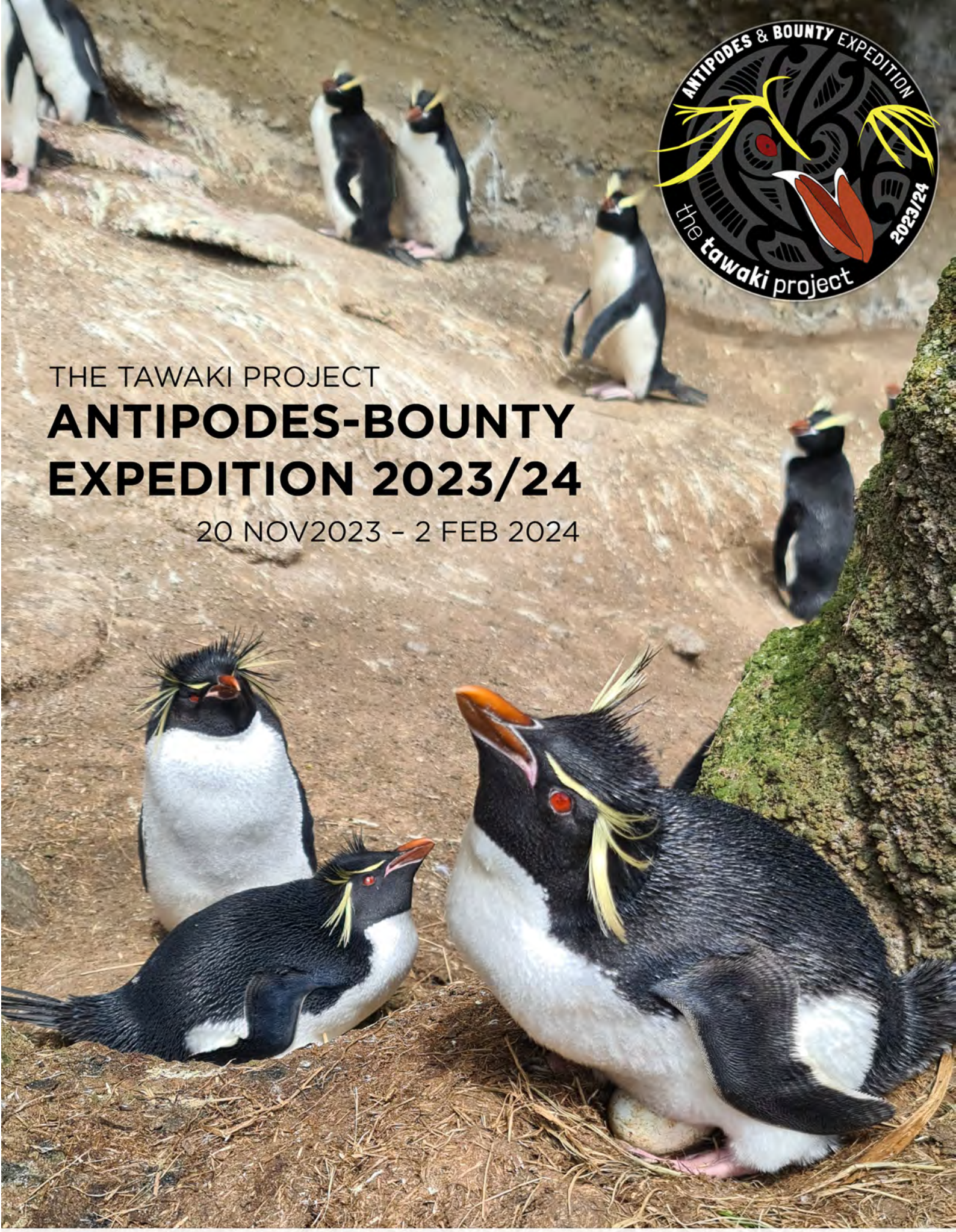

THE TAWAKI PROJECT

ANTIPODES-BOUNTY EXPEDITION 2023/24

20 NOV2023 – 2 FEB 2024

PATREON

GLOBAL PENGUIN SOCIETY

The Tawaki Trust

ANTARCTIC RESEARCH TRUST

VONTOBEL-STIFTUNG

THE TAWAKI PROJECT

ANTIPODES-BOUNTY EXPEDITION 2023/24

20 NOVEMBER 2023 – 2 FEBRUARY 2024

PENGUIN RESEARCH

Thomas Mattern

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Executive Summary

The Tawaki Project's Antipodes-Bounty 2023/24 expedition took place between 20 November 2023 and 2 February 2024.

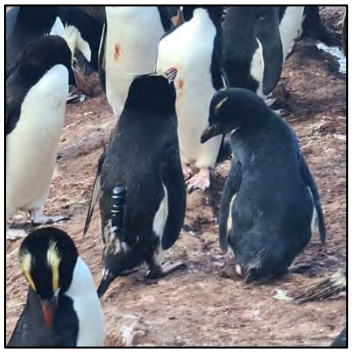
Antipodes Island – 24 November 2023 - 30 January 2024

The Antipodes Island portion spanned from 24 November 2023 to 30 January 2024, totalling 68 days. Initially, the team comprised five members: Thomas Mattern, Robin Long, Richard Seed, Hannah Mattern, and Bianca Keys. On December 18, 2023, the two-person albatross team arrived on the Research Vessel *Evohe*, prompting one member of the penguin team (BK) to return to the mainland.

The main research activity on the island encompassed:

- Foraging studies throughout the chick rearing stages of both Eastern Rockhopper and Erect-crested penguins using GPS dive loggers (including blood sampling for stable isotope analysis).
- Deployment of satellite transmitters on Erect-crested penguins to study the pre-moult dispersal.
- Repeated drone surveys of key penguin colonies to determine changes to the previous year as well as the variability of penguin numbers present in the colony.
- Ground counts to provide ground-truthing for the drone.
- Assessment of breeding success via ground counts and by following chick fates using temporary colour bands in the study colony in Anchorage Bay.
- Maintenance of four time-lapse cameras trained at Erect-crested penguin colonies.
- Collection of parasites (ticks) for disease screening.

The **foraging study was conducted at two main study sites: Anchorage Bay East and Stack Bay**. A total of 33 Erect-crested penguins and 21 Eastern Rockhopper penguins were fitted with data loggers. Additionally**, two Erect-crested penguins were equipped with animal-borne cameras combined** with dive loggers (TDR).



On 25 January 2024, **five satellite transmitters** (Wildlife Computers SPOT-275) were **deployed on chick rearing Erect-crested penguins** from **Stack Bay** (2 males, 3 females); another five transmitters were fitted to Erect-crested penguins (3 males, 2 females) from the **Anchorage Bay** study site three days later (28 January 2024).

Between 25 November 2023 and 29 January 2024, a total of **90 drone missions were flown, covering the major penguin breeding colonies** at least once during this expedition. 19,012 images were recorded to produce detailed orthomosaics of documented penguin colony locations. Additionally, 90 UHD videos allow additional assessment of penguin presence.

Ground counts of Erect-crested penguin nests were conducted at **Anchorage Bay East**, **Reef Point and Stella Bay** bi-weekly. Four ground counts of Erect-crested and three counts of Eastern Rockhopper penguins occurred at **Orde Lees**. Two **Stack Bay** Rockhopper colonies were counted once. **Penguin numbers were higher than in the previous season.**

Breeding success in Erect-crested penguins was closely monitored on the study platform in Anchorage Bay East. 51 nests were active in late November 2023 of which 39 raised one chick to fledging. 33 Erect-crested penguin chicks were temporarily marked with flipper bands. Ground counts and drone surveys also provide information about breeding success in Anchorage Bay East, Orde Lees and Stack Bay.

The four **time-lapse cameras** deployed at four sites along the northern, western, and southern coastlines were maintained. Two of the cameras were found water-logged and defunct and were replaced with new devices. One of these was relocated from the south coast to Stack Bay. Only the camera in Orde Lees recorded imagery covering the entire deployment period.

As in the previous year, **observations of Erect-crested penguins with aberrant plumage colouration** were made. This includes resighting of an **isabelline penguin** on the South Coast, as well as observations of a further case of leucism at Stack Bay; no such cases were observed in Eastern Rockhopper penguins.

Ancillary observations were made regarding the New Zealand Fur seal population on the Antipodes Island. It appears as if fur seals are more numerous than previously thought with not insignificant breeding populations at least at Reef Point and in Northwest Bay. The **Reef Point population is estimates to comprise close to 1,000 animals**.

A **potentially man-made structure in Hannah's Cave** was inspected closely with the drone during the penguin survey at the site. Subsequent assessment of the video data by the Department of Geology, University of Otago concluded that this is **unlikely to be a natural rock formation and warrants archaeological investigation**.

Bounty Islands – 31 January 2024

The expedition arrived at the Bounty Islands in the early hours of 31 January 2024 after being picked up from Antipodes Island the day before. A research team of eight people (TM, RL, RS, HM, BK, Dave Houston, Ursula Ellenberg, Blake Hornblow) managed to make landfall on Proclamation Island at 6:30 hrs in the morning. All research activities on the island took place between 7:00 and 14:30 hrs, so that the total time spent on the island was less than 8 hours.

The main research activity on Proclamation Island encompassed:

- Deployment of 10 satellite transmitters on chick-rearing Erect-crested penguins (including blood sampling for stable isotope analysis).
- Drone surveys of the archipelago main group to determine chick numbers and potential encroachment of penguins and albatross by breeding fur seals.
- Maintenance of time-lapse cameras deployed in the previous season.
- HPAI disease screening for the Department of Conservation.

10 satellite transmitters were deployed on five male and five female Erect-crested penguins by two teams (UE & BH, RL, DH & BK) and were conducted between 8:00 and 13:00 hrs. To ensure only breeding birds were fitted with devices, the teams had to wait until adults fed a chick identifying them as breeders.

Drone surveys were flown by three designated pilots (TM, HM, RS). A **total of eight missions covering the main group** with the aim of **counting of penguin chicks** and recording **ancillary data of albatross chicks and New Zealand Fur seal pups**. Combined mission time amounted to 3:58 hrs; a total of 4,089 images were recorded to produce orthomosaics of all islands in the main group.

All seven time-lapse cameras deployed in November 2022 **were maintained; two devices were recovered and the remaining five replaced** with new devices. Two of these cameras were found destroyed, presumably because of fur seal interaction; all other cameras were found as deployed albeit with various states of water ingress.

Choanal and cloacal swabs to screen for Highly Pathogenic Avian Influenza (HPAI) were taken from **25 Salvin's albatrosses** and **25 Erect-crested penguins**. Samples have been delivered to the Microbiology department of the University of Otago for analysis.

After leaving Proclamation Island, the *Evohe* relocated to Funnel Island so that a **drone mission could be flown to survey Cook's scurvy grass**. A flowering bush was discovered growing on a near vertical cliff wall. The survey was cut short because the drone was destroyed when trying to land on the boat to replace batteries.

Conclusion & Outlook

After the successful conclusion of two expeditions covering the main chick rearing period for both Erect-crested and Eastern Rockhopper penguins, we next plan to examine the penguins' foraging ecology during the egg incubation phase next. Time-lapse camera data indicates that the Erect-crested penguins' male exodus after egg laying occurs around 20 October; Eastern Rockhopper penguin chicks generally hatched in the first week of December. Timing for the next expedition is, thus, determined by the penguins' incubation schedules.

Our tentative dates for the 2024 expedition are,

- **11 October 2024 – Travel to Antipodes Is**
- **6 December – Pick-up Antipodes Is; return to mainland.**

Research activities for this third expedition will revolve around GPS tracking penguins during their incubation foraging trips which in Erect-crested penguins take between 10-14 days in males and 8-10 days in females. Trip lengths of incubating Eastern Rockhopper penguins appear to be more variable.

Additionally, we plan to conduct another full drone survey of the Erect-crested penguin colonies around the island. The late incubation phase may be the best time to obtain a representative count of Erect-crested penguin nests as these will mostly be occupied by single birds so that counts of individuals may reflect the actual breeding pair numbers the closest.

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Acknowledgements

Expeditions to the New Zealand subantarctic region are a major undertaking. This expedition would not have been possible without the support from many different individuals and institution.

First and foremost, getting to and from the islands is not only difficult but also very expensive. And, as in the previous year, we are extremely grateful for the generous financial support that made this research possible:

- **Vontobel Foundation, Switzerland**
- **Antarctic Research Trust, Switzerland**
- **Global Penguin Society, Argentina**
- **The Tawaki Project Patreons (https://patreon.com/TawakiProject)**

It goes without saying, that another crucial element of an expedition such as this one, is the team that does the work. **Robin Long, Richard Seed, Hannah Mattern, Dave Houston, Blake Hornblow, and Ursula Ellenberg** all donated their time and dedication to this project. **Bianca Keys** braved extended stays on the Evohe and the associated seasickness in pursuit of her PhD project. **Claire Concannon** managed to join and document the Bounty Trip for Radio New Zealand after missing out in the previous season.

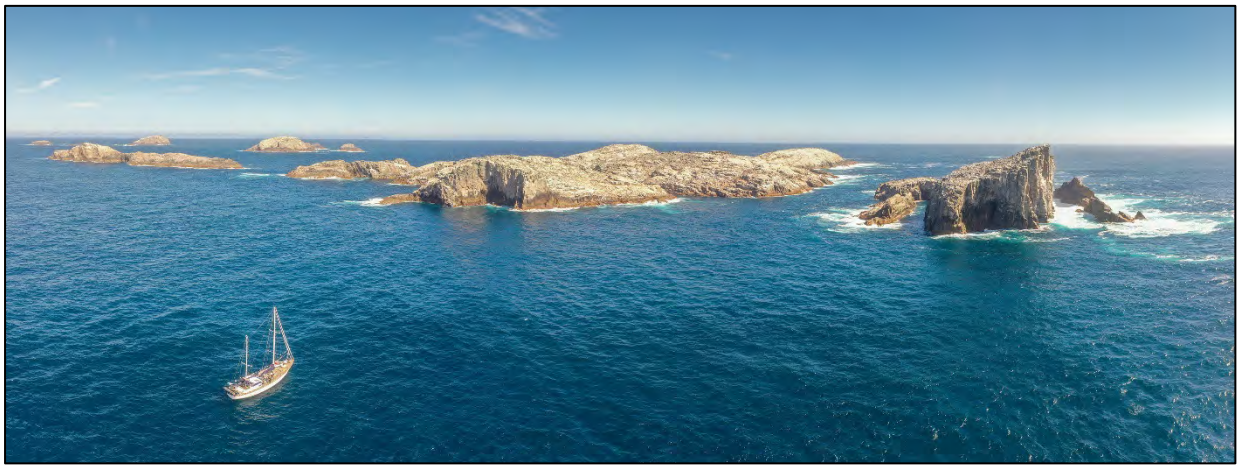
Extra thanks are due to the *Evohe* crew – **Steve Kafka, Murray Watson, Roger Gibson, and Graeme Loh** – who kept us well fed during the journey (as far as we were hungry despite sea sickness or general motion queasiness) and got us safely ashore at both islands.

At the Department of Conservation, we thank **Ros Cole, Sharon Trainor** and **Janice Kevern** (DOC Murihiku) **and their team** to get our gear quarantined and our team briefed. Thanks to the entire CSP team – **Graeme Taylor, Igor Debski, Hendrik Schultz, and Kris Ramm** – for supporting our project from the beginning, and especially to **Johannes Fischer** for sorting out the impossible schedule for all the subantarctic expeditions happening this season.

Thanks to **Kalinka Rexer-Huber** and **Edin Whitehead** – the "Albatross Team" – for being great companions in the Antipodes hut, and especially for the Christmas hats and Mini-Polaroid mementos.

Expedition dates

20 – 23 November 2023	Bluff to Antipodes Islands on board of *Evohe*
24 November 2023	Landed on Antipodes Island
17 December 2023	*Evohe* arrives with albatross team; Bianca Keys returns to mainland
29 January 2024	Evohe arrives to pick up penguin team, landing not possible due to rough conditions
30 January 2024	Field team off the island before midday
31 January 2024	Arrival at Bounty Islands (01:30 hrs), shore party lands on Proclamation Island (06:30-14:00 hrs)
31 January – 2 February 2024	Bounty Islands to Dunedin



Evohe at the Bounty archipelago, 31 January 2024

Expedition team

NAME	ROLE	AFFILIATION
Thomas Mattern	Expedition leader, Researcher, Drone pilot	University of Otago, Tawaki Trust & Global Penguin Society
Robin Long	Researcher, DOC rep	West Coast Penguin Trust, Department of Conservation
Richard Seed	Researcher, Drone pilot	Department of Conservation, Tawaki Trust
Hannah Mattern	Researcher, Drone pilot	Logan Park High School
Bianca Keys	Researcher, PhD student	University of Otago
Dave Houston*	Researcher	Department of Conservation, Tawaki Trust
Ursula Ellenberg*	Researcher	University of Otago, Tawaki Trust & Global Penguin Society
Blake Hornblow*	Researcher	Department of Conservation
Claire Concannon*	Journalist	Radio New Zealand

** Only Bounty Islands portion*

Thomas Mattern, Robin Long, Dave Houston, Hannah Mattern, Richard Seed, Ursula Ellenberg, Blake Hornblow, Bianca Keys, Claire Concannon

Part I – Antipodes Is: 24 Nov 2023 - 30 Jan 2024

Antipodes timeline & study sites

The expedition left Bluff around 15:00 hrs on 20 November 2023 and arrived at Antipodes Island around 3:00 hrs in the early morning of 23 November. Conditions at the island were not favourable for landing with substantial swells rolling in from the northwest. The *Evohe* anchored just north of Leeward Island in Alert Bay for the remainder of the day. Conditions had improved in the morning of 24 November so that landing team and gear was possible.

Research-related activities commenced on 25 November 2023 with first drone missions flown over Anchorage Bay East, Reef Point and Stella Bay. Last drone missions were flown on 28 January 2023.

Starting on 26 November 2023, many penguin colonies were visited on foot to conduct drone surveys. The last trip occurred on 28 January 2024. Many of these excursions were day trips with distances covered ranging from 5.1 to 17.4 km over the course of 3-11 hours (Figure 1). The recorded tracks amount to 236 km, although the actual combined distances covered by the teams on foot is likely closer to 300 km.

GPS logger deployments on Erect-crested penguins were carried out between 29 November 2023 (early chick-guard stage) and 12 January 2024 (advanced crèching stage). With Eastern Rockhopper penguins, similar work was carried out between 7 December 2023 and 6 January 2024.

Study sites

To conduct a comparative study of foraging movements in both penguin species, GPS tracking occurred at two sites, the study platform at Anchorage Bay East (S49.667632°, E178.807795°; Figure 2a), and Stack Bay in the southwest of the island (S49.695058°, E178.741428°; Figure 2b). In Stack Bay, the first GPS logger deployments on Erect-crested penguins were carried out in the top colony (Figure 3a). Subsequent deployments happened in a smaller sub-colony closer to the main landing beach (Figure 3b) which is located opposite the main Eastern Rockhopper penguin nest cluster (Figure 3c) used for the GPS study in this species.

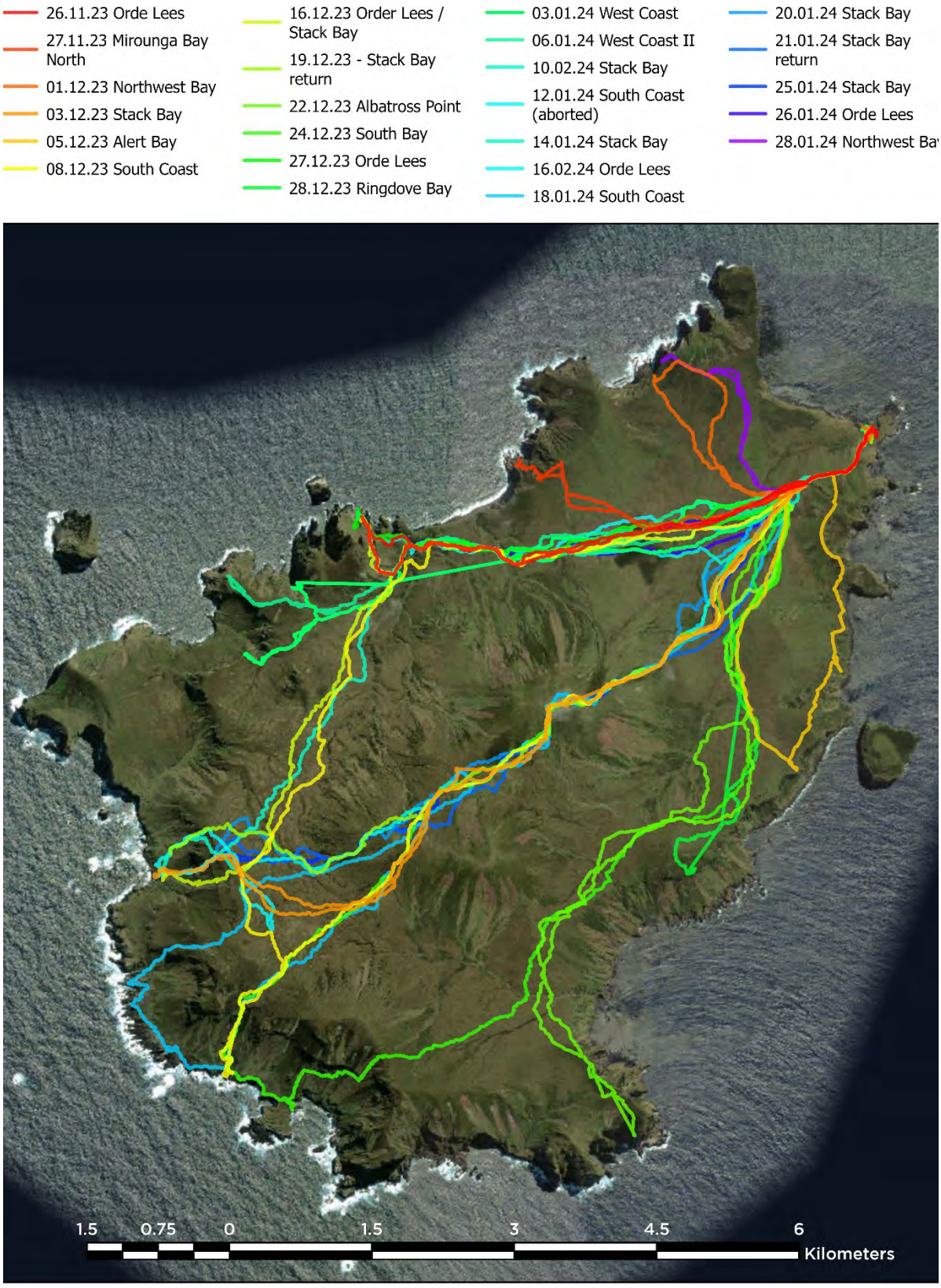


Figure 1. *Main movement patterns of teams on Antipodes Island November 2023-January 2024. Note that some trips to Stack Bay were not recorded but followed the main route across the Central Plain.*

