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Evidence for the continued existence of the South Island kokako (*Callaeas cinerea*) drawn from reports collected between January 1990 and June 2012

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Abstract The South Island kokako (*Callaeas cinerea*) was officially declared extinct in 2007, with the most recent report accepted by the Ornithological Society of New Zealand's Rare Birds Committee, being in 1967. However reports of potential observations of South Island kokako continued to appear. We compiled a total of 241 reports between January 1990 and June 2012. These reports were categorised into 6 categories depending on the details provided by observers. The most highly ranked reports required identification of the wattles which are the most distinguishing feature of South Island kokako. The 13 reports from the highest category were submitted to the Bird Threat Ranking panel in June 2012 and, based on this evidence, the species was then reclassified from "extinct" to "data deficient". The most compelling 11 reports were then submitted to the Ornithological Society of New Zealand's Records Appraisal Committee (RAC). One report was accepted as a South Island kokako while 2 were deemed to be of North Island kokako. This paper reviews all available reports of the South Island kokako from 1990, the assessment process and a map of the distribution of reports. Our analysis of these reports suggests that the South Island kokako is extant.

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INTRODUCTION

The New Zealand wattlebirds (Family Callaeidae) comprise the huia (*Heteralocha acutirostris*), North Island and South Island saddlebacks (*Philesturmus rufusater* and *P. carunculatus*) and North Island and South Island kokako (*Callaeas wilsonii* and *C. cinerea).* Following the introduction of mammalian predators from the latter half of the 1800's all these species suffered a steep decline with the extinction of the huia and localised extinctions of all other species. Today the 2 species of saddlebacks survive only on offshore islands or areas of mainland with extensive predator control. The North Island kokako is likewise now dependant on predator control for survival (http://nzbirdsonline.org.nz/).

In 2007 the Bird Threat Ranking panel convened by the New Zealand Department of Conservation declared the South Island kokako extinct. The last accepted report had been made in 1967 in the Tiel Valley, Mt Aspiring National Park (McBride 1981). Nevertheless, possible reported sightings continued to be made. We collated a total of 241 reports of South Island kokako dated between 1990 and June 2012.

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The detail provided in reports is variable, with some reports containing just auditory evidence while others involved long and detailed visual sightings. Based on the most convincing criteria, a total of 13 reports were selected and submitted to the Bird Threat Ranking panel in June 2012. This resulted in a change of status of the species from 'extinct' to 'data-deficient'. In October 2012, 11 of the 13 reports were submitted to the Records Appraisal Committee (RAC), formerly called the Rare Birds Committee, of the Ornithological Society of New Zealand. One report, from a March 2007 sighting at Rainy Creek, Reefton, was accepted as a South Island kokako. Two other reports from March and June 1997 at Waikawa Bay, Queen Charlotte Sound, were considered to be North Island kokako that were perhaps released in the area. The other 8 submitted reports received either probable or possible assessments.

Based on the continued reports of South Island kokako, the recent reversal of the official status of the species, and the acceptance of the RAC of at least one sighting, it is timely to review the evidence for the continued survival of the South Island kokako, and its likely current distribution. In this paper we review the 241 reports of the South Island kokako, classify them to likelihood based on an objective assessment of the distinguishing features of kokako, and provide an indicative distribution of the species by mapping the highest ranked reports.

METHODS

Reports dating January 1990 to June 2012 were collated into a spreadsheet of 241 entries. Reports earlier than 1990 were not sought for this study although 3 key pre-1990 reports are referred to in the discussion and included in the supplementary material. The majority of the reports were of chance encounters by members of the public who had seen an unusual bird or heard unusual calls, which they believed may have been a kokako. We directly contacted the observers of most of the highest ranked reports for confirmation of their observations. Reports were sourced from Ron Nilsson, Rhys Buckingham, Department of Conservation area offices and directly from members of the public.

We have assumed any kokako identified on the South Island mainland or Stewart Island to be a South Island kokako. Kokako species have limited powers of flight and could not cross between the North Island and South Island unless assisted. The only known translocations are of a single North Island kokako to Stewart Island in 1987 and 2 translocations in 2008 and 2009 to Secretary Island, Fiordland which appear to have failed as no kokako were found on Secretary Island during searches in the spring of 2013. They are not capable of flight from Secretary Island to the mainland.

