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**Project:** Hoiho Population and tracking: POP2018-02  
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## Monthly report for the period 21 December 2019 – 20 January 2020

### Summary

In late December 2019 the chick-guard phase of the current hoiho breeding season has come to an end. Throughout chick-guard, penguins from Bobby Head's/Tavora and Aramoana in North Otago, Mahaka and Long Point in the Catlins, and the Bravo Group, Rakiura/Stewart Island have been successfully tracked with GPS dive loggers. A detailed account of the Rakiura data has been given in last month's report. This report focuses on device deployments that occurred during the chick-guard stage along the various mainland sites. At Bobby's Head/Tavora, three GPS dive loggers were deployed on birds from the only two active nests. One bird was re-deployed after a device it had been carrying proved to be malfunctioning. A total of 12 foraging trips were recorded during which both birds foraged towards the east and south east within a 10 km radius of the colony. Predominantly benthic dives were recorded. At Aramoana, one male and two females from active nests were fitted with devices and performed 17 foraging trips. One female exhibited varying foraging ranges and stayed within 10 km of the colony on some trips while foraging up to 30 km away on others. The longer trips brought the birds into the same region that was utilized during the non-breeding and incubation periods underlining the importance of the continental shelf region between Karitane and Shag Point for North Otago hoiho. The second female's unit failed to record any GPS data; it was subsequently removed from our diminishing pool of reliably working devices. Only one nest is active at Mahaka. We managed to deploy a GPS dive logger on the female penguin and obtain tracking and dive data for one foraging trip during which the penguin foraged southeast to deeper waters some 16 km from the colony during which it mainly foraged pelagically at depths around 60m. At Long Point, penguins from the two nests in Seal Bay were fitted with GPS dive loggers and cameras in late November 2019. One bird preened off the camera while at sea, the other camera only recorded footage during the night. On the eight foraging trips recorded by the GPS dive loggers during chick-guard, the penguins tended to forage mainly to the South in an area also visited by the Mahaka bird. Benthic foraging at depths exceeding 100 m dominated their behaviour.

