# Stitchbird (Hihi), *Notiomystis cincta* Recovery Plan

Threatened Species Recovery plan Series No. 20

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# 1. Introduction

The stitchbird (*Notiomystis cincta)* or hihi is the rarest of New Zealand's three endemic honeyeater species (family Meliphagidae) and one of only two honeyeater species in the world known to use tree holes as nest sites. The other two members of this family in New Zealand are the tui *(Prosthemadera novaeseelandiae)* and the bellbird *(Anthornis melanura),* both relatively common.

The stitchbird is a medium-sized (18-19cm) forest dwelling passerine. The male has a black head, golden shoulders and breast band, white erectile `ear' tufts and a white wing bar. The female is a more sombre olive grey-brown, not unlike a female bellbird, but with a distinctive white wing patch, similar to that of the male. The stitchbird has a number of long "whiskers" around the base of its beak and relatively large eyes, both features unusual among honeyeaters. Another distinguishing feature is its often upward tilted tail. Although stitchbirds are strong fliers, they seldom leave the cover of the forest.

In dense forest the stitchbird is easily detected when it gives its strident call, which Buffer (1888) noted... has "a fanciful resemblance to the word `stitch'". Males also have a powerful territorial call, the "tiora" note, and both sexes have a low warbling song, which may last several minutes. When disturbed the birds often give an alarm call, which is not unlike that of the bellbird, but higher in pitch.

In pre-European times the stitchbird occurred throughout the North Island; on Great and Little Barrier Islands, and on Kapiti Island. Introduced predators, and possibly disease, reduced the distribution to Little Barrier Island and despite recent attempts to establish populations on Hen, Cuvier, and Kapiti, it appears that Little Barrier Island is still the only self-sustaining population. There is a small captive population at the National Wildlife Centre however it cannot yet be considered insurance against loss in the wild. Experimental transfers to predator-free Mokoia Island in September 1994 and Tiritiri Matangi Island in September 1995 are currently being evaluated.

For the moment, the fate of the stitchbird is inextricably linked to the fate of Little Barrier. While the protection of the island in the nineteenth century undoubtedly saved the stitchbird from extinction, we cannot be complacent about its future. Little Barrier and the Hauraki Gulf are subject to the highest recreational and commercial pressures of any marine area in New Zealand. The chance of an accidental or deliberate release of noxious animals on the island is very real. Such a release could mean the extinction of this endemic species. The long term goal of this plan is to increase the number of self-sustaining populations in locations other than Little Barrier. This will be achieved by assessing new release sites for suitability (using established criteria), especially those which lack predators and major competitors.

This plan operates for the period 1995-2000. At that time there should be sufficient results from the programmes outlined in this plan for new programmes to be initiated. A Recovery Group has been established to review recovery projects annually. This group is available for consultation should emergencies arise and comprises members of the Threatened Species Unit; Northland,Auckland, Wellington and Bay of Plenty Conservancies; National Wildlife Centre; Auckland and Massey Universities and other groups as appropriate.

# 2. Distribution and Cause of Decline

## 2.1 PAST DISTRIBUTION

In pre-European times the stitchbird occurred throughout the North Island; on Great and Little Barrier Islands, Kapiti Island (Oliver 1955) and possibly on other northern offshore islands (Figure 1). Subfossil remains have been found as far north as North Cape (Millener 1981). The northernmost record in European times is that of Yate, who discovered the species in the Bay of Islands in 1835 (see Oliver 1955). In the early 1870s Buller (1888) found the species to be "relatively common" in the southern parts of the North Island, yet the last confirmed mainland record is of a bird in the Tararua Ranges in 1883. In the space of a few decades it had become one of New Zealand's rarest native birds (Buller 1888). In 1894 Little Barrier island, the stitchbird's last remaining home, was purchased by the government from its Maori owners and made a nature reserve.

## 2.2 PRESENT DISTRIBUTION

Little Barrier remained the only location for stitchbirds until the 1980s, when in a series of transfers, stitchbirds were released on Hen, Cuvier, and Kapiti Islands, and taken into captivity at the National Wildlife Centre, Mt. Bruce. Stitchbirds do not appear to have established on either Cuvier or Hen Islands (table 1, pg 9).

Recently greater effort has been put into establishing stitchbirds on Kapiti Island through a series of transfers between 1990-1992 (Castro et al. In press (a)). Despite a concerted programme of transfers to Kapiti Island, and although breeding has occurred, numbers remain low. Forty birds were transferred to Mokoia Island (Lake Rotorua) in 1994, and 37 birds were released on Tiritiri Matangi Island in September 1995.

## 2.3 POSSIBLE REASONS FOR DECLINE

A combination of factors probably caused the extinction of the stitchbird on the mainland during the years 1865-1885. The indirect effects of browsing mammals on the forest habitat of the stitchbird were probably not an important factor in the 19th century. It took some time for the numbers of browsing animals to build up to levels high enough to cause serious damage to the forest. Other factors, such as predation and disease, are discussed below, but because there is only circumstantial evidence of their effects on stitchbirds their precise roles can only be speculated upon.

There is no doubt that predators reduced the number of stitchbirds. Atkinson (1973a) has shown that the two European rats arrived in New Zealand at different times; the Norway rat *(Rattus norvegicus)* apparently arriving with Captain Cook in about 1770. If that was the case, then stitchbirds evidently co-existed with kiore *(Rattus exulans)* for centuries and with Norway rats for about 80 years, before the ship rat (*R. rattus)* became widespread. The ship rat is considered by some to be the major cause of the extinction of stitchbirds on the mainland (Atkinson 1973a). Feral cats (*Felis catus)* were probably well established in many parts of the country in the early nineteenth century, and probably also took their toll on stitchbirds. Stitchbirds were already gone from the mainland before mustelids were introduced in 1884 (Wodzicki 1950).

