

## The movements of juvenile and immature variable oystercatchers (*Haematopus unicolor*) from the Kaikōura Peninsula, South Island, New Zealand

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**Abstract:** Variable oystercatcher chicks (*Haematopus unicolor*) were banded at the Kaikōura Peninsula between summer 1999–2000 and summer 2016–2017. Prior to colour banding, there were no reports of Kaikōura Peninsula oystercatchers being sighted at other locations. Since summer 2006–2007 colour banding sequences have been available and these unique identifiers enabled movements of individual juvenile and immature birds to be determined. Forty-two colour banded chicks fledged, and 25 of these have been sighted at 11 locations between Collingwood 215 km to the north-west, and the Avon-Heathcote Estuary near Christchurch, 145 km south. Twelve of the 25 birds sighted away have not been seen back at the Kaikōura Peninsula, the other 13 returned of which 4 travelled away for a second time and did not return. Seventeen birds were not seen away from the Kaikōura Peninsula but 7 with no sightings for periods over 7 months may be away and returned. Siblings often went to different locations. Of 9 pairs of same nest siblings, 1 pair stayed at the Kaikōura Peninsula, 1 pair went initially to Nelson and 1 pair to the Avon-Heathcote Estuary, and birds of the other 6 pairs went to different locations including staying at Kaikōura. Birds seen at Nelson were also seen at the Avon-Heathcote Estuary.

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**Key words:** dispersal, *Haematopus unicolor*, Kaikōura Peninsula, recoveries, sightings, variable oystercatcher

### INTRODUCTION

The variable oystercatcher (*Haematopus unicolor*) is endemic to New Zealand (Gill *et al.* 2010). Birdlife International (2018) has it categorised as “least concern” while in New Zealand it is classified as “at risk: recovering” (Robertson *et al.* 2017). The population of variable oystercatchers has risen from about 2,000 birds in the 1970s (Baker 1973, 1985; Heather & Robertson 2005) to nearly 4,000 birds in the early 1990s (Marchant & Higgins 1993; Sagar *et al.* 1999; Heather & Robertson 2005), to about 4,500 in the mid-2000s (Dowding & Moore 2006), and to perhaps 5,000–6,000 or 7,000 in the 2010s (Bell 2010; Dowding 2013). Variable oystercatchers were

reported as scarce on the 650 km of South Island east coast between Cloudy Bay (41°28'S, 174°03'E) and Dunedin (45°52'S, 170°30'E) (Marchant & Higgins 1993; Heather & Robertson 2005) with very small numbers present at the Kaikōura Peninsula (42°26'S, 173°42'E; Fig. 1) (Baker 1973; Marchant & Higgins 1993; Sagar *et al.* 1999). The Kaikōura Peninsula does not appear in the important (>1% of population) breeding and non-breeding sites in New Zealand (Dowding & Moore 2006). Counts in the mid-2000s of between 30 and 48 variable oystercatchers between South Bay and Point Kean (Rowe 2008) are likely to still be indicative of numbers present in the area into the mid-2010s (*pers. obs.*).

Throughout the world, many oystercatcher species undertake annual migrations, e.g. Eurasian

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oystercatchers (*H. ostralegus*) (Davidson *et al.* 1986), American oystercatchers (*H. palliatus*) (Simons & Schulte 2009), black oystercatchers (*H. bachmani*) (Tessler *et al.* 2014), and, in New Zealand, the South Island pied oystercatcher (*H. o. finschi*) (Sagar & Geddes 1999; Sagar & Veitch 2014). African black oystercatcher (*H. moquini*) adults tend to be sedentary whereas juveniles disperse (Hockey *et al.* 2003; Rao *et al.* 2014). Chatham Island oystercatchers (*H. chathamensis*) have similar traits with juveniles dispersing around the 4 islands (Moore 2014). Adult variable oystercatchers also tend to remain on or near their territories while many juveniles disperse (Baker 1974a; Marchant & Higgins, 1993; Heather & Robertson 2005).

The study of variable oystercatchers on the Kaikōura Peninsula began in summer 1999–2000. Two aspects of the study have been reported:



**Figure 1.** Kaikōura Peninsula study area where variable oystercatchers were colour-banded as chicks. High tide roosts are shown by “X”. (Picture: Google Earth 18 January 2019)

breeding success (Rowe 2008), and changes in plumage colour of pied-morph chicks as they aged and their plumage became typical of intermediate-phase variable oystercatchers (Rowe 2011). There is little detailed information published on movements by juvenile variable oystercatchers, especially birds from Kaikōura, and this paper addresses that gap.

