BIRDLIFE OF THE ASHBURTON RIVER,

CANTERBURY, NEW ZEALAND

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ABSTRACT

The Ashburton River is one of the most important braided rivers in Canterbury for birdlife. The two major branches of the river are over 130 km long and include an important coastal river delta and lagoon. Thirty-nine wetland species and 25 terrestrial species have been recorded since 1980. Between about 14 000 and 26 000 wetland birds have been recorded during annual surveys in spring between 1981 and 1990. The wetland bird fauna during each survey comprised mainly gulls (68-87% of birds), terns (0.5-19%), waders (5-13%), waterfowl (2-5%), herons (0.2-0.8%) and shags (0.1-11%). Much higher numbers of wetland birds were recorded on the South Branch (10 000-18 000) than the North Branch (3000-5500). Up to 699 birds/km were counted on the lower reaches of the South Branch.

Nationally significant populations of black-fronted terns[1], black-billed gulls, banded dotterels and black-fronted dotterels occur on the Ashburton River. Regionally significant populations of wrybill, South island pied oystercatcher, pied stilt and black-backed gull also occur. Overall numbers of these birds appeared to decline over the ten year survey. Their populations appear to be threatened by the combined effects of water abstraction and the encroachment of exotic weed species on their prefered habitats.

INTRODUCTION

Braided rivers of the type found in Canterbury are nationally and internationally rare habitat types. They provide habitat for over 80 species of birds, many of which are unique to New Zealand (O'Donnell & Moore 1983). Four endemic species have evolved on braided rivers and have specific adaptations for breeding and feeding on riverbeds: the wrybill plover[1], black stilt, black-billed gull and black-fronted tern. Two further endemics, the banded dotterel and South Island pied oystercatcher use braided rivers as their major breeding habitats. Two species, the wrybill and black-fronted tern are classed as threatened species, while the black stilt is endangered (Bell 1986).

O'Donnell & Moore (1983) reported on surveys of the 14 main braided rivers in Canterbury (excluding the Mackenzie Basin). They described the species and relative abundance of wetland birds using the rivers, and the major factors contributing to the decline of braided river habitats. Surveys of each river were one off. Each river, while superficially similar to

[1]. For scientific names of birds see Section 'Systematic account of the bird fauna'.

the other rivers in the region, was sufficiently distinctive in its habitat characteristics to provide for a unique combination of wildlife. The individual river systems complemented each other and it was thought that emphasis of bird usage may change from one river to another, and from year to year as conditions changed. However, with habitat degradation continuing, particularly in the form of irrigation abstraction and introduced weed encroachment, birds may lose their versatility of habitat choice.

A survey programme was commenced on the Ashburton River in spring 1981 aimed at monitoring the stability of wetland bird populations over ten years. Specific objectives were:

1. To monitor any changes in bird numbers;

2. To attempt to relate any changes in bird numbers to broad in habitat.

3. To record areas of highest bird usage on the river and determine if these change with time.

METHODS

The Ashburton River was surveyed once each spring (between the end of October (Labour weekend) and the first weekend of December from 1981 to 1990) when breeding of wetland birds was at its peak and the numbers of birds likely to be most stable.

For the purposes of the survey the river was divided into nine sections between the Maori Lakes Bridge and the sea, six on the South Branch (covering 85 km) and three on the North Branch (covering 39 km). The sections were as follows (Figure 1):

SOUTH BRANCH

I Maori Lakes (Buicks) Bridge - Sandy's Knob (8.9 km)
II Sandy's Knob - Inverary Bridge (10.8 km)
III Inverary Bridge - Rangitata Diversion Race (8.7 km)
IV RDR - Valetta Bridge - Braemar Road (21 km)
V Braemar Rd - Ashburton (16.5 km)
VI Ashburton - sea (18.3 km)

NORTH BRANCH

I Pudding Hill Gorge - Highway 72 Bridge (3.2 km)
II SH72 - Springfield Road (10.6 km)
III Springfield Rd - Junction with south branch (25.4 km)

Sections on the South Branch were surveyed concurrently, using groups of 3-5 people spread at approximately equal distances across the riverbed. All wetland birds seen

were counted as the observers walked downstream. Every effort was made not to count birds twice. For example, birds which flew downstream after being counted were subtracted from the total. In some years the North Branch was surveyed concurrently with the South Branch, and in others it was surveyed on the night before, or day after the South Branch count.

The Ashburton River is relatively narrow, so each count can be considered a reasonably accurate census of all riverbed birds. Because the counts were standardised between years, numbers provide an index of long-term changes in breeding bird populations on the river. River conditions during the surveys varied from year to year. In most years the river was in a partial fresh during the survey with milky-coloured water due to snow and glacial melt in the catchment of the Arrowsmith Ranges. The impact of these small floods on counts is not known.

STUDY AREA

The Ashburton River is a relatively small braided river located in central Canterbury. It is formed of two main tributaries, the rain-fed North Branch, and the glacial-fed South Branch which originates in the Arrowsmith Ranges in the Southern Alps. Flows are more stable than those of the larger braided rivers of Canterbury such as the Rakaia (O'Donnell & Moore 1983) and supports dense areas of willows (*Salix* spp.), poplars (*Populus* spp.), broom (*Cytiscus scoparius*) and other exotic shrubs as far up as the Ashburton Gorge. The only expanse of shingle clear of enchroaching weeds is between Sandy's Knob and the Maori Lakes (Buicks) Bridge, in the upper reaches of the South Branch. Both branches have been extensively modified by river control works. The North Branch differs from the south in that it is narrower, less braided and has lower flows. In the upper reaches of the North Branch, small amounts of mountain beech (*Nothofagus solandri* var. *cliffortioides*) is present on the edges of old glacial terraces.

Descriptions of river survey sections

SOUTH BRANCH

Section 1. Maori Lakes (Buicks) Bridge - Sandy's Knob

The first 2 km is a wide expanse of clean shingle. The river is wide and extensively braided. Substrate size is variable, with small and large shingle and sometimes large deposits of glacial flour. The more stable shingle banks have variable amounts of vegetation (20-80%) consisting of mat plants (*Raoulia, Muehlenbeckia*), lichens, tussocks, grasses, some adventive weeds and the occasional small matagouri (*Discaria toumatou*).

The remaining 7 km becomes more confined as the river approaches the Ashburton Gorge. The river progressively changes from being a relatively wide expanse of clear shingle with many braids to being predominantly single channel. Willows, broom and gorse (*Ulex europaeus*) become more frequent lower down and form extensive clumps away from the main stream.

Section 2. Sandy's Knob - Inverary Bridge

In this section the river is confined largely to one channel between willows or glacial terrace edges. The riverbed is often only 20-30 m wide with very small banks of bare shingle. There has been extensive river control work in the stretch below Quarry Road Bridge. Low stopbanks have been constructed in the past and extensive areas of willow poles and even pines (*Pinus radiata)* have been planted.

The Ashburton Gorge (4.8 km) between Sandy's Knob and the Stour River Bridge was not surveyed. The river here is swift-flowing and is confined between gorse and willow-lined banks. Few riverbed birds have ever been seen along this section.

Section 3. Inverary Bridge - Rangitata Diversion Race

The river here is relatively narrow, fast flowing and mainly restricted to one channel, but there are also parts that have good shingle habitat and small sidestreams. Weeds such as gorse, broom and blackberry (*Rubus* sp.) cover the riverbed more extensively and some willow plantings have been made in the upper reaches.

Section 4. Rangitata Diversion Race - Braemar Road

Above Bowyers Stream the river gradually improves as it becomes wider and less rapid. However, encroachment of introduced weeds becomes extensive in this section and the riverbanks become continuously lined with willows. Below Bowyers Stream the river becomes more braided and although the river gets wider, weed enchroachment is also extensive. Large amounts of water are taken from the river for irrigation at the Rangitata Diversion Race.

Section 5. Braemar Road - Ashburton

In this section the river is extensively braided with both major and minor channels. Along the river banks dense willows overhang many small ponds and slow moving channels. Where the North Branch enters, the volume of water increases markedly. Vegetation enchroachment has also become extensive over the last 10 years, willow, broom, lupins (*Lupinus arboreus*) and *Mimulus* being the most widespread problem species.

Section 6. Ashburton - Rivermouth

This section is similar to Section 5, except the riverbed can be even wider and more braided, the river channels larger, the substrate finer and patches of bare shingle can be more extensive. There are many slow-moving sidestreams and backwaters with plentiful water weeds.

At the rivermouth a very wide braided river delta is formed which drains into a long, coastal bar-type lagoon. A shingle barrier usually blocks the mouth off from the sea during peak irrigation abstraction and low flows. At other times of the year the mouth is open. The brackish lagoon is shallow with exposed mudflats.

NORTH BRANCH

Section 1. Pudding Hill Gorge - Highway 72 bridge

This short section of river is up to 300 m wide. The shingle consists of both small and large sized stones, and is relatively free of introduced weeds. Most vegetation is clumped. Some mountain beech, is present on terraces on the north and south banks where the river comes out of the gorge. Willow poles have been planted along the river banks.

Section 2. Highway 72 - Springfield Road

The uppermost part of this section has some clean shingle, especially at the junction with Pudding Hill Stream. Further down the river is mainly one channel, but there are small braided parts. There are strips of willows along both banks, but these are not continuous. Encroachment of weeds on the riverbed is extensive.

Section 3. Springfield Road - Junction with South Branch

This long section is narrow (only 150 m wide) and is confined between dense willows, poplars, broom and other shrubs. It is apparent that these weeds have greatly reduced the extent of the riverbed. The river is predominantly one channel, although smaller channels are frequent. There are patches of bare shingle which appear to be flood-prone, and extensive patches of broom and lupins.

Changes in riverbed habitat over 10 years

The riverbed habitat has changed markedly over the 10 years of survey. Most notable has been a considerable increase in the extent of encroachment of introduced shrubs, particularly broom, gorse, and in some places, willows (Plate 1). Between 1981 and 1984 there were increasing amounts of vegetation (particularly broom) on the river each year. By 1985 the riverbed was almost completely covered in broom with relatively small areas of bare shingle along the sides of braids. Many places from Valetta downstream, were covered in broom up to two metres high. Even though some patches of broom had been sprayed, the dead plants were still on the river, and continued to make many shingle areas unavailable to breeding birds. The continuation of weed encroachment seemed to coincide with drought conditions in Canterbury, a high draw-off of water for irrigation, and no floods or freshes capable of clearing the shingle areas of vegetation.

An exception to the years of intensive weed encroachment was during the 1986 and 1987 counts when the level of weed enchroachment was significantly less. In autumn 1986 major floods occurred in South and Mid-Canterbury. As a result almost all vegetation was washed away, and unstable bare shingle and flood debris remained (Plate 2). Almost all of the riverbed, below the high river terraces on either side, was clean shingle, free of vegetation. On the lower river sections there were many areas of bare wet mud and shallow muddy backwaters. In 1987 the riverbed was largely devoid of vegetation although already there were occasional patches of broom and lupin seedlings (most <10 cm high). By 1988 recolonisation of weeds was extensive again and by 1989 the level of encroachment was similar to pre-1986 conditions.

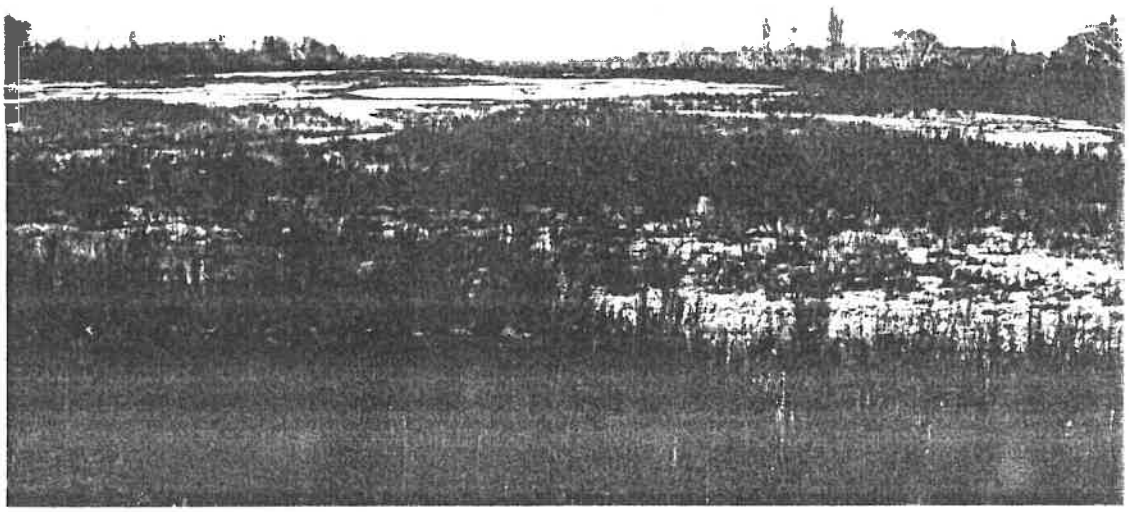


Plate 1. Extensive weed enchroachment below Ashburton State Highway 1 Bridge, spring 1984.

Plate 2. Clear shingle riverbed below State Highway 1 Bridge, spring 1986.

RESULTS

A total of 64 bird species were recorded on the Ashburton River between 1981 and 1990, comprising 39 wetland species and 25 terrestrial species (Table 1). Wetland species can be further categorised as coastal species using the river incidentally (4 species), birds recorded only on the rivermouth lagoon (8 species), birds generally confined to the riverbed for breeding (7 species), and those which use a wide range of wetland habitats (20 species). A much larger number of species were recorded on the South Branch (62 species) compared to the North Branch (39 species) (Table 1).

