POPULATION SIZE AND BREEDING SUCCESS OF NORTH ISLAND KOKAKO IN THE WAIPAPA ECOLOGICAL AREA, PUREORA FOREST PARK

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ABSTRACT

The southern third (1300 ha) of the Waipapa Ecological Area, Pureora Forest Park, was surveyed for North Island Kokako (*Callaeas cinerea wilsoni*) during the summer of 1990/91. Thirty four territories were located (0.03 territories ha^{-1}). At least 17 of these territories contained a pair, four (23%) of which fledged a total of seven juveniles. A conservative estimate of density was 0.04 Kokako ha^{-1} over the whole study area. These results suggest that there has been a large (up to 60%) decline in Kokako density in the Waipapa Ecological Area since the previous survey in 1980-81.

INTRODUCTION

The North Island Kokako (*Callaeas cinerea wilsoni*) is widely distributed in the northern half of the North Island, but mostly as small isolated populations (Rasch 1991). However, the recently surveyed Urewera National Park population is large, probably consisting of more than 1000 birds (C. Ward pers. comm.). Most populations are declining, probably due to degradation of habitat after past logging, and impacts of introduced mammals. These impacts may be in the form of predation (by mustelids, rats, cats or possums), or food competition from possums, rats, goats and red deer.

The Waipapa Ecological Area (E.A.) in Pureora Forest Park is one of the few remaining large areas of unlogged dense podocarp forest in the North Island and supports a high diversity of native wildlife.

The area was described as a major stronghold of Kokako by Crook *et al.* (1971) and by Rasch (1991). Only 350 ha had previously been intensively surveyed for Kokako, with territories mapped in 90 ha of this (Hay 1981). No subsequent information was available on Kokako density changes, or the long term viability of the Waipapa's Kokako population.

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The Department of Conservation initiated this survey in 1991 to quantify Kokako density in the area for long term population monitoring; to contribute information to an extensive research programme which aims to quantify the effects of introduced mammals on Kokako demography (Rasch 1991), and to accurately map ten Kokako territories which can be used to monitor the effect on Kokako of future aerial control operations against possums (*Trichosurus vulpecula*).