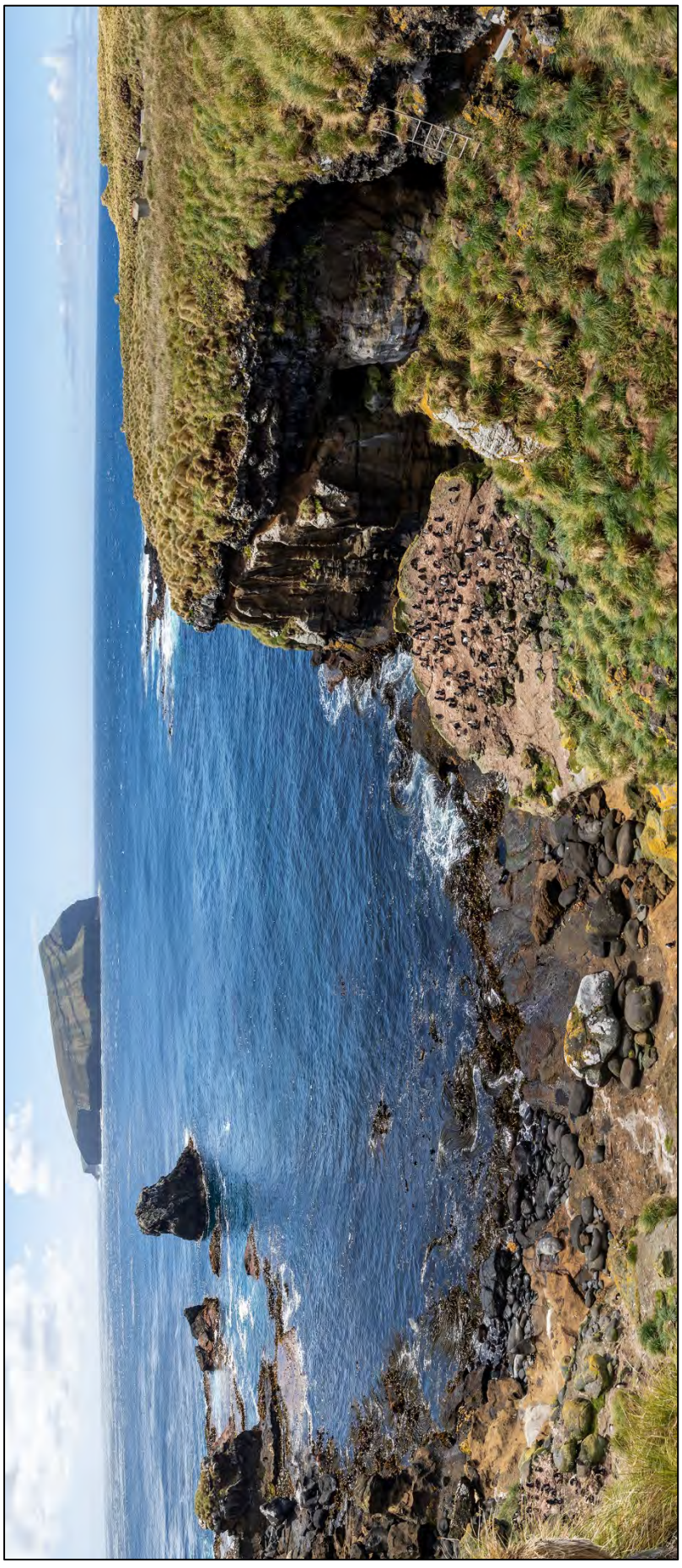


Figure 2a. *The northern research site, Anchorage Bay East with the "Study Platform" visible.*

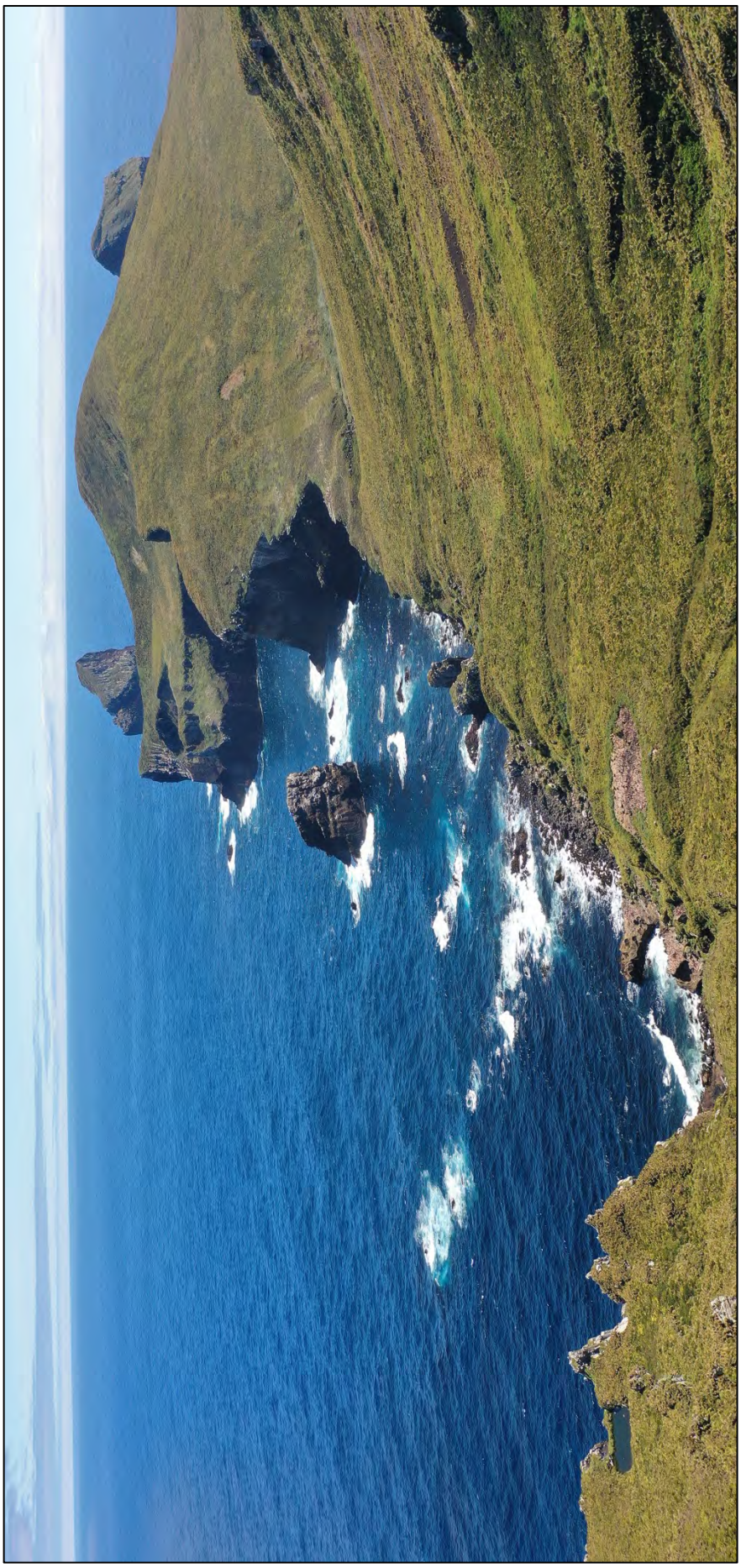


Figure 2b. *The southern study site, Stack Bay. The top colony is visible at the centre-bottom of the image.*

Figure 3a. *Erect-crested penguin top colony, Stack Bay*

Figure 3b. *Lower Erect-crested penguin study colony (right foreground), Stack Bay*

Figure 3c. *Eastern rockhopper penguin study colony, Stack Bay*

Camp at Stack Bay

Working with penguins in Stack Bay required overnight stays. Therefore, a camp was established on a tussock hillock south of the top colony (S49.694913°, E178.742224°). Although no vegetation was cut for this purpose, several tussock bushes were flattened to establish a surface to pitch a tent on. The camp was established on 2 December 2023 and remained at the site until 25 January 2024. Drinking water was sourced from a creek ~50m south of the camp.

Figure 4. *The camp at the top colony in Stack Bay*

Teams were present in the camp to deploy and recover GPS data loggers for a total of 20 nights (Table 1).

Table 1. *Dates of overnight stays in Stack Bay by two-person teams (Robin Long & Richard Seed, Thomas & Hannah Mattern).*

2023	Team	2024	Team
10-12 Dec	RL & RS	05-6 Jan	RL & RS
16-18 Dec	TM & HM	10-13 Jan	TM & HM
20 Dec	RL & RS	15-19 Jan	RL & RS
27-28 Dec	RL & RS	19-20 Jan	TM & HM

Deployment of data loggers on penguins

Erect-crested penguins – Anchorage Bay East

On arrival on Antipodes Island on 24 November 2023, hatching in Erect-crested penguins was well underway. However, most chicks were only a few days old and very small, so that it was decided to wait a few days before deploying the first GPS dive loggers.

The first batch of five GPS dive loggers (TechnoSmart Axy-Trek Marine with 2000mAh batteries, Figure 5) were deployed during the chick-guard stage on 29 November 2023 on chick rearing female penguins from the study platform. Of these, one bird had been marked in the previous season (PIT tag: 956 0000112 70101); the remaining birds were tagged with PIT tags during the deployment process. Weights ranged between 2500 and 4000 g. The five devices were recovered between 7-10 December, i.e. 8-11 days after deployment.

A second round of chick-guard deployments started on 7 December 2023. Three GPS dive loggers were fitted to chick rearing females weighing between 3400-3750 g. One of the penguins had been PIT tagged in the previous season (956 00001130 1612). Devices were recovered 7-10 days later (14-17 December). On 12 December 2023, two previously unmarked female penguins weighing 3600 and 4100 g, respectively, were fitted with camera loggers (Eudyptes *PenguCam*, Figure 5) combined with miniature TDRs. Both devices were recovered on 15 December with both birds performing a three-day foraging trip while carrying the camera.

First crèches formed on the platform on 15 December 2023. Once crèching was underway, the next round of GPS logger deployments happened on 23 (3 females, 1 male; all previously unmarked) and 26 December (1 unmarked male). Females were significantly lighter with body masses ranging between 3300-3400 g. The two males weighed 4500 and 4800 g, respectively, having recently returned from their first multi-day foraging trip after the long chick guarding phase. Devices were recovered 5-11 days after deployment.

The final round of GPS dive logger deployments was carried out on 4 January 2024. Five devices were attached to 3 male (4700-5400 g) and 2 female penguins (both 3900 g). Except for one device, all loggers were recovered on 11 January; the last device was recovered on 15 January.

All devices were attached to the penguins' lower backs using the Tesa-tape method[1] (Figure 5) which allows detachment of the loggers after the deployment period without causing significant damage to the plumage. To prevent birds from preening off devices, one (GPS) or two cable ties (*PenguCam*) were looped around the devices and tightened with a cable tie gun.

Figure 5. *GPS dive logger (left) and PenguCam combined with TDR (right) deployed on Erect-crested penguins. The GPS logger (Axy-Trek with 2000 mAh battery) weighs 50 g. PenguCam and TDR weigh in combination ca. 95 g.*

[1] Wilson, R. P., K. Pütz, G. Peters, B. M. Culik, J. A. Scolaro, J.-B. Charrassin, and Y. Ropert-Coudert. 1997. Long-term attachment of transmitting and recording devices to penguins and other seabirds. Wildlife Society Bulletin 25:101–106.

Erect-crested penguins – Stack Bay

The first chick-guard logger deployments at Stack Bay coincided with the visit to establish the camp on 2 December 2023. Five female penguins tending chicks at their nest were fitted with GPS dive loggers. The birds weighed between 3500 and 4300 g. Devices remained on the birds until they could be recaptured 8-10 days later (10-12 December 2023). One of the penguins had managed to preen off the device and was recovered without the logger; the bird was identified by scanning the PIT tag it was marked with during deployment.

This first round of deployments occurred in the top colony (see Figure 3a). However, recapturing the birds for device recovery sometimes required pursuing penguins into the centre of the colony which caused some disturbance. This problem was alleviated by relocating deployments to a smaller and spatially constrained colony closer to the landing beach (see Figure 3b) during all subsequent GPS logger deployments.

The second round of chick-guard deployments only encompassed two females (3900 and 4100 g) due to a limitation of available devices. These deployments were carried out on 10 December; both units were successfully recovered on 19 and 20 December, i.e. 9 and 10 days later.

During the crèching stage, a total of eight GPS logger deployments were carried out in two rounds on 27-28 December 2023 and 12 January 2024. Two females (3400 & 3700 g) and three males (4300-4600 g) were fitted with devices during the first round; two males (no weights recorded) and one female (3500 g) were subject to deployments during the second round. Devices of the first round were recovered 9-10 days later; the remaining three GPS loggers remained on the penguins for only 5 days.

No camera loggers were deployed in Stack Bay.

Figure 6. *Female Erect-crested penguin equipped with GPS dive logger guarding her chick in the Stack Bay top colony. Her mate is standing facing her.*

Eastern Rockhopper penguins – Anchorage Bay East

The number of accessible Eastern Rockhopper penguin nests in Anchorage Bay is limited. Only four active nests were found on the fringes of the Anchorage Bay East Erect-crested penguin colony below the ladder.

Additional Rockhopper penguin nests are in two caves in a rock gut to the north of the Erect-crested penguin study colony. Only one active nest was present in the open cave, while five more nests were found in the narrow cave that can only be reached by climbing into the cave over a tumble of rocks. This cave was also frequented by loitering non-breeders that would scatter when a person would enter the cave making it difficult to identify breeding birds.

As a result, only one of the device deployments to investigate foraging behaviour of chick rearing Eastern Rockhopper penguins was conducted in the cave. All other deployments were conducted on the four nests directly accessible (Figure 7).

Figure 7. *Robin Long and Hannah Mattern during device deployments on Eastern Rockhopper penguins, 7 December 2023. Two of the four accessible Rockhopper penguin nests can be seen along the base of the rock walls in the background.*

A total of five female chick-guarding Eastern Rockhopper penguins were fitted with GPS dive loggers (TechnoSmart Axy-Trek Marine with 800mAh batteries; Figure 8) in Anchorage Bay East. The first three deployments were conducted on 7 December 2023 on female penguins weighing between 2500-2600 g. All devices were recovered on 12 December. Another two

deployments happened a week later (14&15 December) with both birds weighing 2500g; devices remained on the penguins until 19 December.

Figure 8. *Axy-Trek Marine with 800 mAh battery attached to the lower back of an Eastern Rockhopper penguin. The device weighs about 20 g.*

Eastern Rockhopper penguins – Stack Bay

Stack Bay represents one of the best sites to work with both species of penguins simultaneously. Unlike along the South Coast where Eastern Rockhopper penguins breed under boulders and rocks, at Stack Bay a significant portion of birds nest in open and accessible colonies. For the purposes of GPS logger deployments, we focused on a cluster of 33 nests located halfway down the main access track to the Erect-crested penguin top colony.

On 10 December 2023, four chick-guarding Eastern Rockhopper penguin females were fitted with 800mAh Axy-Trek Marine GPS loggers. The penguins' body weights ranged from 2270-2700 g. Devices remained on the birds for six (two birds), seven, and nine days, i.e. recoveries occurred between 16-19 December. Two additional logger deployments during the chick-guard were carried out on 16 December. The females fitted with the devices both weighed 2400 g. The loggers were recovered on 20 December, four days after deployment.

Foraging behaviour of Stack Bay Rockhopper penguins during the crèching stage was examined in two rounds with four females fitted with GPS loggers on 21 December 2023, and an additional six birds – 3 females and 3 males – on 5-6 January 2024. Female weights ranged from 2150-2400 g; males were only slightly heavier at 2300-2700 g. Except for one logger that was recovered after 4 days, the other devices stayed on longer than intended despite intensive and prolonged efforts to recapture the penguins. To recover the devices, teams were present in Stack Bay from 10-14 and 16-21 January. All devices were eventually recovered between 10-14 days after deployment.

Hannah Mattern observing the landing in Stack Back for logger birds, 11 January 2024.

Preliminary results

Note: all data in this section represent preliminary results and may be subject to change during detailed analysis. Discrepancies in number of deployments and presented foraging data is related to device loss, no data recorded because of device malfunction, or male penguins not going to sea while fitted with devices.

Erect-crested penguins – Chick-guard

GPS logger data recorded on Erect-crested penguins from Anchorage Bay (AB) and Stack Bay (SB) during chick-guard represented a total of 35 foraging trips performed by 7 different individuals and 22 foraging trips by 6 birds, respectively. They showed clear spatial segregation in the marine habitat utilization. Penguins from the northern study site (AB) dispersed to the north and northeast, while birds from the southwestern site ranged from west to southeast (Figure 9).

SB penguins ranged somewhat further away from the colony (mean home range calculated from individual means: 38.4±17.1 km, n=6 birds) when compared to birds from Anchorage Bay (31.0±12.8 km, n= 7 birds). Accordingly, trip distances also differed between both sites (SB vs AB: 122.7±38.4 km vs 83.9±53.9 km) as did trip durations (2.3±1.2 days vs 1.3±0.7 days).

In terms of diving behaviour, there were no marked differences between penguins from both sites. Penguins foraged at an average depth of 30.5±4.2 m and 30.7±4.6 m and reached maximum depths of 101.6±7.8 m and 113.7±19.0 m at Anchorage Bay and Stack Bay, respectively.

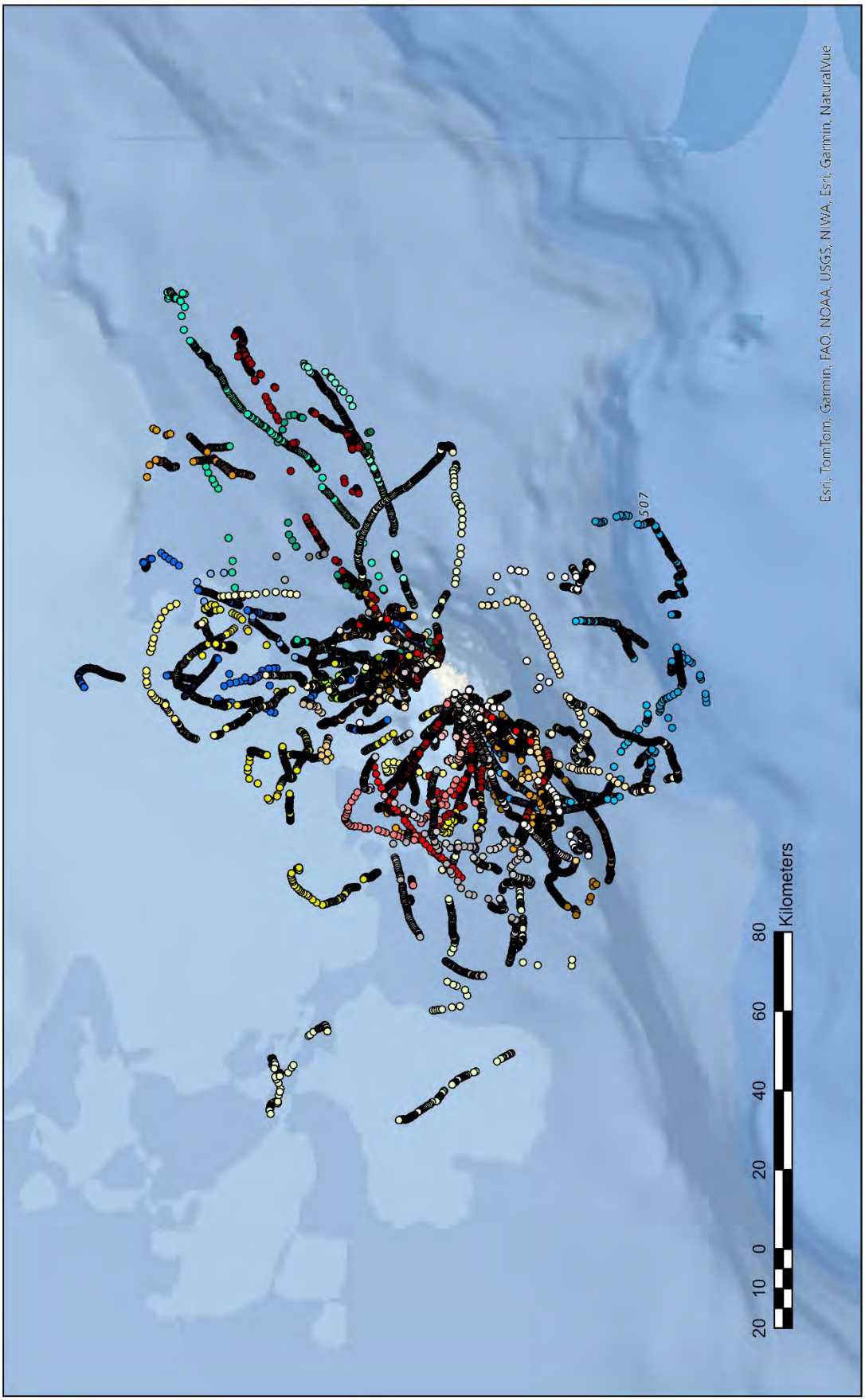


Figure 9. *GPS fixes recorded on chick-guarding female Erect-crested penguins between 30 November and 18 December 2023 at Anchorage Bay East and Stack Bay.*

Erect-crested penguins – Crèching

Foraging data recorded with GPS dive loggers during the crèching stage represents 9 birds performing 35 trips in Anchorage Bay with the same number of birds and resulting trips recorded in Stack Bay. At-sea movements at both sites followed similar travel trajectories as during the chick-guard stage at both sites with clear spatial segregation between birds from the two study sites (Figure 10).

Trip durations averaged 1.8±1.2 days in Anchorage Bay penguins and 1.5±1.3 days in birds from the Stack Bay colony. The only exception was a female Erect-crested penguin from Anchorage Bay that went on a 10.5-day long trip during which she travelled almost 260 km to the east, covering 560 km on the return journey (Note: this trip is cropped out in Figure 10).

Interestingly, trips were considerably shorter in male penguins at both sites when compared to females. Anchorage Bay males stayed at sea for 1.4±0.9 days (n=6 birds) whereas females foraged for an average 2.8±1.5 days (n=2). At Stack Bay, males stayed at sea for 1.0±0.6 days (n=5) but females only returned after 2.4±1.4 days (n=4). This reflected in foraging ranges as well – AB males: 28.5±17.6 km vs AB females: 46.7±23.7 km; SB males: 25.0±15.6 km vs SM females: 50.2±31.3 km. Similarly, Trip distances covered by males were substantial shorter than in females (AB males vs females – 77.6±43.6 km vs 189.4±124.7; SB – 62.9±37.6 vs 170.9±86.3 km).

Mean dive depths at both sites were again comparable with 30.4±4.6 m in Anchorage Bay penguins (n=9) and 28.7±10.7 m in Stack Bay (n=9). But there were marked differences between male and female penguins with males foraging on average at depths of 33.2±0.5 m (n=11) whereas females spent most dives looking for food at 25.0±1.7 m (n=7). However, maximum depths reached did not differ significantly between sites and sexes and ranged around 112.2±9.8 m.