Wetland birds were abundant on the Ashburton River with between 13 676 (110 birds/km) and 26 146 (211 birds/km) birds recorded on the whole river between 1981 and 1990, despite large areas of habitat being unavailable because of introduced weed encroachment (Table 2).

Overall, numbers of wetland species and individuals were far higher on the South Branch of the Ashburton (Table 2). Counts varied between 10 891 (128 birds/km) and 21 127 (249 birds/km) on the South Branch, and between 2783 (71 birds/km) and 5551 (142 birds/km) on the North Branch.

Over the 10 years of the survey there appeared to be a general decline in overall wetland bird numbers (Figure 2) with over 20 000 birds present 1981-84, but 13 000-16 000 in the remaining years (except 1987)(Table 2). Numbers declined markedly in 1985-1986 as weed enchroachment reached its worst levels, but temporarily increased in 1987 after major floods had cleared the river. Numbers appeared to decline again in 1989-1990 as weed encroachment built up.

The wetland bird fauna during each survey comprised mainly gulls (68-87% of birds), terns (0.5-19%), waders (5-13%), waterfowl (2-5%), herons (0.2-0.8%) and shags (0.1-11%)(Table 3). Species composition on each branch and for each year of the survey are summarised in Appendices 1 and 2. The proportion of shags in the bird community was usually between 0.1 and 0.5%, except in years when flocks of spotted shags were recorded at the rivermouth. Proportions of herons and waterfowl were relatively consistent from year to year. However, the proportions of waders, gulls and particularly terns in the population was more variable (Table 3).

Overall, numbers of wetland birds were low on the upper three sections of the South Branch, but increased steadily further downstream to reach peak numbers on Section 6 (e.g 1987, Figure 3). A few species were concentrated on specific sections (e.g. wrybill on Section 1 and black-fronted dotterel on Section 6). Three species were usually only near the rivermouth or on the lagoon (spotted shag, white-fronted tern, red-billed gull) and the vagrant arctic migrant waders were also usually on the rivermouth delta (e.g. godwit, sandpipers, knot, turnstone). Gulls were dominant on all sections on the South Branch (Table 4).

Most birds on the North Branch, particularly the riverbed specialists, and almost all breeding colonies of gulls were confined to the upper river sections (e.g. Table 5 and Appendices). For example, in 1981 these sections supported 90% of banded dotterels, 97% of black-fronted terns, 55% of pied stilts and 47% of oystercatchers. Overall, gulls were the largest

bird group on this branch of the river and most were concentrated on Section 2 (Table 5). The most numerous species on the long lower river section (apart from gulls) were oystercatchers, stilts, spur-winged plovers and mallard ducks.

The highest total number of wetland birds (26 146) was recorded on the South Branch in spring 1987. This coincided with the clearest riverbed conditions recorded, and the presence of stable backwaters, one and a half years after major floods had washed the riverbed clear of vegetation. Numbers were nearly double that of 1985 when vegetation encroachment was at its greatest. Numbers were lowest in 1986, the summer after the major flood. Despite the riverbed being clear, aquatic invertebrate numbers appeared to be very low and the river had probably not stabilised sufficiently for there to be well developed aquatic feeding habitats. The main species contributing to the increase in 1987 was black-billed gull. There were c.11 000 of these gulls breeding on the river in 1987 compared with c.2000 in 1986 and c.4000 in 1985. However, black-backed gull numbers remained similar to previous years. Black-fronted tern and white-fronted tern numbers also increased while oystercatcher, banded dotterel and pied stilt numbers were slightly lower than previous counts (Appendix 1). The number of birds on the North Branch was similar to other years in 1987, possibly because river conditions were similar each year.

Noticable declines in numbers of some wetland birds were noted as early as 1982. Numbers of black shag, white-faced heron, mallard and grey ducks, pied oystercatcher, banded dotterel, pied stilt and black-fronted tern appeared to decline over the survey period. Only Canada goose and black-fronted dotterel (a newly colonising species) numbers appeared to increase steadily over the survey period, while numbers of paradise shelduck, little shag, and spur-winged plover were relatively constant (with yearly variations). Numbers of wrybill and kingfisher were too small to notice a trend. Numbers of coastal species using the riverbed usually near its mouth (spotted shag, white-fronted tern and red-billed gull) were very variable from year to year, and sometimes there were none present. The patterns for black-backed and black-billed gulls were variable, but may be declining overall. Only future monitoring will clarify some of these trends.

No formal counts of terrestrial bird species were made but most were numerous. The 25 terrestrial species recorded on the Ashburton (Table 1) are generally common in all habitats in Canterbury and use the riverbed, areas of exotic weeds and willows along the river banks along with a wide range of other habitat types. Most species were introduced to New Zealand (Table 1) and are of lower conservation priority than wetland species dependent on braided river and other aquatic habitats. Of note, however, was the presence of a few rifleman in willows along the river margin. This endemic forest bird had almost disappeared from lowland Canterbury.

Figure 1. Location of the Ashburton River, Mid-Canterbury and river sections surveyed, 1981-1990 (South Branch Sections 1-6, North Branch S1-S3).

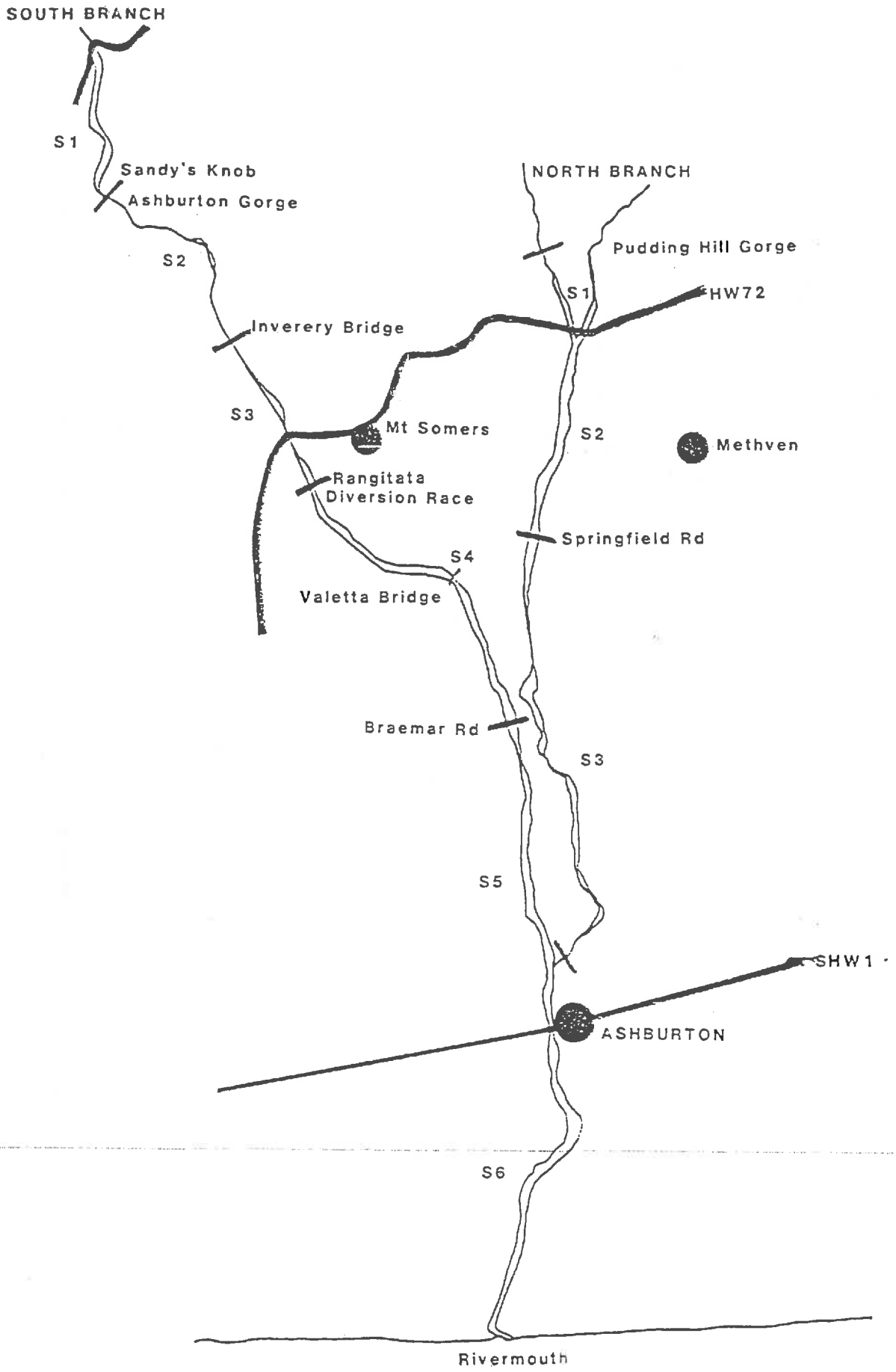


Table 1. Bird species using the Ashburton River and their abundance, 1981-1990 (1. Status: E= endemic species, e=endemic subspecies, i=indigenous, m=migrant, I=introduced. 2. Habitat use describes dominant habitat used on the river. Wetlands=uses all wetland habitats.

Bird species	Status[1]	South Branch	North Branch	Habitat Use[2]
black shag	i	low numbers	low numbers	wetlands
little black shag	i	rare	rare	wetlands
little shag	i	low numbers	low numbers	wetlands
pied shag	i	rare		coastal
spotted shag	E	common		coastal
white-faced heron	i	common	common	wetlands
Australasian bittern	i	rare		wetlands
royal spoonbill	i	rare		wetlands
white swan	I	rare		rivermouth
black swan	I	rare		wetlands
Canada goose	I	common	occasional	wetlands
paradise shelduck	E	common	low numbers	wetlands
mallard	I	common	common	wetlands
grey duck	e	low numbers	rare	wetlands
grey teal	i	rare		wetlands
NZ shoveler	e	rare		wetlands
pukeko	i	rare		wetlands
SI pied oystercatcher	e	common	common	riverbed
golden plover	m	rare		rivermouth
spur-winged plover	i	common	common	wetlands
banded dotterel	e	common	occasional	riverbed
black-fronted dotterel	i	common		riverbed
wrybill	E	rare		riverbed
long-billed curlew	m	rare		rivermouth
bar-tailed godwit	m	rare		rivermouth
turnstone	m	rare		rivermouth
Siberian tattler	m	rare		rivermouth
knot	m	rare		rivermouth
pectoral sandpiper	m	rare		rivermouth
pied stilt	i	common	common	wetlands

black stilt	E	rare		riverbed
black-backed gull	i	common	common	wetlands
black-billed gull	E	common	common	riverbed
red-billed gull	i	low numbers		coastal
caspian tern	i	rare		wetlands
black-fronted tern	E	common	common	riverbed
white-fronted tern	E	common		coastal
welcome swallow	i	common	common	wetlands
NZ kingfisher	e	low numbers	low numbers	wetlands
harrier	i	low numbers	low numbers	terrestrial
California quail	I	common	common	terrestrial
rock pigeon	I	common	common	terrestrial
shining cuckoo	e	rare	rare	terrestrial
morepork	e		rare	terrestrial
little owl	I	occasional	occasional	terrestrial
skylark	I	common	common	terrestrial
NZ pipit	e	common	common	terrestrial
hedge sparrow	I	common	common	terrestrial
grey warbler	E	common	occasional	terrestrial
fantail	e	common	common	terrestrial
rifleman	E	rare		terrestrial
song thrush	I	common	common	terrestrial
blackbird	I	common	common	terrestrial
silvereye	i	common	common	terrestrial
bellbird	E	rare	rare	terrestrial
yellowhammer	I	common	common	terrestrial
chaffinch	I	common	common	terrestrial
greenfinch	I	common	common	terrestrial
goldfinch	I	common	common	terrestrial
redpoll	I	common	common	terrestrial
house sparrow	I	common	common	terrestrial
starling	I	common	common	terrestrial
rook	I	rare		terrestrial
white-backed magpie	I	low numbers	low numbers	terrestrial

Table 2. Total wetland bird counts for the Ashburton River, 1981-1990

Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
North Branch (39 km)	5,551	4,502	4,055	5,024	4,086	2,785	5,019	no count	2,777	3,458
South Branch (85 km)	18,080	18,034	16,421	17,419	12,075	10,891	21,127	14,044	11,030	12,504
TOTALS	23,631	22,536	20,476	22,443	16,161	13,676	26,146	14,044	13,807	15,962

Table 3. Percent composition of the wetland bird fauna by major bird groups, South Branch, Ashburton River, 1981-1990

Bird Group	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
shags	0.4	0.2	0.2	0.1	0.1	1.5	0.2	0.5	11.1	4.2
herons	0.3	0.4	0.2	0.2	0.3	0.3	0.8	0.2	0.2	0.3
waterfowl	3.1	4.7	3.2	1.5	2.4	5.4	2.4	3.9	4.1	3.3
waders	12.5	7.8	7.7	7.4	9.4	12.3	4.6	6.9	12.4	9.8
gulls	79.1	67.8	85.7	87.3	86.9	77.6	82.1	79.9	70.6	81.3
terns	3.6	18.9	3.1	1.8	0.5	2.9	10.5	8.6	2.7	1.2
others	0.02	0.2	0.1	0.4	0.5	0.1	0.7	0.6	0.1	0.5

Table 4. Percent composition of the wetland bird fauna by river section, South Branch, Ashburton River, 1987

Bird group	Section 1	S.2	S.3	S.4	S.5	S.6
waterfowl	0.23	0.3	0.23	0.3	0.41	1.15
waders	0.44	0.03	0.15	0.97	1.36	1.59
gulls	1.42	0.07	0.54	11.1	21.04	47.91
terns	0.08	0	0	0.02	0.65	9.76
others	0.05	0	0.04	0.14	0.09	0.17
Total percent	2.2	0.1	1.0	12.5	23.6	60.6
Birds/km	53	3	23	124	302	699