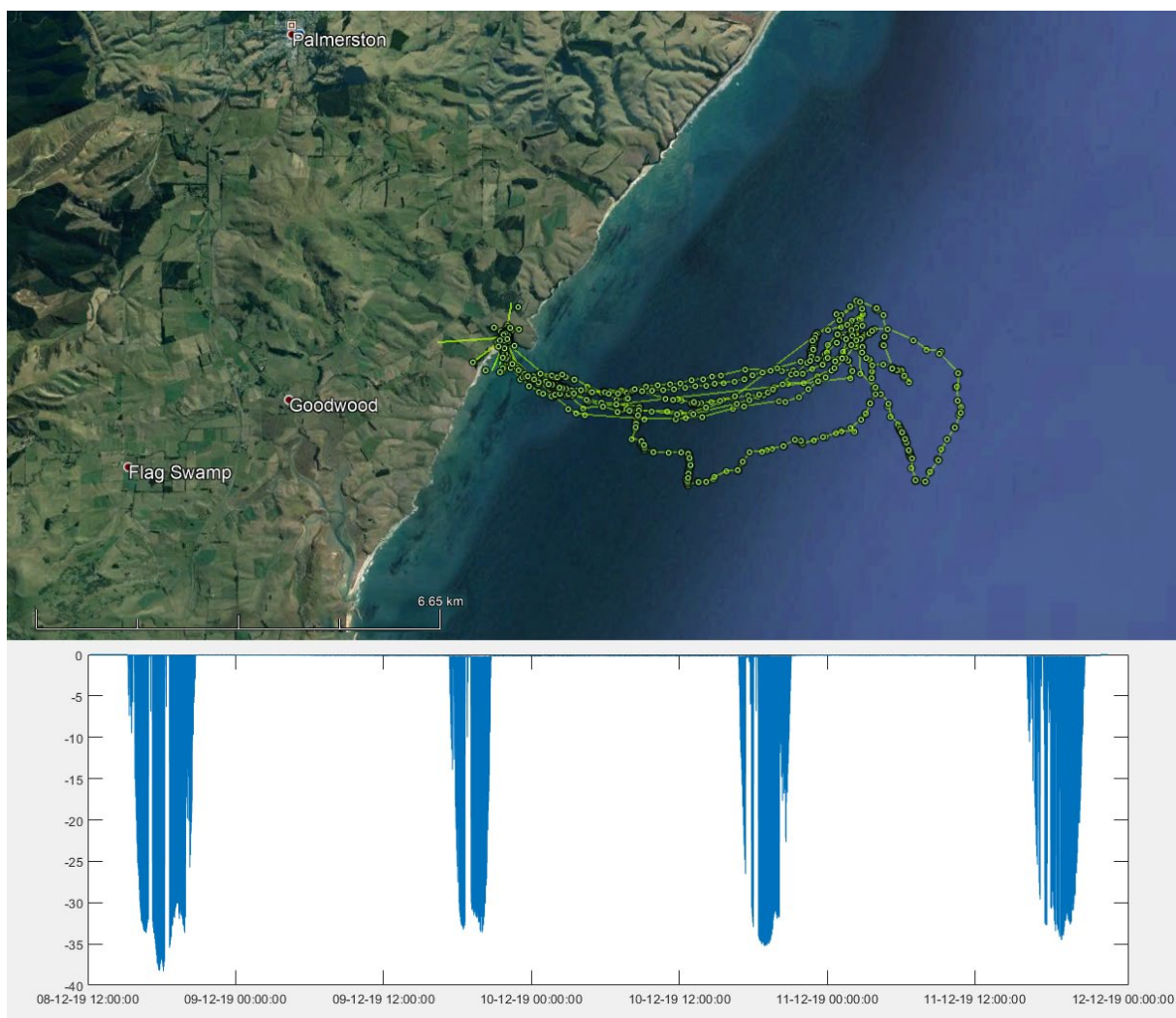
## Results

### *Bobby's Head/Tavora, North Otago*

**Male, bird id: 982 000405533753, 5400 g, AxyTrek, 8-14 December 2019**

The penguin was guarding a single chick in the nest box. The chick weighed around 1 kg looking very healthy and agile. The adult was calm throughout the deployment procedure. It left on its first foraging trip about two hours after the device was attached and returned the same night at around 8pm.

A clear pattern of relatively short afternoon trips emerged from the tracking and dive data that were recorded over the next four days. The bird's at-sea movements were highly consistent. On all trips it foraged about 6 km due east of Bobby's Head. Dive depths never exceeded 40 m which is reflective of the water depth within the area visited by the bird. Dive profiles indicate predominantly benthic foraging.

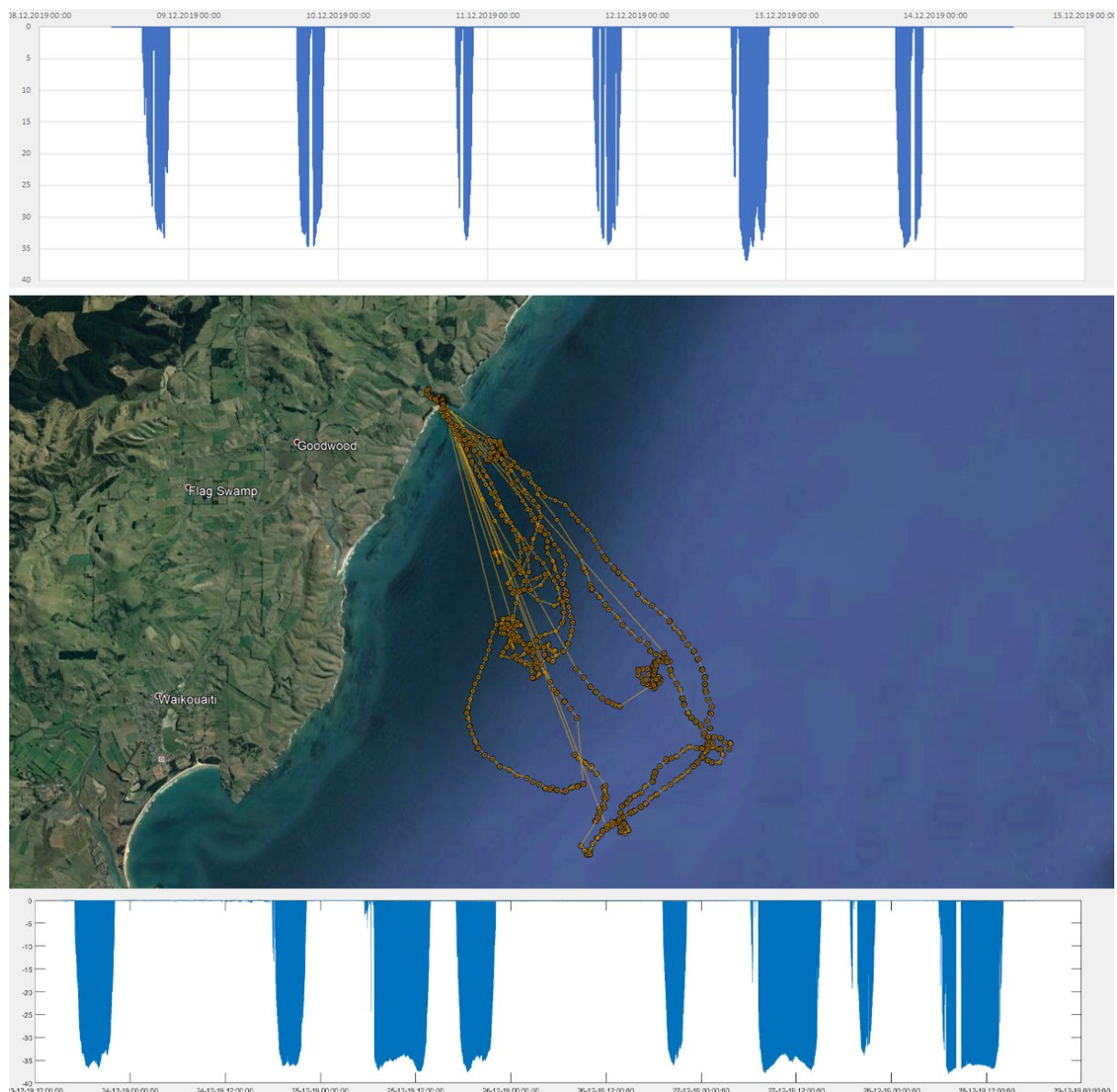


*Foraging tracks and dive profiles of male 982 000405533753 recorded between 8-12 December 2019.*

**Female, bird id: 982 000365942040, 5800 g, AxyTrek, 8-14 & 22-28 December 2019**

On both occasions when the female was fitted with devices, she was guarding her two big chicks in the nest box. The GPS logger used during the first deployment proved to be malfunctioning and did not record any GPS data; however, dive data for six foraging trips were recorded. Because vital tracking data are sparse for the important North Otago region, the bird was fitted once more with device a week after the first device was recovered. This second deployment yielded both GPS and dive data.

