



Falkland Islands Seabird Monitoring Programme

Annual Report 2019/2020 (SMP27)

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August 2020

Funded by the Falkland Islands Government



Recommended citation: Crofts, S. & Stanworth, A. 2020. Falkland Islands Seabird Monitoring Programme - Annual Report 2019/2020 (SMP27). Falklands Conservation, Stanley.

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Summary

The Falkland Islands support seabird populations that are of global importance; both numerically, and in terms of conservation status. Accordingly, fluctuations in local populations may substantially affect the global conservation status of these species.

The Falkland Islands Seabird Monitoring Programme (FISMP) monitors Gentoo Penguin (*Pygoscelis papua*) at 11 sites (17 colonies), Southern Rockhopper Penguin (*Eudyptes c. chrysocome*) and Macaroni Penguin (*Eudyptes chrysolophus*) at five sites (14 colonies) and Magellanic Penguin (*Spheniscus magellanicus*) at one site (one colony). King Penguin (*Aptenodytes patagonicus*) and Black-browed Albatross (*Thalassarche melanophris*) are monitored at single, but key sites, in terms of population numbers. Southern Giant Petrel (*Macronectes giganteus*) is monitored at one site (two colonies), Imperial Shag at three sites (four colonies) and Brown Skua (*Catharacta antarctica*) at one site (four colonies).

Overall

In 2019 breeding pair numbers of Gentoo Penguin were down whereas Southern Rockhopper Penguin numbers remained relatively unchanged from 2018; this continued to represent a significant loss (31 % and 28 % of pairs respectively), with no signs of recovery following the significant drop in breeding pair numbers during the season of 2016 (when a strong El Niño Southern Oscillation event was in place). FISMP 2019 showed a 7 % decrease in numbers of Black-browed Albatross breeding pairs, whereas numbers of Southern Giant Petrel breeding pairs increased by 7 %, when compared with 2018. In general, breeding success across the species was similar or lower than the previous year.

A weak El Niño Southern Oscillation event was in force throughout October 2019 to March 2020.

Gentoo Penguin breeding pair numbers at the FISMP sites showed a decrease (9 % or 2,039 pairs) when compared with 2018. Breeding pair numbers had not fully recovered following the significant drop during 2016, and currently are at 31 % below the 2015 value. In 2019, overall breeding success (0.94 chicks/pair) was similar from the previous year and reflected the FISMP long-term annual average (0.94 chicks/pair).

Southern Rockhopper Penguin breeding pair numbers increased by 1 % compared to 2018, so had not fully recovered following the significant drop during 2016, and remained at 28 % below the 2015 value. As expected, breeding success was highly variable between locations with overall performance reduced when compared to 2018; the average for all sites in 2019 remained below the long-term annual average.

Magellanic Penguin burrow occupancy at Gypsy Cove was broadly associated with the extent of tussac habitat. In 2019 the burrow occupancy rate of 27.7 % was similar to the previous year (25.0 %), but still below the annual average for this site (33.0%).

King Penguin numbers of pre-fledged chicks at Volunteer Point increased by 63 % or 317 chicks when compared to 2018. The 2019 chick count of 824 is the highest number of chicks per season since the colony established itself in the 1970s. The long-term monitoring at the site shows periodic fluctuations with an overall upward trend. The dip in pre-fledged chick numbers in 2016 coincided with an overall poor season for seabirds monitored under the FISMP; this was likely due to unfavourable environmental sea conditions during the 2015-2016 El Niño event.

Black-browed Albatross breeding pair numbers at the monitoring sites at Steeple Jason showed an overall decrease of 7 % when compared with 2018. Taking into account annual fluctuations, the overall FISMP trend suggests a stable population. The overall breeding success in 2019 remained below the annual average for the fifth consecutive year, and the lowest figure since 2010.

Southern Giant Petrel breeding pair numbers at Steeple Jason increased by 7 % from the previous year. The overall increase reflected the positive trend at the Neck colony, whereas the Northwest colony continued to decline. The breeding performance at Steeple Jason in 2019 was 7.5 % and well below the long-term annual average of 32 %. The North End colony at Bleaker Island saw complete breeding failure in late January as the result of a prolonged storm event.

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Introduction

The Falkland Islands support seabird populations that are of global importance, both numerically, and in terms of conservation status. An estimated 72 % of the global population of Black-browed Albatross (*Thalassarche melanophris*) breeds in the Falkland Islands (ACAP 2010, BirdLife International 2016). This species was down listed to 'Least Concern' on the IUCN Red List in 2017. The Falklands are also home to approximately 36 % of the world's population of Southern Rockhopper Penguin (*Eudyptes c. chrysocome*) (Red Listed as 'Vulnerable') and approximately 34 % of the world's population of Gentoo Penguin (*Pygoscelis papua*). The Gentoo Penguin was recently down listed from 'Near Threatened' to 'Least Concern' (IUCN 2017). Accordingly, fluctuations in local populations may substantially affect the global conservation status of these species.

Falklands Conservation initiated the Falkland Islands Seabird Monitoring Programme (FISMP) in 1989/90. Its initial purpose was to monitor the diet and population dynamics of Gentoo Penguin, Magellanic Penguin (*Spheniscus magellanicus*), Southern Rockhopper Penguin, and Black-browed Albatross. Diet sampling was discontinued in 2003. Since then, population monitoring has continued on an annual basis with some changes taking place to the original format, such as the addition and loss of some monitoring sites and the addition of other species.

Currently the FISMP monitors Gentoo Penguin (*Pygoscelis papua*) at 11 sites (17 colonies), Southern Rockhopper Penguin (*Eudyptes c. chrysocome*) and Macaroni Penguin (*Eudyptes chrysolophus*) at five sites (14 colonies) and Magellanic Penguin (*Spheniscus magellanicus*) at one site (one colony). King Penguin (*Aptenodytes patagonicus*) and Black-browed Albatross (*Thalassarche melanophris*) are monitored at single, but key sites, in terms of population numbers. Southern Giant Petrel (*Macronectes giganteus*) is monitored at one site (two colonies), Imperial Shag at three sites (four colonies) and Brown Skua (*Catharacta antarctica*) at one site (four colonies).

Based on the last Island Wide Census in 2010, monitored colonies made up approximately 18 % of the Falklands' breeding population of Gentoo Penguin (estimated at 132,000 breeding pairs; Baylis et al. 2013a), approximately 2.6 % of the Falklands' breeding population of Southern Rockhopper Penguin (estimated to be 319,000 breeding pairs; Baylis et al. 2013b) and approximately 0.5 % – 0.6 % of the total Falklands' breeding population of Black-browed Albatross (estimated to be

between 475,500 and 535,000 breeding pairs; Wolfaardt 2012). The monitoring site for Southern Giant Petrel made up approximately 8.6 % of the total Falklands' breeding population based on the latest 2015/16 Island-wide census (Stanworth & Crofts 2017). The only population estimate for Magellanic Penguin in the Falkland Islands is for 76,000 to 142,000 pairs (Woods and Woods 1997). As a very rough estimate, the current monitoring site is likely to represent less than one percent of this. Woods and Woods (1997) also provide the only population estimates for Imperial Shag (45,000 – 85,000 pairs) and Brown Skua (5,000 – 9,000 pairs) for the Falkland Islands. On this basis the FISMP monitors approximately between 2 % and 4 % of the Imperial Shag and Brown Skua breeding populations. There are no other significant King Penguin colonies within the Falkland Islands and the small numbers of individuals at other locations are not systematically monitored. The current monitoring site at Volunteer Point is likely to represent over 95 % of the breeding population in the Falklands.

The information gathered as a result of the FISMP has contributed to the identification of local, regional and global conservation priorities and provides information necessary for IUCN Red Listing assessments. The FISMP provides an important long-term data set on population trends and breeding success, which further contributes to other areas of research.

This report details monitoring results from the 2019/2020 breeding year as well as contributed data collected by landowners at Dunbar and Bleaker Island settlements.

Materials and methods

Within this report, breeding periods are referred to by the year in which they commenced, for example; 2019 describes the 2019/2020 austral summer breeding period. 'Location' or 'site' refers to a named geographical area, such as a settlement or 'camp', and this may support more than one colony. For example, Johnson's Harbour has Gentoo Penguin colonies at Volunteer Green, Lagoon Sands and at Cow Bay; Race Point has Gentoo Penguin colonies at Rookery Sands and Fanning Harbour. 'Colony' refers to a group or groups (sub-colonies) of birds in close proximity, typically within 50-100 m of each other and/or with the same or proximate access from the sea. Monitoring locations are shown in **Figure 1**, exact grid references are provided in **Appendices 2 to 5**.

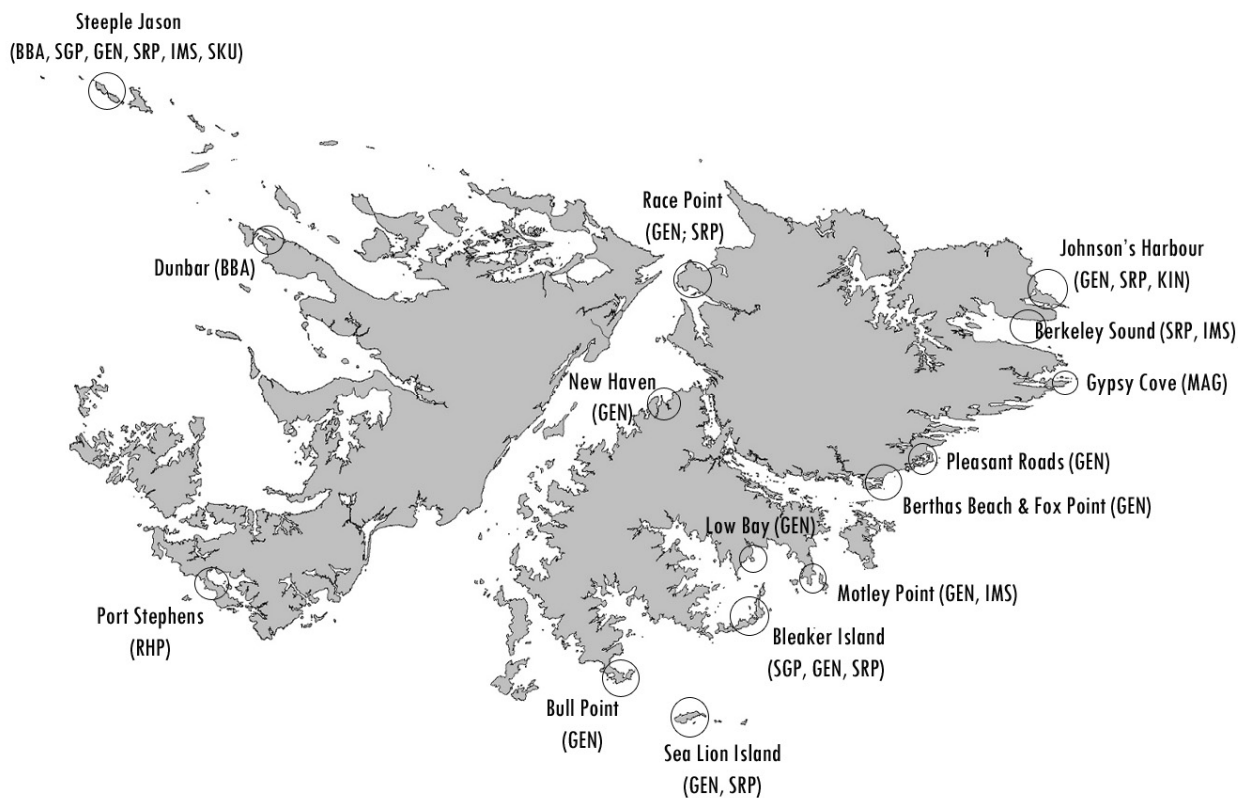


Figure 1: Map of the FISMP monitoring locations.

In addition to those counts undertaken by Falklands Conservation (below), counts have also been undertaken at Dunbar (Black-browed Albatross) and Bleaker Island (Southern Giant Petrel, Southern Rockhopper and Gentoo Penguin) by the landowners. Any variation from the standard methodology is reported in the text.

Gentoo Penguin

Apparently Occupied Nests (AON) of Gentoo Penguins were counted during egg-laying, over the period 31 October to 19 November 2019 to provide a breeding pair estimate. The number of chicks was counted before fledging (Pre-Fledged Chicks (PFC)), during the period 6-27 January 2020, and used to estimate breeding success. The monitoring locations (colonies in brackets if more than one) were:

- Johnson Harbour (Volunteer Green, Cow Bay and Lagoon Sands);
- Race Point (Fanning Harbour and Rookery Sands);
- Sea Lion Island;
- New Haven;
- Bull Point (Bull Point and Bull Roads);
- Motley Point;
- Low Bay;
- Bertha's Beach;
- Fox Point;
- Pleasant Roads; and
- Steeple Jason (House and Neck).

Southern Rockhopper Penguin

Southern Rockhopper Penguin breeding pair counts (using AON) were performed from the commencement of egg-laying during the period 31 October to 19 November 2019. Chick counts (PFC) were carried out over 08-26 January 2020. A new study colony (Steeple Jason S5 Finger) was added in 2019. The locations (colonies in brackets if more than one) were:

- Steeple Jason (Northwest Flat, Northwest Ridge, S5Tip, Southeast and S5 Finger);
- Sea Lion Island (Rockhopper Point);
- Race Point (Fanning Head North and Fanning Head South);
- Berkeley Sound (Diamond Cove, Rugged Hill and Eagle Hill); and
- Port Stephens (Stephen's Peak).

Magellanic Penguin

Transects were carried out every 100 m (approximately) from Engineer Point to the Car Park at Gypsy Cove on 18 December 2019. Transects were 4 m wide, starting from the shore line, and running perpendicular to it, for a distance 40 m further than the last burrow found. Using a pole with torch attached, burrows within the transect were categorised as either 'occupied',

'unoccupied' or 'unknown', if it was not possible to determine occupancy. Burrow density was derived from each transect as number of burrows in the transect area from the start of the transect to as far as the last recorded burrow.

King Penguin

The only significant population of King Penguins within the Falkland Islands is found at Volunteer Point. This population has been monitored annually since the onset of the FISMP, with the first independent counts having been performed earlier, since 1980. A few individuals also breed at nearby Lagoon Sands. The breeding cycle of King Penguins extends over a year and consequently is not synchronised to summer breeding as with the other penguin species. The chosen unit of measure for King Penguin is pre-fledged chicks (PFC) that have survived the winter. This is not a measure of the total number of chicks produced (as some will have perished over the winter), nor is it an exact indicator of the number of breeding pairs. The counts were conducted on 16 November 2019.