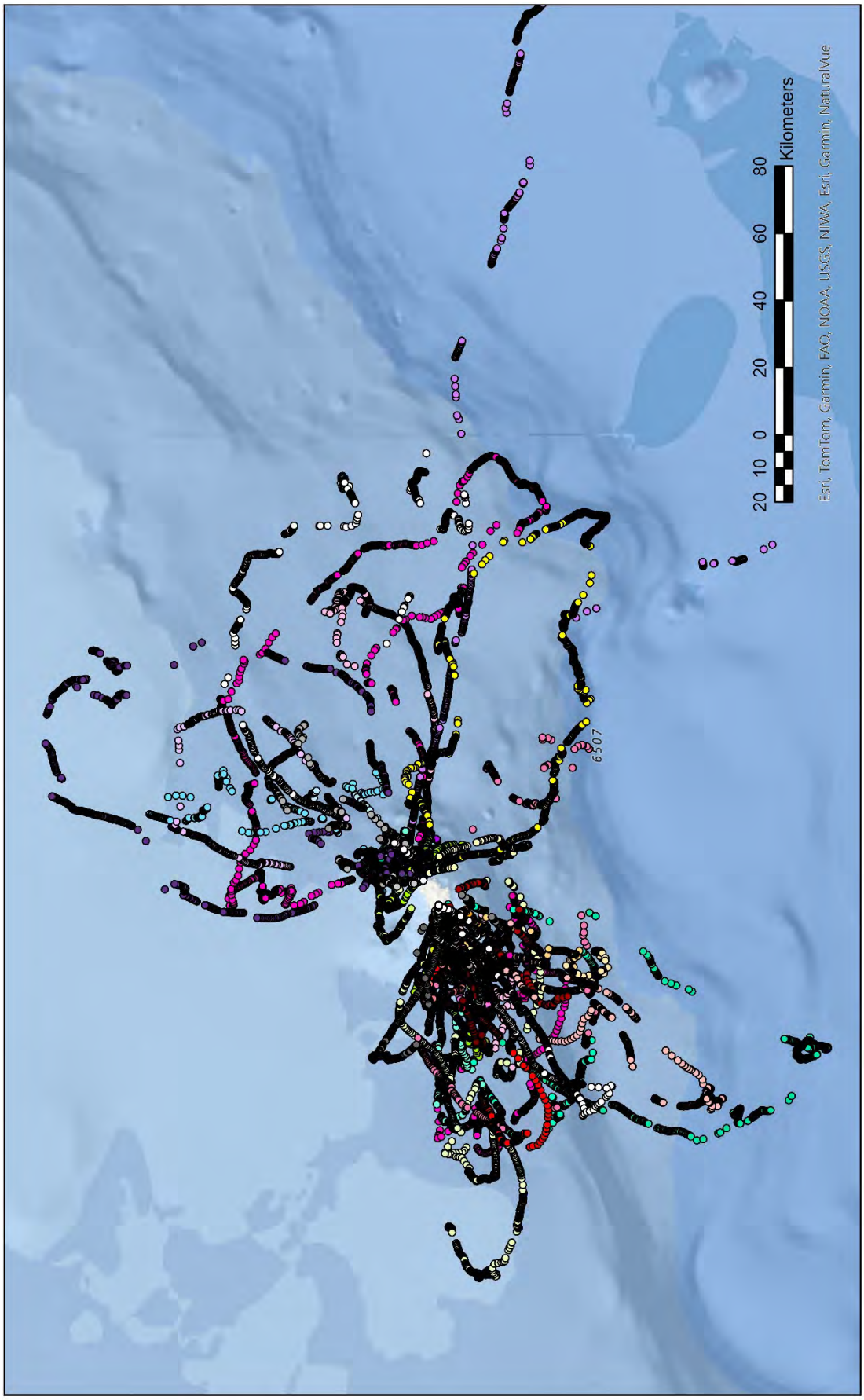


Figure 10. *GPS fixes recorded on male and female Erect-crested penguins during the crèching stage between 16 December 2023 and 17 January 2024.*

Eastern Rockhopper penguins – Chick-guard

GPS logger data recorded during chick-guard stage on female Eastern Rockhopper penguins (ERP) from Anchorage Bay East and Stack Bay allowed reconstruction of a total of 54 foraging trips (Figure 11).

At the northern site, Anchorage Bay East, data from 5 females, representing 21 foraging trips showed similar foraging patterns as observed in Erect-crested penguins (ECP) at that stage, that is, foraging movements to the north with no overlap in foraging ranges with Rockhopper penguins from Stack Bay. Compared with ECP, the Anchorage Bay Rockhoppers showed a slight tendency to forage northwest whereas the bigger species dispersed more in a northeastern direction (cf. Figures 9 & 11). The penguins stayed at sea for an average 17.3±3.4 hours, stayed within a mean 27.1±12.5 km from their colony covering 43.7±24.4 km on these trips. The penguins performed an average 561±61 dives per trip foraging primarily at depths around 27.5±2.9 m although reaching maximum depths of up to 108 m (mean: 86±11.5 m, n=5).

On the southwestern end of the island, 10 female ERP from Stack Bay undertook 33 foraging trips while fitted with GPS loggers (Figure 11). On these, they ranged 34.1±22.9 km from their colony and stayed at sea for a mean 26.5±13.8 hours covering trip distances of 87.4±66.9 km. As with the northern study site, movement patterns of ERP matched those of Erect-crested penguins from the same site. And just as in ECP, foraging trips were longer and further afield while the diving behaviour at both sites was comparable with Rockhopper penguins from Stack Bay foraging at depths around an average 27.0±6.1 m reaching maximum depths of 85.9±15.6 m.

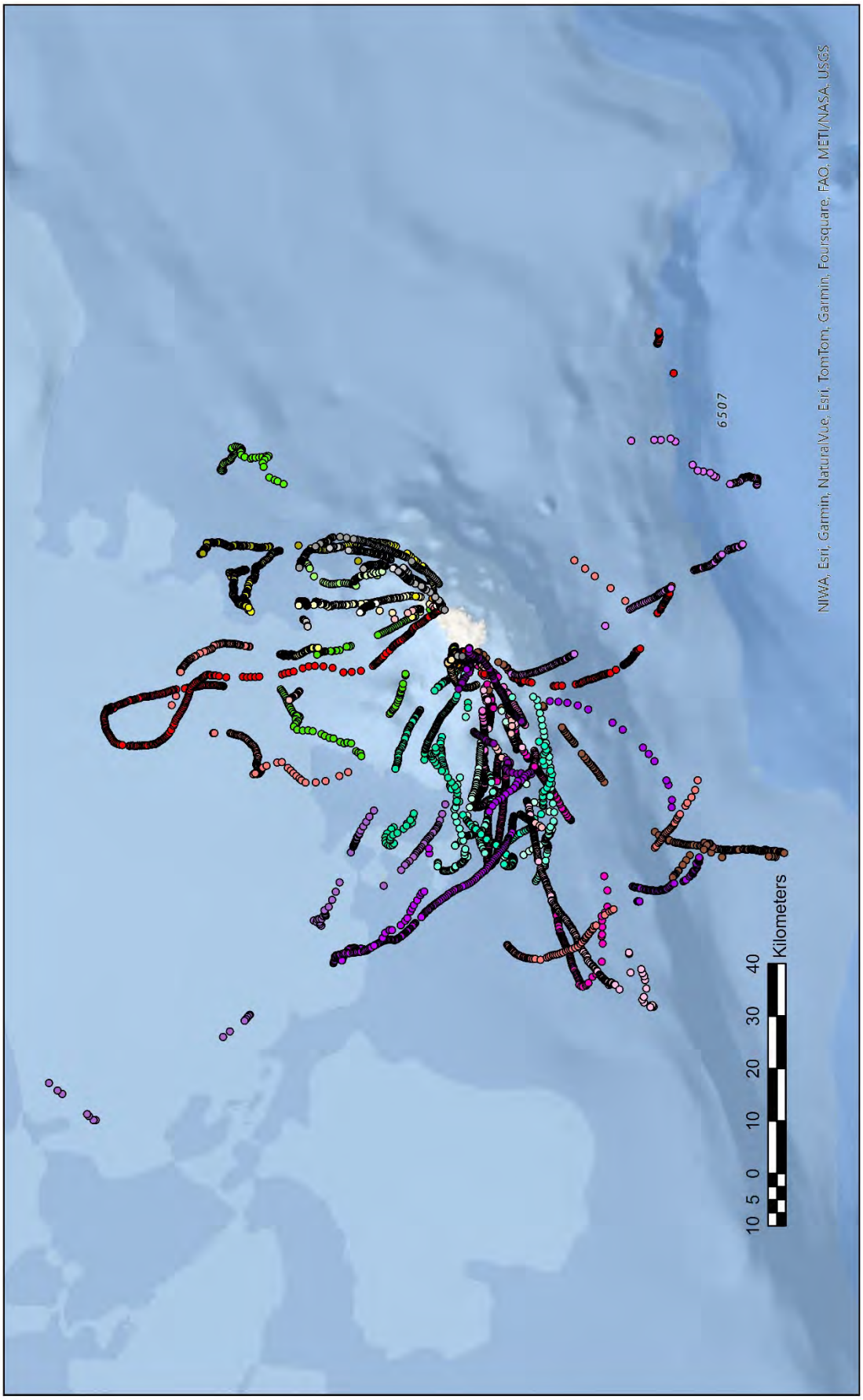


Figure 11. *GPS fixes recorded on female Eastern Rockhopper penguins during the chick-guard stage between 8-28 December 2023.*

Eastern Rockhopper penguins – Crèching

Between 23 December 2023 and 14 January 2024, a total of 20 foraging trips performed by Eastern Rockhopper penguins looking after chicks during the crèching stage were recorded (Figure 12). Of these 11 trips were performed by females (n=4), the remaining 9 trips by male penguins (n=4).

Foraging behaviour of Eastern Rockhopper penguins changed markedly during the crèching stage of breeding. Compared to Erect-crested penguins, female Rockhopper penguins exhibited comparable at-sea movements to the west and southwest. Males, however, travelled much further away with one bird travelling as far as 270 km away from the island.

Overall, penguins stayed at sea considerably longer with an average 2.4±1.0 days in females and 3.4±2.3 days in males. Females covered an average 221.7±146.3 km and ranged within 54.1±16.9 km from their home colony. Male penguins ranged further (85.0±56.0 km) although travel distances were comparable with females at and average 230.2±145.8 km.

One female was the exception of the patterns described above and undertook four one-day trips (mean: 17 hrs) during which the bird foraged around West and East Windward Islands, less than 3 km to the North.

In terms of diving behaviour, sex specific differences were apparent. The female penguins foraged principally around the 25.1±7.0 m depth range, while males consistently reached mean depths of 40.5±6.7 m. The maximum depth reached by the birds differed also considerably with maximum depth reached in males averaged around 111.1±1.4 m whereas female penguins reached a mean 92.0±10.6 m.

Detailed comparative analysis of all foraging data is pending.

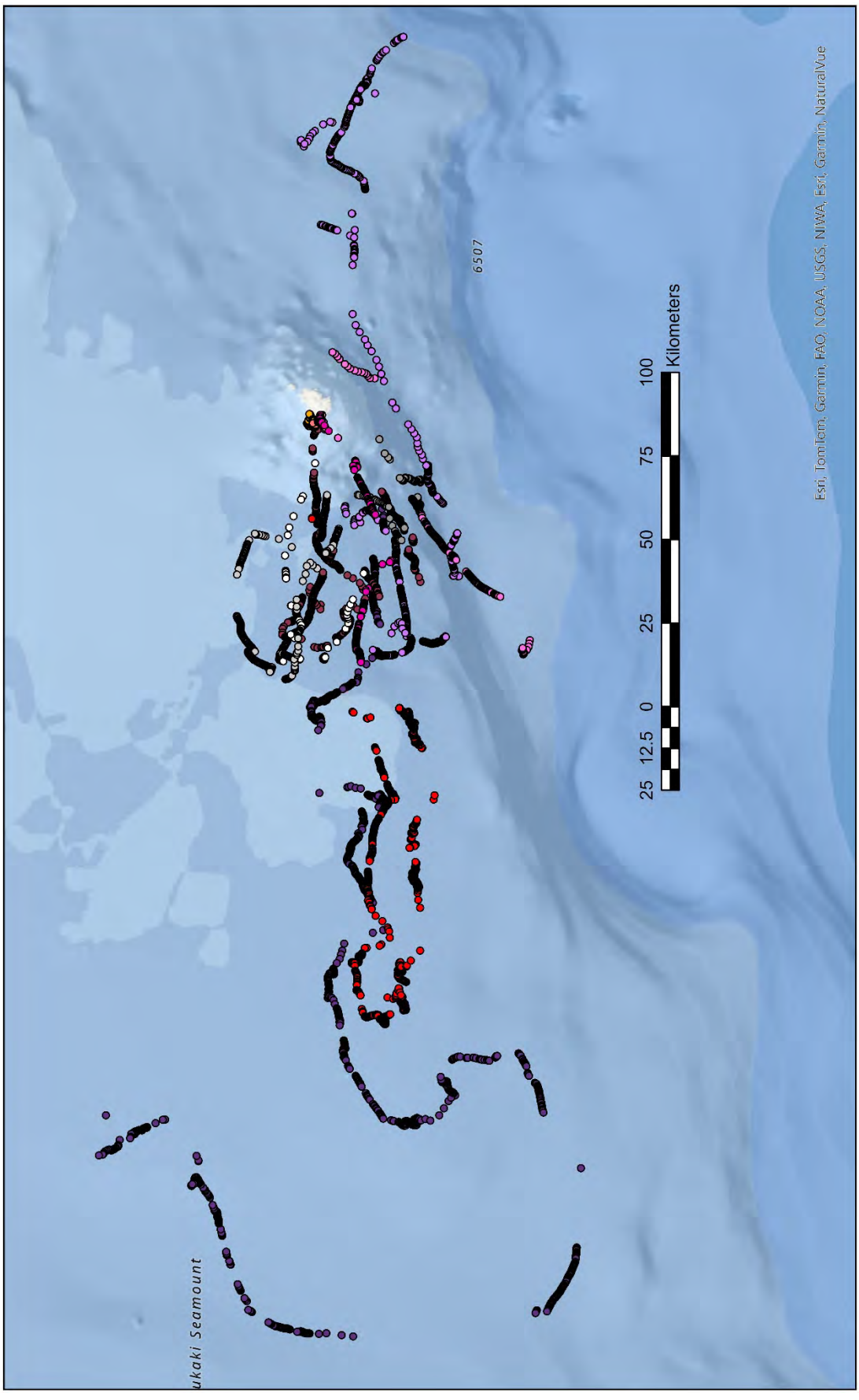


Figure 12. *GPS fixes recorded on male and female Eastern Rockhopper penguins from Stack Bay during the crèching stage between 23 December 2023 and 14 January 2024.*

Deployment of satellite transmitters on Erect-crested penguins

In the last week of the expedition, satellite transmitters were deployed on 10 Erect-crested penguins with the aim of examining their pre-moult dispersal after their chicks have fledged. Fledging was imminent in late January with most chicks having moulted into their juvenile plumage by then (Figure 13).

Figure 13. *Erect-crested penguin chicks in the platform colony, the main study site in Anchorage Bay East on 30 January 2024.*

Consistent with the GPS tracking work carried out during guard-stage and crèching, satellite transmitter deployments was divided into two groups consisting of the study sites at Anchorage Bay East and Stack Bay.

At Stack Bay, transmitters were deployed in the top colony on adult Erect-crested penguins that could be visually confirmed to be feeding chicks. Between 15:15 hrs and 17:15 hrs on 25 January 2024, 3 female and 2 male penguins were fitted with Wildlife Computers SPOT-275 tags using the Tesa-tape and two cable ties. After wrapping tape and tightening cable ties around it, the top of the device was sealed with a layer of two-component epoxy glue to increase the likelihood of the transmitter remaining on the birds until their moult in March. The devices were attached about two-thirds of the way down from a bird's neck to its tail (Figure 14). That way, the transmitter's antenna is less likely to dangle in the water which would disrupt uplinks to the Argos satellite network when the birds are at the surface during their pre-moult journeys.

Figure 14. *Satellite transmitter deployed on an Erect-crested penguin from Stack Bay, 25 January 2024.*

On 28 January 2024, another 5 satellite transmitters were fitted to 2 female and 3 male Erect-crested penguins that were confirmed to be feeding chicks at the study platform in Anchorage Bay East. The deployments were carried out between 18:50 and 20:50 hrs using the same methodology as employed on Stack Bay birds (see above).

Until the departure from the island on 30 January 2024, the satellite birds were observed repeatedly in the colony without any indication of being adversely affected by the transmitters (Figure 15). Four of the birds performed a one-day trip on 29 January and returned to feed their chicks in the evening of that day. One male penguin remained with its chick until the team left the island around 9:00 hrs on 30 January 2024.

Figure 15. *Male Erect-crested penguin guarding its chick after being fitted with a satellite tag in the Anchorage Bay East platform colony, 28 January 2024.*

Preliminary results

The 10 penguins fitted with satellite transmitters left the island on their pre-moult journeys between 29 January and 10 February with a mean departure date of 3 February 2024. Anchorage Bay penguins left an average two days before their Stack Bay counterparts although this difference is likely arbitrary. A photo taken by Edin Whitehead on 16 February 2024 showed a single chick remaining in the Anchorage Bay East platform colony (Figure 16), suggesting that some adults probably departed only in mid-February.

Figure 16. *The last Erect-crested penguin chick to be recorded in the Anchorage Bay East platform colony, 16 February 2024 (Photo: Edin Whitehead).*

The satellite data received to date shows diverse movement trajectories with some of the penguins foraging some 300 km due west of Antipodes Island, while others travelled considerable distances due south some going as far as the Subantarctic Front some 1,400 km from the island (Figure 17).

At the time of writing (late February 2024), none of the satellite tagged birds have returned to the island to moult although the movement trajectories in some birds suggest that they have started their return journey. Based on time-lapse camera data it can be expected that the birds will return to their nest sites to go through the moult in the first half of March.

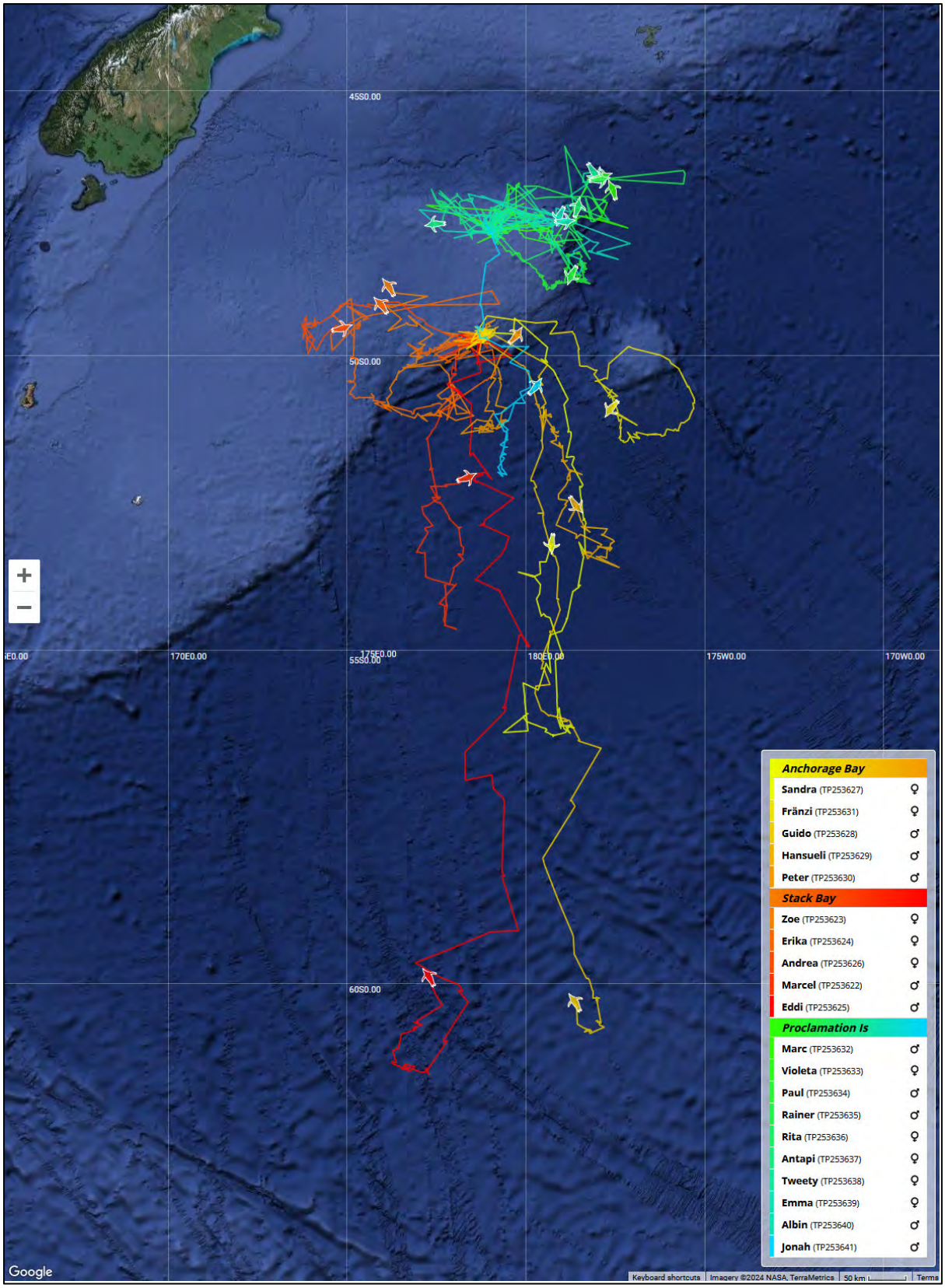


Figure 17. *At-sea movements of Erect-crested penguins from the Antipodes (yellow to red colours) and Bounty Islands (green to blue) as of 26 February 2024.*

Drone surveys of penguin colonies during various stages of breeding

As in the previous season, surveying penguin colonies from the air was a core component of the expedition. Unlike traditional methods of population surveys that only report numbers that cannot be revisited later, drone imagery will be available for evaluation and reprocessing in the future. However, the composition of a penguin colony not only varies between locations, but also over time. So, the focus of this season's drone surveys was to conduct repeat surveys combined with counts for ground-truthing. This allows to account for the dynamic nature of penguin colonies, where number of adults present fluctuates as the breeding season progresses and chicks form crèches during the post-guard stage (Figures 18a & b).

Between 25 November 2023 and 28 January 2024, 90 drone missions were flown with a cumulative airtime of 12 hrs 4 minutes. A total of 19,012 images and 90 videos were recorded (Table 2). Most of the still imagery represent top-down photographs that will be used to produce ultra-high resolution orthomosaics. At sites where top-down photography was not possible (e.g. cave settings, like Hannah's Cave in Northwest Bay), series of photos were taken at an oblique angle that can be stitched together into high-resolution panorama images (Figure 19).

