BAS Wildlife Interaction Manual

Edited by the Environment Office

Edition	Version	Date	Reason for amendment	Status/Approved by
1	1.3	07/12/23	Addition of a new chapter on HPAI. Addition of SOP for bird strikes on ships (Appendix 1). Instruction to seek advice from BAS Avian Influenza Response Team, as relevant (Chpt. 7)	Kevin A. Hughes

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Contents

1. Introduction to the BAS Wildlife Manual

The British Antarctic Survey undertakes scientific and logistical activities across a large geographic area in the Antarctic region, and increasingly in other parts of the world. Inevitably, BAS personnel on the ships, stations and in the field interact with wildlife when undertaking scientific, logistical and recreational activities. In this Manual, wildlife is considered to include vertebrate species such as whales, seals and birds.

The aim of the BAS Wildlife Manual is to provide:

- information on the legislation relating to wildlife interactions in Antarctica and South Georgia and the South Sandwich Islands;
- guidelines on how to interact with wildlife when operating in the Antarctic region; and
- details of the additional processes required for scientific research on wildlife.

The BAS Wildlife Interaction Manual is managed by the BAS Environment Office, but includes information developed by departments across the organisation. The Manual will be reviewed and updated at regular intervals, so please ensure you refer to the most recent version (available on the BAS Environment Office webpage: https://www.bas.ac.uk/for-staff/polar-predeployment-prep/intro-guidelines-and-forms/preliminary-environmental-assessment/).

Chapter 2 sets out basic information that must be followed by everyone traveling to Antarctica, South Georgia and the South Sandwich Islands. Chapter 3 provides information on Highly Pathogenic Avian Influenza (HPAI). Chapter 4 describes the overarching BAS/NERC approach to animal welfare and provides details of the requirement for project ethical review and approval by the BAS Animal Welfare and Ethical Review Body (AWERB). Chapter 5 is the BAS bird welfare policy and describes the acceptable circumstances and methods for the human killing of injured birds. Chapter 6 describes the BAS response to situations where humane killing of a mammal might be considered appropriate. Chapter 7 sets outs prevention and response regulations should a bird strike occur. Chapter 8 sets out procedures that should be considered when planning the use of Remotely Piloted Aircraft Systems (RPAS) over concentrations of wildlife. Chapter 9 provides practical guidance should it be necessary for scientific or operational reasons to move wildlife on station. The Appendices provided in Chapter 10 include legal documents and guidelines produced by scientific and/or policy bodies concerning interaction with wildlife within the Antarctic Treaty area and/or South Georgia and the South Sandwich Islands.

Table 1. Relevance of each chapter to different areas of BAS science and operations.

Chapter No.	BAS operations and science areas				
	Antarctic stations and field activities	South Georgia stations and field activities	Air operations	Ship operations	Science
1	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓		✓	✓
6	✓	✓		✓	✓
7	✓	✓	✓	✓	✓
8	✓	✓		✓	✓
9	✓	✓			✓
10	✓	✓	✓	✓	✓

For further information, please contact: animalwelfare@bas.ac.uk

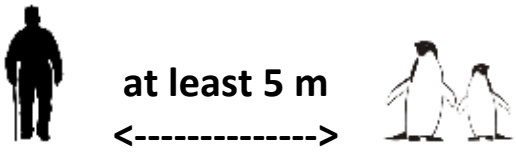
2. Antarctic wildlife – basic information you need to follow

(NB: closer interaction with wildlife may be possible if appropriately assessed and permitted)

1 The taking of, or harmful interference with, Antarctic wildlife is prohibited. Do not collect anything of biological/geological origin unless you are permitted to do so.

2 When in the vicinity of wildlife, move slowly and keep noise to a minimum.

3 Maintain an appropriate distance from wildlife to avoid disturbance. While in many cases a greater distance may be necessary, in general keep at least 5 metres from wildlife on land.



4 Always give animals the right of way. Do not block their access routes between the sea and land, nesting places or other destinations.

5 Animals may alter their behaviour if disturbed. If wildlife changes its behaviour (standing when it was sitting, moving its head around alerted, start vocalizing when it was silent, etc.) then slowly move away.

6 Stay outside the margins of a colony and observe from a safe distance. Animals are particularly sensitive to disturbance when they are breeding (including nesting) or moulting.

7 Watch your steps for eggs, chicks or nest materials.

8 Do not feed wildlife or leave food or scraps lying around.

3. Avian influenza

What is Avian Influenza?

- A viral infection, meaning it is sickness caused by a virus.
- The virus is highly contagious among birds.
- The virus has been around globally a long time, since at least the early 1960s.
- Found in domestic poultry (such as chickens) and in many different types of wild birds.
- The virus has evolved over time. There are a range of types of avian influenza, some are
- low pathogenic (causing no disease in wild birds: all HA subtypes) and some are high
- pathogenic (associated with disease and death in poultry and wild birds: only the H5 and
- H7 subtypes). The virus can infect some mammals.
- Many Antarctic bird species are hosts for the low pathogenic type of virus and it does not
- cause concern.
- The type we are concerned about regarding Antarctic species is Highly Pathogenic Avian
- Influenza of the Clade 2.3.4.4b.
- Commonly referred to as HPAI H5N1.
- To date, HPAI H5N1 has spread globally very rapidly but has not been found in the Antarctic Treaty Area. There is now a heightened risk that it will arrive there through natural migration of wild bird species this austral summer season 2023/24. The Antarctic bird groups considered most vulnerable are the gulls and skuas. Fur seals and elephant seals are considered the most vulnerable Antarctic mammal species.

HPAI H5N1

- "HP" or "Highly Pathogenic" means it makes infected birds [and some infected mammals] sick and causes mass mortality events where many infected animals die.
- An infected bird usually displays visible signs of the infection, such as nervousness, tremors, lack of coordination, lack of movement or odd movements, coughing/gasping for air, and swelling or redness around the eyes, neck and head.
- Although, some infected birds may not show any of these symptoms.
- Multiple dead animals in one area may be an indication that the virus is present.

What is the risk to humans?

- Recently, there have been increasing reports of outbreaks among mammals, with sporadic detection in humans reported but remaining very rare. To date, human-to-human transfer has never been detected.
- Infections in humans can cause severe disease with a high mortality rate.
- The human cases thus far are mostly linked to close contact with infected birds, or from their carcasses, body fluids or faeces, and from virus contaminated environments mostly occurring in the poultry industry

What does BAS need you to do?

We cannot prevent the natural migration of wildlife to/from Antarctica, which is the most likely way HPAI will spread; however, we still have a responsibility to stop our activities having any chance of spreading the virus. Actions you must take: -

1. Avoid close contact with bird colonies or poultry farms (in home country) immediately before you depart for Antarctica.

2. Thoroughly complete your biosecurity checks and clean your kit before travel.

3. When at gateways take particular care to follow methodically the BAS biosecurity measures asked of you.

4. Whilst out and about at Gateways (e.g., Punta Arenas/ Falkland Islands/ South Africa) do not enter bird colonies and stay at least 10 meters from birds and seals you encounter.

5. Whilst in Antarctica or Sub Antarctica do not enter bird colonies unless given prior permission by the Station Leader or local scientist.

6. Please remain vigilant, while in the Gateway, Antarctic or sub-Antarctic and please follow these instructions:

× Do not approach or interact with birds acting strangely or showing signs of illness.

× Do not in the event of discovering dead birds or mass mortality events, closely

investigate, touch or dispose of the dead bird carcasses.

× Do not if you encounter dead mammals such as seals, investigate, touch or dispose of

the dead animal carcasses.

✓ Do remain a reasonable distance from birds and seals (10 meters)

✓ Do take photos or videos to record what you saw to support further investigations.

✓ Take note of the location(s).

✓ Do report to the responsible person at your location (Station Leader, Master, or local Agent). Alternatively, you can send details direct to the BAS Avian Influenza Response Team by email avian@bas.ac.uk.

Station Leaders, Master, Local Agents or line managers if you are notified that a suspected HPAI case has been observed in you locality.

- Ensure this is reported directly via the avian@bas.ac.uk email. Ideally all details, photos and videos should be collated and sent.
- Ensure the avoidance and data gathering instruction above are being followed.
- You may be instructed by BAS to move to Phase 2 in the BAS HPAI protocol and all activities involving close contact with birds in you locality should be paused until further assessment.
- All staff should be reminded to be vigilant and importantly to stay clear of birds.
- The BAS Avian Influenza Response Team will assess the evidence and provide instructions on next steps.

Latest global information at: https://www.woah.org/en/disease/avian-influenza/.

Latest COMNAP guidance at: https://www.comnap.aq/heightened-risk-of-hpai-in-antarctica.

Latest information from the SCAR Antarctic Wildlife Health Working Group at:

https://www.scar.org/

4. Animal welfare

BAS expects and strives for excellence in animal welfare, with all research being assessed against the principles of the 3Rs and a harm/benefit analysis of the research. The 3R's are the replacement, reduction and refinement of animal experiments wherever possible and the use of innovative techniques to achieve these aims is expected. The harm/benefit assessment ensures that any potential harms to the animal are fully considered and are justified by the knowledge-benefits that will help protect the species/marine ecosystem, etc.

All research involving animals that if performed in the UK would require a licence from the UK Government must be permitted by the BAS AWERB (Animal Welfare and Ethical Review Body). If you want to work with animals, please complete the form available from Simon Morley (smor@bas.ac.uk) who chairs the AWERB.

All research that would not require a UK licence and non-research animal interactions must adhere to similar high animal welfare and undergo ethical approval.

Reporting procedure

1) Reporting an animal welfare incident

- Any incident should be reported through your management chain via the BAS Incident Reporting System, i.e., Maximo. It is important that the BAS AWERB [chaired by Simon Morley: smor@bas.ac.uk] and the BAS Environment Office are aware of any animal related incidents so that relevant authorities can be notified and investigations initiated.

2) Reporting an animal welfare concern

- Concerns should be raised, in the first instance, through your management chain. Hopefully these can be resolved quickly with your managers
- Concerns can also be raised with the AWERB [smor@bas.ac.uk] at any stage where they will be investigated thoroughly
- Unresolved concerns will be passed to a third party for resolution

Animal pathogen awareness

Any concerns about illness in the wild should be reported to the BAS Environment Office BUT animals should not be approached due to the risk of spreading any pathogens. (see the BAS Animal Mass Mortality Event Response Plan in the BAS Biosecurity Regulations, Section 11.5)

Response to injured animals

- **Animals injured by natural means**. The BAS policy under these circumstances is that there should be no intervention by BAS personnel and nature should be permitted to run its course

- **Animal injured as a consequence of interaction with BAS infrastructure or personnel (e.g. bird strike injury)**. If an animal is injured by a BAS employee or as a result of an interaction with BAS scientific or logistical infrastructure then BAS has an obligation to minimise the suffering of this animal within the bounds of the directions set out in the 'BAS Bird Welfare Policy' and the 'Euthanasia of Marine Mammals' documents within this manual (Chapters 5 and 6, respectively).

5. BAS bird welfare policy

For further information on this policy, please contact: animalwelfare@bas.ac.uk.

6. Euthanasia of marine mammals

For further information on this policy, please contact: animalwelfare@bas.ac.uk.

7. BAS bird strike prevention and response regulations

Introduction

- All Antarctic birdlife is protected under the Protocol on Environmental Protection to the Antarctic Treaty (1998), while birdlife on South Georgia and the South Sandwich Islands is protected under the Wildlife and Protected Areas Ordinance (2011). BAS has an obligation to minimise the likelihood of bird strike incidents and, should such incidents occur, to report to the relevant government authority and take appropriate mitigation action.
- A bird strike occurs when there is a collision between a bird and a vehicle (e.g., ship or aircraft) or man-made structure (e.g., power lines, masts, buildings and wind turbines).
- Analysis of existing data show that BAS infrastructure presents a risk to birds in the Antarctic and South Georgia. Most BAS research stations are located in close proximity to bird colonies, which increases the risk of bird strike. Lights on ships and BAS stations can sometimes lead to bird disorientation, which may result in bird strikes. Bird strikes on aircraft, while rare, may put the aircraft at risk.

Aims and objectives

These regulations aim to:

- detail steps to prevent bird strikes
- describe response actions should a bird strike occur across BAS stations and vessels

The regulations

<u>General instructions</u>

- All bird strikes shall be recorded on the BAS incident reporting system (MAXIMO). These should include all occasions when a bird collides with a man-made structure, irrespective of the subsequent outcome, e.g., a bird that:
    - takes off again of its own accord,
    - is successfully released after recuperating under BAS care,
    - is injured to some degree, or
    - is killed by the collision.

  The incident report should include date, time, location, weather conditions, species (with reference photograph), condition of bird, where found, treatment and outcome, plus any relevant information relating to why the bird may have been involved. This information may also be passed to the BAS Animal Welfare Ethical Review Board (AWERB) for review.

- All bird fatalities shall be reported to the BAS Environment Office within 48 hours so that the UK Government or Government of South Georgia and South Sandwich Islands (GSGSSI) can be informed where relevant.
- Where possible, all unavoidable interactions with birds (e.g., following a bird strike) should be undertaken by trained and experienced bird biologists. Where this option is not

available, advice should be sought from designated members of the BAS Conservation Biology group and the Environment Office kept informed of developments. In the first instance, please provide details of the incident to animalwelfare@bas.ac.uk and we shall endeavour to provide advice as soon as possible.

Prevention

Personal behaviour

- Nothing shall be done to encourage or attract birds to the vicinity of the research stations and ships. Do not feed any wildlife, including birds. Do not attempt to attract any wildlife using food. This information should be communicated during environmental briefings for all staff going south during their pre-deployment training, and during safety briefings on station.
- Do not leave any food in a position whereby it may attract wildlife, including birds. Take care not to leave food waste outside.

