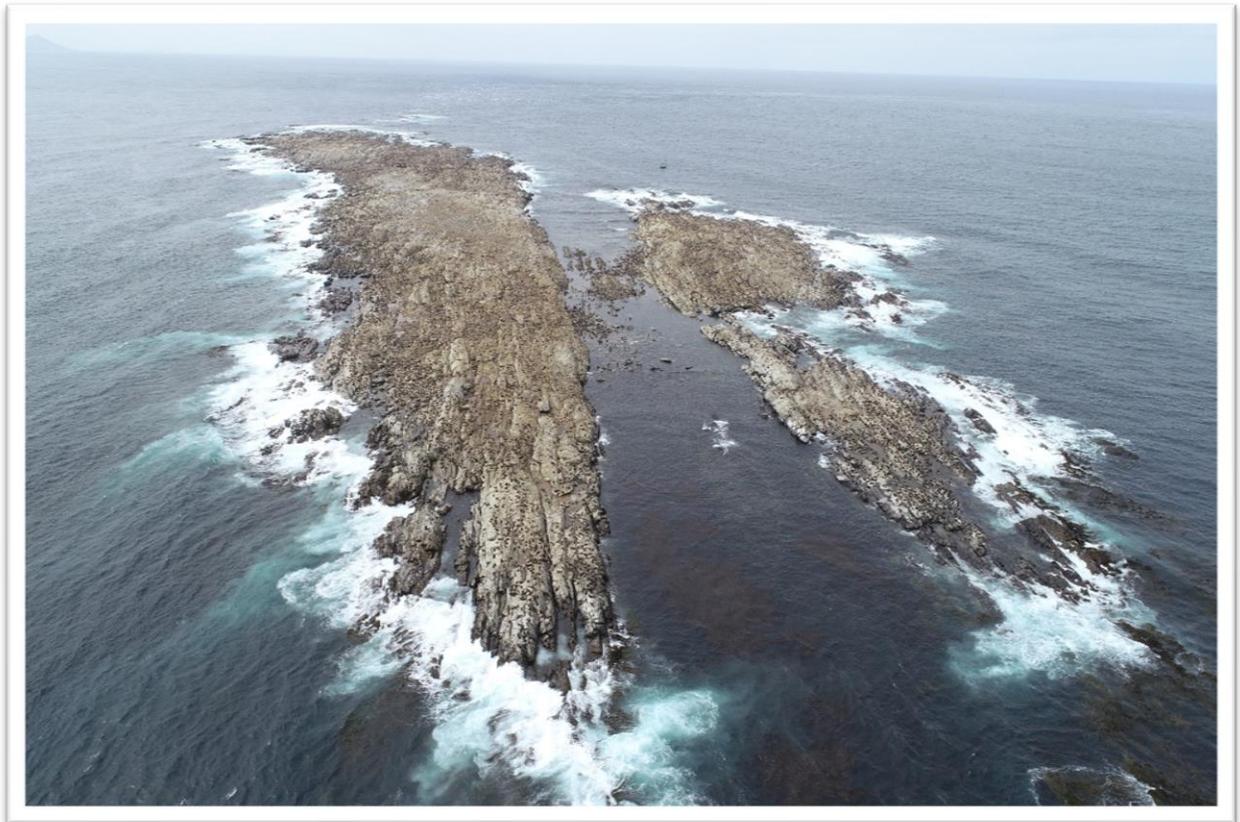


ESB funding report

2021 census of southern sea lions and South American fur seals breeding at the Falkland Islands: preliminary results

Alastair Baylis, Leiv Poncet and Rachael Orben



Jason West Cay 2021 – the largest Falklands fur seal breeding colony.

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Summary

With support from the Falklands Islands Government, we completed the sixth Falkland Islands archipelago-wide sea lion census and the second archipelago wide census of South American fur seals. Both fur seals and sea lions have increased since the last archipelago wide census in 2014 and 2018, respectively.

Southern sea lions:

- A total of 5,375 pups (preliminary results) were counted in 2021, representing a 17 % increase from 4,443 pups counted in 2014.

Falklands fur seals:

- Two new fur seal breeding colonies were discovered – Flat Jason Island (approx. 2,000 pups) and The Fridays (approx. 200 pups). We are still counting fur seal pups from colony orthomosaics. However, we estimate that the Falklands fur seal population of South American fur seals is about 44,000 pups, 97% of which are found in the Jason Islands group.