## METHODS

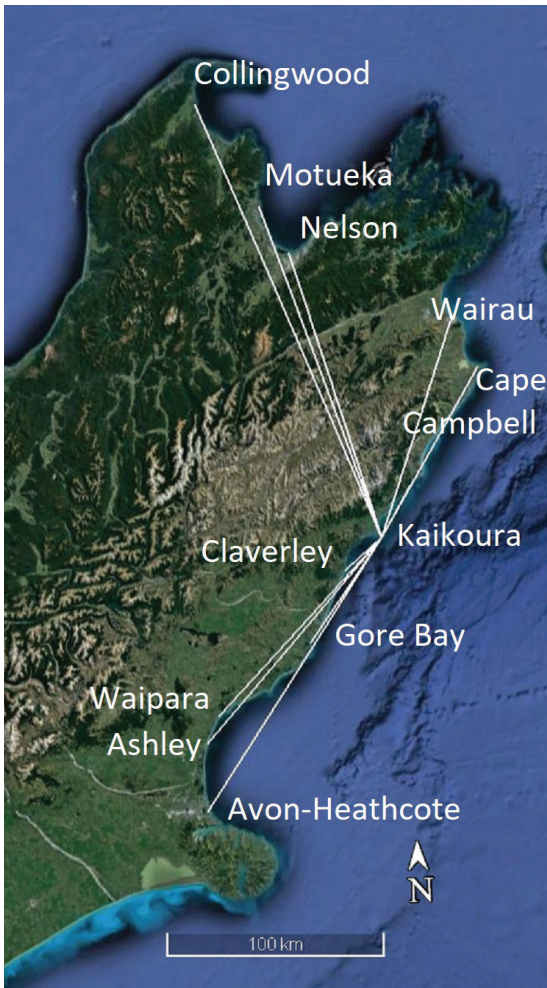
The original study area was 3 km of shoreline on the Kaikōura Peninsula (Fig. 1). Observations began in summer 1999–2000. Prior to February 2007, 23 chicks were banded with unique-numbered stainless-steel bands supplied by the Department of Conservation (DOC). Colour-band sequences became available in February 2007. From then until January 2017, 54 chicks were metal-banded on the tibiotarsus and 46 grew to an age when 2 wrap-around darvic colour bands could be put on each tarso-metatarsus. Seven adults were also colour-banded.

Observations of variable oystercatchers at the Kaikōura Peninsula were made at approximately weekly visits to the study area during the breeding season and, at irregular intervals throughout the year visits were made to the high-tide roosts (Fig. 1). No coordinated searches were made outside of the Kaikōura Peninsula where all sightings were either a by-product of regular searches of waders at some sites by other observers, or chance observations. These sightings were sent direct to the author or via the DOC Banding Office (Wellington) and are biased by unquantified observer effort at the sites. It is important to note that as birds moved between locations, they would have left at an unknown time after the last observation and arrived at unknown times before the next observation.

**Table 1.** Locations where variable oystercatchers colour-banded at the Kaikōura Peninsula were sighted.

Location	Latitude (°S)	Longitude (°E)	Distance from banding site (km)	Birds seen
Avon–Heathcote Estuary, Christchurch	43°32′	172°43′	145	14
Ashley River Estuary	43°16′	172°44′	125	2
Waipara River Mouth	43°09′	172°48′	110	1
Gore Bay	42°51′	173°18′	60	1
Claverley	42°34′	173°30′	25	1
Kaikōura Peninsula	42°26′	173°42′	0	-
Waipapa Bay	42°13′	173°52′	30	1
Cape Campbell	41°44′	174°16′	90	3
Wairau Lagoon	41°32′	174°05′	105	1
Nelson and environs	41°19′	173°12′	135	8
Motueka	41°08′	173°01′	155	1
Collingwood	40°41′	172°41′	215	1





**Figure 2.** Upper South Island, New Zealand, showing the recovery locations of variable oystercatchers colour-banded at the Kaikōura Peninsula. (Picture: Google Earth 18 January 2019).

at the Kaikōura Peninsula and the first time back was 1.8 years ( $n = 12$ ; 95% CL  $\pm 0.38$  years; range 0.7–3.2 years). There were no significant differences in distances and times birds were first seen away for birds that returned to the Kaikōura Peninsula to stay or were last seen away (distance:  $t = 0.27$ , c.f.  $t = 2.07$  df = 22; time:  $t = 0.46$ , c.f.  $t = 2.07$  df = 22). Five of the 16 birds not seen back at the Kaikōura Peninsula were aged 5.1 to 8.5 years when last sighted.

