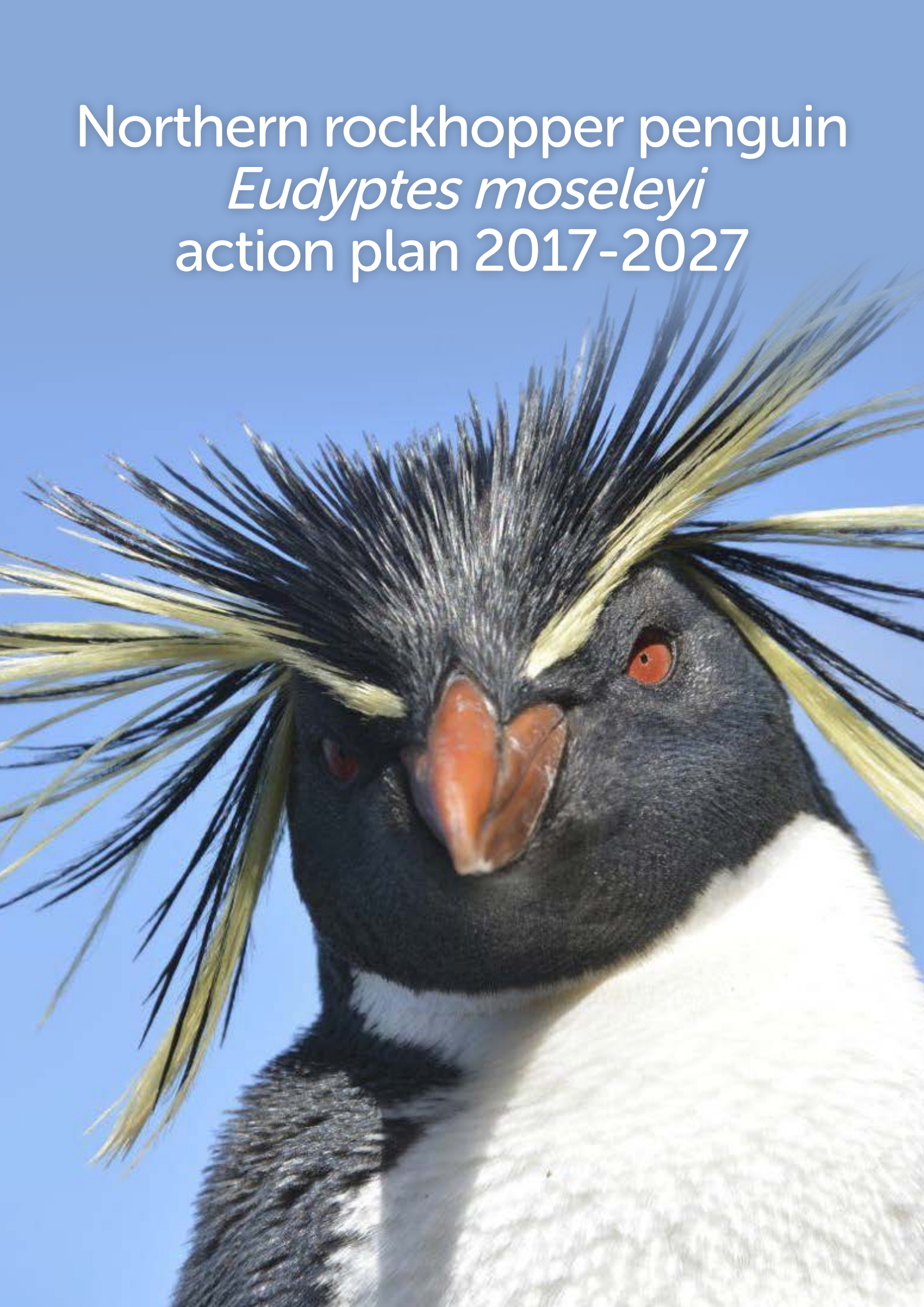
Northern rockhopper penguin *Eudyptes moseleyi* action plan 2017-2027



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Northern rockhopper penguin *Eudyptes moseleyi* action plan 2017-2027

FOREWORD

Strategic planning for species is one of the three key elements in the assessment-planning-action cycle promoted by the IUCN Species Survival Commission. Species Action Plans provide global frameworks developed by stakeholders to foster cooperation, identify priority actions, and inform decisions on allocation of limited human and financial resources. Species strategies and action plans also contribute to the Convention on Biological Diversity's Aichi Target 12 on improving the status of threatened species.

The SSC's strategic plan for the 2017-2020 quadrennium sets a target for the number of plans to be produced and this Northern Rockhopper Penguin Action Plan represents a valued contribution towards achieving this target.

Penguins are sentinel species informing humans about problems both on land and in the water. The remote islands in the southern Atlantic and Indian Oceans where this penguin breeds are of global importance not only for their breeding colonies of seabirds but because of the endemic species of flora and fauna they have. Some of the islands these penguins use are among the most pristine environments left on earth.

The action plan for the Northern Rockhopper penguin is the product of a collaborative effort among over 15 key stakeholders, government research agencies, local administrations, and international NGOs, who have devoted considerable time and effort over many years into conserving the Northern Rockhopper.

On behalf of the IUCN SSC Penguin Specialist Group, we congratulate and commend all partners for their work on preparation and production of this action plan. We urge all stakeholders including governments to implement the goals, objectives and actions of the plan.

Pablo Garcia Borboroglu and **P. Dee Boersma**
Co-chairs IUCN SSC Penguin Specialist Group

Northern rockhopper penguin *Eudyptes moseleyi* action plan 2017-2027

EXECUTIVE SUMMARY

- Northern rockhopper penguins *Eudyptes moseleyi* (NRP) are listed as Endangered on the IUCN Red List due to significant population declines combined with a limited distributional range and increasing land and sea-based threats.
- The northern rockhopper penguin occurs in the South Atlantic and Indian oceans, breeding on seven islands, five in the Tristan da Cunha group in the South Atlantic (UK Overseas Territories), and Amsterdam and St Paul islands in the southern Indian Ocean (French Southern Territories).
- The northern rockhopper penguin is an iconic species of cultural importance to the residents of Tristan da Cunha and of value to tourism.
- The reasons behind the declines are poorly understood, but changes to the marine environment, including climate change, changing sea temperatures, reduction or displacement of prey, diseases, and oil pollution are among the suspected causes.
- This action plan synthesises the results from an Action Planning workshop held at the Royal Zoological Society of Scotland in October 2017 and the knowledge and input from >15 key stakeholders and experts from governmental, non-governmental and research organisations to detail the actions needed to secure populations of the northern rockhopper penguin into the future. Some key actions required are:
  - Establishment of a better knowledge base for the understanding of northern rockhopper penguin ecology and the marine processes that might be affecting its decline. This requires, in particular, the maintenance of infrastructure and funding for the routine monitoring that will underpin the development of this knowledge base.
  - To urgently investigate the causes of recent breeding failure on Amsterdam and St Paul and establish mitigation measures.
  - The protection of breeding and foraging sites through the designation of protected areas.
  - The development of safeguards and processes to ensure that future increases to tourism occur in a way that is sustainable and can benefit the conservation of rockhopper penguins.
  - The development of a scientific evidence-base to inform future discussions around the egg harvesting on Tristan da Cunha.
  - The strengthening of the dissemination of the outputs of northern rockhopper penguin research and conservation actions to all stakeholders, particularly involving those with guardianship responsibilities for the species (i.e. the local community and tourists). A severe constraint on this currently is the quality of internet connectivity to Tristan da Cunha.

CONTENTS

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ABBREVIATIONS AND ACRONYMS

AO	Atlantic Ocean
BAP	Biodiversity Action Plan
BAS	British Antarctic Survey
CEBC-CNRS	Centre d'Etudes Biologiques de Chizé-Centre National de la Recherche Scientifique
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CEP	Comité de l'environnement polaire
DEA	Department of Environmental Affairs (South Africa)
DEFRA	Department of Environment, Food and Rural Affairs
EAZA	European Association of Zoos and Aquaria
EU	European Union
FCO	Foreign and Commonwealth Office
IMO	International Maritime Organization
IO	Indian Ocean
IPEV	Institut Polaire Français Paul-Émile Victor
IUCN	International Union for the Conservation of Nature
JNCC	Joint Nature Conservation Committee
mIBA	Marine Important Bird Area
MMO	Marine Management Organisation
MYA	Million years ago
NMU	Nelson Mandela University
NRP	Northern rockhopper penguin
ODA	Overseas Development Authority
OT	Overseas Territory
PSSA	Particularly Sensitive Sea Area
RSPB	Royal Society for the Protection of Birds
RFMO	Regional Fisheries Management Organisation
RZSS	Royal Zoological Society of Scotland
SO	Southern Ocean
TAAF	Terres Australes et Antarctiques Françaises
TCD	Tristan da Cunha Conservation Department
TOM	Territoire d'outre-mer
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHS	World Heritage Site

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1. INTRODUCTION

Northern rockhopper penguins *Eudyptes moseleyi* (NRP) are listed as Endangered on the IUCN Red List due to significant population decline combined with a limited distributional range and increasing land and sea-based threats. The specific factors behind the declines are poorly understood, but changes to the marine environment, including climate change, changing sea temperatures, reduction or displacement of prey, diseases, and oil pollution are among the suspected causes (BirdLife International 2017).