Introduction

Southern sea lions

Southern sea lions (*Otaria flavescens*) breeding at the Falkland Islands declined by 97%, from the largest population in the world in the 1930's (pup production of 80,500) to now one of the smallest populations (Hamilton 1939, Thompson et al. 2005). Five archipelago-wide censuses have been undertaken (1934-1936, 1965, 1995, 2003 and 2014) and consequently population data for the Falkland Islands is more comprehensive than at many other southern sea lion breeding locations (these being Peru, Chile, Argentina and Uruguay) (Baylis et al. 2015). At the Falkland Islands, sea lions breed at about 70 sites. To assess the current status of southern sea lions, we undertook the sixth Falkland Islands archipelago-wide sea lion census.

Falklands fur seals

South American fur seals (*Arctocephalus australis*) breed along the Atlantic and Pacific coasts of South America, from Uruguay to Peru, including the Falkland Islands. South American fur seals that breed in Peru and northern Chile are currently recognized as a separate unnamed sub-species from those that breed in southern Chile and the South Atlantic *A. australis australis*, although there is evidence to support the reclassification of these sub-species into separate species. In the Falkland Islands, a partial census of fur seals in the 1980s estimated 18,000–20,000 SAFS of all age-classes (Strange 1972, 1992). In 2018, an archipelago-wide census of South American fur seals breeding at the Falkland Islands was undertaken for the first time since 1965, which provided the first pup abundance estimate since 1926 – data that are critical for assessing population trends (Baylis et al. 2019). In total, 36,425 pups were counted in 2018.

Although data on pup abundance in the 1980s are not available to calculate the rate of change, the number of SAFS pups in 2018, was almost twice the total number of SAFS (*i.e.*, all age-classes) estimated in the 1980s, which implies a period of rapid SAFS recolonization at

the Falkland Islands, particularly considering that in other fur seal species, correction ratios >4:1 (unobserved:observed) are used to estimate the total population size from pup number (Kirkwood et al. 2010). Rapid population growth is consistent with the post-sealing population recovery of other fur seal species, such as Antarctic fur seals (*Arctocephalus gazella*) breeding at Bird Island, South Georgia, which increased 10-fold between the 1960s and 1980s (Payne 1977, Boyd 1993). The increase in Falklands fur seals primarily reflects trends at the three largest fur seal breeding colonies (Jason West Cay, Jason East Cay, and Seal Rocks). In 1982, these islands were fur seal haul out sites only (Strange 1996). This implies that fur seal breeding colonies at Jason West Cay and Jason East Cay were established after 1982 and rapidly increased to approximately 12,000 pups born per annum. To better understand trends in pup abundance, we undertook a second archipelago-wide survey in 2021.

Methods

Conveniently for logistics and planning, fur seals and sea lions (both of which are eared seals that belong to the family Otariidae) have similar life histories. For example, both give birth to a single pup during the austral summer, with peak pupping typically being late December. This made planning relatively easy - we timed the 2021 to occur after peak pupping, because we used pups as an index of population size. Pups are a useful metric of population size because they are easy to distinguish from other age-classes based on their size and black natal hair (lanugo). In addition, young pups (age < 1 month) remain ashore. In comparison, the proportion of adult seals away at-sea on any given day is unknown and juvenile colony attendance varies seasonally.

Between 2 January and 1 February 2021, we visited all known southern sea lion and the majority of South American fur seals breeding colonies *via* a yacht (exception being, Bird Island, Beaver Island and New Island, due to logistics and weather). The timing of the 2021 census was consistent with the recommended census period for Southern sea lions first established in the 1930's (Hamilton 1939) and used in subsequent sea lion censuses (Thompson et al. 2005). Similarly, the timing of the timing of the 2021 census was consistent with the 2018 fur seal census (Baylis et al. 2019).

Southern sea lions

The aim of the sea lion census is to understand trends in numbers over time. Therefore, our focus was on revisiting sites counted in previous censuses, while opportunistically searching for new breeding colonies. Consistent with previous censuses, the numbers of pups at breeding colonies were counted by two observers either (1) ashore, from one or more vantage points overlooking the breeding colony (2) direct counted from the charter boat (or zodiac) but from several vantage points along the shoreline or (3) counted from photographs taken from a UAV, when weather permitted.

We did not average counts, because breeding colonies were typically small, or large breeding colonies were dispersed over large areas of coastline, and comprised of small, discrete groups of pups. Therefore, the number of pups counted represents the minimum number of pups born. However, several potential sources of error exist. These are (1) pups were born after visiting breeding colonies, (2) pups died prior to counting and the carcass was not detected and (3) live pups at some sites may have been hidden by tussock grass (*i.e.*, had moved away from the main breeding beach) (Hamilton 1939; Thompson et al. 2005).

