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SHORT NOTE

Breeding of variable oystercatcher (*Haematopus unicolor*) at the Port Waikato sandspit, North Island, New Zealand

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The variable oystercatcher (*Haematopus unicolor*) is an endemic species breeding in coastal habitats around New Zealand. Under national threat rankings the species is listed as Recovering. (Robertson *et al*. 2017). Variable oystercatchers have been reported as scarce on the west coast of the North Island between the Manawatu Estuary and Auckland (Sagar et al. 1999). Most pairs breed on sandy beaches and sandspits and are particularly concentrated around the mouths of streams, rivers, and estuaries (Dowding 2014).

The breeding biology of the species is outlined, but there have been few detailed studies (Rowe 2008; Dowding 2014). This short note reports observations on the breeding success of variable oystercatchers at the Port Waikato sandspit, from October 2017 to March 2018.

The sandspit is situated in the estuary of the Waikato River (37°22′09″S, 174°42′11″E) on the west coast of the North Island. The sandspit has a shoreline that extends for 1,000–1,250 m consisting of sandy beach on the western side and riverbank on the east. The eastern side consists mainly of bare sand with areas of shell, driftwood, and some dead vegetation. There are also some small lightly vegetated dunes. Part of the sandspit is fenced during the breeding season, to protect birds against human disturbance.

The population of variable oystercatchers was followed during the breeding season, between 18 October 2017 and 4 March 2018. Observations were usually made at intervals of one to two days. During high tide on 17, 21, and 24 November, the numbers of pairs were counted while they were sitting near the waterline, and their plumage was noted. Variable oystercatcher plumage varies from a pied morph to an entirely black morph, with an apparently continuous range of intermediate 'smudgy' birds (Dowding 2014). This made it possible to identify six pairs of variable oystercatchers on the sandspit. No fully pied phase variable oystercatcher was recorded breeding in this study.

The nests were scrapes in the sand lined with fragments of driftwood and sometimes also with a clump of dead plant material. All, except one nest, were situated in the north, north-east, or east part of the sandspit, each with a clear view over the river. The distance between the nests and the river (mean waterline) varied between a minimum of 35 m (nest

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no. 6), and a maximum distance of 115 m (nest no. 10).

On the sandspit a total of 11 nesting attempts were recorded, with four nests within and seven nests outside the fenced area. Because of this the fenced area was adjusted during the breeding season, so that by the end of breeding nine nests were within and two were outside the fenced area.

The first eggs were found on 20 October and the last egg on 19 January. Most nests were found in the second part of December (Fig. 1). Of the six pairs that nested, five failed with the first clutch; however, all laid a replacement clutch. From the 11 nest attempts seven were lost before hatching. Two nest attempts were washed away by high tides, but the cause of loss of the other five nests is unknown. One nest with a 3-day old chick was washed out. A total of 17 eggs were laid in the eleven nesting attempts. Eggs are generally laid at 48-hour intervals with a general range of 2–3 eggs (Heather & Robertson 1996). Therefore, a nest found with 1 or 2 eggs was disregarded as the next visit could not verify if the clutch was complete before being lost. Using this criterion seven nest attempts could be considered as complete clutches, with five nests with two eggs and two nests with one egg, a total of 12 eggs and an average clutch size of 1.7 eggs (Table 1) in the completed clutches.

Hatching occurred in January. The first chick hatched on 7 January and the last on 28 January. Five chicks hatched, representing 42% of eggs from completed clutches and 29% of all eggs laid. The mean brood size of the completed clutches was 0.71 chicks/clutch. Two chicks fledged, this comprised 17% of eggs from completed clutches and 12% of all eggs laid. The average rate of fledging was 0.29 birds/completed clutch. The breeding population was six pairs, and so 0.33 birds/pair fledged (Table 1).