A workshop took place at the Royal Zoological Society of Scotland in Edinburgh, 25-26 October 2017, to develop an action plan for the NRP. The workshop was attended by 16 representatives of key organisations involved in the conservation of the species. A second smaller meeting, including a representative from CEBC-CNRS, was held in Cambridge on 18 January 2018 to align inputs from the Atlantic and Indian Ocean breeding sites. A revised draft was later circulated to all participants and other stakeholders and further amended to take into account all comments. Appendix 1 lists participants and contributors and Appendix 2 the Edinburgh workshop agenda.

2. STATUS REVIEW

The following summary is based on Cuthbert et al. (2009, 2013), Birdlife International (2017) and supplemented by information presented at the 2017 workshop and 2018 meeting.

2.1 Nomenclature

Scientific name:
Eudyptes moseleyi; Mathews & Iredale, 1921

English:
Northern rockhopper penguin; Pinnamin (Tristan da Cunha)

French:
Gorfou sauteur du nord, Gorfou sauteur d'Amsterdam

2.2. Taxonomy

This is one of seven species of crested penguins (genus *Eudyptes*). It was formerly considered a subspecies of E. *chrysocome* but is currently recognised by the IUCN as a separate species from the southern rockhopper penguin E. *chrysocome*. The two species are broadly similar in appearance but northern rockhoppers differ from southern rockhopper in having a wider supercilium and longer crest plumes. The northern and southern rockhoppers have been split into two species on the basis of genetic analysis of mitochondrial DNA sequence data (Banks et al. 2006, Jouventin et al. 2006, de Dinechin et al. 2009). These studies revealed that genetic differentiation between northern and southern rockhopper penguin occurred approximately 0.9 million years ago. This timing corresponds with a significant shift in marine isotherms during the mid-Pleistocene climate transition, which resulted in a movement of the subtropical convergence zone. Gough and Tristan da Cunha became surrounded by subtropical watermass creating a barrier to those in the southern Atlantic.

The sequence of island emergence appears to have shaped the species' population structure: Nightingale island (Tristan Archipelago) emerged around 18 MYA, Gough 3-5 MYA, Inaccessible (Tristan Archipelago) 3-4 MYA, Tristan 0.2 MYA, Amsterdam 0.4-0.2 MYA, St Paul <0.2 MYA. Penguins colonised Amsterdam and St Paul from the Gough and Tristan Group in the Atlantic, with immigration being facilitated by prevailing easterly currents (de Dinechin et al. 2009).

Current taxonomic classifications are based on a relatively small sample of both individuals and genes and further investigation, especially of the nuclear genome, may shed further light on both population genetic differentiation and speciation processes, the patterns of geneflow between island and the genetic impact of vagrants (see 2.4).

2.3 Description

E. moseleyi is among the smallest penguin species, reaching about 55 cm in length. It has slate-grey upperparts, white underparts, red eyes with a bright yellow eyebrow ending in long yellow plumes, and spiked black feathers on the top of the head. The English name derives from their agility in moving over steep rocks.

2.4. Distribution

The northern rockhopper penguin occurs in the temperate South Atlantic and Indian oceans, breeding on seven islands between 37–40°S, five in the Tristan da Cunha group in the South Atlantic (UK Overseas Territories) and Amsterdam and St Paul islands in the southern Indian Ocean (French Southern Territories) (Figure 1). The breeding distribution lies north of the Sub-Tropical Convergence Zone, except for Gough Island, which lies just south of this frontal system.

Outside the breeding season, the penguins forage widely in the Southern Oceans (SO). Vagrants have been recorded from South Africa (Rollinson et al. 2013); Falkland Islands/Malvinas (Matias et al. 2009, Crofts and Robson 2015); New Zealand (Moors and Merton 1984) and Kerguelen (de Dinechin et al. 2007). Analysis of mitochondrial DNA revealed that one bird captured on Kerguelen had come from Gough Island, c. 6,000 km away, and not the nearer colonies of Amsterdam and St Paul (de Dinechin et al. 2007). Another adult bird was recorded on Kerguelen in 2017 (C. Bost, pers. comm) which was of unknown provenance. The first breeding attempt of a northern with a southern rockhopper penguin, was recorded in 2014 on East Falkland, raising a chick which later died (Crofts and Robson 2015).

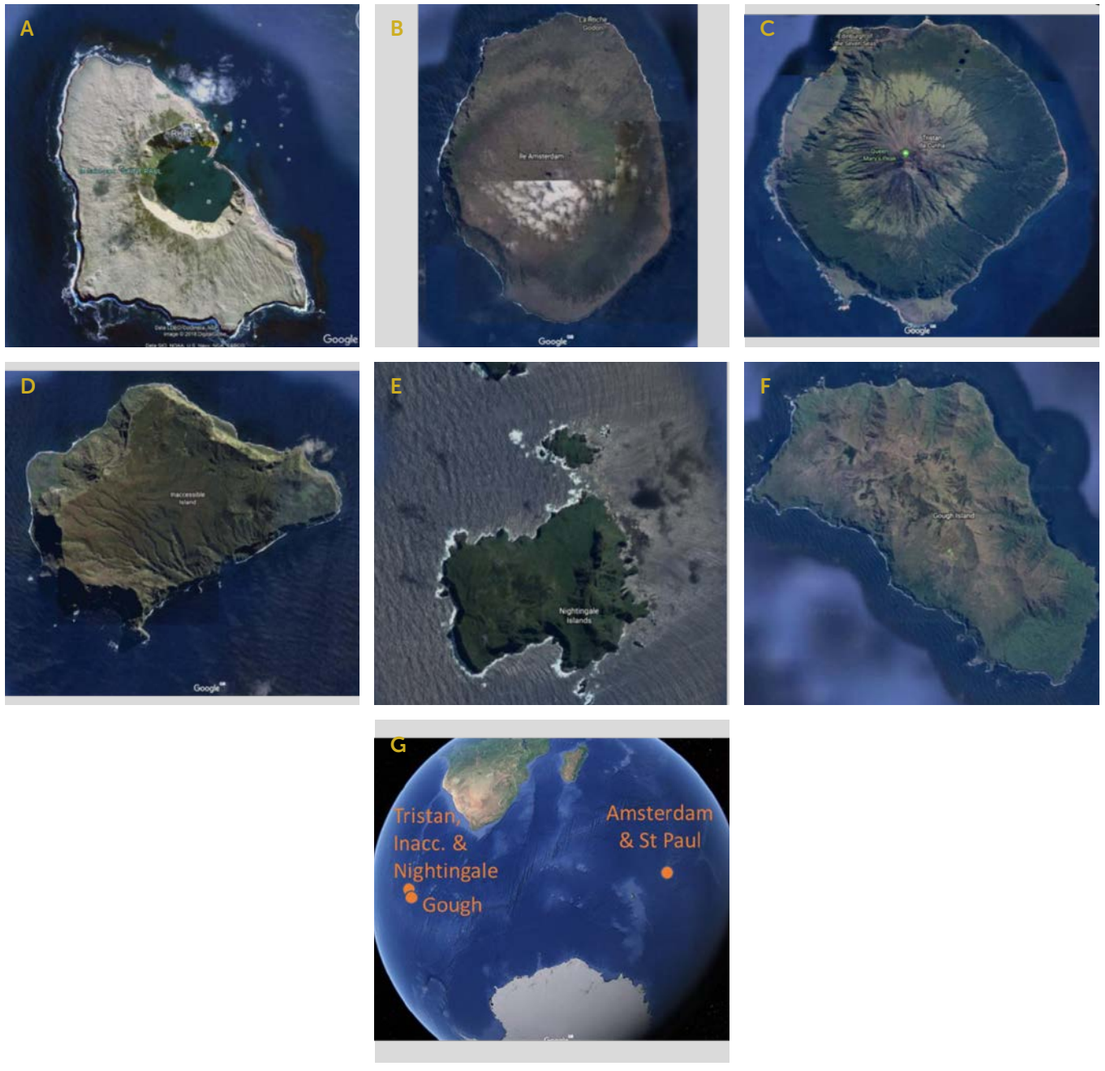

Figure 1: Satellite views (Google Earth) of the islands which make up the global range of northern rockhopper penguin. A. St Paul. B. Amsterdam C. Tristan da Cuna D. Inaccessible Island E. Nightingale Island with Middle/Alex island immediately to the North F. Gough Island. G) The relative location of the islands

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2.4.1. Atlantic Ocean

Northern rockhopper penguins breed on five islands in the Tristan da Cunha group: Tristan da Cunha (98 km2) Inaccessible (14 km2), Middle/Alex (0.1 km2), Nightingale (3.2 km2), and Gough (14 km2). Tristan da Cunha lies approximately 2,000 km from Saint Helena, and 2,400 km from South Africa. The main island, Tristan da Cunha (37°6'S 12°16'W) rises from the ocean in a classic volcanic "cone" shape. The only flat area is on the north-west coast, where the only permanent settlement, Edinburgh of the Seven Seas, is located. Inaccessible and Nightingale islands lie south-southwest from the main island respectively; Gough Island is situated 395 km south-southeast and constitutes the only breeding site of the northern rockhopper penguin south of the Sub-tropical Front.