We categorised reports according to criteria which we believe corresponded with the likelihood of the sighting being a South Island kokako. The identification of the wattle was central to the categorising of sightings. The presence of wattles is highly diagnostic in both species of kokako, and was deemed necessary on any bird fitting the general description of the kokako. Follow-up searches (see Table 1) were searches for kokako in an area where there had previously been kokako reported.

Visual reports

Categorisation of visual reports was weighted towards clear identification of the wattles. Where the presence of wattles has been inferred from the description given, the sighting is noted as such (see description of wattles below). The categories we used were:

> *Category 1*: Close sighting (within 10 m with a naked eye or 50 m through binoculars or scope) of a bird fitting the general description of kokako and wattles at the base of the bill clearly observed (minimum wattle sighting of 3 seconds).
> *Category 2*: Sighting of a bird fitting the general description of kokako and wattles at the base of the bill observed but not meeting category 1 criteria (for proximity to bird or duration of wattle observation). Alternatively, a report was accepted as category 2 if the sighting fit the general description of kokako within moderate range (20 m) and where defining behaviour was observed. Defining behaviour was restricted to (a) running along branches or logs, (b) leaps or bounds, and (c) seen by an experienced kokako observer.
> *Category 3*: Any sighting of a bird the observer believes may be a kokako but not meeting category 1 or 2 criteria. The observation must be consistent with the general description of the kokako and is generally associated with unusual calls or behaviour (note: rare vagrants mistaken for kokako would fall into this category, for example black-faced cuckoo-shrike (*Coracina novaehollandiae*) or Australian red wattlebird (*Anthochaera carunculata*)).

Wattles are described as "colourful fleshy drupes on either side of the gape in saddleback, kokako and huia" (Heather and Robertson 1996). The wattle on South Island kokako is not always obvious, despite the proximity of observation. Buller noted "they usually carried the wattles firmly compressed under the rami of the lower jaw" (Buller 1888) thus it may not appear as a classic hanging fleshy wattle. As a result, 6 sightings have been deemed to include

Table 1. Summary of reports by category.

Category	Number of reports	Number of reports resulting from follow-up searches
1	13	1
2	23	3
3	73	14
Aural	126	36
Other	3	0
Doubtful	3	0

description of wattles without the observer's use of the word 'wattle' (descriptions used include "lumps of orange around its face"; "pink around its beak" or similar). Kokako wattle colour is variable. While South Island kokako wattles are reported predominantly to be orange or yellow, often with the basal part blue, reported wattle colours include orange (Potts 1873, 1882; Campbell 1879; Reischek 1885; Buller 1892), yellow (Smith 1888), orange and blue (Reischek *op. cit*., Buller 1892), blue (Douglas 1899), red (Douglas *op. cit*.), 'rich crimson-lake [*i.e.,* reddish purple], the base tinted with violet' (Campbell *op. cit*.) and 'putty coloured, just a light fawn' (McBride *op. cit*.). Wattles of nestling South Island kokako have been reported as 'rosy pink' (Potts 1873), 'light rose tint, changing to violet towards the base for nearly fledged birds' (Campbell *op. cit*.). Wattle colour of adult North Island kokako is blue although occasionally orange (Buller 1888; Brown 1991). Other wattled birds reported from the South Island are the South Island saddleback (which is half the size of a kokako with a conspicuous chestnut 'saddle' on adult birds and assumed extinct on the mainland in the early 1900's (http://nzbirdsonline.org.nz/), the Australian red wattlebird which has a small red wattle behind the ear (2 reports from the 1800's) and the spur-winged plover (*Vanellus miles*) which has a yellow wattle at the base of the bill but is conspicuously different to kokako in plumage with white underparts. Feral poultry (*Galliformes spp.*) have wattles and may be found in the South Island forest at certain locations however we have assumed that observers are familiar with domestic poultry and have not mistaken poultry for kokako.

