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RECENT DECLINE IN YELLOWHEAD POPULATIONS

by

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Introduction

The yellowhead (*Mohoua ochrocephala*) is a small, insectivorous, forest dwelling passerine bird, endemic to the South Island. It belongs to an endemic genus along with whitehead (*M. albicilla*), and probably the brown creeper (*M. (Finschia) novaezelandiae*).

All three species have suffered through habitat loss at least since the arrival of Europeans in New Zealand, but unlike the whitehead and brown creeper, the yellowhead has disappeared from large relatively unmodified forests and is apparently continuing to decline. Last century yellowheads were one of the most abundant and conspicuous forest birds in the South Island. Historical records show that they were once present in most forest habitats of the South Island and Stewart Island, (some 6.5 million ha, Figure 1). They are now all but absent from 75% of their former range and much of the reduction in range has occurred in the last 20 years (O'Donnell & Dilks 1983, Gaze 1985).

Today yellowheads are absent from Stewart Island and the forest remnants of the Kaikoura Coast, Canterbury and North Otago. They are very rare in Nelson, Marlborough, North and Central Westland, and western Canterbury, with the only known populations being at Mt Stokes in the Marlborough Sounds (c. 15 birds) and near Arthur's Pass (c. 200 birds). In South Westland there are a few small isolated populations and one sizeable one in the Landsborough Valley (O'Donnell & Dilks 1986). In Southland there are isolated populations in the Catlins, Blue Mountains and Waikaia forests. Their stronghold is in Fiordland and Mt Aspiring National Parks where they are widely distributed. They occur in largest numbers in valleys in the north-east of Fiordland and the south-east of Mt Aspiring National Park (Gaze 1985, O'Donnell 1986).

As a response to concerns about the status of yellowheads a workshop was held in Wellington which reviewed the decline, current knowledge, and future research and management possibilities for the species (O'Donnell 1985). One of the objectives for future research recognised at the meeting was "to document the pattern of change in yellowhead populations at a network of sites throughout the South Island so that we can define the trend. In late 1985 a committee met and a yellowhead monitoring programme was developed. The group planned a number of surveys throughout the South Island with the view that they be repeated annually for 10 years.

As part of this programme we have been monitoring populations near Arthur's Pass (COD) and in the Eglinton Valley in Fiordland (GE). The results of the first few years of counts and recent dramatic declines in both populations are reported here.

