SEASONAL CHANGES IN COCK PHEASANT CALLING BEHAVIOUR IN TWO WANGANUI PHEASANT POPULATIONS

By RICHARD J. BARKER

ABSTRACT

Changes in cock Pheasant calling frequency during the breeding season were measured for two Wanganui Pheasant populations between 1986 and 1988 by recording counts at 2-week intervals during the period September to December. Calling intensity varied considerably between successive 2-week intervals. It reached a peak during mid-November but was much less by late December. To estimate variability between successive counts, call counts were recorded in six areas along the Wanganui-Manawatu coast between 6 and 11 November 1988. Within site variance averaged 25% of total variance between and within study sites.

INTRODUCTION

Estimating changes in bird abundance is important for successful management of gamebird species. Information on changes in bird abundance can be used to evaluate past management activity and as a basis for models that predict future population size. The latter is especially important for harvested birds because hunting regulations in New Zealand are set well in advance of the hunting season. Counts of cock Pheasant (*Phasianus colchicus*) calls are widely used in the United States as indices of relative population size (Seber 1982) but there is no published record of their use in New Zealand. In the United States cock Pheasant calling varies seasonally, reaching a peak during the spring breeding season (Burger 1966). If seasonal variation is similar in New Zealand, it needs to be considered when programmes are planned to estimate relative Pheasant population size based on call count indices.

The purpose of my study was to monitor Pheasant calling frequency at regular intervals during the major part of the breeding season to detect any patterns of change, and to estimate the importance of different sources of variability.

Study area

The Nukumaru Recreation Reserve (39°53′ S, 174°45′ E), 25 km north-west of Wanganui City on the Nukumaru coast, comprises lightly rolling sand dunes with a mixed pasture and lupin cover. It has been lightly hunted in recent years. Harakeke Forest (40°00′ S, 175°07′ E), 8 km southeast of Wanganui City on the Kaitoke coast, comprises light rolling sand dunes extensively planted in pine trees and marram grass. Gamebird hunting in Harakeke Forest has been relatively heavy in recent years, with an estimated 80% of cock birds removed each year (Wanganui Acclimatisation Society, unpubl. data).

METHODS

Counts were made at regular intervals from September to December in 1986, 1987, and 1988. To reduce between-count variability, counts were made only on days with no rain and with wind less than 8 km/h. This greatly reduced the number of days on which counts could be carried out, particularly between late September and mid-October, a period of persistent westerly winds.

