

## SHORT NOTE

# New records for passerine introductions to the Otago Acclimatisation Region in New Zealand

MICHAEL P. MOULTON\*

Department of Wildlife Ecology and Conservation, University of Florida, PO Box 110430, Gainesville, FL 32611-0430, USA

EDUARDO S.A. SANTOS

LAGE do Departamento de Ecologia, Instituto de Biociências, Universidade de São Paulo; São Paulo, SP, Brazil

WENDELL P. CROPPER, JR.

School of Forest Resources and Conservation, University of Florida, PO Box 110410, Gainesville, FL 32611-0410, USA

JIAHUI NAT LIM

Department of Zoology, University of Otago, Dunedin, New Zealand

Successfully introduced birds in New Zealand were released in higher numbers and on more occasions than introduced birds that failed to establish (Veltman *et al.* 1996; Duncan 1997; Green 1997; Cassey *et al.* 2004; Lockwood *et al.* 2005; Blackburn *et al.* 2009). This raises an important question: were species successful because they were introduced in large numbers, or were they introduced in large numbers because the initial releases were successful? The former case is called propagule pressure (*e.g.*, Veltman *et al.* 1996; Duncan 1997; Green 1997; Cassey *et al.* 2004; Lockwood *et al.* 2005; Sol *et al.* 2008; Blackburn *et al.* 2009), whereas the latter represents what has been dubbed a “Franklin Delano Roosevelt” effect (Blackburn *et al.* 2013;

Moulton & Cropper 2014a). The term stems from former US president Franklin D. Roosevelt who once said, “Do something. If it works, keep doing it.” By this effect, people would have continued introducing individuals of a species, even if the species was already established, in order either to increase the population or simply expand its range.

Both cases have been argued using historical records taken mostly from the acclimatisation societies in New Zealand. The main references used in these studies for New Zealand were Thomson (1922) and Long (1981). As noted previously (Moulton *et al.* 2011), for nearly all references for exotic birds released in New Zealand, Long (1981) cites Thomson (1922) directly or indirectly (*i.e.*, when the reference he cited actually cited Thomson 1922) as the authority. Thus, the accuracy and thoroughness of the historical records reported by Thomson (1922) are of fundamental importance in

---

Received 18 July 2014; accepted 30 October 2014

\*Correspondence: [moultonm@ufl.edu](mailto:moultonm@ufl.edu)

**Table 1.** Previously unreported numbers of individuals for 26 releases of European species to the Otago Acclimatisation region. Numbers are given for each year of release.

Species	1876	1877	1878	1879	1880	1881	1882	Sum
<i>Turdus merula</i>	5	12	26	48	-	76	16	183
<i>Turdus philomelos</i>	-	-	-	-	-	-	6	6
<i>Sturnus vulgaris</i>	154	220	168	22	182	-	-	746
<i>Alauda arvensis</i>	87	297	-	70	-	-	-	454
<i>Carduelis carduelis</i>	-	-	-	6	-	-	-	6
<i>Fringilla coelebs</i>	-	-	-	18	-	-	-	18
<i>Carduelis chloris</i>	192	-	-	-	-	-	-	192
<i>Prunella modularis*</i>	33	6	-	20	-	28	-	87
<i>Emberiza citrinella</i>	6	-	3	36	-	-	-	45
<i>Emberiza cirrus</i>	-	-	-	42	-	-	-	42
Total	477	535	197	262	182	104	22	1779

\*Santos (2012)

ascertaining the number of birds released and the patterns of these releases.

Recently, Santos (2012) reported additional releases of the dunnoek (*Prunella modularis*) in the Otago region that Thomson (1922) did not include and noted that additional unreported records existed for introductions of other species. Here, we provide a list of new records of passerine bird introductions to the Otago region taken from newly available annual reports of the Otago Acclimatisation Society, that were not listed by either Thomson (1922) or Long (1981).

Following Thomson (1922), we compiled a list of passerine birds introduced to the Otago acclimatisation region. We also compiled a list of individuals released for the years 1876-1882 as well as 1885, 1886, 1894, 1896 using the annual reports of the Otago Acclimatisation Society for the years of 1880, 1886, 1891 and 1896 (Otago Acclimatisation Society 1880; 1886; 1891; 1896). Some of these reports (e.g., 1880) included information for more than a single year. Annual reports for 1883 and 1884 were unavailable to us. It would not be surprising if the numbers actually released were even greater than those currently documented.