Table 5. Percent composition of the wetland bird fauna by river section, North Branch, Ashburton River, 1987

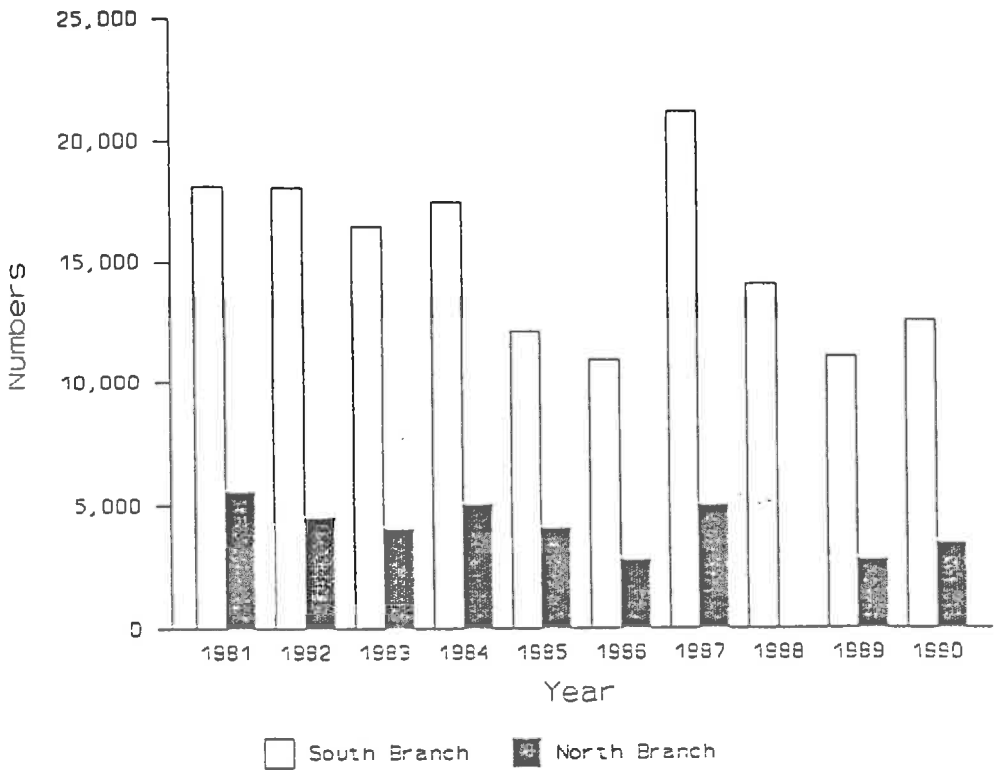
Bird group	Section 1	S.2	S.3
waterfowl	0.3	1.7	1.6
waders	0.2	1.5	2.4
gulls	4.2	76.4	10.5
terns	0	0.2	0
others	0	0.1	0.7
Total percent	4.7	80.0	15.3
Birds/km	75	379	30

SYSTEMATIC ACCOUNT OF WETLAND BIRDS USING THE ASHBURTON RIVER, 1981-1990

BLACK SHAG *Phalacrocorax carbo*

The black shag is a common wetland bird distributed throughout New Zealand in both coastal and inland localities (Bull *et al.* 1985), and in fresh, brackish and saline habitats. It occurred in relatively low numbers in most years on both the North and South Branches of the Ashburton River. Numbers ranged between 4 and 18 birds in all years except 1981, when

Figure 2. Total numbers of wetland birds using the Ashburton River, spring 1981-1990 (North Branch not surveyed in 1988)



over 60 were present. Black shags were absent on the North Branch during four surveys. There appears to be an overall trend of decline between 1981 and 1990 (Figure 4).

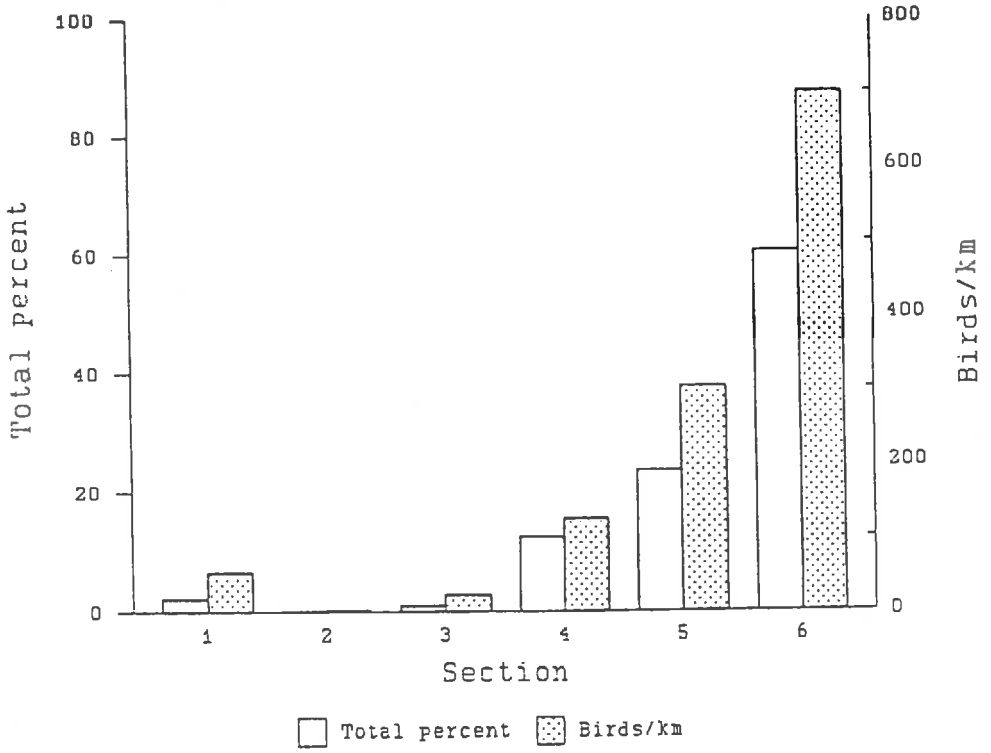
Black shags were recorded on all river sections, although not in all years. On the South Branch they were seen most often on Section 1 (90% of surveys), but only in low numbers (average 2, max 5). Shags were recorded least often on Section 2 (1 survey). They were recorded on other river sections on 50-70% of surveys, again, usually in low numbers (1-2) except Section 5 (average 7, max 51)(Appendix 3).

LITTLE SHAG *P. melanoleucos*

Like the black shag, the little shag is a common wetland bird found throughout New Zealand in both inland and coastal localities (Bull *et al.* 1985). Little shag numbers were generally higher and more variable between years than for black shags, with over 10 recorded in most years and a maximum of 60 in 1988 when a breeding colony was present in willows on Section 5. Birds were seen less regularly on the North Branch (Figure 5). No overall trend was apparent between 1981 and 1990.

Little shags were recorded on most river sections, but the majority were on the lower three

Figure 3. Percent composition and numbers of wetland birds/km per river section on the South Branch, Ashburton River, 1987



sections of the South Branch. They were never recorded on Section 1, and only once on Sections 2 and 3. However, they were found every year on Section 4 (max 13, average 4.5) and in similar numbers, but only on seven of the surveys on Section 6. Largest concentrations were on Section 5 (max 43, average 7.6)(Appendix 3).

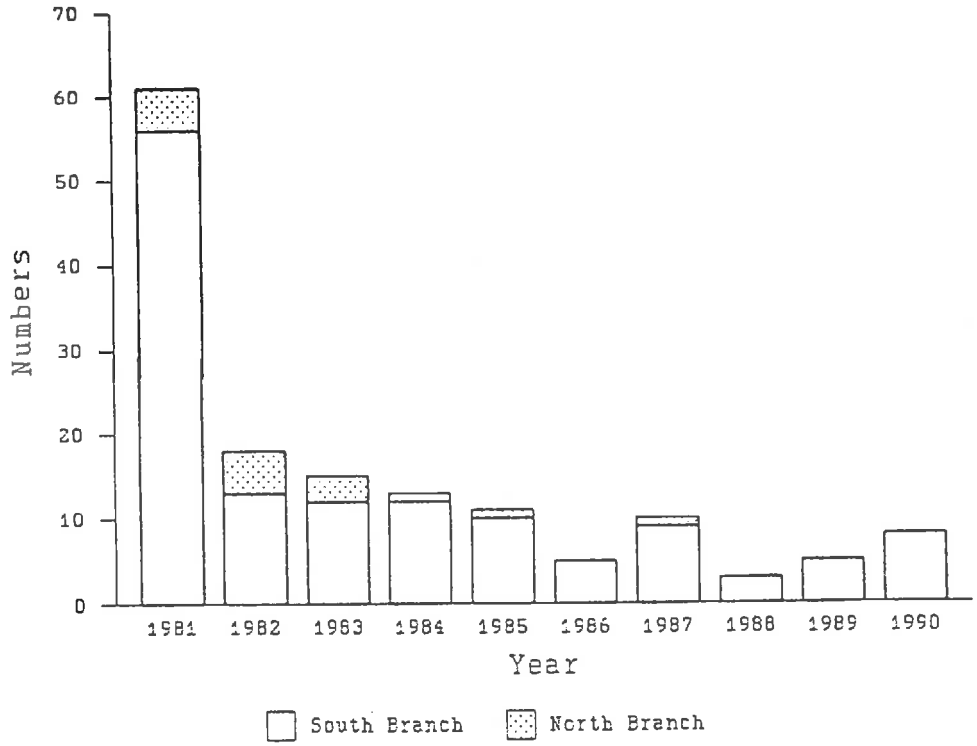
LITTLE BLACK SHAG *P. sulirostris*

The little black shag is common on lakes in the central North Island but rare elsewhere. Recorded as a vagrant on both the South Branch (6 at the mouth in 1981) and the North Branch (3 each in 1983 and 1984). These records were unusual for Canterbury.

PIED SHAG *P. varius*

The pied shag is a coastal species with a widespread but discontinuous distribution around New Zealand. Until recently there were few records from South Canterbury (O'Donnell 1985). Recent records from the Christchurch area suggest this species is currently spreading south in the region. A record of four at the rivermouth in February 1982 was the first for the Ashburton (pers. obs.).

Figure 4. Numbers of black shags on the Ashburton River, 1981-1990



SPOTTED SHAG *Stictocarbo punctatus*

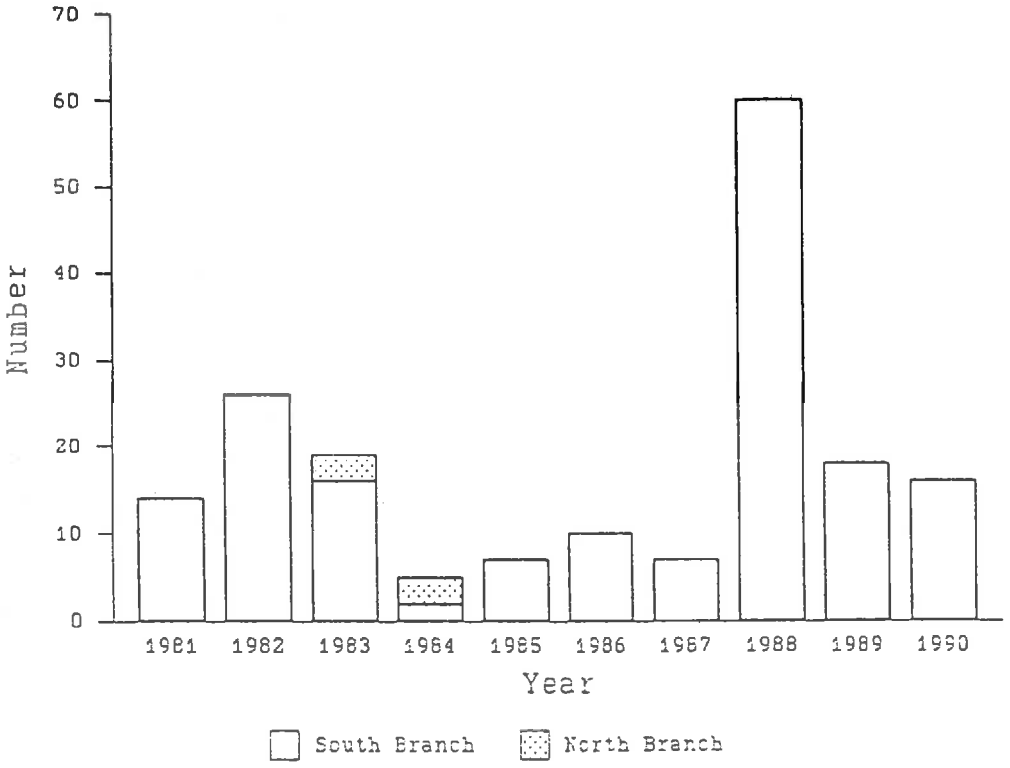
A common pelagic shag found around most of the New Zealand coastline. The largest breeding concentrations occur around Banks Peninsula where many thousands nest. Large flocks (maximum 1200) were recorded roosting on shingle bars at the Ashburton Rivermouth on surveys in 1981 (95), 1986 (145), 1989 (1200) and 1990 (500). Birds roost on cliff-tops and ledges on the north side of the mouth at night after feeding offshore during the day. Spotted shags have also been recorded in other seasons at the rivermouth (e.g. c.1000 in February 1982, pers. obs.).

