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Project: Hoiho Population and tracking: POP2018-02
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Monthly report for the period 21 November 2019 – 20 December 2019

Summary

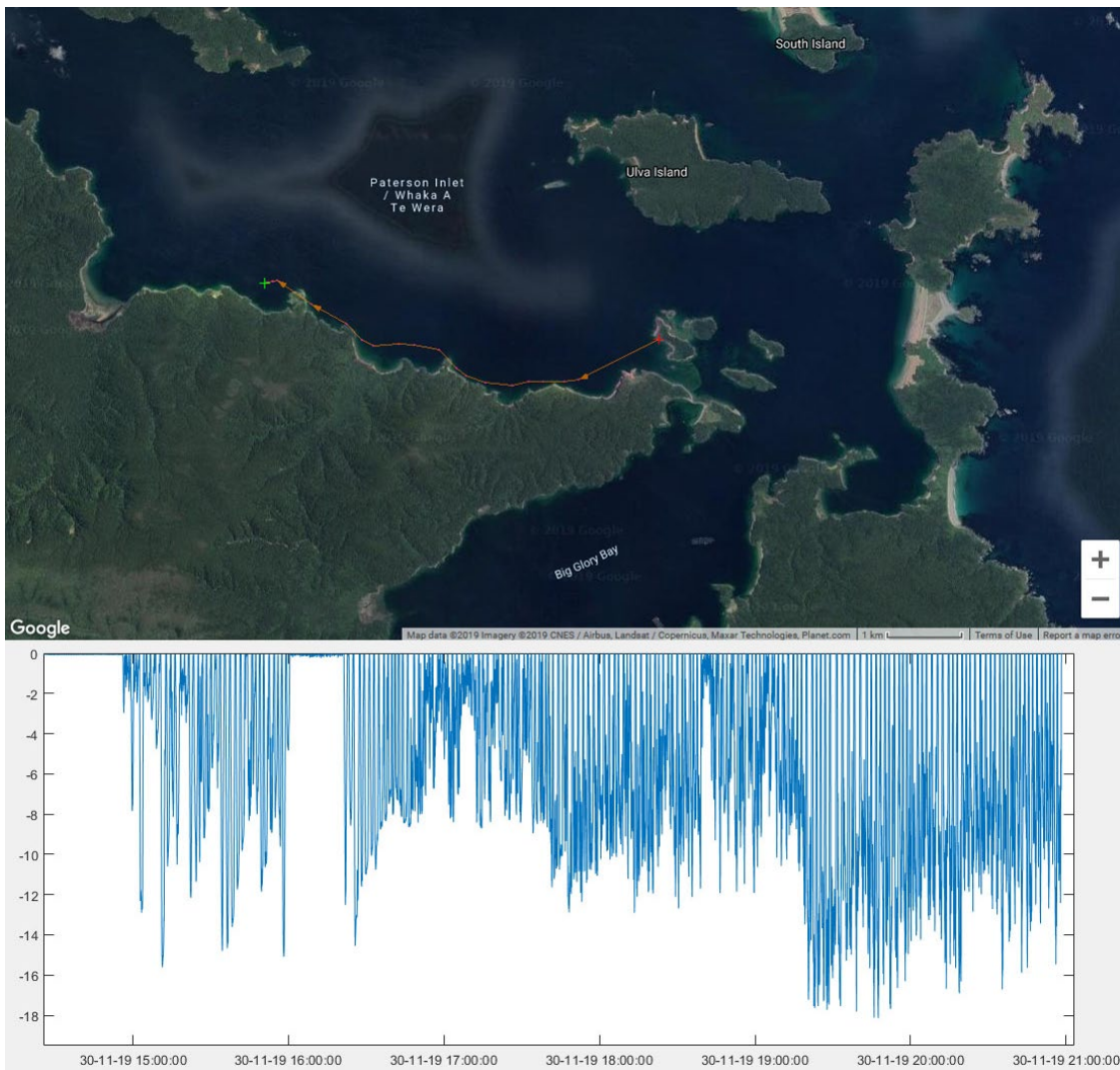
Hoiho tracking is back in full swing. Deployments occurred over a broad range of site ranging from Bobby's Head and Aramoana in North Otago to Long Point and Mahaka in the Catlins and the Bravo Islands in Paterson Inlet, Rakiura/Stewart Island. Mainland data have yet to be fully consolidated and will be summarized in the January 2020 report. In this report, we will focus primarily on data obtained from GPS and camera logger deployments on hoiho from the Bravo Group islands. Field work on the islands commenced on 30 November 2019. Initial nest searches found only 8 active nests (down from 15 nests in 2018), which were down to only six nests by the time the field team arrived. Of these nests, four were found to contain eggs, freshly hatched or chicks <1-week old so that device deployments on these nests were put off for another week. During this period a further three of the nests failed, all of which were nests that contained eggs or freshly hatched chicks in late November. Hence, only three nests remained for the tracking work. Between 30 November and 09 December 2019, all six remaining breeding birds were fitted with camera and GPS loggers. Two birds managed to pull off the cameras before the devices could be recovered; the remaining for cameras were recovered within 24 hours of deployment. GPS loggers remained on the birds for 4-7 days. Three of the six tracked birds foraged exclusively in Big Glory Bay. Two birds foraged further westwards into Paterson Inlet; one bird left the inlet and foraged closely along the coast to Wooding Bay (Maori Beach) before returning to the nest after a night at sea. Camera data is yet to be fully analysed but preliminary assessment indicates very diverse feeding strategies with one bird feeding exclusively on krill in Big Glory Bay, another bird going after whitebait, while the remaining two cameras suggest that birds target larger fish species, e.g. mullets. Overall, it appears that the penguins experienced excellent foraging conditions with most bird performing half-day trips. The low number of nests likely do not reflect the feeding situation but may be owing to a loss of breeding birds during last season's mainland-wide starvation event as well as a very late start to the breeding season. High numbers of loafing adult on the island suggest that nest numbers could pick up again in the coming season. The study indicates that Rakiura/Stewart Island may represent a relative safe-haven for the hoiho mainland population and should receive increased monitoring attention in the future.