Imperial Shag

Counts of Imperial Shag (AON) were conducted at Motley Point (05 January 2020), Berkeley Sound (Eagle Hill and Rugged Hill on 13 January 2020) and Steeple Jason (25 January 2020). Due to the variable breeding times of Imperial Shag, numbers derived represented the numbers of active nests during the January monitoring period.

Brown Skua

Brown Skua counts were initiated on Steeple Jason in 2016. Counts of Apparently Occupied Territory (AOT) were conducted at Steeple Jason between 23 and 26 January 2020. Due to the restricted monitoring window at Steeple Jason AOTs were classified by a territory with egg/s and or chick/s observed or an adult sitting tightly on a nest and assumed to be incubating/brooding. All territories were recorded with a GPS position.

Black-browed Albatross and Southern Giant Petrel

Counts of Black-browed Albatross and Southern Giant Petrel breeding pairs (AON) at Steeple Jason were performed between 31 October and 9 November 2019, and in order to estimate breeding success, chicks (PFC) from these colonies were counted between 13 and 15 March 2020. Two colonies of Southern Giant Petrel and six sub-colonies of Black-browed Albatross were monitored. In 2019 the Black-browed Albatross Penthouse colony chick numbers were no longer incorporated

into the site average breeding success due to its small size. All counts since 2004 were re-calculated to exclude the Penthouse colony. A new study colony (Steeple Jason S5 Finger) for Black-browed Albatross was added in 2019.

Counts of Black-browed Albatross breeding pairs were made at Penguin Point South, Dunbar (30 December 2019 and of chicks in March 2019) by the landowner. Counts were made at Bleaker Island by the landowner for Gentoo Penguin (07 November 2019), Southern Rockhopper Penguin (30 November 2019) and Southern Giant Petrel chicks (01 March 2020).

Count methods

Whenever possible, the total counts (using the above count units) were made at individual locations, whilst in the field, by paired observers (**Appendix 1**). The decision to utilise photo counting was made on an individual colony/sub-colony basis, where it was felt that a paired tally count in the field would not provide a reliable estimate. This was generally due to the size of some colonies (e.g. Steeple Jason Neck). In some instances, for chick counting, large numbers of highly mobile chicks had merged sub-colonies over large areas. Here again, it was felt, that reliable estimates could not be derived and the decision was made to count the other sub-colonies that had remained distinct. These counts still related to individual breeding pair numbers from the counts earlier in the summer, and from this breeding success could be derived; in essence a sub-sampling technique. The various methods, or combination of methods, employed for each location/colony are presented in **Appendices 2 to 5**. Grid references of individual colonies (due south of the approximate centres, 5m from the colony edge) were taken where possible and are provided in **Appendices 2 to 5**.

Field counts

Whenever possible, counts were made at least three times by two or more observers using tally counters in accordance with standard methods (Thompson & Riddy 1993). These counts (and those few of reduced replication) were subsequently averaged to give estimates of breeding pair and chick numbers. These counts are referred to as 'Tally repeated'. Counts at Penguin Point South, Dunbar and Bleaker Island were single counts by a single observer. In some instances, groups or count unit numbers were so small that it was felt the number of count units could confidently be counted without error on a single occasion. These counts are referred to as 'Tally agreed'. Breeding success is expressed on graphs as the number of chicks per breeding pair for species with two or more chicks and as a percentage for those with one chick.

GoPro Counts

A GoPro HD Hero camera was pole mounted and held aloft from a vantage point to a height of approximately 5 m whilst a minimum of three photos were taken in 1920x1080 resolution in jpeg format giving a 127° field of view. Where colonies were too large to fit into a single photograph, markers or natural features were used to subdivide the colonies into sections that could be photographed. There was no evidence of disturbance in the colonies from using this technique. Images were downloaded and counted using ImageJ software. Counts were repeated a minimum of four times by two counters and the average taken. These are referred to in Tables as 'GoPro counts'.

Drone counts

DJI Phantom 4 drones were trialled in 2016 to capture aerial images of colonies under FIG Research Licence No: R13/2016. All operations were conducted at a minimum launch distance of 15 m from a colony and reaching a minimum flying altitude of 15 m when directly over colonies. Greater caution was used when operating the drone at flying seabird colonies. Drone use is prohibited by the landowner at Volunteer Point and therefore was not used at this site. The inbuilt camera produces 4000x3000 resolution jpeg format images giving a 94° field of view. There was evidence that birds were aware of the drone but no evidence to suggest disturbance of breeding birds in the colonies using this method (Crofts 2017). Images were downloaded and counted using ImageJ software. Counts were repeated a minimum of four times by two counters and the average taken. These are referred to in Tables as 'Drone counts'.

Comparison of differing counting methods

Multiple count data for the same colony using two or more of the methods were stored for future comparative work. For the purpose of this report, where multiple counting methods exist for the same colony, the data used were those that exhibited the least error between counts. Where possible the same counting method was used to calculate breeding success for each colony.

Environment

Global environmental conditions and sea surface temperatures are influenced by the natural climate phenomenon of the El Niño Southern Oscillation (ENSO). ENSO is the dominant feature of climate variability on inter-annual timescales (for description see:

<https://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/gpc-outlooks/el-nino-la-nina/enso-description>). The ENSO is used to describe the environmental proxy for the FISMP reporting period. Data and forecasts are taken from the [Climate Prediction Center](#). Any atypical oceanographic features observed at the Falkland Islands are sourced from personal communications with the Falkland Islands Fisheries Department.

Anthropogenic and other impacts at colonies

The first measures of anthropogenic and other impacts were introduced to FISMP in 2017. The measures currently involve recording:

- 1) Direct evidence of marine plastics observed in and around the colonies;
- 2) Any signs of oiling to seabirds;
- 3) Evidence of entanglement or ingestion of fishing gear or other items;
- 4) External signs or symptoms of disease.

Results

Gentoo Penguin

Breeding pairs

There is a complete data set for the current annually monitored locations (excluding Pleasant Roads, Bleaker Island) for the last 17 years. The combined total of estimated breeding pairs for these locations is shown in **Figure 2**. At these monitored sites, the estimated total number of breeding pairs in 2019 was 20,667, a decrease of 9 % or 2,039 pairs when compared to 2018.

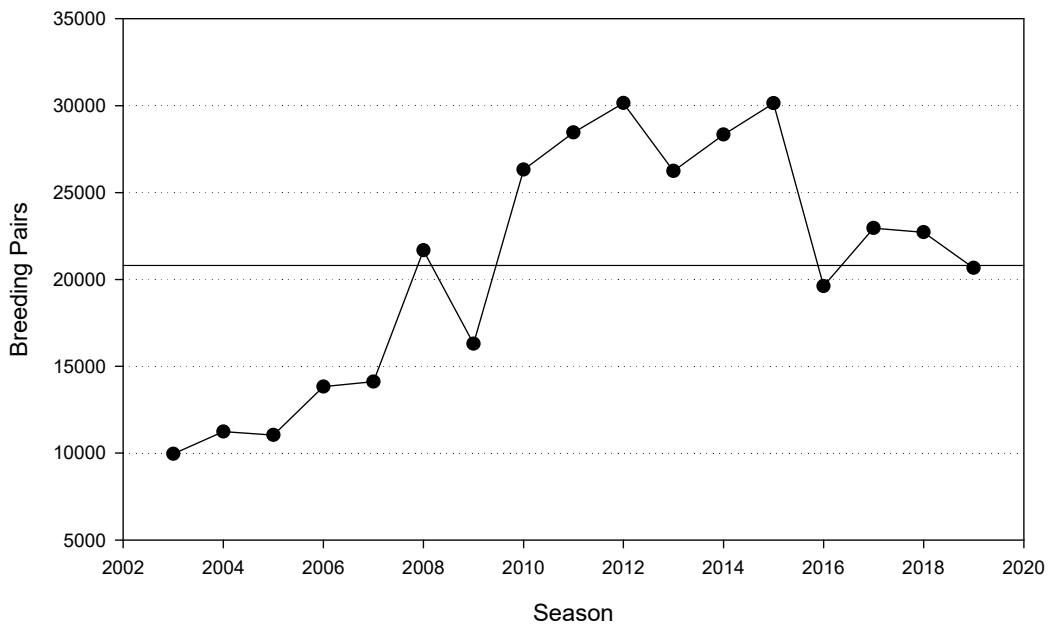


Figure 2: Gentoo Penguin breeding pairs at the FISMP locations, 2003–2019. (Solid line – annual average).

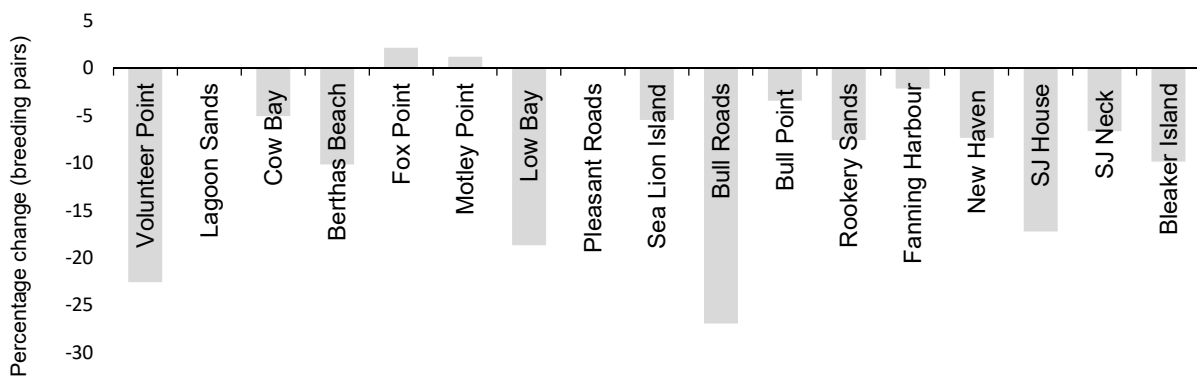


Figure 3: Percentage change of Gentoo Penguin breeding pair numbers between 2018 and 2019 at individual FISMP locations.

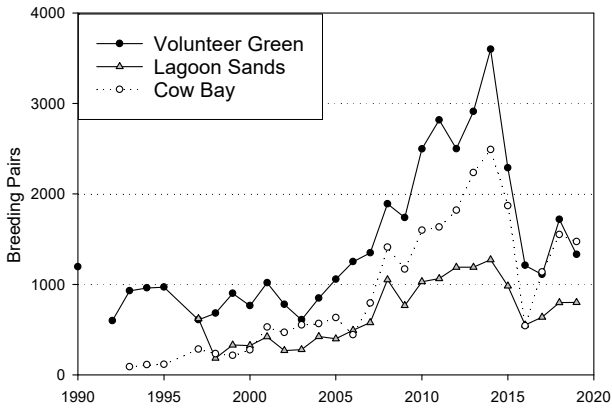


Figure 4: Gentoo Penguin breeding pairs for locations in Northeast Falkland.

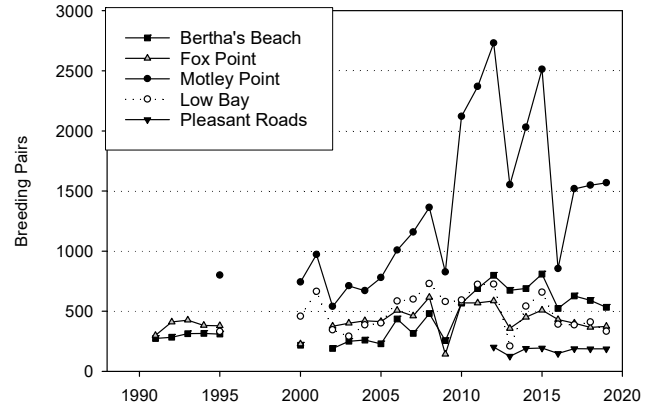


Figure 5: Gentoo Penguin breeding pairs for locations in Mideast Falkland.

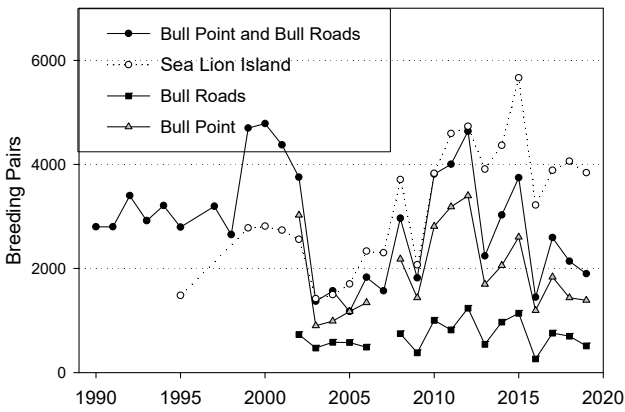


Figure 6: Gentoo Penguin breeding pairs for locations in Southeast Falkland.

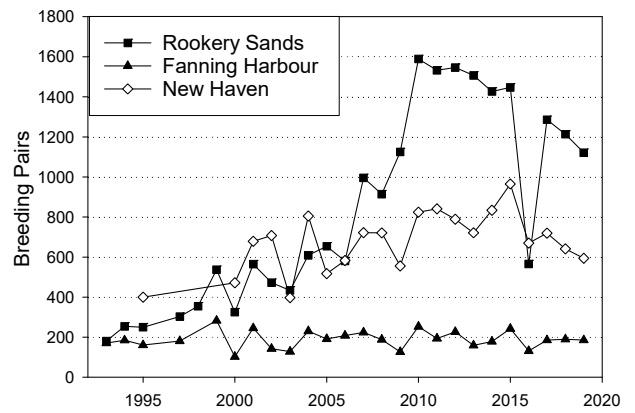


Figure 7: Gentoo Penguin breeding pairs for locations on Falkland Sound.

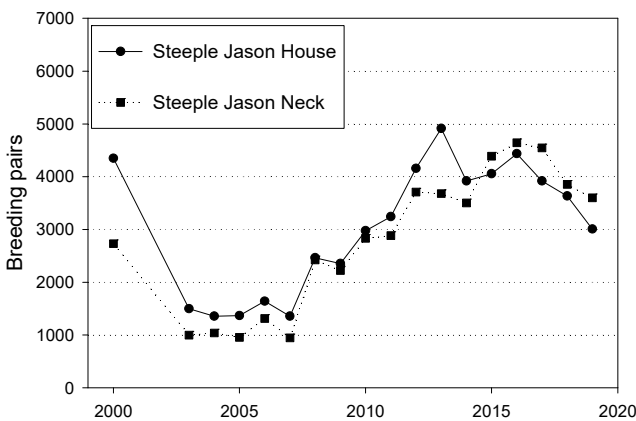


Figure 8: Gentoo Penguin breeding pairs for locations on Steeple.