Our use of the term "general description" of South Island kokako refers to birds with plumage blue-grey to grey-black and a size between a tui and kereru. Defining behaviour exhibited by kokako has been used in assessing some of the category 2 reports. Kokako have relatively long, strong legs allowing them to run, leap and bound through the forest more so than other forest passerines. While these behaviours are more strongly exhibited by kokako than other birds, the degree of subjectivity required to assert any behaviour as kokako behaviour means that kokako identified this way could not be given category 1 status.

Non-visual reports

We classified non-visual reports into 1 of 3 categories:

> *Aural reports*: Reports of unusual calls from an unsighted bird the observer believes may be a kokako (note: for a call to sound 'unusual' to an observer implies some knowledge of calls that are 'usual'. Observers inexperienced in normal calls from common bird species are unlikely to generate reports).
> *Other reports*: There are several reports of unusual moss grubbing (South Island kokako have been associated with unusual moss grubbing; Potts 1873; McBride *op. cit*.) or kokako-type wing beats heard by experienced observers.
> *Doubtful:* Reports that were very unlikely to be kokako.

Aural reports were considered of limited value as evidence of existence of the South Island kokako because of mimicry (both by and of other bird species), because there are no verified South Island kokako calls recorded and because of the more subjective nature of aural reports. While moss grubbing has been associated with South Island kokako (Potts 1873; McBride *op. cit*.) other species also grub moss. Aural reports, moss grubbing reports and reports of kokako-like wing beats were considered unconvincing as evidence.

A spreadsheet summarising all reports and original category 1 and category 2 reports are supplied as supplementary material (see section on supplementary material). Two reports of kokako being identified 'in the hand' in 1956 and 1961 are included because they are referred to in the discussion. Report maps are also included in supplementary material.

Mapping

Due to spatial limitations, names and topographical features have been omitted. A small scale map of the Rainy Creek area is included to demonstrate clustering of reports. This area was used to highlight the clustering associated with the accepted report.

RESULTS AND DISCUSSION

There were 105 visual reports from 92 observers. Three observers with a particular interest in South Island kokako accounted for 16 visual reports with

