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Changes in bird conspicuousness at Pureora Forest

ADAM N. H. SMITH
Science and Research Unit, Department of Conservation, Private Bag 4715, Christchurch, New Zealand.
anhsmith@doc.govt.nz

IAN M. WESTBROOKE
Science and Research Unit, Department of Conservation, Private Bag 4715, Christchurch, New Zealand.
iwestbrooke@doc.govt.nz

Abstract Five-minute bird counts in Pureora Forest Park were compared between one site in a 1978-81 study and two similar sites in a 1997-98 study. The two sites from the more recent study have had different levels of pest control since the historical survey. The mean number of birds detected per count was calculated for each species and the differences among the sites were tested for significance. The results suggest a dramatic decline over time (irrespective of pest control) in many small native insectivores, including the grey warbler (*Gerygone igata*), tomtit (*Petroica macrocephala*), fantail (*Rhipidura fuliginosa*) and rifleman (*Acanthisitta chloris*). A large increase in bellbird (*Anthornis melanura*) conspicuousness was detected. Increases were observed for robin (*Petroica australis*), kokako (*Callaeas cinerea wilsoni*), kaka (*Nestor meridionalis*), parakeet (*Cyanoramphus novaezelandiae*) and kereru (NZ pigeon *Hemiphaga novaeseelandiae*) between the historical site and the recent pest-controlled site, but tui (*Prosthemadera novaeseelandiae*) counts have decreased. The number of species with higher mean counts in the site with more intensive pest treatment suggests that pest control has had a positive effect on some bird populations. However, some species also increased at the site with less-intensive treatment, and tui is more conspicuous at this site than the controlled one. The study shows the value of historical bird count surveys for assessing long-term changes in bird populations, and suggests a need to make similar data sets from around New Zealand more readily available to researchers.

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INTRODUCTION

The five-minute bird count is a tool widely used around New Zealand to monitor bird populations since the technique was comprehensively described and standardised by Dawson & Bull (1975). From 1978 to 1981 a set of five-minute bird counts was made at three sites in Pureora and Whirinaki Forest Parks in the central North Island (Harrison & Saunders 1981). The survey consisted of over 6000 counts, making it one of the largest sets of bird counts ever taken in New Zealand. The focus of the historical study was to investigate the effects of the controversial selective logging that was occurring at the time and to explore the dynamics of the well-represented bird communities in these two North Island forests. No clear effect of selective logging was detected for most of the common bird species that were examined. Nevertheless, this study produced some interesting information about the bird populations at the time, including seasonal changes and the effects of environmental variables.

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The availability of these historical data provided us with a unique opportunity to compare bird communities in recent times with those in 1978-1981 in these two distinct and important forests. The historical data are of particularly high potential for future comparisons because of the sheer size of the data set, because they were made consistently throughout the year, and because the majority were made by one experienced observer. In addition, a report containing comprehensive analysis was produced on completion of the project (Harrison & Saunders 1981).

We had access to unpublished five-minute bird count data from a more recent survey carried out by H. J. Speed over the winters of 1997 and 1998 at two sites very close to historical site within Pureora Forest Park. Their availability has allowed us to compare them with the historical data and to examine any long-term changes in bird conspicuousness. Furthermore, because these two sites were areas receiving high and low levels of pest control, respectively (Moorcroft *et al.* 2000), we were able to compare bird conspicuousness at one site surveyed in *c.*1980 with those of 1997-98 in two sites that have received different levels of pest management in the interim.

Table 1 Percentage of traps catching possums during possum monitoring in *Waipapa* and *Waimanoa*, 1995-99. The month of trapping is shown in brackets. (Table reproduced from Moorcroft *et al.* (2000) with permission).

Site	1995 Pre-control	1995-96	1996-97	1997-98	1998-99
Waipapa	6.3 (Oct 95)	1.2 (Jan 96) 1.8 (Mar 96)	0.17 (Nov 97)	0 (Nov 97)	
Waimanoa	8.9 (Dec 95)		3.1 (Jul 96) 14.1 (Oct 96) 14.7 (Dec 96)	23.7 (Jul 97) 0.22 (Sep 97)	13.2 (Jul 98) 8.6 (Aug 98)