Figure 9: Gentoo Penguin breeding pairs for Bleaker Island.

Of all the Gentoo Penguin colonies monitored (n=17) thirteen (76 %) showed a decrease in breeding pair numbers when compared with 2018. The largest decreases were at Bull Road (27 %) Volunteer Green (23 %) and Low Bay (19 %). Only three sites (Lagoon Sands, Motley Point, Fox Point) showed an increase (albeit very small) in breeding pair numbers (**Figures 3**).

The three Gentoo Penguin colonies in the Northeast region showed a combined decrease of 11 % when compared to breeding pair numbers from 2018, with Volunteer Green decreasing by 23 %, and Cow Bay by 5 % (**Figure 4**). Gentoo Penguin breeding pairs for locations in Mideast Falkland remained similar to those in 2018 (**Figure 5**). The Southeast Gentoo Penguin colonies all decreased in pair numbers with Bull Roads the largest decrease at 27 %, followed by Bleaker Island (10 %), Sea Lion Island (5 %), and Bull Point (2 %) (**Figure 6**). Falkland Sound colonies also all demonstrated decreases with Rookery Sands down by 8 %, New Haven (7 %), and Fanning Harbour (2 %) (**Figure 7**). Both colonies at Steeple Jason decreased for a third consecutive year with the House down by (17 %) and the Neck (7 %) (**Figure 8**). Breeding pair numbers at Bleaker Island decreased by 10 % from 2018 (**Figure 9**).

Breeding success

Average estimated breeding success was 0.94 ± 0.32 chicks/pair in 2019; a similar value to 0.92 ± 0.46 chicks/pair in 2018. The 2019 figure reflected the FISMP long-term annual average (0.94 chicks/pair) and was higher than the previous four year average (0.69 ± 0.18 chicks/pair) (**Figure 10**).

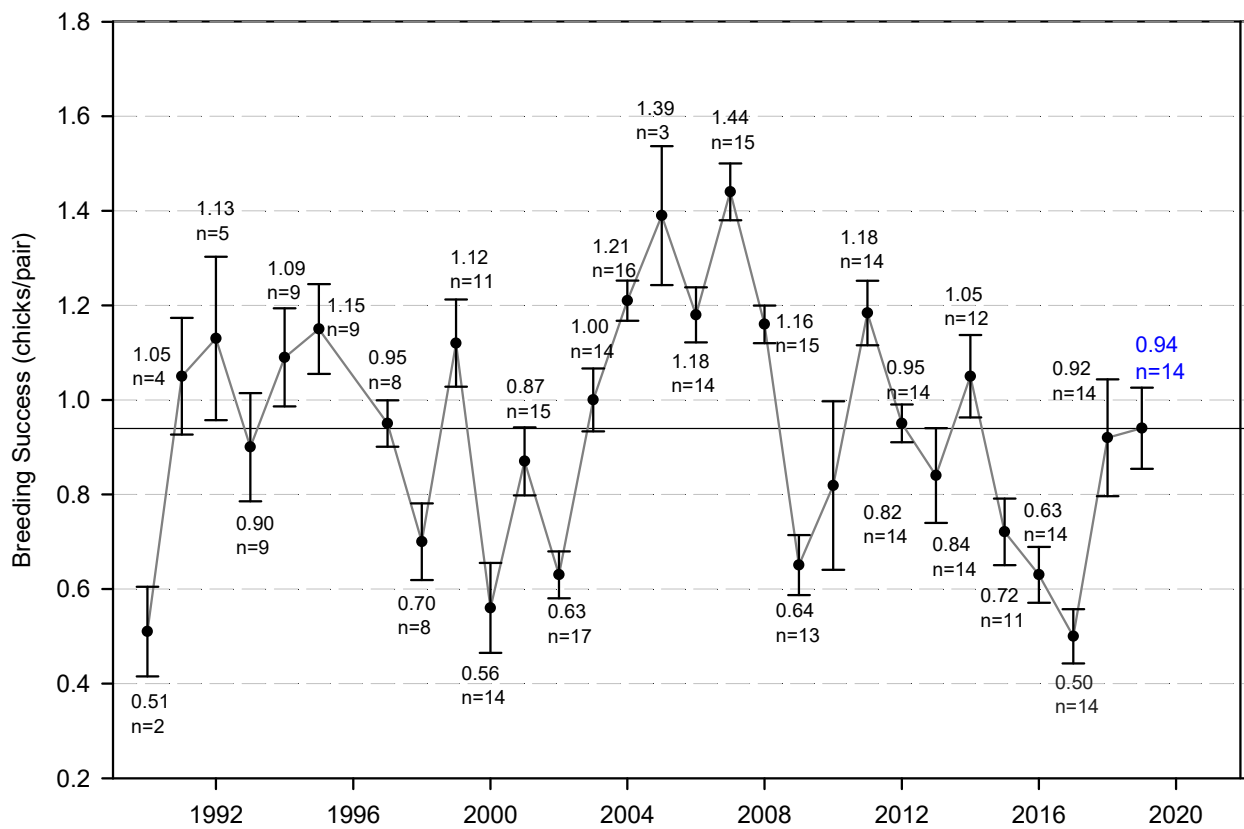


Figure 10: Gentoo Penguin breeding success at FISMP locations, 1990-2019.

(Solid line – annual average). Standard Error bars show error about the overall mean by site means, and do not incorporate error about individual sites.

Breeding success varied between locations, but on the whole performance was similar to 2018. The range of breeding success between locations varied from a minimum of 0.36 ± 0.04 chicks/pair at Motley Point to a maximum of 1.43 ± 0.03 chicks/pair at New Haven (**Figures 11 to 15**). Nine colonies (56 %) demonstrated increased breeding success when compared with 2018, ranging from 725 % at Steeple Jason Neck to 5 % at Rookery Sands. Seven of the monitored colonies decreased in breeding success from the previous year. The largest decreases were at Motley Point (69 %) and Low Bay (59 %).

At Steeple Jason, the FIMSP data suggests an apparent long-term trend of decreasing breeding success for both the Gentoo Penguin colonies (**Figure 15**). In 2019, the average breeding success for Steeple Jason was 0.87 ± 0.02 chicks/pair; this was the first year since 2012 that breeding success was similar to the long-term annual average (0.8 chicks/ pair)

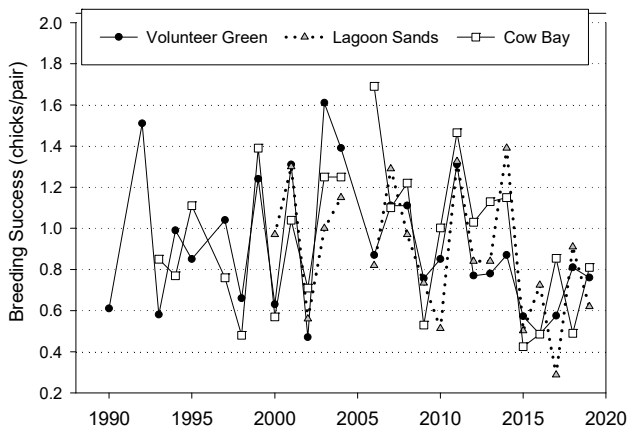


Figure 11: Gentoo Penguin breeding success for locations in Northeast Falkland.

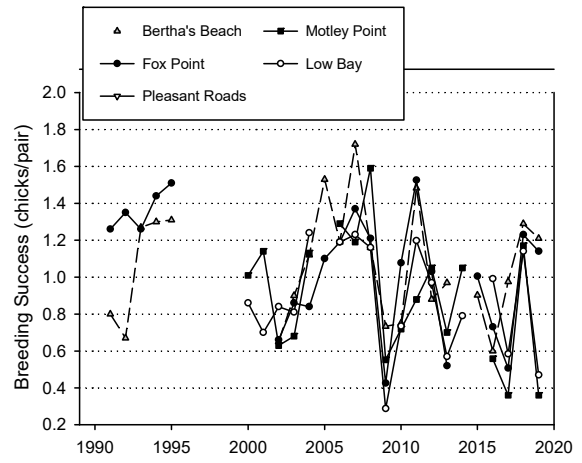


Figure 12: Gentoo Penguin breeding success for locations in Mideast Falkland.

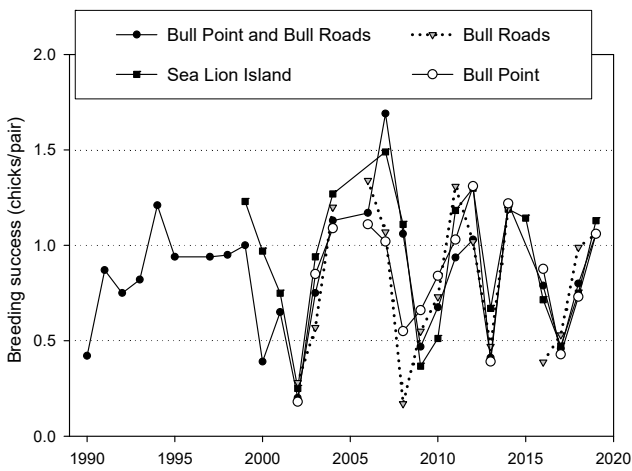


Figure 13: Gentoo Penguin breeding success for locations in Southeast Falkland.

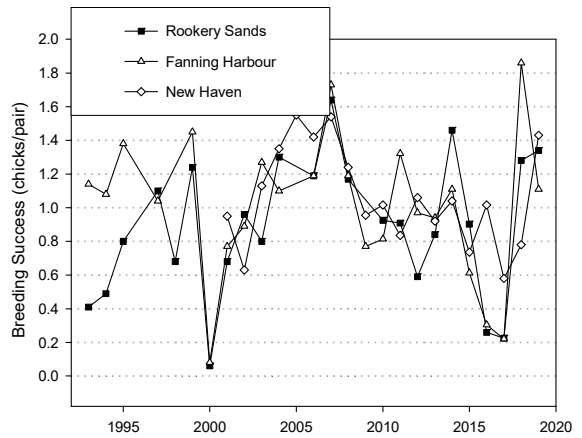


Figure 14: Gentoo Penguin breeding success for locations on Falkland Sound.

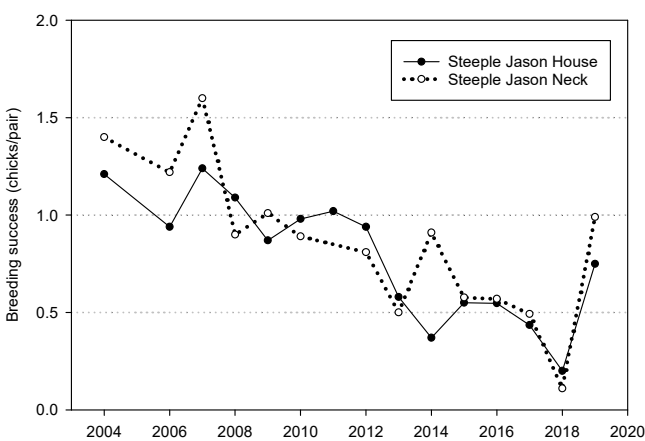


Figure 15: Gentoo Penguin breeding success for locations on Steeple Jason.

Southern Rockhopper Penguin

Breeding pairs

Five locations have been monitored annually since 2005 (Race Point, Steeple Jason Study and NW colonies, Sea Lion Island and Berkeley Sound). At these sites, the combined total estimate of the number of breeding pairs was 4,984 in 2019; this represented an increase of 1 % from the 4,935 breeding pairs estimated in 2018 (**Figure 16**).

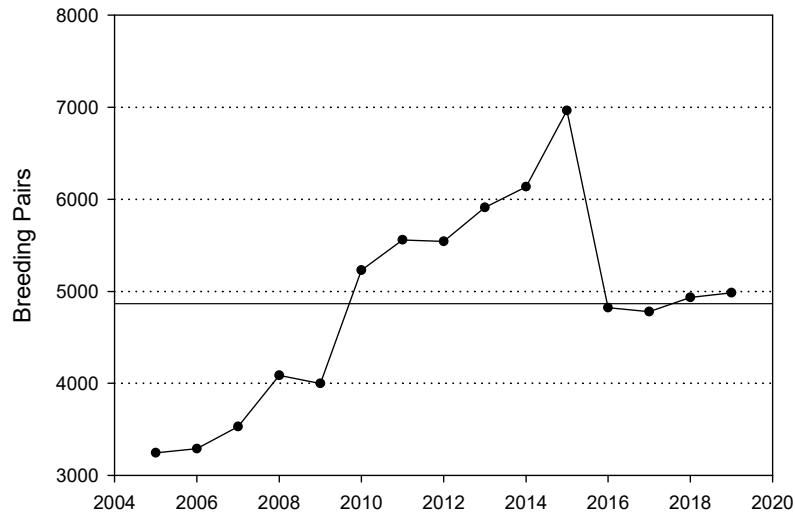


Figure 16: Southern Rockhopper Penguin breeding pairs at FISMP locations 2005-2019. (Solid line – annual average).

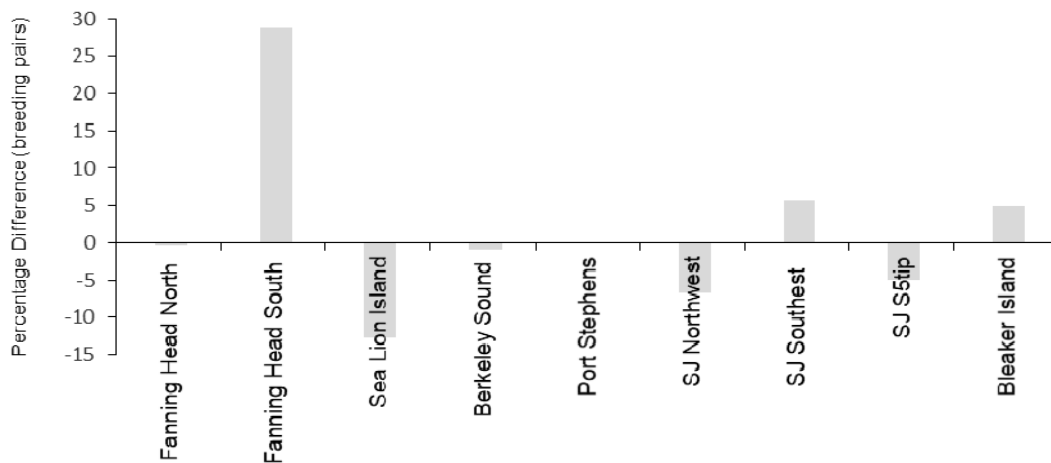


Figure 17: Percentage change of Southern Rockhopper Penguin breeding pair numbers between 2018 and 2019 at individual FISMP locations.