During the first deployment, the penguin only performed afternoon and evening trips. Such trips were first described in hoiho from Oamaru in the early 2000s and seem to be a common occurrence in North Otago penguins, especially during chick guard. During the second deployment, the foraging patterns had changed somewhat. The bird now seemed to alternate between days with afternoon/evening trips on one day were followed a day with a morning trip *and* an afternoon trip, i.e. the bird returned to the nest between trips. During the longer morning trips, it foraged to a region about 10 km to the south east, due east of Waikouaiti. The penguin principally foraged along the seafloor on all trips, reaching depths of around 35 m.



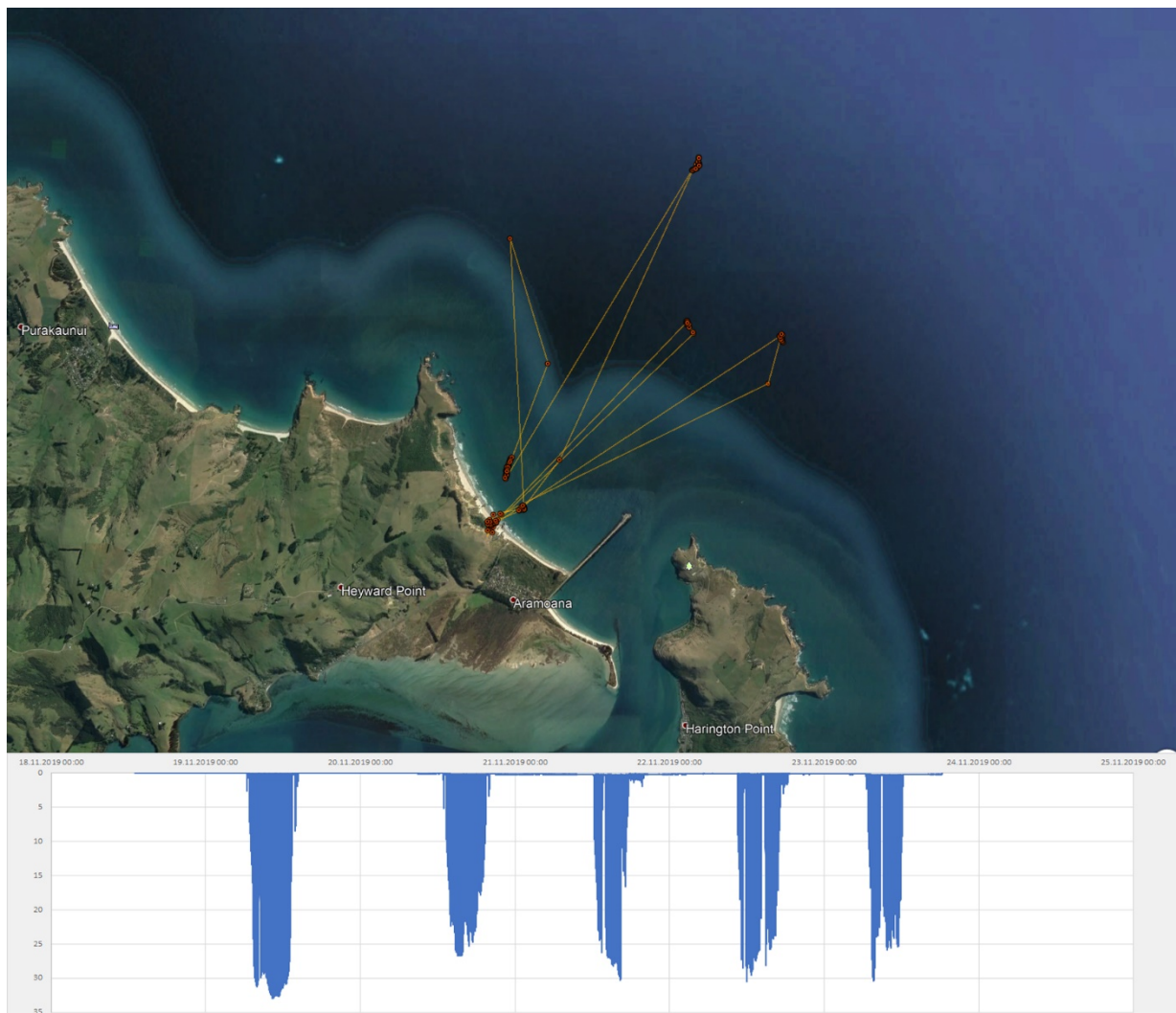
*Foraging tracks and dive profiles of female 982 000365942040 recorded between 8-14 and 22-28 December 2019. Note that the GPS unit failed during the first deployment.*

*Aramoana, North Otago*

**Male, bird id: 982 000365942048, 5400 g, AxyTrek & Penguin Cam, 18-23 November 2019**

We already reported on this bird in November 2019 as it was fitted with a camera logger for a day. Here, we summarize the data that were recorded by the GPS dive logger which was deployed in conjunction with the camera. Unfortunately, the GPS data is of poor quality, probably because the device was attached too far down the penguin's back to make room for the camera. This may have resulted in the GPS antenna being submerged when the bird was at the surface so that GPS reception was only sporadic.