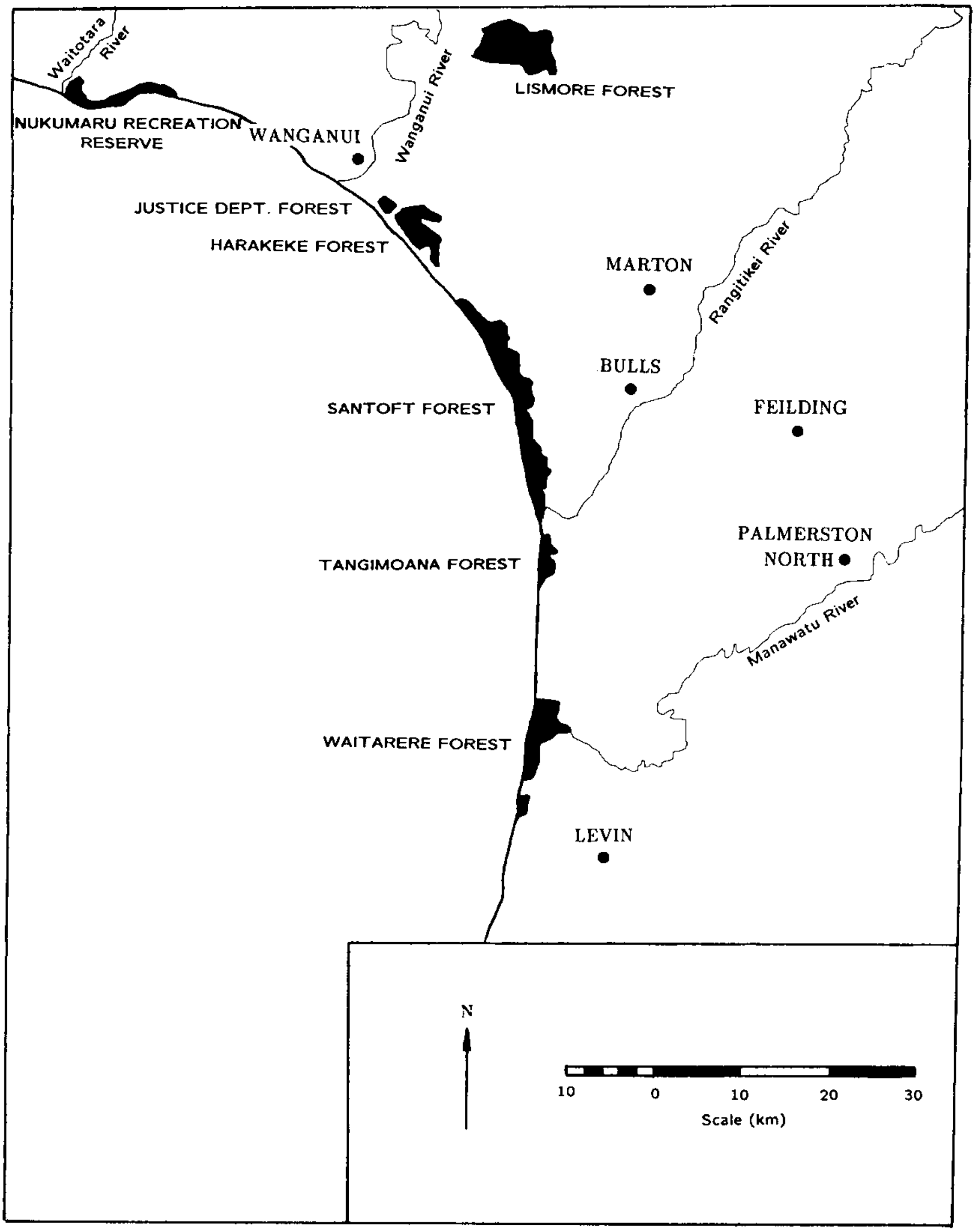

FIGURE 1 — The Nukumaru Recreation Reserve and coastal pine forests of the Wanganui District

A single calling transect consisted of six 5 - min stops at 1.6 km intervals along a fixed route. Counts began 45 minutes before sunrise and were completed 90 minutes later, and all Pheasant calls heard at each of the stops were counted. I made all counts myself, using the same sequence of stops, except for 1 week in November 1988 when a different observer was used in Harakeke Forest.

To investigate between-count variability over a short period in different habitat types, seven observers made simultaneous counts during the period 7 - 11 November 1988, in six habitat types, including the Nukumaru Reserve and Harakeke Forest. All areas included in the study are shown in Figure 1.

RESULTS AND DISCUSSION

Pheasant calling frequency varied considerably between successive counts, although underlying trends were still apparent. Each year, in each study area, the highest number of calls occurred during the middle of the 4-month study period (Table 1). At the Nukumaru Reserve, calling was well under way by mid-September, and it increased slightly to a peak during the period 29 October to 11 November (Figure 2). By early to late December, calling frequency was much lower. At the second station in the Nukumaru Recreation Reserve each year, calling reached a peak during late September to early October and declined. This station exerted a considerable influence on the overall pattern of calling, masking the pattern observed at the other five stations. Superimposed on Figure 2 is the pattern of calling without the results for station 2, showing more clearly the rise to a peak in late October to early November.