Previous studies have suggested these sources of error to be less than 5% (Hamilton 1939; Thompson et al. 2005). To explore potential count error, we will draw a fractional error from a uniform distribution, assuming the uncertainty of the original count was less than 10%. A value (count) will then be randomly drawn from a sampling distribution based on the error. The procedure will be repeated, which will enable us to quantify the 95% confidence interval.

Falklands fur seals

Fur seal breeding colonies are large, densely packed colonies (Baylis et al. 2019). It is impractical to census fur seals using direct counts because animals are sensitive to human disturbance. Therefore, we photographed fur seal breeding colonies using an unmanned aerial vehicle (UAV; DJI Phantom 4, 1/2.3" CMOS sensor 12-megapixel camera, ISO 200, max aperture 2.27) at a flight height of 50 m. There was no detectable disturbance to fur seals. Between 100 and 550 photographs were taken at each breeding colony. From these, a single

orthomosaic photograph was created for each breeding colony using Agisoft Metashape Pro (v1.5.0). Finally, a shapefile layer was created in QGIS (v3.4.2) to count pups, which enabled pup location to be georeferenced, and the number of pups to be cumulatively tallied for each colony orthomosaic (Baylis et al. 2019).

Preliminary results and Discussion

Southern sea lions

In total, 5,375 pups were counted at 72 breeding colonies that were distributed around > 800 km of coastline (Fig 1). The number of pups counted in 2021 increased by 17 % when compared to 2014 (4,443 pups), but is still less than 10 % of the 1930's estimate (Fig 2). At least one known sea lion breeding colony was not visited (Seal Bay). One breeding colony (Beauchêne Island) was counted in 2018 but not in 2021. New breeding colonies include Bleaker Island and Flat Tyssen.

Trends between 2014 and 2021 in numbers of pups at individual breeding colonies were variable. We found that some colonies had trebled in size, while others had halved. Large swings in colony size could represent the movement of adult females between breeding colonies.

Falklands fur seals

We are still in the process of counting pups. However, two new breeding colonies were discovered. These were, Flat Jason Island with approximately 2,000 pups and The Fridays, with approximately 200 pups. Flat Jason is an established colony, while The Fridays appears to be a new colony, likely established within the last few years. We also surveyed the coastline of Beaver Island, and note that, while the Beaver Island colony is difficult to accurately census because the colony terrain is comprised of large boulders, it is likely to be an order of magnitude larger than the 100 pups estimated in 2018. The 2021 census confirms that the

Falkland Islands are currently the world's largest population of South American fur seals, and we estimate approximately 44,000 pups born in 2021.

ESB Budget

£8,000 was spent on boat charter (includes 3 weeks during the census, and transit to and from Stanley).

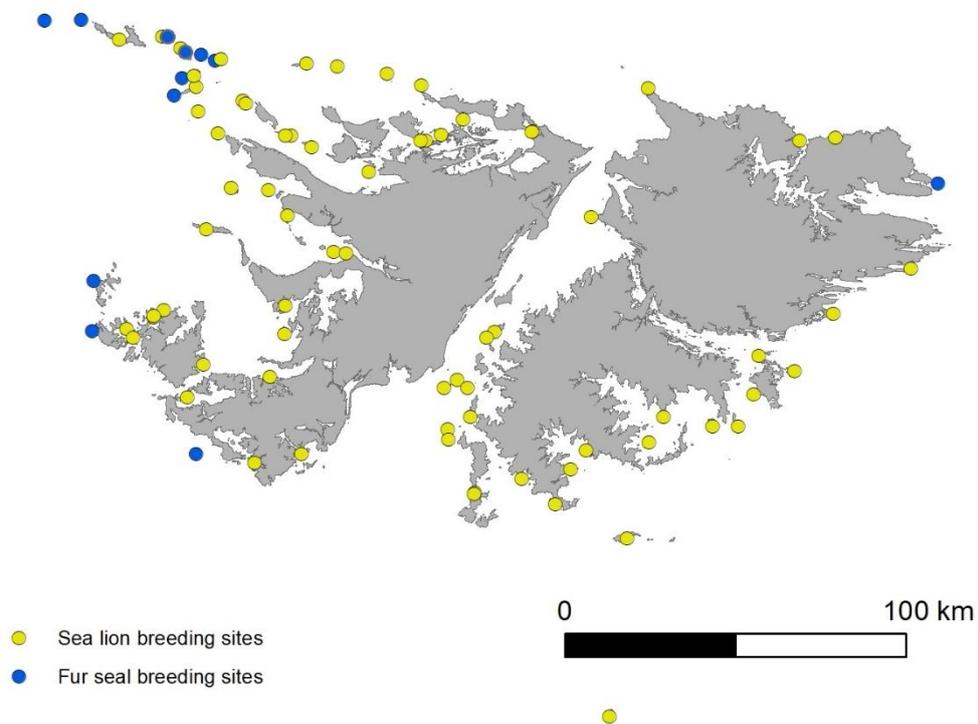


Fig 1. Locations of southern sea lion and Falklands fur seal breeding colonies.