While fitted with GPS dive logger, the penguin performed five half-day foraging trips, mainly afternoon trips. During none of the trips it moved further than 5 km from the colony. During the first trip, when the bird carried the camera, it foraged at the seafloor at around 30 m water depths. On subsequent trips most dives were also benthic, although some pelagic dives interspersed the data set, probably indicating that the bird changed its position and travelled for brief periods before returning to the benthic dive routine.



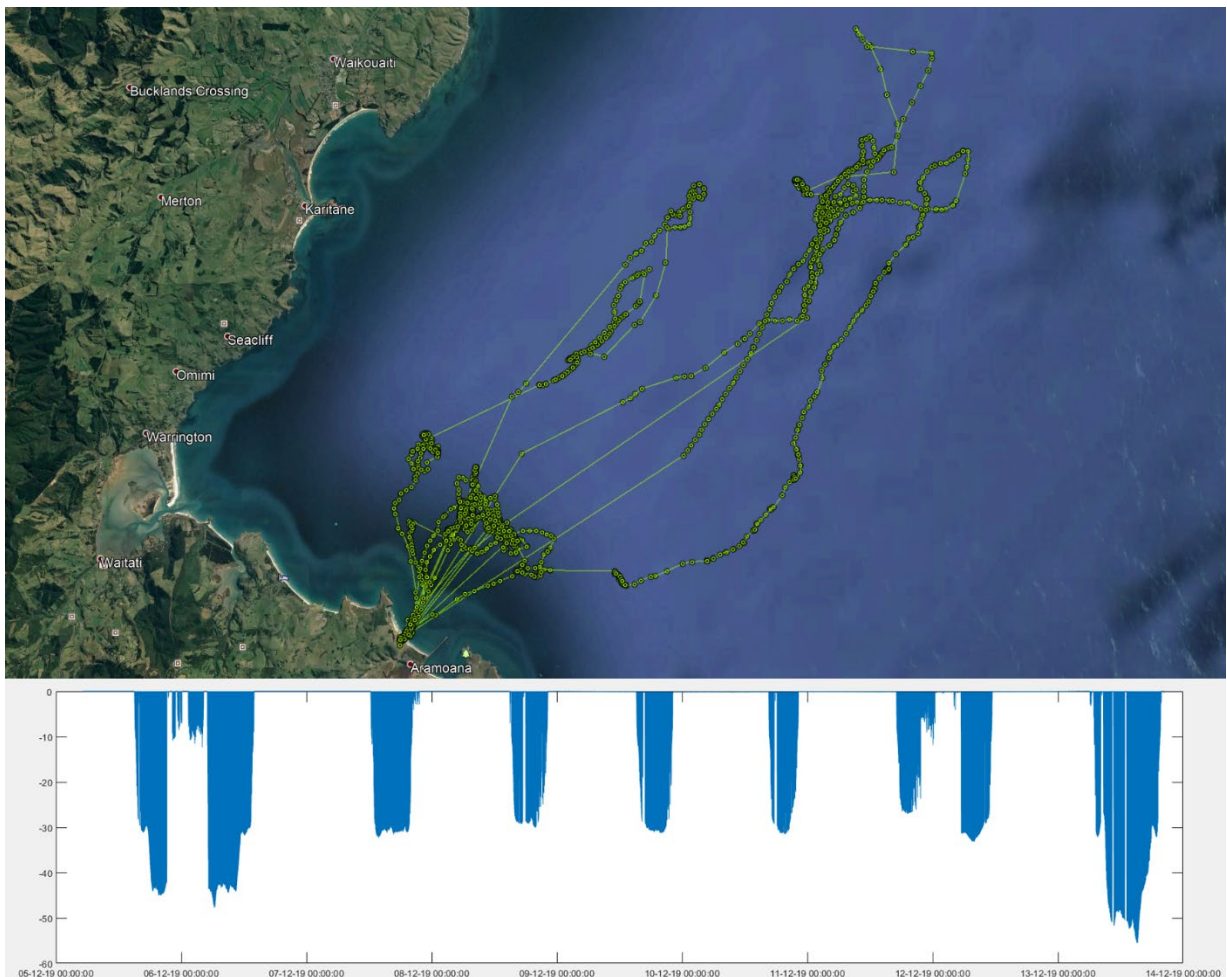
*Foraging tracks and dive profiles of male 982 000365942048 recorded 18-23 November 2019.*

**Female, bird id: 982 000365941878, 5000 g, AxyTrek, 5-13 December 2019**

The female was encountered on the nest guarding two plump and fluffy chicks. Both chicks retreated into dense vegetation when the nest was approached so that no weight measurements were possible.

The penguin performed a total of seven foraging trips while fitted with a GPS dive logger. Two of these trips were overnight trips during which the bird left the nest in the afternoon and returned around lunchtime the following day. On the first overnight trip (6-7 Dec) the bird travelled 26 km to the Northeast to an area that was frequented by penguins during the winter and while incubating eggs. One penguin from Bobby's Head also foraged in the region underlining the importance of this area for hoiho (see above). During the second overnight trip (12-13 Dec) the bird stayed much closer to Aramoana (<7 km) despite not returning for the night. Four trips were half day excursions performed in the afternoon. Before device recovery in the evening of 13 December, the bird performed one full day trip on which it ventured further to the North once again.