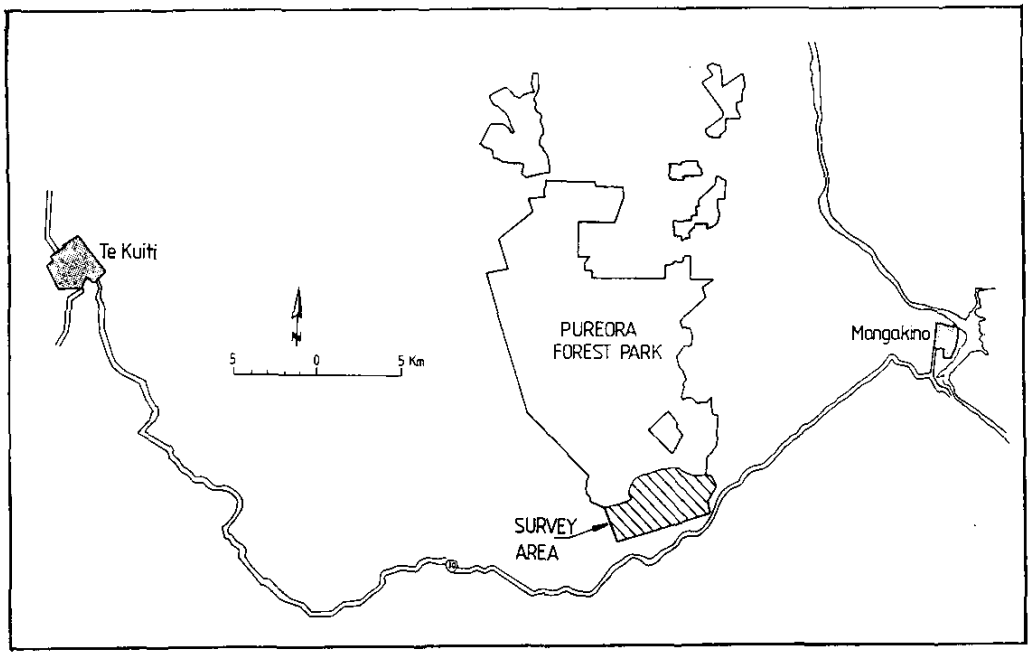

FIGURE 1 – Map of the study location, central North island

METHODS

The area surveyed was the southern 1300 ha of the Waipapa E.A. (Figure 1). The vegetation is described by Leathwick (1987). The tall (to 35 m) canopy is dominated by tawa (*Beilschmiedia tawa*), with frequent dense emergent conifers, especially rimu (*Dacrydium cupressinum*), matai (*Prumnopitys taxifolia*) and miro (*Prumnopitys ferruginea*). Altitude ranges from 500 to 600 m a.s.l.

Surveys were undertaken between 7 January and 25 March 1991. Transect lines were placed 300 m apart, with listening stations every 250 m along them. In total, there were 167 listening stations in the study area (Figure 2).

The survey consisted of three phases:

1. Walk-through survey 1 (WTS1), 7-23 January 1991. Between dawn and 11:00 hrs (NZST), observers walked along the transect lines, stopping each 250 m at predetermined listening stations to listen for Kokako calls. If after three minutes none was heard, a sequence of locally recorded Kokako calls was played to solicit a response from any Kokako in the area. The sequence of calls was as follows:

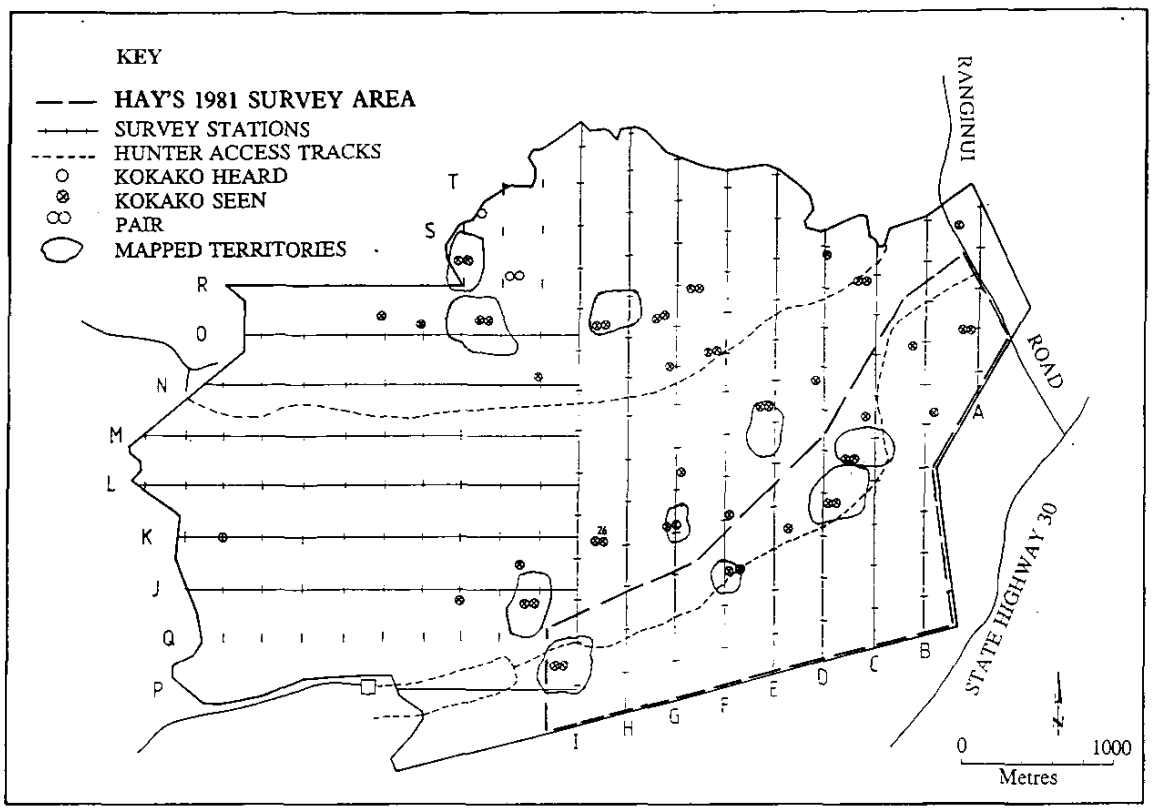

FIGURE 2 – Map of the southern portion of the Waipapa Ecological Area showing locations of transect lines, listening stations, Kokako heard and seen on walk-through surveys, territory-mapped Kokako, and the boundary of the 1981 survey of Hay (1981).