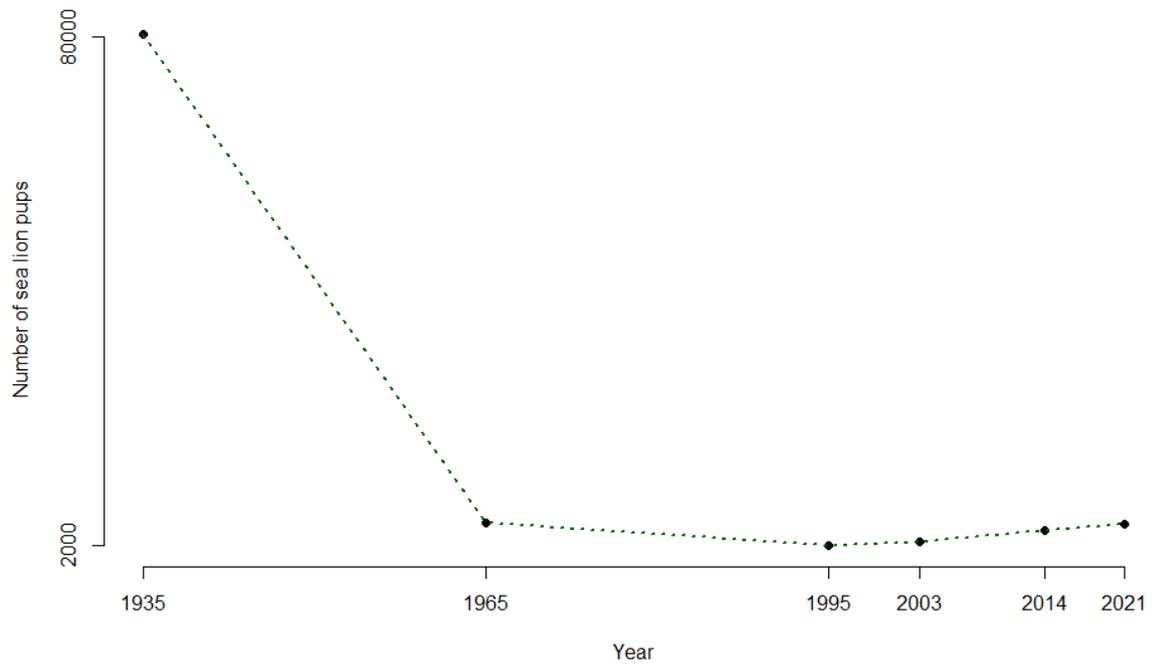


Fig 2. Decline in the number of southern sea lion pups at the Falkland Islands from the first census in 1934-1937, and subsequent censuses in 1965, 1995, followed by an increase in pup production from 2003 to 2021. Between 2014 and 2021 the estimated number of pups born increased by approximately 900.

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Appendix Table 1: Sea lion breeding sites visited during the 2021 Falkland Islands archipelago-wide census. Pup counts were either direct from shore, from a zodiac or via UAV. 2021 counts provided are preliminary. TBC = to be confirmed.