Results

Tommy Island, female, bird id: 982 009102645580, 4700 g, tawaki cam & AxyTrek, 29 November – 07 December 2019

The bird was guarding two healthy and active chicks (ca. 2 weeks old) at its nest when captured just after midday. It was fitted with GPS dive logger and camera logger and returned to its nest immediately upon release. It was relieved by its partner around 1500 hrs and left the island to forage. During the first hour of the trip the bird followed the southern coastlines of Paterson Inlet westwards, staying close inshore. Unfortunately, as it turned out, the camera deployed lacked appropriate shielding so that the electromagnetic interference generated by the device disrupted the GPS dive logger's functionality and drained the battery quickly. As a result, no GPS fixes were recorded after the camera started recording; dive data is only available for the first six hours of the trip. The camera logger itself recorded for approximately one hour, 20 minutes of which the bird spent at the surface preening.

The penguin's dives never exceeded 20 m depths. During the last 20 minutes of the video footage, the penguin started engaging in foraging behaviour and it appears as if it targeted primarily whitebait. This behaviour would explain the penguin's affinity for inshore waters.



Foraging tracks and dive profiles of female 982 009102645580 recorded on 30 November 2019. The green Plus-symbol indicates where video footage was recorded (and GPS functionality was disrupted by camera)



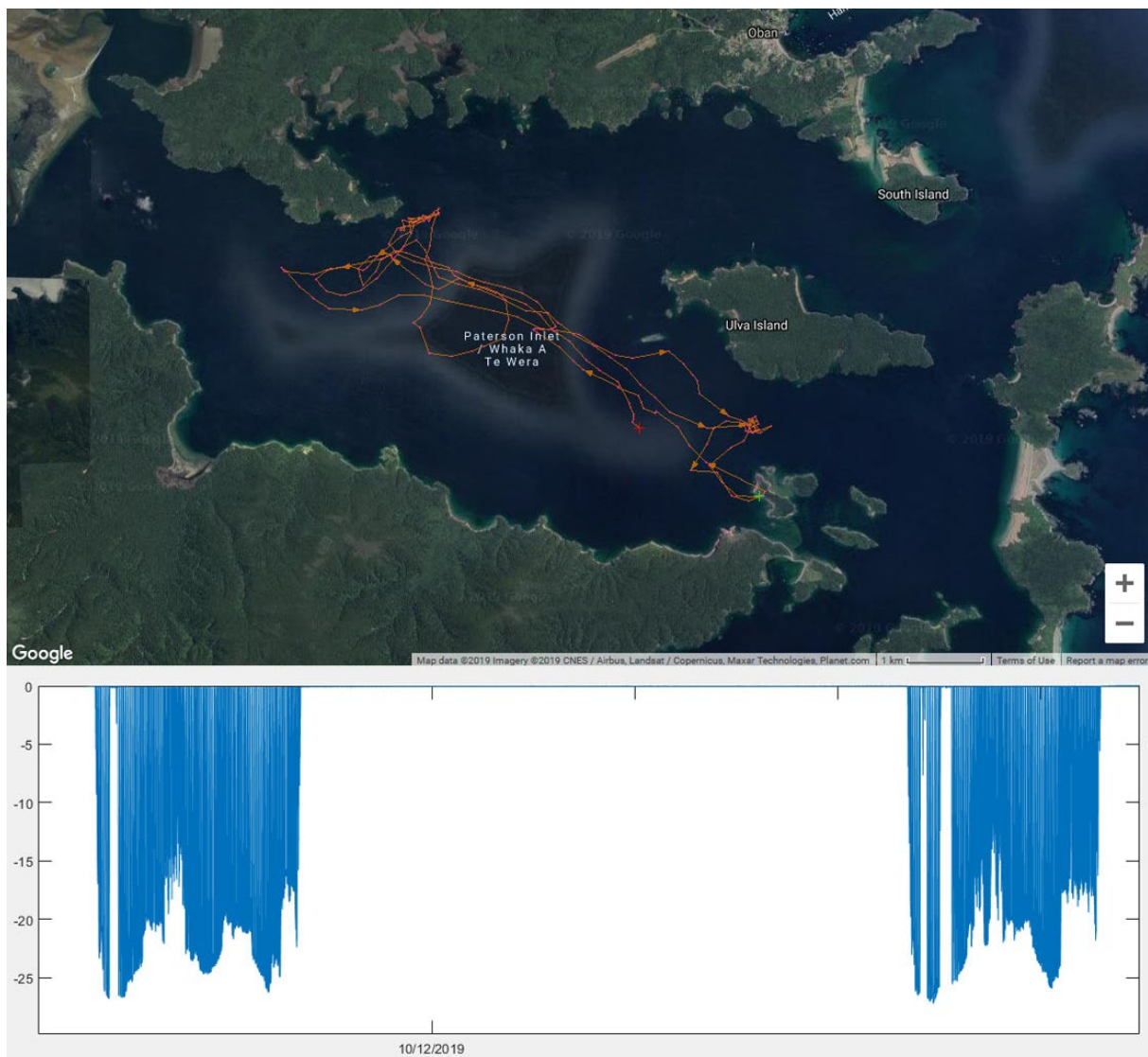
Female 982 009102645580 from Tommy Island initially foraging along the seafloor in southwestern Paterson Inlet.



