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SHORT NOTE

Bird deaths on Riverside Drive between Whangarei and Onerahi, New Zealand

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There are limited data on the loss of birds on New Zealand roads or the impacts of speed limits on such mortality. This is not surprising given that few native birds are considered threatened primarily by traffic, but there are some exceptions. For example, Stidolph (1971) considered that pipits (*Anthus novaeseelandiae*) were killed more frequently along sealed roads with high speed limits in rural Wairarapa. Weka (*Gallirallus australis*) were also killed frequently on Gisborne roads from the 1950's, but warning signs were only erected after the population crash of 1982-86, and concern that traffic kills would further endanger the population. More recently there have been increasing deaths of northern brown kiwi (*Apteryx mantelli*) on the margin of Trounson Kauri Park (N. Coad, *pers. comm.*) and at Russell (H. O'Deally, *pers. comm.*) where restoration has secured increasing populations.

In this study, I report surveys of bird deaths along a route between the top of Sherwood Rise, Onerahi, and Riverside Bridge, Whangarei. The route was cycled 1 to 5 times a week, during which I recorded the number and identity of dead birds on the road. The route had variable speed zones, and included 2.4 km of a 50 km h^{-1} zone, 0.5 km of a 70 km h^{-1} and 2.3 km of an 80 km h^{-1} zone. The 50 km h^{-1} zone included a 2-lane road within urban housing (0.8 km in length), and an area of small factories and housing on a 2- and then 4-lane road (1.6 km in length). The 70 km h^{-1} zone was a 2-lane road, bounded by large drains and rank grassland, and tree-covered bluffs. The 80 km h^{-1} zone was a 2-lane road along the margin of Whangarei Harbour, including grassed areas, boatsheds and an area of oioi (*Leptocarpus simplex*) salt marsh and mangroves (*Avicennia resinifera*). Inland of the 80 km h^{-1} zone was reclaimed farmland, a dumping site for harbour-dredged silt, mangroves, and tree-covered bluffs. Three streams, 2 with margins of mangroves, drained under 20 m long concrete-sided bridges. The grass edges along the road edge were mown. I started counts of road-killed birds on 1 Sep 2005 and then took more detailed location records from 1 Sep 2007 to Aug 2008.

I recorded a total 116 deaths over the 3 year period of the study. These were divided about equally over this time period with 35, 41 and 40 bird deaths in the Sep 2005-Aug 2006, Sep 2006-Aug 2007 and Sep 2007-Aug 2008, respectively (Table 1). The number of deaths appeared positively related to increasing speed limit zones. Using the period from Sep 07-Aug 08 in which I kept detailed notes of location, no bird deaths were recorded in the 50 km h^{-1} (n = 705.4 km) zone, 4 birds were killed in the 70 km h^{-1} zone (8 deaths km^{-1} y^{-1}, n = 235.2 km), and 36 were killed in the 80 km h^{-1} zone and on the bridge separating the 70 and 80 km h^{-1} zones (15.6 deaths km^{-1} y^{-1}, n = 470.4 km).

A total of 17 species of birds were found dead on the road (Table 2). The range of species found dead included 9 native species and 8 introduced species. The number of dead native birds found (n = 72 individuals) was slightly higher than the number of introduced birds found dead (n = 44 individuals). Pukeko (*Porphyrio melanotus*) and blackbird (*Turdus merula*) were the species most frequently killed along this route (Table 2). Only single individuals were found dead for banded rail (*Gallirallus philippensis*), morepork (*Ninox novaeseelandiae*), grey warbler (*Greygone igata*) and fantail (*Rhipidura fuliginosa*).

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Table 1. Numbers of various species of birds found dead between 1 Sep 2005 and 31 Aug 2008.

Species	No. killed 2005-06	No. killed 2006-07	No. killed 2007-08
red-billed gull	5	2	1
pukeko	15	16	11
banded rail		1	
morepork			1
kingfisher	2		2
song thrush		1	1
blackbird	8	9	6
grey warbler		1	
silvereye	4	2	6
welcome swallow			2
fantail			1
house sparrow		1	2
goldfinch	2	3	2
greenfinch	1	1	
yellowhammer		2	1
common myna		2	2
starling			1

The region adjacent to the western bridge appeared particularly prone to bird kills. In 2007-08, 8/40 (20%) of the deaths occurred within 5 m of the bridge. These included 2 welcome swallows (*Hirundo tahitica*), a fantail, a kingfisher (*Todiramphus sancta*), 2 silvereyes (*Zosterops lateralis*), a house sparrow (*Passer domesticus*) and a goldfinch (*Carduelis carduelis*). This site was likely a crossing point for birds using the mangroves on the stream margins. During 2005-07, 2 grey warblers, some silvereyes and a juvenile banded rail were also killed there. Most of the birds killed were intact with broken necks and other bones, and it is likely that some died when they were driven against the concrete sides of the bridge by vehicle drafts.