In late January, with most penguin chicks having moulted into their juvenile plumage, penguin colony sections were also photographed at an oblique angle with the aim of examining ratios of juveniles and chicks in each section as they will be difficult to distinguish from adult penguins in orthomosaics (Figure 20).

At several sites, 4K videos of coastal fly-bys were recorded. When flying drones, pilots may miss small details like Rockhopper penguins hiding between rocks. With these fly-by videos it is possible to revisit some of the sites to examine whether penguins were present. Moreover, in cave settings videos recorded while the drone laterally shifts its position allows assessment of numbers of penguins obstructed by topographic features like rocks (Figure 19).

Although some processing of the recorded drone data commenced on the island, most of the data is yet to be processed. Once processing and analysis have been completed, drone imagery will be made available via the following online repository - https://figshare.com/account/home#/projects/197170.

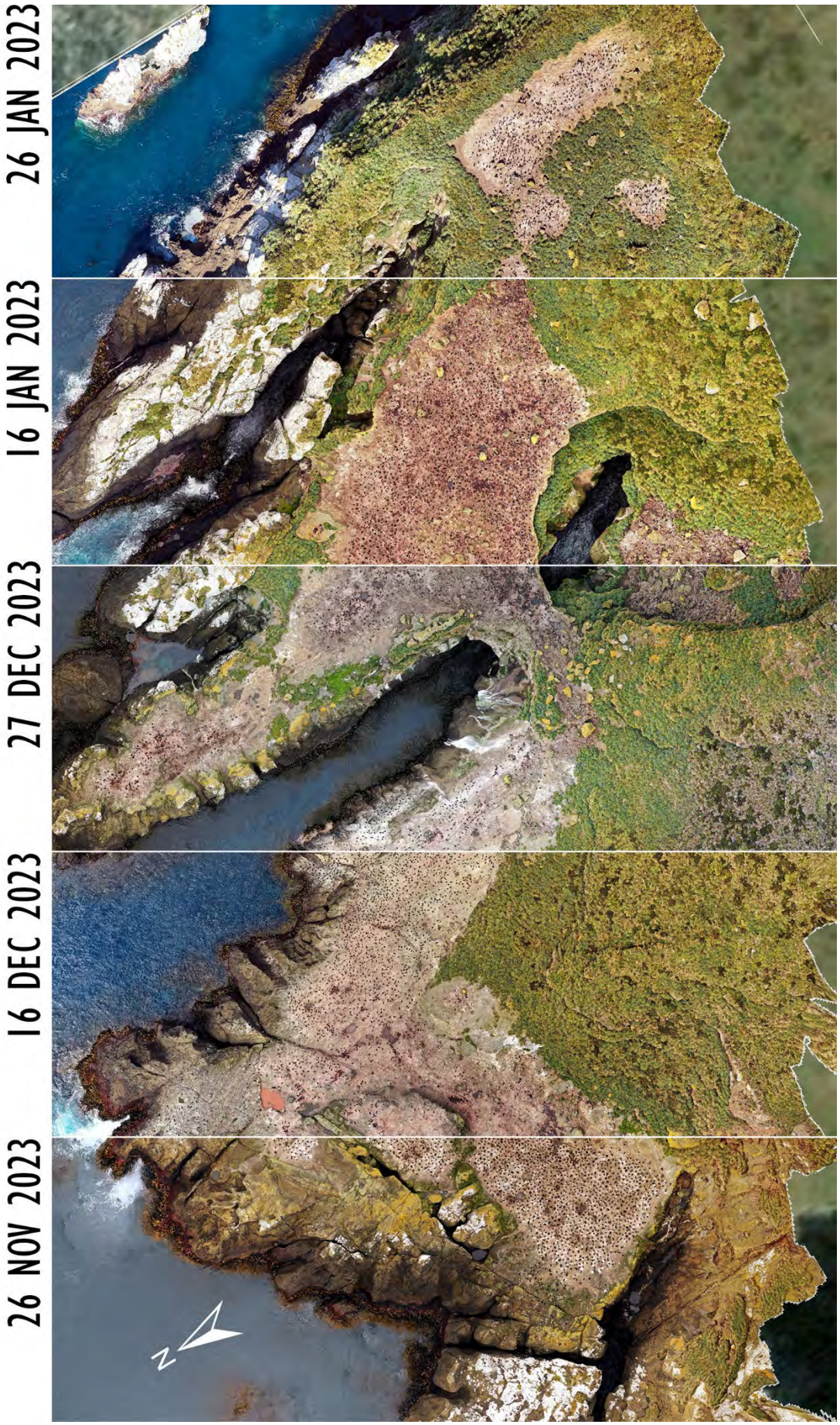


Figure 18a. *The Orde Lees penguin colony – vertical slices of orthomosaics generated from drone imagery.*

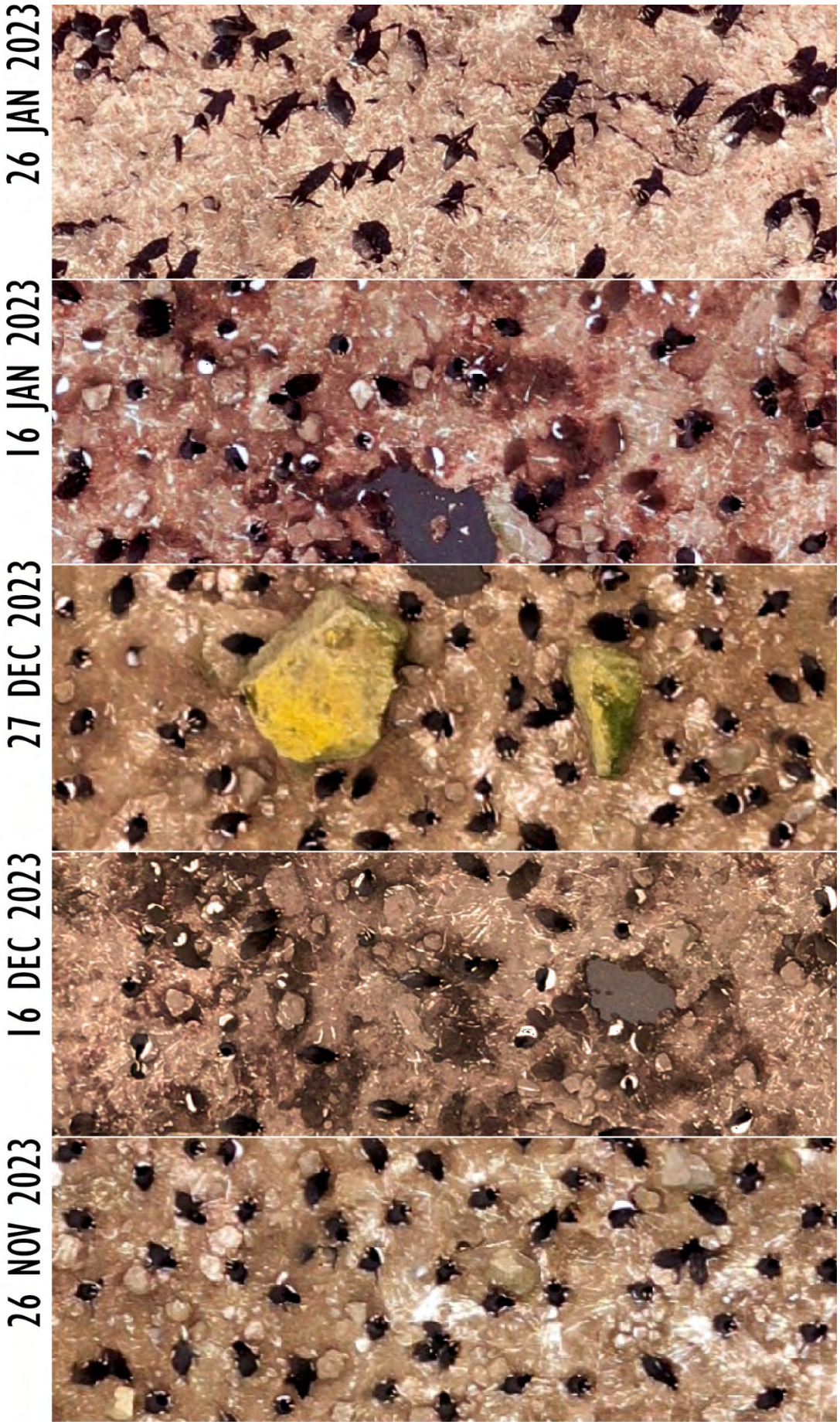


Figure 18b. *Comparison of Orde Lees penguin densities at different times of the breeding season. Images are cropped details from the orthomosaics shown in Figure 18a.*

Table 2. *Overview of drone missions flown on the Antipodes Island in between November 2023 and January 2024.*

Date	Site	Missions flown	Start time	End time	Images (n)	Videos (n)
25/11/2023	Anchorage Bay East	1	10:57	11:05	131	0
25/11/2023	Reef Point	1	14:19	14:33	307	0
25/11/2023	Stella Bay	1	16:05	16:18	92	0
26/11/2023	Orde Lees	2	13:46	14:51	909	0
27/11/2023	Mirounga Bay North	4	13:43	14:32	688	0
30/11/2023	Crater Bay	2	14:26	14:59	199	0
30/11/2023	Northwest Bay	7	14:51	15:21	182	11
01/12/2023	Reef Point	1	12:38	13:01	309	0
03/12/2023	Stack Bay	1	12:36	14:30	405	0
05/12/2023	Alert Bay	11	13:29	16:34	1,004	8
05/12/2023	Ringdove Bay	8	13:53	15:07	182	0
08/12/2023	South Coast	2	12:25	14:33	1,653	0
12/12/2023	Reef Point	1	17:29	18:13	663	0
14/12/2023	Anchorage Bay East	2	15:17	15:47	570	0
16/12/2023	Orde Lees	3	13:06	14:23	1,353	0
22/12/2023	Albatross Point	1	13:27	13:56	3	16
23/12/2023	Anchorage Bay East	3	16:02	16:46	307	4
23/12/2023	Reef Point	1	12:25	13:10	648	0
24/12/2023	South Bay	3	13:36	14:31	642	5
27/12/2023	Orde Lees	2	12:28	13:17	913	0
28/12/2023	Ringdove Bay	3	14:29	15:14	401	6
31/12/2023	Anchorage Bay East	1	16:30	16:47	276	0
31/12/2023	Reef Point	1	15:23	16:04	673	0
03/01/2024	West Coast	6	14:04	16:26	410	18
06/01/2024	West Coast	1	14:32	14:44	1	4
08/01/2024	Stella Bay	2	14:51	15:12	244	0
10/01/2024	Reef Point	1	12:06	12:32	497	0
13/01/2024	Stack Bay	3	12:02	14:11	249	6
15/01/2024	Anchorage Bay East	2	14:46	14:59	185	0
16/01/2024	Orde Lees	3	14:16	17:23	858	2
18/01/2024	South Coast West	3	13:36	17:00	1,525	0
24/01/2024	Reef Point	1	17:17	17:43	366	0
25/01/2024	Stack Bay	1	14:34	14:53	888	4
26/01/2024	Orde Lees	3	14:19	16:23	894	0
28/01/2024	Anchorage Bay East	1	13:12	13:20	162	0
28/01/2024	Northwest Bay	1	12:07	12:48	223	6
25/11/2023	Anchorage Bay East	1	10:57	11:05	131	0
25/11/2023	Reef Point	1	14:19	14:33	307	0
25/11/2023	Stella Bay	1	16:05	16:18	92	0
26/11/2023	Orde Lees	2	13:46	14:51	909	0
27/11/2023	Mirounga Bay North	4	13:43	14:32	688	0
30/11/2023	Crater Bay	2	14:26	14:59	199	0

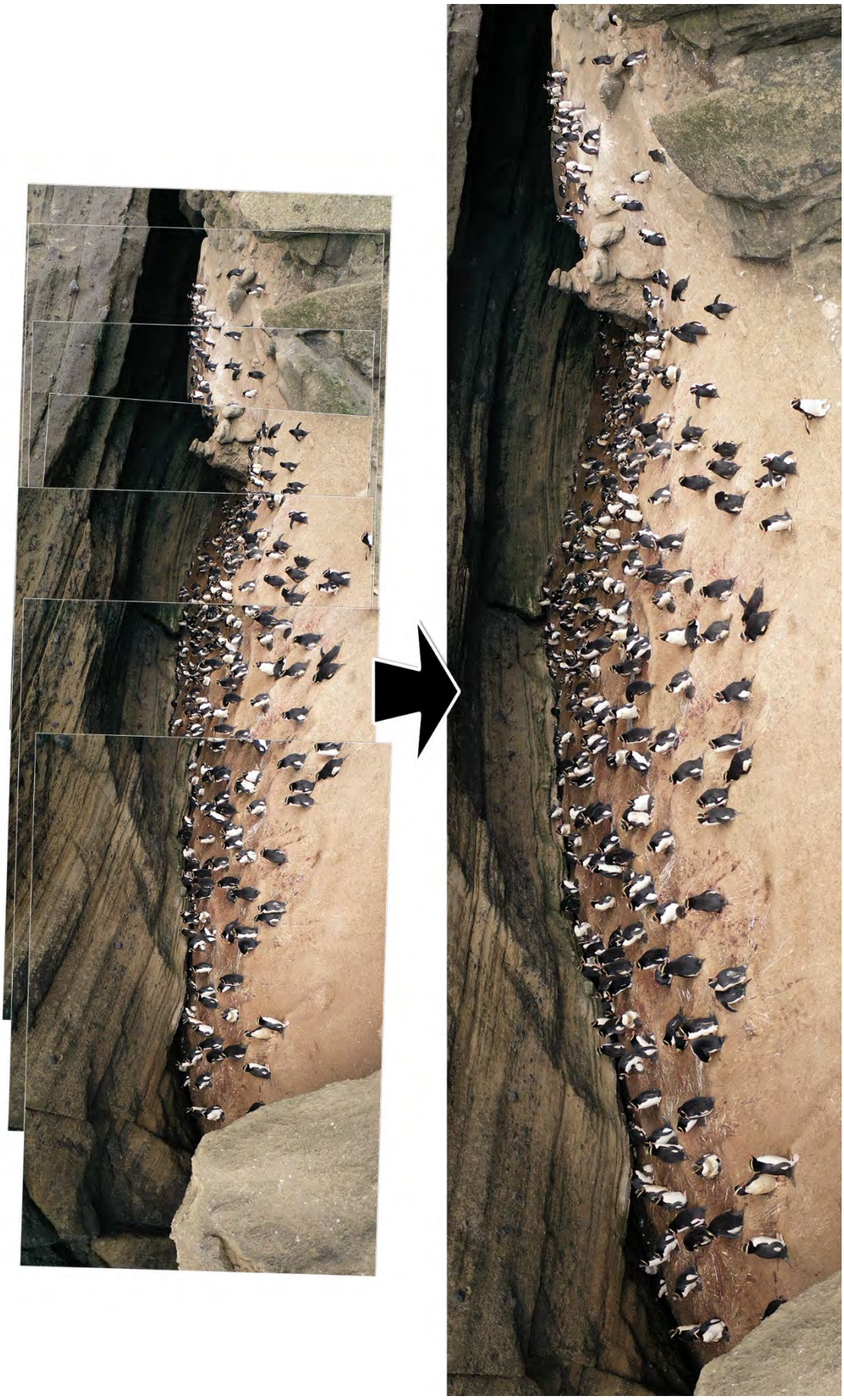


Figure 19. *Example of high-resolution panorama stitch from individual drone images – Hannah's Cave, Northwest Bay.*

Figure 20. *Example of oblique angle drone photography to examine chick/juvenile-to-adult ratios.*

Ground counts of penguin nests and chicks/juveniles

Ground counts were an integral part of the drone work and serve as ground-truthing data for aerial surveys. The surveys started off with counts of nests as identified by adult penguins sitting prone with an extended brood patch while still on eggs or attending a small chick. As the season progressed the static structure of established nests broke up when chicks started to form crèches. From this point onward, chicks were counted.

Counts were conducted by 1-3 observers using tally counters. For larger colonies, observers would agree to count subsections marked by topographical features before moving to the next subsection. Subsections were counted and tallies of each observer compared. If tallies differed, counts were repeated up to three times and before the mean value of the observer's counts was used. Eventually, the counts for all subsections were summed up.

Bi-weekly counts were conducted in the penguin colonies closest to the hut, that is, Anchorage Bay East (divided into three areas – slope, ladder and study platform, Figure 21), Reef Point and Stella Bay.

At Orde Lees, one subsection of the Erect-crested penguin colony ("The Knob") was counted four times between 26 November 2023 and 26 January 2024 (Figure 22a). Also, the main Eastern Rockhopper penguin colony was counted three times. No further count attempts were made after chick counts proved to be difficult when crèching had begun in the second half of December.

In Stack Bay, the two main Eastern Rockhopper penguin colonies – "The Study Colony" and "The Pyramid" – were counted once (Figure 22b).

Preliminary results

Chick numbers decreased steadily at all sites in December (Figure 21), which to a large degree is due to predation of small chicks by Skuas, especially during the early crèching phase. The maximum Erect-crested penguin nest/chick counts at the different sites were 633 chicks in Anchorage Bay East (6 December 2023), 298 chicks at Reef Point (8 December 2023), 60 chicks in Stella Bay (8 November 2023). These figures are higher than last season (Anchorage Bay East – 2022: 455 nests, Reef Point – 2022: 285 nests[2]) or comparable (Stella Bay – 2022: 61 nests). Still, counts compare poorly against estimates from a decade ago. Anchorage Bay East has dropped from an estimated 1,176 nests in 2011[3] (-46%), Reef Point from 505 nests (2014[4], -41%), and Stella Bay from 222 nests (2014[4], -73%).

At Orde Lees, a maximum of 191 were counted (16 December 2023); there is no older data for this part of the penguin colony. However, a maximum of 319 Rockhopper penguin nests were counted in the amphitheatre colony, which is slightly up from the previous season (314 nests) but compares poorly to the last count dating back to 2011[3] of 580 nests (-42%).

At Stack Bay, ground counts showed that Eastern Rockhopper penguin numbers there also are lower than 13 years earlier. In the "Study Colony" (equivalent to SKB-009), 33 nests were counted (10 December 2023) compared to 47 in 2011[3] (-29%). In the "Pyramid" colony (equivalent to SKB-010), Rockhopper penguin nest numbers were down to 72 nests (11 December 2023) from 211 nests in 2011[3] (-65%).

While the apparent increase in nest numbers at some sites compared to the previous year are welcome news, this should not be construed as a first sign of recovery on Antipodes Island. The 2022 season was at the tail end of a nearly 3-year long phase with strong La Niña conditions that brings with it marine heatwaves known to have a negative effect on the breeding success of seabirds and especially penguins in New Zealand. In this light, it is imaginable that a portion of the Erect-crested penguin population skipped breeding in the 2022/23 season and returned to breeding now that the marine conditions have swung to El Niño.

[2] Mattern, T. 2023. *The Tawaki Project - Bounty-Antipodes Expedition 2022 - 8 November - 21 December 2022*. Dunedin, New Zealand. https://doi.org/10.13140/RG.2.2.16148.78722/1.

[3] Hiscock, J. 2013. *Monitoring penguins in the Antipodes Island Group Methods and baseline data*. Department of Conservation, Wellington, New Zealand.

[4] Chilvers, B. L., and J. A. Hiscock. 2019. Significant decline of endangered Antipodes Island penguins: Is extreme weather an additional impact? Aquatic Conservation: Marine and Freshwater Ecosystems 29:546–553. https://doi.org/10.1002/aqc.3034.

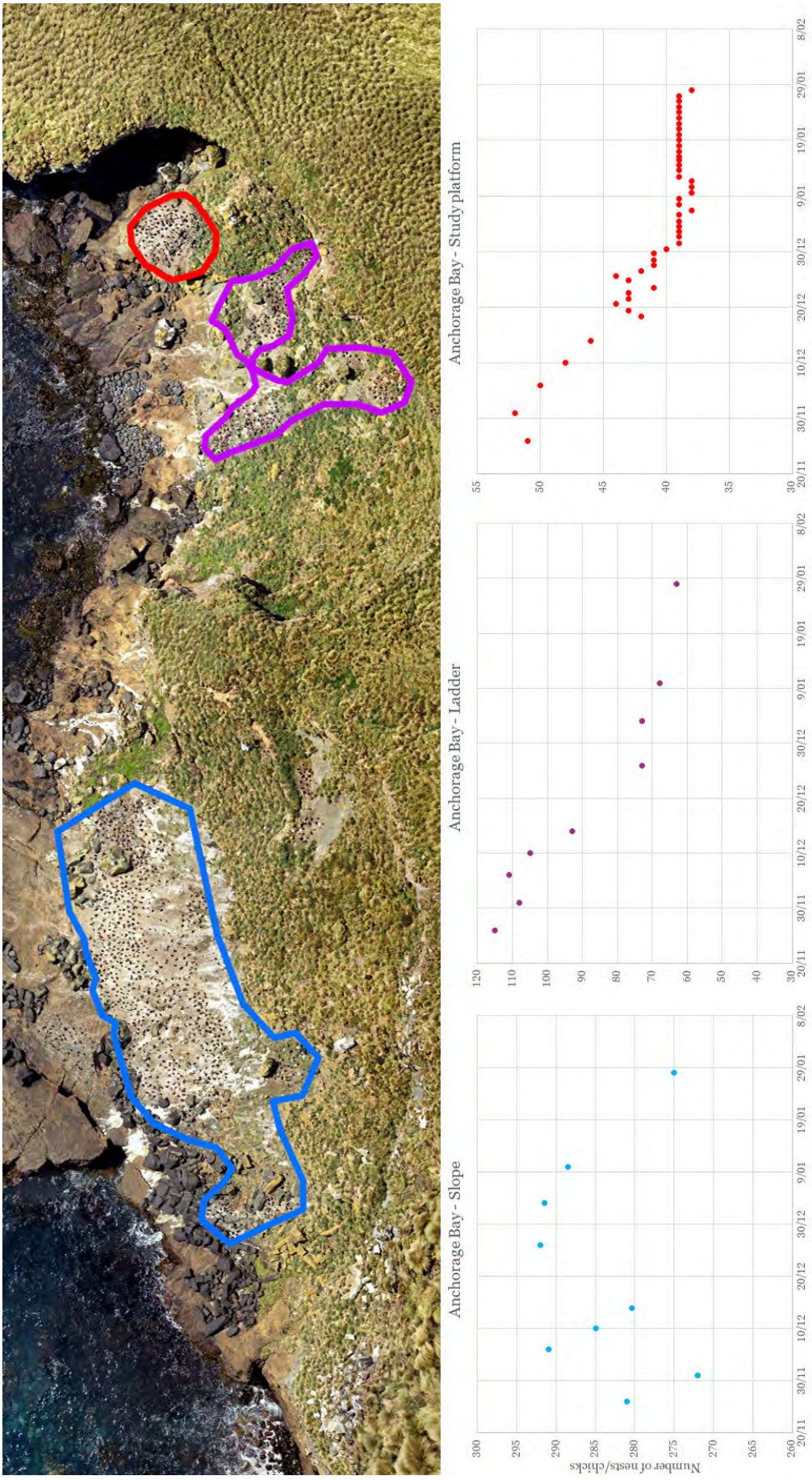


Figure 21. *Erect-crested penguin ground count areas and preliminary results in Anchorage Bay East. The three count sections are highlighted with coloured outlines – the slope (blue), ladder (purple), and study platform (red)*