Aerials, antennae, masts and wind turbines

- Masts and antennae shall only be installed where necessary, and in accordance with the mitigation measure detailed in the associated Environmental Impact Assessment.
- Particular caution must be exercised when considering the installation of masts, aerials, wind turbines and antennae on stations located in close proximity to flying seabird colonies (e.g., Rothera, Bird Island, Signy and King Edward Point). Environmental Impact Assessments will be required on each occasion.
- The scale of infrastructure shall be kept to the minimum needed to deliver the scientific or logistical objective.
- All antenna and mast guy lines located at Rothera and at island stations shall have bird deflectors installed at an interval of 3 metres, unless such installations shall interfere with the operation of the equipment. In such cases, there should be consultation with the BAS Environment Office to consider other mitigation measures.

Aircraft

- Use of techniques to chase away birds from the Rothera Research Station runway are authorised by the UK Government, as they are essential to ensure the safe operation of the landing facility.

Station buildings located near concentrations of birds

- During periods of dusk/darkness, the level of light emitted from research station buildings must be kept to a minimum, unless engaged in essential science or logistical operations that require the use of external lighting. For example, for reasons of safety, some limited external building lighting may be maintained to ensure safe outdoor movement of personnel during the hours of darkness.
- Window blackout blinds must be installed and used on all station windows, every night at dusk, including accommodation. All personnel must be made aware they have a shared

responsibility. Station leaders must be made aware of and approve reasons for specific exceptions to this rule.

- External lighting must be kept to the minimum required and switched off when not in use. Where possible, external lighting should incorporate movement sensors, or other similar technology, to minimise the duration of illumination. Lighting must be restricted to the areas requiring illumination at the minimum intensity practicable. Lighting must be directed downwards where possible.
- The requirement to close blinds after dark every day, must be included in environmental briefings for all staff going south during their pre-deployment training, and at the usual safety briefing on first arrival at the station.
- Nightly checks to ensure all blinds are closed should be included as part of the standard "Night Watch" duties.
- A Bird Strike station member must be designated. Ideally this will be a trained bird biologist or individual trained to manage the welfare of a bird following a strike. If no such person is present, then the Station Leader should select the most appropriately trained and responsible person available.

Vessels

Bird strikes occur on vessels as a result of light pollution, in particular when operating around the shores of South Georgia. The problem is exacerbated on foggy nights. This may result in mortality or injury to birds. Birds may also become coated in oil or grease by coming into contact with mechanical parts on ships (e.g., hydraulic cranes). It is not uncommon for tens of birds to be affected in one night, generally small petrels. The presence of BAS staff on board with training and experience in handling birds will be a significant contribution towards mitigating this impact. Vessels sailing in Antarctic waters require artificial light, including deck lights and high power search lights to assist safe navigation and scientific work undertaken at night. **Nothing in these guidelines will affect the safety of operations on BAS ships**. The following points detail ways to minimize bird strikes due to light pollution aboard ship:

- During periods of dusk/darkness, the level of light emitted from vessels shall be kept to a minimum, unless engaged in essential science or logistical operations that require the use of external (including deck) lighting. For example, for reasons of safety, vessel searchlight(s) shall be used during the hours of darkness when the ship is operating immediately to the south or south east of the Falkland Islands (see the Polar Water Operational Manual (PWOM) available on MAXIMO).
- Window blackout blinds shall be installed and used at night.
- Avoid over-lighting: do not leave lights on unnecessarily.
- The requirement to close blinds and curtains on board ship after dark every day, must be included in environmental briefings for all staff and crew going south during their pre-deployment training, and at safety briefings on-board ship.
- Posters/notices should be displayed instructing crew and staff to draw blinds in cabins and common spaces when lights are on at night. Instructions to close blinds and curtains should be included in all cabin information booklets.
- Nightly checks to ensure all blinds are closed in public areas on board ship must be carried out.
- The AWERB will arrange for the training of appropriate members of the ship's crew and/or other BAS staff to deal with bird strikes. As far as possible, on each cruise, at least one suitably trained member of the crew shall be nominated as the designated Bird Strike staff member. The most suitable individuals will likely be the Laboratory Supervisors.

- When in areas of increased bird strike risk (e.g., at South Georgia), the designated Bird Strike staff member must carry out daily checks of decks and external superstructure, when safe to do so and in coordination with the ship's crew. Ideally, this should take place as early as possible after dawn.

Response

Actions if a bird is discovered following a bird strike

Inform the designated Bird Strike response staff member immediately, who should take charge of the bird's care. The designated Bird Strike staff member must assess the condition of the bird and decide on the appropriate course of action, i.e., determine if the bird is injured and if so, how badly and whether or not it is likely to survive. Record the circumstances of the bird strike (i.e., time, date, location, distance from the nearest structure, bird species, age and the nature of any injury to the bird) and report this on the Bird Strike Log. The course of actions will depend upon the status of the bird:

- **Dead bird**: Report the bird strike on the BAS incident reporting system. Provide a photograph of the dead bird. Inform the BAS Environment Office within 48 hours. If possible, identify the bird species. BAS seabird experts can be contacted to assist. Place the bird in an appropriate location in the field (e.g., in the sea or on the beach), some distance from the station and allow natural decomposition/consumption by scavengers. Ensure that protective equipment or utensils used to handle the bird are washed (or placed in the appropriate hazardous waste if washing is not possible).
- **Bird stunned or disorientated, but with no obvious injury**: Appropriate PPE should be used when handling birds (e.g., stout gloves, eye-protection, face masks). To allow time for recovery, place the bird in a cardboard box and leave in a secure, quiet and dry place at ambient temperature for several hours or overnight. Depending on species, release the bird during daylight (skua, kelp gull, shag, giant petrel, albatross spp.) or at dusk (all other species). Timing of release will reduce the risk of predation, and risk of the bird being attracted back to the station. Where possible, maintain observations to ensure that it has resumed normal flight. Release the bird ensuring that down-wind of your location there is an unobstructed flight route. As far as possible, birds must be handled and released by trained personnel. All releases must be logged as part of the bird strike log. If aboard a vessel, release the bird towards the stern of the ship, ensuring that down-wind of your location there is an unobstructed route to the water's surface. In rough conditions contact the officer on watch to ensure it is safe to access the deck. For advice, please send make a request at the following e-mail address: animalwelfare@bas.ac.uk.
- **Bird alive, but with an injury that will limit long-term survival (e.g., broken wing)**: Humane killing may be appropriate. Birds may be killed by trained personnel using humane methods. Training will be provided through the BAS Animal Welfare and Ethical Review Board (AWERB).

Birds oiled following bird strike

BAS do not have the capacity to deal with more than a very small number of oiled birds. If a large number of birds are oiled the Environment Office should be contacted. Advice will be provided following consultation with relevant BAS and external experts (as appropriate).

If an individual bird has become oiled/greased from lubricants, etc., where feasible, it should be cleaned straight away to avoid the bird ingesting chemicals during preening. Equipment needed may include a cardboard box to temporarily hold the recovering bird, absorbent towels, mild detergent and cleaning cloths. PPE must be worn, including gloves and eye protection. The Bird Strike staff member will clean the bird using mild detergent and appropriate cleaning cloths in a "dirty" sink area designated for this task. When cleaned, the bird should be placed in a dry box and allowed to rest, dry out and warm up. NOTE: a "cleaned" bird will need time to re-waterproof its feathers before release and as such advice should be sought from the AWERB and/or Conservation Biology scientists as to how long to retain the bird before attempting release. Please contact animalwelfare@bas.ac.uk and we shall endeavour to provide suitable advice as soon as possible.

Bird strikes and aircraft

- In accordance with BAS Air Unit policy and operational requirements, all bird strikes involving BAS aircraft shall be reported to the regulator Air Safety Support International (ASSI).
- Bird strikes involving aircraft in the Antarctic shall be reported to the BAS Environment Office as soon as possible, and within 48 hours, providing as much information as is practically possible, depending upon the circumstances of the incident. A report shall also be provided to the BAS Incident Reporting System (MAXIMO).

Highly Pathogenic Avian Influenza (HPAI)

At all times there should be vigilance for evidence of avian influenza in wildlife populations (e.g., unusual mortality levels or atypical behaviour in birds or marine mammals) (see Chapter 3). Potential evidence of avian influenza shall be reported immediately to the BAS Avian Influenza Response Team (AVIAN@bas.ac.uk), as well as the Ship Master, as appropriate.

Before the commencement of any bird strike response, and at regular intervals during the cruise, the individuals dealing with bird strikes shall check which phase of the BAS avian influenza action plan is in effect (as described in the document: 'BAS Response to a Potential Avian Flu Epidemic'). Relevant information can be obtained by contacting the BAS Avian Influenza Response Team at: AVIAN@bas.ac.uk. See also Appendix 1: SOP: Handling of live birds involved in ship strikes.

If the BAS avian influenza action plan is at Phase 2 or above, the bird strike response shall not proceed. Following this point, activities involving close interaction with wildlife shall only proceed following the consultation with the Avian Influenza Response Team and with the full implementation of any further specified conditions.

8. Procedure for operation of multirotor Remotely Piloted Aircraft Systems (RPAS) of < 7 kg over colonies of seabirds and seals in the Antarctic and South Georgia

All activities involving the use of a Remotely Piloted Aircraft System (RPAS) will need to be assessed through the Environmental Impact Assessment process and permitted, as appropriate. This document is a procedure designed to standardise permit applications to the BAS Environment Office and Animal Welfare Ethical Review Board (AWERB) when planning RPAS surveys of colonial seabirds and seals. The additional risks and mitigation of any proposed work that deviates from this procedure will need to be explained in Environment and AWERB documentation for ethical review, Environmental Impact Assessment and Permit applications.

This procedure falls under the umbrella of the Civil Aviation Authorities UK Civil Aviation Authority Drone Code and the BAS Unmanned Aircraft Systems (UAS) Operations Regulations. All RPAS pilots should observe the broader set of restrictions outlined in these documents. Carl Robinson of the BAS Airborne Survey Technology Unit (carob@bas.ac.uk) should be consulted on any survey work involving RPAS. RPAS flights for any purpose in South Georgia must adhere to further requirements set out by the Government of South Georgia and the South Sandwich Islands and be assessed through the Regulated Activity Permit (RAP) process.

This procedure is relevant to multirotor RPAS of a mass < 7 kg. Heavier multirotor or fixed wing aircraft are outside the scope of this document, and a permit application for their use in wildlife surveys will need to be developed in consultation with the Airborne Survey Technology Unit, Environment Office and AWERB will be required.

Risk 1. RPAS crash, forced landing or fly-away that injures wildlife:

Malfunctions, pilot error or bird attack causes the RPAS to fall to the ground in an uncontrolled manner and strike an animal. This results in the animal suffering blunt trauma (from being struck by the airframe) or cut injuries (from spinning propellers).

Risk assessment without mitigation

Likelihood: Low Impact (individuals): High Impact (population): Very Low

Risk assessment with mitigation (see measures below)

Likelihood: Very Low Impact (individuals): Medium Impact (population): Very Low

Justification: Likelihoods are low as modern RPAS have numerous safety features and are easy to fly, and risks are minimised where competent pilots are following appropriate operational procedures. Impacts on individuals are high because being struck could include severe injury or death: mitigation by use of small drones with propeller guards will reduce the impact (see below). As no more than one or two individuals are likely to be injured by a crash owing to the small size of multirotor RPAS the effects on the population will be very low.

Risk 2. UAV causes disturbance to animals: The sight or sound of the drone causes a behavioural response in animals that might have a significant adverse effect on their individual fitness.

Risk assessment without mitigation

Likelihood: Low Impact (individuals): Medium Impact (population): Very Low

Risk assessment with mitigation

Likelihood: Very Low Impact (individuals): Medium Impact (population): Very Low

Justification: Studies have shown that most seabird and seal species show little response to RPAS other than vigilance, unless they are flown at very low altitudes or in an erratic manner (see Note 1 and Further Reading): these are not compatible with survey work so should not occur. If the mitigation measures are followed (see below) the likelihood of disturbance is very low. The impact on individuals is medium as disturbed birds may lose eggs or chicks to skuas, but since they are long-lived they are likely to breed again in future years. When following the mitigation measures (see below) the likelihood of birds exposing nest contents is minimised. The impact across the population is likely to be very low as only a small proportion of breeding birds are likely to lose eggs or chicks during a survey.

Mitigation Measures

1. *Aircraft safety*

- RPAS models used for survey work should be recognised as airworthy by the BAS Airborne Survey Technology Unit.
- Inspections of the airframe, propeller, motors and controls for damage and functionality should be completed prior to take off.
- The RPAS compass should be calibrated away from metallic objects. GPS/RC signal reception confirmed before flights. Pilots should avoid flying near sources of electromagnetic or radio signal interference.
- The home point (the take-off and landing point) should have a flat, level surface for gyroscope calibration and be protected with a portable helipad to prevent moisture/dirt ingress into the aircraft at take-off and landing.
- Efforts should be made to keep batteries within recommended operational temperatures to ensure stable, safe flights. If batteries are below the recommended operational temperatures pilots must warm them up under their coat.
- A short test flight should be completed >150 m away from wildlife to ensure all systems are working as expected.
- Propeller guards or crash cages should be fitted to reduce the risk of cut injuries from spinning propellers. The smallest possible RPAS model that is suitable for the application should be used to minimise impact trauma.
- The return to home altitude should be set at a height that provides ample clearance of all collision hazards within the area of operation and at a height that will limit disturbance to wildlife.