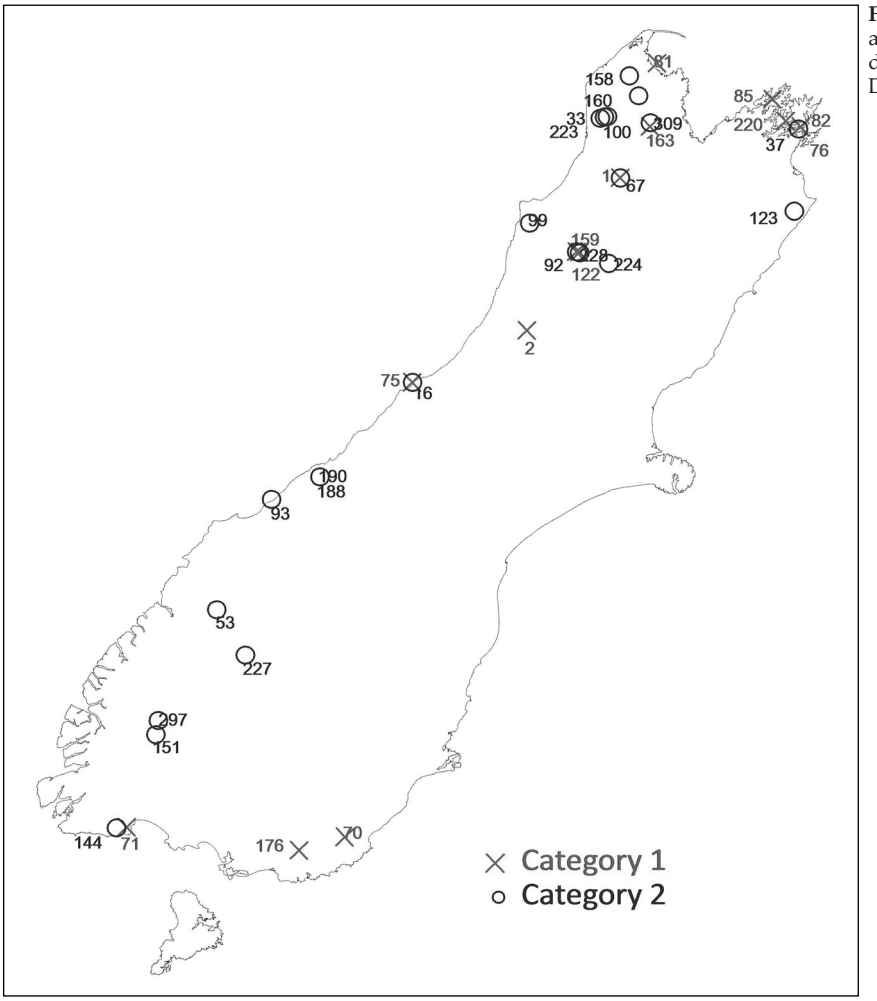

Fig. 1. Map of Category 1 and category 2 reports (map data sourced from LINZ Data Service).

the other 89 visual reports from other individual observers.

There were 13 reports that provide compelling evidence of the continued existence of the South Island kokako and another 23 reports that are likely to be South Island kokako (Table 1). These reports were distributed over the length of the South Island, but were predominantly in the west but also in the Marlborough Sounds and the Catlins (Fig. 1). The reports show a degree of spatial clustering, an example of which is given in Fig. 2. The low rate of reporting is not unexpected for a bird that may continue to exist in low numbers. Failure of follow up searches to provide substantive and confirming evidence may be due to an increase in cryptic behaviour over time in the South Island kokako population. Other species to have followed a similar process of rediscovery to the South Island kokako include the New Zealand storm petrel (*Fregetta maoriana*) rediscovered in 2003 (http://nzbirdsonline.org.nz/), where reported observations led to a change of status from 'extinct' to 'data-deficient' and finally to reports being accepted by the RAC.

Explanations of sightings

There are limited alternate explanations for those category 1 reports where wattles at the base of the bill have been clearly sighted on birds fitting the general description of kokako. One explanation is that the observers simply 'got it wrong', however given disparate observers the length of the South Island giving similar descriptions, this possibility must be considered minimal. Wattles may have been mistaken, for example, as juvenile tui with pollen-coated faces or blackbirds with *Coprosma spp.* berries in their bill. Yet this likelihood must be considered low given the proximity and duration of the category 1 sightings (Table 2). The criteria

