device type (if known) or ring number. If applicable, please also give details of any care provided to the bird prior to release (or death) - e.g. placed in ventilated box stored in protected area on deck until bird was dry, released from back deck at dawn.	
EXAMPLE	Common diving-petrel	17	8	On the foredeck	14	3	No	No	One juvenile with broken wing.
1									
2									
3									

Figure 1. Screen shot of Part A (top image) and Part B (bottom image) of the new GSGSSI Bird-strike Reporting Form.

Click on the following embedded link for full access to the bird-strike reporting form:



SGSSI-BirdstrikeReporting\_FINAL\_150921



### **3.3. Bird-handling guidelines**

A screen shot of the final version of the SGSSI bird-handling guidelines are shown in Figure 2. They can be accessed for viewing in full via the embedded link, or requested from GSGSSI. The beta version of the bird-handling guidelines consists of a two-sided sheet with images and texts about how to safely handle, care-for and release birds which might be found on deck after a bird-strike event.

- The first side has a decision tree with steps for the handler to follow, depending on how 'alert' or injured the bird may be.
- The second side contains information on the type of equipment that will be needed to handle and care for birds, who should do the handling, and the actual method for handling the birds – different guidance is given for birds in different size categories. There is also an 'Additional Information' section which covers other elements to consider, such as how to approach a bird, health and safety for the bird and handler, when to monitor and how to respond to bird-strike events, and reporting responsibilities. A note is also included, stating the guidelines are only intended for use outside outbreaks of HPAI – otherwise specific guidance from GSGSSI on handling birds should be followed.

To maximise the applicability and utility of the bird-handling guidelines, they have also been translated from English into six of the common languages spoken onboard vessels operating in the SGSSI MZ: (Simplified) Chinese, (Spain) Spanish, German, (France) French, Korean and Tagalog. These can also be accessed for viewing from GSGSSI.

Circulation of the guidelines has been temporarily put on hold due to the outbreak of the H5N1 strain of Highly Pathogenic Avian Flu (HPAI) in South Georgia (confirmed in October 2023) which has necessitated specific biosecurity protocols to be put in place by the GSGSSI with respect to the handling of birds. Once a decision has been made on how HPAI will be managed within the Territory, it is hoped these guidelines can be circulated to vessels for their crews to use, and thereby enhance the chances of survival of any landed birds.

Figure 2. Screen shot of the new GSGSSI Bird-handling Guidelines.

Click on the following embedded link for full access to the bird-handling guidelines:



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#### 4. CONCLUSIONS AND NEXT STEPS

Whilst there were existing forms for reporting bird-strike in SGSSI and some bird-handling guidelines prior to this project commencing, it was recognised that these tools could be enhanced to improve long-term monitoring and assessment of the impact of bird-strike on SGSSI seabird populations, and increase the likelihood of survival of landed birds. The project utilised the expertise of the project team and engaged with stakeholders who included a range of practitioners and end-users of bird-strike reporting forms and bird-handling guidelines (i.e. seabird ecologists, seabird/fisheries observers and operators, ships' crew, expedition leaders and data managers) to both help design and test the new reporting forms and guidelines. This has resulted in the following:

1. Development of bird-strike reporting forms which: i) contain data fields which are considered necessary to enable robust analysis of bird-strike events; and ii) are in format to ensure they are practical for use in real-world situations. In tandem with established data management systems (see b, below), GSGSSI now have the tools to monitor and assess bird-strike events which occur on vessels operating in the SGSSI MZ.
2. Confirmation that data returned in the new reporting forms are compatible with the existing data management system for: i) submission and collation of data; ii) access

for onward analysis; and iii) archiving, while at the same time retaining features which made them as easy and practical for people reporting bird-strike to complete (a feedback point emphasised by end-users).

3. Development of bird-handling guidelines which show clear step-by-step instructions for how to handle, care-for and release seabirds which may strike and land on a vessel. Instructions show handling and care techniques for seabirds of different size categories, equipment required and health and safety considerations (for both the human handler and the bird). These guidelines (once circulated) should now help to enhance the chances of survival for any birds which strike vessels in the SGSSI MZ. As well as English, the bird-handling guidelines have been translated into the following six languages: (Simplified) Chinese, (Spain) Spanish, German, (France) French, Korean and Tagalog.

Overall, the new reporting forms should now result in the collection of robust data that can be used to monitor and assess factors leading to bird-strike events and the magnitude of the problem in the SGSSI MZ. If, in time, it is revealed that bird-strike is a substantial problem, data could also be used to help design and test mitigation measures, and adapt conservation management plans accordingly. In the interim, it is felt that a number of other actions could be taken, to enhance awareness of bird-strike issues and the importance of reporting, as well as how to further build capacity of expedition team/crews to safely handle birds. In regards to the former, ideas which may be explored include providing incentives to vessels who do report, and highlight, through some simple messaging to crews, the impact different pressures (including bird-strike) can have on vulnerable seabird populations. In regard to the latter, ideas include developing some training materials (e.g. videos) or in-person courses which can be run for expedition staff/crew to demonstrate the bird-handling techniques depicted in the guidelines.

## 5. REFERENCES

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