WHITE-FACED HERON *Ardea novaehollandiae*

The white-faced heron is a common native species found throughout New Zealand (Bull *et al.* 1985). Before about 1940 it was rare but has since increased in numbers and become widespread on coastal and inland wetlands and rivers and in farmland habitat. These herons were common throughout the Ashburton with numbers ranging from 30-87 on annual counts. Numbers were much lower on the North Branch. Heron numbers appeared to decline slightly over the ten year survey period (Figure 6).

White-faced herons were recorded on all river sections. Numbers on the South Branch were

Figure 5. Numbers of little shags on the Ashburton River, 1981-1990



lowest on the upper three river sections, occurring on 6-9 of the annual surveys and averaging between 2 and 3.2 birds. Numbers were much higher on the lower three sections, with birds occurring in all years and ranging on average between 8.9 and 13.5 (max 25 on Section 6)(Appendix 3).

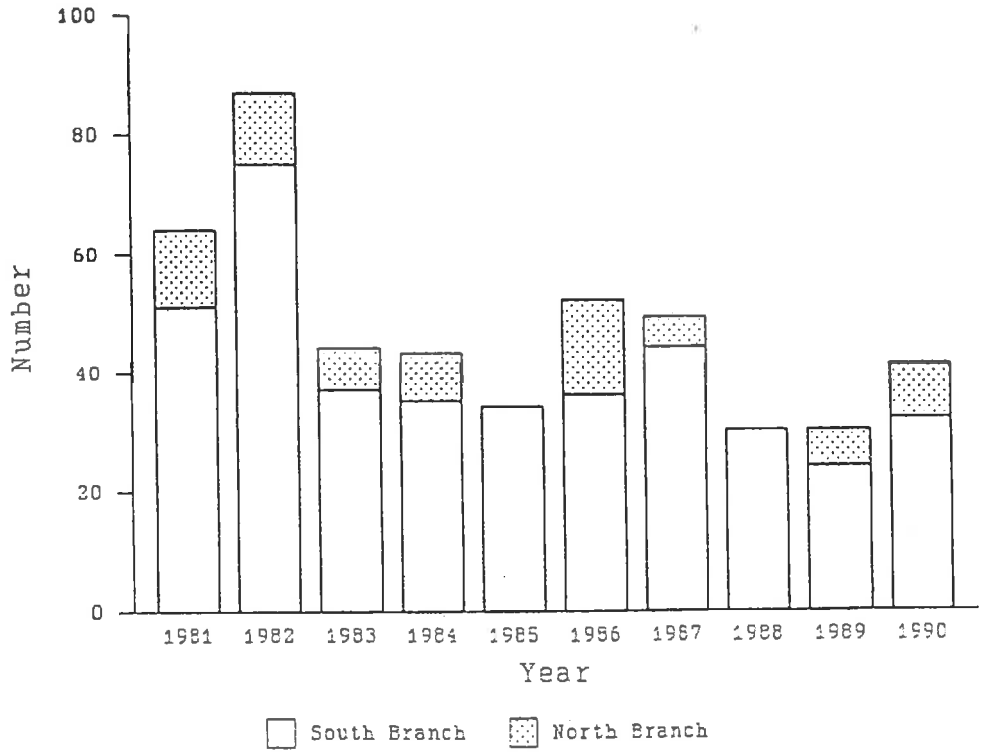
ROYAL SPOONBILL *Platalea regia*

The spoonbill is rare in New Zealand with less than 330 birds in 1992 (P. Schweigman pers. comm.) occupying four colonies in Otago, Westland and Marlborough. The spoonbill is a vagrant to the rivermouth. One bird, recorded in 1987 was feeding in shallow river channels up to 1 km from the rivermouth.

AUSTRALASIAN BITTERN *Botaurus poiciloptilus*

The bittern occurs widely in swamps throughout New Zealand. However, increased drainage has caused a recent decline in numbers and the population could be as low as 1000 (Ogle & Cheyne 1981), classing the species as threatened (Bell 1986). There was one recorded on Section 1 (the upper Ashburton) in 1983.

Figure 6. Numbers of white-faced herons on the Ashburton River, 1981-1990



BLACK SWAN *Cygnus atratus*

The black swan is a common introduced waterfowl species now characteristic of many freshwater and brackish habitats. The black swan rarely occurs on braided rivers and is a vagrant to the Ashburton with two birds recorded in 1984 on Section 1.

MUTE SWAN *C. olor*

This increasingly rare introduced swan species was reported from the Ashburton Rivermouth in 1981.

CANADA GOOSE *Branta canadensis*

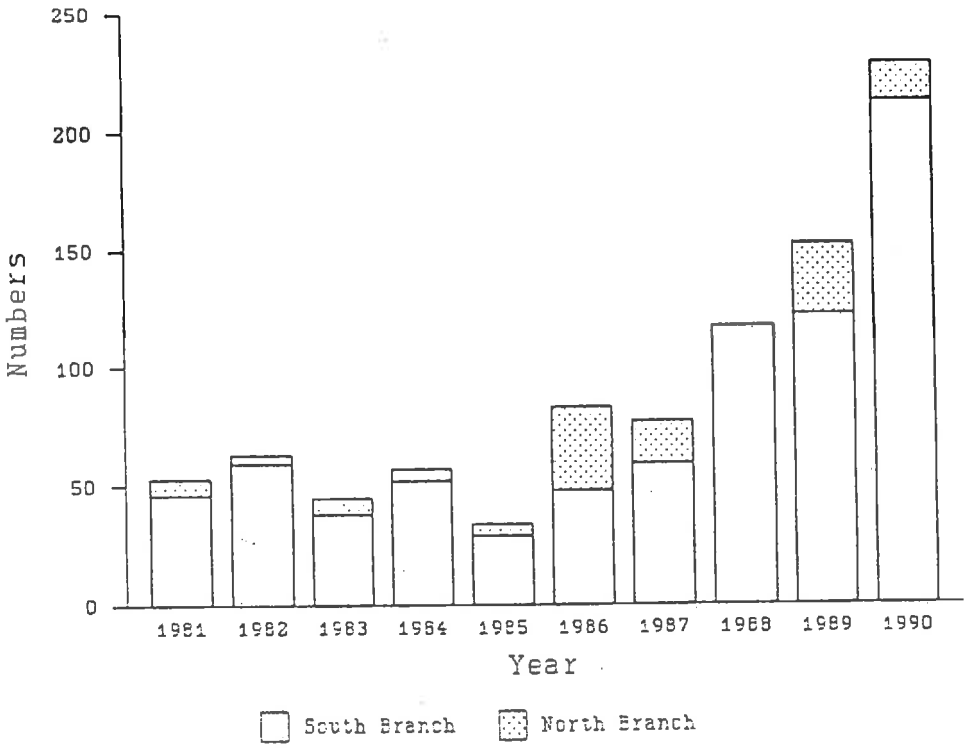
The Canada goose is an introduced waterfowl species which is now common throughout the high country of the eastern South Island. It is generally considered a grassland pest by farmers. This goose was common on the Ashburton, particularly on the South Branch. Numbers increased steadily over the 10 year survey from about 50 in 1981 to 230 in 1990 (Figure 7).

The Canada goose was recorded in most years from all river sections. Numbers on the upper three sections of the South Branch ranged on average between 1.3 and 4.7 (max 17) but were higher on the lower river where average numbers ranged between 11.5 and 28.9 (max 52 on Section 6)(Appendix 3). None were recorded in a survey of the lower reaches in mid-winter, 1991 (pers. obs.).

PARADISE SHELDUCK *Tadorna variegata*

The paradise shelduck is an endemic species which, before the arrival of Europeans, was found mainly in the eastern South Island and Wairarapa. It has extended its range and spread throughout much of New Zealand. On the Ashburton these shelducks occurred widely but in low numbers. Most were in pairs, but groups of up to 10 birds was seen. Overall, numbers appear to have remained about the same, between about 35 and 55 birds (Figure 8). The two exceptions were in 1988 and 1990, both years when the North Branch was not fully surveyed. Relatively high numbers of paradise shelducks occurred in most years on the North Branch (Figure 8). On the South Branch, numbers were highest in the upper-most river section (average 12.2/survey, max. 29), followed by Section 4 (average 9.4, max. 32). Average numbers on the other sections ranged between 1.6 (Section 2) and 2.7 (Section 6)(Appendix 3).

Figure 7. Numbers of Canada geese on the Ashburton River, 1981-1990



MALLARD *Anas platyrhynchus*

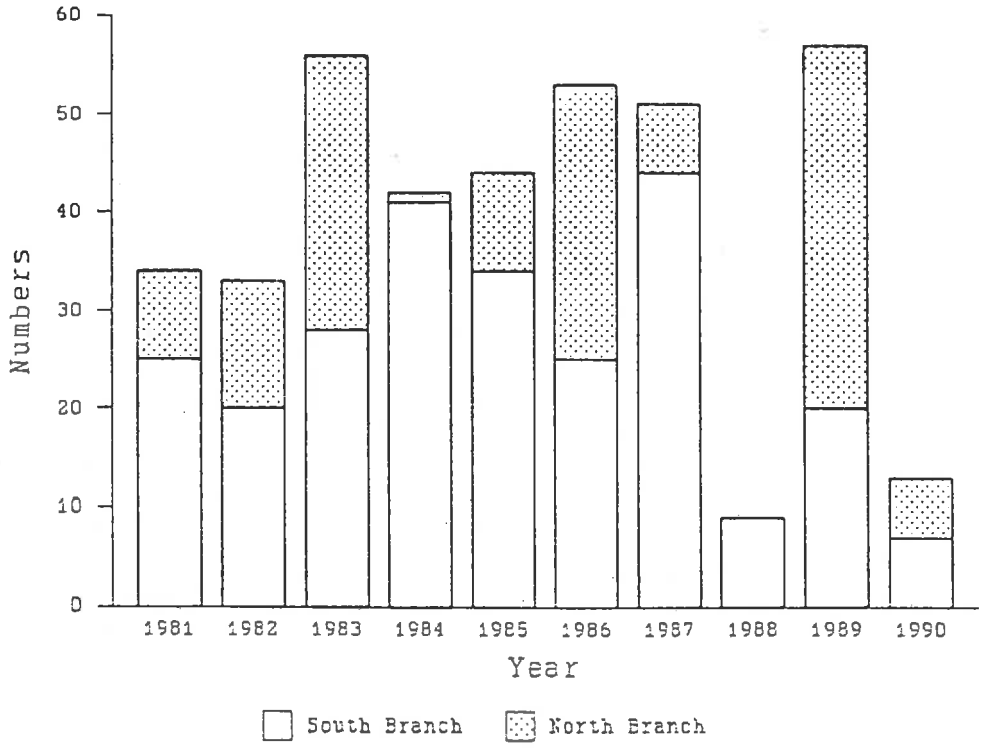
The introduced mallard is the commonest and most widespread waterfowl species in New Zealand, occurring in a wide range of wetland habitats including braided rivers. Mallard were common on the Ashburton with up to 800 recorded on annual counts (Figure 9). Most unidentified ducks (Figure 9) were also probably mallards. Numbers varied considerably from year to year with high numbers in 1982 and 1986, and much lower numbers in 1984, 1985 and 1990. Numbers were usually much higher on the South Branch (Figure 9).

Mallards were recorded on all river sections, but numbers increased steadily towards the sea. On the South Branch numbers averaged 4.1 on Section 1, 14.3 on Section 2, 28.8 on Section 3, 63.9 on Section 4, 49.3 on Section 5 and 154.9 in Section 6 (Appendix 3).

GREY DUCK *A. superciliosa*

The mallard has now virtually displaced grey ducks from wetlands throughout New Zealand and as a result this species is becoming scarce. Numbers were low on the Ashburton with a maximum of 33 and in most years less than 10. Grey duck were only recorded on the North Branch during two surveys (Figure 10). On the South Branch they were recorded on

Figure 8. Numbers of paradise shelducks on the Ashburton River, 1981-1990



all river sections but not every year. Numbers averaged only 0.9-1.1 on Sections 1-5. Numbers were slightly higher on Section 6 (average 3.2, max. 12)(Appendix 3).

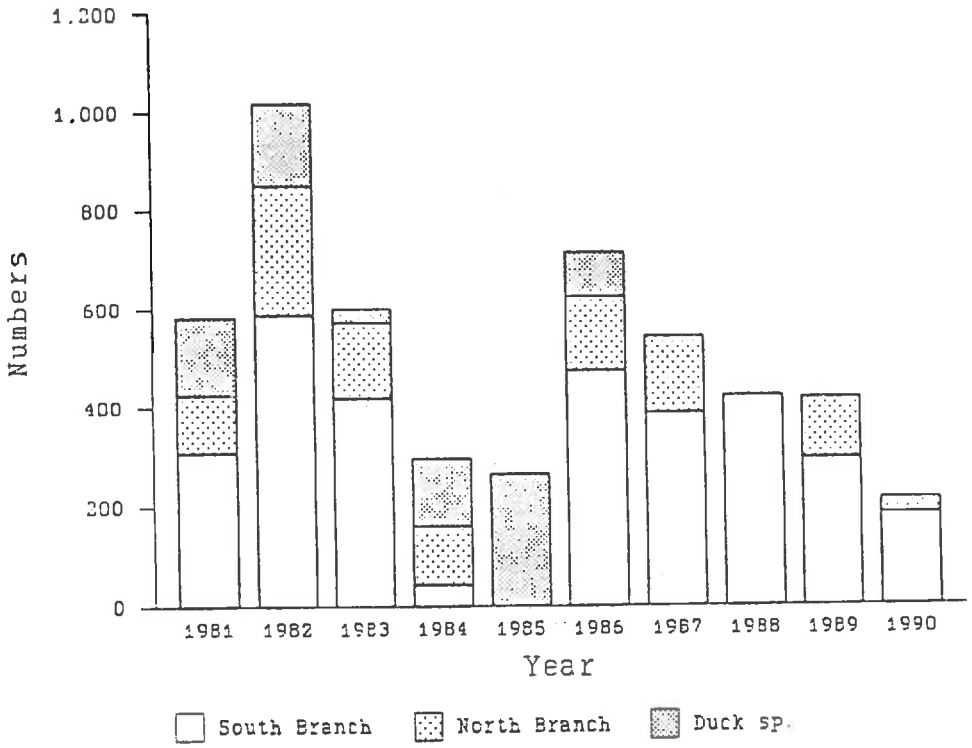
GREY TEAL *A. gibberifrons*

Grey teal apper to have increased markedly in New Zealand in recent years (O'Donnell 1985). The occurrence of low numbers of birds (2-6) on the South Ashburton between 1987 and 1990 is consistent with this increase (Appendix 1). Grey teal were recorded only on Sections 1 and 6. A small group (6) was also present at the rivermouth in mid-winter in 1991 (pers. obs.).