Three of the monitored colonies decreased in breeding pair numbers (Sea Lion Island, Steeple Jason Northwest, Steeple Jason S5Tip) whilst a further three colonies showed increased numbers (Steeple Jason Southeast, Fanning Head South and Bleaker Island) when compared with 2018 (Figure 17).

The largest increase in breeding pair numbers was seen at Fanning Head South at 29 % (102 pairs) and Steeple Jason Southeast at 6 % (43 pairs). The largest decrease in breeding pair numbers was 13 % at Sea Lion Island. At Fanning Head North and Berkeley Sound the breeding pair numbers were similar to the values in 2018 (Figures 18 to 21). There was no count data collected from Port Stephens in 2019.

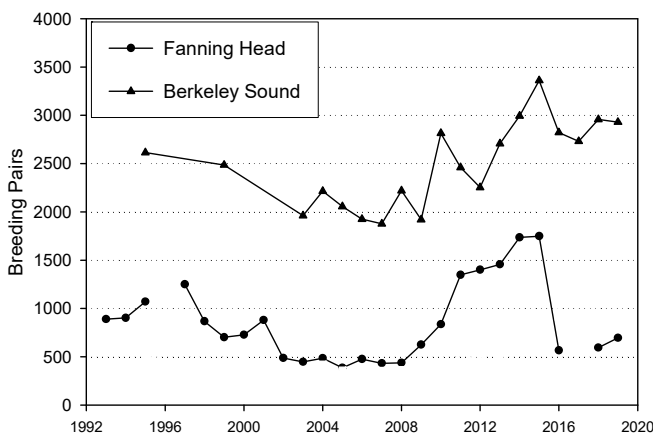


Figure 18: Southern Rockhopper Penguin breeding pairs for locations in mainland East Falkland.

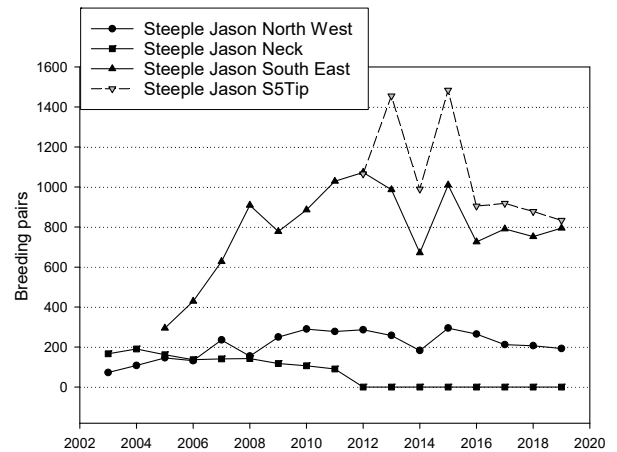


Figure 19: Southern Rockhopper Penguin breeding pairs for locations on Steeple Jason

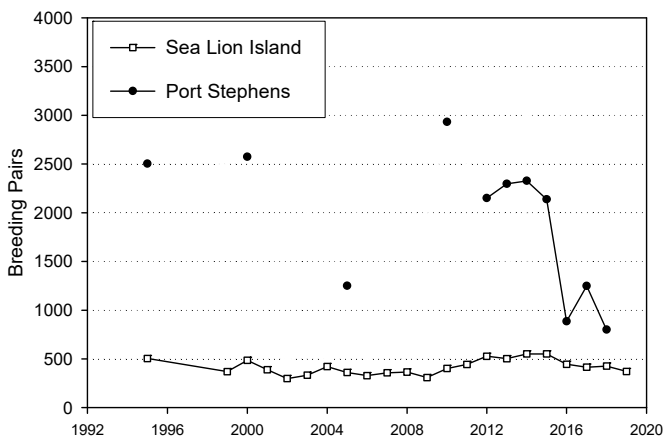


Figure 20: Southern Rockhopper Penguin breeding pairs for locations in South Falklands.

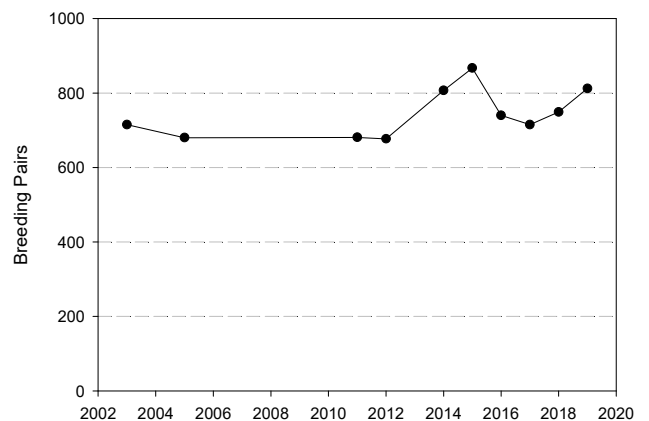


Figure 21: Southern Rockhopper Penguin breeding pairs for Bleaker Island.

Breeding success

Average breeding success for Southern Rockhopper Penguin was 0.47 ± 0.14 chicks/pair in 2019; this represented a 12 % decrease in performance from 0.54 ± 0.26 chicks/pair in 2018. The figure remained below the annual average (0.63 ± 0.16 chicks/pair) for the fifth consecutive year (**Figure 22**).

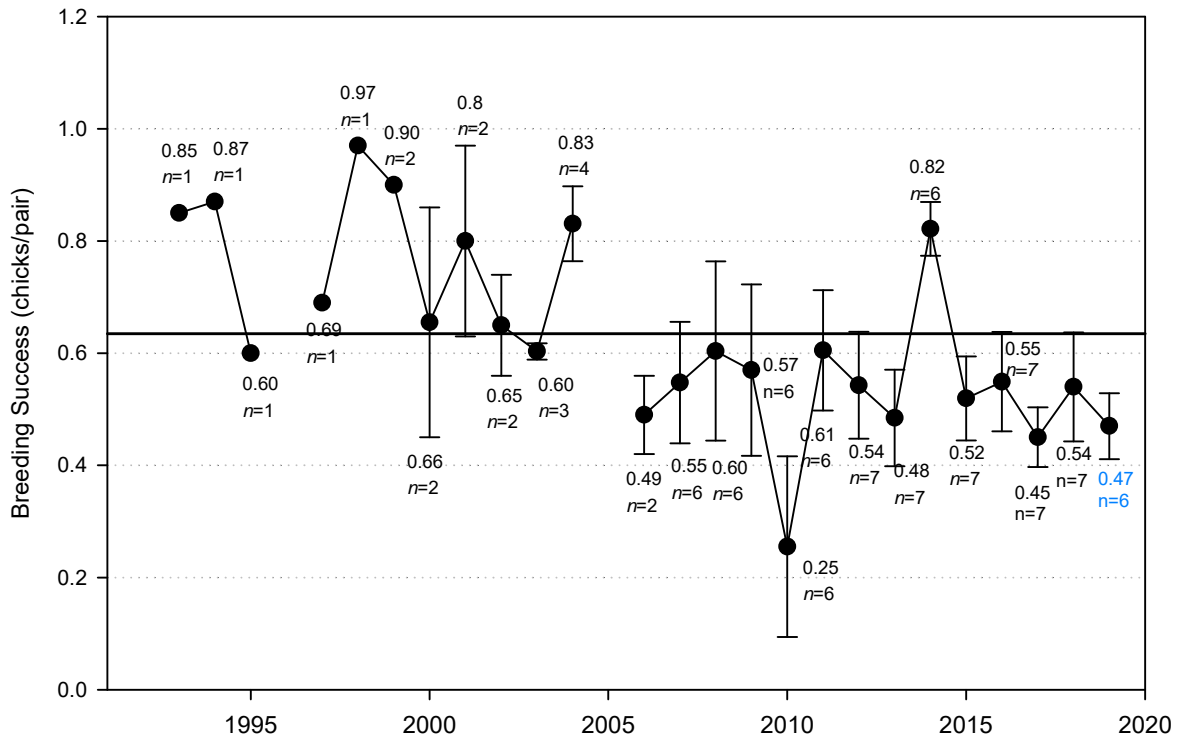


Figure 22: Southern Rockhopper Penguin breeding success at FISMP locations, 1993-2019. (Solid line - annual average). Standard Error bars show error about the overall mean by site means, and do not incorporate error about individual sites.

Breeding success varied between locations from a minimum of 0.29 ± 0.02 chicks/pair at Steeple Jason Northwest to a maximum of 0.68 ± 0.01 chicks/pair at Berkeley Sound. The largest changes in breeding success between 2018 and 2019 were seen at Steeple Jason S5Tip with a 34 % increase, and at Sea Lion Island with a 33 % decrease (**Figure 23 to 25**).

In 2019 a new study colony was added at Steeple Jason (S5 Finger) with 1,057 breeding pairs and a breeding success of 0.43 ± 0.04 chicks/pair.

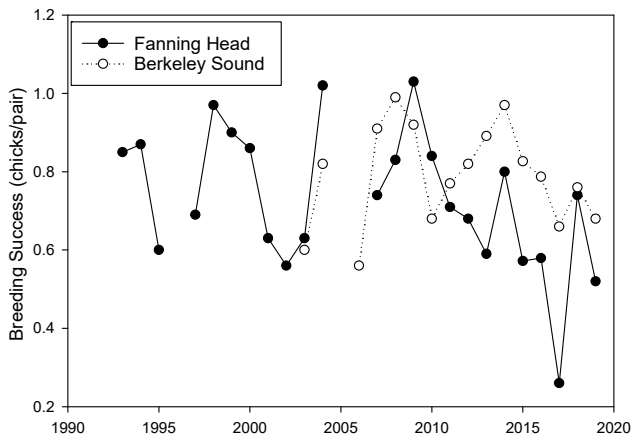


Figure 23: Southern Rockhopper Penguin breeding success for locations in mainland East Falkland.

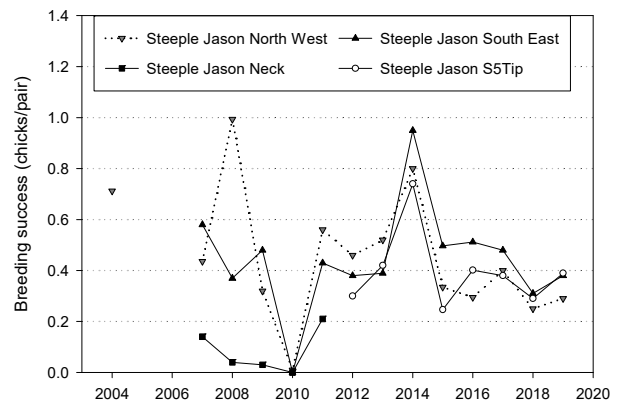


Figure 24: Southern Rockhopper Penguin breeding success for locations on Steeple Jason.

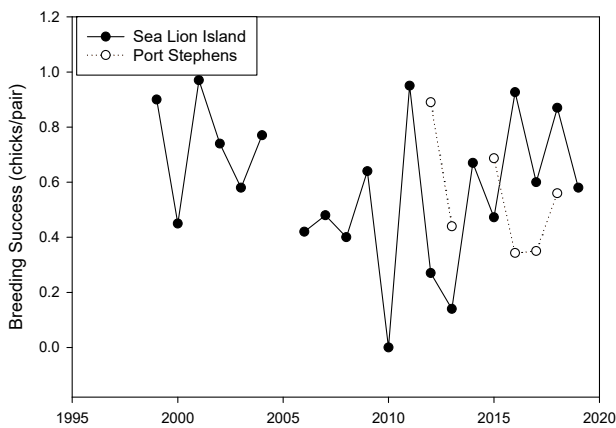


Figure 25: Southern Rockhopper Penguin breeding success for locations in south Falklands.

Magellanic Penguin

The location and extent of transects and the estimated occupied burrow densities at Gypsy Cove are shown in **Figure 26**. Twenty nine transects were carried out between Engineer Point and the Car Park at Gypsy Cove, of which, around a third ($n = 10$) contained occupied Magellanic Penguin burrows (yellow, orange, dark orange and red coloured bars on **Figure 26**).

Where burrows occurred, estimated densities ranged from 3,676 to 125,000 occupied burrows /km², with an average density of $8,184 \pm 6,529$ /km² - notably higher than the previous year of $3,989 \pm 3,163$ /km². Mean occupancy rate derived from transects using the current methodology for Gypsy Cove was 28.1 ± 7.7 % (± 1 Standard Error, $n = 17$). Taking all burrows where there was no uncertainty over occupancy status ($n = 67$), as per surveys prior to 2012, gave an occupancy rate of 27.7 %. This occupancy rate was well below the seasonal average for the site (**Figure 27**).



Figure 26: Transect locations for the Magellanic Penguin survey at Gypsy Cove, 2019 (image from Google Earth). Yellow (≥ 0 and $\leq 10,000$ breeding pairs/ km^2), light orange ($> 10,000$ and $\leq 20,000$ breeding pairs/ km^2), dark orange ($> 20,000$ and $\leq 30,000$ breeding pairs/ km^2) and red ($> 30,000$ breeding pairs/ km^2) lines show minimum breeding pair densities between the shore and the furthest burrow from the shore; light grey lines show the extent of each transect where no burrows were present, dark grey lines where only unoccupied burrows were recorded.