2. *Personnel competence*

- Pilots should have a CAA recognised qualification to fly small (< 7 kg) multi-copters and a current pilot's log to prove their competence (> 20 hours flying with similar aircraft in a range of conditions in lifetime, and > 2 hours within the past year).
- An observer with knowledge of the animals and survey area must accompany the pilot to witness any incidents, warn of hazards (approaching bird strike risk or squalls), control additional personnel and defend the pilot from fur seals (as necessary). The observer must

also be instructed in the emergency procedures. In the event that the pilot is incapacitated, the observer must know how to initiate the return-to-home protocol and call for help.

3. *Flight restrictions*

- Operations must remain within Visual Line of Sight, defined as 400 ft above ground level (AGL) and 500 m from the pilot. AGL is taken from the highest point of relief within the survey area.
- Flights should not enter areas to be avoided (special wildlife protection areas, air traffic control zones, danger areas) without authorisation and/or the relevant permit from the FCDO or GSGSSI.
- Pilots should avoid routes that cause topography to obscure their view of the aircraft or compromise the signal between RPAS and ground station.
- Aircraft should only be flown in weather conditions within those stipulated by the manufacturer of the RPAS model used in the survey (wind speed, temperature, precipitation). An anemometer and thermometer should be used to quantify conditions prior to flights.
- Flights should be avoided if bird strike risk in the area is considered high (e.g. several albatrosses or giant petrels gliding above the colony within the operational altitude of the RPAS).

4. *Operational procedures*

- The home point (take off/landing point) should be in a safe location that provides a clear view of the area of operation. It should be at least 30 m from any breeding colonies to minimise significant disturbance risk to animals.
- The survey should be flown at the highest altitude that provides the ground sampling distance (GSD: Note 2) required for the survey's objectives. This will reduce the number of transects required to cover the colony, minimise disturbance and allow more time to move the aircraft away from the colony if pilot errors or malfunctions occur. The altitude shall be calculated in advance of the field work and reported in any documentation (EIA, permit applications, etc.) required by the BAS Environment Office, FCDO, AWERB or GSGSSI.
- Flights should not be flown at altitudes that cause significant disturbance (Note 1) to wildlife (defined in Note 1). Reference to previous literature will provide guidelines for safe separation distances (see Further Reading), but observers should monitor for disturbance to animals during surveys as sensitivity can vary across species, sites and environmental conditions.
- Should the observer see disturbance occurring at the selected flight altitude he/she should instruct the pilot to increase survey altitude or increase separation distance of the home point.
- If the separation distance needed to prevent significant disturbance is greater than that at which the required GSD can be achieved, the survey work will need to be conducted using an RPAS with a higher resolution camera sensor or greater focal length.
- Flights should be of the minimum duration required to fulfil the objectives of the research.
- Reductions in altitude should be made outside the colony boundary as vertical movements toward animals tend to elicit higher disturbance than horizontal passes.
- If a bird-strike hazard approaches the RPAS, the pilot should make evasive manoeuvres in a controlled and predictable manner, avoiding sudden changes in direction or altitude. An attacking bird will usually veer away from the RPAS without making contact; by making

sudden changes to the RPAS flight path there is increased likelihood of a bird-strike. If the interaction is a persistent attack (e.g., from a skua, gull or tern) the pilot should land the aircraft. Operations should be modified to avoid the risk of attack (e.g., change home point, increase altitude) and if attacks continue, the survey should be abandoned.

- Controls should be applied gently to avoid sudden changes in direction / speed or increases in propeller noise that might alarm animals.
- The RPAS should be landed once the battery reaches 30% of maximum charge.
- In the event of a crash or forced landing reasonable efforts should be made to recover the drone. This should be avoided, however, if the retrieval would be dangerous (e.g. on cliff faces, in water or seal colony), leads to intrusion into a controlled area (consult with the appropriate authority to arrange potential recovery) or will lead to high levels of wildlife disturbance.

Reporting requirements

- Pre-deployment forms (Appendices 1 and 2 in UAS Operating Safety Case – Volume 1 Operation Manual: BAS RPAS Operations Manual) should be completed prior to flights that will recognise hazards in the operating area and make specific plans for mitigation of impacts on wildlife.
- Any incidents should be reported on the BAS incident reporting system (i.e., Maximo), including a detailed description of the incident and submission of the pre-deployment form.

Notes

1. Significant disturbance is classed here as changes in behaviour caused by the RPAS that might affect individual fitness. This includes incubating/brooding birds fleeing the nest or chicks dispersing from crèches, which could increase predation risk or cause ejection of nest contents. Vigilance or movements of non-breeding/off duty animals are not considered significant here as these have negligible time/energy/stress costs in the context of their normal daily activity budget. Previous studies have found disturbance responses by seabirds and seals other than vigilance are rarely found at survey altitudes above 50 m (see Further Reading).
2. Ground sampling distance (GSD) is the number of mm on the ground per image pixel. This is determined by the attributes of the camera (sensor megapixels, focal length) and its altitude. A lower GSD provides higher image resolution, and allows better recognition of count units. GSD will need to be lower where birds are difficult to distinguish from the background (small size, cryptic colouration), where identification of similar looking species is necessary (e.g., chinstrap and Adélie penguins) or nesting birds need to be distinguished from non-breeding or off-duty ones. Based on experience in previous surveys, altitudes of 30 m – 50 m will be a suitable option for most seabird and seal applications.

Further reading

Brisson-Curadeau, *et al.* (2017). Seabird species vary in behavioural response to drone census. *Scientific Reports* **7**: 17884. https://doi.org/10.1038/s41598-017-18202-3

Irigoin-Lovera, C., *et al*. (2019). Response of colonial Peruvian guano birds to flying UAVs: effects and feasibility for implementing new population monitoring methods. *PeerJ.* **7**: e8129. https://doi.org/10.7717/peerj.8129

Harris, C.M., *et al.* (2019) Environmental guidelines for operation of Remotely Piloted Aircraft Systems (RPAS): Experience from Antarctica, *Biological Conservation* **236**: 521-531. https://doi.org/10.1016/j.biocon.2019.05.019.

Hodgson, J. & Koh, L. (2016). Best practice for minimising unmanned aerial vehicle disturbance to wildlife in biological field research. *Current Biology* **26**: R404-R405. https://doi.org/10.1016/j.cub.2016.04.001

Laborie, J. *et al.* (2021). Behavioural impact assessment of unmanned aerial vehicles on Weddell seals (*Leptonychotes weddellii*). *Journal of Experimental Marine Biology and Ecology* **536**: e151509. https://doi.org/10.1016/j.jembe.2020.151509

Mustafa, O. *et al.* (2018) State of knowledge: Antarctic wildlife response to unmanned aerial systems. *Polar Biology* **41**: 2387–2398. https://doi.org/10.1007/s00300-018-2363-9

Pomeroy, P. *et al*. (2015). Assessing use of and reaction to unmanned aerial systems in gray and harbor seals during breeding and molt in the UK. *Journal of Unmanned Vehicle Systems*. **3**: 102-113. https://doi.org/10.1139/juvs-2015-0013

Raoult, V. *et al*. (2020) Operational Protocols for the Use of Drones in Marine Animal Research. *Drones* ***4***: 64. https://doi.org/10.3390/drones4040064

Rümmler, M.C. *et al.* (2018) Sensitivity of Adélie and Gentoo penguins to various flight activities of a micro UAV. *Polar Biology* **41**: 2481–2493. https://doi.org/10.1007/s00300-018-2385-3

Weimerskirch, H., *et al.* (2018). Flights of drones over sub-Antarctic seabirds show species- and status-specific behavioural and physiological responses. *Polar Biology* **41**: 259–266 https://doi.org/10.1007/s00300-017-2187-z

9. BAS station wildlife movement guidance

Training

- A member of the station management team who has been fully briefed by the BAS Environment Office should deliver the animal movement training to staff on station. (They can also train other members of the BAS station management team to deliver the training on station).

- Anyone involved with moving wildlife (seals or penguins), must be appropriately trained in how to do this safely prior to undertaking the activity. This includes all BAS staff and any subcontractors.

- The training must include a practical element to ensure that everyone has the opportunity to demonstrate their skills and their understanding of animal stress signs whilst being observed by the trainer (animals will only be moved where there is a requirement and not for the purposes of training only). Only when the trainer is content that an individual is competent can they attempt to move wildlife independently.

When to move wildlife

- Wherever possible, find a route that minimises interaction with wildlife.

- Your safety and the wildlife's' safety must never be jeopardised. The first option should always be to pause and allow wildlife to move away naturally. Intervention to move wildlife should only be used if it is absolutely necessary.

- If wildlife is preventing essential work from progressing or is in close proximity with vehicles or construction works the first step should be to stop the work/engines and allow the animal some time (5 minutes is a useful guide but will depend on the situation) to move away or follow its original path without human interference.

- The following are example situations where wildlife may need to be moved – this is not an exhaustive list:

    - During cargo offload from the vessel to protect wildlife from crane operations, cargo depoting and vehicle movements.
    - During aircraft operations at Rothera to protect or move wildlife from the runway.
    - Where seals are resting on equipment or cargo materials that need to be used/accessed.
    - Where seals are resting on the road/track preventing vehicles from passing and have not moved away naturally after a pause in operations.

- Use the techniques described in Section 0 to move animals only where absolutely necessary. The least intrusive methods should be attempted first before moving onto more intrusive methods. In general, be patient and don't rush to move to a more intrusive method straight away. Each situation and animal will be different and so it is important to read the behavioural signs of the animals and the urgency of the situation to determine whether the method you are using is effective or whether it is necessary to move onto a new technique or seek additional help.

General advice and safety

- Avoid approaching seals at all other times. On-going unnecessary human interaction makes seals habituated to humans and more difficult to move later.

- Moving wildlife is a high-risk activity and should not be attempted alone. At least one other person should be present even if they are an untrained observer.

- **NEVER** directly touch wildlife as part of an attempt to move the animal. It can put you and the animal in danger and means you are far too close.

- Moving wildlife, especially seals, takes time to do in a safe manner. Remember the wildlife has more right to be there than you. Do not lose your temper, working with wildlife requires patience!

- Look out for signs of stress and aggressive behaviour. If observed, back away from the animal until it has returned to pre-interaction behaviours.

- Consider other station activities around you. Do not herd animals to a location where they will need to be moved again later.

- Be aware of your surroundings and watch out for other wildlife, concentrating on an individual seal can often lead to people forgetting about other seals in the vicinity and getting too close.

- Ensure the animal has an obvious and safe (to the animal) route to move away. If cornered, animals can get confused, stressed and may become aggressive.

- Do not purposely drive a seal into another seal's space as this may cause unnecessary aggressive behaviour between the seals that could result in their injury.

- Vehicle drivers need to be able to see the entire animal at all times. Where available, vehicles should only be used to encourage seals (elephants only) to move as a last resort and only if other methods have not been effective. Where this technique is used then vehicles should be kept a minimum of 5 metres away (or 3 metres with a seal movement trained banksman).

- Be vigilant for signs of moulting. Seals and penguins moult during the summer. As a result, their fur and feathers are less waterproof during this time and they conserve energy ashore by not feeding at sea. They are more sensitive to disturbance at this time and should not be moved unless absolutely necessary. Do not try to herd them into the water.

Species Specific Guidance

The guidance below refers to the commonly found species across most BAS research stations.

Elephant Seals

- Although elephant seals are large animals, they can move extremely quickly over short distances. Your safety is paramount so make sure you can get out of their way before they start to charge. They can easily lunge over a metre in distance, so avoid standing close enough that you could be bitten. They also have a large turning circle and can easily (unintentionally) hit you with their tail.

- Whilst elephant seals have thick skins, they can still be injured. An injury could affect an animal's ability to hunt for food or defend itself. The most vulnerable areas of an elephant seal are the eyes, so ensure that any equipment that is used to move seals e.g. flags, are not in direct contact with their eyes.

- Elephant seals are well insulated which means that if forced to move quickly they can easily overheat on land. Seals must be allowed to rest between periods of movement. Rule of thumb is that a 5 minute rest should be given to individual seals once they have moved a distance equal to twice their length. Be extra cautious on hot sunny days.

- When moving elephant seals, move the animals a short distance, retreat and return a few minutes later. They tend to become habituated to constant disturbance.

- Avoid moving them over: i) ground containing trenches, pits or deep depressions as they can get stuck due to their weight, ii) towards objects they can damage or injure themselves on and iii) towards a jetty or other steep drop as they can injure themselves by falling.

- Watch out for signs of stress. An open mouth, without making sound, can indicate stress. If an elephant seal evacuates its bowls whilst you are attempting to move it this is a further sign of stress. Back-off and give the animal time and space to rest.

- If you are unable to successfully move a seal after 15-20 mins you should stop. The animal is likely to be stressed and assistance or advice from a more experienced member of staff is needed. Retreat to a safe distance and contact BAS Station Management for further advice and assistance.

Fur seals

- Antarctic Fur Seals, particularly breeding/territorial fur seals, can at times be highly aggressive animals. They are generally more aggressive than elephant seals and are considerably quicker and more mobile. Wherever possible find a route that minimises contact with fur seals.

- Fur seals want to avoid getting hurt as much as you do and their reaction to a person is often brought on by fear and confusion. Fur seals will normally provide ample warning of their intentions through the use of threat behaviour. This is obvious to a person intruding upon their territorial space. The fur seal will turn towards the 'intruder' and will display an open mouth threat accompanied by a growl. It may begin moving towards the intruder or if startled it may instead turn tail and run. Note that if a fur seal is surrounded by other fur seals it could perceive that the easiest way out is past you rather than face other seals - thus you may inadvertently be rushed at and most likely get bitten during its 'escape'.