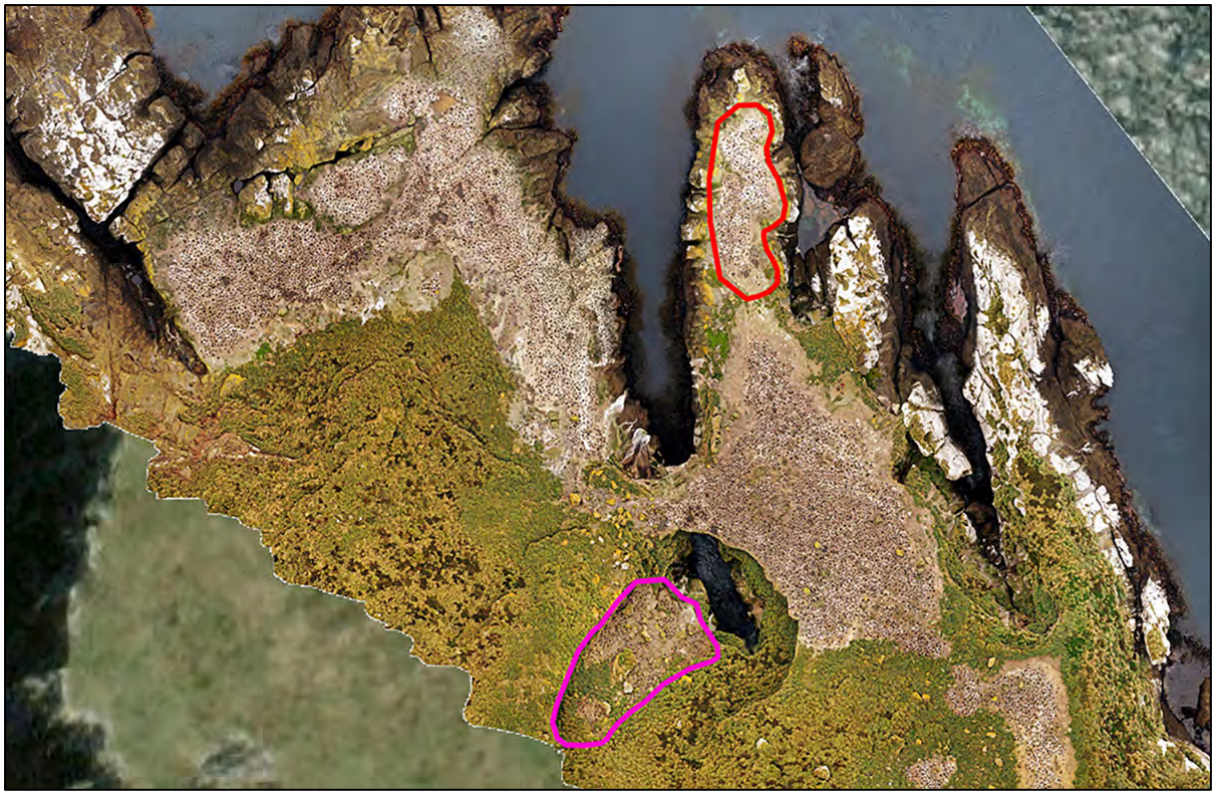


Figure 22a. *Ground count areas at Orde Lees. "The Knob" (Erect-crested penguins, red outline) and "Amphitheatre" (Eastern Rockhopper penguins, purple outline).*

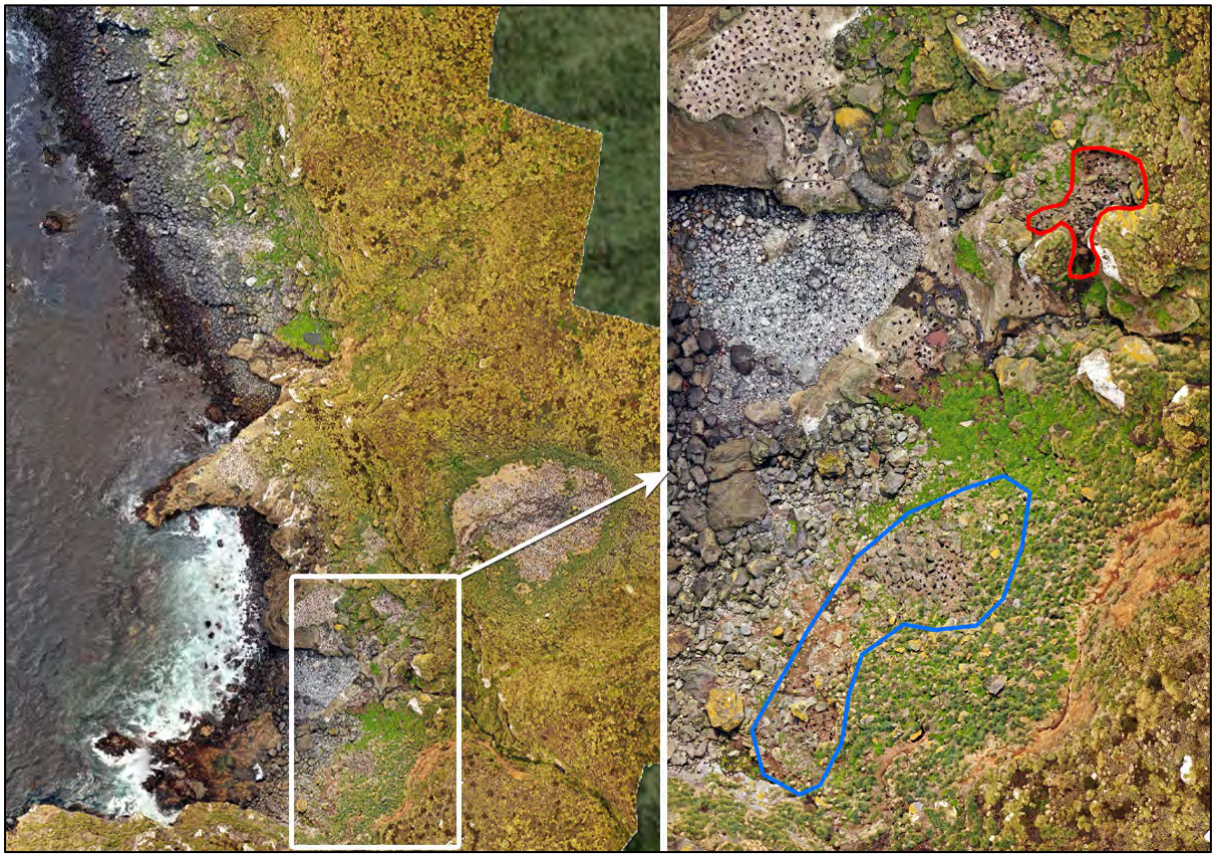


Figure 22b. *Ground count areas at Stella Bay; the Eastern Rockhopper penguin study colony (red outline) and "The Pyramid" (blue outline)*

Maintenance of time-lapse cameras

During the 2022/23 season, four time-lapse cameras were installed on Antipodes Island. One camera overlooked the penguin study platform. Another camera was mounted on a rock and trained at penguin nests of the central colony section at Orde Lees. A third camera was installed in the top colony at Stella Bay. And another camera overlooked parts of a south coast colony. All cameras were observing Erect-crested penguins.

Upon arrival, the Anchorage Bay camera was found completely water-logged. Presumably the bay's exposure to north-westerly storms that often result in significant amount of sea spray caused the device's seals to fail. The camera ceased recording images on 03 June 2023; it recorded a total of 2,347 images.

The Orde Lees time-lapse camera was checked on the first visit to the colony on 26 November 2023. Although some water ingress was apparent, the camera was found still operational. 6,244 images were downloaded from the device's SD card and batteries replaced. The image data represents encompasses 11 months (Figure 23). The camera did not record any images between 5 September and 5 October 2023. Why this was the case is unclear.

The camera at Stack Bay did not show any signs of significant damage. However, it was no longer operational when visited on 3 December 2023. The device recorded 3,997 images. It turned out that the device's batteries had run out in the first week of July. Why this happened while the Orde Lees device's batteries lasted for the full year is unclear.

Like the Anchorage Bay device, the South Coast camera was found destroyed by water ingress on 8 December 2023. It stopped recording images on 11 September 2023 just as the first penguin returned from their winter dispersal journeys. A total of 5,246 images were recorded in its 10 months of operation time.

The South Coast camera was subsequently replaced and moved to Stack Bay where it is now trained at the Eastern Rockhopper penguin study colony.

Figure 23. *Time-lapse images from the Orde Lees Erect-crested penguin colony. Shown are images taken at midday on the first of each month starting with November 2022; the actual data set comprises hourly photos for every day recorded from 04:00 to 22:00 hrs. Note that American date format (MM/DD/YYYY) is shown on the images.*

Preliminary results

The full data set from the Orde Lees time-lapse camera provides some essential information about the Erect-crested penguins' annual cycle. Chick fledging seem to have occurred almost as a mass exodus on 1 February 2023; chick numbers in the images dropped markedly after that day with all chicks gone by 6 February. This day also marked the beginning of the pre-moult phase for the adults.

First adults returned on 22 February, with most birds back by early March. This means that the pre-moult dispersal in Erect-crested penguins from Orde Lees lasted 4-5 weeks suggesting that the birds do not perform substantial migrations at this time like it is the case in Tawaki[5]. The satellite transmitter data largely confirms this hypothesis.

After the moult, the colony started to empty with the beginning of April with many birds having left on their winter sojourn by 4 April. The last Erect-crested penguins left the colony on 18 April. However, in the top of the image frame, the Eastern Rockhopper penguin colony is visible which at this stage is still fully occupied with moulting birds. Rockhopper penguin numbers only start to dwindle in late April. The last birds left the colony on 13 May.

In the night of the 3 July 2023, it snowed with a layer of snow settling on the ground; the snow has disappeared by midday (Figure 24).

Figure 24. *Snow covering the Orde Lees penguin colony, 3 July 2023*

[5] Mattern, T., K. Pütz, P. Garcia-Borboroglu, U. Ellenberg, D. M. Houston, R. Long, B. Lüthi, and P. J. Seddon. 2018. Marathon penguins – Reasons and consequences of long-range dispersal in Fiordland penguins / Tawaki during the pre-moult period. PLOS ONE 13:e0198688. https://doi.org/10.1371/journal.pone.0198688.

To ring in the new breeding season, the first two Erect-crested penguins are visible on 3 September 2023. Two days later the camera stopped recording images for a month. When the device resumes operation, both the Erect-crested and Eastern Rockhopper penguin colonies appear to be fully occupied by pairs already.

A first discarded A-egg in the frame on 11 October 2023 signals the onset of the incubation period. Pairs remain together at their nest site until males start to leave the colony on 20 October. By 23 October, only single incubating penguins can be seen suggesting a synchronized male exodus as it is known from Snares penguins[6]. Pairs start to reunite from 6 November onwards although more detailed analysis is required to identify the exact dates of changeovers for the nests visible in the frame. The male's foraging trips during the incubation is likely to not exceed 14 days.

A pipping egg is visible on 16 November 2023; discarded eggshells make an appearance on 18 November 2023. Three days later, chicks can be seen in several of the nests. It is a hot day with temperatures reaching 26°C at 15:00 hrs so that chicks need to be exposed to not overheat (Figure 25). More in-depth analysis of all time-lapse imager to determine breeding success is pending.

Figure 25. *Hatching well underway on a hot day at Orde Lees, 21 November 2023*

[6] Warham, J. 1974. The breeding biology and behaviour of the snares crested penguin. Journal of the Royal Society of New Zealand 4:63–108. https://doi.org/10.1080/03036758.1974.10419407.

Further records of leucistic and resighting of isabelline penguins

In the previous season, several Erect-crested penguins with aberrant plumage colouring – leucism and isabellinism – were observed. These observations were summarised both in our previous expedition report[7] as well as a dedicated short note in Notornis[8].

During this stay on the Antipodes Islands, an additional case of leucism was repeatedly observed in Stack Bay. Unlike last season's observation of birds having the lower half of their back coloured white, the male penguin at Stack Bay featured white blotches over his eyes extending halfway to the back of the head and up to the crests on both sides of the face; large parts of the chin were also white (Figure 26). Moreover, the forward lower quarter of both flippers were also covered in white feathers so that in a state of increased blood circulation the flippers appeared in a pink hue. The penguin was seen repeatedly commuting between the penguin landing and the top colony. It was seen roosting apparently without an associated mate or chick in the southeastern section of the top colony.

Figure 26. *Leucistic male Erect-crested penguin on the path leading up to and roosting in the top colony, Stack Bay, 13 January 2024.*

While surveying the south coast on 18 January 2024, an isabelline female Erect-crested penguin was observed in the same area of the penguin colony as in the previous season (S49.702413, E178.739836) and it is assumed that this was the same individual reported on last year (Figure 27). The bird seemed to be paired up with a normal coloured male and a nearby sitting chick may indicate that the penguin was breeding. The bird is also clearly visible in the orthomosaics generated from drone imagery of the area.

[7] Mattern, T. 2023. *The Tawaki Project - Bounty-Antipodes Expedition 2022 - 8 November - 21 December 2022*. Dunedin, New Zealand. https://doi.org/10.13140/RG.2.2.16148.78722/1.

[8] White, J. W., T. Mattern, K. Pütz, H. L. Mattern, D. M. Houston, R. Long, B. C. Keys, U. Ellenberg, and P. Garcia-Borboroglu. 2023. Plumage colour aberrations in erect-crested penguins (Eudyptes sclateri) on Antipodes Island. Notornis 70:143–146.

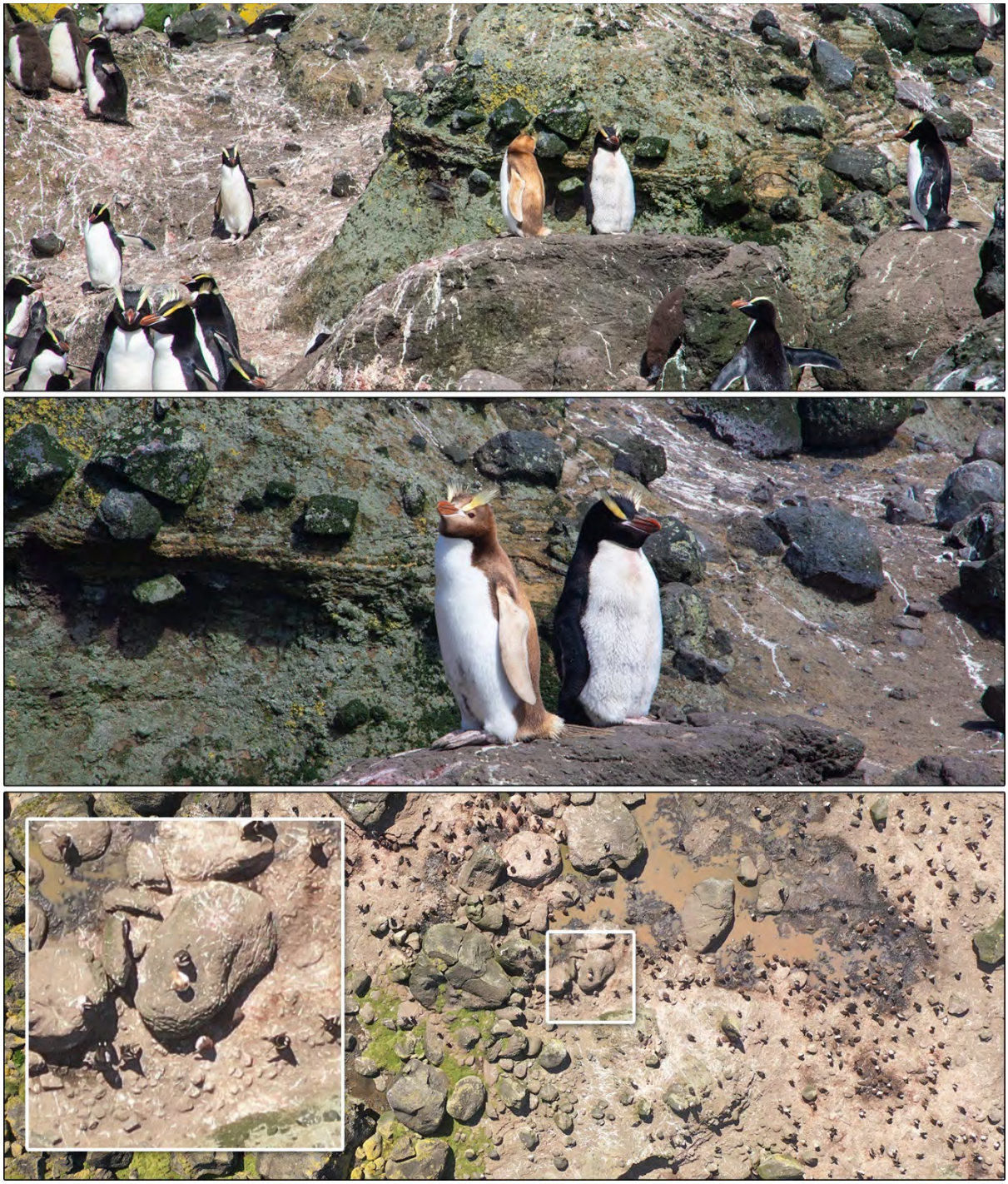


Figure 27. *Isabelline female Erect-crested penguin roosting in the south coast colony, 18 January 2024. Lower panel shows the bird clearly visible in the drone imagery.*

Breeding population of New Zealand Fur seals

New Zealand fur seals were a significant part of the Antipodes fauna before the arrival of sealing operations in the early 1800s. Over roughly a quarter of a century, fur seals were almost hunted to extinction and have since only experienced a slow recovery. In the report generated after the 1995 expedition to the Antipodes Islands[9], observations of fur seals were documented, but their numbers seemed very low. As a result, the author concluded that "Antipodes is not currently a major breeding island for fur seals."

However, the 1995 expedition took place in October and November, which likely impacted the observable number of fur seals.

Fur seals typically give birth from late December to early February. During our repeated surveys of various penguin colonies, we noticed a marked increase in fur seals on land throughout December, with numbers in some bays substantially growing. Preliminary analysis of orthomosaics generated from drone surveys flown over Reef Point in November 2023 and January 2024 illustrates this.

On November 25, 2023, a total of 56 fur seals—adults and subadults with some yearlings—were present on the northern promontory of Reef Point; no pups were observable (Figure 28). Approximately six weeks later, on January 10, 2024, preliminary counts of the same area found 301 juvenile and adult seals (Figure 29). At least 117 pups born in the previous weeks are visible. Many of the younger pups would hide under rocks and are therefore not visible from above, so this number likely represents an underestimate. Including the western promontory of Reef Point (which was not covered by the November drone mission) in the January count increases the number of fur seals to 383 and the number of pups to 154.

Following the population estimate method described by Rowley Taylor[10], we can assume that at least 20% of the pups were missed in the counts. Thus, the total number of pups can be estimated to be around 193. Multiplying this number by Taylor's correction factor of 4.9, the full estimate of the resident Reef Point fur seal population should be around 940 fur seals. This seems plausible if the substantial number of fur seals present in Stella Bay in January 2024 is considered a part of the Reef Point population.

[9] McClelland, P., M. Imber, A. Tennyson, G. Taylor, A. Grant, T. Greene, J. Marris, A. McIntosh, and R. Cotter. 2001. *Antipodes Island Expedition, October-November 1995*. Wellington, New Zealand.

[10] Taylor, R. H. 1996. *Distribution, abundance and pup production of the New Zealand fur seal (Arctocephalus forsteri Lesson) at the Bounty Islands*. Wellington, New Zealand. https://www.doc.govt.nz/documents/science-and-technical/sfc032.pdf.