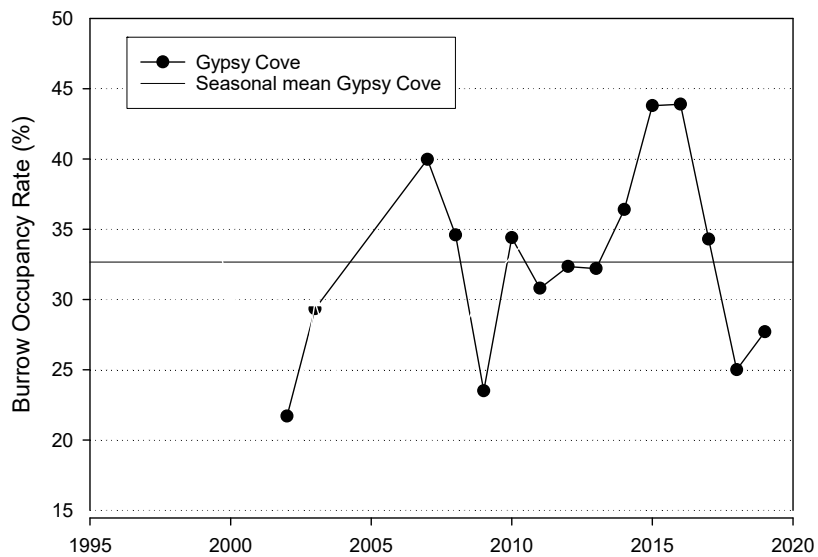


Figure 27: Magellanic Penguin burrow occupancy rate at Gypsy Cove, 2002 -2019.

King Penguin

The number of pre-fledged chicks at Volunteer Point in November 2019 was 824, this was the highest count since monitoring began in 1980 and a 63 % increase from 507 chicks in 2018 (**Figure 28**). The numbers of pre-fledged chicks at Volunteer Point continues to show an overall increasing trend, despite intermittent fluctuations.

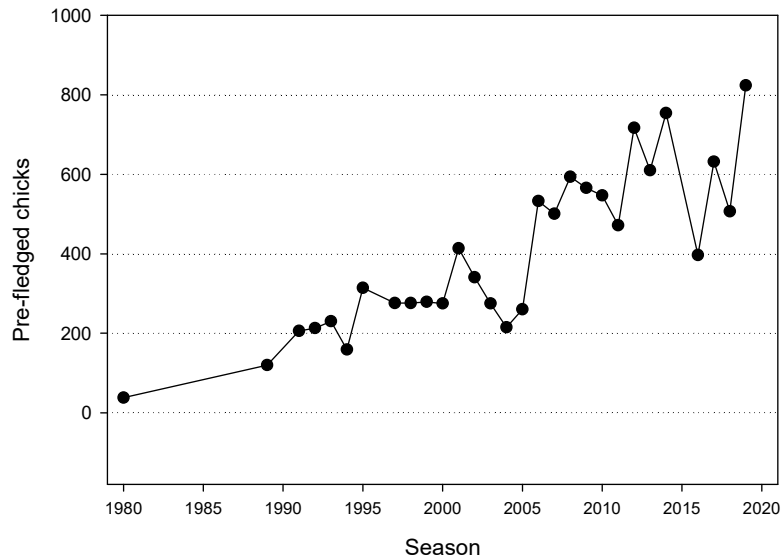


Figure 28: King Penguin pre-fledged chick numbers at Volunteer Point, 1980-2019.

Imperial Shag

Imperial Shag monitoring was initiated in 2013 at two colonies and expanded to four colonies in 2016. Numbers of Adult on Nests (AON) of Imperial Shags were counted in January 2020; the results at the colonies continues to be variable over sites and seasons (**Figure 29**).

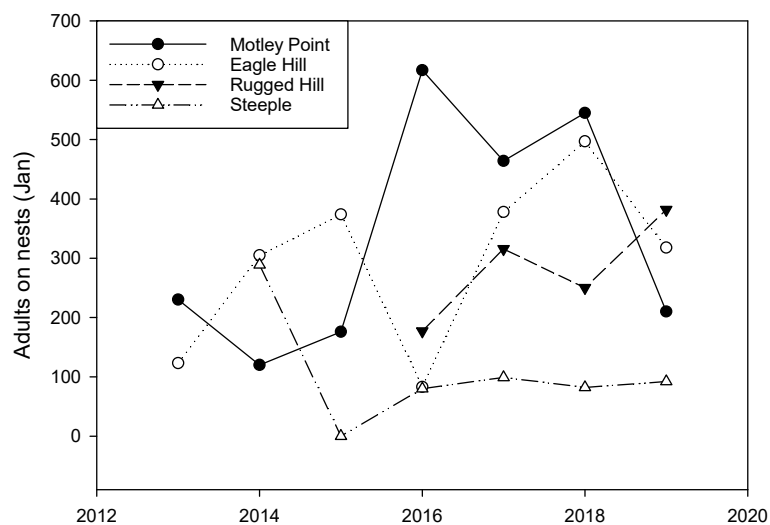


Figure 29: Imperial shag Apparently Occupied Nests (AON), 2013-2019.

Brown Skua

There was a small increase (4 %) in the total numbers of Apparently Occupied Territories (AOT) of Brown Skua from 2018 to 2019, at 225 AOT. A broad measure of productivity (the ratio of nest eggs/chicks per adult territory) was 1.39. This was higher than recorded in 2018 (**Figure 30**). In 2019, of the site total, the Northwest colony had the largest number of AOT (44 %) followed by Neck (28 %), House (16 %), South (11 %) and South of Ridge (1%).

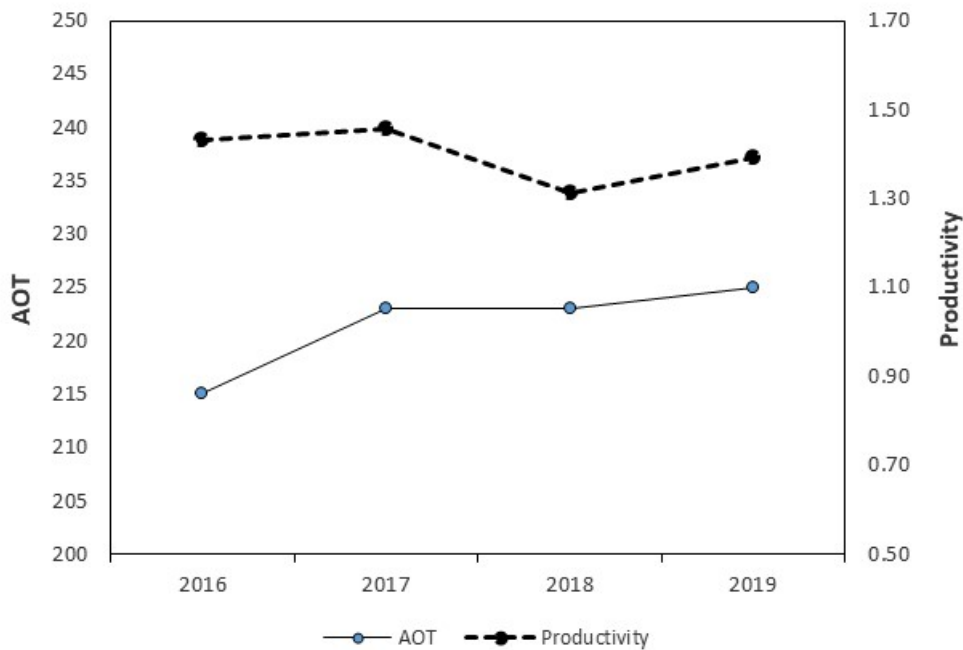


Figure 30: Brown Skua Apparently Occupied Territories (AOT) and productivity at Steeple Jason, 2016-2019.

Black-browed Albatross

Breeding pairs

The estimated number of breeding pairs of Black-browed Albatross at Steeple Jason monitoring sites was 3,206 in 2019; this represented a 7 % decrease from 3,444 pairs in 2018 (**Figure 31**).

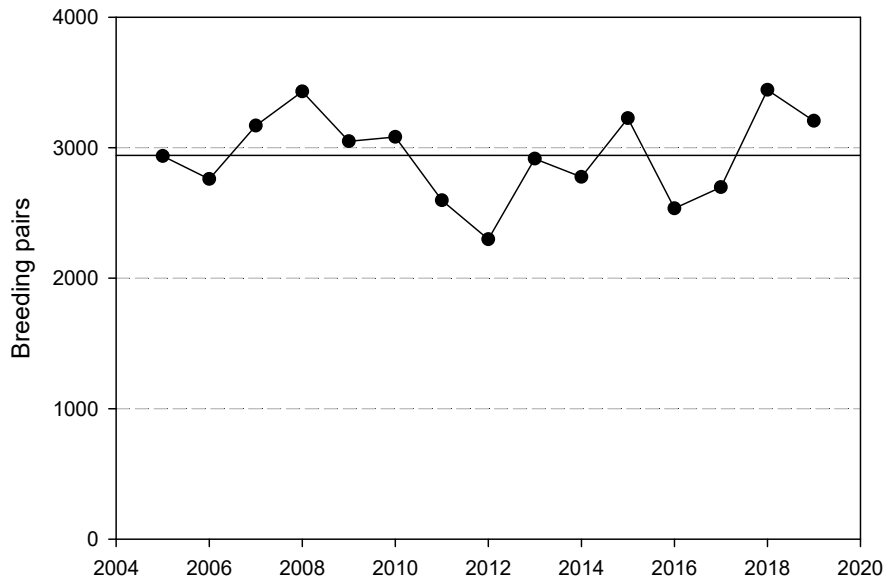


Figure 31: Black-browed Albatross breeding pairs at FIMSP sites, Steeple Jason, 2005-2019.

(Solid line – annual average).

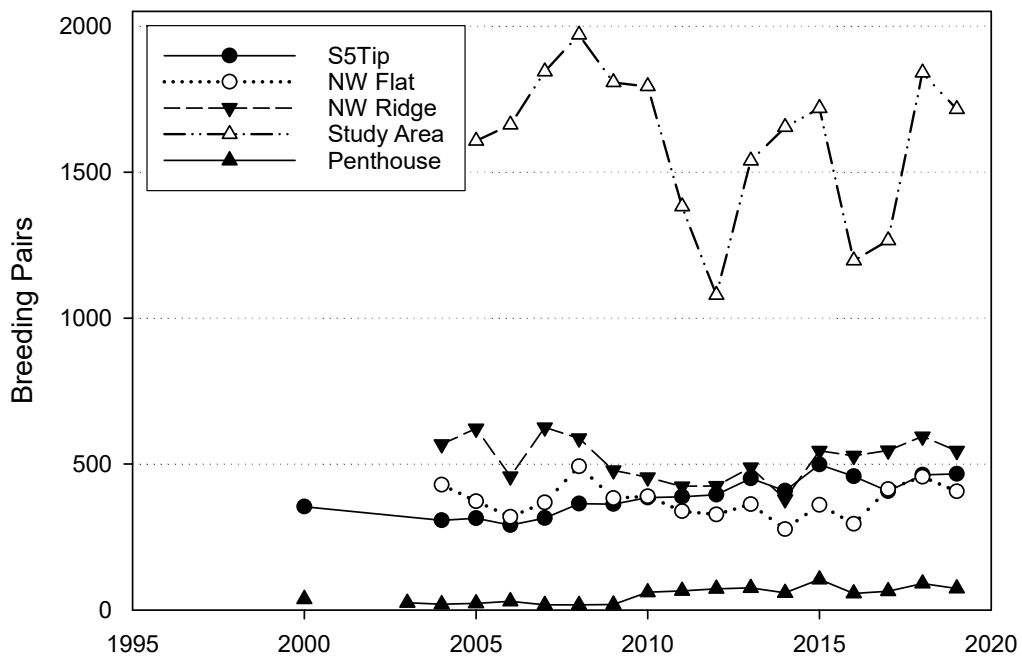


Figure 32: Black-browed Albatross breeding pairs at individual FISMP sites on Steeple Jason, 2000-2019.

Four of the five monitoring colonies at Steeple Jason showed decreases in breeding pair numbers when compared with 2018; Penthouse (19 %), Northwest Flat (11 %), Northwest Ridge (8%) and Study Area (7 %). The S5Tip colony showed a small increase (1 %) (**Figure 32**).

Breeding success

Overall breeding success for the four monitored colonies (excluding the Penthouse colony) was 32 % ± 17 chicks/pair in 2019, a drop from 57 % ± 8 chicks/pair in 2018. (**Figure 33**). Breeding success remained below the annual average (53 %) and was the lowest value since 2010.

Breeding success was highly varied between the individual colonies; S5Tip (43 %), NW Flat (22 %), NW Ridge (14 %) and the Penthouse (3 %) (**Figure 34**).

Breeding success at the Penthouse colony for the last 4 years has been notably low. In 2017 the colony experienced complete breeding failure (0 %) and in 2016, 2018 and 2019 chick success was 3.5 %, 14 % and 3 % respectively (**Figure 34**). In 2019 a new site at Steeple Jason was added (S5 Finger) with 2,440 ± 93 breeding pairs and breeding success of 44 % ± 5 chicks/pair.

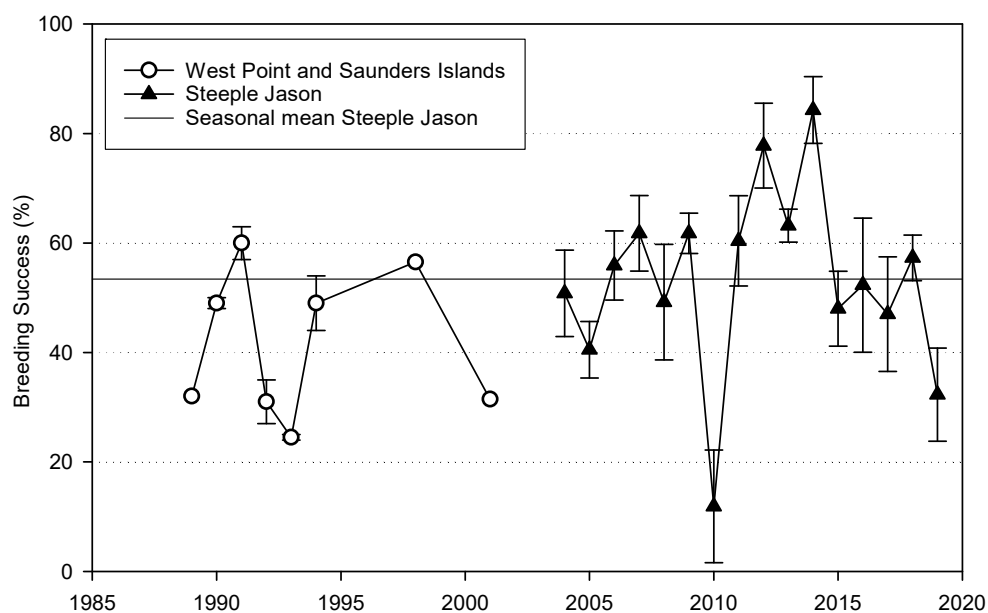


Figure 33: Black-browed Albatross breeding success at FISMP sites on Steeple Jason, 2004-2019 (excluding Penthouse colony for all years) and West Point and Saunders Island, 1989-2001.