- Extreme care is needed not to cause the animal to think it is cornered, i.e. ensure that there is an obvious escape route for the seal, that is clear from other seals, objects and people. Animals that feel trapped, are likely to run directly at people and will bite.

- The most dangerous circumstances are when a fur seal is showing signs of fear. This is most common amongst non-territorial males. Such fear is often shown by "snake neck" behaviour involving the rapid movement of the head from side to side as the seal looks for a way out of the

danger it believes it is in. Recognise this behaviour and ensure that you allow a frightened animal room for escape.

- If a person does not recognise the common fur seal behavioural signs (below) then there is a greater probability of being attacked and sustaining an injury.
    - Initially fur seals will approach and lunge out to snap at the legs, they will then retire quickly.
    - The first attack is often a sham and the animal may not bite - this should persuade the intruder to retire.
    - The second attack carries a greater chance of actual injury when the attack is driven home.

- Where it is essential to move a fur seal, refer to the appropriate **Techniques to move wildlife** . Clapping (gently) or other low level noise is usually effective and should be used in the first instance. Where individuals are not responding to efforts to move them then a long blunt stick can be used to tickle the whiskers under the animal's chin. This mimics the snapping by female fur seals at the whiskers of males to deter unwanted attention.

- **Do not hit the seal.** Only as a last resort when there is imminent danger of being bitten[1], should the stick be used to deter an attack. Note that heavy-handedness with a stick can often provoke rather than avert an aggressive encounter with a fur seal and it could cause permanent injury to the seal. Avoiding a seal encounter is always the preferred option. If a seal is struck, then an incident report must be submitted and will result in an internal investigation by BAS.

Penguins

- Penguins will move easily if disturbed by simply approaching them. Move slowly and carefully (do not make excessive movements such as clapping or waving your arms and avoid shouting or loud noises such as laughter) and allow the penguins to walk if possible. Moving them too quickly, aggressively or noisily can instil panic and erratic behaviour and they may not take the obvious escape route.

- Ensure that they have a safe route away. Guide them away from hazards such as steep drops or objects they may become entangled in.

- Be extra cautious with moulting penguins (often seen resting on snowy patches) and all penguins on hot sunny days (often seen resting and panting). Do not move moulting penguins into the sea as their waterproof feathers will not have developed and they will not survive at sea.

Situational Awareness

- Do not take photos or videos of anyone moving animals. Without a full explanation such images and footage can be misinterpreted.

- Wherever possible, avoid or delay moving animals when tourists are present as without context the displacement of animals can be misinterpreted.

- Do not share any images on personal blogs or social media - this is a requirement of the BAS Communications Policy as communicated to all staff at the BAS pre-deployment training.

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[1] Bites should be reported to the doctor immediately for treatment (seal bite kits are on station)

Injury or fatality

Unpermitted injuring or killing of native wildlife through human activities is a breach of the GSGSSI Wildlife and Protected Area (WPA) Ordinance and the Antarctic Act (1994;2013). In the event of an injury to animal, as a result of human activity:

- Do not attempt to help or move the animal as this could cause further distress.
- Contact the BAS Station Management team immediately.

Station management should follow the BAS Bird Welfare Policy and note on Euthanasia of marine mammal in the BAS Wildlife Interaction Manual. The BAS Environment Office should be notified. At KEP, the BAS Station Management shall inform the GSGSSI Government Officer as soon as possible. BAS Environment Office will consult with the GSGSSI and Foreign, Commonwealth and Development Office on any appropriate action.

Techniques to move wildlife

	Techniques for moving wildlife (listed in priority order – the lower graded techniques should be attempted first before higher graded methods are attempted)	Elephant seal **Be aware of:** - Open mouth (no sound) - They overheat when moving on land - Become habituated to efforts to move them. - Moulting	Fur seal **Be aware of:** - Open mouth threat/growling - Lunging & snapping - "Snake neck" behaviour	Penguin **Be aware of:** - Erratic movement - Moulting - Panting
1	**Slow walking:** Move slowly and carefully (do not make excessive movements such as clapping or waving your arms) and allow animal to move away slowly. Speak quietly avoiding loud noises such as laughter.	✓(for young elephant seals)	✓(for young fur seals)	✓
2	**Clapping (low level):** Gentle clapping or other low-level noise is usually enough to get the attention of seals and encourage them to move away.	✓	✓	×
3	**Arm Waving**: Making yourself as large as possible and approach to a safe distance. A safe distance will vary enormously on the situation and could be up to 30 metres.	✓	✓	×
4	**Bamboo flags**: Dominance in elephant seals is usually established by being the tallest, so holding or waving an object, like a flag, above the seal will mimic this. To turn a seal around flags can sometimes be effective if used to gently 'tickle' tails and flippers. Never wave a flag in the seals eyes.	✓	×	×
5	**Big flag**: Use a long thin piece of wood around 5 meters in length as a flagpole. Attach an FIBC bag to the end, stretched out so that the maximum surface area is displayed, almost like a kite. Hold high and approach to a safe distance and wave it about in a controlled manner. This method works on the same basis as using the flags where dominance is established by being the tallest animal.	✓	×	×
6	**Long blunt stick:** Only as a last resort with particularly stubborn fur seals. A stick can be used to tickle the whiskers under the animal's chin.	×	✓	×
7	**Vehicles (last resort technique where all other methods must have been attempted first)**: Approaching slowly (< 5mph), no closer than 5m, in a large vehicle with bucket or forks held high in the air can encourage elephant seals to move. **However, extra caution must be taken to avoid any contact or injury to the seal.** A 'banks person'	✓ (for large elephant seals)	×	×

	should always be used if getting closer than 5 metres (but no closer than 3m) and they must be seal trained.			

10. Appendices

Appendix 1. SOP: Handling of live birds involved in ship strikes

COSHH Assessment(s): SCI-AL-CSH-ENV-1000

Risk Assessment(s): SCI-AL-RA-ENV-1004

Chemicals Required:

Chemical	Hazard Class	H-phrases
BioGuard disinfectant		H315 – Causes skin irritation

Other Hazards:

Biological pathogen		Suspected known animal pathogen
Physical terrain		Extreme cold. Slips, trips and falls.
Biological physical		Scratches and pecks

Sustainability Actions:

Reuse boxes	Use cardboard boxes from ship logistic supply waste

- Potential Group 2 or 3 known Pathogens: Only carry out if fully trained.
- Wear Tyvek suit, boots, face shield/safety glasses and suitable chemically/biologically resistant gloves (double nitrile gloved).
- Wear ffp2 face mask that has been face fit tested and approved for the user
- Only fully trained staff can carry out this procedure
- Two people should be assigned to this activity. One to carry out the bird handling and one to assist with procedure and PPE removal.

Procedure aligns with Chapter 7 of BAS Wildlife Interaction Manual

For further advice, contact animalwelfare@bas.ac.uk

Application

- For rescue of birds that have accidentally collided with the ship and subsequently alighted on deck.
- For handling of birds to cause minimum stress and to minimise any long-term and acute effect of handling on the welfare of the birds.
- For temporarily holding disorientated and wet birds prior to safe release, ideally within 24 hours.
- For close examination of birds to assess health status and to permit the safe handling of birds while other first aid procedures are being conducted (such as cleaning grease off feathers and releasing by hand).

Ship Safe Operations

In rough sea conditions contact the officer on watch to ensure it is safe to access the deck. Always follow ship safety instructions as provided by the crew.

When catching birds always be aware of personal surroundings: ensure you are spatially aware of any risks from equipment, slippery surfaces, ship superstructure before attempting to capture a bird.

Only proceed with a bird capture if you are satisfied you can do so safely.

Cautions

- Covering the nostrils of a bird while holding the bill can prevent breathing.
- Incorrect restraint, allowing the bird to struggle excessively, increases the likelihood of it sustaining injuries.
- The greatest risks come at the point of capture and release, if birds are moved or if there is a change of handler.

Pre-prepare a box of suitable size for the bird species.

1. The box should be constructed of cardboard or other material that can be destroyed by incineration after use. Ensure it is undamaged and the lid flaps close properly. The box should be of a suitable size to hold the bird with enough room for the bird to comfortably move around. Also ensure the sides are high enough to prevent the bird from escaping by climbing out.
2. Line bottom of box with paper towels which can be destroyed by incineration after use.
3. Make a minimum of 10 holes and maximum of 40 holes of roughly 0.5 cm in size in the lid of the box with a pen, screwdriver, or similar tool, or ensure box lid is not a close seal (i.e. air flow can take place).

Handling procedure for small birds (e.g. diving petrels and prions)

Initial restraint is achieved by gaining control of the head of the bird using the one-handed 'ringers grip', as follows:

1. Use the most comfortable hand to grasp the bird (e.g. if you are right-handed, it may be more comfortable to hold the bird in your left hand, or vice versa for left handers), leaving the dominant hand and free for other tasks such as checking for injury
2. Gently but firmly grasp the bird with its back and closed wings against the palm of the hand.
3. The head should be held between the index and middle finger while remaining fingers are closed around the body of the bird.
4. The wing can be held open (to check for injury) by gripping the upper wing (humerus) between the thumb and tip of the index finger. This can also be done using the index and middle finger.
5. The wings should be secured by naturally folding against each flank of the bird as per the natural resting posture of the bird, and then by holding the bird in such a way as the wings are not able to move.
6. Usual handling time should be less than a minute to allow a handler to safely capture and restrain the bird, before placing it in a suitable container (see below).

Handling procedure for medium to large birds (e.g. skua, white-chinned petrel)

Initial restraint is achieved by using both hands:

1. Firmly but gently grasp the bird with the hands placed either side of the bird so that the wings are held against the bird's body by the handler's palms.
2. The thumbs should be placed on the bird's backbone at the level of the scapulae or shoulder and the fingers curled around the breast and abdomen, with the legs tucked up against the underside of the bird. A variation on this technique can be to brace the back of the head with the index and middle finger to prevent bites.
3. The bird's body can be held horizontally (with the head facing away from the handler) or tilted vertically (head up) with the legs facing forward

Handling procedure for very large birds (e.g. albatross)

Restrained by at least two handlers; one to hold the body and wings and another to restrain the head and legs using an underarm hold as follows:

1. The body of the bird is held under the handler's left or right arm with the wings held against the bird's body with pressure from the handler's torso and left or right elbow and forearm (which side of the body the handler is holding the bird against will correspond with which arm is under the bird) .
2. In most cases, the bird's head can be held behind the handler because this will prevent it from lunging at the handler's face and eyes (i.e. a handler will be holding a bird so that it is facing backwards, whilst held against their side)
3. Place the left hand under the bird's abdomen and the right hand across the bird's back to help restrain the legs and wings, respectively.
4. Another handler can restrain the bird's head and legs to prevent injuries caused while struggling to escape.

Care of birds for recovery

Be aware that birds may overheat in warm conditions, such as in a cabin. Only place in approved recovery area.

The box must be handled by the person assisting to prevent contamination of the external surfaces.

1. Carefully place the bird in the pre-prepared box and secure closed.
2. With help of assistant, spray gloves and Tyvek suit (if worn) with BioGuard and remove, placing in bag for disposal.
3. Place the box in the designated recovery area, which should be quiet, moderately warm and dry: Heli Hanger area identified.
4. Check on bird every 2 hours to ensure it is still alive. Open the box by minimal amount required for good visualisation of the bird.
5. Do not provide any food or drink during recovery.

Release of recovered birds

- Incorrect release could result in the bird colliding with ship superstructure or crashing into the sea.
- Timing of release will reduce the risk of predation, and risk of the bird being attracted back to the vessel.
    - Daylight - skua, kelp gull, shag, giant petrel, albatross species
    - Dusk – all other species

- Ensure that the beak is kept under control at all times.
- All birds must be released prior to vessel moving off station to ensure release in same location as strike.

1. Move slowly, quietly and carefully to avoid unnecessary stress and to avoid the bird panicking and attempting to escape. This could lead to it becoming injured.
2. A careful check on the bird's breathing and posture should be made for the complete duration of the procedure.
3. Only one bird per person should be held simultaneously, even if the bird is very small (e.g. diving petrel).
4. Select a launch spot relatively high up on the ship's superstructure to allow the bird more air space to manoeuvre and reduce risk of it hitting the sea. Use the Observation deck or heli-deck.
5. Release the bird towards the stern of the ship, ensuring that down-wind of your location there is an unobstructed route to the water's surface.
6. Maintain observations to ensure that it has resumed normal flight.

Report details of bird strike on BAS Maximo and GSGSSI reporting system

Waste Disposal

- Decontaminate all PPE before disposal to mitigate the suspected pathogen risk. Use only approved disinfectant.
- Dispose of any PPE and tissues as biohazard waste in accordance with local waste procedures.
- Waste material that has been in contact with the bird must be bagged and incinerated.

Emergency Procedures

- First Aid: BAS standard procedures. Provide COSHH & SDS if chemicals involved.
- Chemical Spill: BAS standard procedures for chemical spill response.

Waste Produced:

Decontaminated PPE		>1% biological pathogens (deactivated)	Plastic waste bag
Contaminated box		>1% biological pathogens	Waste bag for incineration on board

Sign Off:

Document Owner: M D

Accepted by Lab Manager: E F

To be made available as a generic procedure? Y

User Sign-off

Name: Date:

Approved by Line Manager:

Name: Date:

Appendix 2. SCAR's Environmental code of conduct for terrestrial scientific field research in Antarctica

Background

This Scientific Committee on Antarctic Research (SCAR) Code of Conduct (CoC) provides guidance for scientists undertaking terrestrial scientific field research in Antarctica. Reference was made to the need for this CoC during CEP IX (CEP IX Final Report; para. 132). A CoC was approved by the XXX SCAR Delegates Meeting in Moscow July 2008. SCAR presented the CoC to the CEP XII (2009) as IP 4. A further review of the CoC was coordinated by SCAR in 2017, through experts and the broader SCAR community, and the revised version submitted for consideration at CEP XX (WP 18). Further consultation was carried out in the 2017/18 intersessional period, including with COMNAP.

