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SHORT NOTE

Breeding attempts by Fiordland crested penguins/tawaki (*Eudyptes pachyrhynchus*) on the Otago Coast

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Three nesting attempts by Fiordland crested penguins (*Eudyptes pachyrhynchus*), or tawaki, have been noted on the Otago coast since October 2010. The breeding range of tawaki is reported as being confined to islands within Foveaux Strait, including Stewart Island (Rakiura), Codfish Island (Whenua Hou) and Solander Island (Hautere), as well as Fiordland and the West Coast of the South Island of New Zealand south of Heretaniwha Point (Mattern 2013). Dispersal of tawaki away from these breeding areas outside the breeding season is widely reported, and it is assumed that these birds are juvenile or non-breeders (Marchant & Higgins 1990a; Mattern 2013). Previous extra-limital breeding attempts have been reported at Palliser Bay in 1953 and 1954, and suggested but not confirmed on Banks Peninsula (Falla 1954; Gill *et al*. 2010). This short note reports our observations of 3 tawaki breeding attempts in Otago.

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Long Point/Irahuka, Catlins

A tawaki nesting attempt was recorded at Long Point (Irahuka), Catlins (46° 34′ S, 169° 34′ E) on 21 October 2010. During routine nest searches for yellow-eyed penguins (hōiho; *Megadyptes antipodes*), a prone tawaki was found incubating 2 eggs (Fig. 1). On a revisit to the nest on 3 November 2010, the lengths of both eggs were measured with vernier callipers (Table 1), but breadth measurements were not taken. The tawaki attending the nest weighed 3.3 kg. The nest was a small rock cave with a shallow earthen bowl. On 23 November 2010 the nest was found abandoned and a single egg and a freshly dead neonate chick were found in the nest bowl; no adults were present. The chick carcass was assumed to be that of a tawaki chick rather than hōiho because of the

Fig. 1. Adult tawaki at a nest on Long Point, Otago, October 2010.

wispy light-coloured primary down on the chest of the chick; hōiho chicks are uniformly covered in brown down.

A vagrant or non-breeding tawaki had been recorded at Long Point/Irahuka within the vicinity of the 2010 nest since 2007. This bird was regularly seen during nest visits in October to December of each year from 2007 to 2009 and was assumed to be resident over this period. It is possible this vagrant bird was one of the birds attending this nest.

Waterfall Bay, Otago Peninsula

The second observation of a tawaki nest was at Waterfall Bay, Otago Peninsula (45° 54′ S, 170° 37′ E) during a nest search for hōiho. On 7 October 2011 a tawaki was lying prone on 1 egg in a rock crevice, within 2 m of an active hōiho nest containing 2 eggs. The egg appeared to be smaller than that of a hōiho egg, however it was not measured as the nest could not be easily accessed. A re-visit to the nest on 15 December 2011 revealed that this nest had failed, and no trace of the egg was found.

A tawaki was seen moulting at Waterfall Bay in February 2012 near to a pair of pre-moult hōiho, and a pair of tawaki were seen with one bird in full moult on 12 February 2013. During the February 2013 visit, both tawaki actively defended an area they were sharing with 2 fully-fledged hōiho chicks (G.P.D. Brannigan, *pers. comm*.).

Tunnel Rocks, Catlins

A third possible nesting attempt at Tunnel Rocks, Catlins (46° 30′ S, 169° 42′ E) was observed on 30 October 2011 during a survey of hōiho nest distribution. An adult hōiho (J12575) was observed 'keeping company' with an unmarked tawaki in a rock crevice. Keeping company in this context means 2 birds observed together which are actively interacting with each other (Richdale 1957). Two abandoned penguin eggs were seen nearby to the rock crevice, one of which was obviously smaller than the other. The eggs were measured and were observed to be more spherical than the typical oval-shaped hōiho eggs. On handling of the eggs it appeared they were light in mass and were addled; based on observations from previous seasons when it is common to find eggs in nest bowls from previous seasons we concluded that they had been laid in 2010.

The same hōiho (J12575) was seen in November 2007 at Tunnel Rocks, keeping company with a tawaki in the same general area as it was seen in 2011 (D. McFarlane, *pers. comm*.).

Egg measurements for the 2 tawaki nests we were able to access were compared with published accounts of egg size both both tawaki and hōiho (Table 1). Our measurements of egg lengths for the nest at Long Point indicated a dimorphism between the 2 eggs, and whilst the eggs were longer than the means summarised by Mattern (2013), they were within the reported range of tawaki eggs (Table 1).

Egg-laying for tawaki is reported to be initiated and completed between 30 July and 9 August of each year (Marchant & Higgins 1990a; Mattern 2013). The observations we made of 2 active tawaki nests

Table 1. Published and observed egg size for A- and B-eggs of tawaki (*Eudyptes pachyrhynchus*) and hōiho (*Megadyptes antipodes*). Sizes given are length by breadth in millimetres unless otherwise stated.

Species	A-egg range	B-egg range	Source
Hōiho (*M. antipodes*)	68-83 x 51.5-60.5 71.5-80 x 51.8-60.7	70-85 x 51.25-62.5 71.5-80 x 51.8-60.7	Richdale (1957) Marchant & Higgins (1990b)†
Tawaki (*E. pachyrhynchus*)	59-75 x 44-56	65-78 x 51–59	Warham (1974)
Tawaki nest, Long Point	73 length	77 length	This study
Tawaki nest, Tunnel Rocks	67 x 47	72 x 55	This study

†Data summarised from J.T. Darby, *pers. comm*.

at Long Point during October 2010 and Waterfall Bay in October 2011 are not consistent with this breeding phenology within the known breeding range.

On 8 November 2010 a remote camera was set up to determine if there was interchange of 2 tawaki at the Long Point nest; however, no interchange of any birds was observed over a 15-day observation period, with 1 bird remaining on the nest at all times. During the period the remote camera was deployed, a tawaki was recovered decomposed from Purakaunui Bay (46° 32′ S, 169° 36′ E), *c.* 3.5 km northeast of the nest at Long Point. It is possible this was the mate of the lone bird on the nest.

Tawaki and hōiho are generally considered to have separate ranges in southern New Zealand, with the exception of overlapping ranges on Stewart Island and offshore islets within Foveaux Strait. Tawaki are regular post-breeding visitors to the Otago coast, with birds coming ashore to moult from January to April each year, although published records of these visits are scant. For example, in February 2015 there were at least 6 tawaki recorded on the Otago coast as moulting. In comparison, anecdotal reports from 2014 consisted of 1-2 birds in a similar range and time. We hypothesise that there is a small number of resident individuals of tawaki on the Otago coast, and that intraspecific interactions in existing breeding habitats in the Southern Islands are intense enough to deter new recruits to the breeding population from using existing habitats, and consequently these younger birds are having to seek new areas in which to nest. It is also possible that this species is recolonising an area from which they were extirpated after human colonisation of New Zealand. We acknowledge that records of this long-range dispersal away from the known range of tawaki are lacking, as is our ability to identify individuals within Otago.

To be able to investigate these hypotheses would require that tawaki on the Otago coast be marked with subcutaneous transponders to aid future identification of individuals.

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