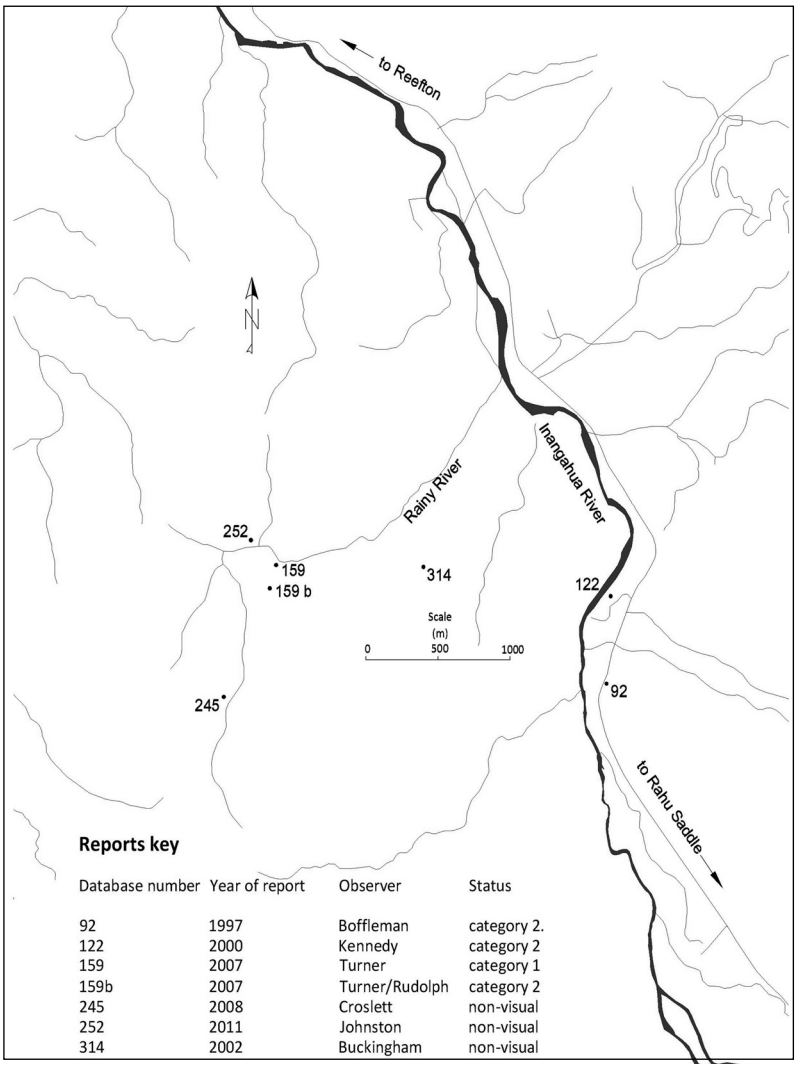

Fig. 2. Map of reports clustered near Rainy Creek (map data sourced from LINZ Data Service).

for category 1 were set specifically to minimise the chance of misidentification of wattles. Fabrication of rare bird sightings is an unfortunate aspect of ornithology in many parts of the world, however the majority of the category 1 observers were unaware of South Island kokako before their encounter and therefore could not have fabricated their sighting. It is possible that there is another wattled species (rare vagrant) as yet unreported in New Zealand but given the number of category 1 reports, this possibility must also be considered low. We found the most likely explanation for the sightings is that many of them were in fact kokako and that it is unreasonable to claim that all 13 of the category 1 reports are such inaccurate descriptions of what was seen (either because the observers deliberately fabricated detail or they were unwittingly influenced by subsequent research) to the extent that the reports are invalid. Due to variability in wattle colour, it may not be possible to distinguish between the North Island kokako and South Island kokako in the field. However, as there are no reports of kokako in the North Island with blue and orange wattles, the accepted 2007 report from Rainy Creek of a kokako with blue and ochre wattles is most unlikely to be a North Island kokako. As there have been no known releases of North Island kokako to the South Island mainland and they are not capable of self-introduction, we have assumed any kokako on the South Island mainland to be South Island kokako.

A number of reports have been followed up by people with a particular interest in South Island kokako, increasing the search effort in a given area and therefore the likelihood of generating more

Table 2. Summary of Category 1 sightings.

Record	Date	Location	Distance	Duration of view	Number of observers	Follow -up search?
1	1 January 1990	Lake Matiri	5 m	> 5 minutes	1	No
2	1 January 1992	Taipo River	< 10 m	> 3 minutes	1	No
75	24 October 1996	Whataroa River	7 m*	3 seconds	1	Yes
70	1 January 1997	Catlins River	3.5 - 20 m	45 seconds	1	No
76	15 March 1997	Waikawa Stream	3 m	2+ minute	1	No
81	1 June 1997	Parapara Ridge	4 m	1 minute	2	Yes
82	23 June 1997	Waikawa Stream	7-10 m	5-10 minutes	1	No
85	27 July 1999	Tennyson Inlet	30 m*	1 minute	1	Yes
71	1 January 2000	Wairaurahiri River	10 m	>3 seconds	1	No
220	1 January 2003	Mahau sound	3-4 m	3 minutes	2	No
176	15 October 2006	Waimahaka Bush	4-7 m	> 20 seconds	1	No
159	21 March 2007	Rainy Creek	10 - 12 m	30 seconds	2	Yes
163	4 February 2008	Arthur Range	7 - 40 m**	2 - 3 minutes	1	No

* Observed with binoculars
** Observed with 7x spotting scope

reports, however the clearest and best described sightings have been all chance encounters. In only 1 of the 13 category 1 reports was the observer actually looking for South Island kokako and even this sighting can be considered a chance encounter in that he was not using playback at the time but located the bird while it was fossicking on the ground (see supplementary information on report for Whataroa 1996).