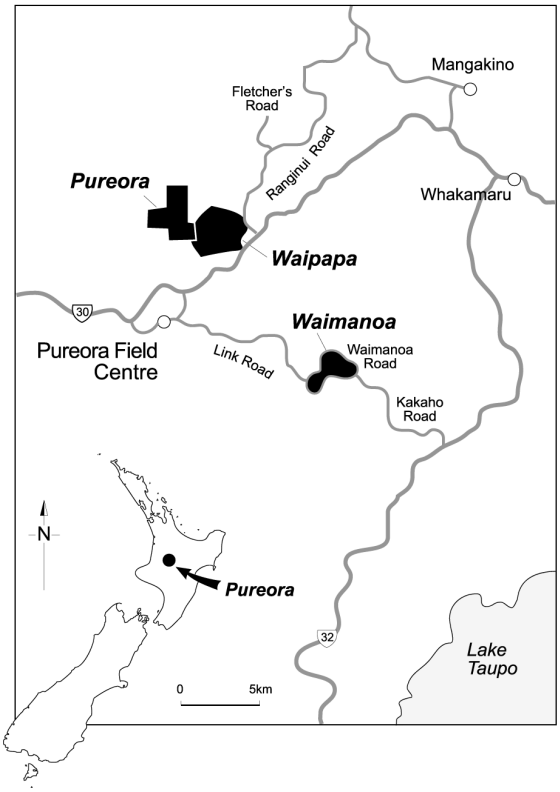

Figure 1 Map of Pureora area showing locations of the three study sites.

STUDY SITES

Site names are italicised in this paper so that they will not be confused with the names of actual forests. Our study looks at three sites within Pureora Forest Park, one from the Harrison & Saunders survey from 1978-81 named *Pureora* and two from the Speed survey from 1997-98 named *Waipapa* and *Waimanoa*. In this paper, the 1978-81 study is referred to as the "historical" study and the 1997-98 as the "recent" study. Fig. 1 shows the locations of the sites.

Pureora (1978-81)

This historical site is one of the three used in the Harrison & Saunders survey and is located in the western half of what is now called the Waipapa Ecological Area. At the time of the survey there had been no pest control other than commercial trapping of possums (*Trichosurus vulpecula*). The selectively logged section of the site had an extraction level less than 30%, and the 40 counting stations were allocated equally between the logged and unlogged areas. In the original study, 2520 counts were made at this site, but we used only 349 of these from 1979 and 1980 in our comparison as we were restricted to counts made in the same months as the more recent study. All *Pureora* site information is from Harrison & Saunders 1981.

Waipapa and *Waimanoa* (1997-98)

Both of these recent sites are within Pureora Forest Park. *Waipapa* is situated in the Waipapa Ecological Area immediately adjacent, with some overlap, to the south-eastern edge of the historical *Pureora* site. *Waimanoa* is approximately 10 km south-east of Waipapa. The counts were taken in May and June in both 1997 and 1998, and were dispersed throughout the day similarly to those of the historical study. There were 203 counts from 72 counting stations in *Waipapa* and 114 from 60 stations in *Waimanoa.*

Moorcroft *et al.* (2000) summarised predator control in this area. *Waipapa* has been the focus of intensive predator control since an aerial 1080 operation in 1991, and on-going ground control from 1993 onwards, including the Waipapa Restoration Project which has been in operation since 1995. *Waimanoa*, our non-treatment site, has had relatively lower levels of pest control than *Waipapa*. The site was, however, included in an aerial 1080 drop in August 1997. Table 1, reproduced from Moorcroft *et al.* (2000), shows the results of possum monitoring from 1995 to 1999, and indicates that possum numbers were consistently very low in *Waipapa*. *Waimanoa* possum numbers were consistently higher and fluctuated more widely than in *Waipapa*, and were