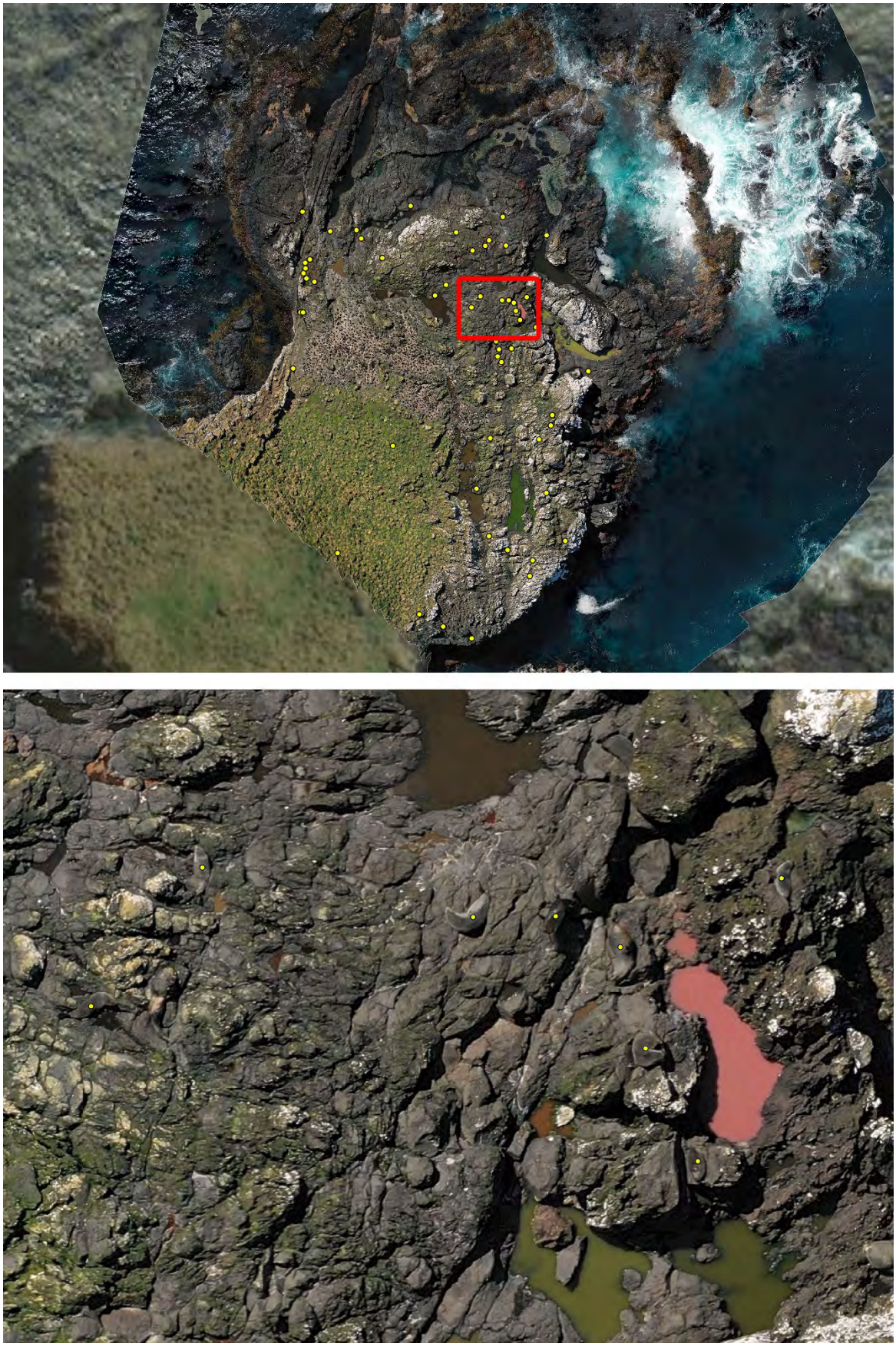


Figure 28. *Fur seal (yellow dots) presence at Reef Point 25 November 2023. Red box indicates location of detailed view in lower panel.*

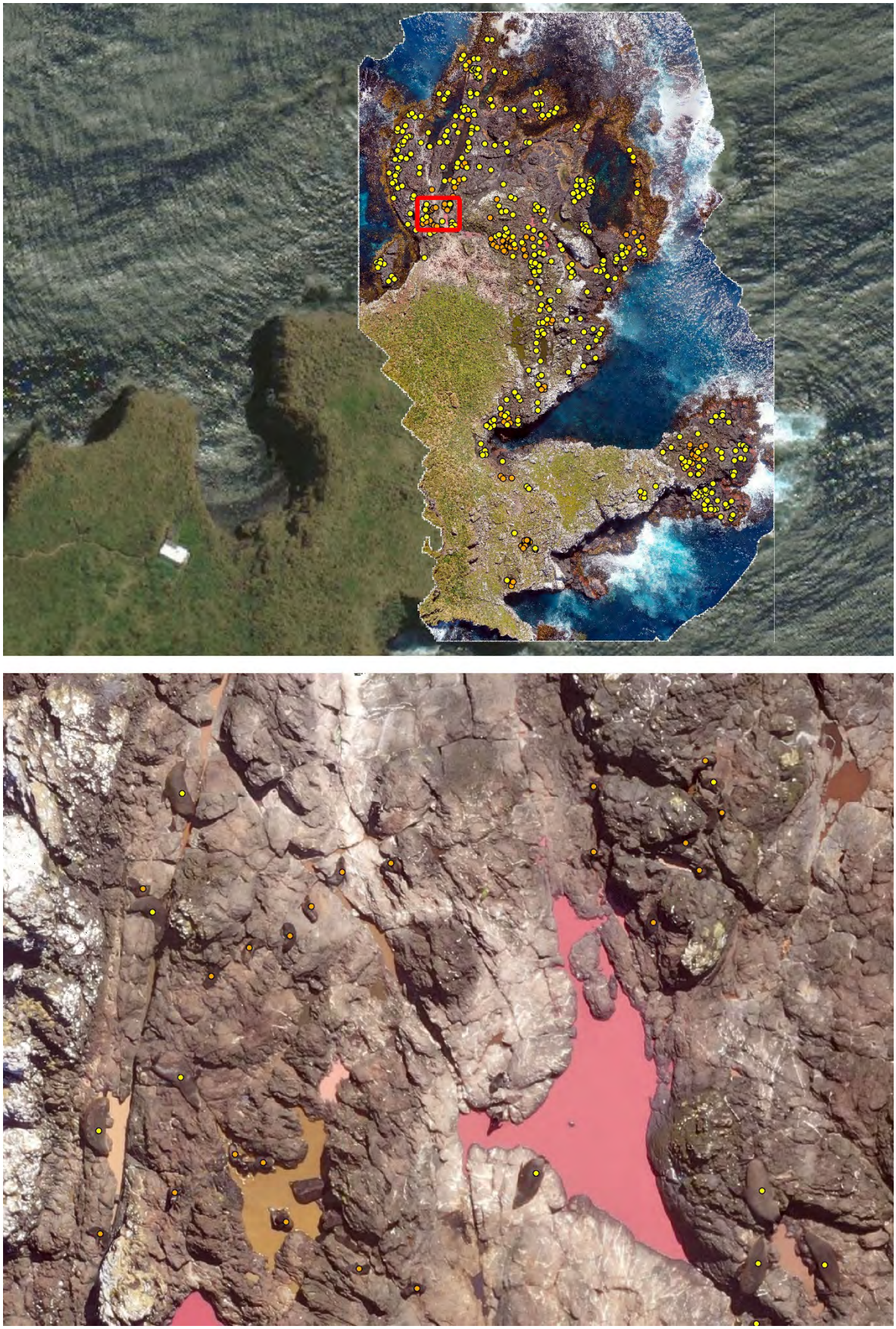


Figure 29. *Fur seals (yellow dots) and pups (orange dots) presence at Reef Point, 10 January 2024. Red box indicates location of detailed view in lower panel.*

On January 8, 2024, a drone survey of the entirety of Stella Bay revealed 205 fur seals on the northern beach, where the penguin colony is also located, and an additional 105 seals on the southern beach (Figure 30). No newborn pups were visible anywhere, indicating that the bay is not a breeding site. Stella Bay was not fully surveyed by drone in November or December, but fur seal numbers were significantly lower in November 2023.

Combining the counts of fur seals not classified as pups from both Reef Point and Stella Bay adds up to 693 animals hauled out during the drone surveys. Therefore, observed numbers of fur seals appear to approach the total estimate of the Reef Point fur seal population using Taylor's method.

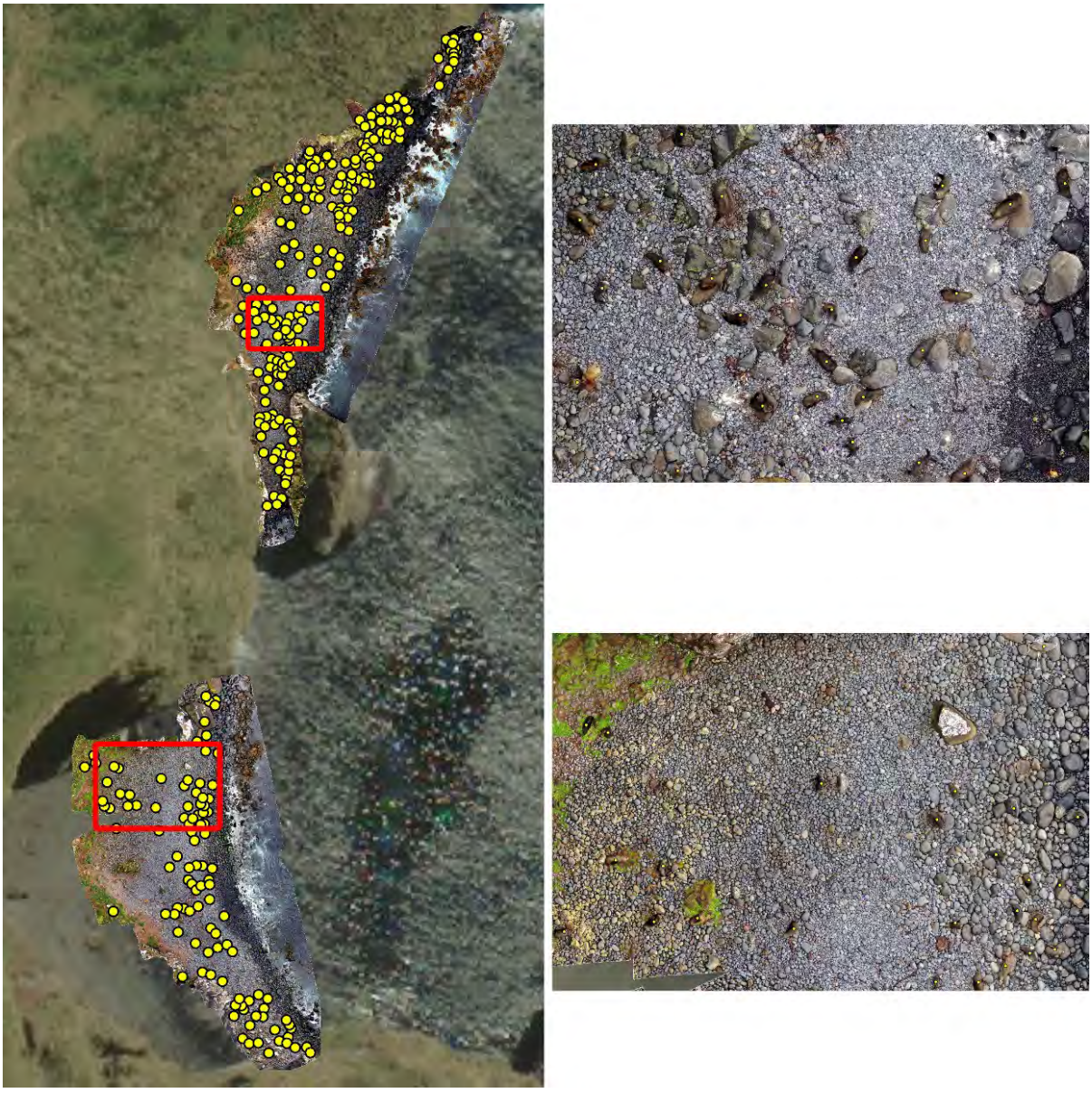


Figure 30. *Fur seals (yellow dots) presence in Stella Bay, 23 January 2024. Red box indicates locations of detailed view in panels on the right.*

Newborn fur seal pups were also observed opportunistically while surveying penguin colonies in Northwest Bay (S49.664910, E178.786092; 28 January 2024) (Figure 31).

Figure 31. *Fur seal pups observed via drone in Northwest Bay, 28 January 2024.*

Besides Reef Point and Stella Bay, substantial fur seal presence was recorded in Northwest Bay (see above), Mirounga Bay, Midwest Bay (S49.681098, E178.745669), Stack Bay, and Ringdove Bay. Overall, fur seals were omnipresent around most of northern, western, and eastern coastlines. While there were seals present at the western end of the south coast penguin colonies, they appeared to be a lot less abundant along the southern shores of the island.

Overall, it appears as if the Antipodes Island hosts a significant, potentially growing New Zealand fur seal population again that would warrant a full survey. Such a survey should ideally be conducted in early January and follow the methodology outlined by Taylor[10].

Discovery of a potential man-made structure in Hannah's Cave

During the analysis of the 2022 drone data from Hannah's Cave in Northwest Bay, an odd rock formation on a platform inside the cave was noticed. The platform is located at the southern end in the cave, some 3 m from the cave entrance (Figure 32). At the end of the platform, a rock formation with the appearance of a man-made rock cairn stands about 1 m high; it consists of at least three flat rocks stacked on top of another. No comparable rock formations are visible elsewhere in the cave or, in fact, in any comparable location anywhere on the island. When Hannah's Cave was re-visited with the drone on 30 November 2023 to survey the penguin colony, additional drone data was recorded that provided closer and more detailed look at the rock stack. The sequence of images shown in Figure 33 was extracted from a 4K video that is accessible via the following link: https://youtu.be/QMHpDkubvv0.

While the rounded features of the rock stack seem to give it the appearance of a seemingly natural formation, the peculiar stacking and its location raised some doubts. The fact that the rock stack is inside a cave greatly diminishing potential effects of falling rocks and/or wind erosion. After the return to the mainland, the details of the cave – location, photos, 4K video – were presented to Prof James Scott, a geomorphologist at the Department of Geology, University of Otago who has visited and published about Antipodes Island[11]. Particularly after inspecting the video, he is of the opinion that this is unlikely to be a natural formation and, therefore, is likely made by sealers.

The use of this cave by sealers is indeed plausible. Given that we found a breeding population of New Zealand fur seal in the bay, it must have been a particular point of interest for sealers. The bay is only accessible from the sea, which is only possible in ideal sea conditions. Given the likely large numbers of seals present in the 19th century in the bay and the quickly changing conditions, Hannah's Cave is not only the best possible option for sealers to camp and store skins – it is also the only option.

It is therefore recommend to add Hannah's Cave as a site of historic interest[12] that should be subject to an archaeological examination in the future.

[11] Scott, J., I. Turnbull, A. Auer, and J. Palin. 2013. The sub-Antarctic Antipodes Volcano: a <0.5 Ma HIMU-like Surtseyan volcanic outpost on the edge of the Campbell Plateau, New Zealand. New Zealand Journal of Geology and Geophysics 56:134–153. https://doi.org/10.1080/00288306.2013.802246.

[12] Petchey, P., R. H. Taylor, K. Walker, and G. P. Elliott. 2023. *Archaeology of the Antipodes Islands*. Wellington, New Zealand. https://www.doc.govt.nz/our-work/heritage/heritage-publications/archaeology-of-the-antipodes-islands/.

Figure 32. *Hannah's Cave and location of rock cairn, Northwest Bay, 28 November 2022.*

Figure 33. *Image sequence showing the rock cairn from different angles extracted from a 4K video recorded by drone, 30 November 2023. The video is accessible on the Tawaki Project YouTube channel at* https://youtu.be/QMHpDkubvv0.

Part II – Bounty Islands: 31 January 2024

Bounty timeline & study site

The *Evohe* arrived at the Bounty Islands around 01:30 hrs in the early morning of 31 January 2024. The vessel anchored east of the channel between Proclamation and Spider Islands. At 06:30 hrs a team of two (TM & RL) was dropped off on the rock platform in Bucket Cove that provides access to Proclamation Island. Landing was straight forward with regular and predictable swells. Ropes were rigged to provide safe access for the rest of the team to the top of the island. The rest of the team (UE, BH, DH, RS, BK, HM, CC) landed on the platform around 07:00 hrs and reached the top of Proclamation Island circa 15 minutes later. Work on the various tasks started immediately.

Two teams (UE & BH and DH, RL & BK) focussed on the deployment of five satellite tags on each on Erect-crested penguins. Both teams were also responsible for HPAI sampling of a total of 25 Salvin's albatross and Erect-crested penguins.

Three drone pilots (TM, HM & RS) started flying drone missions around 07:15 hrs. Flights were paused for two hours just before 09:00 hrs to account for increased albatross traffic over the island between 08:00 and 10:00 hrs. Drone missions to cover the main group resumed after 11:00 hrs and were completed by 11:30 hrs.

During the drone intermission, a team of two (TM & RS) recovered all seven time-lapse cameras on the island; of these, five devices were replaced with new cameras. One mount was replaced.

All work on Proclamation Island was completed by 13:30 hrs. All people were off the island by 14:00 hrs. The total time ashore amounted to 7 hrs, 30 minutes. The *Evohe* relocated to Funnel Island where one drone mission was flown to investigate Cook's Scurvy grass presence at 15:30 hrs.

The *Evohe* started the journey back to the mainland at 16:00 hrs. The boat arrived in Dunedin on 2 February 2024, at around 22:00 hrs.

Deployment of satellite transmitters on Erect-crested penguins

To compare pre-moult dispersal patterns between Erect-crested penguins from the Antipodes and Bounty Islands, 10 satellite transmitters were deployed on chick rearing penguins from Proclamation Island, i.e. the same number of devices as on the Antipodes.

Due to the timing of our visit, in the morning, the number of penguins returning to feed their chicks was low as birds usually return from mid-day forward after at least half a day at sea. Nevertheless, a few birds that spent the night at sea did in fact return from 07:00 hrs onward.

Between 07:30 and 13:45 hrs a total of 10 Erect-crested penguins (5 males, 5 females) were fitted with Wildlife Computers SPOT-275 tags using the same methods as described for Antipodes Island birds. Breeding birds were identified as breeders if they interacted with begging chicks, specifically if feeding events were observed.

Deployments were carried out at two sites on the top of Proclamation Island. One team (DH, RL & BK) operated to the east of the plateau that served as base of operations for the entire team; a second team (UE & BH) operated around the plateau (Figure 34). All penguins handled for satellite transmitter deployments were also used for HPAI screening (see below).

Figure 34. *Areas of satellite transmitter deployments on Erect-crested penguins, Proclamation Island, Bounty Islands group, 31 January 2024. Five deployments were carried out in each zone (red – UE & BH, green – DH, RL & BK).*

Preliminary results

One thing that became apparent quickly after our arrival on the island was the fact that the timing of breeding of penguins from the Bounty Islands was lagging behind that of their conspecifics on Antipodes Island. Most chicks were still in their down phase; most of them only started to show first signs of moulting into juvenile plumage (Figure 35). It was estimated that the penguins on the Bounty islands were about 2 weeks behind the Antipodes birds.

Figure 35. *Erect-crested penguin chick on Proclamation Island, 31 January 2024. Most chicks were still covered in down with minimal signs of moulting into juvenile plumage (i.e. first spots on tip of the flippers or tail feathers emerging).*

As such it was not surprising that satellite tracked penguins from the Bounty Islands left on their pre-moult journeys later than their Antipodes counterparts. The first of the Bounty birds left on 5 February 2024, although all remaining birds left between 10-18 February 2024 (mean departure date: 13 February 2024). Therefore, penguins from the Bounty Islands started their pre-moult dispersal on average 11 days later when compared to Antipodes Island penguins. Considering the moulting stage of most chicks, it would appear as if the Bounty Island penguins ceased feeding their chicks earlier than on the Antipodes.

The different timing of the departure does not seem to be the only difference between the two islands. While the Antipodes penguins showed a diverse range of travel trajectories to the west, south and east (but not north), Bounty Island penguins appear to show a high degree of consistency in their dispersal (Figure 17). Eight of the ten birds travelled to the east and northeast and remained within reasonable proximity to another in an area about 250 km east-northeast of the island. This area is associated with the southern fringes of the Bounty Trough, a bathymetric depression separating the Bounty Plateau and the Chatham Rise, extending all the way to the NZ mainland. Moreover, the Bounty Trough also coincides with the southern remnants of the Subtropical Front which is generally associated with increased primary productivity.

What this means in the context of the dispersal patterns of Erect-crested penguins from both island groups will be a matter of detailed analysis once the data set is complete.

Drone surveys of the Bounty Islands main group

Drone surveys of the Bounty Islands main group were a core aspect of the visit to the archipelago. The aim of the surveys was to generate high resolution orthomosaics that allow it to count number of Erect-crested penguin chicks as well as Salvin's albatross chicks and New Zealand fur seal pups. The last fur seal census dates back to 1994; in this light it was opportune that our visit coincided with the ideal time for a seal survey[13].

Immediately after arriving on at the top of Proclamation Island, a team of three drone pilots (TM, HM & RS) commenced flying drone missions to survey the main group of the Bounty archipelago (Figure 36). These encompassed a total of eight individual missions, covering Depot, Lion, Penguin, Proclamation, Ranfurly, Ruatara Spider and Tunnel Islands (Table 3). A combined 03:58 hrs of drone flight time was required to complete all missions. During these missions 4,089 images were recorded that will be used to compile orthomosaics.

Figure 36. *Richard Seed and Hanah Mattern piloting drones from the top plateau on Proclamation Is, Bounty Islands, 31 January 2024.*

[13] Taylor, R. H. 1996. *Distribution, abundance and pup production of the New Zealand fur seal (Arctocephalus forsteri Lesson) at the Bounty Islands*. Wellington, New Zealand. https://www.doc.govt.nz/documents/science-and-technical/sfc032.pdf.

Table 3. *Overview of drone missions flown on the Bounty Islands on 31 January 2024.*

Site	Pilot	Start time	End time	Mission time	Images (n)
Proclamation Is	HM	07:20	07:53	00:33	501
Spider Is	RS	07:34	08:13	00:39	790
Depot Is	TM	07:38	08:32	00:54	1,028
Tunnel Is	HM	08:00	08:18	00:18	222
Ranfurly Is	HM	08:47	09:21	00:34	464
Penguin Is	TM	08:50	09:21	00:31	496
Ruatara Is	TM	11:08	11:09	00:11	241
Lion Is	HM	11:16	11:34	00:18	347

Drone collision with an Salvin's albatross

At around 08:30, RS was in the process of landing his drone after a pre-mission flight to determine best camera settings for the Penguin Island mission. After returning the drone to Proclamation Is at an altitude of ca 50 m above the launch position (i.e. ca 110 m above sea level), the landing sequence was initiated with the drone descending at ca 2 m/s. Approximately 15 m above the launch point the drone started passing through the layer of Salvin's albatross circling above the islands. However, rather than continuously descending, the pilot stopped the descend at out 5 m above the launch point to adjust the lateral position of the drone.

At this point, a flying Salvin's albatross collided with the drone dislodging the device's propellers causing the unit to fall the remaining 5 m uncontrolled, crashing into a gap between two rocks. The impact destroyed the drone although mission imagery could be recovered from the SD card.

The albatross continued its flight after the collision, and it appears that the bird did not suffer injuries from the impact with the drone. Risk of injury primarily stems from the rotating propellers in drones. However, the model used for the surveys (Mavic Pro 2) is a small drone with a propeller radius of 10 cm and propeller blades that swivel on hinges at the centre of the prop. On two instances while flying mission on the Antipodes, operators got their fingers into the rotating propellers of a landing drone with no injuries sustained in both cases.

To prevent drone loss, missions were suspended after those in progress had completed. The number of albatrosses in the air decreased after 10:00 hrs and flights resumed around 11:00 hrs. In the future, when flying on the Bounties, drones will be fitted with propeller guards and missions scheduled to occur around midday to reduce the risk of drone loss.

Maintenance of time-lapse cameras

The visit on Proclamation Island also offered the opportunity to recover seven time-lapse cameras deployed in November 2022. Five of these cameras were trained at Salvin's albatross nests for research by the Department of Conservation's Conservation Services Programme; two additional cameras were deployed as part of our penguin research.

Four of the albatross cameras were recovered without any evidence for physical damage due to seal or seabird interactions. However, two of these cameras showed condensation inside their lens covers suggesting humidity ingress at some stage. One camera was found still attached to the rock mount, but the mount was bent so that the camera was pointing to the ground. When recovered and opened, the camera was found flooded with water with the electronics badly corroded and the SD card rusted into the card slot.

All albatross cameras were replaced with new devices; in the case of the damaged mount, this was replaced with a new mount using the same hole drilled for the device in 2022. Attachment hole was drilled out and made deeper so that mount hinge now sits as close to the rock as possible. Replacement camera sits further under a rock overhang now.

The two penguin cameras were recovered but not replaced. One camera close to the top plateau was found in place but showed significant sign of corrosion. While the device was still operational it had not recorded any images; it is assumed that the SD card failed. The second camera had been knocked off its mount presumably by a fur seal. The device was found wedged between rocks and covered in penguin scat. The electronics and batteries were badly corroded, and the SD card destroyed by leaking battery acid.

Overall, four of the seven cameras recorded 11,197 images at one-hour intervals covering the period from 11 November 2022 to 18 May 2023, although this varied significantly between cameras (Table 3).