N.Z. SHOVELER *A. rhynchotis*

The shoveler is widespread and common in some wetlands, particularly lake-swampland complexes. Shoveler were probably only transient users of the Ashburton River, being recorded on three surveys in low numbers (between 1 and 6, Sections 2, 5 and 6, Appendix 1 & 3) on the South Branch.

Figure 9. Numbers of mallards and duck spp. on the Ashburton River, 1981-1990



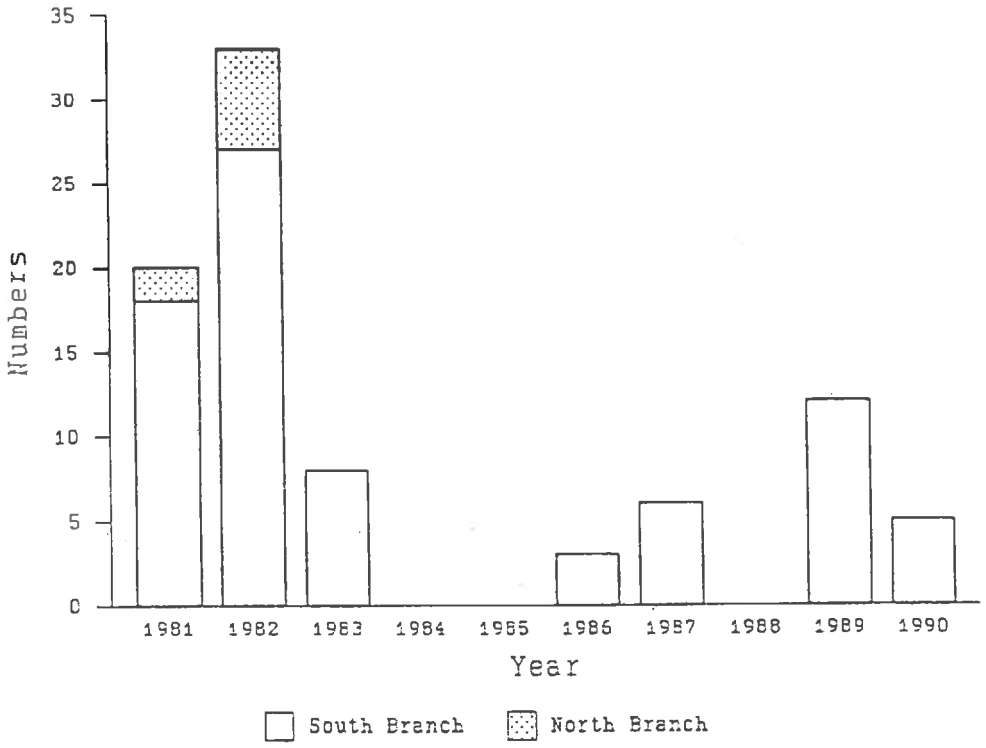
PUKEKO *Porphyrio melanotus*

The pukeko is a common rail associated with wetlands throughout New Zealand. Pukeko were recorded in willow swamplands in low numbers (1-6 birds) on six of the surveys, five times on the South Branch (always on Sections 5 and 6) and once on the North Branch (Appendices 1, 2 & 21). They were also present on Section 6 in mid-winter in 1991 (pers. obs.).

SOUTH ISLAND PIED OYSTERCATCHER *Haematopus ostralegus finschi*

South Island pied oystercatchers occur throughout New Zealand in the non-breeding season, with large concentrations on estuaries in both islands. During the breeding season birds nest throughout the South Island in inland areas, on developed farmland, in some swamps and also on braided rivers. Oystercatchers were common on both branches of the Ashburton. Numbers ranged between 131 and 412 on the South Branch and 43 and 94 on the North. However, numbers appeared to decline slowly over the ten year survey (Figure 11).

Figure 10. Numbers of grey ducks on the Ashburton River, 1981-1990



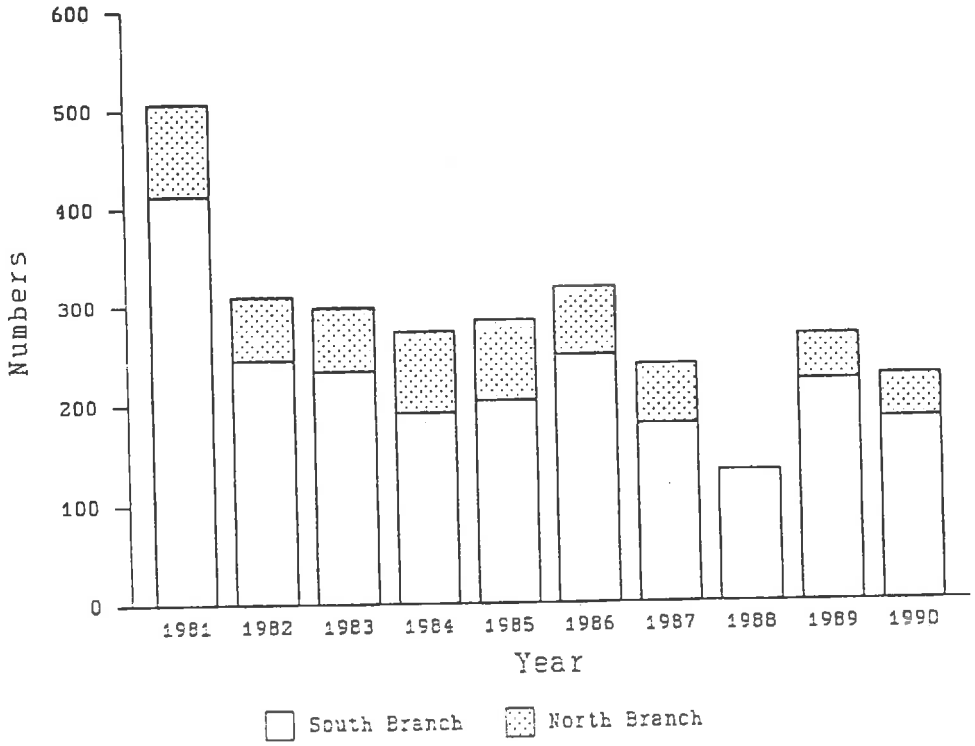
Pied Oystercatchers occurred on all river sections in almost all years (Appendix 3). Numbers on the South Branch were high on Section 1, low on Sections 2 and 3, and then high again from Section 4 down to Section 6 and the sea (average 48.2-64.9). Oystercatchers return to the river in very low numbers in mid-winter (e.g. 11 on Section 6 in June 1991, pers. obs.).

SPUR-WINGED PLOVER *Lobibyx novaehollandiae*

The spur-winged plover is recently self-introduced from Australia. Birds were first recorded in the 1930s and have now spread throughout the country. In Canterbury the plover is found from the coast to far inland in a wide range of habitat types. Plovers were common on the Ashburton River with between 100 and 307 being counted on the South Branch and 29 and 91 on the North. Numbers fluctuated from year to year with no clear population trend emerging (Figure 12).

Spur-winged plover were recorded on all river sections (Appendix 3). On the South Branch numbers were low on Sections 1-3 (average 10.2-13.3) but increased from an average of 46.4 on Section 4 to 73.9 further down stream on Section 6.

Figure 11. Numbers of South Island pied oystercatcher on the Ashburton River, 1981-1990



GOLDEN PLOVER *Pluvialis fulva*

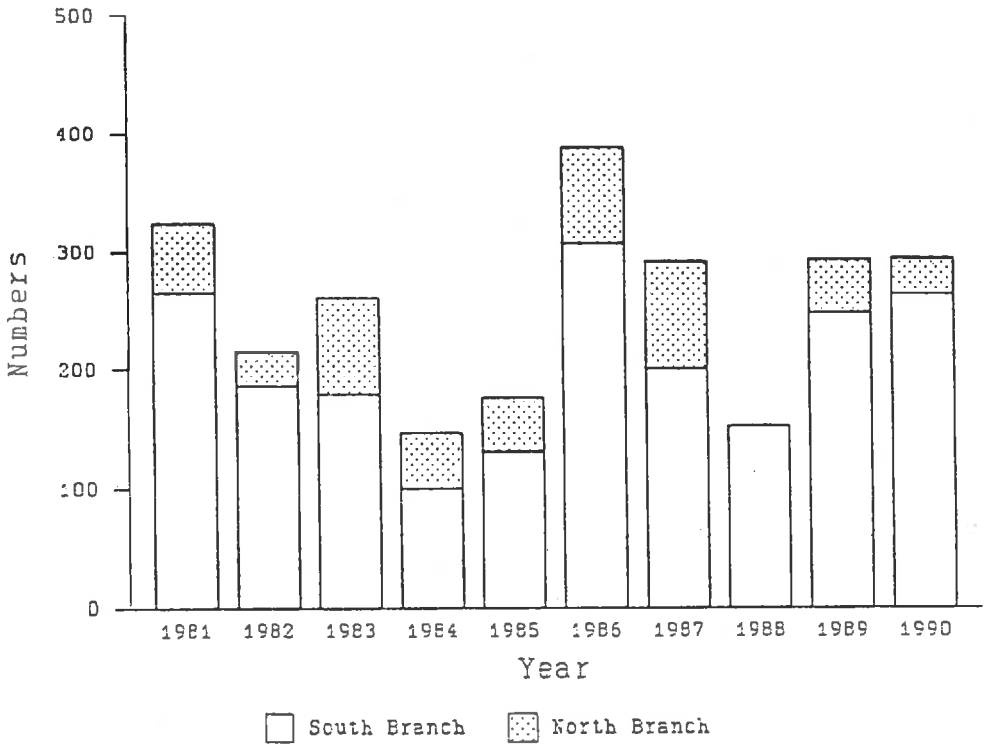
The golden plover is a summer migrant to New Zealand occurring in moderate numbers on some coastal wetlands. A vagrant to South Canterbury which was reported from the Ashburton Rivermouth in 1981 (M.Lane pers. comm.).

BANDED DOTTEREL *Charadrius bicinctus*

The banded dotterel breeds only in New Zealand. In the North Island breeding birds are largely confined to coastal areas. Much larger numbers are found in the South Island in both coastal and inland areas. Most birds flock after breeding and move to the coast in winter and some migrate to Australia. Braided rivers are a primary breeding habitat for the species and dotterels are the most numerous wader on Canterbury riverbeds (O'Donnell & Moore 1983).

Banded dotterels were common on the Ashburton River with numbers ranging from 350-950 for the whole river (Figure 13). By far the majority of birds occurred on the South Branch. Numbers on the North Branch varied between only 21 and 98 compared with 345-843 on the

Figure 12. Numbers of spur-winged plover on the Ashburton River, 1981-1990



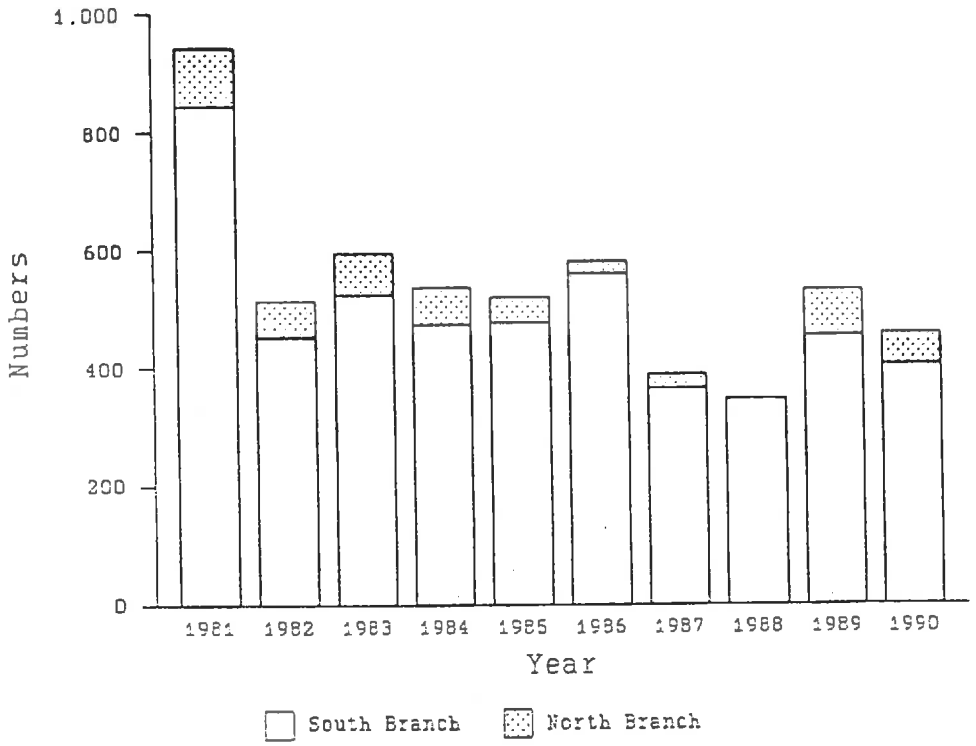
South. Numbers appeared to decline over the ten years. They were very high in 1981, dropping to 500-600 between 1982 and 1986, and were lowest in 1987 (Figure 13). Dotterel numbers were usually highest on the uppermost river section in clean shingle and herbfield habitats and on the lower reaches between Ashburton and the sea. Concentrations also occur at the rivermouth in autumn (e.g. c.100 in February 1982) and winter (e.g. 101 in June 1991)(pers. obs.).