Distribution of reports

Clustering: Many of the reports form clusters, with these clusters distributed over the length of the South Island. An example of clustering is given in the small scale map of the Rainy Creek area, Reefton (Fig. 2), where 4 category 1 and category 2 sightings plus 3 aural reports were generated over an 11 year period by 6 different observers and all lie within a 1.5 km radius (Fig. 2). The clustering associated with some of the reports increases the likelihood that the reports are of kokako and is consistent with Buller's observations of their sporadic distribution (Turbott 1967).

Indicative distribution: The map of reports (Fig. 1) provides an indicative distribution only. Absence of evidence is not evidence of absence - little frequented areas may hold undetected populations of South Island kokako, for example there are few reports from Fiordland. While the map of reports shows only the most likely reports, some reports may not be of kokako. Hence the distribution of reports is only indicative of the likely distribution of kokako.

The 13 category 1 reports from the 22 years of collated records (Table 1) average to more than 1 report every 2 years. For comparison, the rate of reporting in the South Island for the Australasian Bittern (B*otaurus poiciloptilus*), a rare and cryptic native, has averaged 2 reports per year over the past decade (http://ebird.org/). The rate of reporting of South Island kokako supports the conclusion that they are still extant albeit in small numbers. Unfortunately it is too late to determine if there are, in fact, significant historic gaps in the sightings of South Island kokako as ardent collection of reports only started with Rhys Buckingham and Ron Nilsson's effort in the 1980s.

This is the first attempt that we are aware of to collate all reports of South Island kokako over a given period. We are aware that there are a significant number of reports pre-dating 1990 but have made no attempt to collate them.

South Island kokako behaviour: shy and cryptic vs. bold and confiding

A predominance of shy and cryptic behaviour helps explain the difficulties of detection. There are no photographs of live South Island kokako and there are reports from areas where there are large gaps of many years since the previous reports. The following is our explanation as to how the personality of the South Island kokako has changed over time to become predominantly shy and cryptic (hence the moniker 'grey ghost') following the introduction of mammalian predators.

Early naturalists described a range in the character of the South Island kokako with both bold and shy

behaviours recorded (Buller 1888; Reischek *op. cit*.; Potts 1882; Cockayne 1909; Smith *op. cit*.; Washbourn 1933). Washbourn's *op.cit*. observations span 50 years from the 1850s and he comments on the decline in the bold, confiding forest birds following the introductions of mammalian predators. This novel selective pressure by predatory mammals applied across the suite of New Zealand forest birds. Writing his memoirs in his final year, Washbourn stressed the change " Those who have not had the privilege of knowing them as they were in those days may find it difficult to believe that I have not exaggerated their fearless confidence and tameness, but I certainly have not done so." By the 1960s South Island kokako were described as very secretive (Breen 2009). There are accounts of their being identified in the hand when the observers had previously been unaware of their presence despite familiarity with the area and its wildlife (refer supplementary material: Maruia 1961 and Ikamatua 1956).

Research at the Netherlands Institute of Ecology into bold and shy personalities has shown differences between individual great tits (*Parus major*) to be clear cut, consistent over time and heritable (Birkhead 2008: 124; Drent *et al* 2002). While there is little published research on personality in island bird species such as the South Island kokako, the consistency of results in animal personality studies across taxa gives validity to its application.

Follow-up searches relying on vocal responses to playback from shy and cryptic birds are unlikely to be successful if the target bird is not vocal. Early naturalists noted the low vocal output of South Island kokako (Douglas *op. cit*.). Low population density and selection pressure against bold birds may have further reduced vocal output (Naguib *et al*. 2010).

Explanations for the behavioural differences between North Island and South Island birds may be simply due to the genetic bottleneck that occurred when the North Island population split from the parent South Island population carrying with it behavioural characteristics different from the South Island population. Population fragmentation and range contraction are likely contributing factors and may also have had significant influence on increased shy behaviour in the North Island birds. If selection due to introduced mammalian predators has led to an increase in shyness and cryptic behaviour in the South Island species this may explain both its continued survival and the difficulty of obtaining more direct evidence for its continued survival.

SUPPLEMENTARY INFORMATION

All files and reports are available as supplementary information on the Notornis website.

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