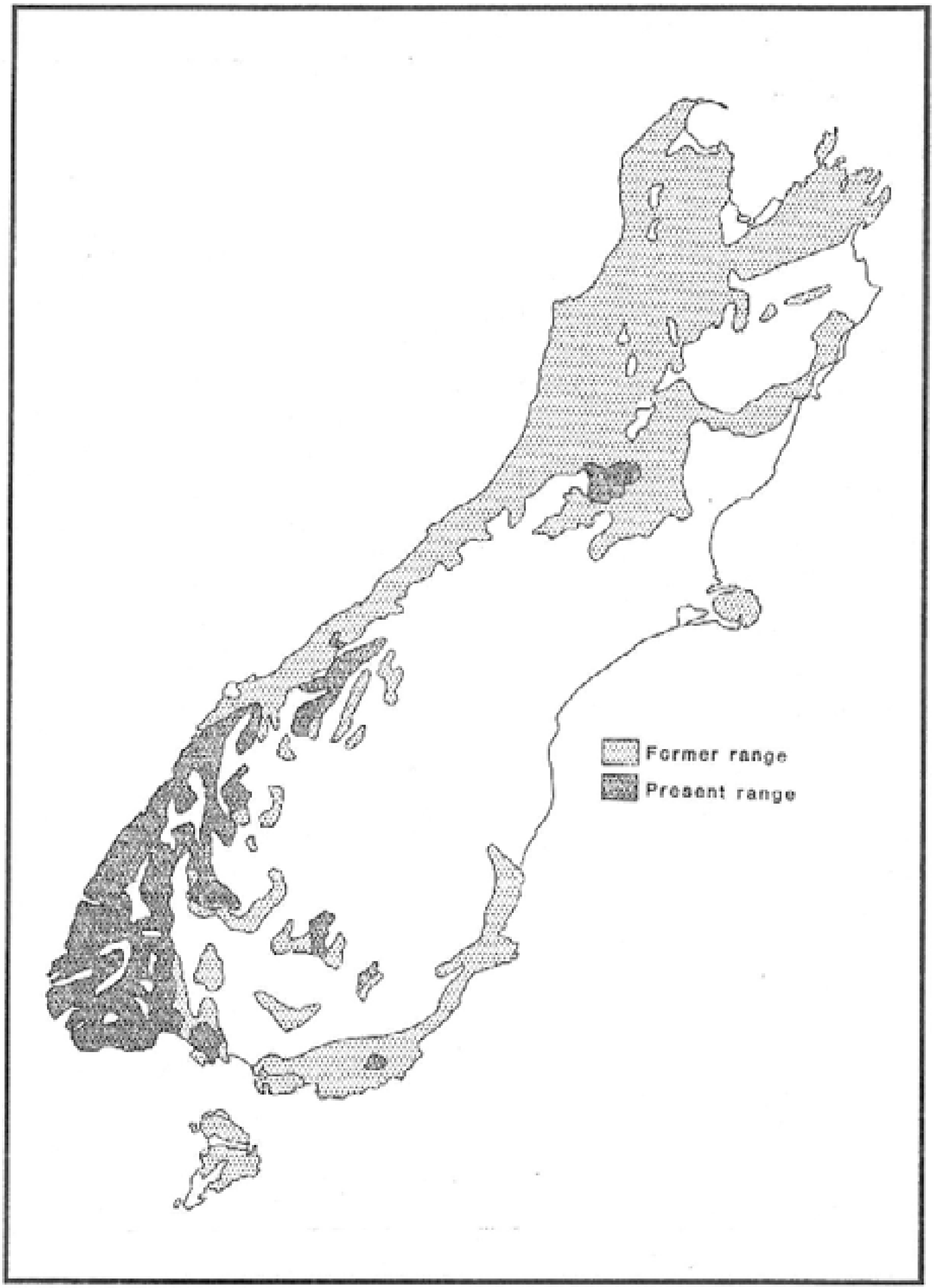

Figure 1. The present and former range of yellowheads.

Arthur's Pass

The Arthur's Pass yellowhead population is isolated (c. 200 km from other known populations) and contains less than 200 birds centred on a few valleys in the upper Waimakariri catchment, particularly the Hawdon and Poulter Valleys.

This study was carried out in a 500 ha study area in red and mountain beech forest in the Hawdon Valley.

Methods

Since 1984 surveys have been undertaken in late November and early December when yellowheads are breeding. At this time the birds are most conspicuous because the males are territorial and very vocal. During each survey an 11.5 km transect is traversed at c. 0.8 km/hr and the positions of all yellowheads encountered mapped. Results are expressed as birds/km. The results of some earlier surveys have been reported previously (Read 1984, Read & O'Donnell 1987).

Because counts were so low on our survey on we subsequently resurveyed the transect on 7/12/87 to confirm our results. Additional survey work was carried out by J. Whitford and N. Phillips from 15/2/88 - 11/3/88 in an effort to help determine causes of decline.

Results

Results are summarised in Table 1. Only 14 adult yellowheads were recorded in 1987, less than half the number counted in previous years. When the study area was checked again in December no new birds were found despite approximately 17 hours of searching. The February -March 1988 survey confirmed these results. In a total of 79 hours of searching only 12 adults were found. This represents a reduction of 65% on the previous year's count and a 70% reduction from the maximum count recorded in 1985.

In February -March 13 young were recorded with the adults. The average brood size was 2.6 young (n=5, range=2-3).

Table 1

Yellowhead population statistics – Hawdon Valley 1983-1988

Year	1983	1984	1985	1986	1987	1988
Transect length	12.5	12.5	12.5	12.5	11.5	11.5
Area (ha)	500	500	500	500	400	400
No. adult birds	31	35	40	34	14	12
Birds / km	2.48	2.8	3.2	2.72	1.22	1.04
Birds / ha	0.06	0.07	0.08	0.07	0.04	0.03

The upper Hawdon Valley outside the study area was also surveyed but no further yellowheads were found. Up to 20 individuals had been found there in previous years (Read & O'Donnell 1987).

Eglinton Valley

Yellowheads are widespread in Fiordland and Mt Aspiring National Parks, but they occur in highest density in a few valleys centred on the Eglinton and Dart catchments in north eastern Fiordland.

This study was carried out in 30 ha of tall red and silver beech forest on the valley floor near Knobs Flat in the Eglinton Valley. Eleven to thirteen yellowheads live within this area.

Methods

Since the summer of 1984/85 the survival and breeding success of yellowheads that live in the study area have been monitored during their November-to-March breeding season. This involves attempting to band all the birds within the study area, and locating and monitoring all their nests. By doing this an exact count is obtained of all the birds in the study area, all the chicks they produce, and the year to year survival of the chicks and adults.

Results

Table 2 shows the population size, survival and production of yellowheads in the study area since the summer of 1984.

Table 2
Population parameters for yellowheads at Knobs Flat since 1984.

Parameter	1984-5	1985-6	1986-7	1987-8
Number of birds in November	28	41	32	30
Number of breeding pairs	12	13	12	11
Chicks fledged	31	26	30	10
Overwinter chick survival	-	0.36	0.15	0
Overwinter adult survival	-	1.00	0.73	0.88
Nesting female survival	1	1	1	0.5

Of particular note is the high mortality of nesting females and low production of chicks in In every breeding season except 1987-88 there has been no mortality amongst adult birds. In 1987-88 there was no mortality amongst males and non-breeding females, but half of the nesting females were killed on their nests by predators. This difference results from yelloweads apparently being most prone to predation when they are on the nest, and the fact that only females incubate. The low chick production is also attributed to predation: 43% of the nests failed because the female was killed and an additional 21% of nests were preyed on though the female escaped. At many nests there was no clue to the identity of the predator, but when there was identifiable predator sign it was always attributable to stoats.

Discussion

The drastic decline in yellowhead numbers in the Hawdon Valley and the low production and survival in the Eglinton Valley recorded in the last surveys are cause for considerable concern. Both almost certainly result from irruptions in mouse and stoat populations and the associated increase in predation by stoats.

Yellowheads appear to be particularly prone to mammal predation while nesting because their nests are usually in holes in the trunks of trees and are thus relatively easy to find and easy to climb to. Furthermore once a predator has put its head in a nest hole there is no means of escape for any adult birds on the nest and thus predators often kill not only nestlings and eggs, but adults as well. Loss of adult birds is more serious than loss of eggs or nestlings which can be replaced by renesting.

During the summer of 1987-88 in the Eglinton there were much higher numbers of mice and stoats than in previous years: mice and stoats were often seen in the forest during this summer, whereas none was seen in other years. This irruption was known to follow a heavy seeding of beech in the previous autumn and winter. A similar irruption was seen in the summer of 1986-87 in the Hawdon.

Mouse and stoat numbers are known to increase rapidly following heavy beech seed fall (King 1983). With increased food supply, mouse numbers rapidly build up. In response to increased prey availability stoat numbers also increase. When beech seed supplies dwindle the mouse population crashes. There is a lag period before stoat numbers also decline (Figure 2, King 1983). During this period incidental predation of birds probably increases and yellowheads, and perhaps some other species, may decline.

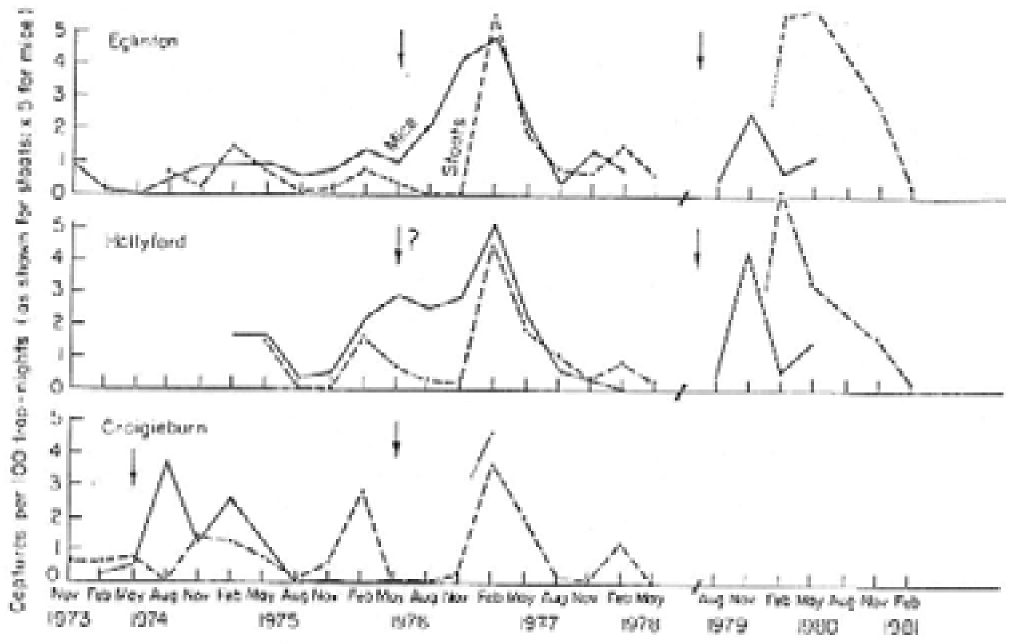

Figure 2. Seasonal and annual variation in the capture rate of stoats and mice. Arrows mark the central periods of major seedfalls. (From King 1983).

To investigate the likely long term effects of periodic crashes such as those we have observed, a simple deterministic model of yellowhead numbers was produced using survival and productivity estimates from the Eglinton Valley. The model predicts that the effect of periodic crashes varies with the length of time between crashes: if crashes occur more frequently than every 11 years then the populations will decline (Figure 3). The model also predicts that even when crashes occur less frequently than once every 11 years the populations are always less dense than they would be without crashes and their sex ratios are always imbalanced (Figure 4) as they have been in the Eglinton Valley for the last four years.

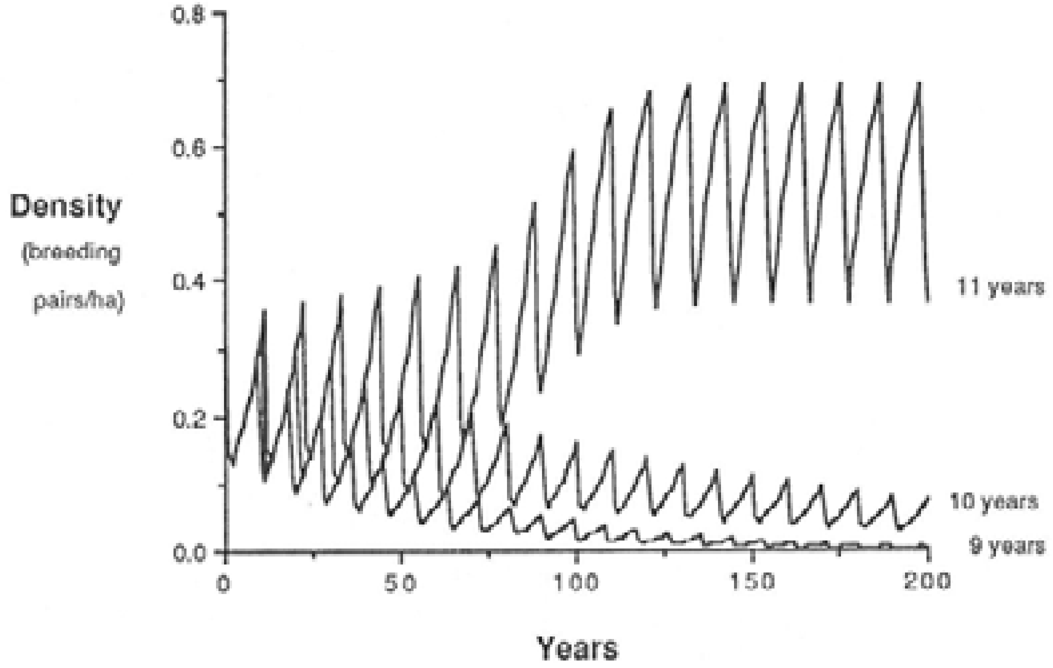

Figure 3. The predicted effect of different intervals between population crashes on yellowhead populations in the Eglinton Valley.

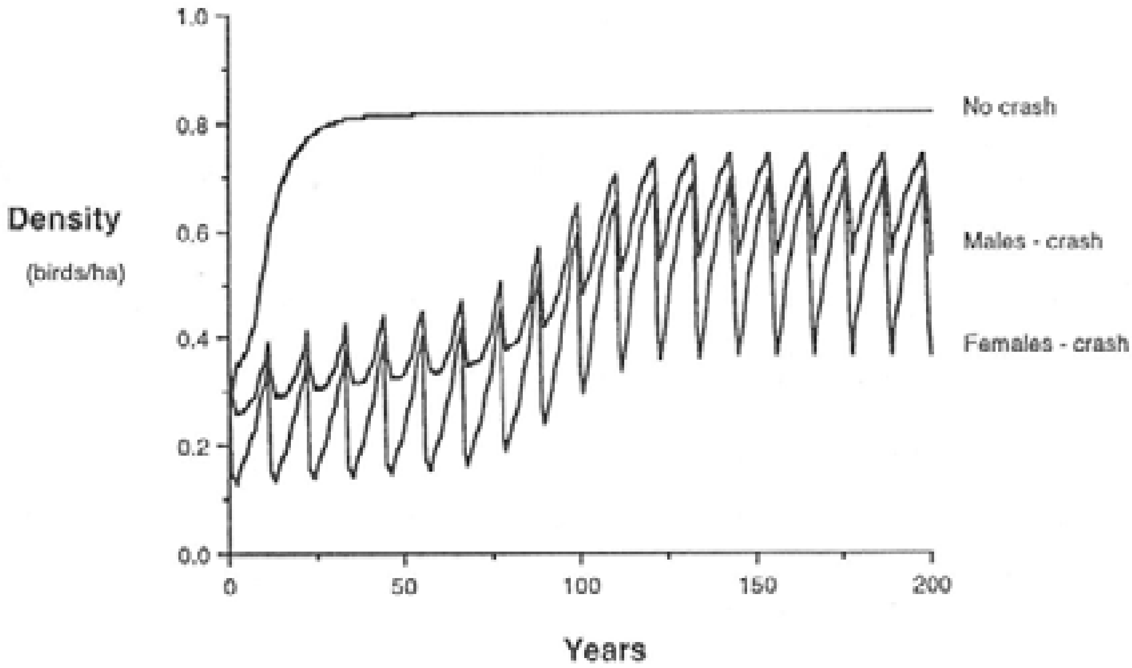

Figure 4. The predicted effect of periodic crashes on the density and sex ratio of yellowhead populations in the Eglinton Valley. Eleven year interval between crashes.

Though we have no productivity and survival measures from Arthur's Pass they can be estimated from those from the Eglinton Valley. Read (1984) found that yellowheads were not only in low density near Arthur's Pass, but they usually produced only one clutch of chicks a year, not two as in the Eglinton Valley. Estimates of the likely breeding success and level of predation in such populations can be made by looking at these parameters during only the first clutch in the Eglinton Valley. Such estimates predict that Arthur's Pass yellowhead populations are even more vulnerable to population crashes than those in the Eglinton Valley.

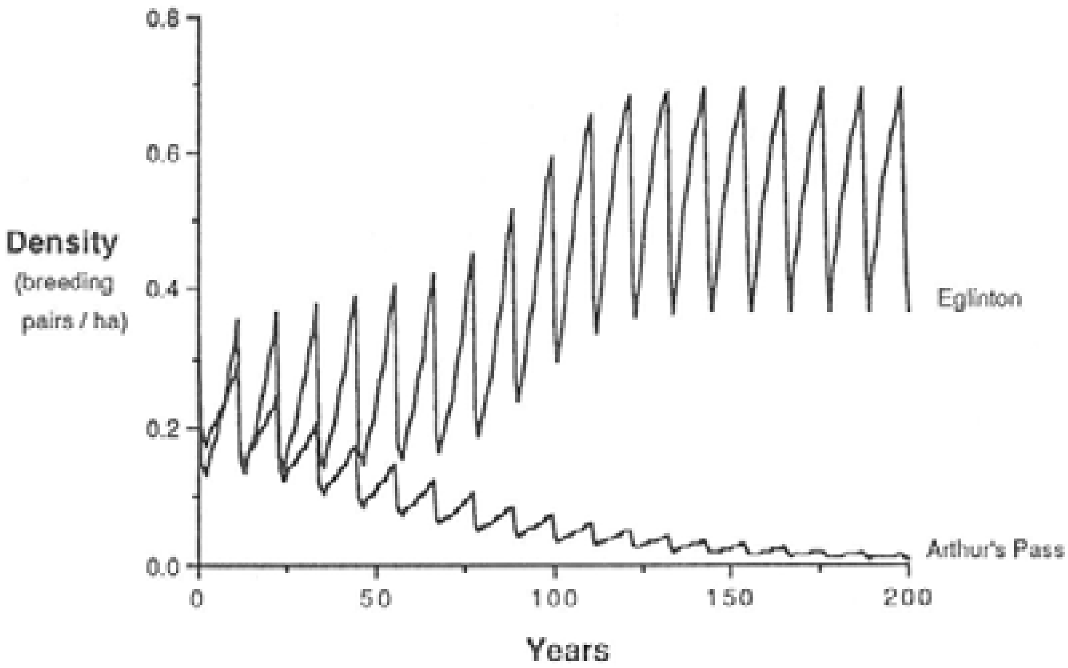

Figure 5. A comparison of the predicted effects of crashes on yellowhead populations in the Eglinton Valley and near Arthur's Pass. Eleven year interval between crashes.

Wardle (1984) predicted that heavy beech seedfall occurs at irregular intervals of between 4 and 6 years, and if stoat plagues such as we observed are this frequent then the model predicts declines for both populations.

Such predictions are however probably slightly pessimistic as:

1. There is evidence from Arthur's Pass that there is increased chick productivity following crashes.

2. There is evidence that the stoat plague we observed in the Eglinton was unusually severe, and stoat plagues this severe probably occur less frequently than once every 4 to 6 years.

3. If the productivity was always as low as we recorded in the Eglinton Valley, the population would already be on the verge of extinction, which it is not.

The findings of these two studies are not completely pessimistic, since they point to ways in which yellowhead populations can be preserved:

1. There is approximately a year's warning of small mammal plagues, because the beech trees flower about a year before the small mammal numbers rise.

2. The yellowheads are only vulnerable to predation while they are on the nest; a period of about four months in the Eglinton Valley, but only two months at Arthur's Pass. It seems possible that small vulnerable yellowhead populations could be protected by trapping or by protecting nests during stoat irruptions. Such management would require monitoring of beech seeding so that these irruptions could be predicted.

Conclusions

It is apparent from our two studies that yellowheads suffer periodic population crashes in response to stoat irruptions that follow beech mast. It is also apparent that in populations with low productivity the period between crashes is probably insufficient for yellowheads to recover fully and consequently such populations are declining. Furthermore our results suggest that even dense, productive populations such as the one in the Eglinton Valley, are badly affected by stoat irruptions.

Recommendations

1. We recommend that a conservation plan for the yellowhead be formulated. Clearly the status of the species gives cause for concern and a conservation plan incorporating both management and research priorities is needed.

2. We believe that the content of such a conservation plan should be decided at a meeting of all managers and researchers with an interest or responsibility for yellowhead conservation.

3. A conservation plan should at the very least address the following points:

    (a) The desirability of continuing detailed yellowhead population ecology studies at Arthur's Pass and in the Eglinton Valley.

    To determine whether or not yellowheads can stand repeated stoat plagues we need accurate estimates of the productivity and survival of yellowheads. We already have some estimates from the Eglinton but we need estimates of the productivity of yellowheads after stoat irruptions. We have no estimates from places such as Arthur's Pass where we suspect that yellowheads have low productivity.

(b) The desirability of setting up beech and small mammal monitoring programmes at key sites throughout the range of yellowheads so that future yellowhead crashes can be anticipated.

With adequate warning it may be possible to reduce the worst effects of stoat irruptions.

(c) The desirability of developing and assessing management techniques such as:
(i) Local predator control.
(ii) Protection of nest sites from predators.
(iii) Captive breeding.

We need to develop techniques for managing yellowhead habitat, and if these fail we may need to develop handling techniques so that the species can be moved to predator-free islands, or as a last resort, bred in captivity.

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