Dotterels were recorded on all river sections. However, they were very rare or absent on Section 3 of the North Branch and Sections 2 and 3 on the South Branch. Numbers were very high on the South Branch on Section 1 (average 117.5), Section 5 (average 118.6) and Section 6 (average 193)(Appendix 3).

BLACK-FRONTED DOTTEREL *C. melanops*

The black-fronted dotterel was self-introduced from Australia in the 1950s and has spread to a number of localities in the North and South Islands. Unlike in Australia, birds in this country primarily breed on braided riverbeds. In the South Island breeding is restricted to the Wairau River in Marlborough (Kinsky 1970), the Opihi and Orari Rivers in South

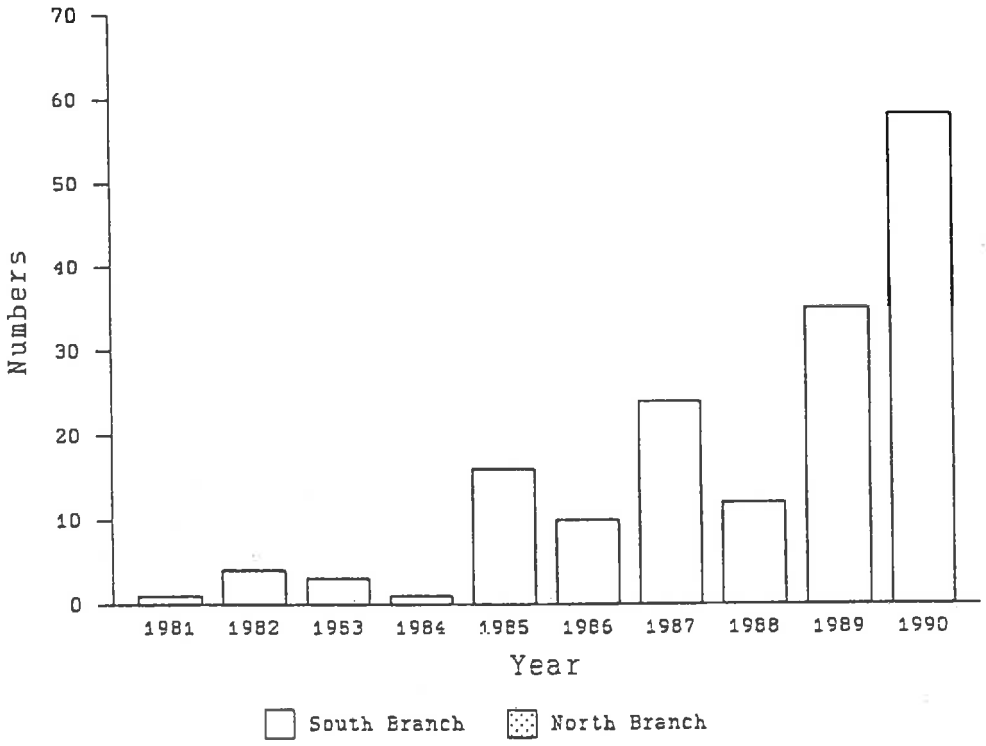
Figure 13. Numbers of banded dotterel on the Ashburton River, 1981-1990



Canterbury (Pierce 1971, O'Donnell 1987), and a handful of rivers in Otago and Southland (e.g. Child 1982). These dotterels appear to be continuing their spread. A bird was first recorded on the Ashburton River in 1981. Between 1981 and 1984 numbers remained low, but between 1985 and 1990 numbers increased every year (Figure 14). During the ten year survey the population steadily expanded its range upstream (Figure 15). Almost all records were on Section 1 where by 1987 they occurred over c.7 km of riverbed from Milton Road to just below Wakanui School Road. Sightings were made once on Sections 1, 4 and 5. By 1990 birds had spread over the full length of Section 6 and were beginning to expand upriver of Ashburton township. The lower Ashburton was surveyed again in mid-winter in 1991. Black-fronted dotterel numbers appeared to have doubled after the previous summer, with 115 recorded (pers. obs.). Dotterels were spread down the whole length of Section 6 from Ashburton to the sea, although several concentrations were found including one flock of 18 birds. The presence of so many of these dotterels in winter indicates that unlike other wader species they do not migrate away at this time of year. Two colour-banded birds were also recorded. They were both within 300 m of the site where they were banded two years previously.

Almost all records were from areas of wet mud around backwaters and minor runs. A few fed on shingle edges of the main river channels. Nesting has been recorded on usually from bare shingle areas well away from the main channels.

Figure 14. Numbers of black-fronted dotterel on the Ashburton River, 1981-1990



WRYBILL *Anarhynchus frontalis*

The wrybill is a New Zealand endemic which only breeds on braided riverbeds of Canterbury and Otago. The total population is probably about 3-4000 birds (P. Sagar pers. comm.) and the species is classed as threatened (Bell 1986). Only low numbers of wrybill were found on the Ashburton River (0-15, average 6.3, Figure 16). Almost all records were in the upper 3 km of the river (on Section 1) at an altitude of about 600 m asl. Breeding was confirmed most years. The wrybills were generally seen away from the main stream, nesting on clean shingle.

The presence of a wrybill nest near the river delta in the 1981-82 breeding season (I.Watson pers. comm.) and birds on Section 6 in 1983 and 1986 may indicate that if conditions were suitable these birds may breed more widely on the river.

Figure 15. Expansion of the range of black-fronted dotterels on the lower Ashburton River, 1981-1990

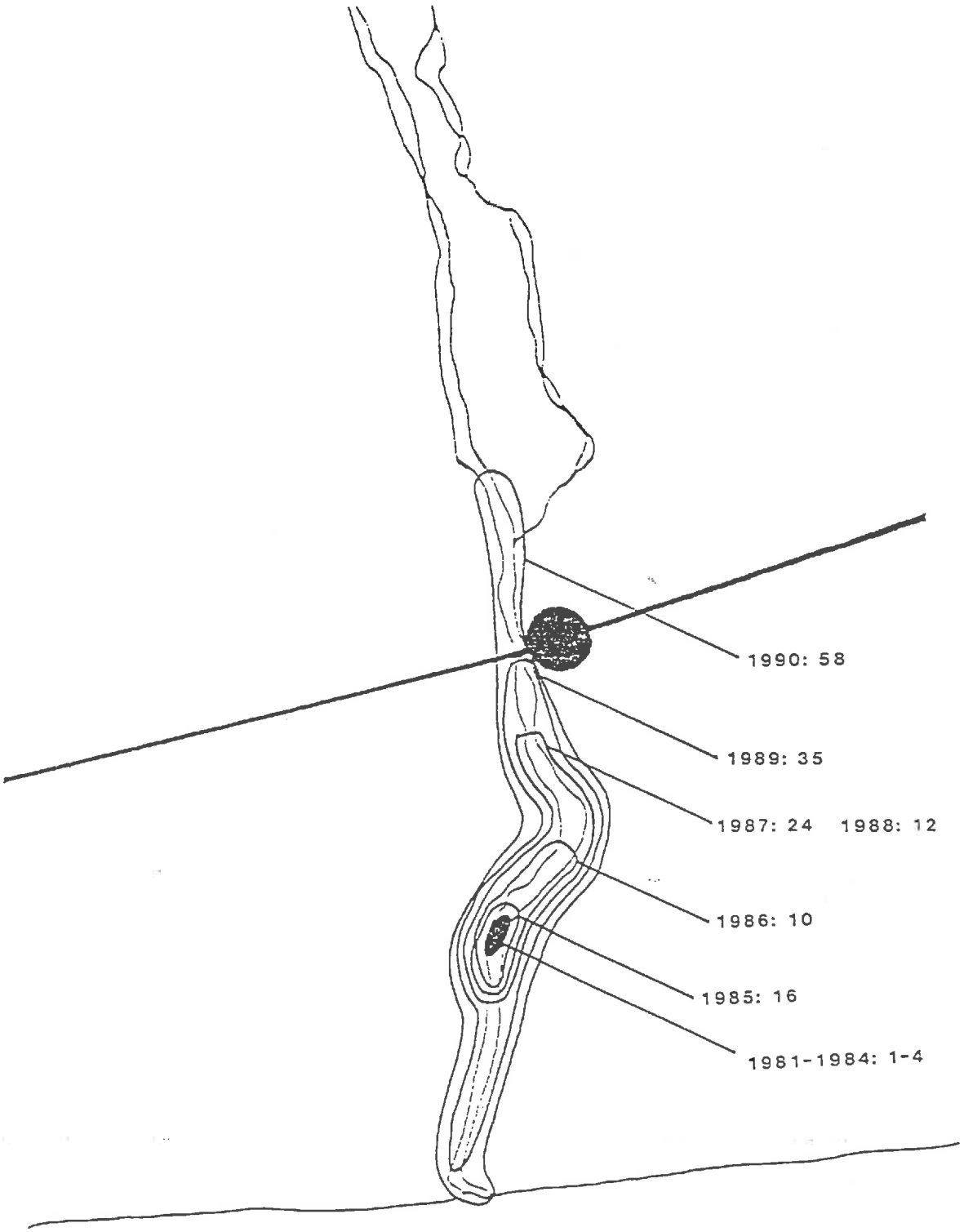
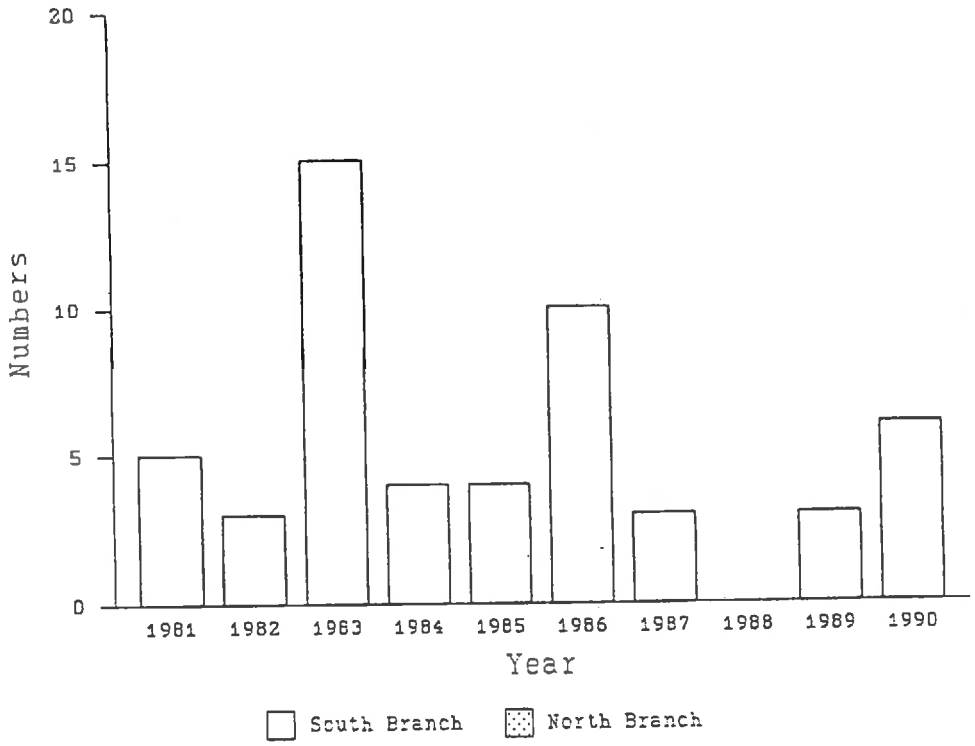


Figure 16. Numbers of wrybill on the Ashburton River, 1981-1990



LONG-BILLED CURLEW *Numenius madagascariensis*

The curlew is an arctic migrant wader which occurs in New Zealand each summer in low numbers. One was present at the Ashburton Rivermouth in 1981-1982 (M. Lane pers. comm.).

BAR-TAILED GODWIT *Limosa lapponica*

The godwit is the most numerous arctic migratory wader which spends its winters in New Zealand. However, few are found away from large estuaries. A vagrant to the Ashburton Rivermouth with small groups seen occasionally during the summer (M. Lane pers. comm.) and nine present on the 1989 survey.

SIBERIAN TATTLER *Tringa brevipes*

An arctic migratory wader which rarely reaches New Zealand. A vagrant to the Ashburton rivermouth with one recorded on the 1990 survey. This bird stayed for 18 months and was joined by a second for six months (D. Geddes pers. comm.).

TURNSTONE *Arenaria interpres*

About 4000 turnstones reach New Zealand each summer, making it the third-most numerous arctic wader in this country. Only low numbers usually reach Canterbury (O'Donnell 1985), and it occurs as a vagrant to the Ashburton Rivermouth (e.g. 11 in 1981).

KNOT *Calidris canutus*

Knots are the second-most numerous arctic migratory wader which spend their winter in New Zealand. A vagrant to the Ashburton Rivermouth with a maximum of three in 1987.

PECTORAL SANDPIPER *C. melanotos*

An arctic migrant which occurs regularly in New Zealand but in very low numbers. A vagrant to the Ashburton Rivermouth with one present in February 1982 (pers. obs.).