Standard Error bars show error about the overall mean by colony means and do not incorporate error about individual sites. (Solid line – annual average).

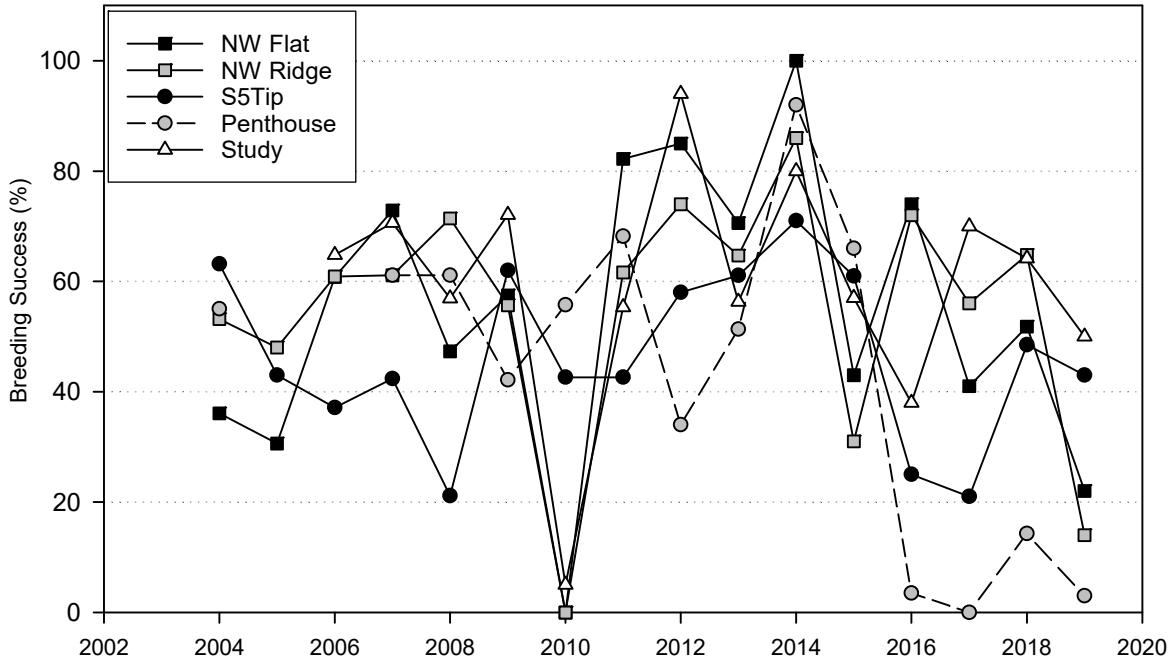


Figure 34: Black-browed Albatross breeding success at FIMSP locations on Steeple Jason, 2004-2019.

Penguin Point South, Dunbar

The breeding pair counts at Dunbar increased by 14 % from 238 in 2018 to 271 in 2019. Breeding success decreased from 58 % in 2018 to 45 % in 2019 (**Figure 35**). A number of chicks were lost during January due to a pro-longed storm event.

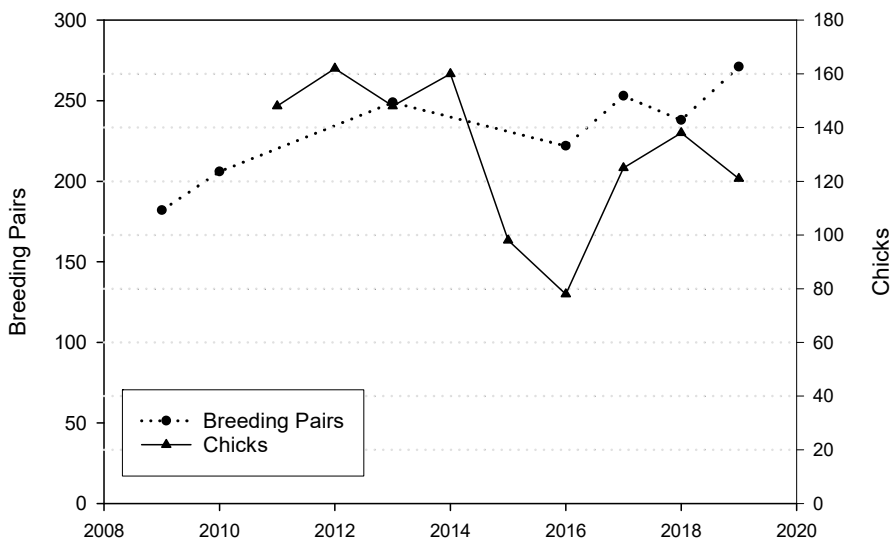


Figure 35: Black-browed Albatross breeding pair and chick numbers for Penguin Point South, Dunbar, 2009-2019.

Southern Giant Petrel

Breeding pairs

The overall number of breeding pairs for Southern Giant Petrel at monitored colonies on Steeple Jason increased by 7 % from an estimated 1,655 pairs in 2018 to 1,771 in 2019. A small increase was observed at the Neck colony (13 %) compared with 2018, whilst the Northwest colony decreased (23 %) (Figure 36).

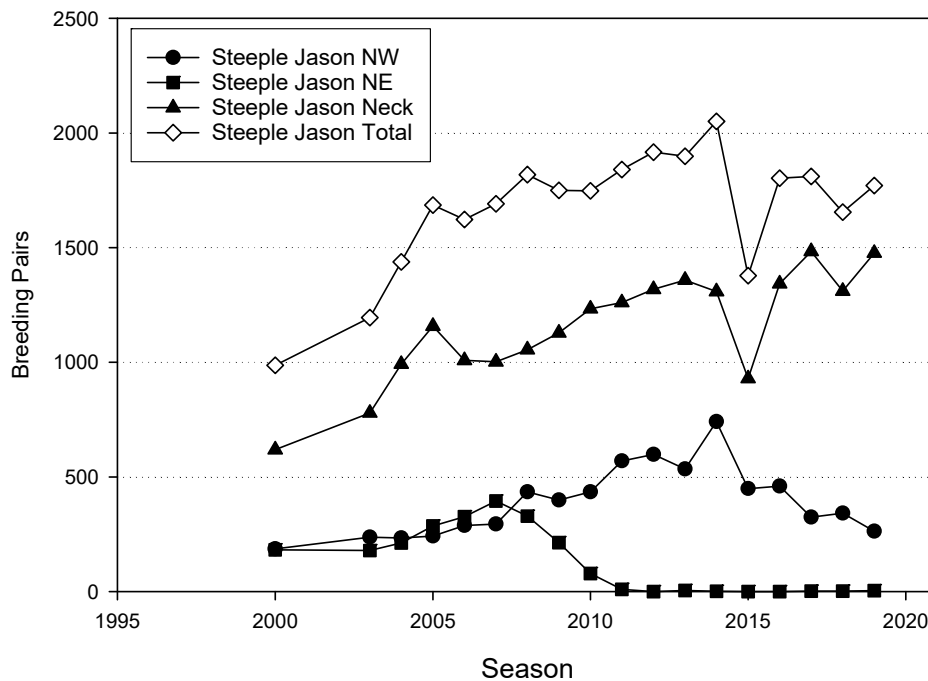


Figure 36: Southern Giant Petrel breeding pair numbers at FISMP sites on Steeple Jason, 2000-2019.

Breeding success

In 2019, average breeding success of the two colonies at Steeple Jason decreased from 30 ± 21.92 % in 2018 to 8 ± 2.25 % (Figure 37). The Neck colony decreased by 33 % and the Northwest colony by 11 %; the latter was very near to complete breeding failure, the third time within four consecutive years (Figure 38). Breeding success for 2019 still remained below the long-term annual average (32 %), and an apparent declining trend of breeding success since monitoring began in 2004 is of concern (Figures 39).

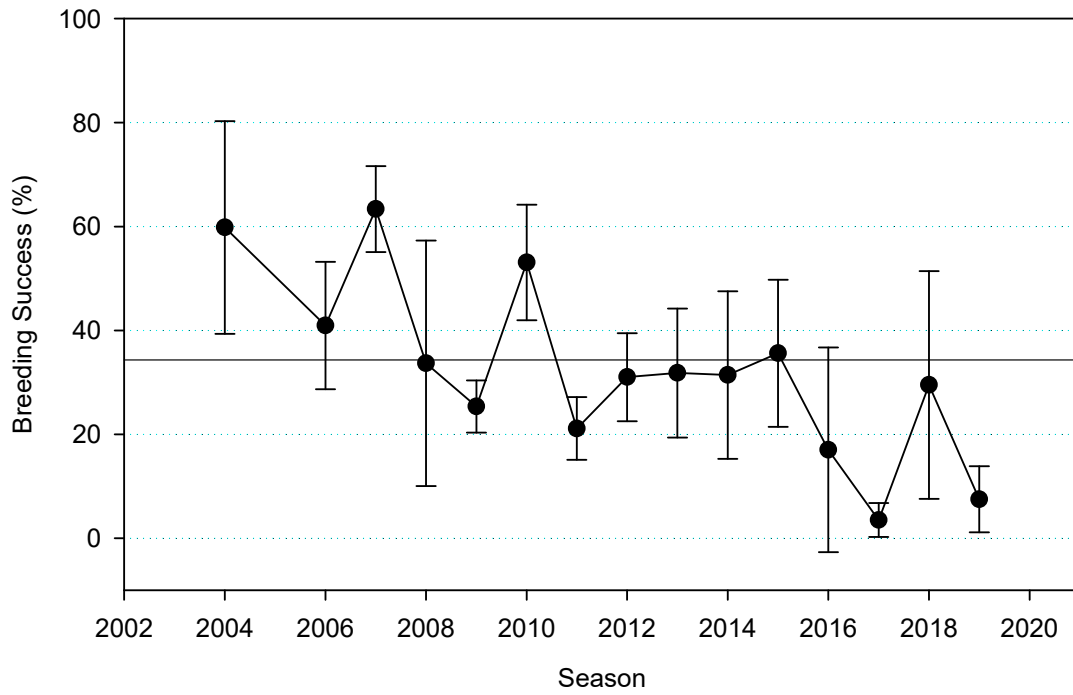


Figure 37: Southern Giant Petrel average breeding success at FISMP sites on Steeple Jason, 2004-2019. Standard Error bars show error about the overall mean by colony means and do not incorporate error about individual sites. (Solid line – annual average).

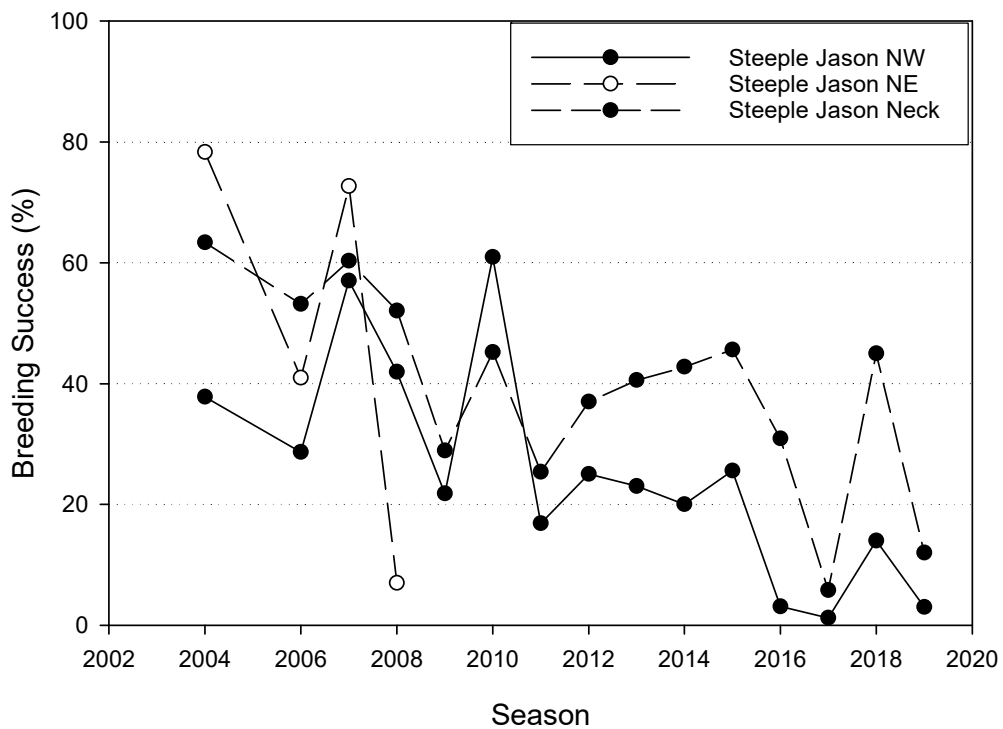


Figure 38: Southern Giant Petrel breeding success at FISMP sites on Steeple Jason, 2004-2019.

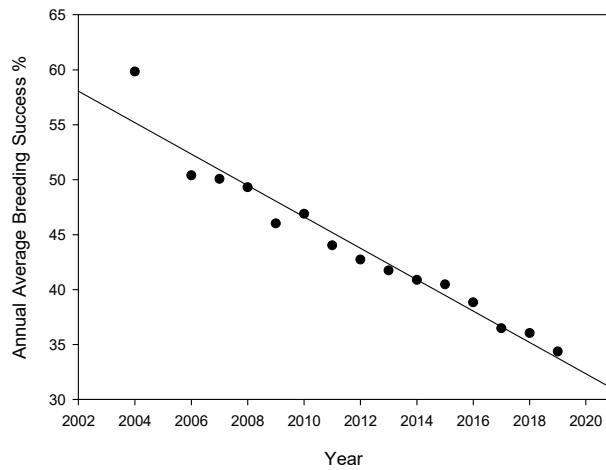


Figure 39. Average overall breeding success for all years at FISMP sites on Steeple Jason, 2004-2019.

During 2019, seventeen Southern Giant Petrel nests were observed from drone imagery near the Black-browed Albatross Northwest Flat colony; this is the sixth year that Southern Giant Petrel have nested in this area. A further four nests were observed along the Northwest track (House) location and a new site with ten nests were counted at the Northwest Coast Tussac. No nests were observed at Lagoon Sands near the Gentoo Penguin colonies in 2019, despite a small number (6) that attempted to breed at this site in 2017.

