Notornis, 2014, Vol. 61: 170-173
0029-4470

SHORT NOTE

Bird electrocutions in New Zealand

SARA M. KROSS
School of Biological Sciences, University of Canterbury, Christchurch, and Marlborough Falcon Conservation Trust, Blenheim, New Zealand

Due to their large size and preference for perching from high vantage points, raptors are especially prone to electrocution, and mortality from electrocution on power structures is a major threat to birds of prey in human-modified landscapes around the world (Lehman *et al.* 2007). Globally, agricultural expansion and intensification has drastically changed landscapes (Foley *et al.* 2005). While some species of raptor can take advantage of the food sources available in agricultural landscapes, the low availability of natural perches and high frequency of electrical structures in these regions can lead to a high incidence of electrocution, sufficient to limit population growth (Real *et al.* 2001; Marchesi *et al.* 2002; Sergio *et al.* 2004; Lehman *et al.* 2007). Internationally, electro-utility structures with multiple conductive components close together, or those that have grounded hardware, are more likely to electrocute birds (Lehman *et al.* 2004).

Received 21 January 2014; accepted 31 July 2014
Correspondence: *saramaekross@gmail.com*
Current address: Department of Wildlife, Fish & Conservation Biology, University of California, Davis, U.S.A.

Electricity is transported throughout New Zealand over a network of high-power (50-220 kV) transmission lines carried over 12,000 km and supported by approximately 41,000 towers and poles and 61 switchyards (Transpower 2013). Local lines companies deliver power to consumers through 85,601 km of 11-50 kV overhead distribution lines in rural, remote and rugged regions, and 18,504 km of overhead distribution lines in urban regions of New Zealand (Commerce Commission 2013). In comparison, New Zealand has 83,000 km of local roads and 11,000 km of state highways (NZ Transport Agency 2012). Distribution transformers change the current of electricity travelling across distribution lines to a current used for standard residential and business electricity. There are 124,067 pole-mounted distribution transformers in New Zealand (Commerce Commission 2013).

Following reports of New Zealand falcons (*Falco novaeseelandiae*) being electrocuted in Marlborough (Fox & Wynn 2010), I contacted a number of organisations and individuals to determine if the problem is widespread, as well as to determine if electrocution also affects non-raptor species in New Zealand. I used electronic mail to contact all

Table 1. Reports of birds collected dead under power lines or found after being electrocuted.

Species	Year	Number of individuals	Location	Found beneath	Reported by
New Zealand falcon (*Falco novaeseelandiae)*	2009	1	Glenorchy, Otago	Transformer	Barry Lawrence
	2010	1	Ngakuta Bay, Marlborough	Transformer	Dianne John; Fox & Wynn (2010)
	2010	2	Glenorchy, Otago	Transformer	Barry Lawrence
	2005-2010	7	Wairau Valley, Marlborough	Transformer	Fox & Wynn (2010)
	2005-2010	3	Wairau Valley, Marlborough	Unknown	Fox & Wynn (2010)
	Unknown	1	Arthurs Pass, Canterbury	Transformer	Graeme Kates; Fox & Wynn (2010)
	2013	1	Unwin Lodge area, Aoraki/ Mount Cook National Park	Substation	Shirley Slatter
Australasian harrier *(Circus approximans)*	2010	1	Wairau Valley, Marlborough	Transformer	Mike Bell & Phil Bradfield
	2010	1	Wairau Valley, Marlborough	Transformer	Sara Kross
Kea (*Nestor notabilis)*	2009	1	Mt Cook Village, South Canterbury	Substation	Raoul Schwing
	2013	5	Unwin Lodge area, Aoraki/ Mount Cook National Park	Substation	Shirley Slatter
Kaka (*Nestor meridionalis*)	2009	1	Whakatane	Power line	John Groom
	2010	1	Parua Bay, Whangerei, Northland	Transformer	Suzi Phillips
Kereru (*Hemiphaga novaeseelandiae*)	1998	1	Southland	Unknown but definite electrocution	Ralph Powlesland
	2005	2	Southland	Power pole (possible electrocution)	Ralph Powlesland
	2006	3	Southland	Transformer	Lloyd Esler
Eastern rosella (*Platycercus eximius*)	2010	1	Whakatane, Bay of Plenty	Transformer	Rosemary Tully
Canada goose (*Branta canadensis)*	1992	4	Auckland	Power line & transformer	Graham Jones
Magpie (*Gymnorhina tibicen*)	~1990	1	Invercargill	Transformer	Sally Dunston
Black swan (*Cygnus atratus*)	2009	1	Awatere valley, Marlborough	Power line	Sara Kross
Cook's petrel (*Pterodroma cookii)*	2009	1	Whakatane, Bay of Plenty	Power line	Rosemary Tully