The islands are all of volcanic origin and the main island of Tristan da Cunha is still active, having last erupted in 1961.

The Tristan da Cunha group is a United Kingdom Overseas Territory forming part of the UK Overseas Territory of St Helena, Ascension, and Tristan da Cunha. The main island of Tristan da Cunha has a permanent settlement (Edinburgh of the Seven Seas) which is home to a community of 262 people (January 2017). It is administered by a UK-appointed Administrator, with support from an elected Island Council. The other islands are uninhabited, except for a South African weather station on Gough Island that is permanently staffed by six meteorologists, and three biologists, employed by the South African Department of Environmental Affairs (DEA) or RSPB.

2.4.2. Indian Ocean

Amsterdam Island and St. Paul Island (Île Amsterdam, Île Saint Paul) form part of the Terres Australes et Antarctiques Françaises (TAAF; French Southern and Antarctic Territories), which are an overseas territory (Territoire d'outre-mer or TOM) of France. Amsterdam (37°50'S 77°31'E) and St Paul (38°43'S 77°31'E) are extinct volcanoes and cover an area of 61 km2. They are situated about 85 km apart and are administered by a Préfet, based in Saint-Pierre on Réunion Island and appointed by the French administration. There is no permanent civilian population, but 25-45 scientific researchers and support staff are permanently stationed at the Martin de Viviès research base on Amsterdam Island.

2.5. Population

Early records indicate that millions of northern rockhopper penguins used to occur on both Tristan da Cunha and Gough Island prior to 1955. As a very rough estimate, approximately 2 million pairs (98%) were lost from Gough Island between 1955, and 2006 and Tristan da Cunha is thought to have held hundreds of thousands of pairs in the 1870s, which were reduced to around 5,000 pairs by 1955 (Cuthbert et al. 2009).

On Amsterdam Island historical data indicate a decline of 90-99% in the global population since the 19th century. Between 1971 and 1993, populations had decreased by a rate of 2.7% per year while the population at St Paul Island increased by 5.5% (Guinard et al. 1998). The current trend on Saint Paul Island is unknown, but a decrease is suspected based on photographic evidence that show a reduction in the extent of the colonized area (Barbraud, Delord, Bost, Weimerskirch, unpubl. data).

Obtaining precise estimates of population size is complicated by the difficulty of accessing some of the colonies and of counting the nests or birds in dense tussock grass. Counts are made either by counting nests in whole colonies or sub-colonies (Tristan da Cunha, Gough), by estimating density along transects that is scaled to the colony area (Nightingale and two locations on Inaccessible Island) or by counts of birds commuting to and from the colony (Amsterdam, St Paul and remaining Inaccessible colonies).

There are no population estimates available that have been made at all of the colonies in the same year, and using the same methodology. Interpretation of trends is often hampered by poorly documented changes in the extent of the areas or number of sub-colonies counted among years. Variation in the timing of counts relative to breeding phenology and nest survival can introduce annual variation into nest counts. Those made shortly after the peak of incubation during a year of high nest survival will include the majority of breeding attempts, but those made later in the season in a year of low survival will omit substantial numbers of birds that failed prior to the count being made.

The latest estimates of the number of breeding pairs present on each island are presented in Table 1. These suggest a total population of c. 206,850 breeding pairs, 89.7% in the Atlantic and 10.3% in the Indian Ocean populations.

Recent analysis of population trends indicates that over the previous 30 years (three generations) the numbers of northern rockhopper penguins globally declined by 57% (Birdlife International 2010; 2017). At the two breeding locations in the Indian Ocean, numbers have been declining at an average rate of 3-4% since the early 1970s while at Amsterdam Island the decline over the past three generations has reached 74% (Barbraud, Delord, Weimerskirch unpubl. data).

2.6. Life cycle and associated habitats

After breeding and moulting, the penguins depart on their winter migration and spend up to six months at sea before returning to their respective breeding sites the following season (Cuthbert 2013). During the incubation period, penguins forage on average 400 and 500km, away from their breeding sites on Nightingale and Gough Island, respectively, whereas during the brood-guard, foraging ranges are restricted to a maximum distance of 35 km (Nightingale Island) and 24 km (Gough Island) (Steinfurth et al. unpubl. data). Tracking data from Nightingale and Gough islands further reveals that birds disperse after moult over an area stretching to the east along the Walvis Ridge and to the region of the Southern African shelf, (approx. 21°S and 15°E), towards the South American continent (approx. 42°W) and south into the region of the Antarctic convergence (approx. 51°S). While Nightingale penguins display high variability in foraging locations during incubation and over-winter migration, penguins from Gough Island show consistent directed movements to the south and southeast (Steinfurth et al. unpubl. data).

Amsterdam Island penguins make looping trips during the incubation period, with a mean foraging range of 230 km, but some birds may forage as far as 410 km away from their colony. Oceanic fronts appear to be an important habitat feature as for many top-predators of the Southern Ocean (Bost et al. 2009). Brooding birds usually forage much closer to the colony (8-80 km), staying in shallow, inshore waters of the shelf (C.A. Bost, unpubl. data). During creching birds may forage

Island	# breeding pairs	Year of estimate
Atlantic		
Tristan	3,584	2015
Nightingale	20,423	2017
Middle/Alex	62,791	2016
Inaccessible	33,867	2016
Gough	32,000 - 65,000	2006
Subtotal	185,665 (89.7%)	
Indian Ocean		
Île Amsterdam	12,161	2015
Île St Paul	9,023	1993
Subtotal	21,184 (10.3%)	
TOTAL	**206,849**	

Table 1: Northern Rockhopper penguin: latest population size estimates

Figure 2: Northern rockhopper penguin habitat. A) Rocky breeding colony on Gough Island (© P.G. Ryan). B Spartina tussock grass habitat on Nightingale Island © A. Steinfurth. C. St Paul © Henri Weimerskirch.

up to 600 km south of Amsterdam. After moulting, Amsterdam penguins perform long-range movements of up to 2200 km away from the colony, mainly in longitudinal direction, as far as the south-western side of Australia, without any return to land. Most birds head south-east, along the Indian Ridge and forage south of the southern boundary of the sub-tropical front using deep waters (3000-3500 m) with very heterogeneous sea surface temperature anomalies and chlorophyll concentrations (Thiebot et al. 2012).

Nests at Atlantic Ocean colonies are located on open boulder-strewn beaches on Gough Island and Tristan da Cunha and in stands of tussock grass (mainly *Spartina arundinacea*) on Nightingale, Middle/Alex and Inaccessible islands (Cuthbert 2013). On Amsterdam and St Paul, penguins breed on steep or gently sloping ground from sea-level up to 170 m. Habitats vary from open boulder beaches to dense stands of tussock grasses (*Spartina arundinacea* and *Poa novarae*) (Figure 2).

2.7. Breeding and moulting biology

Adults arrive at the breeding colonies in late July and August. Two eggs are laid, the earlier 'A' egg being smaller than the later 'B' egg as for other *Eudyptes* penguins (Figure 3). Only one chick is raised, usually from the B egg. Chicks hatch in October and once large enough, they huddle into creches, protected by one or two adults while others feed. These adults are generally failed breeders who continue to defend their territories from skuas, so they incidentally protect chicks as a by-product of this behaviour rather than actively doing so- the parents themselves spend most of the time foraging. Chicks remain in the rookeries until they depart in December or early January. For northern rockhoppers breeding on Gough Island and hence south of the Sub-tropical front the penguin's breeding cycle commences about 3-4 weeks later than in the northern islands.

Breeding success of northern rockhopper penguins tends to be variable and is often lower than congeners elsewhere (Birdlife International 2010). In general, *Eudyptes* breeding success is not that variable from year to year as they can effectively buffer environmental variability via plasticity in trip durations and chick growth rates (Crawford et al. 2006, Baylis et al. 2013, Horswill et al. 2016). For northern rockhoppers on Tristan and Amsterdam, this plasticity seems to be overwhelmed in some years. So in "good" years northern rockhopper penguins perform about as well as congeners achieve on average elsewhere, but in poor years they do considerably worse. This is likely to be due to food availability being on average lower and more variable in the seas around Tristan and Amsterdam compared to more southerly sites, such that the maximum buffering capacity is reached in a greater proportion of years. The reasons behind this are one of the key avenues for further research. However, monitoring of study colonies on Amsterdam Island indicates that almost no chicks have fledged for the past 4 years in these colonies (Jaeger et al. 2018).

During their annual moult, penguins must return to shore, standing as still as possible to conserve energy for several weeks until their new feathers have grown and been waterproofed.