PIED STILT *Himantopus leucocephalus*

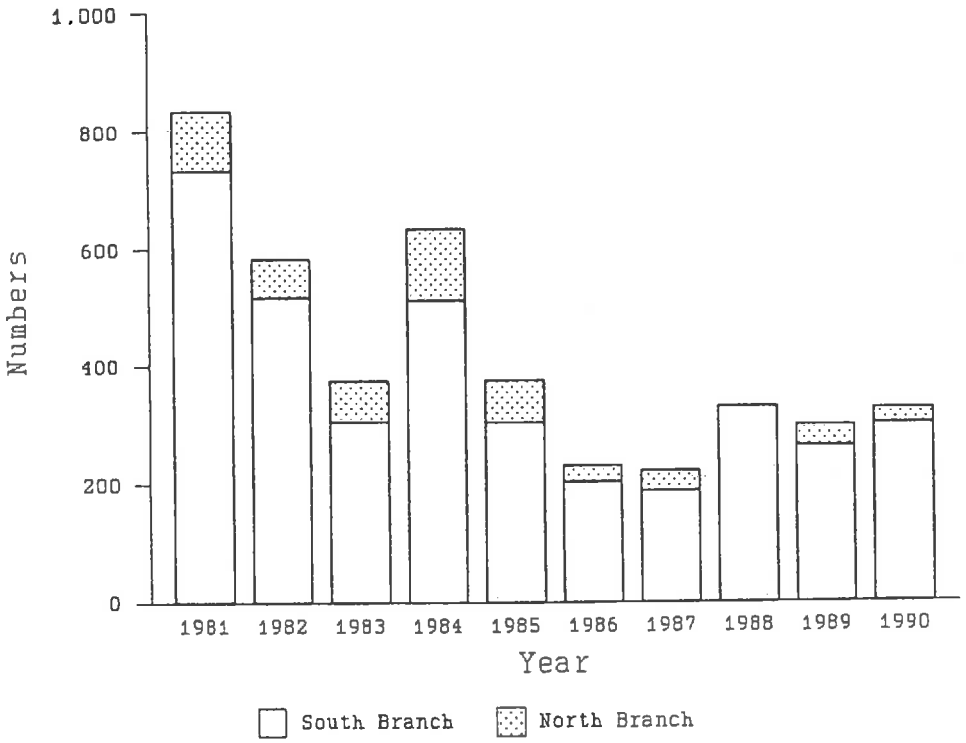
The pied stilt was relatively rare in New Zealand in the middle of the nineteenth century and was very rare north of Auckland. This stilt became common towards the end of the nineteenth century as it apparently benefited from development of farmland at the time. The stilt penetrated far inland as well as living on the coast. Today pied stilts are common throughout the country and recent counts on northern harbours suggest a population in excess of 30 000 birds (Falla *et al.* 1979, Pierce 1982).

Pied stilts were common and scattered over much of the Ashburton River. Numbers varied between 188 and 732 on the South Branch and 25 and 120 on the North Branch. Numbers appeared to decline over the ten years with over 800 in 1981, declining to about 370 in 1985 and a low of 220 in 1987. Numbers increased slightly to just over 300 in 1990 (Figure 17). Most occurred as pairs but larger groups occurred at breeding colonies on the lower three sections of the South Branch. Stilts were recorded on all sections of the South Branch but usually only in low numbers in the upper three sections (average < 10). Numbers increased markedly below Valetta Bridge on Section 4 and were highest (average 173) on Section 5 (Appendix 3).

BLACK STILT *H. novaezealandiae*

This stilt is an endangered endemic wader with a population of less than 100 birds (Robertson *et al.* 1983). An almost pure black stilt (Hybrid Node I, Pierce 1982) bred with a pied stilt on Section 2 in the summers of 1989-90 and 1990-91.

Figure 17. Numbers of pied stilts on the Ashburton River, 1981-1990



RED-BILLED GULL *Larus scopulinus*

The red-billed gull is a common coastal gull found throughout New Zealand. Although resident on the coast adjacent to the Ashburton Rivermouth, the closest breeding colony is on Banks Peninsula. These gulls were present on only four of the surveys and only on Section 6 in low numbers (2-25). In spring 1987, two pairs (one with a nest and eggs) were present at a black-billed gull colony 8 km inland. Inland breeding of red-billed gulls on South Island braided rivers is very rare (e.g. one pair 5-6 km inland on the Rangitata River in 1988, D. Geddes pers. comm.; and on the lower Waitaki River in October 1967, P. Sagar pers. comm.).

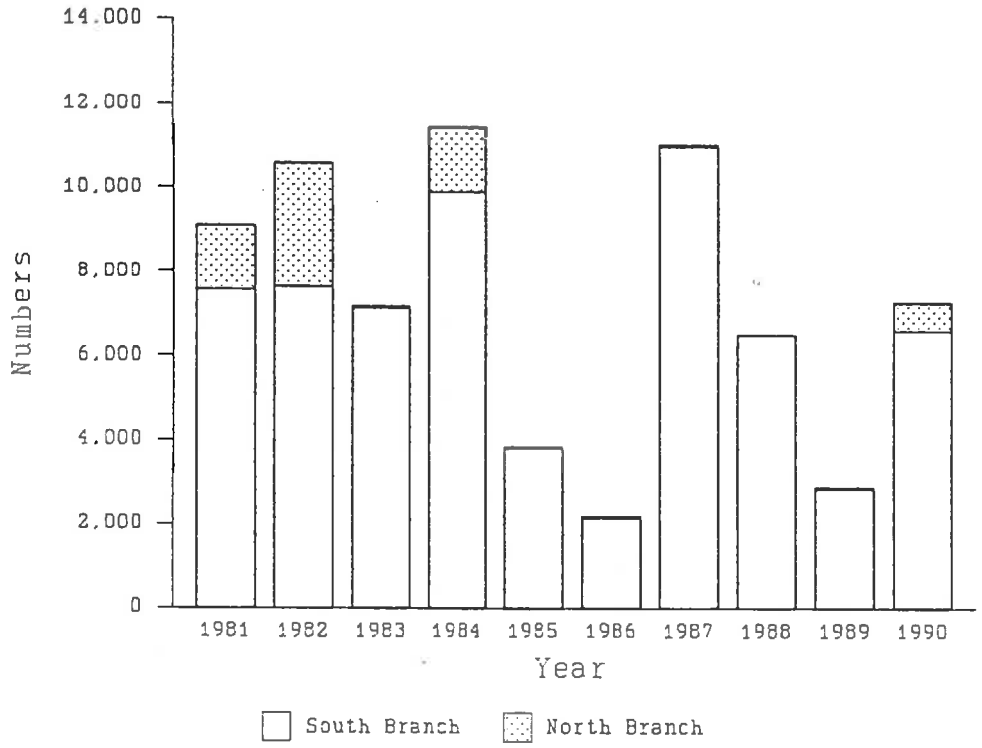
BLACK-BILLED GULL *L. bulleri*

The black-billed gull is an endemic species whose breeding is mainly confined to braided rivers in Canterbury, Otago and Southland. The size of the national population is not known. This gull migrates to the coast and some North Island localities in winter. Some of the highest counts of black-billed gulls for any braided river surveyed to date were recorded on the Ashburton. Numbers varied on both branches of the river markedly between years and there may be an overall trend or decline in the population (Figure 18). Maxima of nearly 11

000 were recorded on the South Branch (1986) and c.3000 on the North Branch (1982). Overall numbers of gulls on both branches were greater than 10 000 in three years (1982, 1984, 1987). High numbers were on the North Branch in only three years (1981, 1982, 1984) when large breeding colonies were present above the Highway 72 Bridge. Breeding colonies were scattered over much of the South Branch with most on the lower two sections (examples in Figure 19). Breeding colony sizes varied between c.700 and c.5000 birds.

Black-billed gulls were recorded on all river sections except Section 3 on the South Branch. However, numbers were low in the upper reaches of the South Branch (Appendix 3). Numbers increased markedly on Section 4 (average 234) but by far the greatest concentrations were on Sections 5 (average >3300) and Section 6 (average >2800). Large breeding colonies were present on the upper South Branch (Section 1) before 1980 (P. Howden pers. comm.).

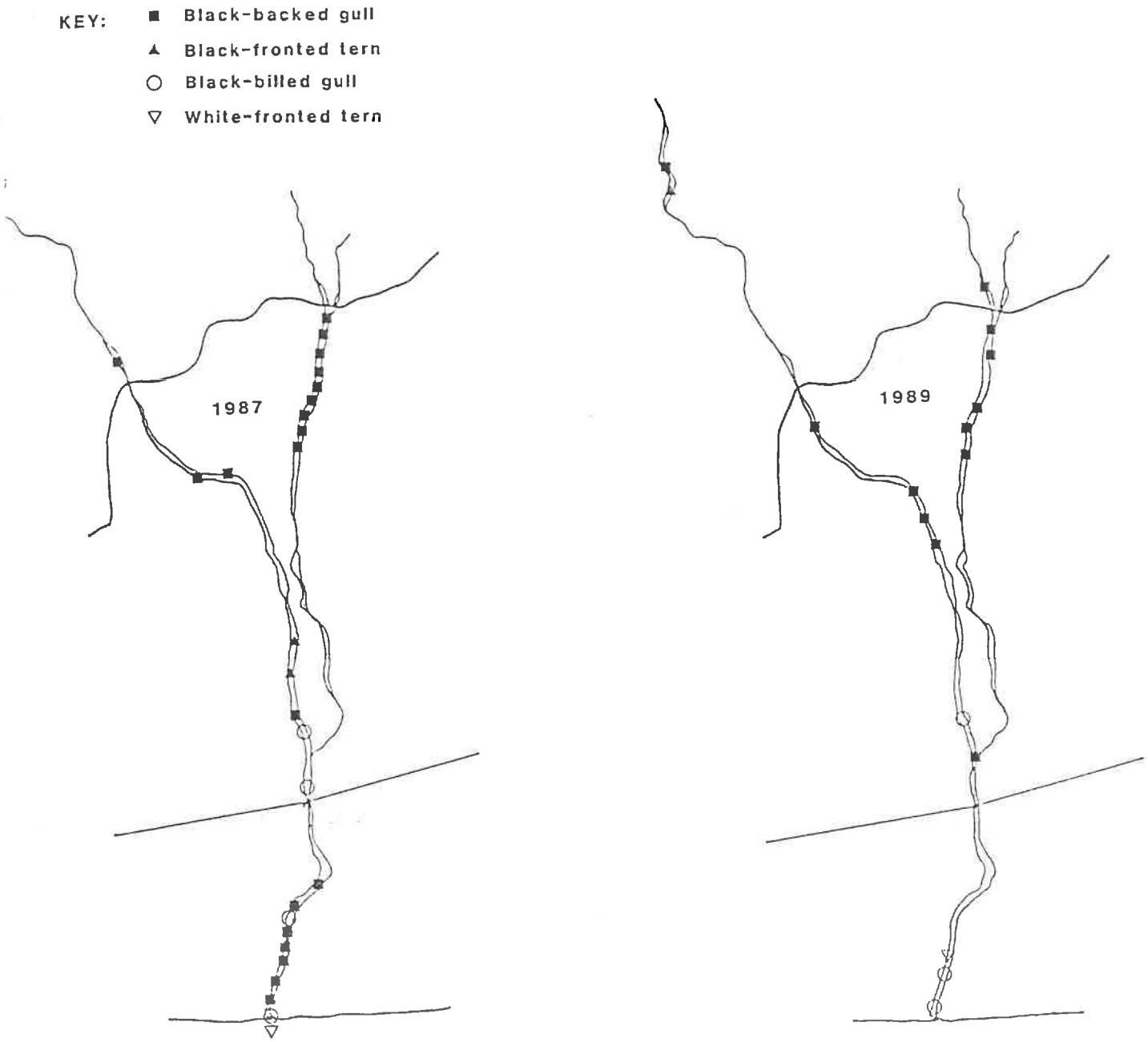
Figure 18. Numbers of black-billed gulls on the Ashburton River, 1981-1990



SOUTHERN BLACK-BACKED GULL *L. dominicanus*

The black-backed gull is one of the most common and widespread wetland bird species found in New Zealand, being found from the coast to sub-alpine zones. Along with the black-billed

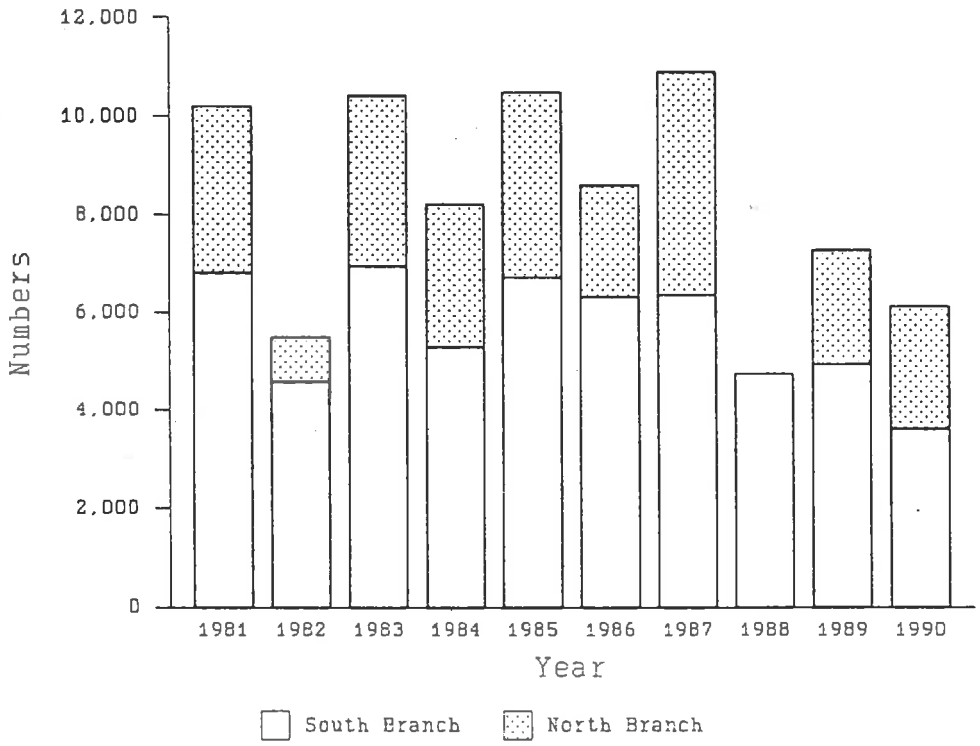
Figure 19. Examples of the distribution and size of gull and tern breeding colonies on the Ashburton River, 1987 and 1989



gull it was the most numerous wetland species on the Ashburton River, with breeding colonies present along the full length of the South Branch and in the upper-most reaches of the North Branch (e.g. Figure 19). A maximum of nearly 11 000 birds was recorded in 1987. Numbers fluctuated markedly from year to year but there appears to be an overall pattern of decline (Figure 20). Numbers on the South Branch varied between 3587 and 6932 and on the North Branch between 898 and 4543. Counts were above 6000 on five surveys on the South Branch and above 3000 for four on the North. Highest numbers were concentrated on Sections 4 and 6 of the South Branch, where the breeding colonies became almost continuous along the full length of the river especialy within 10 km of the sea.