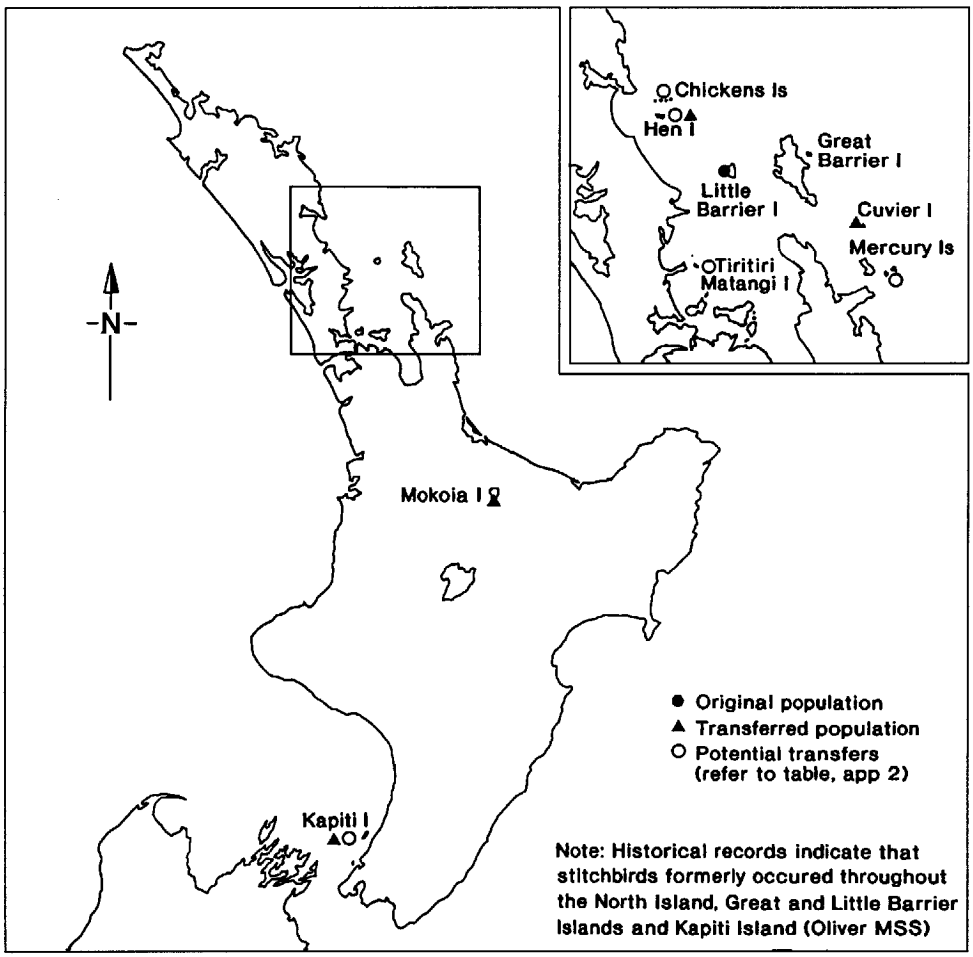


FIGURE 1. PRESENT DISTRIBUTION OF STITCHBIRD *(NOTOMYSTIS CINCTA)*

It is quite possible that an avian disease, perhaps brought into the country with introduced birds, was an important factor in the loss of stitchbirds from most of the country. About the time that the stitchbird vanished from the mainland, bellbirds, tui and other species declined sharply in number, particularly in the north. In most places bellbirds and tui have since recovered, although bellbirds are absent from Northland.

Impressions of population density on Little Barrier Island have varied through the years being variously described as uncommon, common or flourishing. During Reischek's first visit to the island in 1882, stitchbirds were extremely rare, but only a year later he found that they had increased in number (Reischek 1930). The period

of rarity coincides with the decline of the stitchbird on the mainland. Since cats were well established by then, and rats (ship and Norway) were absent, it is possible that disease may have affected the Little Barrier population. Due to the tendency for birds to cluster around seasonally variable resources, interpreting transect data is difficult. However, there is a strong indication that population levels vary dramatically between years.

For many years stitchbirds were thought to be at saturation point on Little Barrier, with a total population of perhaps 800 to 1000 birds (Veitch 1980, 1983, Angehr 1984b). However, in 1980, after the last feral cat was removed from Little Barrier, the population increased initially to an estimated maximum of 5000-6000 birds (Veitch 1980, 1983, Angehr 1984b). This maximum should be accepted with caution, however, given the difficulty of deriving estimates of numbers from transect data. Since then, the population has continued to fluctuate and may now be at the same level as that prior to cat eradication (Figure 2).

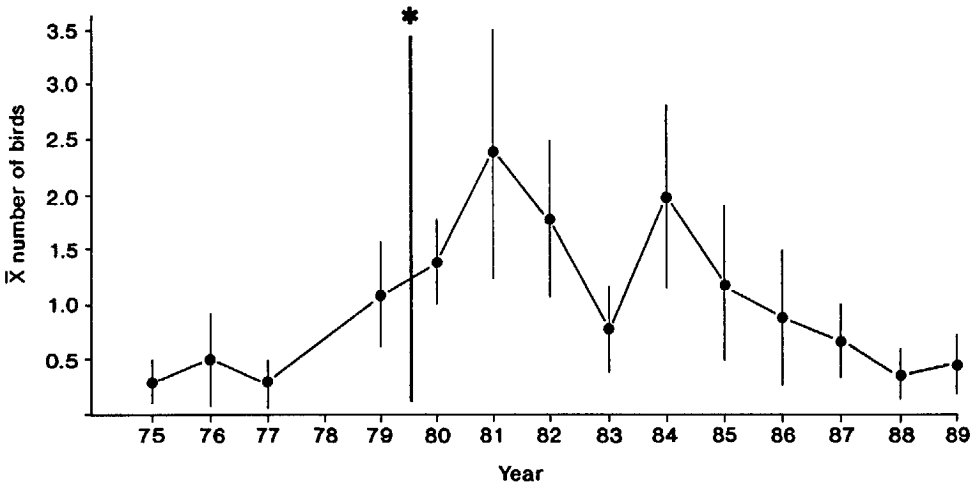


FIGURE 2. AVERAGE NUMBER OF STITCHBIRDS COUNTED PER TRANSECT ON LITTLE BARRIER ISLAND 1975-1989.

*"*"indicates cats removed. Three transects (over four habitat types), each covering 1 hectare are counted 8-12 times apiece (+/- 2 x standard error shown). The transects are run to March-April, which means that the results are affected by breeding success the previous summer and thus do not reflect the more stable adult, breeding population.*

# 3. Ecology

(Details contained in Appendix 1.)