Most pairs of variable oystercatcher breed on sandy beaches and sandspits and are particularly concentrated around the mouths of streams, rivers, and estuaries. A total of 78% of the breeding population breed on sandy beaches (Marchant and Higgins 1993). In this type of habitat, densities at some North Island sites can be high (Dowding 2014). The 1,000–1,250 m-long Waikato River sandspit had a total of six breeding pairs, a density of 10 birds/km. According to Dowding (2014) high densities (50–62 birds/km) are found on sandspits. Much lower densities are found on rocky shores, such as in the Marlborough Sounds, 0.49 birds/km, during the period September to December 2006 (Bell 2010) and Wellington Harbour, around 0.70 birds/km, during the period September to January, 1986–1988 (Robertson 1992). These densities were recorded

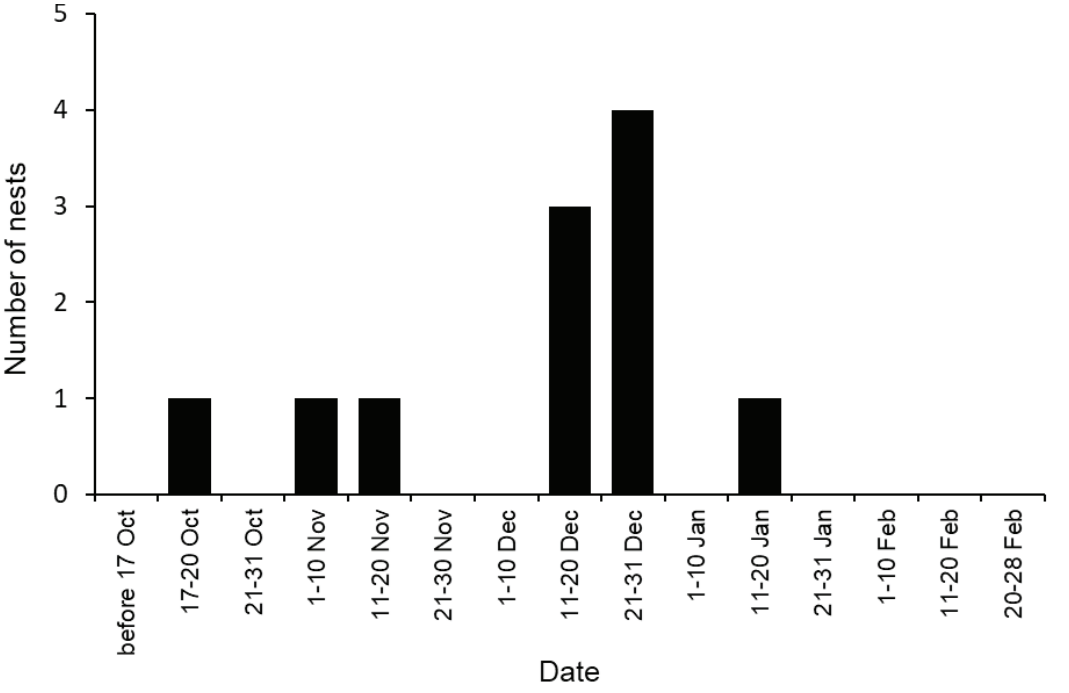

Figure 1. Nests laid per period from commencement of observations on 17 October. In most cases periods are ten days, some periods are adjusted to fit the months.

Table 1. Summary of variable oystercatcher breeding success at Port Waikato sandspit.

Variable	Value
Total nest attempts	11
Total eggs laid	17
Number of known complete clutches	7
Number of eggs in these complete clutches	12
Mean clutch size (eggs/complete clutch)	1.7 eggs/complete clutch (range 1–2 eggs)
Number of eggs hatching	5
Mean brood size (chicks/complete clutch)	0.71 chicks/complete clutch
Number of young flown	2
Mean fledging (chicks flown/pair)	0.33 chicks/pair

during annual census by boat, bicycle, or by foot.