Proponents of the propagule pressure hypothesis typically assume that the total number of individuals released was needed for the species to become established (e.g., Veltman *et al.* 1996; Duncan 1997, Green 1997). However, we believe it is possible that people in different locations might have continued to introduce additional individuals of species that were already established simply because they wanted more of them and because they were able to obtain more individuals. The total numbers

of individuals released per species could thus be more a reflection of human desire than ecological necessity. Thomson (1922) listed introductions of 22 passerine species to the Otago region between the years 1865 and 1886. However, there were 13 years during this 22-year span for which Thomson (1922) reported no passerine introductions. Our survey of available annual reports of the Otago Acclimatisation Society for the years 1880, 1886, 1891, 1896 revealed 26 additional releases of 1779 individuals of 10 of the 13 successfully introduced species beginning in 1876 (Table 1). These 26 releases include the 4 additional releases of *Prunella modularis* reported by Santos (2012). As shown in Table 2, Thomson (1922) listed just 1 release of 1 of these 10 species after 1871 (*Alauda arvensis*, 56 in 1875). Thomson (1922) listed a number of releases similar to our list for these 10 species (28 releases) for Otago but only about half as many (868) individuals (Table 2) versus 1,779 individuals (Table 1). Thus, for these 10 species, we now know that at least 2,600 individuals were actually released.

Our focus here involves additional records for 10 passeriform species of European origin. Of the 13 successfully introduced passerines in the Otago region reported by Thomson (1922), we found no additional releases for 3 species: *Passer domesticus*, *Gymnorhina tibicen*, and *Carduelis flammea*. We also note that although Thomson (1922) listed a release of 80 *Manorina melanocephala* to Otago, in 1880 the original Acclimatisation Society reports listed these by the common name, "Australian Minahs". Thus, it is not possible to identify these to species unequivocally, as other authors (e.g., Thomson 1922; Lamb 1964) have suggested that "Australian Minahs" actually could have been Common Mynas (*Acridotheres tristis*)

**Table 2.** Numbers of individuals for the ten species in Table 1, reported by Thomson (1922). Numbers are given for each year of release.

Species	1865	1867	1868	1869	1871	1875	Sum
<i>Turdus merula</i>	2	6	39	21	70		138
<i>Turdus philomelos</i>	2	4	49		42		97
<i>Sturnus vulgaris</i>		3	81	85			169
<i>Alauda arvensis</i>		4	35			56	95
<i>Carduelis carduelis</i>		3	30	54	31		118
<i>Fringilla coelebs</i>			27	6	66		99
<i>Carduelis chloris</i>			8				8
<i>Prunella modularis</i>			18		80		98
<i>Emberiza citrinella</i>			8		31		39
<i>Emberiza cirtilus</i>					7		7
Total	4	20	295	166	327	56	868

whereas Hutton (1871) listed 'Australian Mainahs' as '*Myzantha garrula*' (= *Manorina melanocephala*).

When comparing successfully with unsuccessfully introduced species, proponents of the propagule pressure hypothesis have invariably used the sums of individuals released (Veltman *et al.* 1996; Duncan 1997; Green 1997; Cassey *et al.* 2004; Lockwood *et al.* 2005; Blackburn *et al.* 2009). This is unfortunate for 3 reasons. First, this assumes that the historical records in Thomson (1922) are accurate. As shown here and elsewhere (Santos 2012) they are not. Therefore, relying solely on Thomson (1922) and Long (1981) for historical data on bird introductions could jeopardise conclusions about the processes involved in the introductions and their consequences. Second, such studies ignore the span of time over which the introductions occurred. This gives a false impression of importance of the sum of individuals released for a species (Moulton *et al.* 2011, 2012, 2014a). Indeed, recognising this potential bias, Green (1997) limited his analysis to the sum of individuals released within 10-year periods. Finally, these studies have blurred the distinction between the numbers that were released and the numbers that were actually necessary for establishment of species. Thus, given the updated data listed here, propagule pressure advocates presumably would have to assume that the 3 releases of 169 individual *Sturnus vulgaris* were insufficient for establishment and thus required an additional 5 releases of another 746 individuals to ensure success. Indeed the additional releases ranged from 1 to 6 releases for each of the 10 species and from 3 (*Emberiza citrinella* in 1878) to 297 individuals (*Alauda arvensis* in 1877).