Bleaker Island pre-fledged chick count

The number of Southern Giant Petrel chicks on Bleaker Island decreased significantly from 265 in 2018 to 80 chicks in 2019 (**Figure 40**). During late January 2020 a prolonged storm event resulted in complete chick loss (death from hypothermia) in the colony at the north end of Bleaker Island.

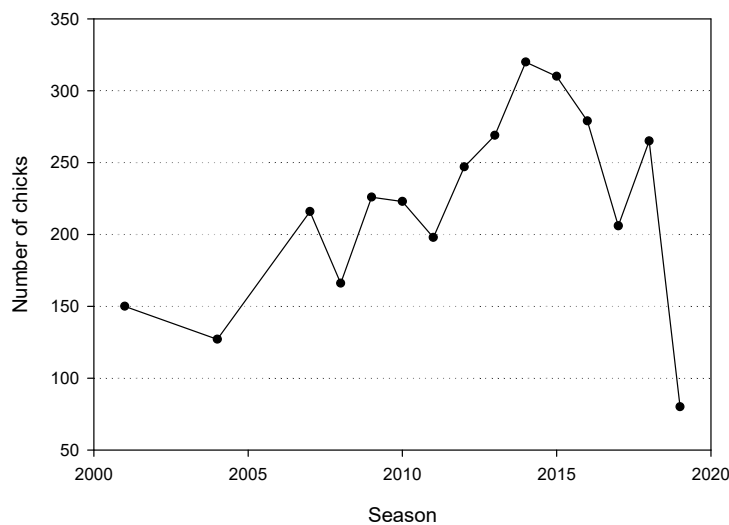


Figure 40: Southern Giant Petrel chick counts at Bleaker Island, 2001-2019.

Environment

A neutral El Niño Southern Oscillation (ENSO) was in place during the winter (Jul-Oct 2019); followed by predominantly neutral to weak ENSO conditions through October 2019 to March 2020. Weak events can still produce moderate or strong impacts in some places, but such impacts are less likely overall. (Figures 41).

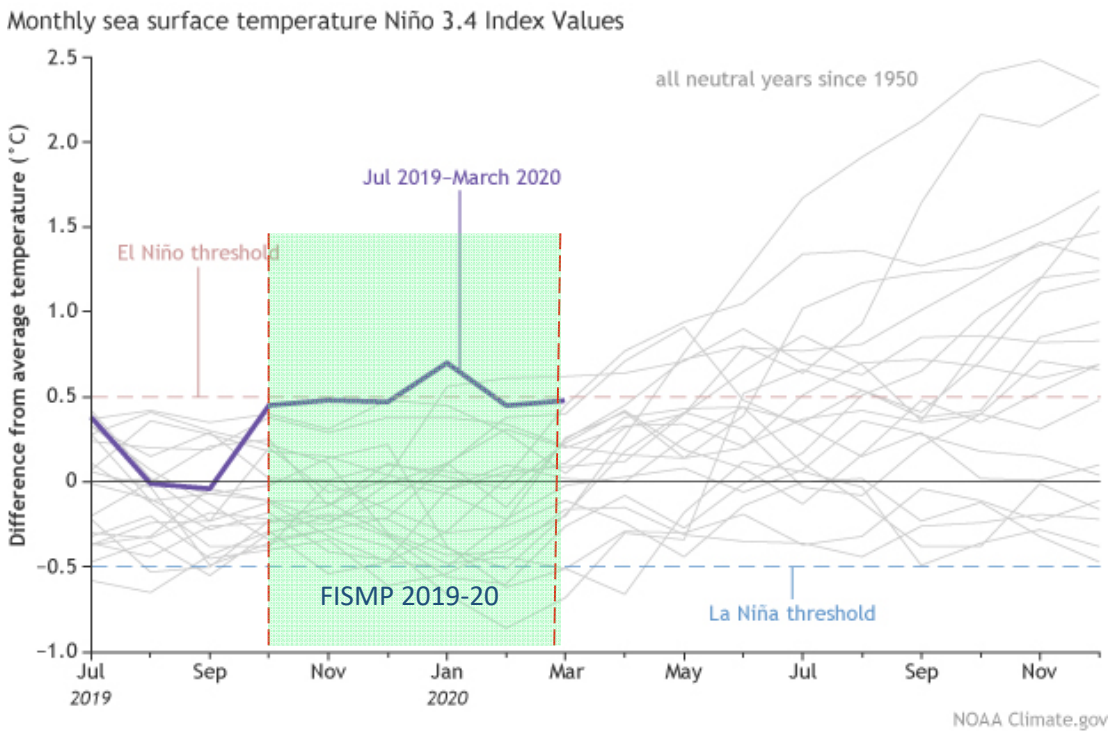


Figure 41: Monthly sea surface temperature differences for ENSO: SOURCE: <https://www.climate.gov/enso>

Anthropogenic and other impacts at colonies

Marine plastic

Marine plastic was observed at Steeple Jason Black-browed Albatross NW Ridge and Study colony. Twenty one items of marine plastic were recorded at 19 nests in November 2019. The majority of marine plastic items were located at the Steeple NW Ridge and Study colony. Items included: blue plastic sheeting (commercial fishing boat); various ropes/ twines (vessel) and plastic drinking bottles. For full details see **Appendix 6**.

A wider marine debris survey was conducted at the Study colony (an area approximately 500m²) in Nov 2019 and produced 63 plastic bottles, 32 pieces of polystyrene foam, broken plastic pieces (8), aerosol spray cans (3), fishing buoy (1) and flip-flops (3).

Oiling

One Black-browed Albatross was observed with patches of oil around the head at the Southeast colony at Steeple Jason in November 2019.



Marine entanglements

No marine entanglements were observed at the FISMP sites.

Disease

In January a higher than typical number of Black-browed Albatross and Southern Rockhopper Penguin chick carcasses were observed at the Steeple Jason monitored colonies. The carcasses appeared to be at a similar size and state of decomposition (around 4-8 weeks old). There were reports of dying Gentoo Penguin chicks in late February from 7 sites in the north of East Falklands (Crofts 2020). Post-mortem examinations undertaken by the Falkland Islands Government Veterinary Department suggested starvation was the most likely cause.

Discussion

Gentoo Penguin: IUCN status: Least Concern (2018)

Falkland Islands breeding pair estimate: 132,321 ± 2,015 in 2010 (34 % of global population)

The FISMP 2019 annual change in breeding pair numbers: Decrease (9 %)

In 2019 the total estimated number of breeding pairs of Gentoo Penguins at the FISMP sites showed a decrease (9 % or 2,036 pairs) when compared with 2018. This continued to represent a major reduction (31%) from the 2015 counts.

In 2016, the FISMP reported a notable decrease in breeding pair numbers and this was likely (at least partially), due to birds choosing to defer breeding under the unfavourable environmental conditions during a period that coincided with a strong El Niño Southern Oscillation event (Crofts & Stanworth 2017). In 2017 a partial recovery in breeding numbers was likely explained by birds re-entering the breeding population as environmental conditions had improved. However, the FISMP in 2019 showed there had been no further recovery in breeding pair numbers since 2017. As an unknown portion of the adult and juvenile population were permanently lost through mortality in 2016 this equates to fewer adults returning to breed and fewer younger birds entering into the breeding population. Numbers are unlikely to fully recover to 2015 values within the short-term.

Twelve of the individual colonies (n=17) showed decreased breeding pair numbers compared to the previous year, with the largest decreases at Bull Road, Volunteer Green, Low Bay and Steeple Jason House. A further four colonies showed little or no change in breeding pair numbers when compared to 2018 (Lagoon Sands, Motley Point, Fox Point and Pleasant Roads).

In 2019, the overall breeding success estimate (0.94 chicks/pair) was similar to the 2018 value, and notably improved from the previous 3 years. The 2019 value reflected the FISMP long-term annual average (0.94 chicks/pair). Breeding success was variable between individual colonies, and ranged from 1.43 chicks/pair at New Haven to 0.36 chicks/pair at Motley Point.

Southern Rockhopper Penguin: IUCN status: Vulnerable (2018)

Falkland Islands breeding pair estimate: 319,163 ± 24,820 in 2010 (36 % of global population)

The FISMP 2019 annual change in breeding pair numbers: Increase (1 %)

The estimated number of breeding pairs of Southern Rockhopper Penguin increased marginally by 1 % from the 2018 estimate. This continued to represent a substantial loss (28 %) from the 2015 counts.

The overall trend in estimated breeding pair numbers showed a steady increase from 2003, reaching a peak in 2015, followed by a significant drop in 2016 and remained at a plateau from 2017 to 2019. During March 2016, Southern Rockhopper Penguin mortality (due to starvation during the moult period) was recorded at the Falklands (Crofts & Stanworth 2016, Morgenthaler et al. 2018), and an overall decrease of 31 % in breeding numbers was recorded at the FISMP sites in the following November 2016. By 2019 numbers had only recovered marginally and the decrease from 2016 was estimated at 28 %. It is unknown what the level of mortality was during 2016, and as with Gentoo Penguins, breeding deferral is reported in *Eudyptes* penguins (Crawford et al. 2006). However, the FISMP data suggests that significant numbers of breeding individuals had been permanently lost to the population and recovery to the 2015 figures will not be likely within the short-term.

Breeding success at the FISMP sites was variable, and overall had decreased by 12 % when compared to 2018. The 2019 value of 0.47 ± 0.14 chicks/pair still remained below the long-term annual average (0.63 ± 0.16 chicks/pair) for the fifth consecutive year.

Approximately 80 % of the chicks at Sea Lion Island were lost in late January 2020 (after the FISMP count) through the combination of a pro-longed storm event and predation by Southern Giant Petrels. Higher than typical numbers of Rockhopper Penguin chick carcasses were observed (along with Black-browed Albatross chick carcasses) at the Steeple Jason monitoring colonies in late January 2020. The carcasses appeared to be the same size and age, although fairly decomposed, and as they were scattered throughout the colonies, a possibly explanation could be disease, as opposed to storm exposure.

Magellanic Penguin: IUCN status: Near Threatened (2018)

Falkland Islands breeding pair estimate: 76,000 – 142,000 (1997) (<10 % of global population)

The FISMP 2019 annual change in burrow occupancy rate: Increase (11 %)

At Gypsy Cove in 2019 breeding Magellanic Penguin burrow occupancy remained associated with the extent of tussac habitat. The 2019 occupancy rate of 27.7 % was similar to the previous year (25 %), but still remained below the annual average for this monitored site (33.0 %).

King Penguin: IUCN status: Least Concern (2018)

Falkland Islands breeding pair estimate: 750-1000 (<1 % of global population)

The FISMP 2019 annual change in chick numbers: Increase (63 %)

In November 2019 the number of pre-fledged chicks at Volunteer Point was 824, an increase of 63 % when compared with 2018, and the highest value recorded since monitoring began in 1980. The long-term monitoring at this site shows periodic fluctuations with an overall upward trend. The significant drop in chick numbers during 2016 coincided with an overall poor year for the seabirds monitored under the FISMP; likely due to the unfavourable conditions coinciding with a strong ENSO event.

Black-browed Albatross: IUCN status: Least Concern (2018)

Falkland Island breeding pair estimate: 475,000-535,000 in 2010 (70 % of global population)

The FISMP 2019 annual change in breeding pair numbers: Decrease (7 %)

The overall breeding pair numbers of Black-browed Albatross at Steeple Jason monitoring sites in 2019 showed a decrease of 7 % when compared with 2018. Given the annual fluctuations, the overall FISMP trend continues to suggest a currently stable population at the monitored colonies.

The overall mean breeding success in 2019 was down from 2018 and remained below the annual average. During chick monitoring at Steeple in January 2020, higher than typical Black-browed Albatross chick carcasses (along with Southern Rockhopper Penguin chicks) were observed at the monitored colonies. The carcasses appeared to be at a similar size and state of decomposition (around 4-8 weeks old) and as they were scattered throughout the colonies, a possibly explanation could be disease, as opposed to storm exposure. At the Northwest Ridge colony, the breeding

success was the lowest (14 %) since 2010 when a storm event resulted in complete breeding failure. During monitoring at the colony in November 2019, it was noted that a high number of nests (68 %) did not have eggs, and although the reason for this was unclear, it was evident that a nearby South American Fur Seal (*Arctocephalus australis*) colony had moved to the boundary of this albatross colony, and potential disturbance could offer an explanation. The Fur Seal population at Steeple Jason at the Northwest end has increased since 2010 (S. Crofts pers. obs.) and is moving further south into the vicinity of the seabird colonies.

Breeding success at the Penthouse colony was notably low (3 %) in 2019, a similar outcome to the colony's complete breeding failure in 2017. The breeding success at the Penthouse, considering it is a marginal colony (<100 pairs), has a disproportionate influence on the overall average breeding success of colonies monitored at Steeple Jason and has now been excluded from the annual site means for breeding success. In 2019 a new colony (S5 Finger) was added to the monitoring colonies, and is now the largest monitored. In 2019 the S5 Finger estimate for breeding pairs was 2,440 and breeding success 44 %. The addition of the new site will increase the proportion of Black-browed Albatrosses monitored at Steeple Jason from 2 % to 3 %.

Southern Giant Petrel: IUCN status: Least Concern (2018)

Falkland Island breeding pair estimate: 20,970 ± 180 pairs in 2015 (43 % of global population)

The FISMP 2019 annual change in breeding pair numbers: Increase (7 %)

Overall breeding pair numbers of Southern Giant Petrel at Steeple Jason increased by 7 % from the previous year. The two monitored sites showed opposing trends, with the Neck colony demonstrating an overall positive trend since 2000, whereas the Northwest colony continues to show a declining trend. There were three other new sites where individuals were attempting to breed with a total of 31 breeding pairs during November 2019. Breeding success at these 3 sites was low (3 %), most likely due to the location and proximity to disturbance from people.

The breeding performance at Steeple Jason in 2019 was low at 3 % and 12 % for the Northwest and Neck colonies respectively. An apparent long-term decreasing trend in breeding success at Steeple Jason is of concern for this site. In 2004, the mean breeding success was 59.8 % and in 2019 this figure had steadily dropped to reach 7.5 %.

As the Southern Giant Petrels breeding at the Falkland Islands represent 43 % of the global population (Stanworth and Crofts 2017), continuation of declines in breeding success at Steeple Jason (representing around 8 % of the Falklands breeding population) would be of international concern. It would be desirable to encourage opportunities to assess breeding performance at a broader scale for the Falklands' population.