## 3.1 FOODS AND FEEDING

Angehr (1985) found that the stitchbird took nectar, fruits and invertebrates from a wide range of sources in many forest types at various altitudes on Little Barrier. The proportions of each type of food varied during the year (Figure 3). Rasch (1985a) suggested that stitchbirds preferred nectar to fruit, as foraging in her study area followed patterns of flower availability more closely than the availability of fruit. A recent study (Castro et al., in press (b), following the release of birds on Kapiti Island has shown that food availability is a major factor in stitchbird establishment. The high intake of nectar from feeders by stitchbirds on Kapiti during particular seasons may indicate that food or access to resources is limited at times. If this is the case then long term survival of stitchbirds may be affected by limited seasonal food sources on Kapiti and at other transfer sites.

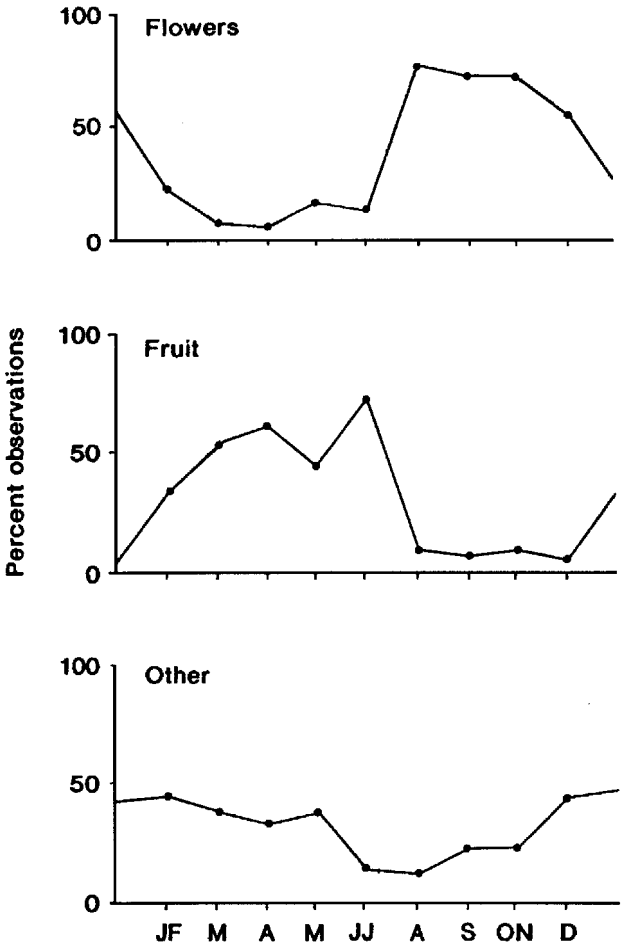


FIGURE 3. PERCENTAGE OF FOOD TYPES IN STITCHBIRD DIET, LITTLE BARRIER ISLAND 1982-1984.
*"Other" refers to invertebrates. From Angehr 1984b.*

The important conclusion from these studies is that stitchbird diet is highly variable, and will be dependent both on what plants are locally available and on the changeable nature of flower and fruit production for a particular species from year to year.

## 3.2 COMPETITION WITH OTHER HONEYEATERS

Food choice by stitchbirds is greatly influenced by competition with other honeyeaters. Stitchbirds are behaviourally subordinate to tui and bellbirds, and these birds prevent stitchbirds from feeding on many kinds of nectar and fruit (Craig et al.

1981, Rasch 1985a, Angehr 1986, see Appendix 1 figures 1 and 2). On Little Barrier tui and bellbirds tend to monopolise flowering species in the canopy while stitchbirds tend to concentrate their nectar feeding on flowering species that grow in the understorey and shrub layer (Angehr 1984b).

## 3.3 HABITAT

Little Barrier is the only place where a natural population of stitchbirds remains, therefore providing much of the recorded information on the habitat requirements of the species. Comparison of habitat with that on other islands where stitchbirds have been transferred is valuable in that it allows us to determine which elements of the habitat on Little Barrier Island may have sustained the population. We can only guess at the full botanical composition of some of the bird's original haunts in the North Island, because those areas that have not already been cleared for farming, or converted to exotic forests, have been modified by browsing mammals.

# 4. Recovery to Date

## 4.1 TRANSFERRED POPULATIONS

Hen and Cuvier Islands were chosen for the first transfers, because both are free of European rats and were assessed to have suitable, although limited, stitchbird habitat. Like Little Barrier, the only rat on these islands is the kiore. The transfer of stitchbirds to Kapiti Island, which has a similar range of habitat to Little Barrier Island but also has Norway rats, was considered more experimental. Both bellbirds and tui are present on Kapiti and Hen, but only bellbirds are found on Cuvier. Mokoia Island (Lake Rotorua) is free of mammalian predators (except mice) and bellbird competitors and appears to have a range of suitable food plants. Tiritiri Matangi Island (Hauraki Gulf), the most recent transfer site, is also predator-free but has bellbirds and tui present.

The early transfers (1980-1985) did not establish self sustaining populations (Table 1). Numbers have fallen rapidly at some sites and have continued to decline slowly on Hen and Cuvier Island.

TABLE 1. SUMMARY OF STITCHBIRD TRANSFERS 1980-1995 AND THE MOST RECENT ESTIMATES OF POPULATION NUMBERS

| TRANSFER OPERATIONS | | | RECENT POPULATION ESTIMATES | |
|---|---|---|---|---|
| Island | No. of birds transferred | Transfer date | Survey year | No. of birds observed |
| Hen Island | 30<br>16 | 7-4-80<br>11-3-81 | 1994 | 1-2 |
| Cuvier Island | 29<br>37 | 21-"2<br>4-4-85 | 1993 | 1 |
| Kapiti Island | 30<br>30<br>12<br>48<br>47 | 11-8-83<br>21-8-84<br>14-8-90<br>28-8-91<br>6-8-92 | 1990<br><br><br>1995 | 6<br><br><br>40-50 |
| Mokoia Island | 40 | 6-9-94 | 1995 | 25 adults<br>28 fledged juveniles |
| Tiritiri Matangi Island | 37 | 4-9-95 | | |

## A. Hen Island (1980-1992)

At first the birds appeared to thrive on Hen Island. In 1983 the population was estimated to number between 100 and 200 based on a sample of 21 birds (Angehr 1984c). Subsequent annual searches of the island, however, have recorded declining numbers.