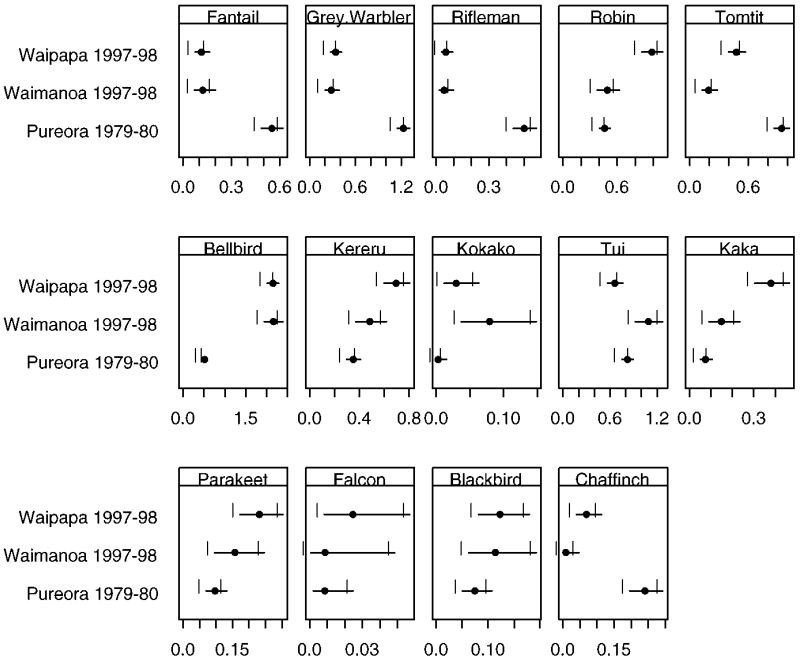

Figure 2 **W**inter (May and June) mean bird conspicuousness in two studies in Pureora Forest Park, with confidence intervals based on the assumption that the counts have a Poisson distribution. Note that the panels for different birds have varying scales.

particularly high in July of both 1997 and 1998, which is about a month after the survey was taken in both years.

METHODS

Both the historical and recent studies followed the five-minute bird count procedure as described by Dawson & Bull (1975) and the details of the methods used in the historical study are outlined in the original Harrison & Saunders (1981) report.

We derived the mean of the number of birds detected per five-minute count (an index we use to represent "conspicuousness") for each species at each of the three sites. For each species, we graphed the means with their 95% confidence intervals calculated on an assumption of a Poisson distribution of the counts. We compared the means using a Poisson regression, appropriate for count data, and used the least significant difference test of contrasts of means between sites (Everitt, 1998). This test is relatively liberal in finding differences, appropriate to exploring these data.

Bird conspicuousness varies significantly according to the time of year as found by Dawson *et al.* (1978) and Harrison & Saunders (1981). The only obvious difference in observation techniques was that, in the 1997-1998 data, silvereyes (*Zosterops lateralis*) and whiteheads (*Mohoua albicilla*) were recorded as "detected" or "not detected", whereas the historical data showed actual numbers that were observed. These birds tend to flock in the winter months, so trying to estimate the actual number in a flock was considered too inaccurate in the recent survey (H. J. Speed pers. comm.). Both species were left out of the analyses.

RESULTS

The mean numbers of birds recorded per count in the three sites from the two studies are presented in Table 2. The bird species are grouped according to whether they are native or introduced and then into similar feeding guilds. Within these guilds are consistent patterns (Fig. 2).

Native insectivores

Grey warbler, tomtit, fantail and rifleman all showed large, statistically significant decreases in conspicuousness from the historical to the recent study. Within the recent study, tomtit and the N.I. robin were significantly more conspicuous in *Waipapa*, the pest treatment site, than in *Waimanoa*. The robin was the only species in this group which increased in conspicuousness from the historical to the recent study, and this increase was only in *Waipapa*, the treatment site. Robin conspicuousness in *Waimanoa* was not significantly different to the historical *Pureora* levels.

Table 2 Average conspicuousness and significance tests by species in three different sites in two studies in Pureora Forest Park (NS = not significant, * = $P < 0.05$, ** = $P < 0.01$).

		Mean number of birds per count			Pair-wise comparison tests (least significant difference)		
		Pureora 1978-81	Waipapa 1997-98	Waimanoa 1997-98	Pureora and Waipapa	Pureora and Waimanoa	Waipapa and Waimanoa
Guild	**Species**	*n*=349	*n*=203	*n*=114			
Native insectivores	Whitehead *(Mohoua albicilla)*	0.09	unavailable	unavailable			
	Fantail *(Rhipidura fuliginosa)*	0.55	0.11	0.12	**	**	
	Grey Warbler *(Gerygone igata)*	1.23	0.34	0.28	**	**	
	N.I. Rifleman *(Acanthisitta chloris)*	0.50	0.05	0.04	**	**	NS
	N.I. Robin *(Petroica australis)*	0.46	0.99	0.49	**	NS	**
	Tomtit *(Petroica macrocephala)*	0.94	0.48	0.19	**	**	**
Native herbivores	Silvereye *(Zosterops lateralis)*	1.38	unavailable	unavailable			
	Bellbird *(Anthornis melanura)*	0.52	2.16	2.17	**	**	NS
	Kereru *(Hemiphaga novaeseelandiae)*	0.35	0.69	0.48	**	*	*
	Kokako *(Callaeas cinerea)*	0.003	0.03	0.08	*	**	NS
	Tui *(Prosthemadera novaeseelandiae)*	0.82	0.66	1.09	*	**	**
	N.I. Kaka *(Nestor meridionalis)*	0.07	0.38	0.15	**	*	**
	Parakeet sp. *(Cyanoramphus sp.)*	0.10	0.23	0.16	**	NS	NS
Native raptors	N.Z. Falcon *(Falco novaeseelandiae)*	0.01	0.02	0.01	NS	NS	NS
	Harrier *(Circus approximans)*	0.003	0	0			
Introduced	Blackbird *(Turdus merula)*	0.07	0.12	0.11	NS	NS	NS
	Chaffinch *(Fringilla coelebs)*	0.24	0.07	0.01	**	**	*
	Magpie *(Gymnorhina tibicen)*	0	0.11	0			
	Lesser Redpoll *(Carduelis flammea)*	0.09	0	0			
	Goldfinch *(Carduelis carduelis)*	0.05	0	0			
	Song Thrush *(Turdus philomelos)*	0.03	0	0			