Table 3. *Overview of data recorded by four time-lapse cameras found functional when recovered on Proclamation Island, 31 January 2024.*

Camera ID	Start Time	End Time	Images	Notes
Albatross 1	11/11/2022 15:36	09/04/2023 16:00	2,237	lens fogged up
Albatross 2	11/11/2022 16:14	18/05/2023 20:00	3,390	
Albatross 3	11/11/2022 16:00	26/04/2023 20:00	2,995	
Albatross 5	11/11/2022 17:12	05/02/2023 14:00	2,575	lens fogged up

HPAI screening in Erect-crested penguins and Salvin's albatross

On request from the Department of Conservation, our teams conducted screening for the Highly Pathogenic Avian Influenzas virus. For this a total of 25 Salvin's albatrosses and 25 Erect-crested penguins were handled to take choanal and cloacal swabs using sampling materials supplied by DOC.

Erect-crested penguins were opportunistically captured and sampled throughout the stay on the island. Every handled penguin was weighed, and sex determined from their bill dimensions. A total of 19 male and 6 female penguins were sampled weighing an average 4,548±477 g and 3,610±297 g, respectively.

The Salvin's albatrosses could not be weighed due to a lack of the required measuring equipment. Sex was estimated from bill dimensions; 17 male albatross and 8 females were swabbed for HPAI screening.

All collected samples were handed over to the Department of Microbiology at the University of Otago, Dunedin on 6 February 2024.

Further observations of Cook's Scurvy grass on Funnel Island

Before commencing the return journey to the New Zealand mainland, the *Evohe* relocated to Funnel Island with the intention of flying drone missions to get more information about the distribution of Cook's scurvy grass on the island. The drone was piloted from the deck of the Evohe and launched at 16:45 hrs.

The southwestern cliffs of Funnel Island were visited with the drone approaching the island at about 10 m altitude and then slowly climbing upwards along the cliff wall to avoid any albatross traffic above the island. While ascending, a previously undocumented patch of Scurvy grass was encountered growing in a crack of a virtually vertical cliff wall (Figure 37). The plant appeared to be in flower and was located some 25 m to the west of the previously documented plants (see 2022 Expedition Report).

The drone had to be recalled shortly after the discovery for a battery replacement. During the landing attempt (ca. 16:55 hrs) the drone collided with the *Evohe*'s rigging, dropped into the ocean and sank immediately preventing a recovery of the device. As a result, none of the recorded video and photographic data could be recovered and only screen shots of the video feed transmitted to the controller are available. No further drone missions were flown as this was the second drone lost this day.

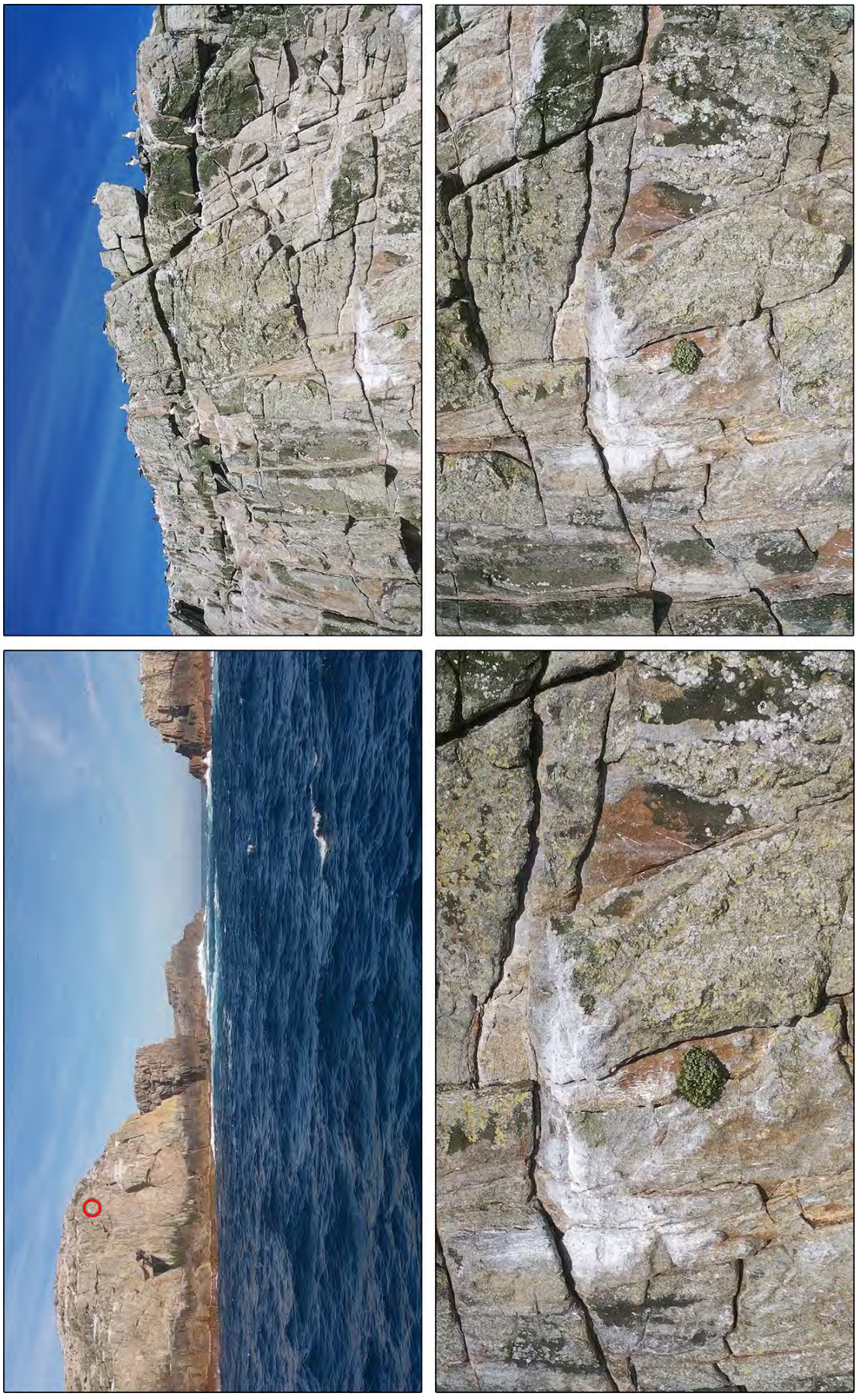


Figure 37. *Imagery transmitted by drone documenting a patch of Cook's scurvy grass growing on a near vertical cliff wall on the southwest of Funnel Island, Bounty Island group. The red circle in the first panel indicates the plant's location.*

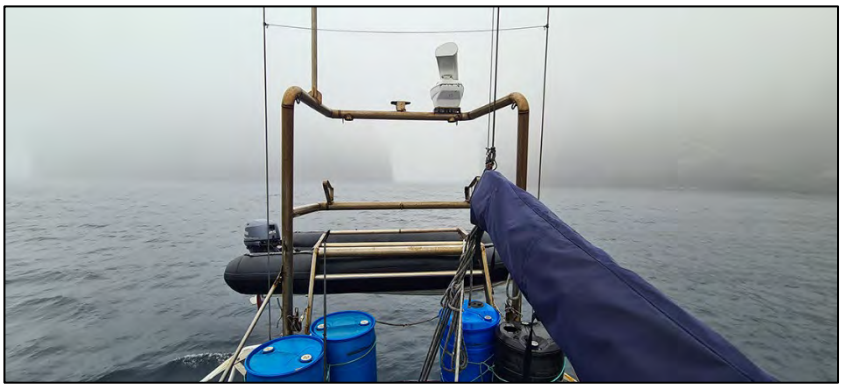
Expedition log

20 November 2023

Quarantine of expedition gear and briefing of the team at DOC Southland's Quarantine Store. Transport of quarantined gear to Bluff and load onto *RV Evohe*. Depart with Destination Antipodes Island around 15:00 hrs.

23 November 2023

Arrival at Antipodes Island in the early morning around 3:00 hrs. Island shrouded in mist with substantial northerly swell preventing landing of gear and/or personnel. Anchor for the day in Alert Bay.



24 November 2023

Assessment of conditions around 08:00 hrs; landing possible and proceeds with dropping off Thomas & Richard on the Anchorage Bay rock platform. They rig the flying fox for a dingy based offloading. Remaining team dropped off around 11:00 hrs.

Transfer of gear commences around lunch time and is complete by 15:00 hrs. *Evohe* leaves around 16:00 hrs.

25 November 2023

Track/hut maintenance throughout the day. First drone missions flown covering Anchorage Bay East, Reef Point, and Stella Bay.

26 November 2022

Thomas, Hannah, Robin & Richard head towards Orde Lees at 10:00, arrive 12:30 hrs. Thomas & Hannah fly drone missions that cover main Orde Lees penguin colony and smaller side colony. Robin and Richard do ground counts of sub-section of Erect-crested penguin colony (promontory north of landing, aka "The Knob") and entire Eastern Rockhopper colony. Meanwhile, Bianca performs ground counts in Anchorage Bay East, Reef Point, and Stella Bay. Orde Lees team back at the hut 19:00 hrs.

27 November 2023

Robin, Hannah & Thomas walk to Mirounga Bay North to perform ground counts and fly drone missions.

Richard continues track maintenance at hut. Bianca maps Anchorage Bay study colony and starts daily nest check recording.

28 November 2023

Nest checks at Anchorage Bay study colony otherwise hut day spent analysing last year's drone data.

29 November 2023

Showery day; no trips to other part of the island. Further drone data analysis. In the evening first five GPS loggers deployed on female Erect-crested penguins from the Anchorage Bay East study platform.

30 November 2023

In the afternoon, Robin, Hannah & Bianca walk to Crater Bay to fly drone missions there. Thomas and Richard walk to Northwest Bay to do the same. Besides obtaining drone imagery of penguins in Hannah's Cave, a secondary objective is to get more detailed imagery of potentially man-made rock cairn in the cave.

1 December 2023

Maintenance work around hut. Richard fixes toilet door, the others continue last year's drone analysis. After lunch, Robin,

Richard & Bianca conduct ground counts in Anchorage Bay East, Reef Point and Stella Bay.

2 December 2023

Thomas, Hannah, Richard & Robin leave for Stack Bay via Mt Galloway and the Central Plains at 08:30 hrs. Misty and windy on the tops. They descend to Stack Bay down a steep slip on the southern end of the bay. Hannah & Thomas fly drone missions to cover the penguin colonies in the bay. Richard & Robin establish the camp near the top Erect-crested penguin colony. Deployments of 5 GPS loggers on Erect-crested penguins in the top colony. Around 16:00 hrs the team heads back the way they came. Back at the hut by 19:00 hrs.

3 December 2023

Westerly storm with frequent heavy showers and wind gusts shaking the hut. Only leave the hut for nest checks in the study colony. An Erect-crested penguin somehow made it to the top of the cliff and is sleeping on the track above the ladder to Anchorage Bay.

4 December 2023

Storm continued all through the night violently shaking the hut, breaking the StarLink dish mount on the roof. Thomas fixes dish to the roof of fuel shed. By the afternoon the storm turns to squally showers in between sunny episodes. The penguin from the track has disappeared.

5 December 2023

Little wind and sunny, with cold southerly. During nest checks in the morning, it seems as if one of the logger nests has failed and the decision is made to recover the device. Around lunch time the penguin from the track shows up in the tussock above the western bunk room of the hut. After lunch, Hannah & Robin walk to Ringdove Bay to fly drone missions, while Richard & Thomas do the same in Alert Bay. In the evening, the penguin outside the hut looks increasingly disoriented and is relocated by Thomas to the penguin area below the ladder. At 18:00 hrs the logger female from the failed nest is back, incubating an alive and a dead chick; the logger is recovered as a precaution.

6 December 2023

Bianca conducts ground counts in Anchorage Bay East, Reef Point and Stella Bay. Hut day for the rest of the team.

7 December 2023

Misty and drizzly day. Second logger recovered after the bird is spotted in the colony in the evening with the tape that holds the device pretty worn and in tatters. 3 Eastern Rockhopper penguins and another 2 Erect-crested penguins are fitted with GPS dive loggers.

8 December 2023

At 09:00 hrs Thomas, Hannah, Robin & Richard start walking towards the South Coast via the Central Plains route. Contrary to the forecast, wind seems to be getting stronger as they progress. At 11:30 hrs, Hannah & Robin swing west to ascend along a creek to the western end of the South Coast while Richard & Thomas carry on south and down the main slip to last year's camp site. The two team fly drone missions that cover the entire coast, but the strong wind and low light conditions due to mist result in suboptimal drone imagery. Both teams reunite and ascend back the main slip around 16:00 hrs. Hannah & Robin return to the hut via the established Central Plains route through thick fog, Thomas & Richard follow the western route past Orde Lees to see if this is a viable alternative in poor conditions. The top route team arrives back at the hut around 19:00 hrs, the western route team an hour later.

9 December 2023

Resting day. In the afternoon and evening, two GPS loggers are recovered from female Erect-crested penguins.

10 December 2023

Calm morning after another stormy night. Around 14:00 hrs, Robin and Richard walk to Stack Bay to camp for 2-3 nights to recover and deploy GPS loggers on Erect-crested and Eastern Rockhopper penguins. The team recovers 2 GPS loggers while also deploying four loggers on Eastern Rockhopper penguins as well as two additional devices on Erect-crested penguins. They also perform ground counts of Rockhopper penguins. In

Anchorage Bay, the rest of the team starts marking chicks with coloured tape and recover the remaining two GPS loggers from the first batch of deployments.

11 December 2023

In the morning, the wind picks up again and develops into another westerly storm. The Anchorage Bay penguin colonies are lashed with sea spray so that any work apart from nest checks is postponed until tomorrow. The Stack Bay team recovers 1 GPS logger from a female ECP in the afternoon and finishes the Rockhopper ground counts.

12 December 2023

Still strong winds but clear skies. The Anchorage Bay team continues marking chicks on the study platform with coloured tape. In the evening, Thomas & Bianca deploy 2 PenguCam camera loggers on breeding female Erect-crested penguins in the platform colony; they also recover 3 GPS loggers from Rockhopper penguins in the evening. The Stack Bay team recovers a GPS logger around 05:00 hrs in the morning but must wait until late in the night to recover the remaining 2 loggers.

13 December 2023

The Stack Bay team returns after lunch. The study platform is checked hourly to recover the camera loggers as soon as the penguins return. However, the birds do not make an appearance; the last check happens just before midnight.

14 December 2023

Some of the marked chicks have already lost their temporary bands. Richard and Bianca re-apply new bands and mark some

additional chicks. In the afternoon, Bianca, Richard & Robin conduct ground counts in Anchorage Bay East, while Thomas & Hannah fly drone missions of the same area. Two ERP are deployed with GPS loggers in the evening, which means the contingent of suitable nests to work with in Anchorage Bay is exhausted. Again, no sign of the camera birds all day.

15 December 2023

The Hertiage Expedition cruise boat visits Anchorage Bay in the morning but does not stay long due to the vessl rolling heavily. In the morning, another Erect-crested penguin with a logger with severely frayed tape is spotted and the device is recovered. For the rest of the say, hourly checks for the camera birds. Both are eventually recaptured in the evening. First signs of crèching in the study colony.

16 December 2023

Thomas, Hannah, Richard & Robin leave around 10:30 hrs for Orde Lees and reach the penguin colony by 13:00 hrs. Thomas & Hannah fly drone missions, while Richard & Robin repeat their ground counts from two weeks ago. They leave the colony around 15:30 hrs with Robin & Richard returning to the hut. Thomas & Hannah continue along the western route to Stack Bay, to recover and deploy GPS loggers on Rockhopper penguins. By 22:00 hrs, they have recovered 2 devices and fitted two additional penguins with GPS loggers.

17 December 2023

The Stack Bay team spends the entire day observing the penguin landing to intercept Rockhopper penguins with GPS loggers. They recover one device around midday so that only one device remains to be recovered. However, no further recoveries occur. At the hut, the team rigs the flying fox in anticipation of the Evohe and the Albatross team.

18 December 2023

Sunny and warm. In Anchorage Bay, the Evohe has arrived and starts unloading gear around 10:00 hrs. All gear is hauled and in the hut after lunch. The albatross team comes ashore, and Bianca leaves the island to return to the mainland with the *Evohe*. In Stack Bay, the team continues waiting for the last logger bird. But again, the bird remains MIA. In the late afternoon it is decided to spend another night in the camp.

19 December 2023

The Stack Bay team manages to recover the last Rockhopper device shortly after midnight; on the way to the tent, they come across one of the Erect-crested penguins with logger and recover this one as well. The team leaves camp around 11:30 hrs. They reach the top of Mt. Galloway just after 14:00 hrs and are back at the hut around 15:30 hrs. Meanwhile, the Anchorage Bay team manages to recover 2 GPS loggers from Erect-crested penguins.

20 December 2023

Richard and Robin return to Stack Bay to recover the remaining 3 GPS loggers from Erect-crested and Rockhopper penguins, and to deploy 4 more devices on Rockhopper penguins. The

team leaves around midday and has recovered the first two devices by 16:30 hrs already. In Anchorage Bay, Thomas tries to troubleshoot the solar power, which is not charging the battery banks – to no avail.

21 December 2023

Blustery but sunny day. The Stack Bay team recovers the third device overnight and deploys 4 Rockhopper penguins with GPS loggers around lunchtime before returning to the hut.

22 December 2023

Thomas & Hannah walk towards Albatross Point around 10:00 hrs following the eastern route south. They reach the southeastern promontory by 13:20 hrs and make their way to its tip to fly the drone along the coastlines to inspect locations of previously reported penguin colonies. The drone controller runs out of battery before they can finish all planned missions. They start walking back by 15:30 hrs and are back at the hut around 19:00 hrs.

23 December 2023

Crèching is well and truly underway in Erect-crested penguins. So, the next round of logger deployments is on. In the evening, four Erect-crested penguins are fitted with GPS loggers on the study platform.

24 December 2023

Thomas, Hannah, Richard & Robin leave for South Bay via the Central Plains route at 09:15 hrs. They reach last year's camp site on the south coast at 13:00 hrs and follow the coast east towards South Bay. They arrive at the penguin colony around

14:15 hrs. Thomas & Hannah fly drone missions of the entire bay, while Robin & Richard conduct ground counts of Rockhopper penguins. The team starts the trek back to the hut at 16:00 hrs, this time climbing up the massive slips above South Bay, then across Ringdove Creek and along the eastern route back to the hut where they arrive at 19:00 hrs.

25 December 2023

Foggy, stormy and rainy Christmas break at the hut.

26 December 2023

Sunny day. Computer work in the hut, nest checks in the study colony and fifth crèching deployment on a male Erect-crested penguin in the evening.

27 December 2023

At 10:00 hrs, Thomas & Hannah walk to Orde Lees to fly drone surveys again and attempt chick counts in the Rockhopper colony. They arrive at 12:20 hrs and finish the drone surveys about an hour later. Ground counts of Rockhopper chicks prove to be exceedingly difficult due to the crèching behaviour with chicks congregating under rocks or in crevices. The team heads

	back to the hut at 15:30 hrs and arrive there just before 18:00 hrs. Richard & Robin walk to Stack Bay after lunch for crèching deployments and logger recoveries. 3 Erect-crested penguins are fitted with fresh devices; one Rockhopper penguin with logger is recovered.
28 December 2023	The Stack Bay team deploys 2 GPS loggers on Erect-crested penguins in the lower colony and recover 2 devices from returning Rockhopper penguins. One logger carrying penguins does not show so that the team decides to stay another night. At 10:30 hrs, Hannah & Thomas walk to Ringdove Bay to fly drone missions of the north coast of Albatross Point they could not complete last week.
	
29 December 2023	Bad weather looms. The Stack Bay team manages to capture the last missing logger bird around 15:00 hrs, pack up and return to the hut by 19:00 pm, just in time before it starts raining.
30 December 2023	Thick fog cover the island. Massive swells hit Anchorage Bay even though the wind is all but gone. Mainly a hut day, except for hourly checks for returned GPS logger birds. One of them finally shows at 22:00 hrs and the device is recovered.
31 December 2023	Still foggy and wet. Chicks in crèches look rather bedraggled. Hourly checks for logger birds resume in the morning. At

	21:30 hrs, a logger bird is finally recaptured, and the device removed. Two more devices to go.
1 January 2024	No sign of the remaining logger birds all day or night. Richard & Robin conduct chick counts at Anchorage Bay East, Reef Point and Stella Bay.
2 January 2024	One of the missing logger birds is finally recaptured in the early morning around 04:30 hrs. Solar power is thoroughly broken now with batteries largely depleted with no charge coming in from the panels. Still no solution found. Last logger bird remains a no show.
3 January 2024	Thomas & Hannah walk to the West Coast via the western route. They pass Orde Lees around 11:30 hrs and settle at the top of a cliff high above the bay facing the two Leeward Islands about an hour later. They fly drone missions from up there surveying all penguin colonies and searching for penguin sites that could not be identified the year before. Of the five apparent colonies, they do manage to find one consisting of 12 adults and some chicks. They start their walk back at 16:00 hrs and arrive at the hut just before 19:00 hrs. Meanwhile, Robin & Richard managed to conduct ground counts in Anchorage Bay East, Reef Point and Stella Bay. In the late afternoon, they recover the final GPS logger.
	

4 January 2024

The solar issue is fixed to some extent when one problem is identified in a wrongly wired panel connector, but current flow still is low albeit better than before. In the evening, another 5 GPS logger are deployed on Erect-crested penguins.

5 January 2024

Robin & Richard set off after lunch for another few nights in Stack Bay to recover devices from ECP and deploy more devices on Rockhopper penguins. They arrive before 16:00 hrs, and have deployed 3 loggers on Rockhoppers by 20:30 hrs. They recover the first ECP device just before midnight.

6 January 2024

Thomas & Hannah return to the West Coast to fly further drone surveys as the footage recorded three days earlier did not cover all sites that penguins were previously reported. They leave at 11:30 hrs, reach the coast south of Orde Lees at 14:00 hrs and finish drone missions by 15:30 hrs, having found no further penguin colonies. They walk back at 16:00 hrs and reach the hut around 19:00 hrs.

In Stack Bay, Robin & Richard manage to deploy another three GPS loggers on Rockhopper penguins in the afternoon and early evening. Between 20:00 and 23:00 hrs they recover 3 devices from Erect-crested penguins so that only one logger remains to be recaptured.

7 January 2024	In Stack Bay, the team waits for missing logger bird which finally makes an appearance at 15:00 hrs. After the logger has been recovered, Robin & Richard start their track back to the hut, where they arrive around 18:30 hrs.
8 January 2024	Strong westerlies. Thomas and Hannah fly drone missions in Stella Bay to document the increasingly strong presence of New Zealand fur seals to examine how this encroaches the penguin colony there.
9 January 2024	Robin & Richard do ground counts in Anchorage Bay East, Reef Point and Stella Bay. The solar panel issue is finally resolved when the entire cabling must be replaced after a panel shifts in the strong winds.
10 January 2024	Thomas & Hannah walk to Stack Bay for Rockhopper device recoveries and the final round of deployments on Erect-crested penguins. They start at the hut at 13:30 hrs and reach the camp around 17:00 hrs. Just after 18:00 hrs they spot two of the six Rockhopper penguins with loggers in the colony but only manage to capture one bird; the other bird leaves the colony while they are busy detaching the device. In Anchorage Bay, Richard & Robin conduct ground counts in Anchorage Bay East, Reef Point and Stella Bay.