## B. Cuvier Island (1982-1991)

By 1984 the stitchbird population on Cuvier Island was estimated to number 20 birds (Veitch 1984). A further liberation of 37 birds was made in 1985 to bolster the population, but by early 1987 the population consisted of 18 males and one female, mostly from the second liberation. Only six males were seen in 1989, and only one male was heard during 1991 (J. Craig,Auckland University, pers. comm.).

## C. Kapiti Island (1983-1990)

Survival of transferred birds on Kapiti was initially low, with only 7 birds from the 1983 transfer remaining in their first breeding season, and only 6 birds from the 1984 transfer. Productivity was good with 18 fledglings produced in the first two years. However, despite good annual productivity there was a continual decline in numbers, with only 6 birds located in 1990. Stitchbirds may have been expected to benefit from the improvement in forest quality since the removal of possums was completed in 1986 (Lovegrove 1986a, 1986b) but this hasn't been reflected in the population.

These island transfers must be considered unsuccessful, due to the failure to establish a self-sustaining population. There are two possible causes for this:

a) The number of birds surviving transfer was too low

- to overcome chance events eg. harsh winters
- to maintain social structure

b) The transfer islands are unsuitable e.g.,

- lacking in critical resources
- adverse effects of competition with other bird species e.g., honeyeaters, saddleback, parakeets.
- potential predator influences.

The increased potential of Kapiti Island after possum eradication led to a second effort to establish stitchbirds. In order to overcome the potential problems of small population size during the establishment phase, 107 birds were transferred over three years. Transfer techniques were experimentally tested in year two and three to determine if any improvements could be made.

## D. Kapiti Island (1990-1994)

Breeding, habitat use and survivorship are currently being monitored and indications are that suitable nest sites are a major limiting factor; the significance of rodents is uncertain and the contribution that supplementary foods and artificial nest sites can make in enhancing survival is still subject to research. Supplementary

nectar sources have been provided during August and April each year. There is some evidence that food could be limiting during late spring and early summer when birds are starting to breed. The population does appear to be stable at ca. 40 individuals but its long term prospects are uncertain.

### E. Mokoia Island and Tiritiri Matangi Island (1994, 1995)

Two experimental transfer sites have recently been initiated. Both are predator-free islands with a range of suitable habitat. They differ however in the competitors which stitchbirds face.

## 4.2 CAPTIVE POPULATION

Small numbers of stitchbirds have been transferred to the National Wildlife Centre on several occasions since 1979. The captive population has gradually declined, with stress factors contributing to respiratory diseases and mortality. Disturbance while on display, stress from housing pairs with other species or adjacent to each other, climatic stress and nutritional stress have been implicated, and management regimes now mitigate against these factors where possible. Breeding success of captive-bred stitchbirds has been encouraging, but the current population (5 adults, 6 juveniles) is the minimum that will allow research objectives to be met (see 6.5).

# 5. Recovery Strategy: Goals and Objectives

## 5.1 LONG TERM GOAL

*To increase the number of self-sustaining stitchbird populations to five.*

Currently the only self sustaining population of stitchbirds is on Little Barrier Island. Continued security of this population is central to the survival of this species. Although numbers of the stitchbird appear good, population estimates have shown large fluctuations in population size. The potential of chance events adversely affecting stitchbird survival can only be diminished by establishing further self sustaining populations.

## 5.2 SHORT-TERM OBJECTIVES

1. Ensure the protection of the Little Barrier Island population.

   *Little Barrier Island contains the only self-sustaining population of stitchbirds and must therefore be accorded a high priority for protection.*

2. Protect, monitor and (where necessary) enhance populations on existing transfer sites (this includes research objectives).

   *This also allows research objectives to be addressed. Ongoing research at these sites will clarify which factors are affecting stitchbird establishment.*

3. Establish at least one more self-sustaining population and gain more information on transfer success by transferring birds to appropriate sites.

   *A high priority should be given to the future establishment of stitchbirds on restoration/enhancement sites. Such sites are likely to contain abundant and diverse food supplies (and provide an opportunity for public involvement). The probable lack of nesting sites can be overcome with provision of nest boxes.*

4. Raise public awareness of the stitchbird recovery programme.

   *The aim of an advocacy programme should be to educate and inform the public as well as gain support and cooperation for management activities.*

5. Maintain a small number of pairs in captivity for research and advocacy purposes.

   *With only one self-sustaining population it is important that we develop effective husbandry techniques in case of emergency and improve the information base for population establishment.*

# 6. Work Plan

## 6.1 PROTECT ALL ISLANDS WITH STITCHBIRDS

At present the future of the stitchbird rests on the protection of the Little Barrier population. Although visitors should be allowed to appreciate Little Barrier and other islands for the special places they are, it is recognised that this imposes a risk through the accidental introduction of ship rats, Norway rats, mustelids, or any other alien predator or browser. Introductions of other threatened species may have an impact on stitchbirds through competition or the accidental introduction of avian diseases.

### Action

- Maintain or increase present protection of islands containing stitchbirds.
- Implement rodent contingency plans for all islands
- Do not release any more potentially competing species onto Little Barrier until another stitchbird population is established elsewhere. Releases of any birds should be subject to quarantine/disease assessment.

*Key Personnel*

- Conservancies as appropriate
- Species Protection Division

## 6.2 MONITOR STITCHBIRDS ON LITTLE BARRIER ISLAND

A monitoring system is necessary in order to detect any serious declines in the stitchbird population on Little Barrier, both for its own sake and for the purpose of determining whether the population can withstand cropping for transfers to other islands. Problems with the current monitoring system include variability in: time of day, time of year, weather, observer skill, food resources (which determines stitchbird absence/presence), differences in breeding success the previous summer (as opposed to changes in the adult breeding population).

### Action

- Develop and implement a standard, national monitoring system as soon as possible.
- Monitor the population : when counts are less than half of the average, the number of birds removed and their source (Little Barrier Island) should be re-evaluated.