Ten of the 42 colour-banded fledglings were only resighted at the Kaikōura Peninsula. After fledging, these birds were generally seen at least once in the next 5 months and at least every 4 months after that until sightings of a particular bird ceased (Table 2). Birds seen away from Kaikōura Peninsula were only seen at the Kaikōura Peninsula in the 3 months after fledging before being sighted elsewhere between 1 and 9 months later. There were 7 birds seen for 1 or 2 months after fledging then with no sightings for over seven months before being seen again at the Kaikōura Peninsula (Table 2). This is a similar pattern for birds seen away, and it is possible they moved away and returned, or they were simply not observed. Thus, a total of 26 birds believed to have settled at the Kaikōura Peninsula were made up of the 9 that went away and back, 7 that may have gone away and returned or were just not observed at the Kaikōura Peninsula, and another 10 birds that were not sighted outside the Kaikōura Peninsula. Of the 11 birds that were likely to be resident at the Kaikōura Peninsula at the end of the study, i.e. seen after 1 January 2017, 7 were between 5 and 9.1 years old.

Of the birds sighted away from the Kaikōura Peninsula, 11 went north, 11 went south, 3 went north to Nelson then south where they were seen at the Avon-Heathcote Estuary or at Claverley, and 1 bird went south to the Avon-Heathcote Estuary before being found dead at Waipapa Bay north of the Kaikōura Peninsula (Table 3). The Avon-Heathcote Estuary was the location with most sightings followed by the Nelson region.

**Table 3.** Known movements of juvenile variable oystercatchers colour-banded at the Kaikōura Peninsula between 2007 and 2016.

	Number	% of fledglings	North only	North then south	South only	South then north
Colour-banded chicks	46					
Fledged	42	100	10	3	11	1
Seen away, not known to have returned to the Kaikōura Peninsula	12	29	4	2	6	0
Seen away, returned, away, not known to have returned to the Kaikōura Peninsula	4	9	0	1	2	1
Seen away and then back at the Kaikōura Peninsula	9	21	6	0	3	0
Birds seen only at the Kaikōura Peninsula	17	41	-	-	-	-

The shortest periods between sightings of birds at Kaikōura and then away were 18 days at the Avon-Heathcote Estuary and 36 days for Bell Island, Nelson. These movements would have been much faster as birds would have been present at Kaikōura for an indeterminate time after the last sighting and arrived at their destinations an unknown time before they were observed.

The known first movements of 9 pairs of same nest siblings are shown in Table 4. Only 3 pairs had both birds go to the same location – 1 pair each to Nelson and the Avon-Heathcote Estuary, and 1 pair seen only at the Kaikōura Peninsula. Each member of all other pairs was first seen at different locations. Movements were observed for 3 pairs of fledglings from each of 2 nesting sites over 5 seasons where it is assumed that the parents remained the same (Table 5); one parent (banded) at Site 7 was present for all years. The pairs from Site 3 all went to separate locations, and there were different site combinations each season. Site 7 birds behaved differently with 1 pair staying at the Kaikōura Peninsula, 1 pair going to Nelson and 1 pair heading to different destinations.

Some juvenile birds flew considerable distances in their first 3 years of life and brief histories of 7 birds that illustrate the range of movements are given in the Appendix.

## DISCUSSION

Most adult variable oystercatchers stay on territories all year (Baker 1974a; Heather & Robertson 2005; Dowding & Moore 2006; Dowding 2014) but some may congregate in wintering flocks (Baker 1974a; Heather & Robertson 2005). Six adults colour-banded at Kaikōura were never sighted off their territories with 1 other seen up to 2 km from its territory. That infers these adults have strong breeding-site fidelity as reported for North Auckland birds by Dowding (2014).