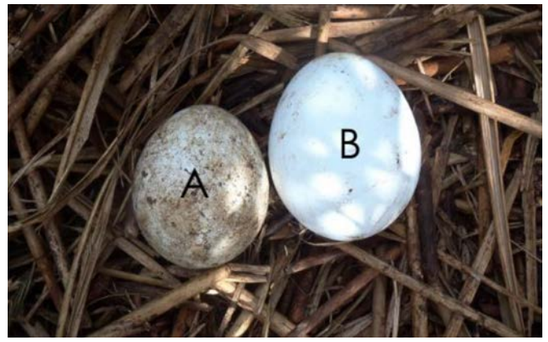

Figure 3: Comparative size of A and B eggs. Photo © A. Steinfurth

2.8 Prey

Northern rockhopper penguins are opportunistic foragers, utilizing different areas during the breeding and non-breeding season. They mainly feed on crustaceans, in particular subtropical krill (euphausids) supplemented with small proportions of fish and cephalopods (Booth and McQuaid 2013, Cuthbert 2013). Dietary studies from Tristan da Cunha and Amsterdam Island reveal seasonal changes in diets: crustaceans (Tristan da Cunha) and cephalopods (Amsterdam) dominated the diet during the early chick-crèche stage but fish became the main prey item at both islands in the later stages of chick rearing (Tremblay et al. 1997, Booth and McQuaid 2013, Booth et al. 2018).

2.9 Predation

During the breeding season on Tristan da Cunha, adult northern rockhopper penguins are regularly preyed on by northern and southern giant petrel *Macronectes hallii* and *M. giganteus* on the shore and at sea (Ryan et al. 2008), while in the colony unprotected eggs and chicks are taken by the subantarctic skua *Catharacta antarctica lonnbergi* and Tristan thrush *Turdus eremita* (Steinfurth, pers. obs.). On Amsterdam Island, active predation by subantarctic skuas also occurs during the breeding season. Predation on adults by seals close to the beaching places is reported but is believed to be rare.

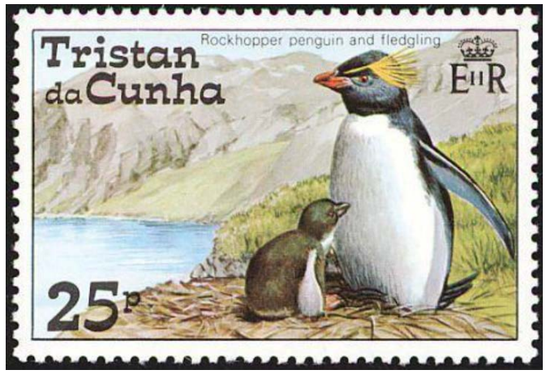

Figure 4: Two examples of northern rockhopper penguin postage stamps.

Predation by sub-Antarctic fur seal (*Arctocephalus tropicalis*), giant petrels and skuas is thought to be influential in population trends of *Eudyptes* populations elsewhere (Horswill et al. 2014, Morrisson et al. 2017).

2.10. Cultural and economic value

The northern rockhopper penguin is an iconic species of the Tristan archipelago and the Amsterdam – St Paul districts. Its image, together with the Tristan Albatross *Diomedea dabbenena*, is the symbol of the Tristan Conservation Department (see logo page) and it features on Tristan and TAAF postage stamps, souvenirs and in TV documentaries (Figure 4). On Tristan it is a prime attraction to bird-watchers on supervised tourist visits (see 3.6).

Historically, penguins were used as bait in crab pots at a number of sites, including St Paul and Tristan da Cunha, and vast numbers of penguin products were collected: eggs, oil from moulting birds, feathers for stuffing pillows and mattresses, and plumes used for making ornamental table mats on Tristan. These practices had largely ceased by 1955, except for the egg harvest by the Tristan community (Hagen 1952, Wace and Holdgate 1976, Richardson 1984).

Tristan islanders have traditionally gathered penguin eggs to supplement their diet. Under the Conservation of Native Organisms and Natural Habitats (Tristan da Cunha) Ordinance 2006 (Government of St. Helena 2006), eggs were only allowed to be harvested from Nightingale and Middle/Alex Islands. Eggs were widely distributed reflecting the sharing culture among the community. The egg harvest was suspended after the 2011 oil spill (see 3.3). As of 2018 the egg harvest was re-opened. Scientific evidence to support an appropriate quota is needed.

Penguin guano is harvested from Nightingale and Alex islands after the breeding season by the Tristan community to provide fertilizer for their famous Potato Patches.

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3. THREATS

The causes of the population declines are poorly understood, but introduced species (including pathogens), increasing competition for habitat and food with a rapidly growing subantarctic fur seal (*Arctocephalus tropicalis*) population, changes in sea surface temperature and/or marine productivity, human-induced activities and pollution, are all likely to be implicated to some degree. The threats are summarised in table 2.

3.1. Fisheries

In the past, penguins were used as bait in crab pots at a number of sites (Ryan and Cooper 1991, Guinard et al. 1998, Cuthbert et al. 2009). With only a few recent records of fisheries-related penguin mortality (Ryan & Cooper 1991, Crawford et al. 2017, TAAF 2011), and no legal gillnet fishery, penguin bycatch does not appear to be a major threat to the northern rockhopper penguin, although bycatch in illegal fisheries will not be reported and could be substantial.

3.2. Food availability

Decreased prey availability is thought to be the likely reason for population decline on the Tristan and Gough island groups. It is unlikely, however, that the availability of preferred prey has been affected by local fisheries or competition by fur seals, since this has not been demonstrated for the macaroni penguins *E. chrysolophus* on Bird Island (Barlow et al. 2002, Ratcliffe et al. 2015) where much higher pressures of seal predation and a krill fishery exist, meaning that climatic factors may be the cause.

A study of northern rockhoppers on Amsterdam and St Paul implicated climate change, changes in sea surface temperatures, growing fur seal populations, and shifts in marine food webs as the reason for decline on these islands. According to Guinard et al. (1998) mean sea surface temperatures near Amsterdam and Saint Paul islands decreased significantly between 1982 and 1993, and this change was significantly related to the decline of the Amsterdam Island population during the same period. Mean sea surface temperature decline could affect the penguin population through changes in distribution and abundance of prey. Such possible effect should be reanalysed using recent temperature data and population counts. Guinard et al. (1998) also suggested that other factors such as the large increase of the subantarctic fur seal population at Amsterdam Island between 1971 and 1993 could have reduced the penguin population. However, analysis of adult body condition during return from winter migration and from the premoult trip at Amsterdam Island does not indicate any significant decrease over the last 20 years, although large inter-annual variations are observed (Delord, Barbraud, in prep).

3.3. Oil Pollution

On 16 March 2011, the cargo ship MS *Oliva* ran aground on Nightingale Island, spilling 1500 tons of fuel and heavy crude oil (Figure 5). This encircled not only Nightingale but also nearby Middle/Alex Island and reaching as far as Inaccessible Island; breeding sites to almost half of the world's northern rockhopper penguin population (Tristan main island was unaffected by the spill). Thousands of oiled penguins were caught on Nightingale and transported to Tristan da Cunha where they were cleaned and rehabilitated by a project involving virtually all the island's inhabitants. Only a few hundred were saved and it is impossible to say how many died. The increase in volume of passing shipping poses a growing risk of chronic oiling and/or further catastrophic spills. An "Oiled Wildlife Response Plan" has been developed for Tristan da Cunha by Estelle van de Merwe in collaboration with Tristan Conservation Department.

3.4. Plastics

The dramatic increase in plastics pollution in the world's oceans is well documented. So far, no impact of plastics pollution on northern rockhoppers has been reported from any of their colonies. During the National Geographic Pristine Seas voyage to Tristan da Cunha in 2017 to carry out an ecosystem assessment at the islands, microplastics were found in 15 of the 19 samples taken (Caselle et al. 2017). Whilst this is a small sample, it indicates the potential necessity for further investigation of the impacts of microplastics.

3.5. Invasive species, disease and parasites

Among birds, penguins are particularly prone to infection by pathogens (Grimaldi et al. 2015). A bacterial infection has been recently detected in northern rockhoppers

Figure 5: Oiled penguins and their rescue after the MS Oliva disaster on Nightingale Island (Photos from National geographic, https://news.nationalgeographic.com/news/2011/03/pictures/110325-oil-spill-penguins-nightingale-island/)

breeding on Amsterdam Island. Two pathogens have been identified: *Pasteurella multicoida* is present in the majority of the birds sampled and in a minority of samples *Erysipelothrix rhusiopathiae*, the causative agent of erysipelas (Jaeger et al. 2018). These infections have been implicated in the high chick mortality of Indian yellow-nosed albatrosses *Thalassarche carteri* on Amsterdam Island, so the infection could be responsible for the four successive years of complete breeding failure of the northern rockhopper penguin population there (see 2.5), although further studies are needed to confirm whether this is the case.

The only study of serology and infections on northern rockhopper penguins in the Tristan group was confined to avian influenza on Gough (Abad et al. 2013). In this study, 5% of birds sampled tested positive for antibodies and none for active infection. The impacts on survival are unknown (few birds with antibodies could indicate that infected birds usually die, rather than infection rates being low). A wider assessment of infections present in northern rockhopper penguins on Tristan is desirable so that the arrival of new diseases, such as the one of concern on Amsterdam, can be monitored.