The penguin foraged predominantly at the seafloor. However, a series of pelagic dives are apparent during the night-time hours of the overnight trips. The frequency of dives and depths reached suggest foraging behaviour. This likely would have been bioluminescent prey, either squid or krill.

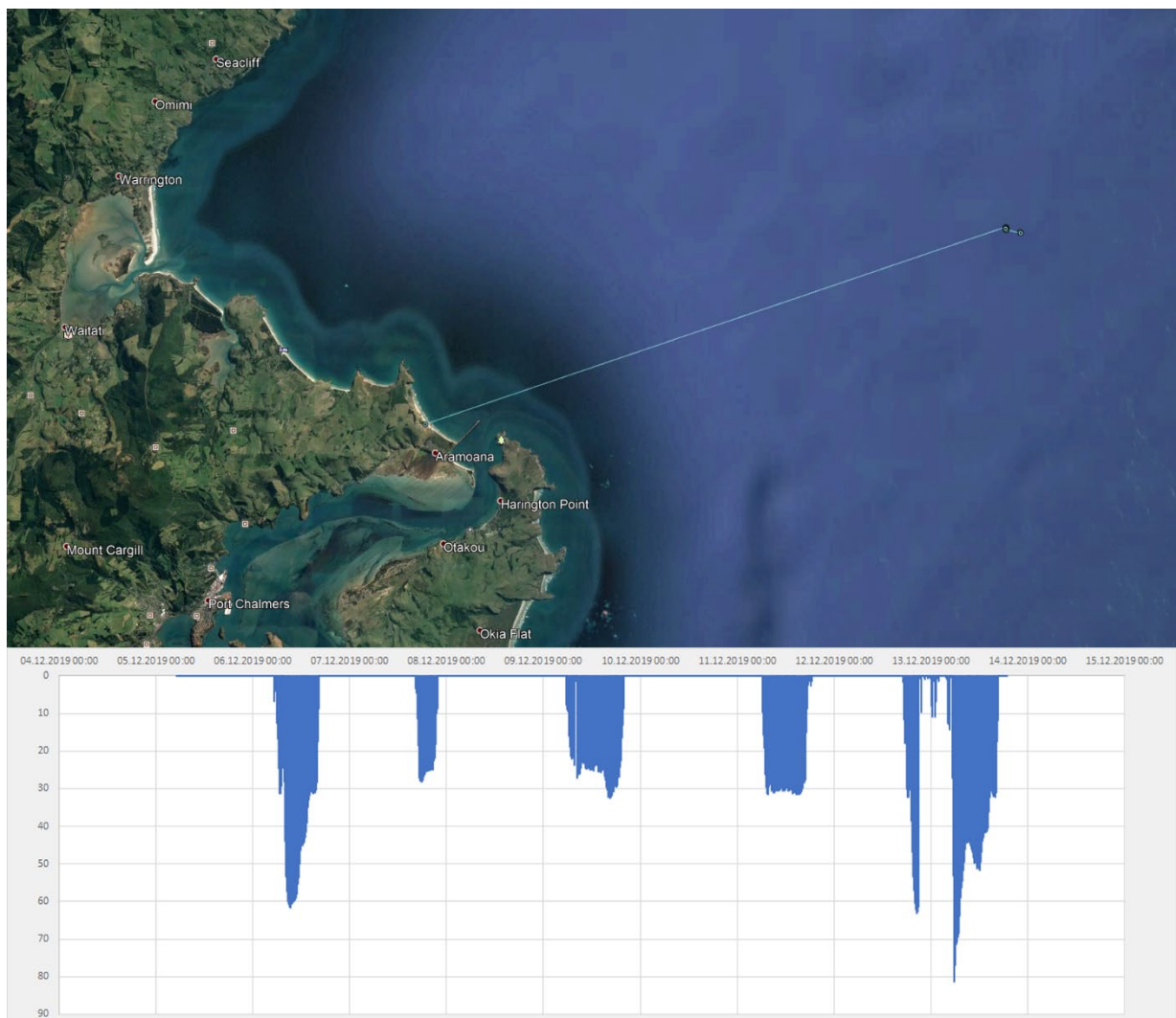


*Foraging tracks and dive profiles of female 982 000365941878 recorded 5-13 December 2019.*

**Female, bird id: 982 000402100727, 5100 g, AxyTrek, 5-14 December 2019**

When the nest was approached for device deployment on the female, both adults were present guarding their chicks. The female retreated into thick vegetation first but could be apprehended when she returned to the nest a short while later.

The bird left on five foraging trips while carrying a GPS dive logger. Three trips were day trips during which the bird left in the morning and returned in the late afternoon. One trip was a shorter evening trip (7 Dec) while the last trip to be recorded was an overnight trip on which the bird left in the evening of the 13 Dec and returned in the afternoon of the following day. Unfortunately, the GPS unit failed to record much meaningful data. Only a handful of positions were recorded about 20 km due east of Aramoana on the first trip. The poor performance was probably due to this unit being an old device; it was subsequently removed from our pool of devices. Nevertheless, the dive data allows to draw some conclusions about the bird's at sea behaviour. The first and the last trip of the data set saw the bird reach moderate dive depths between 50 and 80m. Combined with the available GPS data, we assume that it foraged close to the continental shelf in the East. Dive depths on the shorter day trips hardly ever exceeded 30 m, i.e. depths that other birds from Aramoana foraged at when they stayed within a 7 km radius from the colony. Most dives were typical benthic foraging dives. During the overnight trip the bird showed some dive activity during hours of darkness, further indicating that hoiho from Aramoana may have foraged for bioluminescent prey.