Capturing whitebait near the surface.

Tommy Island, male, bird id: 982 009102431338, 5100 g, tawaki cam & AxyTrek, 09-11 December 2019

Two days after the recovery of devices from the female from nest TM1902 (see above) GPS and camera loggers were fitted to her mate around midday. The bird proved to be very skittish and ran off into the bush upon release. The nest was monitored for approximately 20 minutes to intercept any Weka intrusions until the penguin had returned to guard its chicks. The change-over occurred again just before 1500 hrs after which the male left for a half day foraging trip. It was re-sighted at the next the next morning but attempts to capture the bird and recover the camera were unsuccessful as the bird was extremely weary and would run off to disappear in the thick forest at the slightest indication of our presence. Two attempts of recapture were made that day, both unsuccessful. The bird was eventually caught at the nest in the morning of the following day. By this time, it had pulled off the camera, presumably while at sea; thorough searches around the nest site and along the path to the penguins' landing spot were fruitless. The GPS dive logger was still attached and contained data for two foraging trips. Both trips were afternoon/evening trips on which the penguin travelled across Paterson Inlet towards Prices Point some 8 km to the West of Tommy Island. Dive data suggests principally benthic foraging.



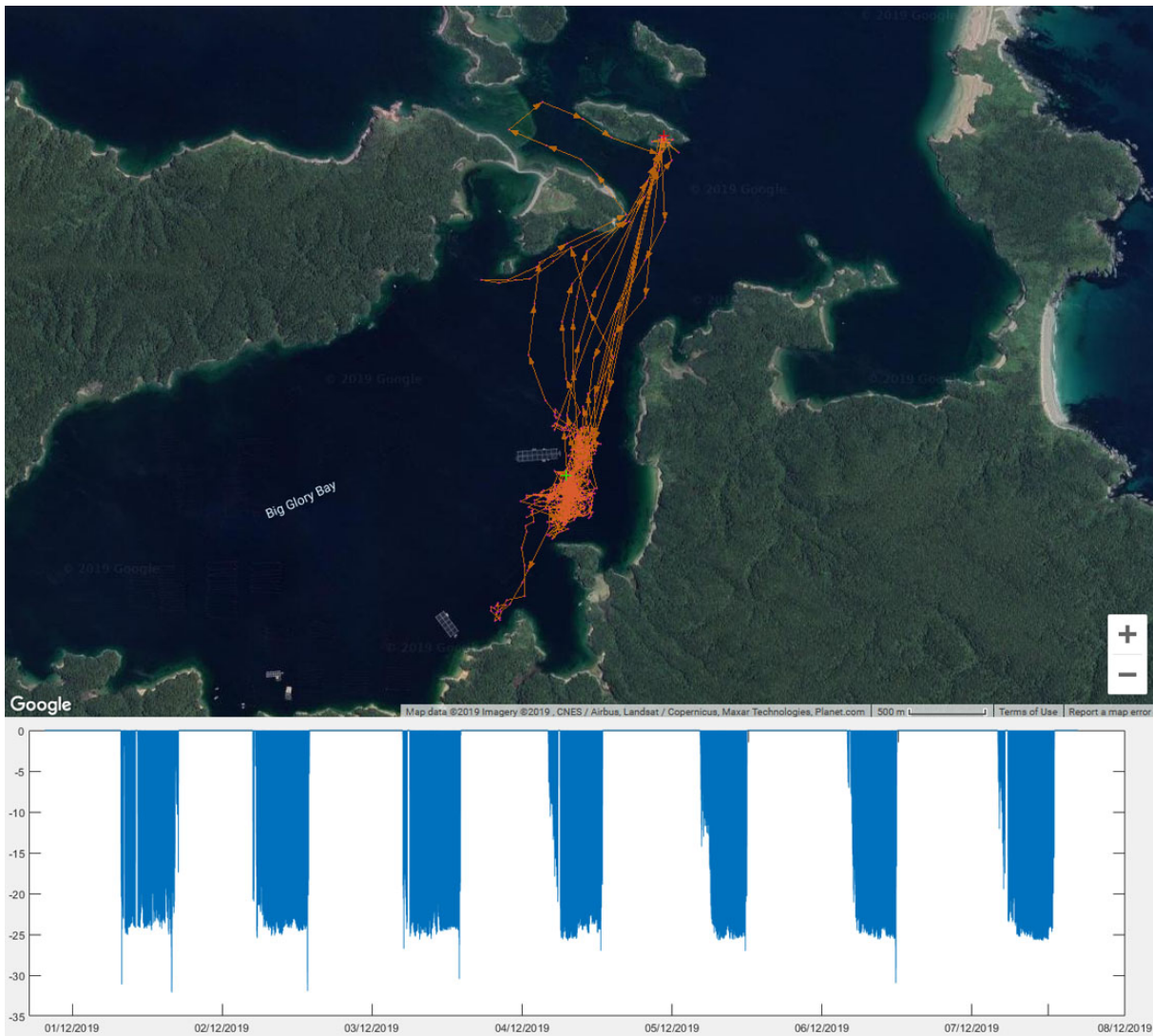
Foraging tracks and dive profiles of male 982 009102431338 recorded between 09 and 11 December 2019.