In the breeding season 2010/2011, Booth (2011) carried out a study on parasitism in breeding northern rockhopper penguins at the Stony Beach colony on Tristan da Cunha. *Babesia* was the only parasite observed in the samples. 61 % of all birds examined presented with *Babesia* infestation (likely *B. peircei*), and 39% of birds presented no signs of parasitism.

Introduced house mice *Mus musculus* on Gough Island are known predators of seabirds but have not yet been recorded preying on penguins. The same applies to introduced rats *Rattus norvegicus* on Amsterdam Island and *R. rattus* on Tristan da Cunha. The only reported cases of major predation by invasive species are by feral pigs on Tristan and Inaccessible islands (where they were eradicated in 1873 and 1930, respectively). Domestic and feral dogs were also reported to be a problem on Tristan da Cunha (BirdLife International 2010) but this factor no longer applies.

Feral cattle used to occur on Amsterdam, but all were removed c. 5 years ago. No indirect impact of feral cattle on penguins was reported on Amsterdam colonies, however grazing may have altered the extent and/or structure of grassland communities which may have had some indirect effect on the habitat. It may take several years for vegetation to recover from the effects of grazing. Direct impact by predation of rats, cats and mice on eggs, chicks or adults has never been reported in Amsterdam Island but are all possible. Rats may act as a reservoir for maintaining bacteria between two breeding seasons while seabirds are absent from the island (Jaeger et al. 2018). Studies on Amsterdam to investigate the role of rats in bacterial maintenance and transmission in the seabird community are currently being conducted.

3.6. Tourism, scientific research & disturbance

Scientific research at the islands is regulated by the Tristan da Cunha Environmental Research Permit System. All research has to fulfil Tristan da Cunha conservation priorities and be approved by the Conservation Department and is subject to ethical clearance. Scientists are required to complete a permit application and protocol for researchers and must abide by the Tristan da Cunha Environmental Charter and conservation management policies and guidelines for the islands. If research is to be carried out within the Gough and Inaccessible Island World Heritage Site or within the northern rockhopper penguin rookeries designated as nature reserves on Tristan, researchers require a Wildlife and Protected Areas Research Permit for this work.

Cruise ship visitors are permitted to go ashore at Nightingale and Inaccessible for guided wildlife tours, only if accompanied by a Tristanian appointed by the Conservation Department team and only on day visits. No tourism is permitted at Gough Island. As part of the Gough and Inaccessible Islands World Heritage Site Management Plan (2015-2020), "Guidelines for Day Visitors to Inaccessible Island" are provided to visiting tourists. All visitors to the outer islands and Tristan have to complete a "Biosecurity Self-Audit Checklist and Declaration". Tourism is not considered to pose a threat at the current low volumes, but the number of cruise ships and tourists can be expected to increase, so the regulations need to be kept under review.

The main habitat on Nightingale, Inaccessible and Middle/Alex islands is peat soil and tussock grass. During dry spells a single spark could set the entire island up in fire.

3.7. Constraints

Several indirect factors affect the implementation of conservation measures (Table 3). The most prominent of these is inadequate knowledge of several aspects of the ecology, prey distribution and abundance at key stages of the life cycle of the species, its relation to the dynamics of the marine environment and sensitivity to pathogens.

The location and character of some of the islands pose severe logistical difficulties in both reaching the islands themselves and then in gaining access to the breeding colonies. Penguins breeding in tussock grass colonies are very difficult to see and to count both in the southern Atlantic and southern Indian oceans, rendering it difficult to make robust and precise population estimates, estimate breeding success, and in turn to interpret trends.

There is a lack of financial and human resources needed to cover the difficult terrain and extensive at-sea distribution. Poor internet connection to the community on Tristan further hampers communication and coordination as well as access to online resources for education, data sharing and other purposes.

Threat (number in brackets refers to the IUCN Threats Classification Scheme)[1]	Report section link	Timing	Scope		Severity	Impact Score (see appendix 2)
			Atlantic Ocean	Indian Ocean		
(4) Shipping lanes	-	Ongoing	All	Nil	Slow, significant declines	Medium impacts:6
(5) Unregulated egg collection	2.10	Ongoing	M/A, N, T	All	Unknown	Unknown
(5) Fishing bycatch - level of reporting unknown	3.1	Ongoing	All	Ams-St P	Negligible declines	Medium impact: 6
(6) Disturbance from recreational activities	3.6	Ongoing	N	Nil	Negligible declines	Low impact: 4
(6) Disturbance Work and other activities	3.6	Ongoing	N	Nil	Negligible declines	Low impact: 4
(7) Land slips, erosions (made worse by livestock)	-	Ongoing	T, G	Ams	Slow, significant declines	Low impact: 5
(N/A) Seal encroachment	4.3	Ongoing	M/A	Ams	Unknown	Unknown
(8) livestock grazing (domestic/ feral), cattle	3.5	Ongoing	T	Nil	Unknown	Unknown
(8) Invasive species (*Sus domesticus*)	3.5	Past, unlikely to return	T, I	St P	Unknown	Past impact
(8) Invasive species (*Canis familiaris*)	3.5	Past, likely to return	T	Nil	Unknown	Past impact
(8) Invasive species (*Rattus rattus*)	3.5		T	Nil	Unknown	
(8) Invasive species (*Rattus norvegicus*)	3.5		Nil	Ams	Unknown?	
(8) Invasive species (*Mus musculus*)	3.5		T, G	Ams-St P	Unknown	
(8) Invasive species (*Felis catus*)	3.5	Ongoing	Nil	Ams	Unknown	
(8) Disease (*Erysipelothrix rhusiopathiae*)	3.5	Ongoing	Unknown?	Ams	Unknown	Unknown but potentially severe
(9) Plastics pollution (potential)	3.4	Ongoing	All	All	Unknown	Unknown
(9) Oil spill	3.3	Past (MS *Oliva* in 2011) likely to return (other ships)	N, M/A, I	Nil	Severe	
(9) Chronic oil pollution	3.3	Ongoing	All	Ams-St P	Unknown	Unknown
(11.) Climate change & severe weather	-	Ongoing	All	All	Unknown	Unknown

Table 2: Threat assessment. Key: M/A = Middle/Alex, N= Nightingale, T= Tristan da Cunha, G=Gough, I = Inaccessible, Ams-St P = Amsterdam & St Paul

Constraints	Scope		Notes
	Atlantic Ocean	Indian Ocean	
Logistics (timing of surveys)	All	St P	Good on Ams; poor on St Paul
Population ecology knowledge gap (breeding colonies, at sea)	I, M/A, T	St P	Good on Ams; study planned on St Paul during the summer 2018/2019; good on Tristan main island and Nightingale; less reliable on Gough owing to quality of documentation on timing and areas counted.
Marine ecosystem knowledge gap	All	Ams-St P	Poorly known
Foraging ecology knowledge gap	I, M/A, T	Ams	Gaps for these Southern Atlantic islands.
Disaster response management	All	Ams-St P	Oil spill plans in place for T.
Stakeholder knowledge – community	All	Ams-St P	Administration concerned: TAAF
Funding gap between UK OT and UK government	All	NA	
Funding for disease impact assessment	All	Ams	Funding of new research on impact of pathogens is desirable (PI concerned: T. Bouliner, CEFE-CNRS)
Communication (Internet)	T	NA	We are currently trying to raise funding for all islands.
Accessibility to islands (e.g. Boat Landing)	T, G, I, N	St P	Only relevant to T, where poor.
Accessibility to colonies on islands	I, G (many colonies)	Nil	Permanent access on Ams, poor on St P.
			Easy on Ams.

Table 3: Constraints Key: M/A = Middle/Alex, N= Nightingale, T= Tristan, G=Gough, I = Inaccessible, Ams-St P = Amsterdam & St Paul

4. CONSERVATION

4.1. Legislation and Protected Areas

Amsterdam and St Paul are part of the Réserve Naturelle Nationale des Terres Australes Françaises, administered by the TAAF (French Southern and Antarctic Territories), which incorporates a protected marine zone covering more than 672,000 km2. The St Paul colony is included in a strictly protected area. Amsterdam colonies are included in a scientific dedicated area with a restricted access. Here, protective measures are implemented on landing and moving around the island to minimise the risk of pathogen spread. The seabirds of Amsterdam-St Paul are protected by law. The Préfet is assisted in management of the reserve by a scientific council containing members of the Polar Environment Committee and a management committee.

All breeding colonies in the Tristan group are protected under the Conservation of Native Organisms and Natural Habitats (Tristan da Cunha) Ordinance (2006) For all breeding sites across the archipelago research permits are required to study them and visit the colonies (see section 3.6)

On Tristan da Cunha, the management authority is the Tristan Conservation Department, which employs permanent staff supported by casual workers and the Tristan "Darwin project team". The Tristan da Cunha Environment Charter outlines the environmental management commitments of the UK Government and the Government of Tristan da Cunha, and serves as a framework policy to guide the development of management policies and plans. The Tristan da Cunha Fisheries Limits Ordinance 1983 controls commercial fishing activity within the Tristan da Cunha Exclusive Economic Zone covering 200 nautical miles offshore from the islands.

Gough and Inaccessible islands are managed as a Wildlife Reserve, IUCN Protected Area category 1, with research and weather monitoring the only activities permitted, and are surrounded by protected marine areas of 12 nautical miles.

