



Risks and drivers of wild bird feeding in urban areas of New Zealand



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ABSTRACT

The practice of feeding wild *birds* is a widespread phenomenon, but there has been little consideration of both human and ecological dimensions of the impacts. We used a comprehensive approach to investigate the practice of bird feeding in the unique avian landscape of New Zealand. We quantified the practice and motivations of bird feeding via a nationwide postal survey, and identified ecological risks from current feeding practices. Our study confirmed that, as in many northern hemisphere countries, bird feeding is a common activity in New Zealand, with an estimated 46.6% of households feeding birds. Increased age and dog ownership were strongly associated with participation. Bread was most commonly provided; we estimated 5.1 million loaves/annum across the population of 1.8 million in six surveyed cities. The principal potential risk identified was that introduced birds are likely to be the main consumers of supplementary food sources in New Zealand, which may have follow-on effects for avian community composition. Disease transmission risks were also identified, with poor hygiene practices reported by many respondents. However, the social benefits to humans of feeding birds were strongly reflected in the motivations of the respondents. Over half fed birds because it brought them pleasure. As urbanisation increases globally, opportunities for connecting with nature decrease. Therefore, experiences such as bird feeding that increase the interaction between people and wildlife could be a powerful tool for fostering environmental awareness and guardianship. Our study highlights that without information about ecological consequences, humans may inadvertently make harmful choices for wildlife, so we recommend promulgation of appropriate guidelines to minimise the risks.

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1. Introduction

Bird feeding is arguably one of the most common deliberate interactions between people and wildlife in modern day society (Jones and Reynolds, 2008). It is a prevalent activity throughout many countries worldwide, with estimates from some nations of up to 75% of households providing supplementary food on a regular basis (Cowie and Hinsley, 1988; Davies et al., 2012; Martinson and Flaspohler, 2003). Whether feeding is considered an acceptable practice greatly depends on the individual country and may vary between regions within a country; in some areas it is actively encouraged by conservation organisations, whereas elsewhere it is strongly discouraged (Jones, 2011). The practice of bird feeding has largely escaped detailed examination by the scientific community (Amrhein, 2014; Jones and Reynolds, 2008), adding to the disparity in general opinion among non-governmental conservation and

birding organisations. The extent of the practice has only been determined in a handful of countries.

Although there have been few studies in situ that investigate the effects of urban supplementary feeding (but see Auman et al., 2008; O'Leary and Jones, 2006; Peach et al., 2013), there is growing evidence that supplying food on a landscape-wide scale is likely to have substantial consequences for wildlife generally (Boutin, 1990; Brittingham and Temple, 1988, 1992; Fuller et al., 2008; Harrison et al., 2010; Martinson and Flaspohler, 2003). The effects of food resource availability on populations are well established (Lack, 1954; Newton, 1998; White, 1978), thus it is reasonable to expect that deliberate feeding will provide support for species capable of exploiting this new resource. In this way, feeding may be a key driver of avian community patterns in urban areas (Amrhein, 2014; Fuller et al., 2008). The influence of supplementary food may even be substantial enough to affect the ecology of a species, such as altering migratory patterns and supporting over-wintering populations of birds in residential areas (Adriaensen and Dhondt, 1990; Jokimäki and Kaisanlahti-Jokimäki, 2012). Along with artificially

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high concentrations of individuals at feeders, these changes have serious implications for the transmission of avian diseases (Robb et al., 2008; Lawson et al., 2012). The effects of feeding are not limited to wildlife, though, with substantial positive social outcomes for those people engaged in the activity (Curtin, 2009; Keniger et al., 2013). Parallel consideration of these social aspects is vital for interpreting the complex influences of bird feeding activities.

Understanding the attitudes and motivations of people who feed birds is crucial, as these will drive their behaviours (Manfredo et al., 2009; Tarrant and Cordell, 2002) and ultimately how their feeding practices affect the surrounding urban ecosystem. For example, their motivations may influence what foods they choose to feed birds and whether they target certain species. Insights into these social dimensions, as well as quantification of feeding practices, are crucial for assessing the acceptability of feeding from a conservation viewpoint. Outcomes of feeding will vary with location and scale (Hostetler, 1999), as human behaviours change and as bird assemblages differ. New Zealand provides a unique location for investigating bird feeding practices. There is little influence of the bird feeding industry as yet (which is still small compared to the USA and UK), no regulatory deterrence, and minimal guidelines for the public from relevant birding and conservation organisations (J.A.G. pers. obs.). Essentially, the practice of feeding in New Zealand, and the attitudes of the public toward feeding, are unlikely to have been influenced by such external pressures.