11 January 2024	Misty and wet in Stack Bay. No sign of logger birds in the Rockhopper colony all day. Rain sets it by 18:00 hrs preventing deployments of devices that evening.
12 January 2024	Gusty northerly, cold. Thomas & Hannah attempt to go over to the South Coast to see if droning conditions in may be suitable. However, after reaching the top of the island, wind seems to be coming from all directions and they return to the camp around lunchtime. No sign of logger Rockhoppers all day. From late afternoon to evening, they manage to deploy 3 GPS loggers on Erect-crested penguins in the small colony opposite the Rockhopper penguin nests.
13 January 2024	No logger birds at Stack Bay overnight, so Thomas & Hannah decide to stay another night. They take turns at watching the colony and main access path all day – the logger birds do not show. One of the male Erect-crested penguins fitted with device last night spends the entire day in the colony with its chick. In the evening, the team receives the forecast for the next day – rain from midday – and decides to return to the hut in the morning of the next day.
	
14 January 2024	Thomas & Hannah check for logger birds all night and in the morning – unsuccessful. After documenting tick hyper-infestation of Erect-crested penguin chicks, Thomas & Hannah leave the camp at 10:30 hrs. The top of the island so covered in

thick fog and it starts raining soon after the team makes it to the western plains. The walk back is arduous as the team frequently loses its way in the fog and within minutes both are soaking. They reach the hut exhausted at 15:30 hrs.

15 January 2024

With the forecast predicting more rain, the team stays put. Richard refreshes his drone flying skills under Thomas's supervision.

16 January 2024

Thomas & Hannah walk to Orde Lees for the second crèching drone survey. They leave the hut at 11:30 hrs and reach the penguin colony 2.5 hrs later. Adult presence in the colony has ramped up considerably since the last visit. Inspection of chicks show that ticks are much less of a problem here than at Stack Bay. Droning begins at 14:30 hrs but must be interrupted because of strong winds. Missions can be resumed around 16:00 hrs. The two leave Orde Lees by 17:30 hrs and reach the hut at 20:00 hrs.

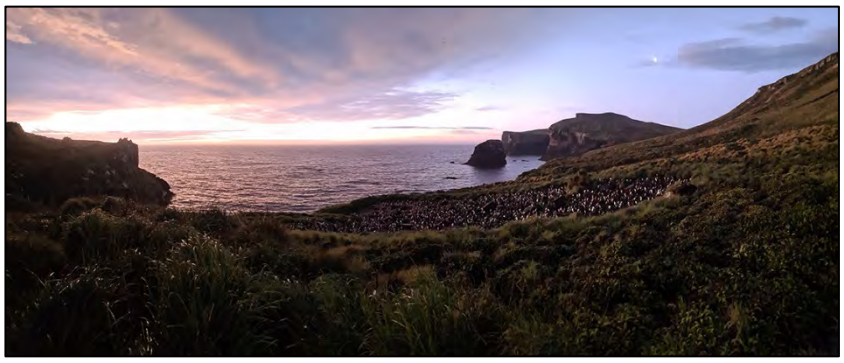
Meanwhile, Robing & Richard have gone back to Stack Bay to continue the logger recovery attempts. Between 19:00 and 23:00 hrs, 3 Rockhopper penguins carrying devices return.

17 January 2024

In the morning, the Stack Bay team recovers the GPS logger of a male Erect-crested penguin which appears to not have left the colony since it was fitted with device. The team keeps both the Rockhopper and the Erect-crested penguin colonies under constant surveillance. Between 16:00 and 20:00 hrs the remaining Erect-crested penguin loggers are recovered. Additionally, one Rockhopper penguin can be recaptured just before 23:00 hrs, so that only one logger bird remains MIA.

18 January 2024

With fair weather and low winds forecast, Hannah & Thomas leave the hut with the droning gear at 09:00 hrs with destination south coast. The aim is to re-do the surveys from December when poor conditions resulted in sub-par data quality. Coming via the Central Plains route, they arrive above Stack Bay around midday where Richard joins them. The three follow the creek at the western end of the south coast to reach the penguin colonies. Between 13:00 hrs and 17:00 hrs the entire stretch of the coast is successfully surveyed in ideal conditions. The isabelline penguin that was spotted last year is resighted. The team ascends to the southern plains via the slip above last year's camp site at 17:30 hrs; Richard heads back to Stack Bay while Thomas and Hannah follow the Central Plains route north. Richard re-joins Robin around 19:00 hrs; the other two are back at the hut around 21:00 hrs.

19 January 2024	The Stack Bay team waits in vain for the last missing logger bird. The others recover from yesterday's long walk in the hut.
20 January 2024	With food running out in the camp, Robin & Richard start to walk back to the hut around 14:30 hrs. At the same time, Thomas & Hannah start in the opposite direction to resume the watch for the missing logger bird. On the central plains both teams meet in the mist around 16:00 hrs. Thomas & Hannah arrive at the camp just before 18:00 hrs; Richard & Robin are back at the hut around the same time. Shortly after their arrival. Thomas & Hannah must retreat into the tent because it starts to rain hard with thunder and lightning making it somewhat uncomfortable in the tent. By 21:00 hrs, there is a break in the weather so that inspections of the Rockhopper colony can resume. No sign of the missing logger bird.
	
21 January 2024	The last logger bird is finally recaptured at 10:30 hrs. Thomas & Hannah pack their gear and start their walk back to the hut via the Central Plains route around 13:00 hrs. They reach the hut at 17:00 hrs.
22 January 2024	Fog with strong westerlies. Hut day.
23 January 2024	Misty and wet with strong westerlies. Conditions not suitable for the planned microchipping of colour banded Erect-crested penguin chicks. The team starts to pack non-essential gear for the scheduled departure next week.

24 January 2024

The weather has cleared. In the morning, the entire team starts the mucky task of microchipping all 39 chicks that remain on the study platform. After two wet days, the colony is slippery, and chicks are caked with mud and scat. Operating in two teams of two, all chicks are microchipped by 13:30 hrs.

On the mainland, the Bounty Island reinforcements (Ursula Ellenberg, Dave Houston, Bianca Keys, Blake Hornblow & Claire Concannon) arrive in Invercargill to pass quarantine inspection.

25 January 2024

The entire team is joined by Edin Whitehead and starts walking towards Stack Bay around 09:30 hrs. Task at hand is clearing the camp, installing a time-lapse camera (previously installed on south coast) in the Rockhopper colony and deployment of five satellite transmitters on chick-rearing Erect-crested penguins. The team arrives at Stack Bay at 12:30 hrs and starts with removing the tent and installing the time-lapse camera. Between 15:00 and 17:15, transmitters are fitted to 5 Erect-crested penguins from the top colony. The team heads back to the hut at 17:30 hrs and arrives just before 21:00 hrs.

The Bounty reinforcements load gear onto the *Evohe* in Bluff in the afternoon and depart around 16:30 hrs. To wait out a storm, the *Evohe* anchors in Port Adventure, Rakiura for the night.

26 January 2024

Richard, Hannah & Thomas head one last time to Orde Lees for final drone missions and ground counts. They leave around

midday and arrive at the penguin colony at 14:15 hrs. Hannah takes care of flying the drone missions while Richard & Thomas conduct ground counts of Erect-crested penguin chicks and juveniles on the knob. No ground counts of Rockhopper penguins are attempted as getting to the colony would have been a major source of disturbance as Orde Lees is crowded with penguins. The Orde Lees time-lapse camera is maintained once more, and the team leaves around 17:00 hrs. They reach the hut around 20:30 hrs.

Meanwhile, the *Evohe* has set off on her journey to the Antipodes after a day and a half in Port Adventure at 06:30 hrs.

27 January 2024

Hut day.

28 January 2024

With the Evohe now not expected to arrive before the next day, Thomas & Hannah walk over to Northwest Bay to fly drone missions with the aim of examining to which extent fur seals may affect penguin distributions there. They walk to the bay via Conical Hill. They pass the finger pointer on top of the hill at 11:30 hrs and arrive on top of the northern cliffs above the bay half an hour later. After flying drone surveys, they return to the hut by 16:00 hrs. Between 18:00 and 21:00 hrs, 5 satellite transmitters are deployed on adult Erect-crested penguins from the study platform in Anchorage Bay East.

29 January 2024

In the morning, the team rigs the flying fox across Hut Cove in anticipation of the *Evohe*'s arrival. At first ETA is 19:00 hrs, but the vessel makes good some time, catches first glimpses of the island covered in mist around 17:00 hrs and arrives in Anchorage Bay an hour later. To inspect conditions, the Steve Kafka & Murray Watson drive the dinghy into Hut Cove. They drop off Claire Concannon on the beach but decide that conditions are too rough for hauling gear. Claire is later picked up in very rough conditions at the rock platform in Anchorage Bay after having conducted interviews with Kalinka and Robin on the island.

30 January 2024

The team starts hauling gear to the dinghy around 07:00 hrs. All gear is successfully transferred to and from the boat by 09:00 hrs and Thomas, Richard, Hannah & Robin are picked up by the dinghy on the rock platform in Anchorage Bay. The *Evohe* starts steaming towards the Bounty Islands around 10:00 hrs.

31 January 2024	The *Evohe* reaches the Bounty Islands around 01:30 in the morning. Between 06:30 and 07:00 hrs the entire team is dropped off on the small platform in Bucket Cove and climbs up to the top of Proclamation Island with the help of ropes temporary roped by Thomas & Robin. Between 07:00 and 09:00 and 11:00 and 12:00 hrs, Thomas, Hannah & Richard fly drone missions to survey the main group of islands. A total of 10 satellite transmitter deployments are carried out by two independent teams between 07:30 and 13:45 hrs. Trail cameras have been visited and replaced between 09:00 and 11:00 hrs. The team leaves Proclamation Is at 14:30 hrs.
	
	The *Evohe* relocates to Funnel Is at 16:00 hrs to fly a Cook's scurvy grass mission with one drone. The return journey to Dunedin commences around 17:00 hrs.
2 February 2024	The *Evohe* arrives in Dunedin at 22:30 hrs.

Appendix I – PIT tagging data

Species	Date & Time	Site	Bird ID	Sex	Weight
Erect-crested penguin	29/11/2023 17:52	Anchorage Bay	956 0000113 52690	Male	4550
Erect-crested penguin	29/11/2023 18:04	Anchorage Bay	956 0000113 43682	Female	4000
Erect-crested penguin	29/11/2023 18:30	Anchorage Bay	956 0000147 83706	Female	3650
Erect-crested penguin	29/11/2023 18:42	Anchorage Bay	956 0000147 75052	Female	3620
Erect-crested penguin	29/11/2023 18:57	Anchorage Bay	956 0000147 81730	Female	3500
Erect-crested penguin	7/12/2023 19:46	Anchorage Bay	956 0000147 95382	Female	3600
Erect-crested penguin	7/12/2023 20:02	Anchorage Bay	956 0000147 89335	Male	4000
Erect-crested penguin	7/12/2023 20:10	Anchorage Bay	956 0000149 53928	Female	3400
Erect-crested penguin	12/12/2023 21:18	Anchorage Bay	956 0000147 75462	Female	4100
Erect-crested penguin	12/12/2023 21:35	Anchorage Bay	956 0000147 96104	Female	3600
Erect-crested penguin	23/12/2023 17:20	Anchorage Bay	956 0000113 30535	Female	3380
Erect-crested penguin	23/12/2023 17:33	Anchorage Bay	956 0000113 40306	Female	3300
Erect-crested penguin	23/12/2023 17:56	Anchorage Bay	956 0000113 40144	Female	3400
Erect-crested penguin	23/12/2023 18:32	Anchorage Bay	956 0000149 55155	Male	4800
Erect-crested penguin	26/12/2023 21:49	Anchorage Bay	956 0000147 75071	Male	4500
Erect-crested penguin	4/01/2024 18:24	Anchorage Bay	956 0000113 61319	Male	4860
Erect-crested penguin	4/01/2024 19:12	Anchorage Bay	956 0000147 78163	Male	5400
Erect-crested penguin	4/01/2024 19:44	Anchorage Bay	956 0000113 33934	Male	4900
Erect-crested penguin	4/01/2024 20:22	Anchorage Bay	956 0000147 88063	Male	4650
Erect-crested penguin	24/01/2024 11:15	Anchorage Bay	956 0000113 60545	Chick	3800
Erect-crested penguin	24/01/2024 11:16	Anchorage Bay	956 0000113 37851	Chick	3970
Erect-crested penguin	24/01/2024 11:28	Anchorage Bay	956 0000113 46453	Chick	4200
Erect-crested penguin	24/01/2024 11:28	Anchorage Bay	956 0000113 36746	Chick	2350
Erect-crested penguin	24/01/2024 11:33	Anchorage Bay	956 0000113 45998	Chick	3180
Erect-crested penguin	24/01/2024 11:36	Anchorage Bay	956 0000113 46733	Chick	3930
Erect-crested penguin	24/01/2024 11:42	Anchorage Bay	956 0000147 76421	Chick	2980
Erect-crested penguin	24/01/2024 11:43	Anchorage Bay	956 0000113 36534	Chick	3600
Erect-crested penguin	24/01/2024 11:49	Anchorage Bay	956 0000147 83895	Chick	4200
Erect-crested penguin	24/01/2024 11:50	Anchorage Bay	956 0000147 75854	Chick	3360
Erect-crested penguin	24/01/2024 11:55	Anchorage Bay	956 0000147 75056	Chick	3950
Erect-crested penguin	24/01/2024 11:56	Anchorage Bay	956 0000113 11330	Chick	3780
Erect-crested penguin	24/01/2024 12:01	Anchorage Bay	956 0000147 74713	Chick	4180
Erect-crested penguin	24/01/2024 12:05	Anchorage Bay	956 0000147 74789	Chick	3120
Erect-crested penguin	24/01/2024 12:11	Anchorage Bay	956 0000113 32092	Chick	2980
Erect-crested penguin	24/01/2024 12:13	Anchorage Bay	956 0000113 38152	Chick	3700
Erect-crested penguin	24/01/2024 12:19	Anchorage Bay	956 0000149 16026	Chick	4300
Erect-crested penguin	24/01/2024 12:21	Anchorage Bay	956 0000147 96609	Chick	3300
Erect-crested penguin	24/01/2024 12:23	Anchorage Bay	956 0000113 40492	Chick	3950
Erect-crested penguin	24/01/2024 12:31	Anchorage Bay	956 0000113 35249	Chick	4450
Erect-crested penguin	24/01/2024 12:31	Anchorage Bay	956 0000113 41430	Chick	3700
Erect-crested penguin	24/01/2024 12:36	Anchorage Bay	956 0000113 28693	Chick	3500
Erect-crested penguin	24/01/2024 12:38	Anchorage Bay	956 0000113 29694	Chick	3500
Erect-crested penguin	24/01/2024 12:45	Anchorage Bay	956 0000113 31773	Chick	4040
Erect-crested penguin	24/01/2024 12:46	Anchorage Bay	956 0000113 45750	Chick	4160
Erect-crested penguin	24/01/2024 12:52	Anchorage Bay	956 0000113 37574	Chick	3500
Erect-crested penguin	24/01/2024 12:53	Anchorage Bay	956 0000113 46953	Chick	3900
Erect-crested penguin	24/01/2024 13:03	Anchorage Bay	956 0000113 32320	Chick	3450
Erect-crested penguin	24/01/2024 13:04	Anchorage Bay	956 0000113 47437	Chick	2800
Erect-crested penguin	24/01/2024 13:08	Anchorage Bay	956 0000113 41474	Chick	4400
Erect-crested penguin	24/01/2024 13:12	Anchorage Bay	956 0000113 40536	Chick	4160
Erect-crested penguin	24/01/2024 13:13	Anchorage Bay	956 0000113 52570	Chick	3100
Erect-crested penguin	24/01/2024 13:16	Anchorage Bay	956 0000113 46281	Chick	3980
Erect-crested penguin	24/01/2024 13:21	Anchorage Bay	956 0000113 40534	Chick	3370
Erect-crested penguin	24/01/2024 13:21	Anchorage Bay	956 0000113 49809	Chick	3200
Erect-crested penguin	24/01/2024 13:26	Anchorage Bay	956 0000113 37512	Chick	3500
Erect-crested penguin	24/01/2024 13:30	Anchorage Bay	956 0000113 37431	Chick	3050

Species	Date & Time	Site	Bird ID	Sex	Weight
Erect-crested penguin	24/01/2024 13:30	Anchorage Bay	956 0000113 45126	Chick	3600
Erect-crested penguin	28/01/2024 18:53	Anchorage Bay	956 0000113 48881	Male	4400
Erect-crested penguin	28/01/2024 19:32	Anchorage Bay	956 0000113 32354	Male	4420
Erect-crested penguin	28/01/2024 19:58	Anchorage Bay	956 0000113 50575	Male	5140
Erect-crested penguin	2/12/2023 14:26	Stack Bay	956 0000157 53468	Female	3360
Erect-crested penguin	2/12/2023 14:53	Stack Bay	956 0000149 53969	Female	3970
Erect-crested penguin	2/12/2023 15:03	Stack Bay	956 0000147 76046	Female	3520
Erect-crested penguin	2/12/2023 15:21	Stack Bay	956 0000147 96591	Male	4340
Erect-crested penguin	2/12/2023 15:27	Stack Bay	956 0000147 76850	Female	4300
Erect-crested penguin	2/12/2023 15:40	Stack Bay	956 0000157 54726	Female	3500
Erect-crested penguin	10/12/2023 19:53	Stack Bay	956 0000113 46154	Female	4100
Erect-crested penguin	10/12/2023 20:05	Stack Bay	956 0000113 34879	Female	3880
Erect-crested penguin	27/12/2023 17:52	Stack Bay	956 0000157 52650	Female	3400
Erect-crested penguin	27/12/2023 18:23	Stack Bay	956 0000113 41132	Male	4250
Erect-crested penguin	27/12/2023 19:24	Stack Bay	956 0000147 96412	Female	3700
Erect-crested penguin	28/12/2023 14:26	Stack Bay	956 0000113 59265	Male	4550
Erect-crested penguin	28/12/2023 15:51	Stack Bay	956 0000113 35877	Male	4450
Erect-crested penguin	12/01/2024 13:39	Stack Bay	956 0000113 47578	Male	-
Erect-crested penguin	12/01/2024 19:40	Stack Bay	956 0000147 88746	Male	4300
Erect-crested penguin	17/01/2024 19:54	Stack Bay	956 0000113 51271	Female	3500
Erect-crested penguin	25/01/2024 15:14	Stack Bay	956 0000113 10002	Male	4050
Erect-crested penguin	25/01/2024 15:42	Stack Bay	956 0000113 38528	Female	3760
Erect-crested penguin	25/01/2024 16:04	Stack Bay	956 0000113 41355	Female	4700
Erect-crested penguin	25/01/2024 16:31	Stack Bay	956 0000112 96148	Female	3950
Erect-crested penguin	25/01/2024 17:08	Stack Bay	956 0000113 62203	Male	5270
Erect-crested penguin	31/01/2024 07:33	Proclamation Is	956 0000113 50807	Female	3700
Erect-crested penguin	31/01/2024 08:21	Proclamation Is	956 0000113 38274	Female	3900
Erect-crested penguin	31/01/2024 08:56	Proclamation Is	956 0000113 34920	Male	5000
Erect-crested penguin	31/01/2024 09:44	Proclamation Is	956 0000113 46455	Female	3950
Erect-crested penguin	31/01/2024 09:49	Proclamation Is	956 0000113 50355	Female	4130
Erect-crested penguin	31/01/2024 10:10	Proclamation Is	956 0000113 32482	Female	3600
Erect-crested penguin	31/01/2024 10:34	Proclamation Is	956 0000113 37382	Male	4400
Erect-crested penguin	31/01/2024 11:25	Proclamation Is	956 0000113 39147	Male	4440
Erect-crested penguin	31/01/2024 11:35	Proclamation Is	956 0000113 49478	Male	4200
Erect-crested penguin	31/01/2024 13:45	Proclamation Is	956 0000113 31707	Male	4250
Eastern Rockhopper penguin	27/11/2023 19:50	Anchorage Bay	956 0000147 84472	Male	3600
Eastern Rockhopper penguin	27/11/2023 20:13	Anchorage Bay	956 0000157 55216	Male	3050
Eastern Rockhopper penguin	27/11/2023 20:26	Anchorage Bay	956 0000149 17067	Male	3100
Eastern Rockhopper penguin	7/12/2023 19:53	Anchorage Bay	956 0000147 83430	Female	2500
Eastern Rockhopper penguin	15/12/2023 00:05	Anchorage Bay	956 0000113 50316	Female	2350
Eastern Rockhopper penguin	29/01/2024 20:00	Anchorage Bay	956 0000113 48491	Chick	2100
Eastern Rockhopper penguin	29/01/2024 20:05	Anchorage Bay	956 0000113 40712	Chick	2600
Eastern Rockhopper penguin	29/01/2024 20:08	Anchorage Bay	956 0000113 49035	Chick	2950
Eastern Rockhopper penguin	10/12/2023 18:33	Stack Bay	956 0000147 84566	Female	2700
Eastern Rockhopper penguin	10/12/2023 18:48	Stack Bay	956 0000113 34207	Female	2270
Eastern Rockhopper penguin	10/12/2023 19:02	Stack Bay	956 0000113 42502	Female	2380
Eastern Rockhopper penguin	10/12/2023 19:23	Stack Bay	956 0000113 38768	Female	2300
Eastern Rockhopper penguin	16/12/2023 21:34	Stack Bay	956 0000113 40949	Female	2400
Eastern Rockhopper penguin	16/12/2023 21:47	Stack Bay	956 0000113 42255	Female	2500
Eastern Rockhopper penguin	21/12/2023 12:50	Stack Bay	956 0000113 41350	Female	2250
Eastern Rockhopper penguin	21/12/2023 13:09	Stack Bay	956 0000113 42500	Female	2250

Species	Date & Time	Site	Bird ID	Sex	Weight
Eastern Rockhopper penguin	21/12/2023 13:24	Stack Bay	956 0000147 95803	Female	2150
Eastern Rockhopper penguin	21/12/2023 13:46	Stack Bay	956 0000149 54958	Female	2000
Eastern Rockhopper penguin	5/01/2024 18:34	Stack Bay	956 0000147 76027	Male	2630
Eastern Rockhopper penguin	5/01/2024 20:02	Stack Bay	956 0000113 46369	Female	2400
Eastern Rockhopper penguin	5/01/2024 20:15	Stack Bay	956 0000157 53832	Female	2500
Eastern Rockhopper penguin	6/01/2024 13:43	Stack Bay	956 0000147 83188	Female	2700
Eastern Rockhopper penguin	6/01/2024 17:25	Stack Bay	956 0000113 32576	Male	2300
Eastern Rockhopper penguin	6/01/2024 19:43	Stack Bay	956 0000113 40504	Male	2200