This CoC has its origins in the 2006 CEP discussions on avoiding the introduction of propagules[2] of non-native species. Since those discussions, the CoC has been broadened to provide guidance to design and conduct terrestrial scientific field research in a way that minimises environmental impacts, including, but not limited to, the transfer of non-native species.

Introduction

Antarctica contains many unique geological, paleontological, glaciological, and biological features. This landscape and its biological communities often have limited natural ability to recover from disturbance. Many features could be easily and irreversibly damaged. This CoC provides recommendations on how scientists and associated personnel can undertake scientific field activities while protecting the Antarctic environment for future generations, as well as not compromising future scientific research. These protocols ensure that human presence will have as little impact as possible. All personnel undertaking scientific research in Antarctica should be familiar with this CoC and field activities in Antarctica should be designed to have as little environmental impact as possible.

The Protocol on Environmental Protection to the Antarctic Treaty (also known as the Madrid Protocol or Environmental Protocol) provides a basis for environmental protection and management in the Antarctic. Climate change and increasing pressure from human activities suggest that comprehensive guidelines are needed to protect the unique features of Antarctica. This CoC complements the relevant sections of the Protocol and provides guidance for researchers conducting land-based field research (including, but not limited to - limnological, terrestrial, coastal/littoral, glaciological, biological, paleontological, sociological, historical, archaeological, climatological and geological research). A 'field' activity is defined here as any scientific activity, and the logistics to support this activity, which is conducted in the natural environment, irrespective of its duration.

All countries with researchers that undertake terrestrial field research in Antarctica are encouraged to include this CoC within their operational procedures and to ensure that personnel undertaking or supporting scientific field research follow this CoC.

It is recommended that this CoC be followed by all personnel undertaking scientific research to the maximum extent possible and as long as it does not affect the safety of the expedition.

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[2] Propagule: means of propagation, *e.g.*, seed, spore, egg, live insect (including microbes in non-sterile soil)

General Guidelines

Antarctic scientists potentially have a higher likelihood of carrying non-native propagules to Antarctic [and sub-Antarctic] ecosystems than other Antarctic travellers because their field of study often takes them to alpine or northern polar habitats. Moreover, Antarctic scientists also move between the Antarctic Conservation Biogeographic Regions (ACBRs)[3,4,5] which can differ substantially in biodiversity and geodiversity. In the process of conducting research within these habitats, Antarctic scientists can inadvertently entrain propagules and/or soil on clothing, equipment and equipment cases. If these items are then taken to the Antarctic, or among ACBRs, and they have not been cleaned/sterilised to remove or kill the propagules, an opportunity to transfer such material to and around Antarctica is created. Equipment should be properly cleaned before it enters the Antarctic, or moves between regions within Antarctica.

The implications of human transfer of taxa between locations can range from the modification of the genetic structure of populations to changes in local biodiversity and subsequent effects on community dynamics. Human transfer may involve species (or their propagules) from sites outside Antarctica, and such species would in most cases be considered non-native. However, given the differences between regions, intra-regional transfer of indigenous species also needs to be minimised. Such accidental movement of indigenous biota could compromise scientific studies of molecular adaptation, regional evolution and biogeography and reduce the inherent value that Antarctica offers as a system with very limited anthropogenic influence.

Before going into the field

Report planned activities to the appropriate national authority as thoroughly as possible and well in advance, in order to allow an assessment of the environmental impact that may be caused on the field site(s) visited, as required by Annex I to the Protocol on Environmental Protection to the Antarctic Treaty.

Prior to conducting any scientific activity, it is essential to consider and clearly define the scope of the planned activity, including its area, duration, and intensity.

Be aware of the cumulative impacts of the activity, both by itself and in combination with other activities within the region. Consider lower impact alternatives to the activity and re-use of existing facilities wherever possible.

In order to minimise environmental impacts of field activities:

i. Choose sites as close as possible to research stations and use existing pathways.
ii. Limit the number of visitors to field sites to the people required to carry out the fieldwork.
iii. Where possible avoid areas that are especially vulnerable to disturbance such as vegetated areas, breeding sites, patterned ground, and water bodies.
iv. Re-use existing sites wherever possible.
v. Consider the capacity required to prevent and respond promptly and effectively to any environmental accident or incident.

Everything taken into the field must be cleaned before being taken into the field, and returned to the main station for proper cleaning, where it is feasible and safe to do so.

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[3] Terauds A, Chown SL, Morgan F, Peat HJ, Watts DJ, Keys H, Convey P & Bergstrom DM (2012) Conservation biogeography of the Antarctic. *Diversity and Distributions* 18:726-741.
[4] Terauds A & Lee JR (2016) Antarctic biogeography revisited: updating the Antarctic Conservation Biogeographic Regions. *Diversity and Distributions* 22:836-840.
[5] Resolution 6 (2012) - ATCM XXXV Hobart; Resolution 3 (2017) - ATCM XL Beijing

Precautions should be taken to avoid introduction of non-native species, or of chemical contamination, and transfer of materials between sites:

i. Ensure that all equipment and clothing, including footwear, is thoroughly cleaned.
ii. Avoid taking unnecessary packaging and materials into the field. Note that several products used for packaging are prohibited in Antarctica, such as polystyrene beads or chips.

Once in the field

Particular care should be taken in areas with sensitive biological, geological, paleontological, historical, archaeological and geomorphological features such as bird and seal colonies, roosting areas, vegetated areas, freshwater lakes and ponds, sand dunes, screes, fluvial terraces, fossil beds, fragile or vulnerable landforms (*eg*, patterned ground, unconsolidated or poorly consolidated sediments, biological soil crusts, weathering pits, water-saturated soils during summer melt periods, etc.), ice core pyramids and ventifacts.

Avoid unnecessary disturbance of Antarctic flora and fauna. Avoid areas where wildlife is easily disturbed, especially during the breeding season.

When taking samples (*ie*, geological, paleontological, biological, ice, etc.) take as small a sample as possible to minimise environmental impacts. Only take samples in accordance with the Environmental Impact Assessment undertaken for the activity and, where appropriate, any permits issued by an appropriate national authority.

The location of any spill, camp site, soil pit, drilling site, sampling site, experimental site, or any other disturbance should be recorded (preferably using a GPS), and reported to the appropriate national authority, for the benefit of future researchers.

Minimise impacts when moving around in the environment:

i. Stay on established trails where available.
ii. Avoid walking on vegetated areas, streambeds, lake margins, and delicate rock, landforms and soil formations.
iii. Restrict ground vehicle usage to snow and ice surfaces, or designated tracks, wherever possible.
iv. Where feasible, use recognized helicopter landing sites and ensure that markers for helicopter pads are clearly visible from the air.
v. Minimise the disturbance to wildlife by following the ATCM guidelines for operations of aircraft near concentrations of birds[6].
vi. Restore any disturbances caused by activities, as long as such restoration does not cause any further environmental impacts.
vii. Algae and invertebrates live beneath stones. Moving rocks and stones should therefore be minimised to the extent required for the work being undertaken.
viii. Do not build cairns.

Management of scientific field sites

Minimise environmental impacts of field sites:

i. Make sites no larger than needed for the proposed scientific activities.
ii. Keep sites tidy during use.

[6] ATCM Resolution 2 (2004) Antarctic Treaty Consultative Meeting XXVII – Cape Town.

iii. Avoid activities which could result in the dispersal of foreign materials into the environment. In particular, avoid the use of spray paint, wooden post markers, etc., and, where feasible, conduct activities such as sawing or unpacking inside a tent or hut.

iv. Secure equipment from being blown away or stolen by inquisitive birds (*eg*, skuas, penguins).

v. Wherever possible, all precautionary measures should be taken to ensure collection and removal of human waste and grey water.

When the work is complete, restore sites as far as feasible without creating further environmental impact. Remember that sites may require subsequent monitoring to comply with the Protocol for Environmental Protection to the Antarctic Treaty.

As it is important to prevent the introduction of foreign materials and contaminants into the environment:

i. Avoid materials liable to shatter at low temperatures, *e.g.*, polyethylene-based plastics.

ii. Take care when handling fuel, chemicals and isotopes (stable or radioactive) to avoid spills or unintentional release into the environment. Consider the recommendations in the CEP Clean-up Manual[7].

iii. Store and handle fuel and chemicals using appropriate containers.

iv. Use drip trays where possible when handling fuels or other liquids and take special care when handling fuel in high winds.

Report any environmental accident or incident to the appropriate national authority.

If equipment is planned to be installed in the field in the longer term:

i. Ensure an Environmental Impact Assessment is undertaken prior to any installation, as required by Annex I to the Protocol for Environmental Protection to the Antarctic Treaty.

ii. Clearly identify any equipment by country, name of the principal investigator and year of installation, and state the duration of the deployment.

iii. Make sure installations can be retrieved and removed when no longer required, unless it is impractical, or would result in a higher environmental impact, or have been identified as useful for long-term monitoring and/or research.

Do not displace materials or collect samples of any kind, except in accordance with the associated Environmental Impact Assessment and any required permits.

When undertaking research with live animals, consider the legal requirements of national authorities and those set out in *SCAR's Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica*.

Field camps

Camping and scientific equipment should be cleaned before being brought into the Antarctic or before being transferred between sites.

Minimise the environmental footprint of field camps by:

i. Camping on permanent snow or glaciers where possible and only if safe to do so.

ii. Locating camps as far as feasible from lake margins, stream beds and associated fans, and vegetated areas, to avoid damage or contamination.

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[7] Committee for Environmental Protection Clean-up Manual (http://www.ats.aq/documents/recatt/att540_e.pdf)

iii. Taking special care to ensure that no food or wastes are accessible to animals.

iv. Re-using campsites whenever possible.

v. Keeping camps tidy during use and restore, as far as is feasible and without causing any further environmental damage, after use.

vi. Using solar and wind power as much as possible to minimise fuel usage.

Ensure that equipment and supplies are properly secured at all times to avoid dispersion by high winds or helicopter downdrafts. Remember that in some locations high velocity katabatic winds can arrive suddenly and with little warning.

Remember that when working in an ASPA or ASMA, the area management plan may have additional requirements for field camps. Follow any conditions contained in the entry permit required for access to an ASPA. Visitor report forms[8] should be submitted to the appropriate national authority as soon as practicable.

Location-specific guidelines

Lakes and streams

Choose sampling equipment that is the least destructive to the aquatic or coastal environment. Sample carefully and avoid excessive and unnecessary sampling. Minimise cumulative impact if sampling repeatedly at a location over a long period or several field seasons. Use of dredges, trawls and box corers should be minimised.

Aquatic ecosystems in Antarctica are typically extremely poor in nutrients (except those with animal influence) and thus are sensitive to anthropogenic pollution. Measures should be put in place to minimise, as far as possible, release of human waste into the environment.

Avoid walking in streams and lake beds or too close to their margins as this may disturb biota and affect bank stability and water flow patterns. When a crossing must be made, use designated crossing points if available, otherwise walk on rocks if possible.

Minimise the use of vehicles on lake ice if possible. If access to the water body is required for scientific research, use non-motorised boats whenever possible.

Ensure that all sampling equipment is tethered or otherwise secured and does not contaminate the water body.

Clean all sampling equipment before using it in another water body in order to avoid cross-contamination. Alternatively, use separate equipment at different sites.

Wherever possible use flumes, not weirs, when monitoring streams to minimise any potential impacts of the study.

To the maximum extent practicable, avoid the use of stable isotope tracers at the complete ecosystem level, but rather use them in closed vessels. Consider the use of naturally occurring tracers in experiments. Radioactive isotope tracers should only be used in closed vessels or in *ex-situ* experiments. No stable or radioactive isotope tracer waste should be disposed into ecosystems. Document all tracer use (location, type of tracer, amount) and report this information to the appropriate national authority.

To avoid introduction of contaminants or disturbance of the stratification of the water body and its sediments:

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[8] See Appendix 2 of the Committee for Environmental Protection Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas. Resolution 2 – ATCMXXXIV CEP XIV – Buenos Aires (2011)

i. Do not swim or dive in lakes, unless it is required for scientific purposes.
ii. Remove all unwanted water and sediment materials from the site, even on permanently ice-covered lakes, rather than discharging them back into the lake.
iii. Ensure that nothing is left frozen into the lake ice that may ablate out.
iv. Consider using a remotely operated underwater vehicle (ROV) as a tool for underwater and under-ice research in lakes and coastal/littoral habitats.

Ice-free environments

Terrestrial vegetation includes very slow growing species and fragile growth forms. Damage by trampling may remain visible for years or even decades and further impact upon the many terrestrial invertebrate species that live in soils and feed on soil algae.

In high use areas, use existing trails where possible in order to avoid disturbing large areas of vegetation and/or soil or surface material. In lower use areas, consider whether trails or a dispersed pattern of travel would have least impact and implement accordingly. Local knowledge will often be a useful guide.

Clean all equipment and footwear, as far as is feasible, between sites to avoid transfer of soil and propagules among sites.

When sampling in vegetated areas, ensure that the site is restored as far as is feasible without causing any further environmental impact.

Limit the use of mechanical equipment for sample collection, whenever possible.

When sampling soil in desert areas, use groundsheets to contain excavated material to minimise the extent of damage to the desert pavement. Backfill soil pits and, as far as feasible, replace the desert pavement materials at the soil surface to restore the site appearance.

Do not disturb or remove rocks, minerals, fossils, meteorites or ventifacts unless it is necessary for the permitted research.