The new records reported here indicate that people in Otago were not following any sort of

stopping-rule, but rather they were simply releasing what birds they could acquire, whenever they could acquire them. These results seem to more clearly support a Franklin Delano Roosevelt effect. It is possible that many releases of passerines in Otago were not successful, perhaps due to stochastic factors, or perhaps due to a changing environment that eventually became better suited to the exotic species. Given the state of the historical record, it is not possible to determine the fate of any single introduction event. Elsewhere we have shown that in the 19th century some passerine species were highly successful in a wide range of locations and propagule sizes (Moulton & Cropper 2014b). It is also possible that the goal of the Acclimatisation Society was to enhance the population sizes and geographic ranges of desired species. This would be consistent with our understanding of the motivations of the Acclimatisation Societies in the 19th century (Moulton & Cropper 2014a).

#### ACKNOWLEDGEMENTS

We thank an anonymous reviewer for comments that improved the manuscript. This research was supported by CRIS program FLA-WEC-005212. ESAS was supported by an FAPESP research grant (2012/20468-4).

#### LITERATURE CITED

- Blackburn, T.M.; Lockwood, J.L.; Cassey, P. 2009. *Avian invasions: the ecology and evolution of exotic birds*. New York: Oxford University Press.
- Blackburn, T.M.; Prowse, T.A.A.; Lockwood, J.L.; Cassey, P. 2013. Propagule pressure as a driver of establishment success in deliberately introduced exotic species: fact or artefact. *Biological Invasions* 15: 1459-1469.

- Cassey, P.; Blackburn, T.M.; Sol, D.; Duncan, R.P.; Lockwood, J.L. 2004. Global patterns of introduction effort and the establishment success of birds. *Proceedings of the Royal Society London B (Supplement)* 271: s405-s408.
- Duncan, R.P. 1997. The role of competition and introduction effort in the success of passeriform birds introduced to New Zealand. *American Naturalist* 149: 903-915
- Green, R.E. 1997. The influence of numbers released on the outcome of attempts to introduce exotic bird species to New Zealand. *Journal of Animal Ecology* 66: 25-35
- Hutton, F.W. 1871. Catalogue of the birds of New Zealand: with diagnoses of the species. Wellington: Geological Survey of New Zealand.
- Lamb, R.C. 1964. *Birds, beasts & fishes: The first hundred years of the North Canterbury Acclimatisation Society*. Christchurch: North Canterbury Acclimatisation Society.
- Lockwood, J.L.; Cassey, P.; Blackburn, T. 2005. The role of propagule-pressure in explaining species invasions. *Trends in Ecology and Evolution* 20: 223-228.
- Long, J.L. 1981. *Introduced birds of the world*. London: David & Charles.
- Moulton, M.P.; Cropper, W.P. Jr.; Avery, M.L. 2011. A reassessment of the role of propagule pressure in influencing fates of passeriform introductions to New Zealand. *Biodiversity and Conservation* 20: 607-623.
- Moulton, M.P.; Cropper, W.P. Jr.; Avery, M.L. 2012. Historical records of passerine introductions to New Zealand fail to support the propagule pressure hypothesis. *Biodiversity and Conservation* 21: 297-307.
- Moulton, M.P.; Cropper, W.P. Jr. 2014a. Establishment success in introduced passeriforms of New Zealand: evidence for a Franklin Delano Roosevelt effect. *Biological Invasions* 16: 233-237.
- Moulton, M.P.; W.P. Cropper, Jr. 2014b. A comparison of success rates of introduced passeriform birds in New Zealand, Australia and the United States. PeerJ 2:e509; DOI 10.7717/peerj.509
- Otago Acclimatisation Society. 1880. *Annual report*. Otago Acclimatisation Society, Dunedin: Otago Acclimatisation Society.
- Otago Acclimatisation Society. 1886. *Annual report*. Otago Acclimatisation Society, Dunedin: Otago Acclimatisation Society.
- Otago Acclimatisation Society. 1891. *Annual report*. Otago Acclimatisation Society, Dunedin: Otago Acclimatisation Society.
- Otago Acclimatisation Society. 1896. *Annual report*. Otago Acclimatisation Society, Dunedin: Otago Acclimatisation Society.
- Santos, E.S.A. 2012. Discovery of previously unknown historical records on the introduction of dunnocks (*Prunella modularis*) into Otago in the 19<sup>th</sup> century. *Notornis* 59: 79-81.
- Sol, D.; Vila, M.; Kuhn, I. 2008. The comparative analysis of historical alien introductions. *Biological Invasions* 10: 1119-1129.
- Thomson, G.M. 1922. *The naturalisation of plants and animals in New Zealand*. Cambridge: Cambridge University Press.
- Veltman, C.J.; Nee, S.; Crawley, M.J. 1996. Correlates of introduction success in exotic New Zealand birds. *American Naturalist* 147: 542-557.

**Keywords** introduced species; Acclimatisation Societies; propagule size; New Zealand