Anthropogenic and other impacts at colonies

Marine plastics were recorded when they were either buried in or very close to the nests of seabirds. The most common type of marine plastic found in nests of Black-browed Albatross at the Northwest and Study colonies was plastic bottles and blue packaging/sheets, and most items recorded were those commonly associated with commercial fishing vessels (**Appendix 6**). A marine debris survey in the vicinity of the Study colony resulted in 63 plastic bottles, with origins including Asia, Spain and South America. One Black-browed Albatross was observed with oil patches around its head at the Study Colony on Steeple Jason in November 2019.

Although in-depth disease screening is not within the current scope of the FISMP, highlighting factors that may be contributing towards seabird breeding performance at an island-wide scale is important to the context of the FISMP results. During January monitoring a higher than typical number of Black-browed Albatross and Southern Rockhopper Penguin chick carcasses were observed at the Steeple Jason monitored colonies. The carcasses appeared to be at a similar size and state of decomposition (around 4-8 weeks) and as they were scattered throughout the colonies, a possibly explanation could be disease, as opposed to storm exposure (which also impacted seabird colonies in late January (e.g. Southern Rockhopper Penguin chicks at Sea Lion Island, Southern Giant Petrel chicks at Bleaker Island and Black-browed Albatross chicks at Dunbar). There were reports of dying Gentoo Penguin chicks in late February from 7 sites in the north of East Falklands. Post-mortem examinations undertaken by the Falkland Islands Government Veterinary Department suggested starvation was the most likely cause.

Acknowledgements

The continuation of the FISMP is dependent on access to seabird colonies. Falklands Conservation would like to thank the many landowners/managers who have allowed us to conduct fieldwork on their land, including the Wildlife Conservation Society, Falkland Islands Government, Sea Lion Island, Port Stephens, Fitzroy, Race Point, Johnson Harbour, Goose Green, Walker Creek and North Arm. We thank Michael McRae and Nikki Summers, Derek and Trudi Pettersson, and Rob and Lorraine McGill for logistical support and the many volunteers who participated in data collection, particularly Mike Morrison for his long-standing support. We would also like to thank the landowners at Dunbar (Hugues and Marie-Paul Delignieres) and Bleaker Island (Mike, Phyl and Nick Rendell) for providing their survey data and allowing it to be included within the report.

The FISMP is made possible with financial support of the Falkland Islands Government through the Environmental Studies Budget.

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Appendix 1: Count information

Location	Date of breeding pair count	Counters	Date of chick count	Counters
Volunteer Green	16/11/2019	S. Crofts P. Underwood, J & S. Whitby K. Rimicans	10/01/2020	S. Crofts E. Philips, N. Anderson
Race Point	19/11/2019	S. Crofts S Rutherford, E. Green	08/01/2020	S. Crofts N. Anderson
Sea Lion Island	10/11/2019	M. Morrison	11/01/2020	M. Morrison
New Haven	06/11/2019	A. Stanworth E. Bertram	06/01/2020	A. Stanworth A. Stanworth
Bull Roads & Bull Point	05/11/2019	A. Stanworth E. Bertram	03/01/2020	A. Stanworth A. Stanworth
Cow Bay	17/11/2019	S. Crofts P. Underwood, J & S. Whitby K. Rimicans	10/01/2020	S. Crofts E. Philips, N. Anderson
Low Bay	06/11/2019	A. Stanworth E. Bertram	04/01/2020	A. Stanworth A. Stanworth
Motley Point	07/11/2019	A. Stanworth E. Bertram	05/01/2020	A. Stanworth A. Stanworth
Bertha's Beach	16/11/2019	M. Morrison	11/01/2020	M. Morrison
Fox Point	16/11/2013	M. Morrison	18/01/2020	M. Morrison
Pleasant Roads	17/11/2019	M. Morrison	18/01/2020	M. Morrison
Steeple Jason	31/10/2019 - 09/11/19	S. Crofts M. Tierney P. Wessels	Gentoo and Rockhopper 21- 27/01/20. Black- browed and Giant Petrel 13-15/03/20	S. Crofts D. Hoy M. Jervois M. Anstee M. Tierney A. Kuepfer
Lagoon Sands	17/11/25019	S. Crofts P. Underwood, J & S. Whitby K. Rimicans	10/01/2020	S. Crofts E. Philips, N. Anderson
Diamond Cove	18/11/2019	S. Crofts M. Anstee N. Anderson	13/01/2020	S. Crofts
Rugged Hill/Eagle Hill	18/11/2019	S. Crofts M. Anstee N. Anderson	13/01/2020	S. Crofts
Port Stephens	NOT DONE		NOT DONE	
Penguin Point South	30/12/2019	M. Delignieres	March 2020	M. Delignieres
Bleaker Island	Gentoo – 07/11/19 Rockhopper – 30/11/2019	N. Rendell N. Rendell	Giant Petrel 01/03/2020	M. Rendell N. Rendell
Gypsy Cove	18/12/2019	A. Stanworth M. Anstee C. Ellard M. Kean		

Appendix 2: Gentoo Penguin count data

Location	Colony	Grid Ref.	Breeding Pairs (Mean±1SD)		Breeding Success (Mean±1SD)	
			Count	Count Type*	Count	Count Type*
Bertha's Beach	Bertha's Beach	-51.882233 -58.358916	531 ± 3	TR	1.21 ± 0.01	TR
Bull Point	Bull Roads	-52.309364 -59.398188	510 ± 13	GP	1.06 ± 0.04	D
Bull Point	Bull Point	-52.342591 -59.321461	1408 ± 6	GP	1.05 ± 0.01	D
Fox Point	Fox Point	-58.45 -51.92	373 ± 1	TR	1.14 ± 0.01	TR
Low Bay	Low Bay	-52.077608 -58.879630	331 ± 5	GP	0.47 ± 0.02	D
Motley Point	Motley Point	-52.108576 -58.643177	1568 ± 12	D	0.36 ± 0.04	D
New Haven	New Haven	-51.742073 -59.222044	594 ± 8	TR,GP	1.43 ± 0.03	D
Pleasant Roads	Pleasant Roads	-51.83 -58.24	186 ± 1	TR	1.40 ± 0.03	TR
Race Point	Fanning Harbour	-51.464667 -59.087958	185 ± 10	TR	1.11 ± 0.07	TR
Race Point	Rookery Sands	-51.434122 -59.106928	1121 ± 14	D	1.34 ± 0.01	D
Sea Lion Island	Sea Lion Island	-52.426578 -59.072513	3840 ± 34	TR	1.13 ± 0.01	TR
Steeple Jason	House	-51.02018 -61.233113	3008 ± 20	D	0.75 ± 0.01	D
Steeple Jason	Neck	-51.034787 -61.214888	3601 ± 33	D	0.99 ± 0.02	D
Johnson Harbour	Cow Bay	-51.428572 -57.879051	1473 ± 30	TR/D	0.81 ± 0.03	TR
Johnson Harbour	Lagoon Sands	-51.513702 -57.77581	802 ± 5	D	0.62 ± 0.02	D
Johnson Harbour	Volunteer Green	-51.478494 -57.837858	1332 ± 57	TR	0.76 ± 0.05	TR

* TR – Tally Repeated, TA – Tally Agreed, GP – Go Pro image count, D – Drone image count

Appendix 3: Southern Rockhopper Penguin count data

Location	Colony/Sub-colony	Grid Ref.	Breeding Pairs (Mean ± 1 SD)	Count Type*	Breeding Success (Mean ± 1 SD)	Count Type*
Berkeley Sound	Diamond Cove	-51.538059 -57.923512	172 ± 7	TR	0.73 ± 0.04	TR
	Eagle Hill East	-51.544064 -57.785118	126 ± 4	D	0.71 ± 0.03	TR
	Eagle Hill	-51.544497 -57.802981	770 ± 19	TR	0.78 ± 0.03	TR
	Eagle Hill West	-51.545082 -57.810499	804 ± 25	D/TR	0.65 ± 0.04	D
	Rugged Hill East	-51.543674 -57.845031	496 ± 0	TA	0.83 ± 0.01	TR
	Rugged Hill West	-51.543488 -57.851570	562 ± 13	D	0.41 ± 0.02	TR
Port Stephens	Stephen's Peak	-52.133803 -60.859281	NOT DONE		NOT DONE	
Race Point	Fanning Head North	-51.460831 -59.141540	240 ± 9	TR	0.54 ± 0.04	TR
	Fanning Head South	-51.469284 -59.137749	455 ± 4.4	D	0.525 ± 0.04	TR
Sea Lion Island	Rockhopper Point	-52.446667 -59.115501	371 ± 7	TR	0.58 ± 0.02	TR
Steeple Jason	Northwest Flat	-51.012810 -61.252682	108 ± 3	DR	0.31 ± 0.02	TA
	Northwest Ridge	-51.012939 -61.252884	85 ± 2	TR	0.27 ± 0.02	TA
	SSTip	-51.037932 -61.220460	834 ± 23	D	0.39 ± 0.03	TA
	Study Area	-51.046215 -61.206635	795 ± 8	TR	0.38 ± 0.01	TR
	S5Finger	-51.031884 -61.231434	1057 ± 46	D	0.43 ± 0.04	TA

* TR – Tally Repeated, TA – Tally Agreed, GP – Go Pro image count, D – Drone image count

Appendix 4: Magellanic Penguin survey data

Transect	Number of Burrows	Number of occupied burrows	Distance to last burrow (m)	Minimum Pair Density per Km ²
T1	0	0	0	0
T2	0	0	0	0
T3	0	0	0	0
T4	5	0	49	0
T5	5	3	49	15306.12245
T6	8	1	33	15151.51515
T7	1	1	2	125000
T8	0	0	0	0
T9	6	4	76	13157.89474
T10	0	0	0	0
T11	0	0	0	0
T12	0	0	0	0
T13	4	0	48	0
T14	3	1	13	28846.15385
T15	8	1	39	10256.41026
T16	6	1	82	4573.170732
T17	7	1	68	3676.470588
T18	1	0	4	0
T19	0	0	0	0
T20	2	0	2	0
T21	0	0	0	0
T22	0	0	0	0
T23	0	0	0	0
T24	6	3	73	10273.9726
T25	9	0	31	0
T26	2	0	14	0
T27	3	2	45	11111.11111
T28	3	0	25	0
T29	0	0	0	0

Appendix 5: Black-browed Albatross and Southern Giant Petrel count data

Black-browed Albatross

Sub-colony		Breeding Pairs (Mean \pm 1 SD)	Count Type*	Breeding Success (chicks/pair) (Mean \pm 1 SD)	Count Type*
Study Colony	-51.046 -61.207	1715 \pm 16	TR	0.50 \pm 0.01	TR/TA
S5Tip	-51.037 -61.220	466 \pm 5	D	0.16 \pm 0.1	TA
Penthouse	-51.031 -61.228	74 \pm 0	TA	0.03 \pm 0.0	TA
Northwest Flat	-51.012 -61.252	406 \pm 1	D	0.22 \pm 0.01	TA
Northwest Ridge	-51.012 -61.252	545 \pm 0	TA	0.14 \pm 0.0	TA
S5Finger	-51.031 -61.231	2440 \pm 93	D	0.44 \pm 0.05	D

* TR – Tally Repeated, TA – Tally Agreed, GP – Go Pro image count, D – Drone image count

Southern Giant Petrel

Colony		Breeding Pairs (Mean \pm 1 SD)	Count Type*	Breeding Success (chicks/pair) (Mean \pm 1 SD)	Count Type*
Neck	-51.042 -61.206	1477 \pm 20	D	0.12 \pm 0.02	TR
Northwest (South of Ridge)	-51.024 -61.248	263 \pm 6	TR	0.03 \pm 0.02	TR
House (Northwest track)	-51.017 -61.241	4 \pm 0	TA	0.25 \pm 0	TA
Northwest Flat	-51.012 -61.251	17 \pm 0	TA	0.06 \pm 0	TA
North Coast Tussac	-51.014 -61.246	10 \pm 0	TA	0	TA
Lagoon Sands	-57.775 -51.513	0			

* TR – Tally Repeated, TA – Tally Agreed, GP – Go Pro image count, D – Drone image count

Appendix 6: Marine plastics at FISMP sites

Serial	Nest	Date	FISMP site	Species	Debris type	Position of debris
1	1	05/11/2019	Steeple SE colony	BBA	1 litre plastic drinking bottle	Next to nest
1	2	05/11/2019	Steeple SE colony	BBA	1 litre plastic drinking bottle	Next to nest
3	3	05/11/2019	Steeple SE colony	BBA	1 litre plastic drinking bottle	Next to nest
4	4	05/11/2019	Steeple SE colony	BBA	1 litre plastic drinking bottle	Next to nest
5	5	05/11/2019	Steeple SE colony	RHP	1 litre plastic drinking bottle	Next to nest
6	6	06/11/2019	Steeple SE colony	BBA	2 litre plastic drinking bottle	Next to nest
7	6	06/11/2019	Steeple SE colony	BBA	1 500 ml plastic drinking bottle (coca cola)	Next to nest
8	6	06/11/2019	Steeple SE colony	BBA	Polystyrene sheet 30x30cm	Next to nest
9	7	06/11/2019	Steeple SE colony	BBA	Plastic Blue bottle (other) <500ml	Next to nest
10	8	06/11/2019	Steeple SE colony	BBA	1 litre Plastic Yellow bottle (other)	Next to nest
11	9	09/11/2019	Steeple NW Ridge	BBA	Plastic blue sheeting	Built into nest
12	10	09/11/2019	Steeple NW Ridge	BBA	Plastic blue sheeting	Next to nest
13	11	09/11/2019	Steeple NW Ridge	BBA	Green plastic twine	Built into nest
14	12	09/11/2019	Steeple NW Ridge	BBA	Plastic blue sheeting	Built into nest
15	13	09/11/2019	Steeple NW Ridge	BBA	Plastic blue foam piece	Built into nest
16	14	09/11/2019	Steeple NW Ridge	BBA	Plastic blue sheeting	Built into nest
17	15	05/11/2018	Steeple NW Ridge	BBA	Plastic blue sheeting	Built into nest
18	16	05/11/2018	Steeple NW Ridge	BBA	Plastic blue sheeting	Built into nest
19	17	09/11/2019	Steeple NW Ridge	BBA	Plastic bottle	Next to nest
20	18	09/11/2019	Steeple NW Ridge	BBA	Plastic bottle	Next to nest
21	19	09/11/2019	Steeple NW Ridge	BBA	Blue fishing line/nylon	Built into nest



Figure 41: Examples of marine plastics at Steeple Jason (blue plastic sheeting).