Furthermore, the avian context in which the feeding occurs is also unique. The native avifauna of New Zealand is distinctive, with high levels of endemism (c. 70% of all breeding bird species at the time of first human contact; Holdaway et al., 2001). Mass extinctions followed human settlement, reducing the number of all breeding bird species by c. 25–30% (Holdaway et al., 2001; Tennyson, 2010) and landbirds by c. 40% (Daugherty et al., 1993). Numerous other species were left on the verge of extinction, where many remain today (e.g. black stilt *Himantopus novaeseelandiae*; Galbraith et al., 2007). Invasive mammals and habitat loss continue to threaten native populations (Clout and Saunders, 1995), and even common species are in decline in native habitats (e.g. grey warbler *Gerygone igata*; Elliott et al., 2010). Few native species have persisted in human-modified landscapes, where most bird feeding takes place. Instead urban and rural landscapes throughout the country support a high proportion of introduced birds (e.g. Eurasian blackbird *Turdus merula*; Robertson et al., 2007; van Heezik et al., 2008). The few native species persisting in urban areas are primarily nectarivorous, frugivorous, or insectivorous, whereas the highly successful introduced species are omnivorous or granivorous (Heather and Robertson, 1996). Because of this dichotomy, the types of food people supply are pivotal in determining the local ecological outcomes of feeding. The provisioning of sugar water may be of benefit to native nectarivores, for example, but foods such as bread and seed will be predominantly consumed by introduced species rather than natives. Feeding practices have the potential, then, to modify the structure of local avian communities by skewing local resource availability either in favour of native or introduced birds.

We took a comprehensive approach to investigating the scale, drivers, and risks of common bird-feeding practices, in an attempt to better understand the potential ecological consequences in an urban bird community dominated by introduced species and how these consequences might be modified by social factors. This was approached by employing a survey of feeding practices in New Zealand. The aim of our study was to quantify the practice of *intentional* bird feeding; consequential feeding (e.g. planting trees for birds) was examined secondarily. Our objectives were to: (1) assess the scale of bird feeding practices; (2) evaluate whether certain socio-demographic factors were associated with feeding; (3)

identify the motivations behind and attitudes toward feeding; and (4) identify risks associated with common feeding practices. This multifaceted approach provides a useful framework for assessing the practice of bird feeding in other locations.

2. Methods

2.1. Survey methods

We surveyed the current feeding practices in New Zealand by sending a questionnaire to 3000 households across six cities (500 per city): Whangarei, Auckland, Wellington, Nelson, Dunedin, and Invercargill. We chose a large and a small city in the north, centre, and south of the country, to represent the geographic spread from the warmer northern end of New Zealand to the cooler climate in the south, and to include a range of population sizes (see Fig. 1). These six cities account for 42.0% of New Zealand's population (www.stats.govt.nz). Households were selected at random from the New Zealand electoral roll (a register of citizens aged 18 years and above enrolled to vote). The survey was distributed via post on 3 November 2011, with participants given 4 weeks to complete it. An accompanying letter informed participants of the study's purpose, highlighted the importance of participating for feeders and non-feeders alike, and indicated that anyone within their household could complete the questionnaire. Participants were given a Freepost envelope to return the survey, or could complete it online. The online version of the survey was constructed using Survey

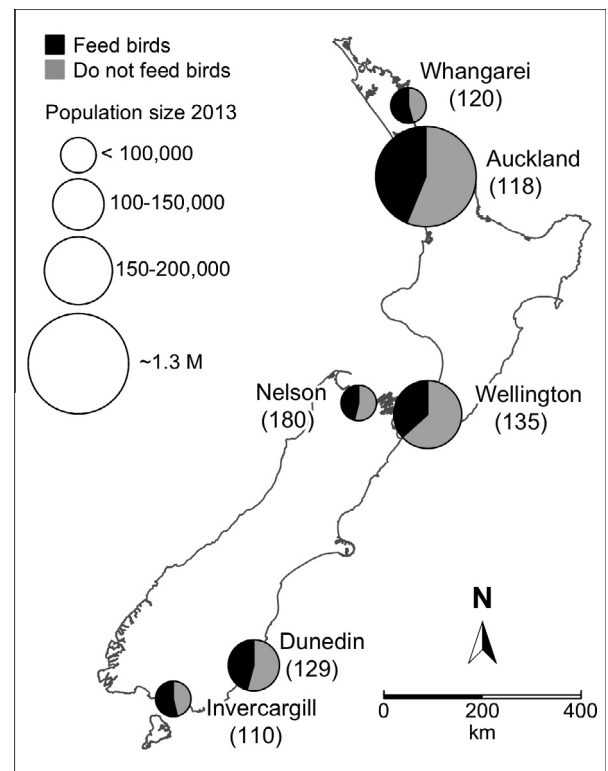


Fig. 1. Estimated rates of bird-feeding participation in six New Zealand urban centres based on a 2011 mail survey investigating bird-feeding practices in New Zealand. Participation rates have been adjusted to account for non-response bias. The number of respondents (n) is presented in parentheses. Pies are scaled according to current estimates of human population size (www.stats.govt.nz). Note that from north to south there is a decreasing temperature gradient. Mean annual temperature 2012 from weather stations located at city airports (NIWA, 2013): Whangarei, 15.8 °C; Auckland, 15.4 °C; Wellington, 13.4 °C; Nelson, 13.0 °C; Dunedin, 10.1 °C; Invercargill, 10.2 °C.

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