

SHORT NOTE

Discovery of previously unknown historical records on the introduction of dunnocks (*Prunella modularis*) into Otago, New Zealand during the 19th century

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Introduced bird species provide researchers with a unique opportunity to study evolutionary processes, such as changes in life history characteristics, genetic and morphological differentiation, or speciation (Duncan *et al.* 2003; Sax *et al.* 2007; Blackburn *et al.* 2009). One of the factors that make deliberately introduced bird species important to evolutionary biology is the fact that, often, their introduction history is well documented (Briskie 2006). Conversely, the history of naturally self-colonised birds into new environments is usually not as detailed (but see Grant & Grant 1995; Clegg *et al.* 2002). New Zealand is well known for a large number of bird introductions that took place during the 19th century by a series of local Acclimatisation Societies. The historic information about these introduced species has allowed a wide range of investigations to be conducted (see Briskie & Mackintosh 2004; Evans *et al.* 2005; Congdon & Briskie 2010).

One of the best “uses” of deliberate species introductions is the investigation of a process known as a population bottleneck. A population bottleneck is a demographic event characterised by a

rapid and large reduction in population size and its subsequent recovery (Frankham *et al.* 2010). Theory predicts that population bottlenecks can result in the loss of genetic diversity, which is dependent on the initial population size and how long it takes for the population to recover (Nei *et al.* 1975; Frankham *et al.* 2010; Jamieson 2011). Introduced birds have been used as a model system to study the effects of population bottlenecks of differing magnitudes (*e.g.*, Baker & Moeed 1987; Baker 1992; Cabe 1998). To test predictions from these theories, researchers rely on data from historical records to estimate the number of individuals that were released into a new environment, the number of events that were involved, and the length of the period that the release events took place. For New Zealand, 2 important sources of data on introduced bird species are Thomson (1922) and Long (1981). Most research that deals with bird introductions to test evolutionary questions rely on data published by these 2 sources to provide information on the numbers of birds released, their locations, and the number of introduction events (*e.g.*, Mathys & Lockwood 2011; Uller & Leimu 2011).

I investigated the introduction history of the dunnock (*Prunella modularis*) into the Otago region of New Zealand as part of a larger project on the

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Table 1. Summary information published in the Annual Reports of the Otago Acclimatisation Society and by Chisholm (1907) on the numbers and dates that dunnocks were introduced into the Otago region. Note that the numbers and dates published by Chisholm (1907) are the same information reported more recently by Thomson (1922) and Long (1981).

Source	Year published	Reported number of dunnocks released (year)	Additional notes
Otago Acclimatisation Society	1865	0	
	1873	0	Reports that dunnocks are thriving around the city of Dunedin
	1878	33 (1876), 6 (1877), 0 (1878)	
	1880	20 (1879), 0 (1880)	
	1886	0	
	1891	28 (1881), 0 (1882-86)	
	1896	0	No dunnocks released between 1886 and 1896
Chisholm	1907	18 (< 1870), 80 (1871)	Same data as provided by Thomson (1922) and Long (1981)

differentiation in genetic and morphological characteristics between dunnocks in Dunedin and a source population in England (Santos *et al.*, *in review*). As with previous researchers, I relied on historical data on the number of dunnocks that were introduced into Otago to conduct that investigation. However, to confirm earlier compilations of the number of birds released, I first searched the literature of the Otago Acclimatisation Society. Thomson (1922) reports that the Otago Acclimatisation Society released 98 dunnocks (18 in 1868 and 80 in 1871) around the Dunedin region. Long (1981) does not report any new information in relation to Thomson (1922), but provides the information in a more accessible manner. Long (1981) cites one of the issues of the Annual Reports of the Otago Acclimatisation Society as the source of these numbers. I searched the Hocken Library of the University of Otago, and found a series of Annual Reports from the Society for the period from 1865 to 1896 (Table 1; bibliographic information available online at: <http://otago.lconz.ac.nz/vwebv/holdingsInfo?bibId=96736>). I also found a book by Chisholm (1907) that was not cited by either Thomson (1922) or Long (1981) but which confirms the data published in these sources.

The Annual Reports of the Otago Acclimatisation Society that I examined were not complete, but spanned a period of 31 years, from 1865 to 1896, which surpasses the previously reported range of dates in which dunnocks were thought to have been introduced. The reports detail the introduction of

an additional 87 dunnocks into Otago that had not been previously reported in the literature (Table 1). With these new sources, the updated estimate of the number of dunnocks released into Otago now stands at 185 birds (98 dunnocks reported previously plus an additional 87 birds reported here). This is almost twice as many birds as previously reported (Otago Acclimatisation Society 1865; 1873; 1878; 1880; 1886; 1891; 1896). Moreover, the number of known introduction events now stands at 6, over a period of 13 years (Table 1).

These new sources of information provide a more accurate view of the introduction history of dunnocks in southern New Zealand. These data will help not only future investigations of the evolution of dunnocks in New Zealand, but also will shed light on investigations that use a comparative approach to investigate broader evolutionary patterns. Unfortunately, the reports do not mention the specific location from which birds were sourced in England for introduction to New Zealand. It is possible that newspapers and other reports may provide information about the location from which birds were sourced, but this was not investigated.

The previously over-looked sources I report here also contained information about the introduction history of other bird species in the Otago region. Researchers that study introduced birds in New Zealand should consult these historic sources of information in order to ascertain that the established literature accurately portrays their original introduction history. It is possible that

other species were introduced in greater numbers than previously thought and this may influence our understanding of the role of bottleneck size in population establishment and viability (for a recent discussion on the reliability of the historical record see Blackburn *et al.* 2011; Moulton *et al.* 2011; Moulton *et al.* 2012).

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