*Key Personnel*

- Auckland Conservancy
- Threatened Species Unit
- Science and Research Division

6.3

## MONITOR AND (WHERE NECESSARY) ENHANCE STITCHBIRD POPULATIONS ON EXISTING TRANSFER SITES

### 6.3.1 Monitor Kapiti Island

Since Kapiti has the largest, most diverse habitat other than Little Barrier, this island has been the first target of further introductions. Ongoing research will clarify which factors are affecting stitchbird establishment on the island.

### Action

- Monitor the Kapiti population and evaluate its long term viability, including what management could enhance survival. A three year evaluation should be made of the population, after 2 years without a transfer, ie.August/September 1995-1997. Note: Assessment criteria, using Population Viability Analysis, will be developed in association with research.

*Key Personnel*

- Wellington Conservancy
- Auckland Conservancy
- Threatened Species Unit

### 6.3.2 Monitor Hen Island

Any future release on Hen Island will be dependent on the results of research from other island transfers. Monitoring of stitchbirds on Hen Island is a low priority given their current status there. It may be useful to monitor phenology and bellbird numbers on the island, so that any future release can be appropriately timed. Given the current criteria for assessment of suitable sites (see Appendix 2) Hen Island transfers are unlikely within the five year period covered by this plan.

### Action

- Implement monitoring programme for phenology and bellbirds as opportunity arises.

*Key Personnel*

- Northland Conservancy

### 6.3.3 Monitor Mokoia Island

As the majority of Mokoia Island is regenerating habitat, the supply of artificial nesting sites is considered an ongoing management requirement. The long term provision of nectar will be evaluated as part of the ongoing research programme. Additional plantings of nectar rich species, to increase the duration of nectar availability, may enhance habitat and substitute for artificial feeders.

An eradication of mice will be carried out on the island in late 1995. It is essential that intensive monitoring take place to determine if primary and/or secondary poisoning is occurring.

#### Action

- Intensively monitor the survival of stitchbirds before, during and after the mouse eradication.
- Establish and implement a rodent contingency plan for the island.
- Provide artificial nest boxes in excess of estimated requirements.
- Support the current research programme for its duration (currently up to 1997). Evaluate long term viability of stitchbirds on the island (as for Kapiti Island, see 6.3.1).
- Evaluate the need for long-term provision of supplementary nectar sources.
- Discuss and incorporate appropriate stitchbird recovery goals into Mokoia Island management strategy.

(Note: timeframes for the above are outlined in 6.3.1 in terms of the evaluation process).

*Key Personnel*

- Mokoia Island Trust Board
- Bay of Plenty Conservancy
- Massey University

### 6.3.4 Monitor Tiritiri Matangi Island

Tiritiri Matangi Island in the Hauraki Gulf has similar potential for stitchbirds as Mokoia Island. Although the island contains bellbirds and tuis it is free of mammalian predators. This offers a comparative research programme with Mokoia Island which will assist in determining the influence of bellbirds on stitchbird establishment.

#### Action

- Support the research programme for its duration (as for Mokoia Island, see 6.3.3).

*Key Personnel*

- Auckland Conservancy

- Species Protection Division
- University researchers.

## 6.4 ESTABLISH SELF-SUSTAINING POPULATIONS OF STITCHBIRDS IN OTHER LOCATIONS

A programme for stitchbird transfers has been developed based on the following assumptions:

1. Stitchbirds are vulnerable to avian and especially mammalian predators.
2. Stitchbirds compete with other honeyeaters for food.
3. Competition with other cavity nesting species may limit stitchbird breeding success (seeAppendix 1).
4. Stitchbirds are particularly vulnerable to stress which can result in disease and mortality.

Based on these assumptions, criteria have been developed as a guide for assessing sites suitable for stitchbirds (see Appendix 2).

### 6.4.1 Further transfers

Subsequent transfers, up to one per season, will depend on the assessment of the Kapiti, Mokoia and Tiritiri Matangi Island transfers. Some potential islands considered for stitchbird transfer have been ranked using suitable criteria in Appendix 2. Further detailed assessments, as part of a formal transfer proposal should be made of these sites prior to any implementation. Other islands may also prove to be suitable for stitchbirds in the future.

## 6.5 SUPPORT CAPTIVE BREEDING PROGRAMME

The current captive population cannot provide insurance against loss in the wild without large new aviaries at considerable expense. It is important however that we continue to build up knowledge of captive breeding techniques, the behaviour and ecology of captive birds and techniques for the release of captive-bred birds. The purpose of the captive management programme is therefore to maintain captive birds for research purposes in order to:

- develop effective husbandry techniques to be used in the event of disaster in the wild population.
- trial techniques which will assist in establishing new self-sustaining populations.

Birds may also be used for display but not kept solely for this purpose.

A draft captive management plan has been prepared by the Captive Management Coordinator. The plan contains a management strategy, information on animals held, population, genetics, facilities and husbandry, and permits and reporting requirements.

### Action

- Maintain a small number of pairs in captivity for research. Use for display if this does not conflict with any research programmes. Research objectives include:
  - maximising productivity
  - increasing juvenile survival
  - increasing survival of second clutches
  - trialing new technology eg. transmitter, feeder and nestbox design
- Release surplus captive-bred birds at appropriate sites, depending on the stage of the recovery programme
- Finalise the captive management plan

*Key Personnel*

- Captive Breeding Coordinator
- National Wildlife Centre
- Wellington Conservancy
- Other institutions as appropriate

## 6.6 ADVOCACY

Although the stitchbird is one of New Zealand's rarest birds, it is little known by people other than visitors to Little Barrier and the National Wildlife Centre. The black robin programme shows that remoteness is not necessarily a hindrance to familiarity. The success of transfers to other, easily visited islands, such as Kapiti Island, Mokoia Island and Tiritiri Matangi Island, will also raise the profile of this species. The inclusion of stitchbirds as possible species for restoration projects is also of mutual benefit to both programmes.

The aim of the advocacy programme is to educate and inform the public on stitchbird conservation and to gain support and cooperation for our management activities. Advocacy should target the general public, in particular schools and local iwi where transfer programmes are taking place.