Date	Location	Pups alive	Pups dead	2021 total	2014 total	
3-Jan-21	Port Harriet	70	0	70	93	
4-Jan-21	Kelp Islands	172	0	172	260	
5-Jan-21	North East Island	85	0	85	48	
5-Jan-21	NE Islet	2	0	2	0	
5-Jan-21	Green Island	186	1	187	181	
5-Jan-21	Sal Island	83	0	83	83	
6-Jan-21	Motley Island	4	0	4	18	
6-Jan-21	Outer Triste	124	1	125	91	
6-Jan-21	North Point Island	1	0	1	0	
6-Jan-21	Turn Island	55	1	56	51	
6-Jan-21	Sisters	39		39	60	TBC
6-Jan-21	Cattle Point Island	4	0	4	5	
7-Jan-21	Kelp Lagoons Bull Pt	86	0	86	64	
7-Jan-21	Blind Island	119	2	121	159	
7-Jan-21	George Islet	92	0	92	70	
7-Jan-21	Geoge Main	105	0	105	77	
8-Jan-21	East Cay	34	0	34	30	
8-Jan-21	Sandy Elephant Cay	138	0	138	130	
8-Jan-21	Mikes Island	65	1	66	57	
8-Jan-21	Calista Island	44	0	44	24	
8-Jan-21	North Wedge Island	56	0	56	39	
8-Jan-21	West Tyssen	174	0	174	126	
8-Jan-21	Sandy Tyssen	128	0	128	56	
9-Jan-21	Flat Tyssen	3	0	3	0	
9-Jan-21	Peat Island	75	0	75	39	
9-Jan-21	Bare Island	35	0	35	39	
10-Jan-21	Tussac Island	49	0	49	71	
10-Jan-21	Circum Island	63	0	63	71	
11-Jan-21	West Double Creek	43	0	43	34	
11-Jan-21	Outer Island	20	0	20	45	
11-Jan-21	Shallow Harbour Islet	160	0	160	100	
12-Jan-21	Weddell Island	57	0	57	45	
12-Jan-21	Hill Islet	128	0	128	48	
12-Jan-21	Hill Island	60	0	60	27	
13-Jan-21	Stuck in the Mud	99	1	100	95	
13-Jan-21	Stinker Island	187	0	187	135	
14-Jan-21	South Fur Island	4	0	4	3	
14-Jan-21	South Jason Island	34	0	34	13	

14-Jan-21	Elephant Jason	18	0	18	20	
14-Jan-21	North Fur	49	0	49	39	
15-Jan-21	Flat Jason	38	0	38	51	
16-Jan-21	Steeple Jason Islet	115	0	115	132	
17-Jan-21	The Fridays (south)	51	0	51	68	
18-Jan-21	3rd Passage Island	99	1	100	45	
19-Jan-21	Town Pt Rocks	31	0	31	14	
19-Jan-21	Gidds Island	53	0	53	22	
19-Jan-21	Rabbit Island	24	0	24	10	
19-Jan-21	Cliff Island	84	0	84	86	
19-Jan-21	Split Island	43	0	43	21	
19-Jan-21	Gibraltar Rock	37	0	37	28	
19-Jan-21	Twins North	54	0	54	49	
20-Jan-21	Twins South	68	0	68	68	
20-Jan-21	Sedge Island	5	0	5	6	
20-Jan-21	Wreck Island	61	0	61	66	
20-Jan-21	Low Island rocks	103	0	103	59	
20-Jan-21	Low Island	40	0	40	23	
21-Jan-21	Dunbar Island	51	0	51	36	
21-Jan-21	Skip Rock	21	0	21	12	
21-Jan-21	Port Egmont Cays	90	0	90	65	
21-Jan-21	Government Island	27	0	27	22	
22-Jan-21	Monday Islet	34	0	34	11	
22-Jan-21	Rabbit Island	163	0	163	101	
22-Jan-21	Bills Islet	248	0	248	125	
22-Jan-21	Penguin Point (Tamar Is)	93	0	93	44	
22-Jan-21	Tamar Rocks	65	0	65	42	
22-Jan-21	North West Island	113	0	113	74	
23-Jan-21	Big Shag Island	200	0	200	328	TBC
8-Jan-18	Beauchene Island	6	0	6	3	
22-Jan-21	Dry island	0	0	0	1	
Jan 21	Bleaker Island				0	TBC
8-Jan-21	Clump Island	0	0	0	2	
7 Jan 21	Fanny Island (south)	100	0	100	61	TBC
Jan 21	Sea Lion Island	50	0	50	50	TBC
Jan 21	Cape Dolphin	250	0	250	172	TBC
				5,375	4,443	

Appendix Table 2: Fur seal breeding sites visited during the 2021 Falkland Islands archipelago-wide census and most recent fur seal pup count data. TBC = to be confirmed.

Date	Location (count via UAV)	2021	2018 Total
15.01.2021	Seal Rocks	TBC	9076
15.01.2021	North Fur Island	TBC	1669
16.01.2021	East Cay	TBC	7889
16.01.2021	West Cay	TBC	12032
17.01.2021	Flat Jason Island	TBC	0
17.01.2021	Elephant Jason	TBC	2325
17.01.2021	South Jason Island	TBC	2473
17.01.2021	The Fridays	TBC	0
	Bird Island	not counted	493
10.11.2021	Beaver Island	Approx. 1,000	100
	New Island	not counted	138
	Volunteer Rocks	not counted	230
Total			36,425