4.2. International designations

The northern rockhopper penguin is listed as Endangered on the IUCN Red List, based on estimated and projected declines exceeding 50% over 27 years (BirdLife international 2017).

Gough and Inaccessible islands have been gazetted as a UNESCO World Heritage Site, as two of the least disturbed cool-temperate island ecosystems in the South Atlantic Ocean with international importance for colonies of seabirds, and several endemic species and subspecies of land birds.

BirdLife International has designated the Tristan Endemic Bird Area (including Inaccessible Island) and Gough Island Endemic Bird Area. The French Southern Territories and Gough Island have been proposed as Important Bird Areas.

The whole TAAF Réserve Naturelle Nationale des Terres Australes Françaises is a Ramsar site. Gough and Inaccessible islands are also Ramsar sites and the northern rockhopper penguin is among the species cited in the designations. Gough Island, and the Plateau des Tourbières on Amsterdam island are both listed as Alliance for Zero Extinction (AZE) sites, for endemic bird species, not penguins.

Although some of these designations are primarily for other species, collectively they highlight the rich biodiversity value of the two island groups, attract support and funding from governments and international organisations, including for the waters around the islands, at-sea foraging and dispersal sites of northern rockhopper penguins (Table 4).

Island	Nature Reserve	World Heritage Site	Ramsar	Alliance for Zero Extinction site	Important Bird area	Endemic Bird Area
Tristan da Cunha	Partial designation					Designated
Middle/Alex						Designated
Nightingale						Designated
Inaccessible	Designated	Designated	Designated			Designated
Gough	Designated	Designated	Designated	Designated	Proposed	
Amsterdam	Designated	Candidate	Designated	Part Designated	Proposed	
St Paul	Designated	Candidate			Proposed	

Table 4: International site designations of the islands where NRP breeds

4.3. Conservation & research projects

Northern rockhopper penguin numbers are monitored annually at sample colonies on Tristan, Nightingale and Middle/Alex by the Tristan Conservation Department. Counts on Inaccessible Island are intermittent. Counts of rockhopper penguins at sample colonies are conducted on Gough by RSPB staff.

On Nightingale Island, a fence was erected to prevent fur seals from encroaching on one of the main breeding sites and a deep rock crevice that was trapping and killing penguins was covered (Cuthbert 2013). However, the fence is not effective as animals can find ways to cross or avoid it and continue inland. Despite the initial concerns about seal encroachment and the ineffectiveness of the current fence, seals rarely or never seem to actually arrive at colonies as these are some distance inland.

The year after the oil spill, in 2012, Trevor Glass, Head of Conservation at the Tristan da Cunha Conservation Department, initiated a comprehensive rockhopper penguin research programme in the islands in partnership with the University of Cape Town (Antje Steinfurth) and the RSPB (Richard Cuthbert). This study compared aspects of the penguins' ecology at breeding sites on Nightingale and Gough islands to help understand the potential impact of any natural and/or anthropogenic threats to this population and to inform conservation actions.

Project Pinnamin (2016-2018)

This project focused on the islands of the Tristan group and aimed to: (1) initiate low-effort monitoring of population dynamics and their drivers which will diagnose declines and inform conservation action; (2) track birds to quantify marine habitat preference and recognise marine Important Bird Areas (mIBAs); (3) strengthen capacity for research, monitoring and data management on Tristan; (4) produce a new species action plan that will identify key conservation measures required to protect northern rockhopper penguins globally. Project partners were: British Antarctic Survey, Royal Society for the Protection of Birds, Royal Zoological Society of Scotland, South African Department of Environmental Affairs, Tristan da Cunha Conservation Department.

Blue Belt Initiative (2016-2020)

The Blue Belt Programme supports delivery of the UK Government's manifesto commitment to provide long term protection of over 4 million km2 of marine environment across the UK Overseas Territories. The programme aims to 1) Improve scientific understanding of the marine environment; 2) Develop and implement evidence-based, tailored marine management strategies, including surveillance and enforcement; and 3) Ensure management is sustainable and long term.

The Blue Belt Programme is initially focused on seven islands and archipelagos: British Indian Ocean Territory, South Georgia and the South Sandwich Islands, British Antarctic Territory, Pitcairn, St Helena, Ascension Island and Tristan da Cunha.

The programme is being delivered in partnership between the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) and the Marine Management Organisation (MMO), and it works closely with the UK Overseas Territories on behalf of the Foreign and Commonwealth Office (FCO) and the Department for Environment, Food and Rural Affairs (DEFRA). The programme's overall focus is to ensure that, in each OT, there are marine protection strategies that are:

- Based on the best available scientific knowledge.
- Legally designated in accordance with domestic legislation where appropriate;
- Effectively managed in accordance with comprehensive, locally-agreed Management Plans. These plans will bring together scientific baseline information with an analysis of current and future threats;
- Environmentally monitored, on the basis of cost-effective and sustainable plans to ensure the objectives and the designations are being delivered into the long-term; and
- Enforced through proven surveillance and enforcement tools. Enforcement will be targeted, risk-based and intelligence led.

ITAGED

This project (PI Charly Bost, CEBC-CNRS) aims at determining key marine habitats of four marine top predators, charismatic icons of the Amsterdam-St Paul Islands, in the French Southern and Antarctic Territories (TAAF; Indian Ocean) which are all currently classified as globally threatened or Data Deficient by IUCN: the northern rockhopper penguin, Indian yellow-nosed albatross Thalassarche carteri, sooty albatross Phoebetria fusca, and MacGillivray's prion Pachyptila macgillivrayi. The main objectives of this project are to:

1. Characterize the key foraging habitats used by these predators, especially the northern rockhopper penguin, during summer through the use of the CEBC-CNRS and BirdLife tracking databases.
2. Create habitat models for the northern rockhopper penguin in order to predict changes in the locations of habitats under various climate change scenarios.
3. Obtain the first tracking data during some key biological stages for a species with an unknown at-sea distribution.
4. Delimit marine Important Bird and Biodiversity Areas (mIBAs) as a tool to help protect key foraging areas.

Research at BAS

Research initiated under Project Pinnamin will be continued by BAS under its new ODA initiative. This aims to examine the effects of climate change upon the marine food-webs of Tristan, particularly those organisms of cultural or economic importance such as lobsters, finfish and seabirds. This is proposed to include developing simulation models of egg harvesting that will provide advice to the Island Council on design of sustainable harvest protocols (submitted in 2018).

Future funding under Brexit

Funding work at Tristan da Cunha is difficult, partly because the islands are a UK Overseas Territory. This means that conservation work at Tristan is not eligible for support from many European Union (EU) funds that are targeted at least developed countries (because Tristan is considered to be part of the UK), while at the same time also being ineligible for support from many funds targeted at work in the UK (e.g. the Heritage Lottery Fund, HLF). With Brexit approaching, and the likely loss of eligibility to apply for funding from EU BEST, the future of funding for conservation work in the UK Overseas Territories is uncertain.

4.4. Ex situ population

In 2016, the AZA Penguin Taxon Advisory Group surveyed all six major zoo associations to determine the population status of all penguins, including northern rockhoppers, held in accredited zoological associations. These institutions included the AZA (Association of Zoos and Aquariums), EAZA (European Association of Zoos), ZAA (Zoo and Aquarium Association), JAZA (Japanese Zoo Association), PAAZA (Pan African Association of Zoos) and the ALPZA (Latin American Zoo & Aquarium Association). Together they represent over 900 zoos and aquariums and have over 350 million visitors annually.

There are three ex situ northern rockhopper populations in three different regional zoo associations. According to the European Studbook, on 31 December 2015 a total of 95 northern rockhopper penguins were held at eight EAZA facilities (Schwammer and Fruewirth 2015). The AZA regional Studbook (Celli, 2017) list 32 at four institutions. There are 106 northern rockhoppers in JAZA institutions. Currently it seems unlikely that these penguins will act as a source population for reintroductions to the wild, and the role of these populations are therefore primarily educational.

The rockhopper penguins at RZSS Edinburgh Zoo, along with other species of penguins at other zoological institutes, have taken part in captive trials to test geolocator (GLS) tags mounting methodology, allowing the ethical approval for deployment of the same devices on wild penguins (Ratcliffe et al. 2013). Zoo funding has also enabled a variety of in situ conservation activities, including purchase of a boat in 2008 and engines in 2018 for the Tristan da Cunha penguin population survey work and hosting of the workshops at RZSS in 2008 and 2017. There are opportunities for continued support of the action plan items listed in this document.

4.5. Strategic framework

In 2008, a Rockhopper Penguin Strategy and Regional Action Plan was developed at a workshop at RZSS Edinburgh Zoo, before the official split into southern and northern species (BirdLife International 2010). This document updates the 2010 plan in relation to the northern rockhopper penguin.

Several other documents are also relevant to the conservation of the species and its marine environment.