The trend in calling in Harakeke Forest (Figure 3) followed a similar pattern, although the rise and fall in calling frequency were more pronounced. In Harakeke Forest peak calling was during the period 12 November to 25 November. When the data summarised in Figures 2 and 3 are compared with the seasonal changes in calling frequency for Pheasants in Wisconsin

TABLE 1 — Date of peak count of Pheasant calls heard at six 5-minute stops along transects in the Nukumaru Recreation Reserve and Harakeke Forest during the period September to December 1986, 1987, and 1988

Area	Date of Peak Count		
	1986	1987	1988
Nukumaru Reserve	13 Nov	28 Oct	10 Nov
Harakeke Forest	15 Nov	18 Oct	24 Nov

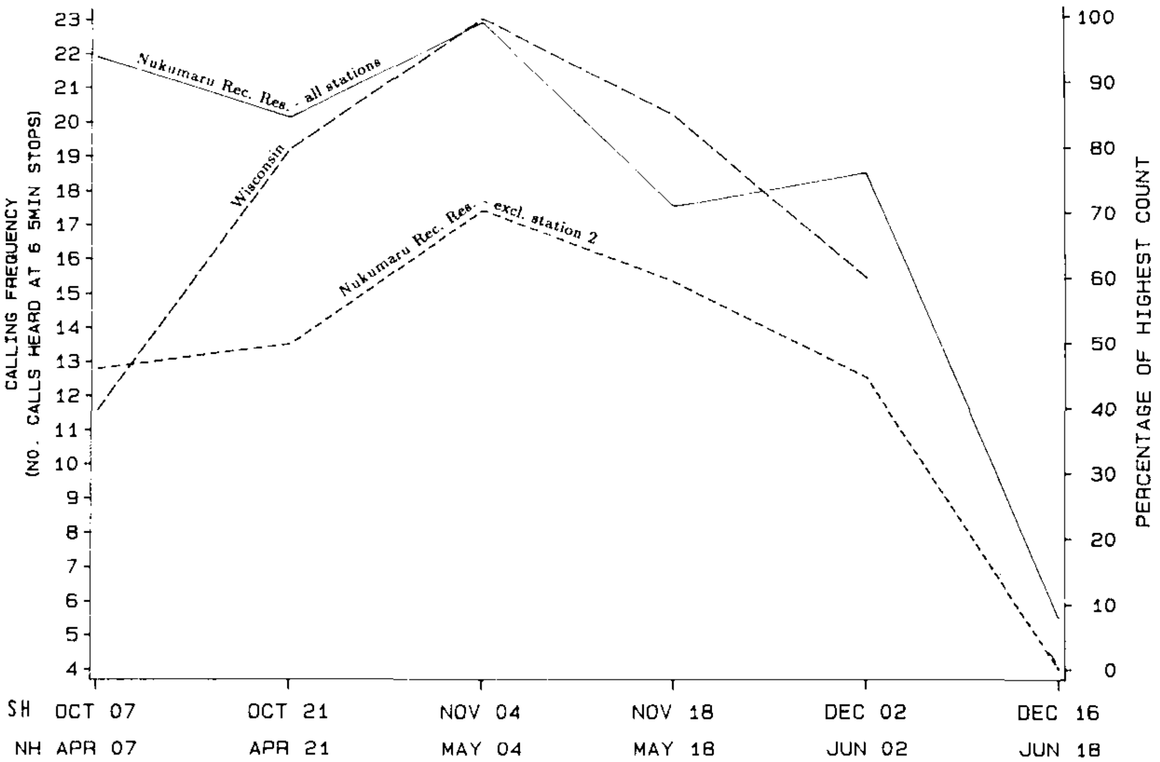

FIGURE 2 — Seasonal change in cock Pheasant calling frequency at 2-week intervals for the Nukumaru Recreation Reserve (calls heard at six 5-minute stops), 1986-1988, and Wisconsin, USA (percent of highest count) (adapted from Gates 1966). For the two New Zealand curves, each point represents the mid-interval mean of counts carried out in each interval during the 3-year study