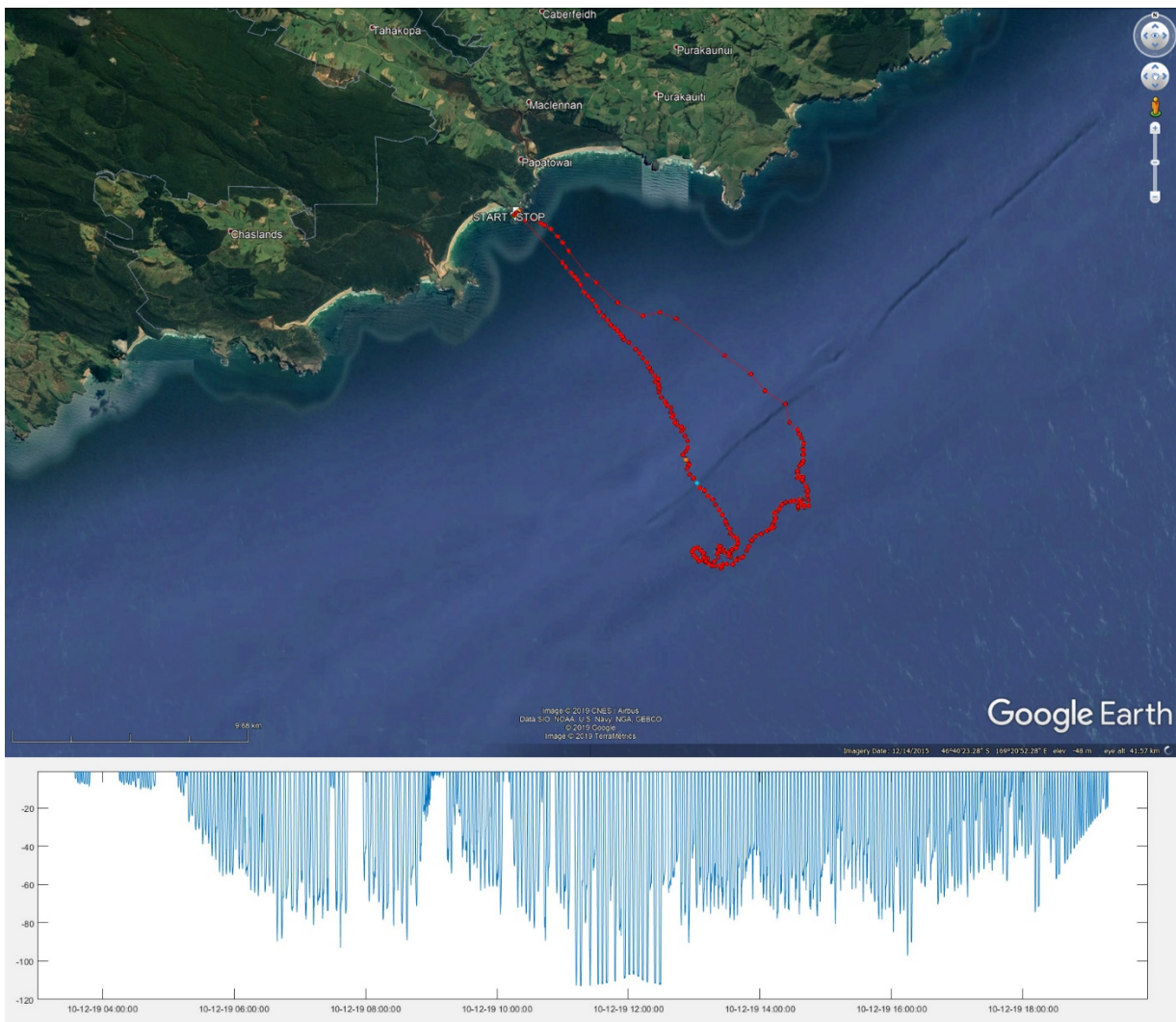
*At-sea location and dive profiles of female 982 000402100727 recorded 5-14 December 2019.*

*Mahaka, Catlins*

**Female, bird id: 982 000405531900, 4600 g, AxyTrek, 10 December 2019**

The bird was semi-brooding a single chick which weighed around 1 kg. Regurgitates of what appeared to be squid were found next to the nest. No sign of a second chick was found. The device was deployed in the afternoon of the 7 December and recovered in the night of the 14 December 2019. However, the device only contained data for a single foraging trip on 10 December. This could be indicative that the bird spent several days guarding the chick before and after the trip. When recovering the device, the chick appeared to be in good conditions although it was out of reach to be weighed. Therefore, it seems as if the male may have performed long overnight trips while the female fitted with device remained with the chick. Since the nest is located in a burrow like setting, GPS reception at the nest was likely very poor which contributes to faster battery depletion of AxyTrek loggers.

The penguin went to sea just before 4 am on 10 December. With exception of about 45 minutes around noon as well as the last hour of the foraging trip, the penguins foraged pelagically at depths ranging from 30 to 80 m. When venturing to the seafloor the bird reached depths of around 115 m.