The UK Overseas Territories Biodiversity Strategy (DEFRA 2009) is a framework document covering conservation in all UK Overseas Territories and contains five strategic priorities (three are broadly relevant to northern rockhopper penguins). The Tristan da Cunha Biodiversity Action Plan 2012-2016 (Tristan da Cunha Government and RSPB 2012) is currently undergoing revision. It contains a Vision, Goal and six Objectives (see Table 5 for those relevant to northern rockhopper penguin).

Management plans for Gough and Inaccessible islands were produced in 1994 and 2001 respectively, followed by a revised management plan for the Gough and Inaccessible Islands World Heritage Site covering 2015-2020 (Tristan Conservation Department and RSPB 2012).

A first management plan (2011-2015) has been produced for the Réserve Naturelle Nationale des Terres Australes Françaises (TAAF 2010). In 2017, a new management plan covering 2018-2027 has been approved. This plan includes actions related to the impact of human activities, improvement of knowledge on species and habitats, restoration of species, both in the land and marine part of the natural reserve.

A national action plan for the preservation of the Amsterdam albatross was produced in 2011 (TAAF 2011) and is currently in revision. It includes actions regarding the impact of disease and introduced mammals on the Amsterdam albatross and other seabirds, including northern rockhopper penguin. A comparison of the actions can be found in Table 5.

Northern rockhopper penguin *Eudyptes moseleyi* action plan 2017-2027

NRP AP (this document - see section 5)	TAAF NNR MP (2010)	Tristan da Cunha Government and RSPB (2012)	UK Overseas Territories Biodiversity Strategy (2009)	Gough and Inaccessible Islands World Heritage Site MP (2012)	Amsterdam Island
Objectives 1-9	Long-term Objectives i-ix 5-year objectives ()	Objectives 1-6	Strat. Priorities - support: i-v Strategic Priorities -action: i-iii	High-level Objectives 1-9 Priority management areas A-G	MP (2018)
1. Ecology of the NRP is fully understood	IV	6	I	8, E	FS 19
2. Marine processes impacting northern rockhopper penguin are fully understood	IV		V	8, 9, C, F	FS 31
3. Impacts of disease and invasive species are understood and mitigated	II, III	5	Ii	3, 5, A	FS 17
4. A comprehensive monitoring programme is implemented	IV	6	I	E	FS 18, FS 35
5. Breeding and foraging sites are adequately protected	V	3			FG28, FS 17
6. All activities undertaken by tourists, the local community and researchers are sustainable	I, VII	5	IV	B	FG28
7. The conservation needs and iconic status of NRP are enhanced and valued by all stakeholders	VI, VII	2		7, G	7, G
8. Adequate capacity to implement the AP is assured		3	Action i		
9. The AP is implemented effectively	I-IX	Monitoring and evaluation plan			

Table 5: A comparison of the actions within existing strategic action plans

5. ACTION PLAN

Vision

Populations of northern rockhopper penguins (NRP) in the South Atlantic and Indian oceans are well understood, are thriving in healthy ecosystems, are valued as an iconic species and are sustainably managed under the stewardship of local communities, national governments and other stakeholders.

Goals

1. Maintain protection of existing breeding colonies
2. Conduct intensive studies of the impact of diseases and immunological consequences
3. Gain a complete understanding of NRP ecology and marine processes
4. Integrate NRP conservation into marine spatial planning

Strategic directions

Breeding site protection
Research (disease and invasive species/ ecology/marine processes)
Monitoring
Education / awareness
Sustainable management (tourism, local community)
Capacity building on Tristan
Resources
Plan implementation
Marine Spatial Planning

Objective/Outcome 1: The ecology of the NRP is fully understood

Action	Indicator/output	Priority	Responsible	Budget	Assumptions
1.1. Investigate causes of NRP breeding failure on Amsterdam and St Paul	Long-term database of CEBC-CNRS Chizé	High (IO)	IO- Karine Delord, Christophe Barbraud, Henri Weimerskirch, Charly Bost (CEBC-CNRS)	IPEV (Prog. 109, 394)	Funding and research capacity available.
1.2. Investigate connectivity between all island colonies/ populations	• Tracking data analysed and available • Genetic samples collected from all islands, analysed and available	Med (All)	AO-BAS, RSPB, TCD, RZSS IO- CEBC-CNRS and CEFE-CNRS	AO/IO- Funding to be found	Funding available, sampling for genetic study can be combined with 3.1.
1.3. Investigate the relationship between NRP and seal diet	Publication of comparison of diets and foraging ranges	Low (AO/IO)	AO- Marthan Bester, Mia Wege (UoPretoria) Antje Steinfurth (RSPB) Maelle Connan (NMU) IO- TBC	AO-Funding partially covered, further funding needed (UoP application submitted, BAS application submitted in Nov 2018)	Funding available
1.4. Research the effects of disease (see also 3.1)	Research conducted and published	High (AO/IO)	AO- Thierry Boulinier (CEFE- CNRS) IO- Thierry Boulinier (CEFE- CNRS)	needed for Ams (about 4000 €)	Disease affects breeding success through chick mortality

Objective/Outcome 1: The ecology of the NRP is fully understood (continued)

Action	Indicator/output	Priority	Responsible	Budget	Assumptions
1.5. Consolidate existing data on NRP diet (SIA -feathers/ blood/eggshells and stomach samples) and incorporate these into the context of the species trophic ecology and movements	Information analysed and published	Low (AO/IO)	AO-Antje Steinfurth (RSPB), Maelle Connan (NMU), Gabriele Stowasser, BAS IO-Yves Cherel (CEBC-CNRS)	AO- Funding application will be submitted in Nov 2018 IO-TBC	Some long-term change in food webs may have occurred. Combined with action 1.2, 1.6., 2.1
1.6. Describe pre-moult tracks at Nightingale/ Gough; start pre-moult tracking at Amsterdam /St Paul	Tracking data recorded and analysed for Nightingale-Gough/ Ams-St Paul	High (AO) Med (IO)	AO-Antje Steinfurth (RSPB), Norman Ratcliffe (BAS) IO- Charly Bost (CEBC-CNRS)	TBC	The penguins have difficulties to sustain at-sea presence during this critical period of their life-cycle Capacity available at RSPB and BAS to analyse existing data.
1.7. Share data for management/ spatial planning	Data sharing protocols/ platforms established	High (AO/IO)	All- lead needed.	Communication & coordination costs	Lead organisation and capacity available.
1.8. Continue research on demography and ecology	Research programmes funded and ongoing	High (AO/IO)	AO- RSPB, TCD IO- Karine Delord, Christophe Barbraud, Henri Weimerskirch, Charly Bost (CEBC-CNRS)	AO-RSPB's partner support contracts; further funding needed IO -IPEV	Continuation of funding secured

Objective/Outcome 2: Marine processes impacting northern rockhopper penguin are fully understood

Action	Indicator/output	Priority	Responsible	Budget	Assumptions
2.1. Model links between marine food webs and processes, incorporating tracking and demographic data from rockhopper penguins	Publications	High (AO/IO)	BAS/CEFAS, Blue Belt/NC-ODA, RSPB, CEBC-CNRS	Funding obtained	Relevant data available
2.2. Monitor sea temperature changes across foraging areas and responses of rockhopper penguins to changes	Publications	Medium (AO/IO)	Karine Heerah, Charly Bost (CEBC-CNRS, RSPB & BAS)	BEST	Relevant data available

Objective/Outcome 3: Impacts of disease and invasive species are understood and mitigated

Action	Indicator/output	Priority	Responsible	Budget	Assumptions
3.1. Investigate the prevalence and effects of *Erysipelothrix rhusiopathiae* and *Pasteurella multocida* on NRP survival, and define a strategy for assessing the potential prevalence/ impact of other infectious diseases	Impact assessment produced	High (AO/IO)	AO- Thierry Boulinier (CEFE-CNRS), Antje Steinfurth (RSPB) IO- Thierry Boulinier (CEFE-CNRS), Patrick Mavingui (PIMIT – Université de La Réunion), Henri Weimerskirch (CEBC-CNRS) RSPB/TCD	AO- Funding needed (ca. 6600 €) (IO) NAP Amsterdam albatross (partially founded)	The disease affects chick breeding success over long-term through chick mortality
3.2. Investigate the role of introduced mammals as potential predators (*Mus musculus, Rattus rattus, R. norvegicus, Felis catus*)	Impact assessment produced	Low (AO/IO)	AO- BAS, RSPB, TCD IO- Cedric Marteau (TAAF)	TBC	Introduced mammals are potential predators of (young) crèched chicks