### Action

- Provide media releases
- Develop educational publications
- Maintain a captive display and nest-monitoring video (National Wildlife Centre)
- Provide information in conjunction with transfers to islands with controlled public access (eg. pamphlets for tour boat operators and visitors, information boards)
- Include stitchbirds in restoration projects where appropriate

*Key Personnel*

- Recovery Group leader
- Public Awareness Unit
- Threatened Species Unit
- Appropriate conservancies
- Non-government organisations

TABLE 2. IMPLEMENTATION SCHEDULE

| OBJECTIVE | YEAR 1 (1995) | YEAR 2 (1996) | YEAR 3 (1997) | YEAR 4 (1998) | YEAR 5 (1999) |
|---|---|---|---|---|---|
| Ensure protection of Little Barrier Island | Maintain existing protection measures | → | → | → | → |
| Monitor and/or enhance populations on existing transfer sites | Develop standard, national stitchbird monitoring system | Monitor Little Barrier Island | → | → | → |
| | Monitor Hen & Cuvier Islands for bellbirds/stitchbirds and phenology as opportunity arises | | Monitor Hen & Cuvier Islands (see year 1) | | |
| | Monitor/evaluate Kapiti Island September | | | If <50 birds and a higher number of juveniles then another transfer | |
| | Establish/implement rodent contingency for islands with stitchbirds | → | → | → | → |
| | Mokoia Is.<br>• monitor stitchbirds during mouse eradication<br>• discuss/incorporate recovery goals into Mokoia Is. management plan<br>• provide nest boxes<br>• support research →<br>• evaluate initial transfer success | Evaluate need for supplementary nectar, additional management | → | | |
| | Transfer stitchbirds to Tiritiri Matangi Island | Monitor stitchbird numbers | Monitor and evaluate need for additional management | | |
| Establish birds in new locations where appropriate | Support research programme<br>Evaluate new sites (see Appendix 2) | | → | → | → |
| Support captive breeding programme | Complete Captive Management Plan | | | | |
| | Research techniques for maximising productivity and survival of captive-bred birds following release. → | → | → | — — — — ? | |
| | Maintain a small number of breeding pairs, release captive-bred birds. → | → | → | — — — — ? | |
| Advocacy | (Refer to 7.6) - ongoing → | → | → | → | → |

## 6.7 RESEARCH NEEDS

a. Development of adequate monitoring techniques (section 6.2)

b. Evaluation of establishment of new stitchbird populations (section 6.3.1)

c. Investigation of foraging by stitchbirds in the presence and absence of other honeyeaters (section 6.3.3)

d. Investigation of diseases of stitchbirds, in particular respiratory problems.

e. Development of techniques for maximising survival and productivity (in the wild and in captivity) and evaluation of survival of released captive-bred birds (6.4).

f. Investigation of breeding systems and genetic variation.

g. Effects of rodent eradication on food supply, breeding success and non-target species.

### *Key Personnel*

- Threatened Species Unit
- Science & Research Division
- Conservancy Advisory Scientist, as appropriate
- Other agencies as appropriate

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# Appendix 1: Stitchbird Ecology

## FEEDING AND COMPETITION

Nectar feeding formed about 38% of foraging observations of stitchbirds throughout the year on Little Barrier (Figure 3, pg 7) (Angehr 1984b). It is especially important from August to December. Stitchbirds fed from flowers of about 20 species on Little Barrier (Angehr 1984b). Important nectar bearing species included haekaro (*Pittosporum umbellatum*), toropapa (*Alseuosmia macrophylla*), rata (*Metrosideros* spp.), pohutukawa (*Metrosideros excelsa*), rewarewa (*Knightia excelsa*), taurepo (*Rhabdothamnus solandri*) and puriri (*Vitex lucens*). It was possibly the stitchbird's habit of feeding on flowering plants close to the ground, e.g., toropapa and taurepo, that made the birds vulnerable to predation by feral cats on Little Barrier.

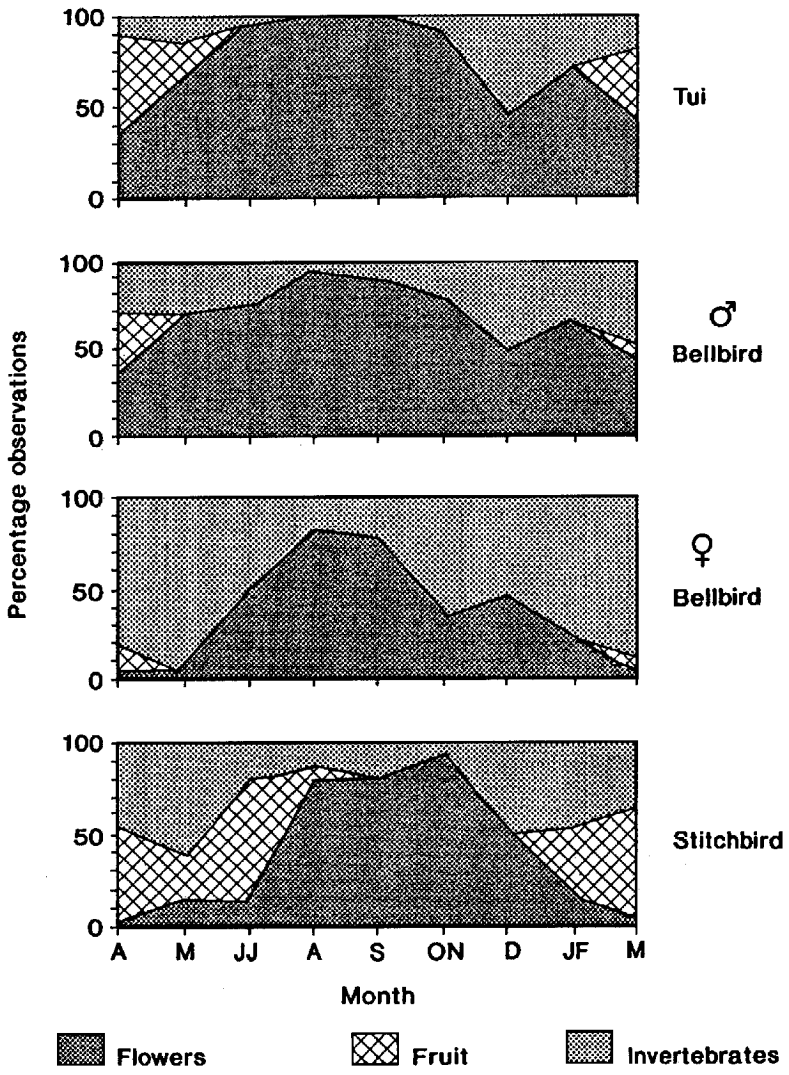


FIGURE 1. PERCENTAGE OF FOODS USED BY HONEYEATERS ON LITTLE BARRIER 1982-1983. FROM ANGEHR 1985.