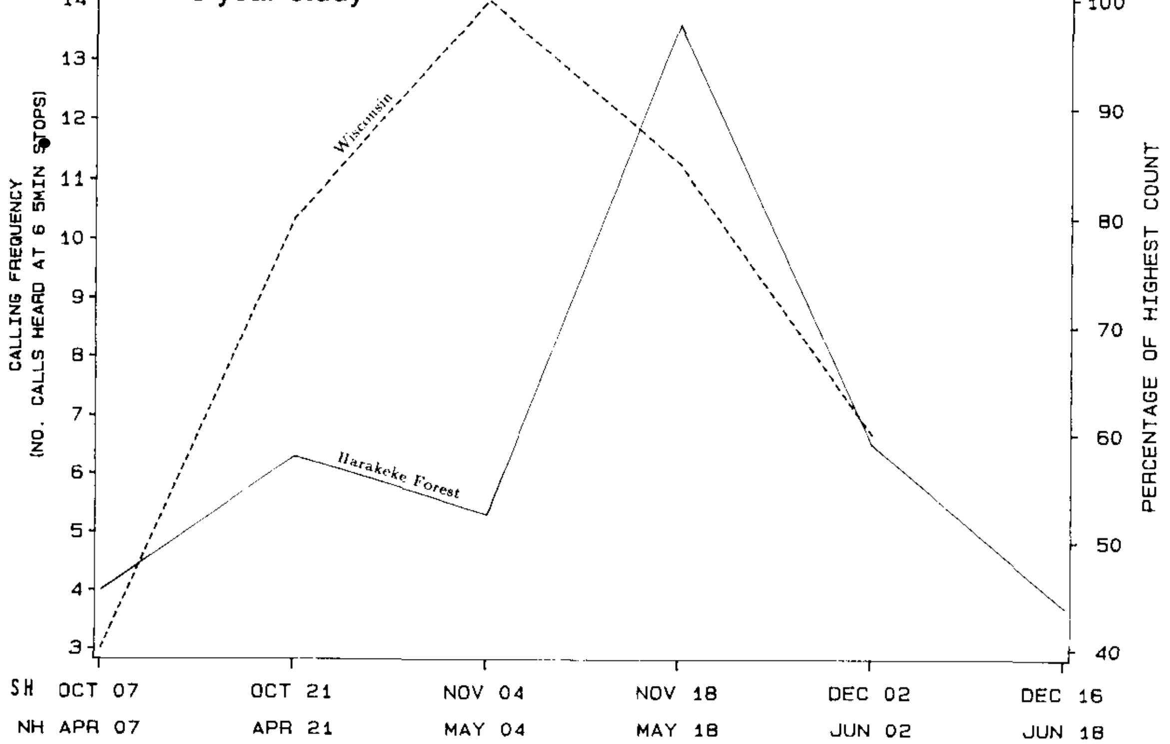

FIGURE 3 — Seasonal change in cock Pheasant calling frequency at 2-week intervals for Harakeke Forest, 1986-1988 (calls heard at six 5-minute stops), and Wisconsin, USA (percent of highest count) (adapted from Gates 1966). For Harakeke Forest, each point represents the mid-interval mean of counts carried out in each interval during the 3-year study

TABLE 2 — Number of counts, mean calls heard at all 6 stations along a calling transect, and maximum likelihood estimates of within and between site variance for Pheasant call counts replicated in six study sites, 7 to 11 November 1988.