For specific guidance on undertaking scientific activities in terrestrial geothermally heated areas, please consult the *SCAR Code of Conduct for Activity within Terrestrial Geothermal Environments in Antarctica*.

Glaciers and ice fields

Remember that the use of water in hot water drills, and the use of other drilling fluids, could contaminate the isotopic and chemical record within the glacier ice.

Given that the hydrological systems under glaciers and ice sheets are connected to the wider environment and downstream contamination could occur, exercise caution when using chemical-based fluids to drill to the base of an ice sheet. Similar caution is necessary when drilling is made through ice shelves to ocean beneath. For further information on activities in subglacial environments, please consult *SCAR's Code of Conduct for the Exploration and Research of Subglacial Aquatic Environments*.

Appendix 3. Annex II to the Protocol on Environmental Protection to the Antarctic Treaty

CONSERVATION OF ANTARCTIC FAUNA AND FLORA

(for full text see: https://documents.ats.aq/recatt/Att432_e.pdf)

Article 1

DEFINITIONS

For the purposes of this Annex:

a) "native mammal" means any member of any species belonging to the Class Mammalia, indigenous to the Antarctic Treaty area or occurring there naturally through migrations;
b) "native bird" means any member, at any stage of its life cycle (including eggs), of any species of the Class Aves indigenous to the Antarctic Treaty area or occurring there naturally through migrations;
c) "native plant" means any member of any species of terrestrial or freshwater vegetation, including bryophytes, lichens, fungi and algae, at any stage of its life cycle (including seeds, and other propagules), indigenous to the Antarctic Treaty area;
d) "native invertebrate" means any member of any species of terrestrial or freshwater invertebrate, at any stage of its life cycle, indigenous to the Antarctic Treaty area;
e) "appropriate authority" means any person or agency authorised by a Party to issue permits under this Annex;
f) "permit" means a formal permission in writing issued by an appropriate authority;
g) "take" or "taking" means to kill, injure, capture, handle or molest a native mammal or bird, or to remove or damage such quantities of native plants or invertebrates that their local distribution or abundance would be significantly affected;
h) "harmful interference" means:
    (i) flying or landing helicopters or other aircraft in a manner that disturbs concentrations of native birds or seals;
    (ii) using vehicles or vessels, including hovercraft and small boats, in a manner that disturbs concentrations of native birds or seals;
    (iii) using explosives or firearms in a manner that disturbs concentrations of native birds or seals;
    (iv) wilfully disturbing breeding or moulting native birds or concentrations of native birds or seals by persons on foot;
    (v) significantly damaging concentrations of native terrestrial plants by landing aircraft, driving vehicles, or walking on them, or by other means; and
    (vi) any activity that results in the significant adverse modification of habitats of any species or population of native mammal, bird, plant or invertebrate.
i) "International Convention for the Regulation of Whaling" means the Convention done at Washington on 2 December 1946.
j) "Agreement on the Conservation of Albatrosses and Petrels" means the Agreement done at Canberra on 19 June 2001.

Article 3

PROTECTION OF NATIVE FAUNA AND FLORA

1. Taking or harmful interference shall be prohibited, except in accordance with a permit.

2. Such permits shall specify the authorised activity, including when, where and by whom it is to be conducted and shall be issued only in the following circumstances

a) to provide specimens for scientific study or scientific information;
b) to provide specimens for museums, herbaria and botanical gardens, or other educational institutions or uses;
c) to provide specimens for zoological gardens but, in respect of native mammals or birds, only if such specimens cannot be obtained from existing captive collections elsewhere, or if there is a compelling conservation requirement; and
d) to provide for unavoidable consequences of scientific activities not otherwise authorised under sub-paragraphs (a), (b) or (c) above, or of the construction and operation of scientific support facilities.

3. The issue of such permits shall be limited so as to ensure that:

a) no more native mammals, birds, plants or invertebrates are taken than are strictly necessary to meet the purposes set forth in paragraph 2 above;
b) only small numbers of native mammals or birds are killed, and in no case more are killed from local populations than can, in combination with other permitted takings, normally be replaced by natural reproduction in the following season; and
c) the diversity of species, as well as the habitats essential to their existence, and the balance of the ecological systems existing within the Antarctic Treaty area are maintained.

4. Any species of native mammals, birds, plants and invertebrates listed in Appendix A to this Annex shall be designated “Specially Protected Species”, and shall be accorded special protection by the Parties.

5. Designation of a species as a Specially Protected Species shall be undertaken according to agreed procedures and criteria adopted by the ATCM.

6. The Committee shall review and provide advice on the criteria for proposing native mammals, birds, plants or invertebrates for designation as a Specially Protected Species.

7. Any Party, the Committee, the Scientific Committee on Antarctic Research or the Commission for the Conservation of Antarctic Marine Living Resources may propose a species for designation as a Specially Protected Species by submitting a proposal with justification to the ATCM.

8. A permit shall not be issued to a Specially Protected Species unless the taking:

a) is for a compelling scientific purpose; and
b) will not jeopardise the survival or recovery of that species or local population;

9. The use of lethal techniques on Specially Protected Species shall only be permitted where there is no suitable alternative technique.

10. Proposals for the designation of a species as a Specially Protected Species shall be forwarded to the Committee, the Scientific Committee on Antarctic Research and, for native mammals and birds, the Commission for the Conservation of Antarctic Marine Living Resources, and as appropriate, the Meeting of the Parties to the Agreement on the Conservation of Albatrosses and Petrels and other organisations. In formulating its advice to the ATCM on whether a species should be designated as a

Specially Protected Species, the Committee shall take into account any comments provided by the Scientific Committee on Antarctic Research, and, for native mammals and birds, the Commission for the Conservation of Antarctic Marine Living Resources, and as appropriate, the Meeting of the Parties to the Agreement on the Conservation of Albatrosses and Petrels and other organisations.

11. All taking of native mammals and birds shall be done in the manner that involves the least degree of pain and suffering practicable.

APPENDICES TO THE ANNEX

APPENDIX A: SPECIALLY PROTECTED SPECIES

Ommatophoca rossii, Ross seal.

Appendix 4. ATCM: General guidelines for visitors to the Antarctic

The General Guidelines apply to all visitors and all activities in the Antarctic Treaty area[9]. All visits to Antarctica should be conducted in accordance with the Antarctic Treaty, its Protocol on Environmental Protection, and relevant Measures, Decisions and Resolutions adopted at Antarctic Treaty Consultative Meetings (ATCM). All activities must be subject to an Environmental Impact Assessment and must have prior approval/permission or meet all the requirements of the relevant National Competent Authority.

These Guidelines provide general guidance for visiting any location, with the aim of ensuring that visits do not have adverse impacts on the Antarctic environment, including wildlife and ecosystems, or on its scientific, wilderness and aesthetic values. ATCM Site Guidelines for Visitors provide additional site-specific advice for some locations. Guidelines concerning particular risks such as aircraft use, or avoiding the introduction of non-native species may also apply.

Consult these Guidelines before you visit Antarctica and plan how to minimize your impact.
If you are part of a guided visitor group, abide by these guidelines, pay attention to your guides, and follow their instructions. If you are the organizer of your own visit or the visit of a group and respective activities, you are responsible for abiding by these guidelines. You are also responsible for identifying the features of the sites you visit that may be vulnerable to visitor impacts, and for complying with any specific requirements related to protected areas, historic sites and monuments, activities or risks. Specific requirements can be included within ATCM Site Guidelines, Antarctic Specially Protected Area (ASPA) and Antarctic Specially Managed Area (ASMA) management plans, or station visit guidelines.

PROTECT ANTARCTIC WILDLIFE

WILDLIFE

- The taking of, or harmful interference with, Antarctic wildlife is prohibited.
- When in the vicinity of wildlife – either on land or at sea, move or maneuver slowly and carefully and keep noise to a minimum.
- Maintain an appropriate distance from wildlife to avoid disturbance. While in many cases a greater distance may be necessary, in general keep at least 5 m from wildlife on land. Abide by any guidance on distances in species- or site-specific guidelines.
- Always give animals the right of way and do not block their access routes between the sea and land, nesting places or other destinations.
- Animals may alter their behavior if disturbed. Observe wildlife behaviour. If wildlife changes its behaviour (standing when it was sitting, moving its head around alerted, start vocalizing when it was silent, etc.) stop moving, or slowly increase your distance.
- Stay outside the margins of a colony and observe from a safe distance. Animals are particularly sensitive to disturbance when they are breeding (including nesting) or moulting.
- Every situation is different. Consider the topography and the individual circumstances of the site, as these may have an impact on the vulnerability of wildlife to disturbance.

[9] It is acknowledged that exceptions to the application of elements of these guidelines may be made for scientific and official governemental activities if the realization of these activities so require and if prior approval has been given by the national competent authority and the activity meets all requirements oft he relevant national authority.

- Watch your steps for eggs, chicks or nest materials of skuas, penguins or petrels.
- Unmanned aerial vehicles must not be used in the vicinity of wildlife.
- Do not feed wildlife or leave food or scraps lying around.

VEGETATION

- Vegetation, including mosses and lichens, is fragile and very slow growing. Do not walk, drive or land on any moss beds or lichen covered rocks, in order to avoid damage.
- When travelling on foot, stay on established tracks whenever possible to minimize disturbance or damage to the soil and vegetated surfaces. Where a track does not exist, choose your route carefully, taking the most direct route while avoiding vegetation, fragile terrain, scree slopes, and wildlife.

INTRODUCTION OF NON-NATIVE SPECIES AND PATHOGENS

- Do not introduce any plants or animals into the Antarctic.
- In order to prevent the introduction of non-native species and disease, carefully wash boots and clean all equipment including clothes, bags, tripods, tents and walking sticks before bringing them to Antarctica. Pay particular attention to boot treads, Velcro fastenings and pockets which could contain soil or seeds. Vehicles and aircraft should also be cleaned.
- In order to prevent the transfer of non-native species and disease between locations in Antarctica ensure all clothing, boots and equipment are cleaned thoroughly before moving between sites and regions.

RESPECT PROTECTED AREAS AND STRUCTURES

ANTARCTIC SPECIALLY MANAGED AREAS (ASMAs) AND ANTARCTIC SPECIALLY PROTECTED AREAS (ASPAs)

- Activities in ASPAs and ASMAs must comply with the provisions of the relevant Management Plan and abide by any restrictions regarding the conduct of activities in these areas.
- A permit from a National Competent Authority is required for entry into any ASPA. Carry the permit and obey any permit conditions at all times while visiting an ASPA.
- Check the locations and boundaries of ASPAs and ASMAs in advance and refer to the provisions of their Management Plans (all can be found at the Antarctic Treaty Secretariat-website (www.ats.aq).

HISTORIC SITES AND MONUMENTS (HSMs) AND OTHER STRUCTURES

- Some historic huts have been designated as ASPAs and require a permit to visit. Visits must follow the provisions laid out in the respective management plan.
- Historic huts and structures can, in some cases, be visited for touristic, recreational and educational purposes. Visitors should not use them for other purposes except in emergency circumstances.
- Do not damage, remove, destroy or change any historic site, monument, or artefact, or other building or emergency refuge (whether occupied or unoccupied).
- Consult relevant ATCM Site Guidelines for Visitors for specific rules concerning historic sites, monuments, items or buildings and other structures in the vicinity.
- Before entering any historic structure, clean your boots of snow and grit and remove snow and water from clothes, as these can cause damage to structures or artefacts.
- Take care not to tread on any artefacts which may be obscured by sediments or snow when moving around historic sites.

- If you come across an item that may be of historic value that authorities may not be aware of, do not touch or disturb it. Notify your expedition leader or NCAs.
- A list of the formally designated HSMs can be found at the ATS-Website.

RESPECT SCIENTIFIC RESEARCH

- Some Antarctic stations may accept visitors where prior arrangements have been made. Obtain permission before visiting Antarctic stations.
- Reconfirm scheduled visits well in advance, or according to guidance provided by the manager of a station before arriving.
- In addition to these general guidelines, comply with any site-specific rules or visitor guidelines in place when visiting Antarctic stations.
- Do not interfere with or remove scientific equipment or markers, and do not disturb experimental study sites, field camps or stored supplies

KEEP ANTARCTICA PRISTINE – LEAVE NO TRACE OF YOUR VISIT

WASTE

- Do not deposit any litter or garbage on land nor discard it into the sea.
- no smoking except in designated areas at stations or camps, to avoid litter and risk of fire to structures. Collect ash and litter for disposal outside Antarctica.
- Ensure that wastes are managed in accordance with Annexes III (waste disposal) and IV (marine pollution) of the Protocol on Environmental Protection to the Antarctic Treaty.
- Ensure that all belongings, equipment and waste is secured at all times in such a way as to prevent dispersal into the environment through high winds or wildlife foraging.

WILDERNESS VALUES

- Do not disturb or pollute lakes, streams, rivers or other water bodies (e.g. by walking, washing yourself or your equipment, throwing stones, etc.)
- Do not paint or engrave names or other graffiti on any man-made or natural surface in Antarctica.
- Do not take souvenirs, whether man-made, biological or geological items, including feathers, bones, eggs, vegetation, soil, rocks, meteorites or fossils.
- Place tents and equipment on snow or at previously used campsites where possible.

BE SAFE

SAFETY PRECAUTIONS/ PREPARATIONS

- Be prepared for severe and changeable weather. Ensure that your equipment and clothing meet Antarctic standards. Remember that the Antarctic environment is inhospitable, unpredictable and potentially dangerous.
- Know your capabilities, the dangers posed by the Antarctic environment, and act accordingly. Plan activities with safety in mind at all times.
- Keep a larger safety distance from potentially dangerous or territorial wildlife like fur seals, both on land and at sea. Keep at least 15-25 m away where practicable.
- Be careful where you walk as seals can lie camouflaged on and among rocks. Keep a safety distance from sea ice edge and be cautious when stepping over cracks in the sea ice.