Three mew calls, followed by a three minute listening period.

Three mew calls, followed by a three minute listening period.

Thirty seconds of song, followed by a five minute listening period.

This sequence was stopped at any stage that a Kokako responded. We attempted to locate any birds which called and to then follow them for at least fifteen minutes to establish whether the bird was a member of a pair, or was alone.

This technique of Kokako surveying was pioneered by Crook *et al.* (1971) and subsequently refined over many surveys (Hay 1981, Bradfield et al. 1988, Rasch 1991). Surveying was not carried out on wet or windy days due to the difficulty of hearing Kokako calls.

2. Territory mapping, 24 January – 4 March 1991. Territories of ten Kokako pairs were mapped. Five of these were known to contain a pair from WTS 1, and five were identified as such thereafter. Each pair was followed on 2-7 occasions, for total follow times of 3-5 hours per pair. A Kokako recording was played to locate the birds if necessary. This recording was not played again during the follow to maximise the chances of observing normal behaviour of the Kokako. Their locations throughout the follow were recorded with reference to the transect lines.

Where there was some doubt as to the number of territories in an area, observers followed adjacent pairs simultaneously. By this method we were able to determine whether there were two territories in close proximity to each other, or whether birds were ranging over one large territory.

3. Walk-through survey 2 (WTS 2), 5-25 March 1991. This survey was a repeat of WTS 1, carried out over the same transect lines at the same listening stations, but between dawn and 0900 hrs (NZST) since Kokako showed a marked reduction in response to the taped calls after about 09:00.

Kokako nest from November to February, and most chicks fledge during January to March (J.Innes & R. Hay, unpub. data). All of these surveys were undertaken during the post-breeding period when fledged juveniles remain in their parents' territories and may be located by following the parents, and so juveniles were searched for during all follows. They were identified by their pink wattles, rather than the deep blue wattles of adults. Juvenile production is expressed as the proportion of pair territories fledging young. These data are minima since late nestings would have resulted in chicks fledging after the WTS 2 in March.

RESULTS

During WTS 1, 34 territories were estimated in the study area. In six of these a pair of Kokako was observed; a single bird was observed in 17 territories, and a further 11 territories were identified only from heard birds. During WTS 2, 30 territories were estimated in the study area, consisting of 14 pairs, 12 singles and 4 heard birds.

Ten territories were mapped during the territory mapping phase of the project (Figure 2). A number of territories adjoining these mapped territories were confirmed to be occupied by a single or a pair.

From the amalgamation of the information from both walk-through surveys, and the territory mapping, we estimate (see discussion) a total of 34 territories in the survey area (0.03 territories ha^{-1}), at least 17 of which contained a Kokako pair and 17 contained a single bird (0.04 Kokako ha^{-1}) (Figure 2).

At least four of the 17 confirmed pairs (23%) successfully fledged a total of seven chicks. Follows of five of the 17 pairs did not quite reach 2 hours in total, the standard duration accepted by the Kokako Recovery Group as adequate for valid comparison of juvenile output between areas, and so the figure is regarded as a minimum estimate.

DISCUSSION

All three surveys were carried out during the breeding season. At this time if a pair is nesting or has fledged juveniles, only one of the pair may be conspicuous, depending on the stage of nesting. Birds were difficult to observe at most times because of the high canopy and dense subcanopy. For these reasons, brief contacts with Kokako may give misleading information about whether a territory is occupied by a single bird or a pair. This is usually

the case in walk-through surveys. Survey accuracy is considerably improved by territory mapping, which greatly increases the period of observation in each territory.

The six most likely survey error sources which we perceive are listed below and discussed in relation to this project:

Cause 1. Territory missed completely due to lack of vocal response from the birds. Our second walk-through survey relocated eight (80%) of the ten pairs whose territories were previously mapped. This result is similar to the mean of 74% initial location by walk-through survey derived from territory mapping in seven study areas over three years (Bradfield *et al.* 1988).