Area	Habitat	No.	Mean calls	Within route variance
Nukumaru Reserve	Coastal scrub-pasture	4	26.0	205.2
Harakeke Forest	Coastal pine forest	5	4.2	2.0
Lismore Forest	Steep hill country pine forest	5	24.3	18.9
Santoft Forest	Coastal pine forest	4	21.3	9.6
Tangimoana Forest	Coastal pine pine forest	4	5.0	0.7
Waitarere Forest	Coastal pine forest	4	20.5	48.5
				Between route variance
Mean			16.1	71.8

(USA), it appears that the rise and fall of calling intensity lasted over a longer period in my study. Westerskov (1956) found that the breeding season for Pheasants in New Zealand was much longer than in the United States. It is likely, therefore, that behaviour associated with the breeding season is also more drawn out, as seems the case in my study. If Pheasant call counts are to be used as indices of population abundance, the effect of seasonal variability could be greatly reduced by timing the counts at the same time each year, provided the seasonal pattern varies little between years. Although it is difficult to test this assumption with only 3 years of data, my study suggests it may be valid, and that counts should be made in early to mid November. Besides seasonal variation, Pheasant calling also varies over even short intervals of time. For a fixed number of birds present within hearing distance of an observer, and for replicates of a count on a single day, the number of calls heard during the 90 minutes following sunrise would be expected to vary at random. In addition, the average number of calls heard between different study areas, or between years, would also vary. The relative magnitude of these different sources of variation has important implications for the design of studies using call count data. I used data from the simultaneous replicate counts in different locations, to estimate the importance of variation within study sites relative to variation between study sites. I assume that the number of birds present along each transect remains constant, and the effect of seasonal changes in calling intensity is trivial within the one week period the replicate counts were made, so that replicates over several days are equivalent to replicating counts on a single day.

I modelled X_i, the average number of calls heard at the *i*th study site, as a normal random variable with mean μ and variance σ^2, and $Y_{i,j}$, the number of counts at the *i*th study site on the *j*th day given X_i, as normal random variables with mean X_i and variance σ_i^2. Under this model the $Y_{i,j}$ are unconditionally distributed as normal random variables with mean μ and variance $(\sigma^2+\sigma_i^2)$, and the variance components can be estimated by the method of maximum likelihood. The variance components estimates (Table 2) indicate that within site variance can be large, relative to overall variation. Expressing the relative variance as the ratio of within site variance to total variability among counts and sites indicates that about 25% (range = 1% to 74%) of variation on average can be attributed to within site error. In analyses of geographic or temporal differences in relative abundance, my results indicate that analyses could be considerably improved by replicating counts over a reasonably short interval, and carrying out the analyses on the mean counts. This is because information on geographic or temporal patterns is provided by the variance between sites, or time, which is unaffected by replicating the counts. Within site variance, however, is reduced by an order of $\frac{1}{k}$, where *k* is the number of replicates.

ACKNOWLEDGEMENTS

I thank Ian Buchanan, Steve Smith, Peter Taylor (Wellington Acclimatisation Society), Don MacMillan, Kevin Bould, and Steve McGill (Dept of Conservation) for assisting with data collection. Permission for access to the study areas was provided by Bill Johnson (NZ Timberlands) and Noel Luff. Jim Hines and Norman Bauman (U.S. Fish and Wildl.Ser.) assisted with preparation of figures. Colin Ogle (Dept of Conservation) made helpful comments on the manuscript.

REFERENCES

BURGER, G.V. 1966. Observations on aggressive behaviour of male Ring-necked Pheasants in Wisconsin. J. Wildl.Manage.30:57-64.

GATES, J.M. 1966. Crowing counts as indices to cock Pheasant populations in Wisconsin. J. Wildl. Manage. 30:735-744.

SEBER, G.A.F. 1982. Estimation of Animal Abundance and Related Parameters. 2nd ed. London: Charles Griffen and Co. 654 pp.

WESTERSKOV, K. 1956. Productivity of New Zealand Pheasant populations. Wildlife Publication No. 406. NZ Dept Int. Affairs.

RICHARD J. BARKER, *Florida Cooperative Fish and Wildlife Research Unit, University of Florida, Gainesville, Florida 32611, USA*