The stitchbird is a subordinate species within the honeyeaters. This can result in limited access to higher quality food resources such as nectar (figures 1 and 2, Rasch and Craig 1988).

Fruit was mostly taken from January to July. Fruit contributed 32% of the stitchbird's diet (yearly average) on Little Barrier. Angehr (1984b) noted stitchbirds taking fruits of about 30 different species on Little Barrier. Important species were: mahoe (*Melicytus ramiflorus*), pate (*Schefflera digitata*), various Coprosma species (e.g., *C. arborea* and *C. grandifolia*), five-finger (*Pseudopanax arboreus*), raukawa (*P. edgerleyi*) and mapou (*Myrsine australis*). Generally only the smaller fruits are eaten, which are swallowed whole. Stitchbirds have rarely been noted taking larger fruits such as that of kohekohe (*Dysoxylum spectabile*).

The other 30% of foraging (yearly average) on Little Barrier was on insects (Angehr 1983, 1984b). Insects were taken mostly from mid summer to early winter. This is partly due to the necessity of providing protein for nestlings. During summer there

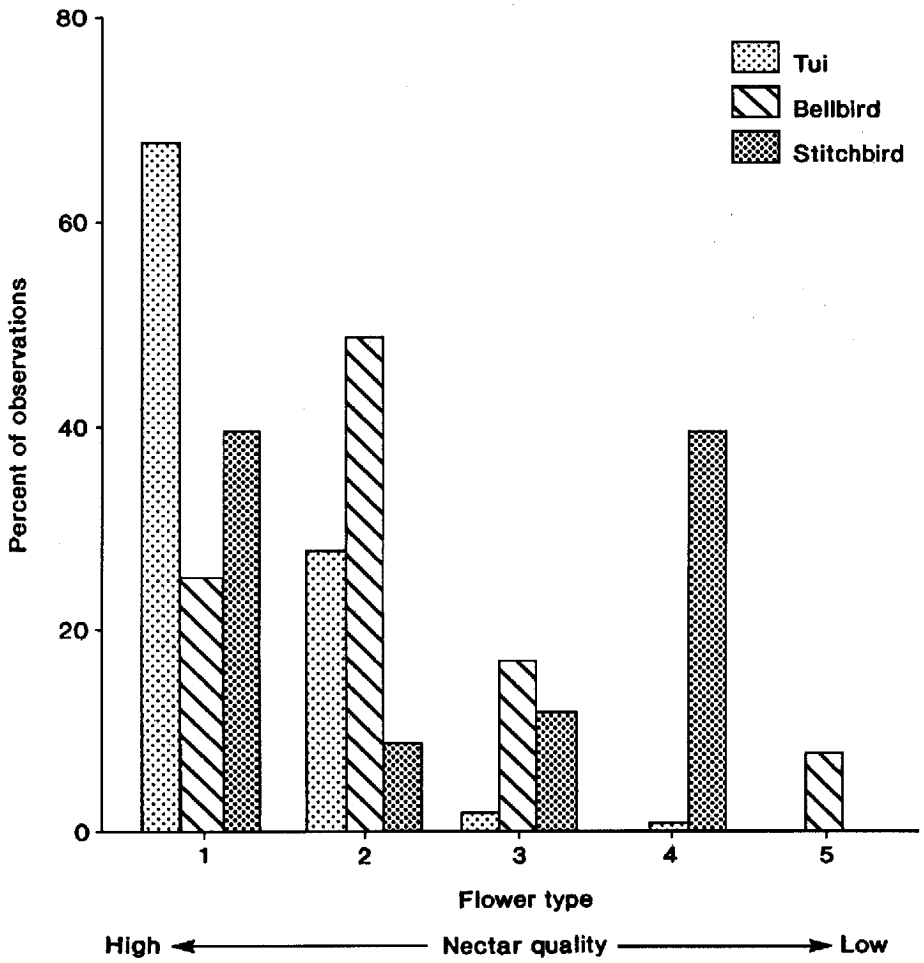


FIGURE 2. NECTAR USE BY HONEYEATERS IN THE TIRIKAKAWA VALLEY, LITTLE BARRIER 1983-1984.
*Types were determined by a combination of daily nectar production and density of flowers. Type 1 species include pobutukawa, rewarewa, and haekaro. Type 2 is puriri. Type 3 species include kohekohe and maire. Type 4 species are taurepo and toropapa. Type 5 species are mingimingi and hebe. Summarised from Rasch and Craig, 1988.*

is a bloom of small invertebrates on foliage, e.g., scale insects. Stitchbirds obtained most of their invertebrate food by gleaning from foliage. They were observed gleaning from the foliage and bark of many tree species, of which the more important ones seemed to be kohekohe, tawa (*Beilschmiedia tawa*), taraire (*B. taraire)* and pate.

## HABITAT

On Little Barrier altitudinal variation produces distinct forest types, each with a different suite of species. The detailed ecological studies by Angehr indicated that stitchbirds move widely between forest types through the year, taking advantage of different nectar and fruit sources in each type. Stitchbirds seem to favour rata/tawa forest in valleys and tawhero/tawa forest at higher altitudes (Angehr 1984b).

On Kapiti Island there is also an altitudinal effect on forest phenology which is reflected in stitchbird foraging behaviour (Castro pers. comm.) and the diversity in species and flowering/fruiting periods may be critical to the survival of the stitchbird.