Kokako sing actively throughout the breeding season and we consider that most territories present were located during our surveys.

Cause 2. Territory misidentified as belonging to a single bird, when it may have been the territory of a pair. This error is likely if at the time of survey the female is sitting on eggs or very young chicks, and is reduced by repeated visits, prolonged follows and experienced observers. We cannot quantify the extent to which this happened. More than 17 of the 34 territories perhaps contained a Kokako pair. This source of error does not affect the estimate of the number of territories present, only the number of Kokako occupying them. Large numbers of single birds are, however, characteristic of declining Kokako populations. Intensive monitoring elsewhere in Pureora Forest revealed ten territories occupied by pairs and 23 by single birds (Rasch, 1991).

Cause 3. Clumping. Recording different birds as belonging to one territory when in fact they were closely spaced separate territories. This is a possible source of error to our results, especially where the territories of the birds were not mapped. This results in an underestimation of territory density. The error is best resolved by banding individual Kokako, although repeated follows of adjacent territories also clarify the situation. In this survey, where the walk-through survey was repeated and considerable territory mapping work was done throughout the area, we think that the error is small.

Cause 4. Double mapping. Recording the same bird(s) in different localities when it or they may in fact be at opposite ends of a large territory. In situations where this seemed possible, we returned at a later date with two observers to confirm whether one or two territories were present. The territory mapping phase of the project also clarified many situations. Where doubt remained, closely adjoining observations were classed as one territory for the final estimate. This approach may have led to "clumping" error as described above and is one reason why the presented density estimates are regarded as conservative.

Cause 5. Mobile subadults. The perceived problem is that subadults may move from area to area looking for space or mate, and could be mapped in several places. However they are unlikely to sing and display territorialism. The importance of this factor in counts is probably small.

The survey was completed before most chicks of the 1990/91 breeding season would have become independent. From field observations in other study areas, this source of error is most likely to apply to those individuals

that are in the dispersal phase between fledging and becoming territorial, ie birds which are 1-2 years old.

Cause 6. Mislocating "heard" birds. This is not perceived to have been a significant source of error during this survey, since the reason most "heard" birds were not seen was because of restricted vision to the canopy, even though we could hear them above us.

The density of Kokako territories (0.03/ha^{-1}) in the survey area is lower than recorded in part of the area 10 years ago. A walk-through survey in 350 ha of the southern Waipapa E.A. was undertaken by Rod Hay in 1980-81 (Hay 1981). Hay visited 18 listening stations, irregularly placed at about 500m spacing, four times between January 1980 and February 1981. All kokako heard and seen at and between stations were noted. Hay identified 24 territories, consisting of 9 pairs, 5 singles, and 9 of unconfirmed status. In the same 350 ha area in 1991, we identified 10 territories (5 pairs and 5 singles), a decline of 58% in 10 years.

This 350 ha area had a territory density of 0.03 ha^{-1} in 1991, much lower than the 1981 density which Hay estimated to be 0.07 territories ha^{-1}. Although the survey by Hay in 1981 was not as intensive as the 1991 survey, we conclude that a large (up to 60%) reduction in Kokako density has occurred between 1981 and 1991.

Fledging of young by at least 4 (23%) of the 17 pairs surveyed is typical of the low chick production recorded for other mainland populations. At Rotoehu Forest in the Bay of Plenty during 1990-94, 8% to 30% of pairs fledged chicks (J. Innes *et al.* unpubl. data). This is much lower than recorded on predator-free Little Barrier Island (75-85% during 1990-94) or in 1992/93 at mainland sites where numbers of mammal pests have been greatly reduced (50% chick output at Mapara, King Country; 85% at Kaharoa, Bay of Plenty; J. Innes *et al.* unpubl. data).

The survey of Kokako density suggests that the population in the Waipapa E.A. will continue to decline unless active management is undertaken, as is being trialled at Mapara and Kaharoa (Rasch 1991). It has provided a valuable baseline territory map with which to monitor future changes. Further detailed survey would be made considerably easier and more reliable if Kokako were individually colour-banded.

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