Transformer electrocutions are for birds that were found dead under power poles mounted with transformers, but it is possible that another connection on the same pole caused the electrocution. Birds found under power poles may actually have been found under a transformer pole but the collector did not note it. Importantly, in cases where birds were found below power lines cause of death may have been collision rather than electrocution. The kea in 2009 was seen to be shocked while within an electrical substation.

New Zealand bird rescue centres listed on the New Zealand birds website (http://www.nzbirds.com/more/centres/html, accessed 25 February 2010). A call for reports was included in the 2010 edition of Southern Bird, and was included on the Birding New Zealand forum (http://www/birdingnz.net/forum/) on 22 February 2010. I also followed up on verbal communications from colleagues.

A total of 28 individuals of 11 different species were either found dead under electrical structures or were found with burns to their feet or bodies (Table 1). This number is in addition to the 12 electrocutions of New Zealand falcons previously reported in Fox & Wynn (2010). The reports were geographically spread between Northland and Southland (Table 1), and suggest that power lines and transformers are dangerous to a wide range of species including native psittacines, raptors, waterfowl, and large passerines (Table 1). However, because this study is based on retrospective, opportunistic observations, and not a systematic survey of electrical structures, it is unlikely to reveal the true scale of the impact of electrocution on bird populations throughout New Zealand. Studies of bird electrocutions that rely on opportunistic collection of dead birds, such as this one, are confounded by decomposition and scavenging rates, 'crippling' of birds by electrocution, and can be biased toward larger species which are more likely to be seen, or to areas and habitats where people are more likely to come across or notice dead birds (Lehman *et al.* 2007).

Aside from being found under power lines or poles, some electrocuted individuals show no physical signs of electrocution, and some birds that have been shocked but not killed may display subtle signs of injury such as minor burns to the feet (Dwyer 2006). For example a 3-year-old kaka (*Nestor meridionalis)* in Northland (Table 1) was found dead under a power pole mounted with a transformer, and was autopsied and found to be in good condition with a full-crop and no signs of trauma (S. Phillips, *pers. comm*.). Similarly, only some of the falcons reported as electrocuted in Fox & Wynn (2010) suffered from obvious burns. In other cases, signs of electrocution can be obvious. For example, a kereru (*Hemiphaga novaeseelandiae)* in Southland was found with both legs burnt off and burn marks over much of its body (R. Powlesland, *pers. comm*.). Birds that are electrocuted are not always killed immediately (Dwyer 2006; Fox & Wynn 2010), as was the case for a fledgling kea (*Nestor notabilis)* at Aoraki/Mount Cook village. This bird was electrocuted at an electrical substation, causing a power blackout. It was located 3 days later alive, but with necrotic flesh wounds, and was later euthanised (R. Schwing, *pers. comm*.).

Retrofitting dangerous structures can be a successful means of mitigating the issue of bird electrocutions (López-López *et al.* 2011). Transformers appear to be the most dangerous structures for perching birds in New Zealand, although substations may be localised sources of danger for birds such as kea and falcon (Table 1). Transformers have a number of different designs, but many are connected to overhead distribution lines via high transmission drop leads. These are un-insulated wires that taper in towards each other to join the bushings on top of the transformer, which is grounded. Birds can form a circuit by perching on the transformer box and touching any one of the wires, or by making contact with 2 wires when landing on the transformer. Because of these features, transformers appear to be the biggest concern for native birds in New Zealand, and have been attributed to most of the mortalities in Table 1. In 2011, Marlborough Lines, the company that owns and maintains the electrical distribution network in Marlborough, put a policy in place to insulate the high-voltage drop leads and bushings on all new and replaced transformer boxes within a designated 'bird protection zone' around the main grape-growing areas in the Wairau and Awatere valleys and in part of the Flaxbourne district (W. Stronach, *pers. comm*.).