The species found dead during my surveys were a subset of those that used the road margins and neighbouring habitats. Other species that were at risk from collisions with traffic (e.g. by flying low over the road) but were not found dead were little shag (*Phalacrocorax melanoleucos*), kukupa (*Hemiphaga novaeseelandiae*), tui (*Prosthemadera novaeseelandiae*), skylark (*Alauda arvensis*), and chaffinch (*Fringilla coelebs*). Species that flew high over the road and were not considered at risk from vehicles in this area included New Zealand pied oystercatcher (*Haematopus finschi*), pied stilt (*Himantopus himantopus*), white-faced heron (*Ardea novaehollandiae*), spur-winged plover (*Vanellus miles*), black-backed gull (*Larus dominicanus*) and red-billed gull (*L. novaehollandiae*). These species foraged in neighbouring fields, and mixed-species flocks exceeding 500 birds occurred for 2-3 days after saturating rainfall. Black-backed gulls were killed along the road prior to Sep 2005 when a tip was active. Similarly, a few red-billed gulls were killed when foraging on rubbish spilled on the road.

It is quite likely that I missed birds killed on the road during my surveys. For example, most of the smaller birds were moved by impact or subsequent traffic-generated wind to the side of the road. Individuals that were moved beyond my view would have been missed. The only species that remained for any time in the traffic zone were larger birds such as pukeko and the morepork. A few birds that were killed on the approaches to bridges lasted less than 2 days, but some birds that were not collected remained on the road for at least a week, and up to 3 months. Although I also found road-killed stoats (*Mustela erminea*, n = 3), Norway rats (*Rattus norvegicus*, n = 2), and cats (*Felis domesticus*, n = 4), there was no evidence of their being killed near or scavenging bird carcasses.

Erritzoe *et al.* (2003) reviewed the literature on road mortality of birds around the world and found highly variable death rates of between 0.4 and 23.8 deaths km^{-1} y^{-1}. The rate at which birds get killed by traffic likely depends on a number of factors, but both density and speed of traffic have been suggested as important. Traffic counts on Riverside Drive during 3-7 Jul 2006 found the number of vehicles on weekdays and during daylight varied between 1265 and 1801 h^{-1}, including morning and evening rush-hours (S. Megchelse, *pers. comm.*). If these counts were representative of annual flows then there were about 2.3 million vehicle movements $annum^{-1}$ on this road, with an average of 1 bird death for each 57,415 vehicle movements.

Overseas studies have found that speed not traffic density is of greater risk to birds (Erritzoe *et al.* 2003). My results support the conclusion of Erritzoe *et al.* (2003) that the speeds of 50-60 km h^{-1} found in most urban streets are of limited threat to birds, but that higher speeds pose greater risk. Land Transport New Zealand (2007) statistics show that there are 44,332 km of sealed roads in New Zealand where traffic speeds are permitted to exceed 80 km h^{-1}, and that 10,893 km have speeds nearer 100 km h^{-1}. If the bird death rate on these roads was similar to that recorded in my study, then it is possible that at least 675,000 birds are killed on New Zealand sealed roads annually. The number could be even greater as this study indicates that

Table 2. Month where birds were killed on Riverside Drive, Whangarei, 1 Sep 2005 to 31 Aug 2008.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
red-billed gull	3	2				1	1	1					8
pukeko	2	4	4	3	5	1	1	1	4	6	8	3	42
banded rail		1											1
morepork						1							1
kingfisher		1		1	1						1		4
song thrush								1	1				2
blackbird	3	1			2			5	5	3	2	2	23
grey warbler											1		1
silvereye	8				1							3	12
welcome swallow		2											2
fantail										1			1
house sparrow								1	2				3
goldfinch							4	2	1				7
greenfinch							2						2
yellowhammer									2	1			3
common myna	2		2										4
starling												1	1

there are deaths on some of the 17,250 km of sealed roads with speed limits 70 km h^{-1}.

A few studies have found road deaths can have substantial impacts on population demography. For example, vehicles were responsible for 72% (n = 22) of Okinawa rail (*Gallirallus okinawae*) mortality during the breeding season, and most deaths occurred along 2 faster and straighter areas of road (Kotaka & Sawashi 2004). Roadside mortality on adult and sub-adult Florida scrub-jays (*Aphelocoma coerulescens*) was also sufficient to render the roadside territories as sinks in a population (Mumme *et al.* 2000). None of the birds I found in my study are currently threatened, although banded rails have a restricted range in New Zealand and traffic mortality could depress local populations.

My study highlights the need to conduct further surveys of traffic mortality in other areas in New Zealand, to get a more accurate picture of national avian roadside mortality and how it varies with road and traffic conditions. Care must be taken to standardise methods (Erritzoe *et al.* 2003) and take into account all types of road including unsealed rural roads, highways, and private roads such as is common in areas of forestry. Other survey methods (e.g. driver questionnaires) may be useful to validate direct counts and estimate near misses or hits in which the bird is propelled far off the road and thus missed by surveys. Rates of carcass loss, due to scavenging and movements also need to be assessed in order to estimate the proportion of deaths missed by current survey methods.

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