Goat Island, female, bird id 982 00036599962, 4600 g, tawaki cam & AxyTrek, 30 November - 7 December 2019

The female penguin was captured at her Goat Island nest containing two ca. 2-to-3-week-old chicks in the afternoon of 30 November 2019. The camera logger was successfully recovered in the morning of the following day while the GPS dive logger remained on the bird for a full week.

With the exception of a brief 30 minute side trip towards Tommy Island one afternoon, the penguin exclusively foraged in Big Glory Bay and stayed within 3 kilometres from her nest site. The bird was extremely consistent in her choice of foraging grounds and predominantly fed amongst the mussel farms to the east and south of the Sanford salmon farms. Although dives generally brought the bird close to the seafloor resulting in consistent dive depths of around 25 metres, it appeared to forage primarily pelagically. The camera footage suggests that the bird located prey from below and against the light of the surface in the otherwise turbid waters of the bay. During the 2.5 hours of video recording the penguin exclusively fed on krill which was very abundant.

Particularly noteworthy is that the penguin foraged in close vicinity of mussel lines and the associated moorings. The latter were densely covered by fouling of seaweeds and sea lilies effectively acting as artificial reef structures that likely attract potential penguin prey.



Foraging tracks and dive profiles of Goat Island female 982 00036599962 recorded between 30 November and 7 December 2019.



Female 982 000365999962 at the surface amongst mussel farm floats in Big Glory Bay

