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## A survey of Fiordland crested penguins (*Eudyptes pachyrhynchus*): northeast Stewart Island/Rakiura, New Zealand, September 2019

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**Abstract:** A ground survey of Fiordland crested penguins (tawaki; *Eudyptes pachyrhynchus*), breeding between Lee Bay and White Rock Point, northeast Stewart Island was carried out from 1–6 September 2019, to obtain a population estimate for the area. A total of 128 nests was found along the ~40 km of coast, 107 of which were located in caves on the cliffy shoreline rather than in the forest as is typical of South Westland breeding areas. Access along this coast is often difficult; however, the confinement of most nests to caves allows for a more accurate search than in forest colonies such as those in South Westland and Milford Sound. The results of this survey suggest that a significant breeding population is present on mainland Stewart Island and needs to be considered in future management plans for the species. Additional surveys of the remaining ~700 km of coastline should be conducted to obtain a better estimate of the entire population.

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### INTRODUCTION

The Fiordland crested penguin, or tawaki, (*Eudyptes pachyrhynchus*) breeds only in New Zealand along the coastline of South Westland, Fiordland, Stewart Island / Rakiura and offshore islands (Mattern 2013). With the exception of a few South Westland colonies such as Munro Beach, Murphy Beach, and Jackson Head, tawaki breeding sites are located in difficult to access areas and experience a minimal amount of human disturbance on land. Tawaki are classified

as Near Threatened with a population estimate ranging from 12,500–50,000 mature individuals (BirdLife International, 2021) and are among the rarest of the penguin species.

From 1990–1995, a series of population surveys conducted by Ian McLean and colleagues throughout the range of the species attempted to census the entire population (Mattern & Wilson 2019). Stewart Island and its offshore islands were surveyed in late July and early August 1993 (Studholme *et al.* 1994). Thirty-two tawaki were counted on beaches around the south, southwest, and southeast coasts from a boat, along with one

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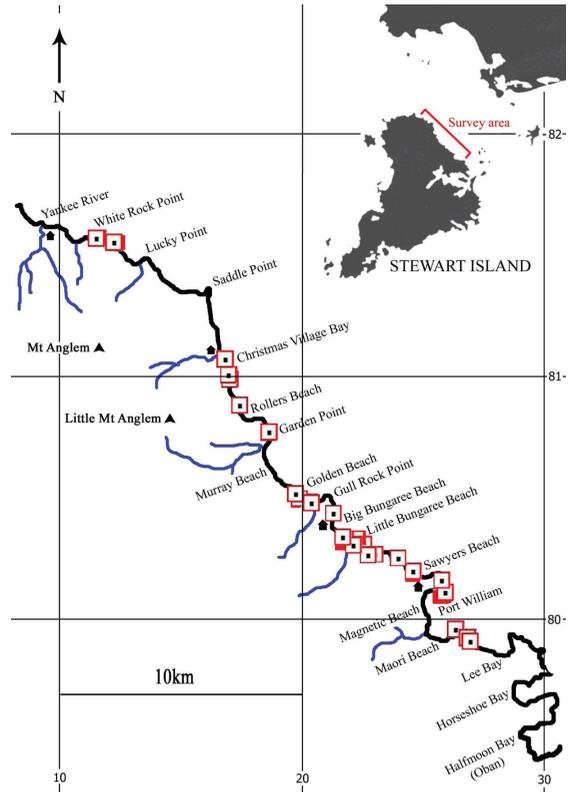
in Easy Harbour and two in Port Pegasus. It was concluded that the mainland Stewart Island population is very low. However, more recently, Thomas Mattern estimated a minimum population of 50 breeding pairs between Halfmoon Bay and Rollers Beach while working with yellow-eyed penguins in the area (Mattern & Long 2017) and it is generally accepted by local fishermen and conservation field staff that a reasonably sized population is present around the Stewart Island coastline (Sandra King *pers. comm.*).

Therefore, it was considered a high priority to conduct an accurate ground count of the tawaki population breeding on the Stewart Island mainland as it would be impossible to assess population trends and protect the species in this area without initial survey data (Mattern & Wilson 2019).

## MATERIALS AND METHODS

The northeast coast of Stewart Island was chosen for this survey as it is the most accessible by foot and was a known location of breeding tawaki (Mattern & Long 2017; Sandra King *pers. comm.*). This coastline consists of sandy bays, occasional boulder beaches, and cliffy headlands with caves sometimes extending many metres inwards that provide habitat for breeding tawaki. From 1–6 September 2019, approximately 40 km of coastline from the end of the road at Lee Bay, to White Rock Point (Fig. 1) was searched on foot by Robin Long and Simon Litchwark for presence of tawaki. The majority of the search had to be carried out between half- and low-tide as much of this coast is impassable at high tide and some tawaki breed in caves with entrances below the high-water mark. Basic rock climbing and on one occasion swimming were used to navigate some of the steeper sections of coast and occasionally it was necessary to walk inland around bluffs to access and survey the shore from the far side. The combination of these methods enabled access to every section of coast, however steep or difficult. Most tawaki were found breeding in caves in the sea cliffs so it was necessary to search every cave as far as feasible using a head torch. A few caves had nests too close to the entrance to allow for a complete search without undue disturbance; however, in general an accurate count of nests could be made. Sandy beaches were searched for footprints and boulder beaches were searched along the forest edge for scat marks and claw marks on rocks indicating entry points. Our team of two spent a total of 30 hours searching the coastline for tawaki.