Objective/Outcome 4: A comprehensive monitoring programme is implemented

Action	Indicator/output	Priority	Responsible	Budget	Assumptions
4.1. Analyse existing population data	Trends analysed and published	High (AO/IO)	AO- RSPB IO- CEBC-CNRS	AO- Funding application submitted IO- TBC?	Existing capacity can be maintained.
4.2. Coordinate / standardize monitoring methods across sites	Standard protocols agreed as far as possible	High(AO/IO)	RSPB, TCD, CEBC-CNRS	TBC	Capacity available.
4.3. Maintain regular monitoring at all breeding sites	Counts on Alex maintained	High (AO)	AO- TCD, RSPB (Next 3-4 years. Use existing logistics)	TCD staff time	Existing capacity for logistics maintained (RSPB's partner support contract scheme)
	Annual counts on Gough maintained	High (AO)	AO- RSPB (Next 3-4 years. Use existing logistics)	TBC	Existing capacity for logistics maintained
	Inaccessible counts maintained	High (AO)	AO- TCD, RSPB (Every 5 years)	TCD staff time	Boat or helicopter provided
	Tristan counts maintained	High (AO)	AO- TCD, RSPB (Next 3-4 years)	TCD staff time	Existing capacity for logistics maintained
	Nightingale counts maintained	High (AO)	AO- TCD, RSPB	TCD staff time	Existing capacity for logistics maintained
	Summer tracking continued (Tristan)	Low (AO)	AO- TBC, RSPB	TBC	Capacity available
	Summer tracking continued (Gough)	Medium/ Low during mouse eradication (AO)	TBC	TBC	Staff time available, not a current priority due to mouse eradication activities
	Transponder monitoring at Nightingale maintained	High (AO)	AO- BAS, RSPB, TCD	Staff time	Existing capacity for logistics maintained
	Transponder monitoring at Gough established	Low (AO)	TBC	AO- TBC	Project established & funded
	Monitoring at Amsterdam/St Paul	High (IO)	Karine Delord, Christophe Barbraud, Henri Weimerskirch (CEBC-CNRS)	IO-Costs covered	Staff capacity available

Northern rockhopper penguin *Eudyptes moseleyi* action plan 2017-2027

Objective/Outcome 5: Breeding and foraging sites are adequately protected

Action	Indicator/output	Priority	Responsible	Budget	Assumptions
5.1. Assess the impact of predation by birds (skuas, Tristan thrush, giant petrels)	Research conducted and published	High (AO/IO)	AO-BAS, RSPB, TCD IO-CEBC-CNRS	IO- Costs covered	Staff capacity available
5.2. Monitor seal encroachment on habitat at Inaccessible & Middle/Alex Island	Quantification of encroachment over time	Medium (AO)	AO- TCD	TBC	Available logistics and funds. Seal colonies expanding into NRP habitat.
5.3. Promote designation of MPAs in key sites	Sites identified and gazetted	Done (IO) High (AO)	AO-TdC Government, CEFAS, MMO, FCO IO-TAAF (In progress for Amsterdam and St Paul islands)	TBC	Political support
5.4. Identify and designate a voluntary 'Area to be avoided' around TDC islands	Area to be avoided gazetted	High (A)	Blue Belt/ODA/BAS	TBC	Criteria met Parties agree
5.5. Designate mIBAs and mKBAs	Sites identified and listed by BirdLife	High (AO/IO)	BirdLife International	TBC	Sites meet mIBA and mKBA criteria

Objective/Outcome 6: All activities undertaken by tourists, the local community and researchers are sustainable

Action	Indicator/output	Priority	Responsible	Budget	Assumptions
6.1. Establish visitor protocols for guided tour groups that include NRP's breeding sites	Protocols developed and in use at relevant sites	Medium (AO) Low (IO)	AO-TdC Government IO-TAAF (Ams, St Paul)	TBC	Regular visits to Nightingale Island continue
6.2. Implement a conservation levy for tourists	Levy collected and contributes to conservation	Medium (AO) Low (IO)	AO-TdC Government IO-TAAF	TBC	Infrastructure for administering levy in place
6.3. Ensure that any egg harvesting regimes and quotas are based on scientific evidence	Scientifically based management plan developed	High (AO)	AO-BAS, TdC Government	In progress, cost covered.	Agreement reached with TdC govt.
6.4. Develop a fire precaution protocol for protection of key colonies on Nightingale, Inaccessible and Middle/Alex	Protocol developed and publicized	Medium (AO)	AO-BAS/ TdC Government	TBC	Implementable protocols can be developed.
6.5 Maintain preventive rules against introduction or spread of pathogens	Biosecurity protocols developed and in use.	High (AO/IO)	AO –TdC Government/ RSPB(Gough) IO-TAAF	In progress-funding application submitted	Effective biosecurity protocols and guidelines followed

Objective/Outcome 7: The conservation needs and iconic status of NRP are enhanced and valued by all stakeholders

Action	Indicator/output	Priority	Responsible	Budget	Assumptions
7.1. Ensure the Tristan community feels a sense of ownership	NRP is part of school curriculum, in overall conservation context	Medium (AO)	AO-TCD	Staff time	Continued support from community
	International penguin day celebrated at the school (Tristan)	Medium (AO)	AO-TCD	Staff time	Continued support from community
	Species profile updated on Tristan website	High (AO)	AO-TCD	Staff time	Internet connectivity improvements would facilitate this (see 8.2).
	TdC Council and community receive annual updates on research and status. Should be factored into deliverables for all research projects.	High (AO)	AO- All	Staff time	Internet connectivity improvements would facilitate this (see 8.2).
7.2. Tourists/visitors are aware of NRP conservation issues	Blog (+ possible audio/video diary for broadcast) by researchers	High (AO)	Requires lead – could be factored into deliverables for all research projects.	Staff time/ Internet infrastructure	Current internet connectivity improved (see 8.2).
	Talks by experts delivered on cruise ships	Med (AO)	Tour companies/ TCD	Covered by cruise ships	Coordinator made available.
7.3. The captive population has an ambassador role for NRP conservation	Zoo holders maximise publicity Funds raised are used for NRP conservation	Medium (AO/IO)	RZSS/International and regional studbook keepers	Staff time	Capacity available
7.4. NRP conservation is integrated into government policies	Updating of Tristan BAP, ODA BAP and TAAF MP encompass NRP needs	High (AO/IO)	TAAF, TdC Government, ODA	Agency budgets	Political will
7.5. Investigate nutrition flux	Research programme funded, data collected, analysed and published	Med (AO)	TBC	AO- Funding needed	Kelp beds are nursing grounds for the Tristan lobster, main economic income on Tristan. Distribution of kelp around islands is linked to penguin colonies i.e. locations of high coastal nutrient influx.

Objective/Outcome 8: Adequate capacity to implement the AP is assured

Action	Indicator/output	Priority	Responsible	Budget	Assumptions
8.1. Replace boat engine (TdC)	Boat engine acquired	High (AO) (delivered 2018 by RZSS)	AO-RZSS/TdC Government	NA	NA
8.2. Improve internet links	Increased bandwidth available	High (AO)	AO- ODA, FCO, TdC Government	TBC	Government support/funding provided

Objective/Outcome 9: The action plan is implemented effectively

Action	Indicator/output	Priority	Responsible	Budget	Assumptions
9.1. Secure government endorsement for the AP	Endorsement obtained	High (AO/IO)	AO- ODA/TdC IO-TAAF	Agency budgets	Agencies support the plan
9.2. Establish an AP steering group to monitor implementation	Steering Group members appointed	High (AO/IO)	All key s/holders	Staff time	Contributing organisations maintain or expand current capacity
9.3. Maintain links between governments and scientific agencies	Liaison channels established and utilised	High (AO) High (IO)	AO- ODA/TdC IO-TAAF All- Scientific agencie	Staff time	Contributing organisations maintain or expand current capacity
9.4. Acquire adequate resources to implement the plan	Plan resourced an implemented	High (AO/IO)	All	Staff time	Funding can be found
9.5. Establish AP monitoring and evaluation schedule	Schedule agreed	Medium (AO/IO)	AP Steering Group	Staff time	Steering Group established and operational
	Mid-term review conducted	Medium (AO/IO)	AP Steering Group	Staff time	Steering Group established and operational

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APPENDIX 1.

Participants-contributors

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Katrine Herian	Tristan Conservation	
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Annette Scheffer	Marine Stewardship Council	Phone/Skype (part)
David Mallon	Facilitator	
Helen Senn	RZSS/ Facilitator	
Susana Requena	RSPB	Phone/Skype
Susan Maclean	RZSS	
Charly Bost	CEBC-CNR	Follow-up meeting
Adrien Chaigne	TAAF	Review via email

APPENDIX 2.
Agenda Northern Rockhopper Penguin Action Planning Workshop 25-26th October 2017

DAY 1		
Opening		
what	who	Time/notes
Open and welcome to RZSS	Sarah Robinson	Whole session - 1 hr max
Aims and Objectives of the workshop /process	David Mallon	
Introductions	All	
Setting the scene		
Status review/RedList	Maria Dias	20 minutes
Overview and/or community engagement aspects	Trevor Glass	15 minutes (to confirm)
Keeping track - temporal and spatial marine habitat use of Northern Rockhoppers in the South Atlantic: Implications for marine spatial management	Antje Steinfurth	20 minutes
Ecological insights from barcoded penguins	Norman Ratcliffe	25 minutes
The effect of latitude and colony size on the breeding biology of the Northern Rockhopper penguin Research on the species	Antje Steinfurth	20 minutes
CNRS/TAAF	Slides from Charly/Karine	Data for info/discussion
Analysing the issues		
Threats	Activity involving all participants led by David	Important to include known and perceived threats -everything should be brought to the table for discussion. Issues will be analysed and prioritised.
Constraints		
DAY 2		
Strategy / Action plan		
Long term goal	Activity involving all participants led by David	
Objectives		
Actions		

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