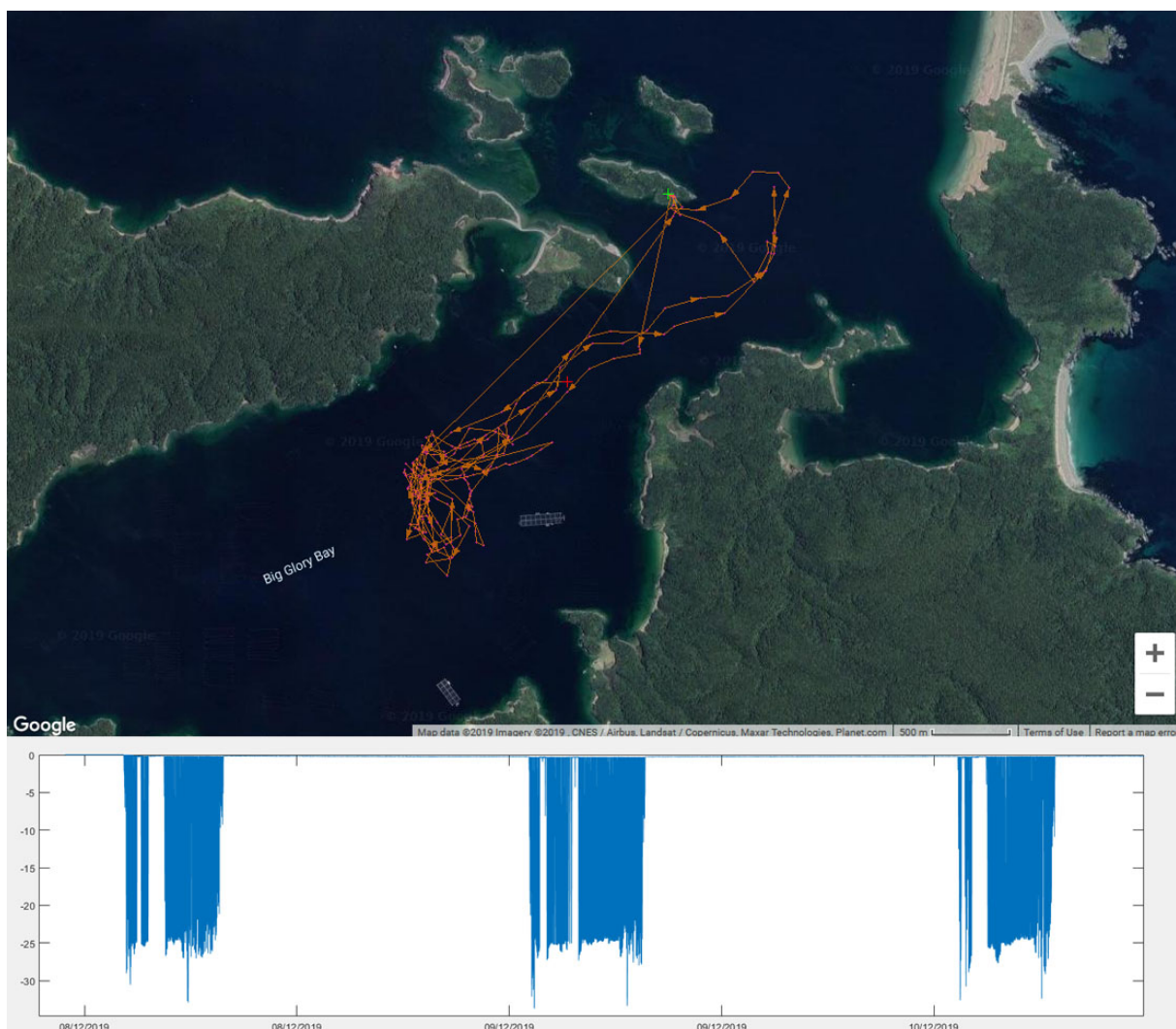


Pursuing krill in the vicinity of the mooring lines of the mussel farm. Note the fouling attached to the line acting as an artificial reef structure.

Goat Island, male, 982 009102724617, 5500 g, tawaki cam & AxyTrek, 8-11 December 2019

A day after the GPS dive logger was retrieved from its mate, the male penguin from the only active nest on Goat Island was fitted with GPS dive and camera loggers around lunchtime on 8 December 2019. The camera was recovered in the morning of the following day; the GPS dive logger was removed two days later.

During the deployment period, the bird performed three foraging trips all of which had a consistent destination, an area to the west of the salmon farms. The bird foraged predominantly along the seafloor. The camera logger recorded 2.5 hours' worth of footage while the bird was at its foraging destination. Full analysis of the footage is still pending, but random excerpts did not show any prey capture or pursuit. There was a noticeable variability in the visibility between dives with the penguin sometimes seeming to be diving in near complete darkness. Presumably, this was due to clouds temporarily obscuring the sun.



Foraging tracks and dive profiles of Goat Island male 982 009102724617 recorded between 8 and 11 December 2019.



Male 982 009102724617 about 500 m west of the salmon farm in Big Glory Bay.