GPS locations of nests or nesting groups were recorded as reference for future surveys. A 'nest' was recorded if a tawaki was found sitting prone on a nest bowl, with or without its mate. Nest contents were not checked in order to reduce disturbance



**Figure 1.** Locations of tawaki (*Fiordland crested penguin* *Eudyptes pachyrhynchus*) nests found between Lee Bay and White Rock Point, Stewart Island 2019. Numbers correspond to NZTM Topo maps.

to the breeding birds, but any eggs or chicks sighted were recorded. A few nests were found containing eggshells from this season which had been abandoned. These were counted but noted as 'already failed'.

## RESULTS

A total of 128 nests was found along the approximately 40 km of coastline between Lee Bay and White Rock Point. Of these, 107 (84%) were located in caves (Fig 2.) and the remaining 21 were either in the forest or amongst rocks at the forest edge.

### Lee Bay to Maori Beach, 1 September 2019

Most of this section of coast revealed no sign of tawaki; however, seven nests were found in three caves on rocky headlands. One of these caves may have contained more nests but could not be searched properly without disturbing one at the



**Figure 2.** Northern Stewart Island coastline and cave nesting habitat of Fiordland crested penguins (*Eudyptes pachyrhynchus*).

entrance. An additional two adult penguins were found which were not breeding.

#### **Maori Beach to Magnetic Beach, 6 September 2019**

A steep headland between two long sandy beaches contained several sea caves; however, neither the headland nor beaches had any sign of tawaki. This was the most inaccessible area encountered during the survey and it was necessary to swim around sections of cliff to access the caves. None was deep enough to provide nesting habitat for tawaki.

#### **Magnetic Beach to Sawyers Beach, 2 September 2019**

Around this rocky headland there were many caves of varying sizes, some containing up to six breeding pairs of tawaki. A total of 17 nests was found.

#### **Sawyers Beach to Little Bungaree Beach, 3 September 2019**

Twenty-two nests were found in groups of 1–5 in caves along this stretch of rocky coastline.

One of these caves was likely undercounted due to a nest near the entrance which could not be passed without disturbance and there was an additional nest bowl which appeared recently used but had no eggshells present.

#### **Little Bungaree Beach to Murray Beach, 4 September 2019**

Little Bungaree Beach and Big Bungaree Beach are both sandy and had no sign of tawaki present; however, there were nests on the headland between these sites. Two small rocky islands on Big Bungaree Beach were also searched but had no suitable habitat. Tawaki were present in caves along the cliffs to Gull Rock Point and around to Golden Beach. At the western end of Golden Beach, the first previously known nests were located in a cave as described by Thomas Mattern (*pers. comm.*). In total, 23 nests were found between Little Bungaree Beach and Murray Beach but a few more may have been present in the rear of some caves. One of these nests had already failed.

**Murray Beach to White Rock Point, 5 September 2019**

The habitat from Murray Beach almost all the way to Garden Point was very similar to South Westland tawaki breeding areas: a boulder beach with sloping mature forest behind. However, despite thorough searching, the beach and forest edge revealed no sign of tawaki in the area. The first nests were found in two caves on Garden Point, then no more until Rollers Beach where they had been recorded previously (Thomas Mattern *pers. comm.*). The maximum number of nests found in one cave was 10, on a headland southeast of Christmas Village Hut. The beach from Christmas Village Hut to Lucky Beach was a mixture of boulders and sand and revealed no sign of tawaki. Because the coast was not so cliffy in this area it was possible to continue searching past half tide and the first group of tawaki breeding in the forest were found up a small stream just east of White Rock Point. Another group of seven was in the forest, and a final six amongst boulders at the forest edge on the western side of White Rock Point.

In total, 59 nests were located between Murray Beach and White Rock Point. Of these, 21 were in the forest or at the forest edge. A few nests may have been missed in the rear of caves and the first newly hatched chicks were heard in a few of the nests. The survey was not continued beyond White Rock Point due to time constraints.

**Table 1.** Number of tawaki (*Fiordland crested penguin* *Eudyptes pachyrhynchus*) nests counted at various sites between Lee Bay and White Rock Point, Stewart Island, New Zealand, 2019.