Native herbivores

Among the honeyeaters, the most obvious difference was in bellbird conspicuousness, which showed a very large significant increase from the historical to the recent study. Within the recent study, no significant difference in bellbirds was detected between the treatment and non-treatment sites. Tui were more conspicuous in Waimanoa than in Waipapa, but counts in neither of the recent sites were significantly different to that of the historical site. Parakeets showed a significant increase from the historical study to the recent study for the *Waipapa* site only. Kaka and kereru increased between the historical and the recent study, with kaka numbers significantly higher at *Waipapa* than at *Waimanoa*

Introduced species

These data showed very similar levels of conspicuousness for blackbirds among all three sites, while chaffinch sharply decreased in conspicuousness from the historical to the more recent data, with *Waimanoa* lower than *Waipapa*.

DISCUSSION

Cross-study comparisons such as this are a crude but cost-effective method of examining long-term changes in populations. They require no additional fieldwork as they utilise existing records, and are able to provide important information with minimal effort. However, caution is needed when interpreting these results because the study is not based on actual repetition of bird count stations, which could yield more powerful and consistent data; instead it is a general comparison between similar areas based on the assumption that levels of bird conspicuousness are similar within a particular area of forest.

Despite the necessary caution, the results highlight a profound decrease in the small insectivores, grey warbler, tomtit, fantail and rifleman, but not robin. The robin may have benefited from pest control, as its conspicuousness has increased at *Waipapa* but not at *Waimanoa*. Rat control may reduce predation and competition for this species as it feeds mainly on the ground and understorey of the forest (Heather & Robertson 2000), while the other species are more arboreal. It is also important to note that unpaired male robins have been observed to sing more than paired ones during the mating season (Powlesland 1983; J. R. Hay pers. comm.). It is therefore possible for a small population in which the sex ratio is skewed in favour of males to be more conspicuous than a

larger, gender-balanced population. Despite being less conspicuous in both sites in the recent study, tomtits may also have benefited from the higher level of pest control at *Waipapa*.

Other species that appear to show a positive response to the intensive pest control in the Waipapa Ecological Area are kaka and kereru, which have significantly higher counts at this site than in *Waimanoa*. Although bellbird, kokako and parakeet are more conspicuous at *Waipapa* than the historical site, any difference between the treatment and non-treatment sites in the recent study is not significant. The results for bellbirds fail to show a greater response of bellbirds at the site with greater pest control, and tui counts appear to contradict such a response.

A similar study made by Pierce *et al*. (1993), involving the replication of five-minute bird counts done in 1979 in six Northland forests, showed quite different results to those presented here. They found that kereru counts did not increase in forests with possum control, although they decreased significantly in those forests without recent control. Our study indicates a significant overall increase for kereru in Pureora Forest Park, particularly in the *Waipapa* site, which has had extensive possum control, confirming a positive response of kereru to pest management. Pierce *et al*. (1993) showed that grey warblers, fantails and tomtits increased in conspicuousness in most forests in their study, whereas ours indicates a considerable decrease in these and other small insectivores. These differences suggest that any contrasting changes in conspicuousness we observed in these species reflect either a local trend or one occurring more recently than 1993.

A more comprehensive study, similar to that of Pierce *et al*. (1993), including additional five-minute bird counts in the same study sites as the 1978-81 report, would be needed to provide more definitive evidence of the trends suggested in this study. Pureora Forest Park contains some of the most heavily controlled areas of New Zealand, and the existence of the historical data could be a useful resource with which to assess the effectiveness of this control. A repetition of five-minute bird counts at the historical sites in Whirinaki Forest Park would afford a comparison of the Pureora trends with an area that has had very limited pest control. Detailed maps exist showing the position of the stations within the sites of the historical study, and the marked tracks between stations can still be found. With these resources the stations could be located with sufficient accuracy to repeat the historical counts.

This study highlights the potential of the many unutilised bird count data sets that exist around New Zealand, and underlines the value of curating data from similar historical studies to give a useful reference with which to compare contemporary avifauna research.

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