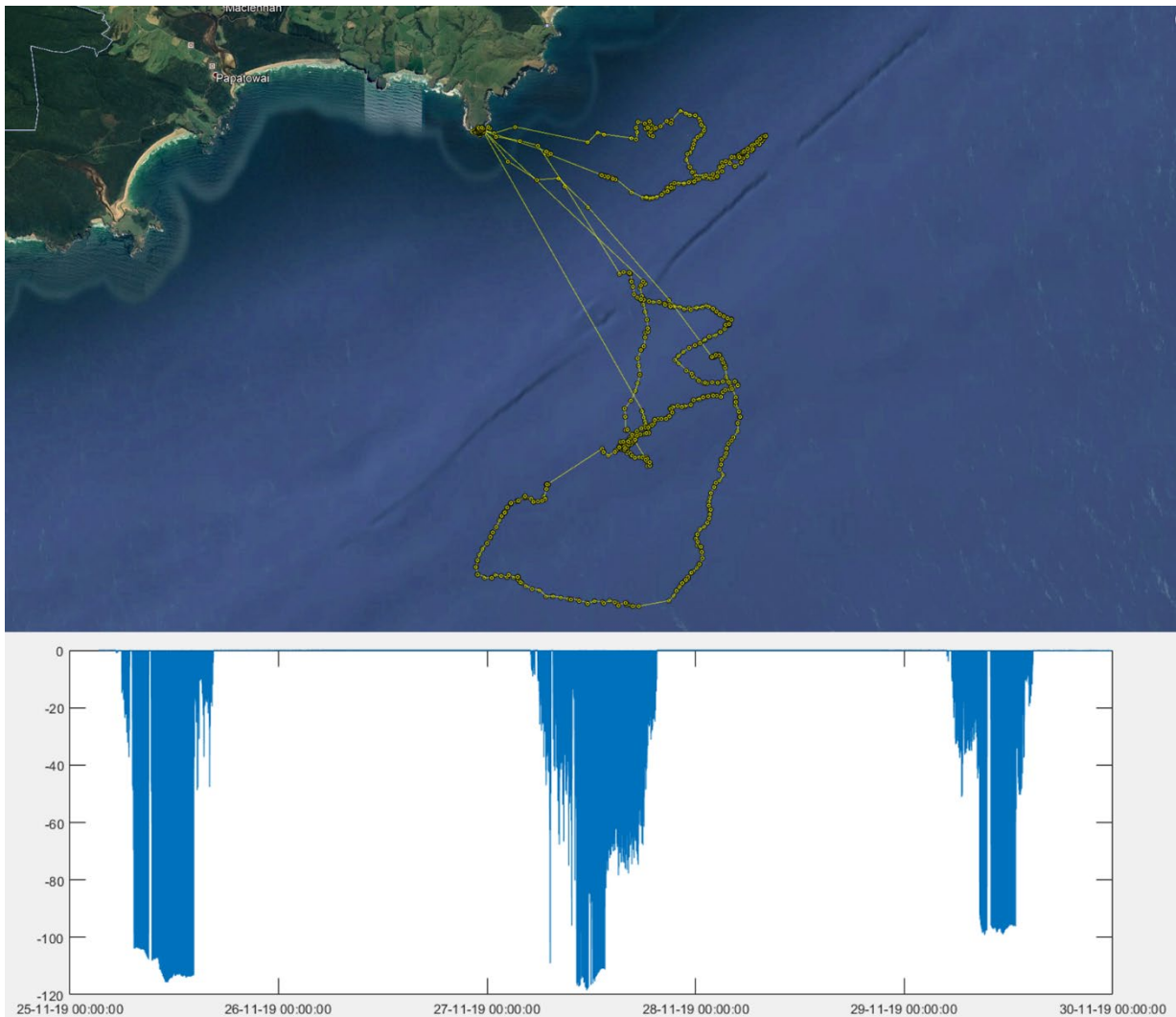


*Foraging tracks and dive profiles of female 982 000405531900 recorded on 10 December 2019.*

*Long Point, Catlins*

**Male, bird id: 982 000063603716, 6600 g, AxyTrek & Penguin Cam, 22 November-1 December 2019**

The bird was captured as it was returning to its nest in Seal Bay where his mate (female 982 000365941883) was guarding two healthy chicks in secondary down. (The female itself was only 4.3 kg and therefore deemed to light for device deployment.) The male was fitted with a camera logger as well as an AxyTrek GPS dive logger. However, when recaptured on the next day, the bird had preened off the camera without any sign that the device had ever been attached. The GPS dive logger remained on the bird until 1 December 2019. The bird performed a total of three foraging trips during the deployment. On the first two trips, it foraged in an area like that visited by the penguin from Mahaka, i.e. some 20 km south to southeast of Long Point. On the third trip it headed in a more easterly direction and stayed within a 10 km radius of Long Point. Benthic foraging was the dominant diving behaviour which brought the bird to depths close to 120 m.