Due to the scale of the electricity network across rural areas in New Zealand and the possibility of scavenging or decomposition prior to birds being located (Lehman *et al.* 2007), the number and widespread geographical range of the reports in Table 1 is likely to be indicative of a larger problem. More effort is needed to quantify the danger of electro-utility structures to New Zealand's avifauna, ideally through larger-scale prospective studies to search for deceased birds under power poles. Further research in conjunction with electrical network companies is needed to determine the importance of electrical substations as a source of bird electrocutions. At a minimum, a national database of bird electrocutions should be kept, and the Marlborough Falcon Conservation Trust has volunteered to administer and report on this database. Anyone picking up a dead bird under power structures should contact the Marlborough Falcon Conservation Trust, noting the species, location, the nearby power structure, and the likely cause of death.

ACKNOWLEDGEMENTS

P. Gaze assisted with accessing reports of electrocutions and provided advice on the manuscript. The individuals listed in Table 1 scoured through old records to report on past bird electrocutions and are thanked for their contributions. I also thank all bird rehabilitators who responded with reports of no electrocuted birds. N. Allen listed the call for reports in Southern Bird. Paul Alexander gave advice on bird electrocutions and power companies. X. Nelson and 2 anonymous reviewers provided helpful comments on the manuscript. W. Stronach and B. Tapp from Marlborough Lines provided information about power structures and retrofitting. T. Orr-Walker responded to a request for information about kea electrocutions. SMK received financial funding for this research through the University of Canterbury, the

Brian Mason Scientific & Technical Trust, Pernod Ricard NZ and Canon NZ.

LITERATURE CITED

Commerce Commission New Zealand. 2013. Electricity distributor's information disclosures - August 2013 (Schedules 1-10). Downloaded 18 January 2014. (http://www.comcom.govt.nz/regulated-industries/electricity/)

Dwyer, J.F. 2006. Electric shock injuries in a Harris's hawk population. *Journal of Raptor Research 40:* 193-199.

Foley, J.A.; Defries, R.; Asner, G.P.; Barford, C.; Bonan, G.; Carpenter, S.R.; Chapin, F.S.; Coe, M.T.; Daily, G.C.; Gibbs, H.K.; Helkowski, J.H.; Holloway, T.; Howard, E.A.; Kucharik, C.J.; Monfreda, C.; Patz, J.A.; Prentice, I.C.; Ramankutty, N.; Snyder, P.K. 2005. Global consequences of land use. *Science 309*: 570-574.

Fox, N.; Wynn, C. 2010. The impact of electrocution on the New Zealand falcon (*Falco novaeseelandiae*). *Notornis 57:* 71-74.

Lehman, R.N.; Kennedy, P.L.; Savidge, J.A. 2007. The state of the art in raptor electrocution research: A global review. *Biological Conservation 136:* 159-174.

López-López, P.; Ferrer, M.; Madero, A.; Casado, E.; Mcgrady, M. 2011. Solving man-induced large-scale conservation problems: the Spanish imperial eagle and power lines. *PloS ONE 6:* e17196. doi:17110.11371/journal.pone.0017196.

Manosa, S. 2001. Strategies to identify dangerous electricity pylons for birds. *Biodiversity and Conservation 10:* 1997-2012.

Marchesi, L.; Sergio, F.; Pedrini, P. 2002. Costs and benefits of breeding in human-altered landscapes for the eagle owl *Bubo bubo*. *Ibis 144:* E164-E177.

New Zealand Transport Authority. 2012. Frequently asked questions. Accessed 18 January 2014 http://www.nzta.govt.nz/network/operating/faqs.html

Prather, P.R.; Messmer, T.A. 2010. Raptor and corvid response to power distribution line perch deterrents in Utah. *Journal of Wildlife Management 74:* 796-800.

Real, J.; Grande, J.M.; Manosa, S.; Sanchez-Zapata, J.A. 2001. Causes of death in different areas for Bonelli's eagle *Hieraaetus fasciatus* in Spain. *Bird Study 48:* 221-228.

Sergio, F.; Marchesi, L.; Pedrini, P.; Ferrer, M.; Penteriani, V. 2004. Electrocution alters the distribution and density of a top predator, the eagle owl *Bubo bubo*. *Journal of Applied Ecology 41:* 836-845.

Transpower. 2013. Asset management framework. Accessed 30 July 2014. https://www.transpower.co.nz/about-us/industry-information/asset-management-framework

Keywords electrocution; falcon; kaka; kea; kereru; mortality; transformer