Location	Number of nests counted
Lee Bay – Maori Beach	7
Maori Beach – Magnetic Beach	0
Magnetic Beach – Sawyers Beach	17
Sawyers Beach – Little Bungaree Beach	22
Little Bungaree Beach – Murray Beach	23
Murray Beach – White Rock Point	59
<b>Total</b>	<b>128</b>

**DISCUSSION**

The results of this survey show that a minimum number of 128 pairs of tawaki breed along the north-eastern Stewart Island coast between Lee Bay and White Rock Point. In South Westland, tawaki breed throughout wide areas of coastal forest where it is impossible to comprehensively search the entire area for nests and therefore very difficult to

obtain accurate population estimates (Long 2017). Although access to breeding locations involved difficulties such as rock climbing, swimming, and crawling into tight caves, we believe our counts missed only a small number of nests, such as those located in the rear of caves that could not be accessed without causing undue disturbance of penguins closer to the entrance. Therefore, the total number provided should be considered a conservative estimate. Compared to tawaki population surveys conducted elsewhere (Long 2017; Mattern & Long 2017) the relative confinement of tawaki breeding colonies to caves makes determination of population numbers more reliable and repeatable. However, experience with tawaki nest searching as well as low grade rock-climbing skills are essential.

The sea cave habitat of Stewart Island tawaki is markedly different to the forest breeding habitat throughout South Westland and Milford Sound (Long 2017; Mattern & Long 2017). On Stewart Island, despite long boulder beaches fringing sloping coastal forest, a habitat very reminiscent of tawaki core breeding areas in South Westland, the majority of nests were restricted to rock caves in the coastal cliffs. Only two nesting groups were found in the forest along the approximately 40 km of coastline. Both of these groups were at the western end of the survey around White Rock Point and it is possible that a greater proportion of nests may be found in the forest beyond this point. The Stewart Island population appears much more scattered than those found in South Westland with the largest nesting group consisting of only 10 nests and large distances between many groups. Nests were found in the majority of caves which were deep enough to accommodate them, and the number of nests could not increase significantly without exceeding the available cave habitat and overflowing into the surrounding forest. These results suggest that caves, if present, may be the preferred nesting habitat of tawaki.

There is evidence that a similar scattered population of tawaki is present around much of the rest of Stewart Island. Thomas Mattern observed another breeding site near Yankee River (Thomas Mattern *pers. comm.*). There are reports from local fishermen of additional sites along the northern coast, in Port Pegasus in the South and within Halfmoon Bay close to the only human settlement on the island (Sandra King *pers. comm.*). Nesting has also been documented in a cave in Horseshoe Bay (Braydon Moloney *pers. comm.*).

It is recommended that an attempt be made to survey the remainder of the coastline between Halfmoon Bay and Mason Bay, as well as Port Pegasus. The rest of the island is relatively difficult to access and may not be worth the investment of time. It is difficult to suggest a population

estimate for the whole of Stewart Island based on this 40 km section as the numbers appear highly dependent on local habitat. On nearby Codfish Island/Whenua Hou, tawaki predominantly breed along the northern and eastern coastlines and are less numerous in the southwest, a pattern that also applies on Solander Island (Studholme *et al.* 1994). It appears that stretches of coast more exposed in south-westerly conditions may be less suitable for the penguins. Mattern (2013) describes the tawaki breeding range on Stewart Island from Rugged Bay (northwest) along the eastern coastlines down to Port Pegasus (southeast), i.e. about half of the coastline. This theory is supported by the observations of Tara Mulvany who kayaked around Stewart Island during November 2013 and saw several hundred tawaki swimming in the water close to shore, mostly along the eastern coastline south of Patterson Inlet (Tara Mulvany *pers. comm.*). Stewart Island comprises around 750 km of coast, almost 100 km of which falls within the shallow Patterson Inlet where tawaki seem to be absent (Thomas Mattern *pers. comm.*). This leaves around 275 km of coastline within the described range that may be occupied by tawaki. Extrapolating our results to this length would suggest that around 880 pairs of tawaki breed on Stewart Island.

The results of this survey are very different to those of the Studholme *et al.* (1994) survey which counted only 32 tawaki along the coast of Stewart Island and recorded no nests. It is difficult to provide a comparison between these results as Studholme *et al.* (1994) did not search the northern stretch of coastline where this survey was focussed. The 1994 survey was conducted in late July and early August using a boat to search the shore for tawaki or signs of tawaki (Studholme *et al.* 1994) rather than physically checking all available habitat for nests. Movements of adults across the beach are infrequent this early in the incubation period so the low numbers counted may not actually have represented a small population. While surveying the northern coastline we found many cave entrances which were small and easy to miss and in order to conclude that a cave was unoccupied it was necessary to enter and check for nests at the rear.

There is anecdotal evidence from local skippers to suggest that the Stewart Island tawaki population has increased since 1994. However, as our survey methods were very different and focussed on

different areas to those of Studholme *et al.* (1994), our results cannot reliably support an increase in population.

Therefore, although further surveys are necessary to provide a more robust total estimate for the island and its outliers, we conclude that this is an important area for the species and continued research as well as management of this population are needed.

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