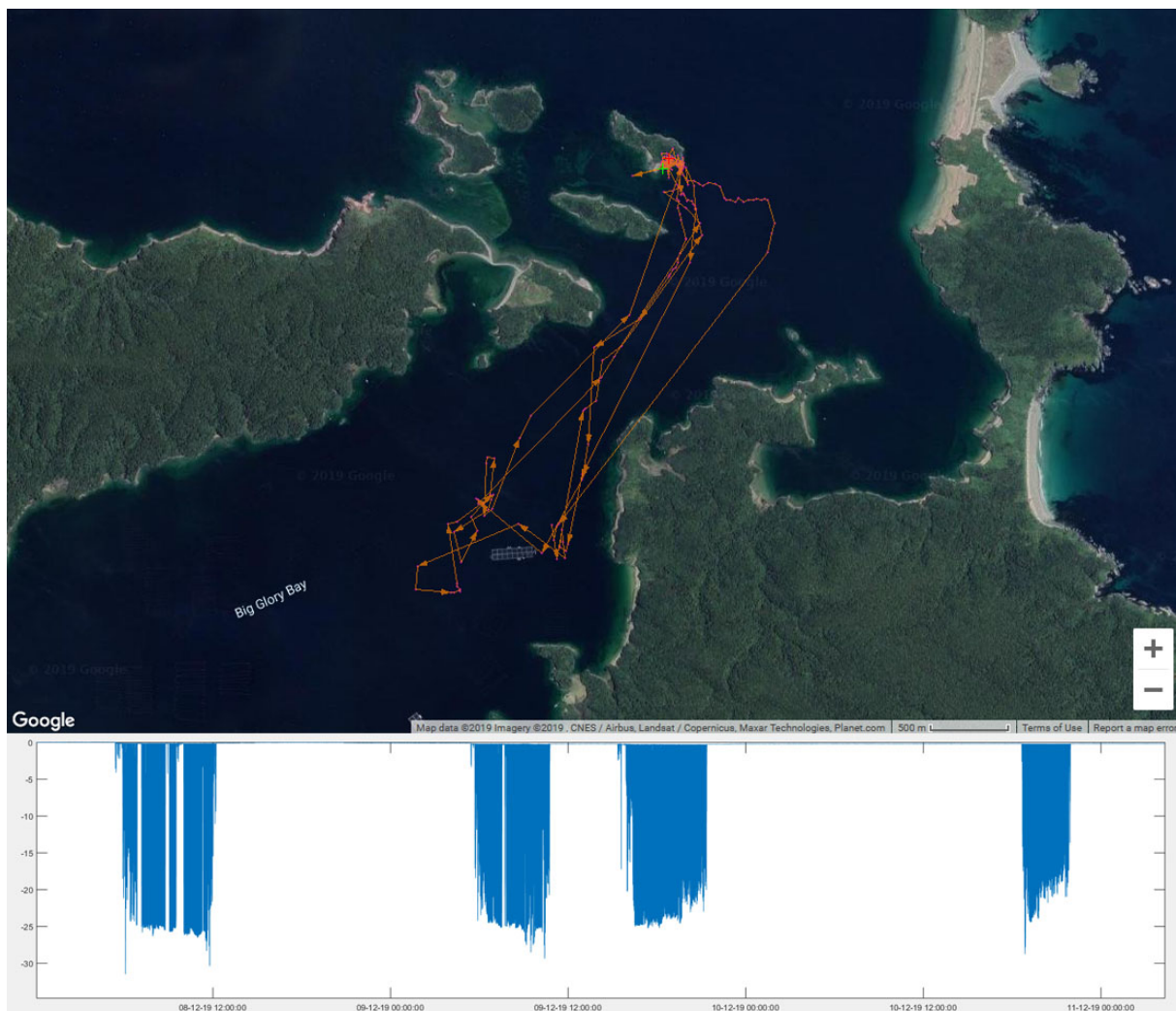
Screenshot illustrating the occasional poor visibility at the seafloor in Big Glory Bay.

Groper Island, male, 982 000033454002, 5600 g, tawaki cam & igotU/AxyDepth, 7-11 December 2019

On the only remaining nest on Groper Island after the first week of field work, the male was encountered in the evening of the 7 December 2019 and fitted with GPS dive logger and camera. While fitted with the camera, the penguin performed a half-day trip and returned with 2.5 hours' worth of video footage. The camera was recovered in the morning of the 8 December. The GPS dive logger remained on the bird for another three days. Interestingly, the penguin performed two 3-4 hour trips on 9 December 2019 while his mate was undertaking an overnight foraging trip out of Paterson Inlet (see below), so that the chicks were left unguarded while the penguin undertook these trips.

The penguin performed three foraging trips while fitted with the GPS dive logger. As with the two penguins from Goat Island, the bird foraged consistently in Big Glory Bay visiting both the mussel farm targeted by the female from GT1901 as well as the area west of the salmon farm that was the destination of the male penguins from the Goat Island nest.

The nearly 3 hours of camera footage – recorded on the same day as the poor visibility footage from the GT1901 male – showed that the penguin foraged along the seafloor. Spot checks of the video footage showed that the bird captured several 15-20 cm long fish which were tentatively identified as grey mullet.



Foraging tracks and dive profiles of Groper Island male 982 000033454002 recorded between 7 and 11 December 2019.



Male 982 000033454002 at the surface west of the salmon farm in Big Glory Bay.