Black-backed gulls were recorded on all river section but were low in the upper reaches of the South Branch, especially on Section 2 (Appendix 3), and in the lower reaches of the North Branch.

Figure 20. Numbers of black-backed gulls on the Ashburton River, 1981-1990

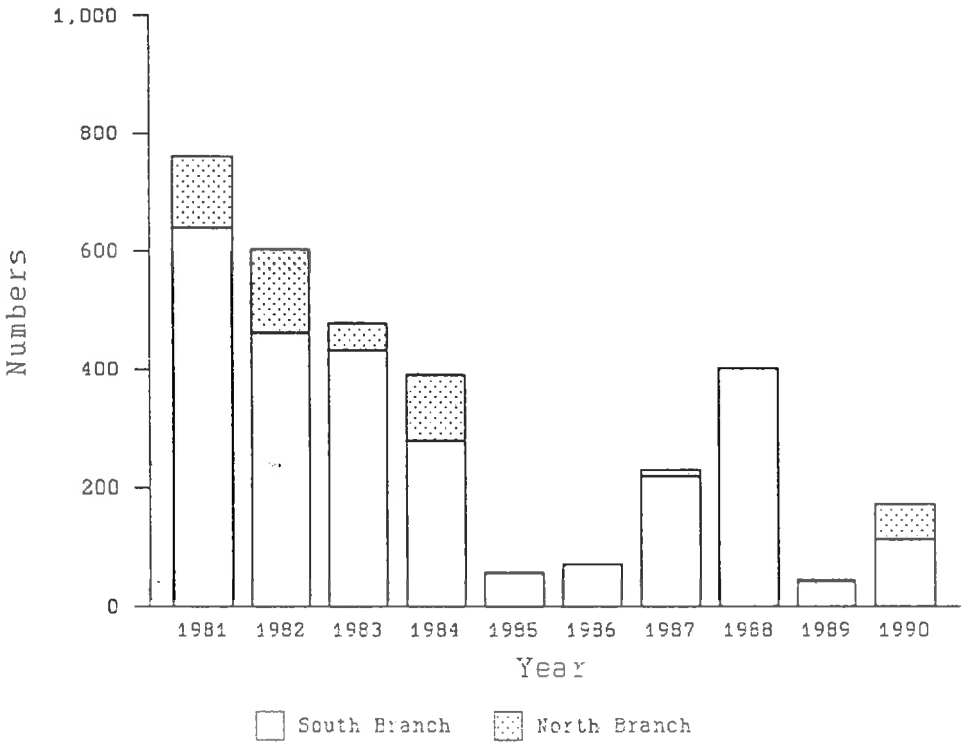


BLACK-FRONTED TERN *Sterna albostriata*

The black-fronted tern is restricted to New Zealand where it breeds almost entirely on eastern South Island braided riverbeds (O'Donnell & Moore 1983). The population is small and was estimated at being no more than 20 000 birds, and probably considerably less, in 1983 (Robertson *et al.* 1983). This tern species is classed as a threatened species (Bell 1986).

In 1981, the black-fronted tern was one of the most numerous wetland species on the Ashburton, however, numbers declined significantly over the next ten years (Figure 21). In 1981 there were over 750 birds but numbers declined to about 400 in 1984 and to less than 100 birds in 1985. There was a slight recovery between 1986 and 1988, but numbers declined again during subsequent surveys. Numbers were particulary low on the North Branch, ranging from none to 142 and being greater than 100 only during the first four years of the survey. Breeding colonies were usually small (e.g. Figure 19). Black-fronted terns were recorded on all river sections, but numbers were low on the upper three sections of the South Branch. Highest numbers (average 120) were on Section 5 (Appendix 3).

Figure 21. Numbers of black-fronted terns on the Ashburton River, 1981-1990

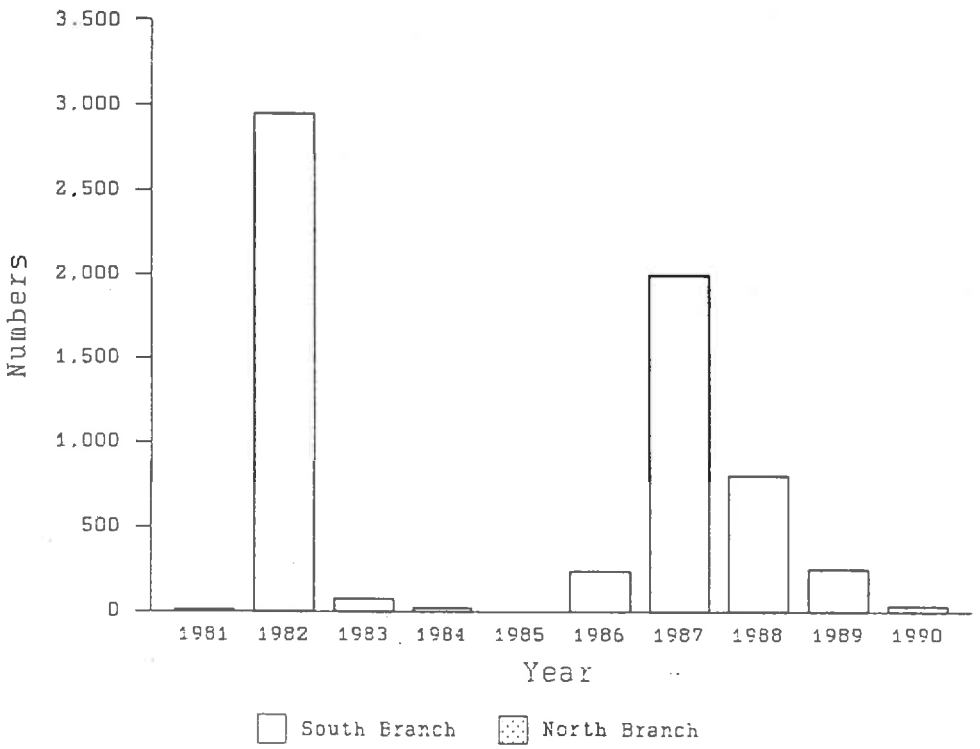


WHITE-FRONTED TERN *S. striata*

White-fronted terns are widely distributed around coastal areas of New Zealand. Flocks occurred during most surveys near the Ashburton Rivermouth, however, numbers were extremely variable (Figure 22), ranging from none in 1985 and c.2950 in 1982. Large breeding colonies (two >2000 birds and one c.800 birds) were recorded on the rivermouth delta and were associated with black-billed gull breeding colonies.

Of note was the occurrence of white-fronted terns up to 19 km from the sea. While in most years these terns were concentrated near the rivermouth, in 1987 some 300 were recorded upstream and c.70 were roosting at a black-billed gull nesting colony 8 km inland. This was unusual for a species which is traditionally thought of as being restricted to the coast.

Figure 22. Numbers of white-fronted terns on the Ashburton River, 1981-1990



CASPIAN TERN *Hydroprogne caspia*

A cosmopolitan species which is represented in New Zealand by a small population concentrated in the north of the North Island. The caspian tern is found around most of the country but is largely a coastal species. Low numbers breed on braided rivers up to c.110 km inland (O'Donnell & Moore 1983, Pierce 1984). Only single birds were recorded on the

Ashburton River during two surveys. Both were on Section 6. Two dead birds, both shot were found c. 10 km inland during the 1990 survey. Caspian terns have been recorded associating with black-backed gull colonies on Section 1 of the South Branch in previous years (P. Howden pers. comm.) and have been seen 3-4 times each year around Valetta and the State Highway 1 bridge (D.Geddes pers. comm.).

N.Z. KINGFISHER *Halcyon sancta*

Kingfishers are commonly associated with most wetland types but can breed elsewhere, including in native forest. They were recorded in low numbers (< 15) along the full length of the Ashburton (excluding Sections 1 and 3 on the South Branch, Appendix 3). Birds were usually seen roosting in willows along the river margins.

WELCOME SWALLOW *Hirundo tahitica*

Before 1958 this swallow was a rare vagrant to New Zealand. In the late 1950s breeding was first recorded in the North Island and since then the species has spread rapidly throughout the country, where it is now commonly associated with wetlands. Numbers on the Ashburton were very variable in spring with a maximum of c.60 recorded (Appendix 1). Swallows were recorded from all river sections (Appendix 3). Numbers appear to be much higher in winter. For example, c.220 were recorded on Section 6 alone in June 1991 (pers. obs.).

DISCUSSION

Braided rivers are a major habitat type in the South Island, particularly in Canterbury. They are extensive areas which provide considerably more wetland habitat than single channel rivers which are typical of other parts of the country. Internationally, braided rivers of the type found in Canterbury are an uncommon habitat type.

The significance of the Ashburton River for wetland birds

The Ashburton River is clearly one of the most important braided rivers in New Zealand for wetland birds. The river has over 130 km of wetland bird habitat on two major branches and an important coastal river delta and lagoon. Thirty-nine wetland species and 25 terrestrial species have been recorded since 1980. Between about 14 000 and 26 000 wetland birds have been recorded during annual surveys in spring between 1981 and 1990. Much higher numbers of birds were recorded on the South Branch (10 000-18 000) than the North Branch (3000-5500). Up to 699 birds/km were counted on the lower reaches of the South Branch. It is likely that numbers of all wetland birds vary considerably between seasons as on other rivers (Robertson *et al.* 1983, 1984, Hughey *et al.* 1986).

Nationally significant populations of black-fronted terns, black-billed gulls, banded dotterels

and black-fronted dotterels occur on the Ashburton River. Regionally significant populations of wrybill, South island pied oystercatcher, pied stilt and black-backed gull also occur. Overall, numbers of these birds appear to have declined over the ten year survey. Their populations appear to be threatened by the encroachment of exotic weed species on their prefered habitats and possibly water abstraction.

Numbers of many wetland birds were among the highest on any braided river in the Canterbury region. The river supports populations of little shag, black shag, white-faced heron, SI pied oystercatcher, spur-winged plover, pied stilt, black-billed gull and black-backed gull, which were higher than any other lowland Canterbury River, except the much larger Waitaki River, which had similar numbers of these species (c.f. O'Donnell & Moore 1983, Robertson *et al.* 1984). Black-fronted dotterel numbers are now probably the highest in the South Island, the only other rivers with relatively good numbers being the Opihi and Orari Rivers (O'Donnell 1987). Black-fronted tern numbers in 1981 were higher than on other lowland Canterbury and MacKenzie Basin Rivers except the Ahuriri (O'Donnell & Moore 1983, Robertson *et al.* 1983). Banded dotterel numbers were also high, numbers being similar only on the Waimakariri and Rakaia Rivers. Although wrybill numbers were low compared with the other major rivers in lowland Canterbury and the MacKenzie Basin, because the national population is so low (Hughey 1985), all breeding populations are significant.

Several wetland bird species which were resident on the Ashburton (shags, heron, ducks) and all species occurring as vagrants (eg. arctic waders, swans, grey teal, shoveler) have much higher populations in other wetland habitat types, particularly estuaries and lakes elsewhere in New Zealand such as the Southland lagoons (Muller 1969), Lake Ellesmere (O'Donnell 1985), the Avon-Heathcote Estuary (B. Armstrong pers. comm.), Lake Wairarapa (Moore *et al.* 1984), Farewell Spit (Edgar 1974, Dennison and Robertson 1979) and the Northland harbours (Veitch 1977, 1978, 1979, Bellingham and Davis 1983).

Numbers of most wetland birds were high compared with single channel rivers. For example, on the Clutha River, the largest river of its type in the South Island and of similar length to the Ashburton, numbers of wetland birds were less than half that recorded in some years on the Ashburton (Hughey *et al.* 1986). On the Clutha, banded dotterel, wrybill, black-fronted dotterel, SI pied oystercatcher and black-fronted tern were absent in spring; pied stilt numbers were three time lower, black-backed gull numbers about seven times lower, and about half the number of black-billed gulls were present. However, shag numbers were similar and waterfowl numbers over ten times higher.

Population declines over ten years

Over the ten years of the survey there appeared to be a general decline in overall numbers of wetland birds. Populations of 10 species characteristic of the riverbed appeared to decline, only two species increased and numbers of three species remained constant. Overall numbers of birds were similar between 1981 and 1984 on both branches. Numbers declined markedly in 1985-1986 as weed enchroachment worsened but increased again in 1987 after major floods. