

**THREATENED SPECIES RECOVERY PLAN SERIES NO.4**

**BLACK STILT  
RECOVERY PLAN**  
*(Himantopus novaezealandiae)*

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Frontispiece: Black stilt at the nest. Photo: Dave Murray.

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## **ABSTRACT**

The black stilt is one of the world's rarest wading birds. There has been active management by the NZ Wildlife Service and Department of Conservation since 1984 when the winter population comprised 32 adults. The most recent winter count recorded 52 adults in the wild (July 1992) and there were then a further 32 in captivity. The birds breed only on the braided riverbeds of the Mackenzie Basin, South Canterbury, though last century they bred in both the North and South Islands.

The decline of the species was probably largely the result of predation by introduced mammals, but habitat loss and hybridisation with pied stilt have been contributing factors. Management of black stilt has and will continue to centre on the protection of eggs and chicks from loss due to predation or river flooding. Trapping of predators will be carried out in priority areas, and all eggs will be taken for artificial incubation and returned to adults at hatching. A programme of habitat management aims to increase open nesting and feeding areas for stilts. Research will be carried out on ways to incorporate the large proportion of unproductive birds into the breeding population. A captive population is being maintained to produce surplus young for release to supplement the wild population.

The establishment of a second population on a predator-free island will be investigated and be carried out as soon as a suitable site has been identified and a transfer proposal approved.

## **1. INTRODUCTION**

### **1.1 Aims and purpose of recovery plan**

The black stilt (*Himantopus novaezealandiae*) is one of the world's rarest wading bird species and is endemic to New Zealand. It has a limited distribution and is classified under IUCN criteria as endangered (Bell, 1986). Using a system of setting priorities developed by the Department, black stilt is ranked in the highest priority Category A - 'requiring management in the short term' (Molloy and Davis, 1992).

This species has declined in numbers and in range since the nineteenth century (Pierce 1984a) and currently only about 80 birds are known. The black stilt is in danger of extinction if the factors which have caused its decline continue to operate, without remedial management.

This plan sets out the proposed management programme for the next 5 years. In the short term our primary aim must be to avert extinction. The long-term aim will be to establish a self-sustaining black stilt population. Currently the main effort is to endeavour to achieve this self-sustaining population on the mainland. This is based on the recognition that we are as well placed now as we ever have been in recent years to achieve this, for several reasons. We have built up a detailed knowledge of the bird and its biology and considerable experience of how to manage its population to reduce the threats to it, and there is also a real prospect of improving the habitats used by the bird as a result of related conservation

initiatives. At the same time, investigations will be carried out in an attempt to establish a population on a predator-free island. At the conclusion of the 5-year term of this plan, progress of the two populations will be evaluated to refine the longer-term direction.

Detailed aims and associated explanations are found in section 11.0, the 'recovery strategy'.

## 1.2 Acknowledgements

This plan was prepared in consultation with the Black Stilt Recovery Group, comprising Dr Ken Hughey (DOC, Christchurch) leader, Dr Ray Pierce (DOC, Northland), John Andrew (DOC, Canterbury), Martin Bell (formerly DOC, National Wildlife Centre (NWC)) and replaced on the group by Hilary Aikman (DOC, National Wildlife Centre), Dr Clare Veltman, (Department of Botany & Zoology, Massey University) and the authors.

The following also contributed to meetings to formulate plan drafts: Simon Elkington (DOC, Twizel), Paul and Dawn Wilson (Kiwi & Birdlife Park, Queenstown), Rob Young (DOC, Twizel), Richard Maloney & Alicia Warren (contract workers, Project River Recovery, Twizel), Liz McGruddy (DOC, NWC). The additional assistance of Anne Bennett (DOC, Twizel) and Rob Wheeldon (ex DOC, NWC) as minute takers during meetings is acknowledged.

The plan has also benefited from comments received from the New Zealand Conservation Authority and the Aoraki, Wellington and Waikato Conservation Boards.

## 2. TAXONOMIC STATUS

The black stilt is one of two species of stilt in New Zealand, each the result of a separate invasion by Australian ancestral stock. After colonisation in New Zealand, the earlier invading form became melanistic (black), as have several of this country's other southern species, e.g. Snares Island tomtit (*Petroica macrocephala dannefaerdi*) and black robin (*P. traversi*). The black stilt is now distinctly different from its relatives in Australia (Pierce 1984b).

A second invasion of stilts occurred in the early nineteenth century - that of the pied stilt (*H. himantopus leucocephalus*) (Pierce 1984b). These two species (black and pied stilt) are known to interbreed in their zone of habitat overlap, resulting in fertile hybrids intermediate in plumage colour between that of their parent types. These hybrids will breed with black and pied stilts to produce a range of stilt plumage types. These have been classified for ease of identification into nodes 'A' (pied) through to 'node J' (black) (Appendix 1).

Black stilt juveniles have a similar plumage to pied or hybrid stilt juveniles, from hatching (October to December) until just after fledging. After this time, black stilts undergo successive moults and become progressively darker. They reach full adult black plumage by their second winter (18 months of age).

Pierce (1984b) summarised juvenile and hybrid plumage types and clarified the taxonomic status of birds identified in past literature (Gould 1837, 1841; Buller 1873, 1875, 1888; Hutton 1871; Potts 1872; Oliver 1930, 1955; Stead 1932). On the basis of ecological, morphological and behavioural differences between pied and black stilts, Pierce concluded that black stilts should "retain their full specific status".

A study has quantitatively examined the genetic variation within and between black and pied stilt populations (Green, 1987). Using gel electrophoresis of blood proteins, she established genetic distances between black stilts and Australian pied stilts ( $D = 0.022 - 0.039$ ) that were within the range commonly reported between bird species. Distances between black stilts and New Zealand pied stilts ( $D = 0.006 - 0.01$ ) were similar to those between hybridising species. Placing these results in a wider context, it should be noted that different bird species have shown genetic distances of 0 using this technique (Daugherty, C.H. pers. comm.). After over 100 years of hybridisation, the finding of any difference suggests that black stilts have maintained their genetic identity and that gene flow has largely been one-way from black to pied stilts (Ibid). These genetic results together with the differences found by Pierce (1984a) provide justification for the management of the black stilt as a separate species. Green (1987) showed that dark hybrids contain significant amounts of black genetic material. Thus all black, black x 'node G', black x 'node H' and black x 'node I' pairs will be managed as black stilts. If resources allow, black x 'node F' pairs may also receive management assistance.

### **3. PAST DISTRIBUTION**

Black stilts were widespread from the central and eastern North Island, to Otago in the South Island during the last half of the nineteenth century (Buller 1878, 1888). Since then, pied stilts have increased in numbers and expanded their range, while black stilts have greatly declined to the verge of extinction (Pierce 1984a) (Figure 1).

There are no records of black stilt pairs having nested in the North Island during the twentieth century. During the early part of this century, they occurred throughout the South Island, but were already declining in numbers and range. The species persisted much longer in South Canterbury than it did in North Canterbury. Some nesting occurred in Central Otago until about 1964. Since that time only single birds have been observed there, and less often in Southland (Pierce 1984a).

Black stilts were common in the upper Waitaki river basin during the 1930's and 1940's, nesting from the Waitaki river in the South, to the Godley and Macauley rivers in the North (Figure 2). A major population decline occurred in the inland population during the early 1950's, about 20 years later than in the coastal areas. During the 1960's, breeding became largely confined to the upper Waitaki basin, with only isolated records of birds breeding elsewhere.

In the 1962 breeding season, a count by the New Zealand Wildlife Service within the Waitaki

basin located 68 black stilt adults. Winter counts (including North island birds) from 1975 to 1979 indicated a total adult population of 50 to 60 birds.

Since 1977, black stilts have been found nesting in valleys of the Ahuriri, Hopkins, Dobson, Ohau, Tekapo, Tasman, Cass, Godley and Macauley rivers, and at kettleponds near Lakes Ohau and Tekapo (Pierce 1984a).

The estimated number of pied stilts in the upper Waitaki river basin in the 1980/81 season was 1500 to 2000 (Pierce 1984a).

#### **4. PRESENT DISTRIBUTION AND NUMBERS**

##### **4.1 Present Population**

The present breeding population of black stilt pairs is confined to the upper Waitaki river basin, from the Ahuriri river in the south, to the Godley and Macauley rivers in the north (Table 1). Mixed pairs (black x pied, or black x hybrid) have nested outside this area (eg. Lake Ellesmere, spring 1986 - Nilsson, pers. comm.).

Figure 3 shows the annual trends of the Mackenzie Basin black stilt population based on counts in winter (usually July). These indicate that the population declined dramatically between 1979 and 1980 and reached a low of 28 birds in 1980. Management was initiated at this point and the population has subsequently increased to its pre-1979 level.

Between 9 and 13 nesting pairs were located in the wild each breeding season from 1983/4 to 1990/91 (Nilsson, unpubl. reports 1983-85; Murray unpubl. annual reports 1986-90), with a further one or two additional pairs that were not observed to nest.

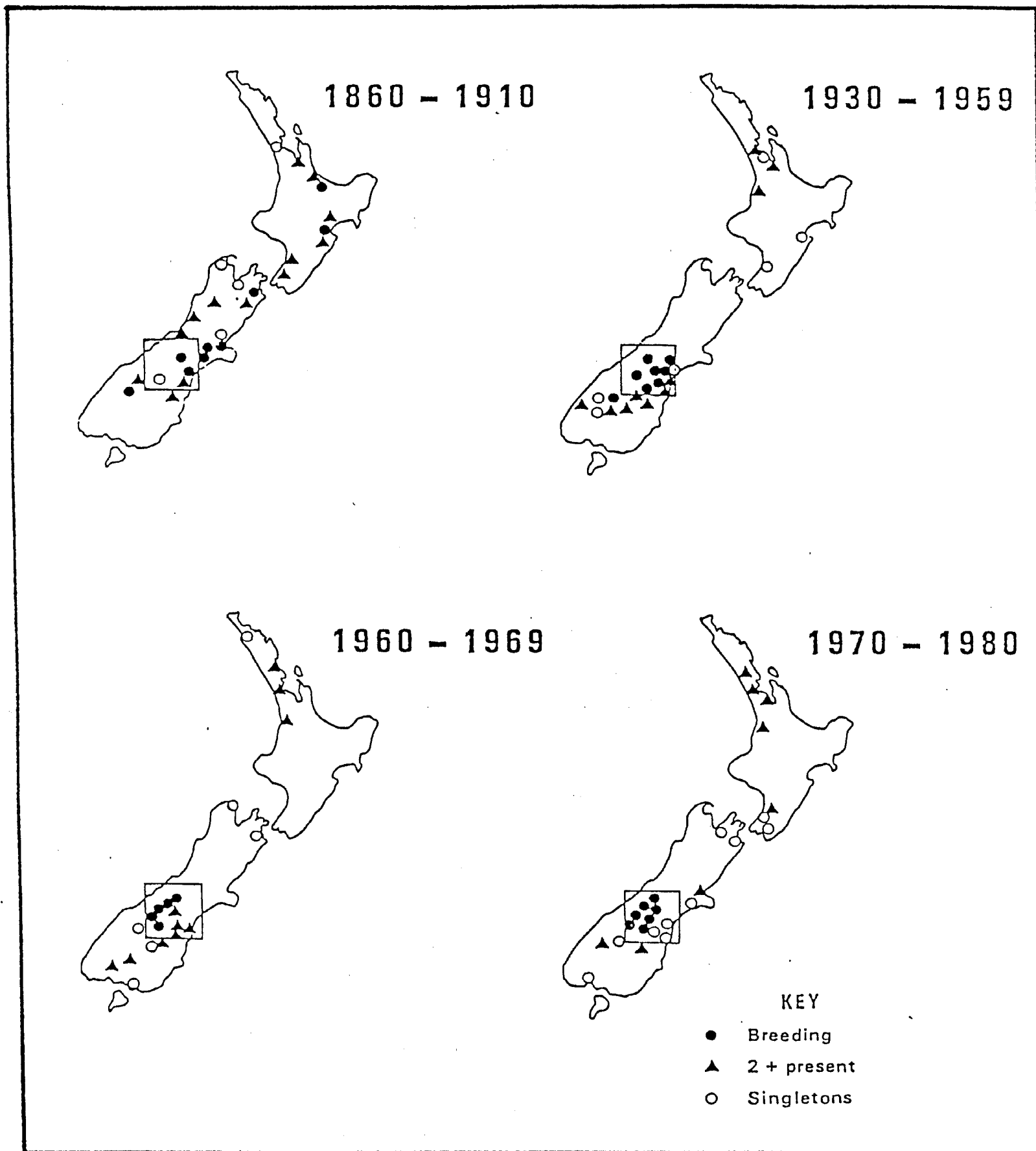
In addition to the wild population, the following table gives the numbers of black stilt held in captivity in January each year:

YEAR	1982	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92
NO HELD IN CAPTIVITY	8	12	14	16	19	20	16	15	30	21	31

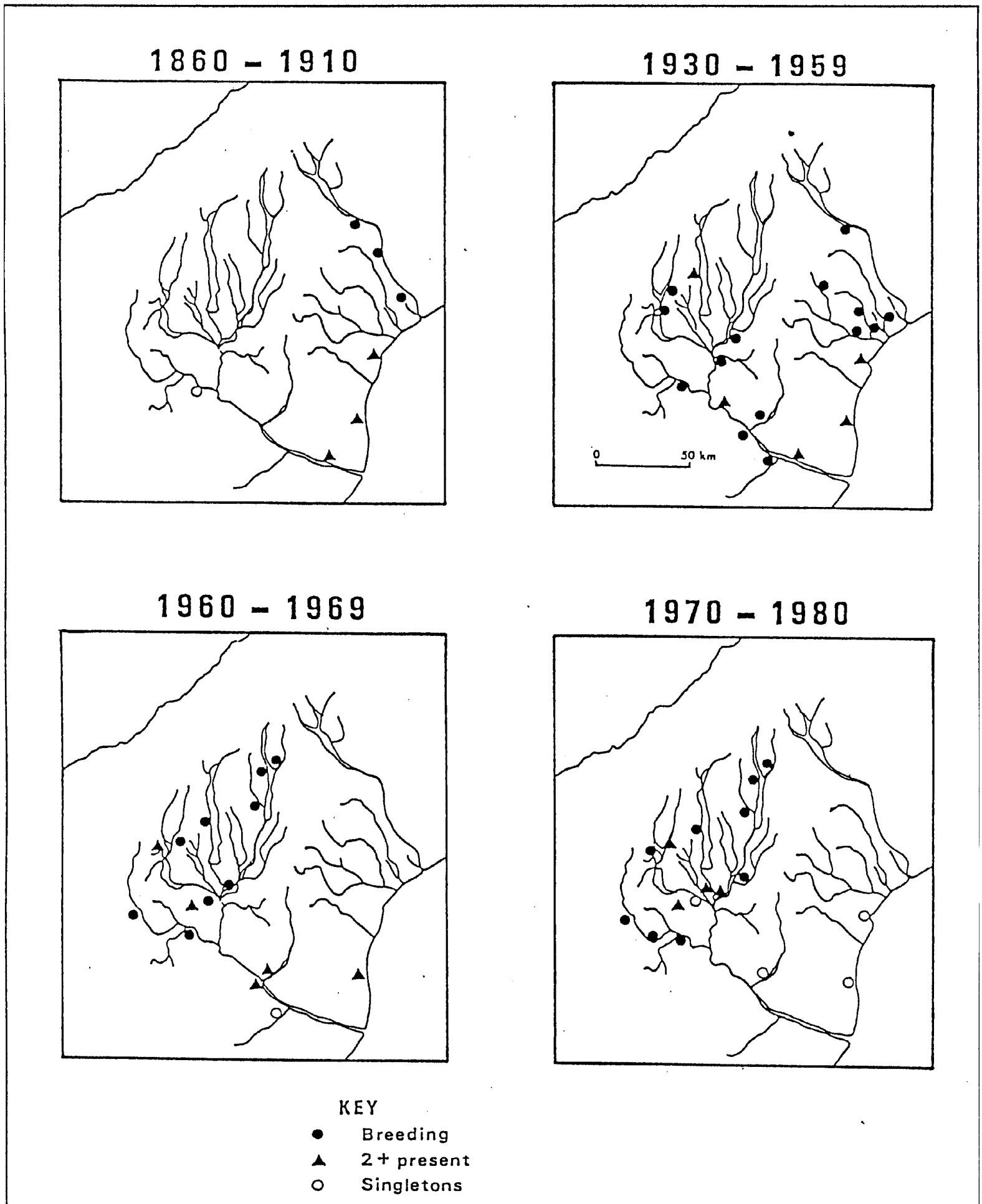
Ten breeding pairs were located in the wild in the 1991/92 breeding season, including 1 black x 'node I', 1 black x 'node H' and 2 black x 'node G' pairs. A further 11 non-breeding pairs were located including 5 black x black pairs (Table 2). The total population count in the wild in the 1991/92 breeding season (including juveniles) stood at 72 black stilts (68 adults, 4 juveniles), 10 'node I' hybrids, 6 'node H' hybrids and 4 'node G' hybrids.



**FIGURE 1: HISTORICAL RECORDS OF BLACK STILT  
IN NEW ZEALAND. (From Pierce (1982))**  
For inset see Figure 2.



**FIGURE 2: HISTORICAL RECORDS OF BLACK STILT  
IN CANTERBURY. (From Pierce (1982))**



**TABLE 1: NUMBERS OF ADULT BLACK STILTS IN SUB-POPULATIONS  
1991/92 BREEDING SEASON**

No. individuals involved in:	Lower Ohau	Ahuriri	Tasman	Cass & Godley	Swamps	TOTAL
Breeding pairs	2	8	0	2	2	14
Non-breeding pairs	2	4	0	10	0	16
Mixed pairs	5	5	1	8	9	28
No pairings	2	2	0	5	1	10
<b>TOTAL</b>	<b>11</b>	<b>19</b>	<b>1</b>	<b>25</b>	<b>12</b>	<b>68</b>

Note: Lower Ohau includes Poaka, Airport swamps, Hopkins/Dobson delta and Tekapo River.

**TABLE 2: NUMBER, COMPOSITION AND ACTIVITY OF PURE AND MIXED BLACK STILT PAIRS IN THE WILD, 1991/92 SEASON.**

Pairs	Nested	Nested as two females	Breeding behaviour seen but no nest	Paired but no breeding behaviour seen	TOTAL
Black x black	6	1	2	3	12
Black x black x node I				1	1
Black x node I	1		1	1	3
Black x node H	1			1	2
Black x node G	2		1		3
<b>TOTAL</b>	<b>10</b>	<b>1</b>	<b>4</b>	<b>6</b>	<b>21</b>

#### 4.2 Movements

Most black stilts remain in the Mackenzie Basin throughout the year. However about 10% of the adult population is recorded on North Island harbours most winters (Wildlife Service unpubl. reports, Notornis to 1987). Based on a few marked birds, these are thought to be individuals that have migrated with pied or hybrid stilt mates almost all of which leave the basin in winter. Other adults have been recorded at Lake Ellesmere and the Ashley river

estuary (O'Donnell pers. comm.), and in Central Otago, Southland, Mid-Canterbury and Lake Wainono on the South Canterbury coast.

Appendix 2 presents all records of banded birds seen outside the Mackenzie Basin. In addition, banded birds not recorded in the basin each winter return to it in spring, so further undefined movements are taking place.

The first band recoveries of black stilt juveniles outside of the Mackenzie Basin were made in March 1987. One black parent of a black stilt pair was seen on Lake Ellesmere with its 3 juveniles (2 of which were banded). This adult and 1 juvenile returned to the basin in June 1987.

## **5. HABITAT REQUIREMENTS AND ECOLOGY**

Although black stilts occur in a wide variety of wetland types, they are primarily birds of braided shingle riverbeds. Early literature (Potts 1872, Buller 1888, Stead 1932) suggests that this has always been the case. Other habitats such as swamps, tarns, and ponds, are often used especially where they occur near to a braided river.

Black stilts feed mainly on aquatic insects, using a wider variety of methods than pied stilts enabling them to remain inland during winter (Pierce 1985, 1986a).

Black stilts mate for life and nest as solitary pairs, sometimes many kilometres from the nearest neighbouring pair. Colonial nesting did however occur in the past (Pierce 1982b). Black stilts are aggressive towards other stilts and dominate pied stilts in territorial disputes.

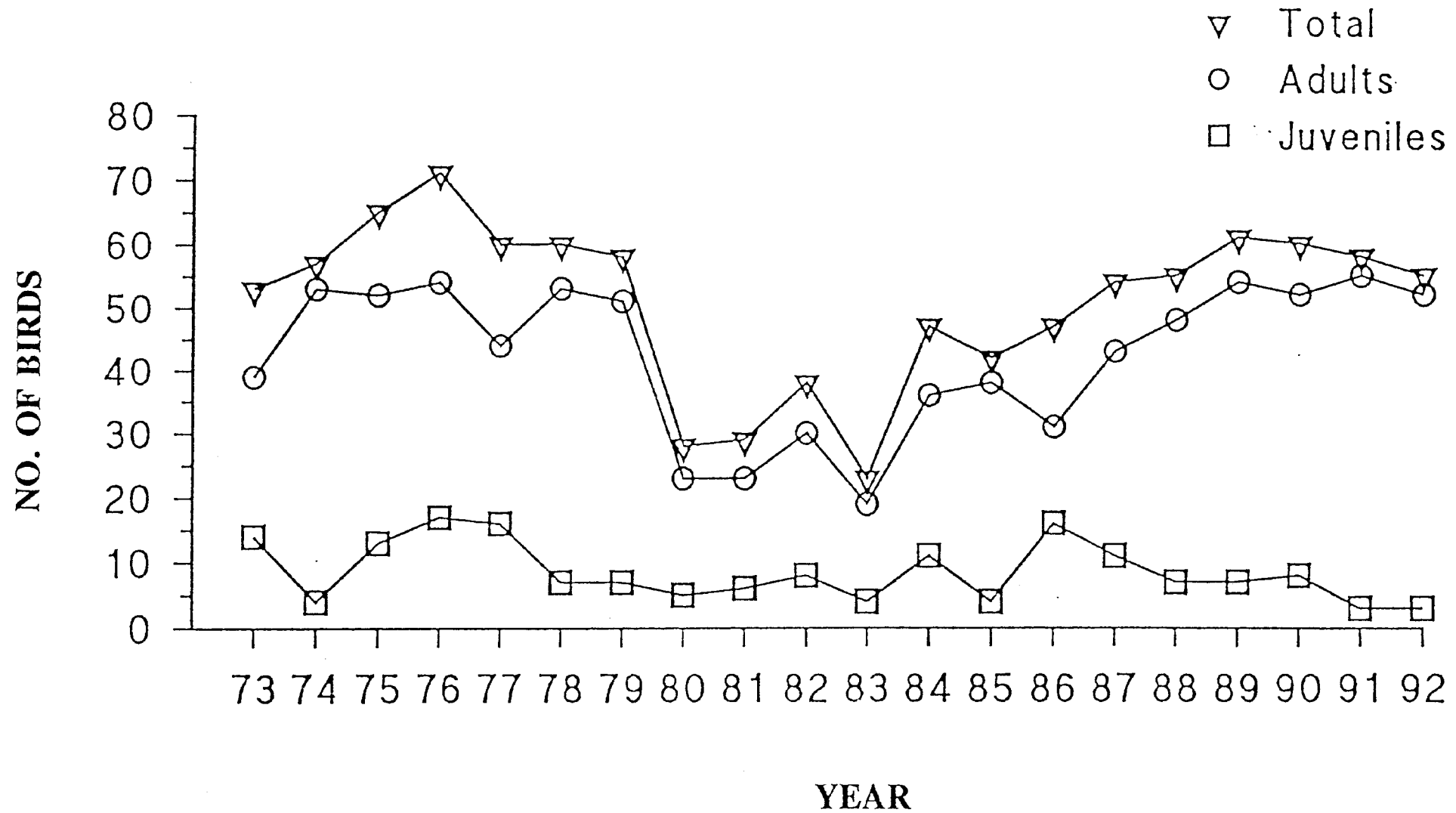
Nesting takes place from the birds' second or third years onward. Stable habitats such as sidestreams of braided rivers or main river channels during low flows are preferred, although swamps and wetlands are used, particularly those with a permanent (spring-fed) water supply. Pairs tend to nest in the same locality each year (ie. they have high site fidelity). However repeated flooding (and depletion of river invertebrates) leads to reduced site fidelity between some years.

Nests are placed close to water (which can make them vulnerable to flooding) and egg-laying takes place from August through to January, peaking around October. The normal clutch is four eggs and incubation duties are shared between the two parents. Incubation takes about 25 days.

Chicks are able to leave the nest and forage on their own within two days of hatching. They generally remain within 200 m of the nest site. It takes between 39 and 55 days for these chicks to grow to fledging stage. Juveniles remain with their parents for a further six to eight months. Once the young have flown, family groups will utilise a variety of habitats including tarns, ponds and swamps adjacent to major rivers.

**FIGURE 3: NO. OF BLACK STILTS IN MACKENZIE BASIN,  
WINTER COUNTS, 1973-1992.**

(Note: In 1983 the Ahuriri River was not sampled above the delta  
so this count represents an underestimate.)



In mid-winter, weather conditions in the upper Waitaki basin result in still-water areas becoming frozen for several weeks at a time. When a freeze-up occurs, black stilts congregate on the large river deltas to feed, particularly the Tasman, Cass, Godley, Macauley, Dobson and Ohau Deltas and the Ahuriri Delta and River.

## **6. REASONS FOR DECLINE**

Three major factors have contributed to the decline of black stilts: predation by introduced mammals, loss or modification of habitat and hybridisation with pied stilts.

### **6.1 Predation**

The single greatest cause of the decline in the black stilt population has probably been the combined effects of introduced mammalian predators.

During the late nineteenth century, ferrets (*Mustela furo*), weasels (*Mustela nivalis*) and stoats (*Mustela erminea*) were introduced to control the spread and increasing numbers of rabbits (*Oryctolagus cuniculus*).

In the 1870's, with the alarming spread of the rabbit, many pastoral farmers transported large numbers of cats (*Felis catus*) and released them into rabbit-infested country.

These introduced predators did not prove to be long term controllers of the rabbit population, and their diet extended to include alternative prey items such as lizards, insects and native birds.

Before the introduction of these predators, black stilts had existed in an environment relatively free from predation pressure. Historically, weeks (*Gallirallus australis*), other now-extinct rails and more recently the Australasian harrier (*Circus approximans*), probably preyed on stilt eggs and chicks. Black stilts have been less able to withstand this change in predation pressure than other riverbed birds because the following aspects of their breeding behaviour render them particularly vulnerable:

#### **6.1.1 Nest timing**

Black stilts nest as early as August, a time when predators are likely to be hungry due to low numbers of their main food, rabbits (Pierce 1987).

#### **6.1.2 Nest location**

Black stilt nests are often sited on the banks of small streams and side braids of major rivers, habitats which are heavily frequented by predators (Pierce 1986, 1987). Mid-stream islands (see Appendix 4) and swamps which are used occasionally have fewer predators, but the

islands may be vulnerable to flooding.

### **6.1.3 Solitary nesting**

As black stilts presently nest as solitary pairs, sometimes several kilometres from other nesting black stilts, they are without the added advantages accrued to nesting in colonies (eg. extra ability to detect and drive away predators). Chicks tend to forage over a greater area than those of colonial nesting pied stilts (Pierce 1986b) making them more vulnerable.

### **6.1.4 Distraction displays**

Pied stilts normally perform distraction displays (e.g. "broken-wing" (McConkey, 1971)) at all stages of incubation, whereas black stilts rarely perform them until late in incubation or when chicks are hatching (Pierce 1982b).

### **6.1.5 Fledging period**

Black stilts have a longer fledging period (hatching to flying, 39-55 days) than do pied stilts (30-37 days). The extra time spent on the ground increases vulnerability of the chicks to predation and late broods may be present in February when predator young are dispersing and predator density is greatest (Pierce 1982).

### **6.1.6 Plumage**

The black stilt does not share the disruptively camouflaged plumage of other riverbed waders making it easier for predators to locate adults, nests or young (Pierce 1986b).

## **6.2 Loss and modification of habitat**

### **6.2.1 Wetland drainage**

Drainage and modification of swamps for agricultural development has seriously depleted good black stilt feeding and nesting habitats. Large swamps (eg. Grays Hill swamp) which provided feeding and nesting sites with some natural barriers to predators, are now rare (Pierce 1984).

### **6.2.2 Riverbed modification**

The loss or modification of braided rivers through hydro-electric development eg. Tekapo, Pukaki and Ohau rivers (Robertson et al 1983) along with river control works, water abstraction and diversion, has removed or reduced feeding and predator-free nesting areas for black stilts.

### **6.2.3 Introduced plants**

The spread of introduced plants into former feeding and nesting areas of black stilts, has reduced the availability and suitability of habitats for this species. Open areas preferred for

nesting have become covered in vegetation.

In particular, the spread of crack willow (*Salix fragilis*) (eg. Tekapo, Pukaki river deltas) and Russell lupin (*Lupinus polyphyllus*) (eg. lower Ahuriri River) in braided riverbeds has resulted in channelisation. The loss of sidestreams and newly created ponds follows stabilisation of river channels, and there is a subsequent loss of feeding and nesting sites. Riverbed vegetation also provides cover for ground predators and observation sites for use by avian predators.

### **6.3 Hybridisation**

Interbreeding between black stilts and pied stilts has probably occurred since at least the latter part of the nineteenth century (Hutton 1871, Potts 1872, Buller 1875). The incidence of hybridisation in the 1860's and 1870's was probably very low (Pierce 1982b), but by the 1890's, it was occurring more frequently. During the first half of the twentieth century, hybrids were observed in many areas of New Zealand but were again rarer by the 1960's and 1970's (Pierce 1982b).

Hybridisation has been a symptom of, as well as a contributing factor in the decline. It assumes greater significance as a factor in decline of the breeding population, now that the black stilt population is so low.

A small number of birds spread over the c.1,000,000 hectares of the Mackenzie Basin has resulted in chance having a more significant role in pair formation. Black stilts are not generally known to range far from their natal (birth) and rearing areas. A sexual imbalance within each localised sub-population (eg. Tasman River) would promote hybridisation by virtue of a lack of suitable black mates, even though they may be available elsewhere (eg. Ohau river). In some cases trios of birds have bred and pairs of females have laid infertile eggs.

Black stilts appear to mate for life. Those involved in a mixed pair bond are lost to the black stilt breeding population until they lose their mate, at which time they could possibly re-pair with a black stilt. However this has only occurred rarely.

## **7. ABILITY TO RECOVER**

The following characteristics of black stilts can aid the management of the population towards recovery:

### **7.1 Multiple clutching**

As an adaptation against natural breeding disasters such as flooding of nests, most riverbed



nesting birds have the ability to lay multiple clutches of eggs. Black stilt pairs have laid up to five clutches a season in captivity and up to four in the wild. This provides an opportunity to increase productivity through manipulation.

## **7.2 Tolerance to disturbance and manipulation**

Black stilts have shown tolerance to human disturbance. Field management activities since 1981 have involved removing early clutches of eggs to induce re-laying, or the eggs are taken for artificial incubation and the parent birds placed on "dummy" eggs (ceramic eggs of similar shape, colour and size of real black stilt eggs). Nest desertion has not occurred as a result of the latter activity.

Black stilts will continue to sit on ceramic eggs well past the normal 25 day incubation period, up to a maximum of 60 days. They are also prepared to switch from incubation to chick rearing well before the normal date. For example one pair accepted the day-old chicks of another pair when they had only just laid their own third egg (of a four egg clutch).

Family groups rarely desert an area following banding of chicks which is carried out just prior to fledging. Adults can usually be readily trapped on the nest for banding in late incubation without deserting.

## **7.3 Mate selection**

Black stilts prefer to mate with members of their own species, but will select a hybrid or pied mate if another black is not available. There is a tendency for black stilts to choose the darkest plumage mate available (Pierce 1982b).

## **8. BLACK STILT MANAGEMENT 1980 to 1991**

The management programme that started in 1981 contained four elements. Two of these, the manipulation of eggs and the control of predators, contributed to an increase in the survival of chicks to fledging to c.35% (1981-1989) compared with 1% recorded in the Cass valley for unprotected nests (Pierce 1986b). The third, captive breeding led to the release of 22 juveniles, 8 in 1981 and 14 between 1987 and 1990. All of the first release died within six months, but one of the later birds has been confirmed as a recruit into the breeding population and 7 others survived at least one year. The fourth element, habitat protection and enhancement, has not yet made a significant contribution to the programme but is expected to do so in future.

### 8.1 Egg manipulation and cross-fostering

The procedure established in the 1980/81 season for the management of black stilt pairs was as follows:

- 1/ Nests located early in the season, eggs taken soon after laying and nest destroyed to induce re-laying.
- 2/ First clutch artificially incubated and fostered to other pairs (e.g. black x pied, black x hybrid or hybrid x hybrid)
- 3/ Second clutch taken, replaced with dummy eggs so that the parent birds continued incubation.
- 4/ Second clutch artificially incubated and returned to parents just prior to hatching for rearing. Eggs were then returned to nests just prior to hatching. When eggs could not be returned to their original nests, e.g. if this had been flooded out, they were given to a different pair, occasionally a hybrid or pied stilt pair if no black pairs were available.

However there proved to be several problems with this approach. The first problem was that first clutch chicks fostered to hybrid and pied stilts acquired at least one behavioural characteristic of their foster species, they migrated out of the Mackenzie Basin during winter. Pair-bonding which takes place in winter/early spring thus occurred away from the nucleus of black stilts. This was a serious enough problem that the technique's effectiveness in recruiting young birds into the black stilt population was minimal.

Band recoveries for individually colour-banded chicks produced between 1981 and 1990 are summarised in Appendix 3. Of the 59 banded chicks fledged between 1981 and 1986, which would all have now reached breeding age, only 4 have been recruited into the Mackenzie Basin black stilt breeding population (Appendix 3, Table 1).

Low recruitment was partly related to the type of foster parent used. When observations of banded birds are allocated into parent-type groups, 3 main points are evident (Appendix 2, Table 1):-

- 1) There was very high chick mortality between fledging and six months of age for all parent types (the high black x black figure reflects a higher proportion of eggs given to this parent type);
- 2) Survival of black stilt juveniles was greatest when reared by two black parents, rather than by hybrid or pied foster parents;
- 3) All juveniles fostered to migratory hybrid and pied stilts were not observed during winter and were assumed to leave the basin. However only two have been seen (at Hawera 2/3/85 and Lake Ellesmere 25/9/86, Appendix 2, Table 2) to confirm this. Some have been recorded back in the Mackenzie in subsequent summers, but most have never returned.

Black stilt juveniles reared by two black parents tend to remain in the basin and although post-fledging mortality is high, some are recruited into the population.

The second problem was that the chicks that migrated were potentially those with the highest chance of survival. For chicks fledging earlier in the season have higher survival than those

fledging later in the season.

As a result of low recruitment due to these problems, there was a shift in management emphasis after 1985 towards producing fewer but higher quality (i. e. reared by 2 black parents) chicks. This was achieved by protection of nest sites through trapping, ceasing multiple clutching, artificial incubation of eggs and the limited use of cross-fostering. Only a few black stilt pairs are induced to reneest and most are allowed to rear their first clutch.

## **8.2 Management of predators**

Predator control using leg-hold traps has been an integral part of the past management programme. Traps were set as a ring around most nests and the major valley systems were trapped on a grid basis beginning prior to the start of the breeding season. Grid trapping were often concentrated in areas in which high predator numbers were predicted as a result of rabbit control operations, as discussed below.

As an indication of trapping effort and results, in the 1989/90 season, 20 cats, 80 ferrets, 1 stoat, 69 hedgehogs, 3 rats and 55 harriers were caught during 2310 trap-nights, an average of 10 animals/100 trap-nights. In 1990/91 165 predators were caught in 2480 trap-nights, an average of 7/100 trap-nights, with a very similar proportion of each species as in the previous season.

In conjunction with the Royal Forest and Bird Protection Society, two predator exclosures have been built around traditional nesting habitats. These exclosures are protected by electric wires at the middle and top of the fenceline. They do not exclude harrier hawks but almost totally prevent entry of mammals. Precautionary poisoning and trapping is carried out within these exclosures as an additional protective measure. As examples, 1 cat, 1 ferret and 7 harriers were removed from Mailbox Inlet in August 1989 prior to the 1989/90 season, and 2 ferrets and 10 harriers from Micks Lagoon. A modified version of the exclosure fence has been erected around the Twizel aviaries.

Of 13 chicks hatched within the Forest & Bird exclosures between 1980 and 1982, 10 fledged (77%). Between 1981 and 1986, one or two black stilt pairs nested in the exclosures annually but none have nested in either since then. During that period 9 chicks fledged from Mailbox and 6 from Micks Lagoon.

The trapping programme was influenced by a study of predators in the Tekapo riverbed and on the Cass river (Pierce 1987) that showed that predator numbers depended on the availability of rabbits. However, control of rabbit numbers through poisoning operations did not achieve a corresponding reduction in predation on ground-nesting birds.

Poisoning of rabbits on these rivers was followed by increased predation on nesting birds in the next breeding season. This was caused by a lag in the decline of ferrets and cats, behind the decline of rabbits. In one area, increased predation was caused by stoats which increased after the exodus of cats and ferrets. Predation pressure on birds was lowest during the recovery of rabbit populations. In at least one case, reduced predation pressure was not a result of fewer predators being present, but rabbits appeared to provide a protection (or

buffer) against predation on ground nesting birds.

### 8.3 Results of past management of wild population (8.1. & 8.2. combined)

Appendix 3 summarises egg production, manipulation and cross-fostering results from 1982 to 1990. Between 3 and 27 chicks have fledged each year.

Table 3 shows that three areas have produced most of the chicks fledged since 1985, the lower Cass River, Ahuriri River and lower Ohau River.

**TABLE 3: NUMBERS OF CHICKS FLEDGED FROM DIFFERENT RIVER AREAS, 1985/86 TO 1991/92.**

YEAR	Lower Cass	Upper Cass	Lower Ohau	Ahuriri	Tasman	Merino Wetland	Airport Swamp	McA *
1985/86	6	5	2	4	3	3	0	0
1986/87	2	1	5	6	2	1	1	0
1987/88	1	1	6	4	0	0	0	0
1988/89	8	0	1	2	0	0	0	0
1989/90	5	0	2	3	0	0	0	0
1990/91	3	0	0	0	0	0	0	0
1991/92	0	0	0	3	0	0	0	1
<b>TOTAL</b>	<b>25</b>	<b>7</b>	<b>16</b>	<b>22</b>	<b>5</b>	<b>4</b>	<b>1</b>	<b>1</b>

\* McAuchtries Swamp

### 8.4 Captive Breeding

In October 1979, eight eggs were removed from 3 nests in the Mackenzie Basin and were transferred for artificial incubation and hand-rearing at the National Wildlife Centre (NWC) at Mt Bruce in the Wairarapa. All eight birds (3 males, 5 females) were reared successfully and at 18 months of age were housed as pairs.

Between 1983 and 1987 eggs from 16 early clutches of one pair were cross-fostered into the wild population, but only 4 resulting young are believed to survive. Thirteen juveniles from final clutches were reared at NWC and retained in captivity.

Eight birds hatched from eggs of wild pairs were hand-reared at NWC in 1980/81 and released in the Mackenzie Basin at 1 year of age. Only one of these birds survived for even

a month. At least two were killed by harriers before release. All were very tame. Pierce (1982) recommended no further liberations until the "habitat in captive pens can be made to resemble that in the wild more closely and precautions taken to ensure that the birds are predator-wary".

As a result of these findings and after a 4 year study of captive birds held at the NWC, Reed (1986) suggested transfer of the breeding programme to the Mackenzie Basin to allow black stilts to be reared within their "natural" range.

In late 1986 a facility was established on 15 ha of Electricorp-owned land adjacent to the lower Ohau River. The site lies approximately 3 km from Twizel and only 1 km from the main tourist route between Mount Cook and Queenstown (State Highway 8). An aviculturist was employed in early January 1987 and construction of a 45m x 14m x 6m aviary was completed in late May. A second aviary of similar dimensions was completed in May 1988 and a third aviary in 1991. In 1992 a new facility was established including an incubator room, food preparation room, laboratory and 8 brooder compartments with adjoining aviaries.

Between June 1987 and January 1992 5 breeding pairs and 10 juveniles were transferred from NWC to Twizel, and three juveniles transferred from Queenstown to Twizel. Three of the juveniles were released in October 1987, one of which was recorded breeding with a 'node H' stilt after 3 years in the wild, and a further 3 released in September 1988, one of which was killed by a predator soon after release. The captive pairs produced one young for release in the 1988/89 season (from wild eggs fostered to them) and 7 in 1989/90. During the 1989/90 and 1990/91 seasons respectively, 7 and 5 juveniles were reared in captivity and released and an additional four hand-reared black x node F hybrids were released in September 1991. Of this total of 23 released birds, eight are known to have survived more than one year, at least five are still alive in the wild and two have been recaptured. Other eggs produced in captivity were fostered to wild pairs or hand-reared for use as further breeding stock.

At the completion of the 1991/92 season (April 1992) there were 32 birds in captivity, (11F, 10M, 11 sex unknown (juveniles and chicks)), 19 at Twizel, 11 at NWC and 2 at Queenstown.

## **8.5 Habitat protection/enhancement**

Adjacent to the captive breeding facility is an area of pastoral lease (Omahau station) lying between Ruataniwha springs and the lower Ohau River. In late 1989, this area was flooded by piping water from Lake Ruataniwha over the old riverbed. Wild black stilts have already been attracted to this new habitat, and captive-released juveniles also use it.