The major movements reported for variable oystercatchers are by juveniles that leave the natal territories in the few months after fledging (Marchant & Higgins 1993; Heather & Robertson 2005), although some may remain (Dowding 2014). The Kaikōura Peninsula birds fit this pattern as 59% were sighted at other locations and 24% were not sighted away from the Kaikōura Peninsula; movements of the remainder are not certain but there are gaps in the Kaikōura Peninsula record that suggest they could have gone away and returned. Birds that moved from the Kaikōura Peninsula were first sighted on average 140 km away, a greater distance than reported by Baker (1974a), on average 36 km for 27 birds at unspecified locations. The furthest a juvenile variable oystercatcher was

**Table 4.** Locations (denoted by X) where sightings were first made of same nest pairs of juvenile variable oystercatchers colour-banded at the Kaikōura Peninsula.

	Kaikōura Peninsula	Kaikōura Peninsula	Nelson	Nelson	Motueka	Cape Campbell	Avon-Heathcote Estuary	Avon-Heathcote Estuary
Pair 1	X	X						
Pair 2	X		X					
Pair 3	X						X	
Pair 4			X	X				
Pair 5			X			X		
Pair 6			X				X	
Pair 7					X		X	
Pair 8						X	X	
Pair 9							X	X

**Table 5.** Locations where sightings were first made of same nest pairs of juvenile variable oystercatchers colour-banded at 2 sites at the Kaikōura Peninsula in different years. These 6 pairs are also represented in Table 3.

Banding Season	Same nest pairs from Site 3	Same nest pairs from Site 7
2008-09	Cape Campbell and Avon-Heathcote Estuary	Nelson and Nelson
2009-10	Nelson and Cape Campbell	–
2010-11	Kaikōura and Avon-Heathcote Estuary	–
2013-14	–	Nelson and Avon-Heathcote Estuary
2014-15	–	Kaikōura and Kaikōura

sighted away was 215 km to Collingwood. Greater distances have been recorded including: Tasman Bay to Dunedin 576 km (Melville *et al.* in Dowding 2014); unspecified movement 483 km (Baker 1974a); Dunedin to Christchurch 310 km (Schweigman 2002). Marchant & Higgins (1993) report long distance sightings but consider them doubtful, including one from Waipu to Eastbourne (570 km) reported by Baker (1985). The longest distance between consecutive sightings here was between Nelson and the Avon-Heathcote Estuary, 250 km. A variable oystercatcher from Tasman Bay has been sighted at the Kaikōura Peninsula (D. Melville *pers. comm.* 2018).

Half of the Kaikōura Peninsula birds were sighted northwards as far as Collingwood and the other half were sighted as far south as the Avon-Heathcote Estuary. This dichotomy of movements may simply be a consequence of the Kaikōura Peninsula being on a long coastline, but there are no other published studies for comparison. That siblings often went in different directions suggests familial influences are also not a major factor in the initial movements from the Kaikōura Peninsula.

Sixteen birds returned to the Kaikōura Peninsula after 1 or more movements away. Baker (1974a) suggested that juvenile variable oystercatchers wandered most in their second and third years before forming pair-bonds and localising in an area. The movements of the individual birds from the Kaikōura Peninsula (Appendix) highlight the extent to which juvenile variable oystercatchers wander. A few Kaikōura Peninsula birds that made at least 1 movement away were outside Baker's (1974a) general time range with 1 bird back as early as 0.8 years old and the last back at 3.2 years old. There are few, if any, published reports of juvenile variable oystercatchers making multiple movements from their natal area nor of birds moving between 2 widely dispersed areas such as Nelson and the Avon-Heathcote Estuary when neither was their natal site.

Reports of the onset of breeding by variable oystercatchers give differing ages: 3 years (Heather & Robertson 2005); 4 years (Baker 1974b, 1985); 5 or 6 years in Northland (Dowding 2014). Birds breeding at the Kaikōura Peninsula tended to be at the older end of this spectrum as 1 bird bred at 4 years old, 3 at 5 years-old and 2 at 7 years old (LKR *unpubl. data*). At the end of the study there were 7 birds present at the Kaikōura Peninsula >5 years old and potential breeders. Another 16 birds last sighted an average 125 km from the Kaikōura Peninsula can be considered dispersed from their natal grounds as they were not back at the Peninsula within 3 years when they start to form pair bonds and localise (Baker 1974a). That

would not be unusual as birds have been reported breeding outside their natal areas at other NZ sites. One Otago bird was breeding 30 km from its natal site (P. Schweigman in Dowding & Moore 2006) and others in Northland have bred up to 61 km from their natal sites (Dowding & Moore 2006). Therefore, it is possible birds that did not return to the Kaikōura Peninsula may have been breeding elsewhere. Five birds were >5 years old when last sighted outside the Kaikōura Peninsula but there was no indication by any observer that the birds may have been breeding.