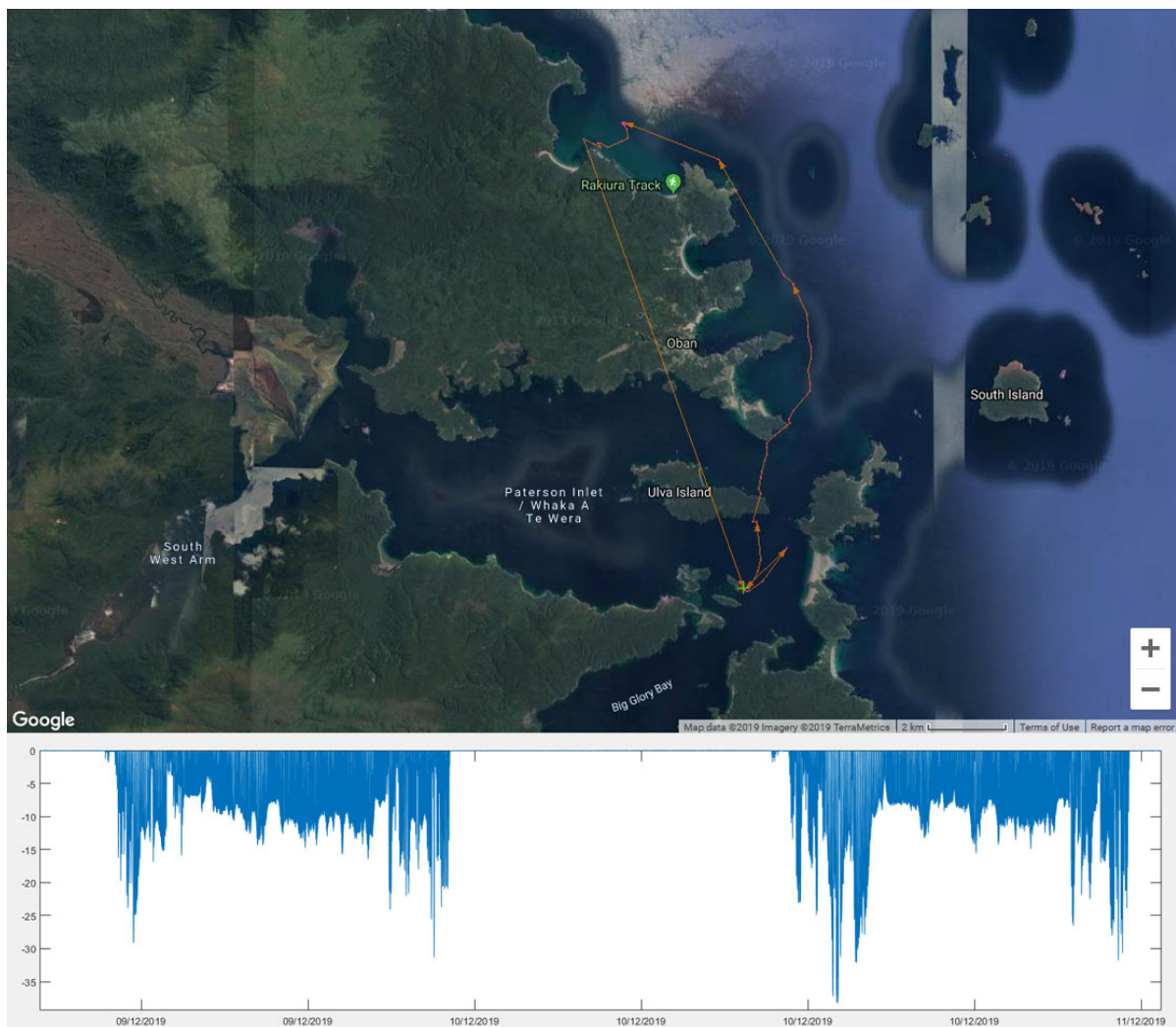
Prey capture of what has been tentatively identified as a grey mullet.

Groper Island, female, 982 000210215839, 4300 g, tawaki cam & AxyTrek, 9-14 December 2019

The female penguin from the last remaining nest on Groper Island was fitted with GPS dive and camera logger in the morning of 9 December 2019. Even though the nest was checked in the morning and evening of the following two days, only the male penguin was encountered guarding the chicks. Given that all other penguin so far performed mainly half-day trips this raised concern that the female had abandoned the nest, possible as a result of the deployment. In the evening of 11 December, a motion triggered trail camera was installed at the nest to monitor whether the bird returned at odd times. Parallely, preparations were made to uplift chicks for rehabilitation if abandonment became evident. However, the concern proved to be unwarranted. The female had returned after our evening check on 10 December and her mate had gone out for a 4-hour late-evening foraging trip preparing himself for another full day on the nest the next day.

The female was finally encountered on the nest around 1700 hours on 12 December 2019. From the trail camera footage, it was already known that the bird also had removed the camera while at sea and that only the GPS logger remained. The GPS data showed that the penguin had left Paterson Inlet and had followed the coast to Wooding Bay, north of Oban. Dive data indicate a mix of benthic and pelagic foraging which may suggest a similar foraging strategy as the Tommy Island female targeting whitebait had employed.

The bird was unmarked at the time of deployment and was inserted with a PIT tag upon recapture.



Foraging tracks and dive profiles of Groper Island male 982 000210215839 recorded between 9 and 12 December 2019.

Low nest numbers and breeding failures

The Bravo Group experienced a significant decline in nest numbers this year with only eight nests found compared to last year's 15 nests. The overall appearance of the state of the population gets even worse considering the failures of five of these eight nests in early December.

However, the observations on the ground contradict the initial impression of a dramatic decline these numbers would suggest.

Firstly, the nests that failed in early December had one thing in common – the birds had laid eggs very late. While the average hatch date for mainland hoiho is generally in the first week of November, the nests that failed were either still sitting on eggs on 30 November or had very small chicks that were <3 days old. It appears that the failed nests were 3-4 weeks behind schedule. This could mean that, if the adult penguins decided to go through with breeding, the fledging of these late-hatched chicks could conflict with the adults' preparation for the annual moult.

Moreover, the conditions of chicks in older nests were excellent. The chicks from the Groper Island nest nearly doubled their weight over the course of only three days, from 1400 and 950 grams on 11 December to 2100 and 1700 g on 14 December.

Finally, there was a substantial amount of non-breeding birds present on all islands as evidenced by calls in the evening. On 7 December, eleven non-breeding birds were counted on Groper Island.

All this combined may be explained as follows.

The starvation event of the 2018/19 season that affected the entire mainland population, may have resulted in a drop in female penguin numbers (females are generally significantly lighter than males and, therefore, presumably more prone to starvation). As a result of this, new pairs may have formed, probably with younger, inexperienced birds that have higher breeding failure rates. This combined with the very late lay dates probably increased the chance of adult penguins aborting their breeding attempts.

So, rather than a catastrophic event occurring in the current season it seems more likely that nest numbers as well as abandonment rates may in fact be an echo of the disastrous 2018/19 season.

Overlooked importance of Rakiura/Stewart Island for hoiho conservation

The foraging data obtained, and observations made on the island during the 2.5 weeks on the Bravo Group islands highlighted that hoiho in Paterson Inlet likely enjoy significant advantages over conspecifics from the mainland:

- by remaining within the inlet, the birds are not exposed to disruptive fisheries activities such as bottom trawling/oyster dredging and set netting;
- the lack of agricultural businesses on Rakiura/Stewart Island as well as the island's up-current location from South Island rivers known to carry substantial amounts of pollutants, likely has a beneficial effect on water quality and, thus, marine habitat for hoiho (the effects of organic pollution from marine farms in Big Glory Bay needs some consideration, though);
- likewise, the lower human population density on Rakiura/Stewart Island likely results in less pollution from sewage outfalls than the mainland hoiho populations are exposed to;
- the absence of mustelids on Rakiura/Stewart Island as well as the low numbers of (uncontrolled) dogs are another boon for local hoiho populations.

Overall, it would appear as if hoiho on Rakiura/Stewart Island have considerably fewer environmental problems to deal with than their mainland counterparts. This probably creates a scenario where well-dosed management efforts could result on high conservation pay-off. This southern hoiho population may not only have a greater chance of withstanding the projected demise of the species on the mainland but could also act as a seeding population should the conditions for hoiho on the mainland ever improve again.

In this light, it would seem as if the importance of Rakiura/Stewart Island for the preservation of the species on NZ mainland is being overlooked.

Currently, there are three visits per season to the monitor breeding effort and outcome to the Bravo Group and two sites along the Anglem Coast. This is insufficient to gain at least a basic understanding of what is driving population numbers on Rakiura/Stewart Island.

Diverting some of the resources from the mainland to increase the monitoring capacity on Rakiura/Stewart Island would provide a much clearer picture about how the local hoiho population is able to deal with the inevitable consequences of climate change, and provide conservation with the baseline information required to develop management actions for a part of the New Zealand mainland, where such actions may have the greatest impact.

Next steps

Originally it was planned to obtain tracking data from Paterson Inlet as well as Port Pegasus in the South of Rakiura/Stewart Island. However, logistic constraints, low nest numbers, and the lack of monitoring information made work in Port Pegasus unfeasible this season. It would be prudent to obtain more information about the marine and breeding ecology of hoiho from the central and southern parts of Rakiura/Stewart Island. However, considering that this project currently will conclude in October 2020, i.e. ahead of the crucial chick rearing period, it appears as if this information will remain unavailable.

A 6-month contract extension would allow further work on Rakiura/Stewart in the coming breeding season.