- Skuas are very territorial birds and will attack anyone approaching their nests by plummeting down on intruders. If this happens, retreat away from the point when the attack started.
- Any wildlife, even penguins, can cause serious harm. Do not underestimate risks.

- If you are travelling in a group, act on the guidance and instructions of your leaders. Do not stray from your group as survival in Antarctica can be a matter of minutes (especially in case of acute hypothermia).
- Do not walk onto glaciers or large snow fields without proper equipment and experience. There is a real danger of falling into hidden crevasses.
- Be vigilant in the vicinity of calving glaciers. Breaking pieces of ice can generate dangerous waves.
- Pay special attention when climbing rocks and/or boulders, as melting permafrost with changing temperatures lead to an increase risk of avalanches.
- Do not expect a rescue service. Self-sufficiency is increased and risks reduced by sound planning, quality equipment, and trained personnel.
- Enter emergency refuges only in case of an actual emergency. If you use equipment or food from a refuge, inform the nearest research station or the National Competent Authority that has approved/permitted the visitors activity in Antarctica once the emergency is over.
- Respect any smoking restrictions. Use of combustion style lanterns and naked flames in or around historic structures is strictly discouraged. Take great care to safeguard against the danger of fire. This is a real hazard in the dry environment of Antarctica.

LANDING AND TRANSPORT REQUIREMENTS

TRANSPORT

- Do not use aircraft, vessels, small boats, hovercraft or other means of transport in ways that disturb wildlife, either at sea or on land.
- Avoid flying over concentrations of birds and mammals. Follow the advice in Resolution 2 (2004) *Guidelines for the operation of aircraft near concentrations of birds in Antarctica*.
- Refilling of fuel tanks for small boats should take place in a way that ensures any spills can be contained, for example onboard a vessel.
- Check small boats are free of any soil, plants or animals prior to the commencement of any ship-to-shore operations.
- Small boats must at all times regulate their course and speed so as to minimize disturbance to wildlife and to avoid any collisions with wildlife.

SHIPS[10]

- Only one ship may visit a site at any one time.
- Vessels with more than 500 passengers shall not make landings in Antarctica.

LANDING OF PASSENGERS FROM VESSELS

- A maximum of 100 passengers may be ashore from a vessel at any one time, unless site specific guidance requires fewer passengers.
- During landings from vessels, maintain a 1:20 guide to passenger ratio at all sites, unless site specific advice requires more guides.

[10] A ship is defined as a vessel which carries more than 12 passengers

Appendix 5. Territories of South Georgia and the South Sandwich Islands Wildlife and Protected Areas Ordinance 2011

(for full text see: https://www.gov.gs/docsarchive/Legislation/Wildlife%20and%20Protected%20Areas%20Ordinance%202011-1.pdf)

PART II PROTECTION OF WILDLIFE

6. Protection of wild birds and mammals

(1) Subject to this Part, and except as permitted under a permit granted under section 21(1), a person commits an offence who intentionally or recklessly —

a) kills, injures, captures, handles or molests a wild bird or mammal;
b) administers any noxious substance to a wild bird or mammal;
c) damages or destroys the breeding site or the nesting place or nest of a native bird;
d) takes, destroys or damages an egg of a native bird; or
e) disturbs a breeding or moulting wild bird, the dependent young of any native bird, mammal or a concentration of wild birds or mammals.

(2) Subject to this Part, a person commits an offence who —

a) uses a vehicle, vessel or aircraft in a manner that disturbs a concentration of wild birds or mammals, or which disturbs any marine mammal of the Order Cetacea;
b) uses firearms or explosives in a manner that disturbs any wild birds or mammals; or
c) does anything that is likely to cause significant damage to the habitat of any wild bird or mammal.

7. Supplementary to section 6
(1) Where a person is charged with an offence in respect of a contravention of section 6(1)(a) of killing, injuring or molesting a wild bird or mammal), it is a defence for him or her to show that the act in question was done for the relief of the suffering of the wild bird or mammal in question.

(2) It is a defence for a person charged with an offence under section 6(1)(a) of capturing or handling a wild bird or mammal if he or she shows that the wild bird or mammal —

a) was captured or handled by him or her for the purpose of attending to any injury or disease suffered by it and thereafter returned it to the wild without unreasonable delay; and
b) if it was injured, the injury was not caused by an unlawful act on his or her part.

(3) It is a defence for a person charged with an offence under section 6(1)(b) of administering a noxious substance to a wild bird or mammal to show that the noxious substance was reasonably used by him or her in providing treatment in relation to any injury or disease suffered by the wild bird or mammal. Protection of other native fauna

Other offences in relation to wildlife

10. Unlawful possession of live or dead wildlife
Subject to this Part and except as permitted under a permit granted under section 21(1), a person commits an offence if he or she knowingly has in his or her possession, transports, sells, exchanges or offers for sale or exchange —

(a) any live or dead wild bird, mammal, native invertebrate or native plant;

(b) any egg of a native bird; or
(c) any part of, or anything derived from, such a wild bird, mammal, native invertebrate, egg of a native bird or native plant.

Appendix 6. Government of South Georgia & the South Sandwich Islands 'Code of conduct whilst ashore' and 'Wildlife protection guidelines'

Code of Conduct Whilst Ashore

When ashore:

- Visitors must know their capabilities and also the dangers posed by South Georgia's environment, and act accordingly. Plan activities with safety in mind at all times.
- Visitors should take note of, and act on, the advice and instructions from leaders and staff. Do not stray from the group.
- Be prepared for severe and changeable weather. Ensure that equipment and clothing are of sufficient strength and quality to withstand Antarctic conditions. South Georgia's weather is unpredictable, when ashore be prepared for the worst, however pleasant it may seem when setting out.
- Do not walk on to glaciers or snowfields without proper equipment and experience. Surface conditions are constantly changing, particularly in the present period of glacial retreat.
- Avoid walking on fragile vegetation; A footprint on a moss bank may remain there a long time. Trampling of vegetation, especially in wet and peaty soils, can cause significant erosion over time. Moss beds and the margins of streams and lakes are particularly fragile.
- Do not collect anything. This includes shells, stones, plants, skulls, bones, teeth and eggs. No items or scientific specimens may be removed from South Georgia without an export permit from GSGSSI. Under the Wildlife and Protected Areas Ordinance the removal of any item without a permit is an offence.
- Be careful when taking photographs or filming. Never disturb plants or animals to get better pictures. Do not use flash photography for animal photographs. A respectful distance from wildlife should be maintained between you and the animal, including the use of 'selfie sticks' and other equipment.
- Always give wildlife the right of way (see wildlife protection guidelines).
- Firearms must not be brought into South Georgia.
- Remove all rubbish.
- Do not pollute lakes or streams.
- Do not remove, disturb or destroy any historical artefacts.
- Do not paint or engrave names or graffiti on rocks or buildings; or deface or vandalise any field huts or other structures.
- Avoid marked sites where scientific experiments are being conducted and do not disturb any scientific equipment.
- Do not smoke. Do not light camp fires.

Wildlife Protection Guidelines

It is the responsibility of everyone to minimise their personal impact on the environment by observing the following guidelines. The guidelines are legally enforced through the Wildlife and Protected Areas Ordinance (2011, as amended). In addition, IAATO staff must ensure that IAATO codes of conduct are adhered to.

- Do not disturb mammals or birds and always maintain a respectful distance.
- Do not use vessels, small boats, or other means of transport in ways that disturb wildlife, whether at sea or on land.
- Stay on the edge of animal groups, approaching slowly and quietly. Do not use flash photography. Avoid surrounding the groups. Back-off immediately if mammals or birds show any sign of being disturbed. If animals are responding to your presence, you are too close.
- Never disturb territorial seals, or seals in breeding colonies to affect a landing, or cause disturbance by cruising offshore in close proximity.
- Do not offer food to any animal. This avoids animals becoming dependent on un-natural food sources, prevents the spread of avian diseases and protects visitors from potential injury.
- Rigorously adhere to biosecurity measures (see separate Biosecurity Handbook).
- Be alert whilst ashore, particularly in tussac grass. Take care to avoid stumbling inadvertently upon a fur seal or a nesting bird, or causing damage to seabird burrows, both in tussac and on scree. Return to the shore if a high density of burrows is encountered.
- Do not touch animals. This may cause substantial stress and disturbance, and may jeopardize the bond between parent and offspring and lead to an aggressive response from the animal.
- The use of Unmanned Aerial Vehicles (UAVs), (also known as drones and quadcopters) for recreational purposes is not permitted. UAVs can only be operated, if permitted in advance by GSGSSI (Regulated Activity Permit for approved use in support of either science or media).

The Wildlife and Protected Areas Ordinance (2011) is available online at www.gov.gs. Failure to comply with Wildlife Protection Guidelines and Biosecurity Protocols could result in prosecution for the individual(s) involved.

It is important that we collect accurate and complete data on bird strike incidences. This information is used to will help us better understand the issue and to develop appropriate mitigation measures. All bird strikes (including birds released unharmed) must be recorded and reported in the GSGSSI Bird strike report form and emailed to the Government Officers whenever a bird strike occurs.

Appendix 7. Antarctic Treaty Consultative Meeting 'Guidelines for the operation of aircraft near concentrations of birds in Antarctica'. Annex to Resolution 2 (2004)

Fixed and rotary wing aircraft operations have the potential to cause disturbance leading to changes in the behaviour, physiology and the breeding success of wildlife. The level of impact will vary according to the intensity, duration and frequency of disturbance, the species involved and the phase in their breeding season. Most species are particularly sensitive to disturbance between late September and early May-the period when Antarctic helicopter and fixed wing operations usually occur.

There are many variables affecting noise levels received on the ground during aircraft operations, including: flight height; the type of aircraft and engine; the flight profile; the weather; and the geography of the location. Pilots have to make the final judgment regarding aircraft operations based on the aircraft type, task and safety considerations. Such judgments should also pay due consideration to potential wildlife impacts, noting that Annex II of the Protocol on Environmental Protection to the Antarctic Treaty defines that "harmful interference" means flying or landing helicopters or other aircraft in a manner that disturbs concentrations of birds and seals".

Minimum recommended separation distances for aircraft operations close to concentrations of birds are set out below. These recommended distances should be maintained to the greatest extent possible, unless greater separation distances are specified for the area of operation, for example by an ASPA or ASMA management plan or guidelines already developed by national operators to suit their own particular needs and circumstances. These distances are only a guide and if wildlife disturbance is observed at any separation distance, a greater distance should be maintained wherever practical:

- Penguin, albatross and other bird colonies are not to be over flown below 2000ft (~ 610 m) Above Ground Level, except when operationally necessary for scientific purposes.
- Landings within 1/2 nautical mile (~ 930 m) of penguin, albatross or other bird colonies should be avoided wherever possible.
- Never hover or make repeated passes over wildlife concentrations or fly lower than necessary.
- Maintain a vertical separation distance of 2000 ft (~ 610 m) AGL and a horizontal separation of 1/4 nautical mile (~ 460 m) from the coastline where possible.
- Cross the coastline at right angles and above 2000ft (~610 m) AGL where possible.

Location of aircraft operations (other considerations)

- Where practical, avoid overflying concentrations of birds.
- Be aware that concentrations of birds are most often found in coastal areas. Snow petrel and Antarctic petrel colonies are also frequently found inland on nunataks. Minimum vertical separation distances should be maintained in these areas.
- Where practical, landings near to concentrations of birds should be downwind and/or behind a prominent physical barrier (e.g. hill) to minimise disturbance.

- Avoid Antarctic Specially Protected Areas, unless authorised to over-fly and/or land by a permit issued by an appropriate national authority. For many ASPAs there are specific controls on aircraft operations, which are set out in the relevant Management Plans.
- Follow aircraft flight heights, preferred flight paths and approach paths contained in the Antarctic Flight Information Manual (AFIM), in station aircraft operation manuals and on relevant charts, maps and any Wildlife and Low Flying Avoidance Maps for the major airstrips in the Antarctic (e.g. Marsh, Marambio, Rothera, McMurdo).
- Particularly avoid flying toward concentrations of birds immediately after take-off and avoid steep banking turns in flight as these significantly increase the amount of noise generated.

Timing of aircraft operations

- Most native bird species breed at coastal locations in Antarctica between September and May each season. During the planning of aircraft operations near to concentrations of birds, consideration should be given to undertaking flying activities outside of the main breeding and/or moulting periods.
- Where aircraft operations are necessary close to concentrations of birds, then the duration of flights should be the minimum necessary.
- To minimise bird strikes, especially in coastal areas, avoid flying after dark between September and May. At this time of year, prions and petrels are active. These birds are nocturnal when breeding and are attracted by lights.
- Aircraft operations should be delayed or cancelled if weather conditions (e.g. cloud base, winds) are such that the suggested minimum vertical and horizontal separation distances given in these guidelines cannot be maintained.

Appendix 8. Environmental Guidelines for operation of Remotely Piloted Aircraft Systems (RPAS) in Antarctica. Annex to Resolution 4 (2018)

Introduction

Deployment of Remotely Piloted Aircraft Systems (RPAS) can, in some circumstances, reduce or avoid environmental impacts that might otherwise occur. Their use may also be safer and require less logistical support than other means of deployment for the same purpose.

These Environmental Guidelines for operation of RPAS in Antarctica aim to assist implementation of Environmental Impact Assessment (EIA) requirements and aid decision-making for use of RPAS through provision of guidance based on current best available knowledge.