The movements of juvenile variable oystercatchers from the Kaikōura Peninsula seem to be typical of other locations in New Zealand (Dowding 2014) and have similarities to juvenile/immature Chatham Island oystercatchers (Moore 2014) and African black oystercatchers (Hockey *et al.* 2003; Rao *et al.* 2014). All 3 species have mostly sedentary adult populations and it is the juveniles that disperse. Of the Kaikōura Peninsula juvenile variable oystercatchers 59% were known to move up to 215 km away. This is a similar proportion to that reported for Chatham Island oystercatchers where 63% moved and bred 5–80 km from their natal areas (Moore 2014), but higher than the 36–46% of juvenile African black oystercatcher that moved up to 2,000 km to nursery areas (Hockey *et al.* 2003). Kaikōura Peninsula birds that returned to the natal grounds did so within 3.2 years, most within 2 years. This is sooner than reported for many immature African black oystercatchers that returned near their natal sites in their 3<sup>rd</sup> and 4<sup>th</sup> years (Rao *et al.* 2014). One point of difference between the Kaikōura Peninsula variable oystercatchers and the African black oystercatcher is that the latter never move again once they return to their natal sites (Hockey *et al.* 2003) whereas at least 4 variable oystercatchers have moved a second time.

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**Appendix.** Examples of movements by juvenile variable oystercatchers banded at the Kaikōura Peninsula.

**K12079.** After fledging it was seen at its nest site at Kaikōura Peninsula on 11 February 2008 and next at the Avon-Heathcote Estuary where it was sighted in November 2008 and August 2009. It returned to the Kaikōura Peninsula for part of the next summer before returning to the Avon-Heathcote Estuary where it stayed until at least July 2010. Five weeks later it was found dead at Waipapa Bay, 25 km north of Kaikōura and 185 km along the coast from its previous sighting. It undertook at least 4 long-distance movements and covered over 620 km

between feeding grounds and Waipapa Bay in its <3 year life span.

**K12072.** After fledging, this bird was seen at its Kaikōura Peninsula nest site for 6 weeks. It was then seen in the Nelson region on 19 March 2009 and 12 August 2009. The next sightings were at the Avon-Heathcote Estuary where it was seen on at least 36 occasions between 27 March 2010 and 5 June 2016. This bird travelled 400 km in its 2 major movements, Kaikōura Peninsula to Nelson and Nelson to the Avon-Heathcote Estuary. It was in its eighth year when last seen at the Avon-Heathcote Estuary.

**K12088.** A probable full sibling to K12072, this bird was seen at its nest site at the Kaikōura Peninsula on 27 February 2009 before heading off to Rabbit Island, Nelson where it was seen on 3 & 4 March 2010. The next sighting was at the Kaikōura Peninsula on 9 January 2011 where it has stayed. In December 2012 it was seen with K12074 about 200 m from its natal site, and was last seen in January 2017 in its eighth year.

**K12094.** This bird was seen away from the Kaikōura Peninsula at the Bell Island shellbank, Nelson, from 28 August 2010 until 1 September 2011. It was photographed at the Kaikōura Peninsula on 3

January 2012 before returning to Nelson where it was sighted on 4 July 2012 and 4 September 2013. Since then it has been seen and photographed at Claverley, 25 km south of Kaikōura, in December 2016, now 7 years-old. These 4 long-distance movements amounted to over 570 km.

**K12099.** After fledging, this bird was seen at Bell Island shellbank, Nelson, on 22 August 2010. In the next 2 years it returned to the Kaikōura Peninsula and made another return visit to Nelson covering more than 540 km in less than 3 years. It was last seen at the Kaikōura Peninsula on 10 March 2015 in its sixth year.

**K15102.** This bird made 2 movements to the Avon-Heathcote Estuary in 2 years, totalling over 440 km. It was last reported at the Avon-Heathcote Estuary on 31 July 2016 aged over 5.5 years.

**K15111.** After fledging, this bird was first seen away at Mapua, Nelson, on 4 September 2011. It was next seen at the Wairau Lagoon mudbank on 1 December 2011 and then back near Rabbit Island, Nelson, on 15 December 2012. It stayed in the Nelson area until at least 7 July 2013 before moving to the Avon-Heathcote Estuary where it was seen until 5 June 2016. Over 5.5 years, K15111 travelled at least 750 km.