The density of 10 birds/km at the Waikato River is relatively low for a sandspit and is more consistent with the density of breeding pairs (11 birds/km) found on rocky shores at Kaikoura (Rowe 2008). These findings, at Waikato River and Kaikoura, are consistent with the number of birds indicated by Sagar *et al*., (1999), who recorded few variable oystercatchers between the Manawatu Estuary and Auckland and on the South Island.

Most eggs in this study were laid in the second part of December. Eggs are laid in September–February, mostly November–December, or earlier in southern New Zealand (Heather & Robertson 1996). Also, according to Robertson *et al*. (2007) most breeding birds are recorded during December.

Michaux (2013) reported a mean clutch size from 16 nests of 2.0 eggs/clutch, range 1–3 eggs at Long Bay Regional Park and Okura Estuary, Auckland, and Rowe (2008) reported a mean clutch size from 30 complete nests of 2.4 eggs/clutch (range = 1–3) at Kaikoura. At the Waikato sandspit the mean clutch size was 1.7 eggs/clutch, which is lower than those reported by Michaux (2013) and Rowe (2008). This difference might be explained by the features of the breeding locations. In the study by Michaux (2013) one breeding location consisted of shell bank covered in low coastal scrub with mangroves along an edge, and the other was located on a rocky shore. The breeding locations from Rowe (2008) consisted of rock outcrops with stoney beaches in between.

Known to be a rocky shore specialist, (Marchant & Higgins 1993) variable oystercatchers may be able to forage more efficiently in rocky areas than in soft substrate (Marchant & Higgins, 1993). Despite this they still prefer sandy beaches as a breeding location (Marchant & Higgins, 1993). This suggests that a sandy beach might be more suitable as a breeding location than as a foraging area, resulting in insufficient food to lay a larger clutch.

Factors which influence the number of eggs laid depend on food supply and predation risk. Most waders incubate a maximum of four eggs: they are not able to incubate more as they are not able to keep them warm enough (van de Kam *et al*. 1999). The assumption is that, although a bird in a poor area is only able to raise one chick, they lay more eggs because most eggs and chicks fail to hatch or fledge (van de Kam *et al*. 1999).

There are few data published on hatching success of variable oystercatchers (Rowe 2008). In this study five chicks hatched from 12 eggs (42%) in seven complete clutches; a mean brood size of 0.71 chick/clutch, which is similar to the mean brood size of 0.77 chick/clutch recorded by Rowe (2008) in Kaikoura.

Compared with Rowe (2008) and Hansen (2005) the 0.29 chicks/pair that fledged in this study is low, as they had respectively 0.37 and 0.40–0.54 chicks raised per complete nest. Loss of eggs and chicks might be caused by three factors – human disturbance, predation, and natural forces. Three of the five nest with unknown cause of loss, were found empty on Monday morning, which might indicate that the observed increase in number of human activities during the weekends disturbed the birds. Birds forced to leave the nest for longer periods increase the risk of predation of nests (Dowding 2014). In this study no eggshell was found in or near the nests, which makes it unclear whether a land or avian predator took the eggs. The Australian harrier (*Circus approximans*) and the southern black-backed gull (*Larus dominicanus*) are avian predators (Dowding 2014) both often seen at the sandspit. Human disturbance also causes a negative impact on foraging behaviour and time available for foraging of the adult birds.

While a small part of the sandspit of Waikato River was fenced, there was still a lot of human disturbance. The fenced area was in the centre of the spit so the public were still able to walk or drive

around it, causing disturbance. Another problem was that not all nests were within the fenced area. Human disturbance was mainly caused by people driving in the study area. Other disturbance activities were horse-riding, (motorised) hang-gliding, people walking with their dog, fishermen, and people walking around to collect driftwood.

To raise the breeding success of variable oystercatchers, it is necessary to reduce disturbance caused by human activities. This can be achieved by closing breeding/foraging areas to the public and providing information signs about the birds and the impacts of disturbance, and/or having knowledgeable people on site. To get a better insight in the influence of ground and avian predators, nests can be monitored with the use of field trap-cameras.

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