System failures and/or RPA loss in Antarctica may release waste into the environment. The short and long-term impacts of RPAS, including of noise and visual intrusion on Antarctic wildlife, are presently not well understood, and there remain uncertainties about the extent to which RPAS have the potential to cause environmental impacts. As such, there is a recommendation to proceed with a precautionary approach to use of RPAS in Antarctica at the same time as seeking to maximise the many potential scientific, logistic and other benefits of RPAS technology.
It is recognised that in some cases it may be desirable deliberately to operate close to fauna or flora to meet specific scientific or other objectives that have been assessed in the EIA or permitting process. Scientific understanding of the impacts of RPAS on Antarctic wildlife is currently not well developed, with limited knowledge of physiological or long-term demographic effects. Species vary widely in the extent to which they appear to be affected by RPAS operations, and this may also vary by many other factors such as breeding stage, local conditions, etc. Behavioural displays, or their lack, are not necessarily clear indicators of the level of disturbance occurring to wildlife. RPAS operations over or near wildlife should be sufficiently justified taking into account potential for disturbance through the EIA or permitting process.

Guidelines to address aspects of RPAS in Antarctica are available from the Council of Managers of National Antarctic Programs (COMNAP), and a number of competent authorities have also prepared practical manuals for RPAS use within national programmes. RPAS users are referred to these guidelines for essential additional information, particularly related to operational and safety aspects (see Appendix 1).

Pre-deployment Planning and Environmental Impact Assessment (EIA)

1 Requirements of the Madrid Protocol and its Annexes

1.1 Any proposed activities undertaken in the Antarctic Treaty area shall be subject to the procedures set out in Annex I of the Madrid Protocol for prior assessment of the impacts of those activities on the Antarctic environment.
1.2 Flying or landing an aircraft in a manner that disturbs concentrations of birds and seals is prohibited in Antarctica, except in accordance with a permit issued by an appropriate authority under Annex II to the Madrid Protocol.
1.3 Removal of wastes from Antarctica, including electrical batteries, fuels, plastics, etc. is required by Annex III5, which should be considered in contingency plans for lost or damaged RPAS as part of the Environmental Impact Assessment (EIA).
1.4 A permit issued by an appropriate national authority is required to enter an Antarctic Specially

Protected Area (ASPA)6, and special requirements to operate RPAS may apply within an ASPA or an Antarctic Specially Managed Area (ASMA): any planned RPAS operation within ASPAs or ASMAs, including any overflight of these areas, must be in accordance with the respective ASPA or ASMA Management Plan.

2 General considerations

2.1 When planning RPAS use in Antarctica, the current approved versions of the documents listed in Appendix 1, which include, inter alia, recommendations, guidelines, Codes of Conduct and manuals prepared by the Antarctic Treaty Parties, SCAR and COMNAP and also recent published scientific papers such as those listed in Appendix 2 may be helpful additional considerations to these guidelines.

2.2 Consider the relative environmental advantages and disadvantages of RPAS and other alternatives, and consider the environmental characteristics of the RPAS and the values present at the proposed location(s) of operation, weighing up both the benefits and environmental impacts of RPAS use.

2.3 Undertake detailed pre-flight planning, including thoroughly assessing the particularities of the operational site in advance of deployment, to ensure an appropriate understanding of its topography, weather and any hazards that may impact upon an environmentally sound operation. Where possible, carry out simulated flights using software tools.

2.4 Map out flight plans, prepare contingency plans for incidents or malfunctions, including alternative landing sites and plans for RPA retrieval should there be a crash.

2.5 Assess the particularities and dynamics of the values that could be affected at the site, including the species of fauna and flora present, their numbers and/or extent, and where they are located to assess their concentrations, as part of the environmental impact assessment process and mission planning. Where appropriate, adjust flight plans, including the timing of the mission to avoid sensitive breeding periods (including for all species that may be present in addition to any study species), so that potential disturbance is minimised.

2.6 Identify any specially protected sites (eg, ASPAs, ASMAs, Historic Sites and Monuments (HSMs) and any special zones within these areas), or sites subject to Antarctic Treaty Visitor Site Guidelines, in the vicinity of planned RPAS operations and ensure any overflight restrictions specified in their management plans or site guidelines are followed.

2.7 Consider options and contingencies carefully in the EIA before planning to operate in and over potentially environmentally sensitive areas (eg, wildlife colony, or extensive vegetation cover that could be impacted by trampling), or where retrieval of a lost RPA would be difficult or impossible, while recognising that such areas may also be of particular interest for RPAS surveys.

2.8 If you plan to operate RPAS from boats or ships, be aware of elevated risks of collisions with flying birds that often follow ships.

2.9 Where multiple RPAS operations are anticipated to occur in the same area or repeatedly over time, consider in the EIA the potential for cumulative environmental impacts.

3 RPAS Characteristics

3.1 Carefully select the type of RPAS and sensors that will be most appropriate for fulfilling the objectives of planned air operations and where possible use Best Available Technology to minimise environmental impacts. Carry out test flights outside Antarctica to verify your choice (eg, testing sensor capabilities at different flight altitudes, and where practicable selecting sensors or lenses that allow greater separation distances from wildlife).

3.2 Consider selecting RPA models with the lowest practicable noise levels, and models with non-

threatening shapes, sizes and/or colours, for example that do not closely resemble aerial predators likely to be present at the site of operation to minimise stress on prey species and/or attacks by territorial species.
3.3 Ensure the RPAS is well-maintained and operates reliably before deployment to reduce risk of failure and loss. The use of RPAS equipped with a Return To Home (RTH) feature is recommended. Ensure sufficient power or fuel to accomplish missions. For electric RPAS closely monitor battery capacity and performance, which varies with conditions. For combustion RPAS, check there are no fuel leaks, that fuel caps are secure, use best practice when handling fuel and refuelling and ensure that fuel spillage counter-measures are in place.
3.4 To reduce the risk of non-native species introductions, ensure that the RPAS and all associated equipment and carrying cases are clean and free of soil, vegetation, seeds, propagules or invertebrates prior to shipment to Antarctica. To reduce the risk of species transfer within Antarctica, carefully clean RPAS and associated equipment after use and prior to use at another site.

4 Operator Characteristics
4.1 RPAS pilots should be well-trained and experienced before undertaking operations on-site in Antarctica.
4.2 Before operating in Antarctica, RPAS test flights should be undertaken in a variety of conditions by the pilot that will be operating in Antarctica with the specific type, model and payload of RPAS that will be deployed.
4.3 RPAS operations should comprise a pilot and, as appropriate, at least one observer. Pilots should have good knowledge of the environmental requirements as listed in Section 1, and all aspects of the planned site of operations before deployment to the field, including site sensitivities and potential hazards.

On-site and In-flight Operations
5 General considerations
5.1 Pilots and any designated observers should operate within Visual Line Of Sight (VLOS) with the RPA at all times, unless the operation is approved by a competent authority to operate "Beyond Visual Line Of Sight (BVLOS)".
5.2 Pilots and any designated observers should be vigilant during operations and maintain good communications with each other throughout operations, watching for wildlife moving into the area of operations.
5.3 Complete flight operations with number and duration of flights as practicable, while still achieving mission objectives.

6 Operations over or near wildlife
6.1 Select RPAS launch/landing site(s) carefully, considering topography and other factors (eg, prevailing wind direction) that may influence selection of the optimal distance from wildlife. Where practicable, consider locating RPAS launch/landing sites out of sight (bearing in mind any requirements to operate within VLOS) and downwind from concentrations of wildlife, and as far away from wildlife as possible.
6.2 Consider the noise level emitted by the RPA during launch and flight to inform decisions about the location of launch/landing site and flight altitude, taking into account the influence of wind conditions on noise at ground level.

6.3 Where practicable, consider attaining flight altitude while avoiding unnecessary overflight of wildlife.
6.4 Where practicable, consider operating RPAS at times of the day or year when the risk of disturbance to species present is minimised.
6.5 During VLOS operations, pilots and any designated observers should be aware of and monitor the proximity and behaviour of predators that could attack animals or their young within the area of RPAS operations, or attack the RPA to present significant risk of collision. Should proximity of predators be observed and if their behaviour is observed to exceed levels of disturbance deemed acceptable in approvals for the activity, RPAS operations should be modified or ceased.
6.6 To the extent practicable, consider avoiding unnecessary or sudden RPA manoeuvres over wildlife, or flying RPA directly at or from above wildlife, and if possible fly in a grid flight pattern while still achieving mission objectives.
6.7 Fly as high as practicable and not lower than necessary when operating near or over wildlife. Where operation of RPA near wildlife is necessary, exercise minimum wildlife disturbance flight practices, maintaining a precautionary distance from wildlife at all times during flight which ensures that no visible disturbance occurs. Wildlife reactions to RPA vary extensively, for example depending on the species, their breeding status, the flight altitude and whether flight approaches are either horizontal or vertical.
Where multiple species are present, follow the most precautionary approach and if wildlife disturbance is observed at any separation distance, a greater distance should be maintained.

6.8 Pilots and any designated observers should operate with special care near cliffs where birds may be nesting, and where practicable maintain the horizontal separation distance. During VLOS operations, pilots and any designated observers should watch for, and inform each other of, signs of wildlife disturbance. They should be mindful that outward behavioural displays may not be a good indicator of the actual level of stress being experienced by wildlife, which should also be taken into account in the EIA and planning phase. Should wildlife disturbance be observed to exceed levels deemed acceptable in approvals for the activity, pilots should adopt a precautionary approach by considering increasing RPA distances from animals if safe to do so, and considering ceasing operations if disturbance persists.
6.9 When BVLOS operations over or near wildlife concentrations are planned, consider the practicality of placing an observer nearby to note potential behavioural changes and inform the pilot.

7 Operations over terrestrial & freshwater ecosystems
7.1 Pilots and observers should take care to minimise disturbance to sensitive geological or geomorphological features (eg, geothermal environments, fragile surface features such as crusts or sedimentary deposits), soils, rivers, lakes and vegetation in the area of RPAS operations, and conduct their activities, including walking over the site, so as to avoid sensitive sites to the maximum extent practicable.
7.2 Should it be necessary to make an unplanned landing and/or retrieve an RPA from an unfamiliar area, the pilot and/or observer should be especially careful to minimise disturbance to site features that may be sensitive, such as wildlife, vegetation or soils.

8 Human considerations
8.1 To the extent practicable, avoid operating RPAS over Historic Sites or Monuments (HSMs) to minimise the risk of RPA loss at these sites. Should retrieval of a failed RPA within an HSM be

necessary, notify the appropriate authority and receive advice before undertaking any action.
8.2 RPAS operators should be aware that many people value Antarctica for its remoteness, isolation and aesthetic and wilderness values. Respect the rights of others to experience and appreciate these values, and where practicable adjust flight operations (eg, timing, duration, distance) to avoid or minimise intrusion.

Post-flight Actions and Reporting

9 Actions

9.1 In the event of an unplanned forced landing or crash, and mindful of the obligations for removal of waste from Antarctica in accordance with the Madrid Protocol (see Item 1.3), retrieve the RPA if:

• It is safe to do so;
• There is a risk that human life, wildlife or important environmental values are endangered, in which case notify the competent authority and as appropriate emergency procedures should be taken to neutralise the risk;
• The environmental impact of removal is not likely to be greater than that of leaving the RPA in situ;
• The RPA does not lie within an ASPA for which you do not have a Permit for entry, unless the RPA poses a significant threat to the values of the ASPA in which case notify the competent authority and as appropriate emergency procedures should be taken to neutralise the risk.

9.2 If a lost RPA cannot be retrieved, notify the competent authority, providing details of the last known position (GPS coordinates) and the potential for any environmental impacts.

10 Reporting and updating these Guidelines

10.1 Observe and record animal reactions before, during and after RPAS flights, preferably by a dedicated observer rather than the pilot who should be principally focused on RPA systems and control.
10.2 Post-activity reporting should be completed in accordance with the EIA and/or permitting associated with the activity. Consider including details of any environmental impacts and consider how such impacts may be avoided in the future. Where practicable, consider using a standard format to report this information (eg, see forms provided in the COMNAP RPAS Operator's Handbook), and consider making the information accessible in order to improve RPAS environmental best practices in the future.
10.3 RPAS operators are encouraged to carry out further research into the environmental impacts of RPAS to help minimise uncertainties, undertake regular reviews of the research, and publish observations in the literature to help refine and improve these Best Practice Environmental Guidelines for the operation of RPAS in Antarctica.

Appendix 1: Selected technical documents relevant to environmental guidelines for Remotely Piloted Aircraft Systems (RPAS) in Antarctica

• Antarctic Treaty Parties, Resolution 2 (2004) Guidelines for the Operation of Aircraft Near Concentrations of Birds in Antarctica.
• Antarctic Treaty Parties, Committee for Environmental Protection Non-Native Species Manual (Version 2017).
• COMNAP (Council of Managers of National Antarctic Programs) 2017. Antarctic Remotely Piloted Aircraft Systems (RPAS) Operator's Handbook. Version 7, 27 November 2017.
• IAATO (International Association of Antarctica Tour Operators) 2016. IAATO Policies on the use of Unmanned Aerial Vehicles (UAVs) in Antarctica: update for the 2016/17 season. Information Paper

120, XXXVIII ATCM held in Santiago, Chile, 23 May – 01 Jun 2016.
- ICAO (International Civil Aviation Organisation) 2015. Manual on Remotely Piloted Aircraft Systems (RPAS) First Edition. International Civil Aviation Organization Document 10019. Montréal, Canada.
- SCAR Code of Conduct for Terrestrial Scientific Field Research in Antarctica (2009).
- SCAR Code of Conduct for Activity within Terrestrial Geothermal Environments in Antarctica (2016).