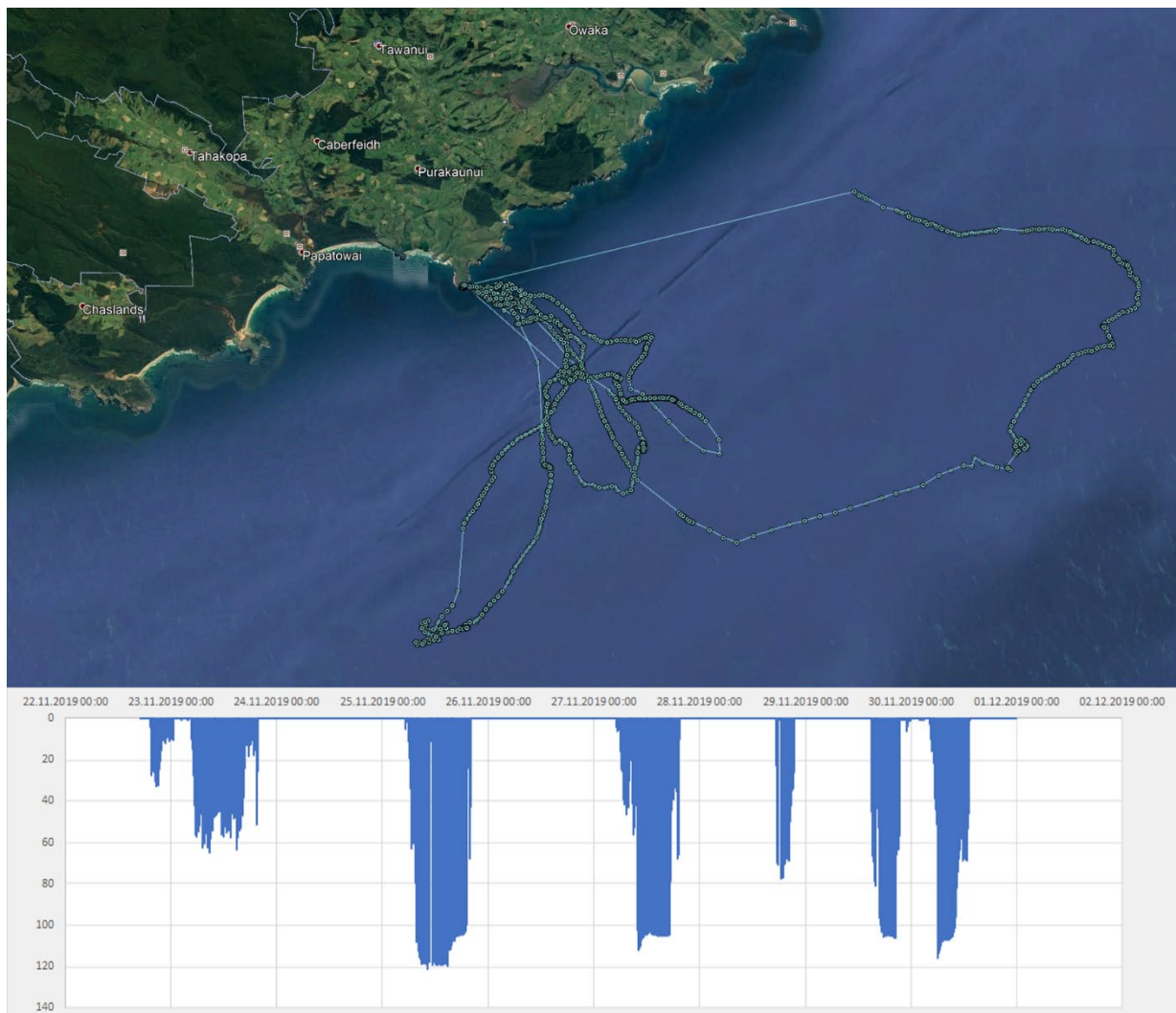
*Foraging tracks and dive profiles of male 982 000063603716 recorded during chick guard 22 November – 1 December 2019.*



**Female, bird id: 982 000365999895, 5900 g, AxyTrek & Penguin Cam, 22-30 November 2019**

The female penguin belongs to the second active nest in Seal Bay, Long Point. She was guarding two 2-week-old chicks when she was captured and fitted with camera logger and GPS dive logger. The bird was recaptured after its first foraging trip. However, the camera had accidentally been triggered to start recording in the night while the bird was on the nest. By the time it was at sea, the camera battery had been depleted. The GPS dive logger remained on the bird for a week during which it performed five foraging trips. These were a mix of two overnight trips (23-24 Nov & 30 Nov-1 Dec), two-day trips (25 & 28 Nov), and one evening trip (29 Nov). The penguin foraged in a similar region as the Mahaka and the other Long Point bird tracked at this stage of breeding some 15 km to the South and Southeast of Long Point. On its first overnight trip it ventured nearly 40 km to the East.

Interestingly, on its first overnight trip the bird showed considerable diving activity until well after midnight presumably going after bioluminescent prey (as presumed to have been the case in Aramoana birds, too). Overall, this trip was characterized by pelagic foraging. This was different on subsequent trips where benthic foraging was dominant with the bird reaching depths of 100-120 m.



*Foraging tracks and dive profiles of male 982 000365999895 recorded during chick guard 22-30 November 2019.*

### Next steps

This report covers data recorded on the mainland during the chick-guard stage. We have been tracking birds throughout the post-guard stage which at some sites started just after Christmas. First data sets from Long Point in the Catlins have been recorded and are currently being processed. Further deployments are underway at Papanui on the Otago Peninsula and Bushy Beach. Further work is planned for Bobby's Head and Aramoana in North Otago, and Mahaka, Haywards Point/Hellen's Falls in the Catlins to complete the post-guard tracking before we head into the pre-moult period.