Stitchbirds also need forest which provides suitable nesting and roosting places. Suitable holes are found only in larger, older trees. On Little Barrier most nests have been found in holes in ancient puriri and pohutukawa trees. On Kapiti Island, the stitchbirds have become established in the mature forest of the two central valleys where ancient rata *(Metrosideros robusta)* and pukatea *(Laurelia novae zelandiae)* trees offer suitable nest sites. Birds have also been recorded nesting in hinau *(Elaeocarpus dentatus)* and kamahi *(Weinmannia racemosa)* trees. However suitable nest sites may be a limiting factor on Kapiti where the forest is comparatively young and parakeets compete for nest sites (Castro et al (b) In press). Suitable nest sites are used every year, more than once in a breeding season, and are defended year round, and polygamy has been observed (cf. monogamy on Little Barrier Island). To date use of artificial nest holes on Kapiti Island has been minimal. However artificial nest boxes in the regenerating forest of Mokoia Island are being nested in successfully. Habitat may be enhanced for stitchbirds by planting suitable food plants and provision of artificial nests sited where they are not available.

## TRANSFERS

While stitchbirds can co-exist with bellbirds, it may be difficult for stitchbirds to overcome the effects of competition during establishment. If in fact transfers are failing because the stitchbirds are food limited, some alternative to bellbird-inhabited islands must be found. The islands recommended for future introductions of stitchbirds in Angehr (1984) all contain bellbirds. Therefore it is necessary to investigate islands which lack bellbirds, but need management for other reasons, as possible sites to transfer stitchbirds to.

Transfers of stitchbirds from Little Barrier Island to sites in addition to Kapiti can occur. Capturing sufficient birds for these is dependent on key flowering or fruiting shrubs which draw the birds down to where they can be readily mistnetted. This occurs in August, when haekaro is in flower, and in March-April, when mapou is in fruit. This potentially allows two opportunities a year when birds can be removed (see 6.2 Monitoring on Little Barrier above). However a maximum of 40 - 50 birds per year, collected in August is the preferred technique. Experiments into transfer techniques have shown that birds hard released into habitats without conspecifics survived better than birds soft released or hard released into areas with conspecifics (Castro et al In press).

# Appendix 2: Criteria for assessing islands suitable for transfer of stitchbirds.

The definition of islands, for this purpose, includes mainland sites where intensive management could significantly improve conservation values for stitchbirds.

Within the five year term of this plan, however, it is not envisaged that the results of current research and management programmes will enable us to consider stitchbird establishment on the mainland.

1. Habitats which are free of mammalian predators, primarily mustelids and ship rats.

   *Explanation: It is now known that stitchbirds are vulnerable to these predators.*

2. Year round supplies of suitable foods in sufficient quantities must be present.

   *Explanation: Whetber or not the food supply is "available" to the stitchbirds, it must at least be present.*

3. Given (ii) above:

   (a) islands where one or more of the known food competitors (bellbirds, tuis) are absent, are preferred;

   (b) where competition with other species for nest cavities is likely to be low.

   *Explanation: This emphasises the fact that the food supply is of primary importance, (factors a and b being subservient to 2).*

4. There is potential for the enhancement of habitats for stitchbirds through management.

   *Explanation: Many islands have the potential for enhancement and/or restoration (eg. planting of suitable food trees, provision of roost/nest boxes) to make them suitable for stitcbbirds.*

5. If intensive monitoring of stitchbirds at a particular site is possible re-evaluation of these criteria should be considered.

INITIAL ASSESSMENT OF ISLANDS CONSIDERED SUITABLE FOR STITCHBIRD TRANSFER.

| ISLANDS | CRITERIA` 1 | 2 | 3A | 3B | 4 | TOTAL SCORE (L=1,M=2,H=3) |
|---|---|---|---|---|---|---|
| CONTAIN BELLBIRDS AND TUIS | | | | | | |
| Hen | M | H | L | L | L | 8 |
| Chickens | H | H | L | L | L | 9 |
| Cuvier | H | H | L | L | L | 9 |
| Mercury Group (Korapuki, Stanley, Red Mercury) # | H | M | L | L | L | 8 |
| Tiritiri * | H | M | L | L | H | 10 |
| CONTAIN TUIS ONLY (NO BELLBIRDS) | | | | | | |
| Mokoia * | MH | M | H | M | H | 12.5 |
| Whale # | H | L | H | L | - | - |
| Motuora * | H | L | H | - | - | - |
| Mana * | H | L | H | - | - | - |
| CONTAIN EUROPEAN RATS, TUIS AND BELLBIRDS | | | | | | |
| Rangitoto * | L | M | L | - | - | - |
| Mayor * | - | MH | L | L | M | - |
| Motuehu * | - | L | L | - | - | - |
| Kapiti * | ML | H | L | L | H | 9.5 |

*Key:* *# Potential for restoration*
** Public access*
*L = low* *LM = low-medium* *M = medium*
*MH = medium-high* *H = high* *- = not ranked*

*Note:* *Islands which were not fully ranked include those requiring restoration and those with other mitigating factors. Criteria are those listed on previous page.*

# Appendix 3
# Published Recovery Plans

| | | |
|---|---|---|
| Stitchbird | ($15) | Approved 1996 |
| Brown teal | ($15) | Approved 1996 |
| Native frogs | ($15) | Approved 1996 |
| Dactylanthus taylorii | ($15) | Approved 1995 |
| Bat (Peka peka) | ($15) | Approved 1995 |
| Otago and grand skinks | ($15) | Approved 1995 |
| Giant land snail | ($15) | Approved 1995 |
| South Island saddleback | ($15) | Approved 1994 |
| Takahe | ($15) | Approved 1994 |
| New Zealand Dotterel | ($15) | Approved 1993 |
| Tuatara | ($15) | Approved 1993 |
| Mohua(yellowhead) | ($15) | Approved 1993 |
| Subantarctic teal | ($15) | Approved 1993 |
| Kowhai ngutukaka | ($15) | Approved 1993 |
| Chevron skink | ($15) | Approved 1993 |
| Black stilt | ($15) | Approved 1993 |
| Whitaker's and robust skinks | ($15) | Approved 1992 |
| North Island kokako | ($15) | Approved 1991 |
| Kiwi | ($15) | Approved 1991 |
| Yellow-eyed penguin* | - | Approved 1991 |
| Blue duck ** | ($10) | Approved 1991 |
| Kakapo | out of print | Approved 1989 |

* *Available: from Otago Conservancy, Department of Conservation, Dunedin*
** *Available:* Science & Research Internal Report No-30,
*Science & Research Division, Department of Conservation, Wellington*

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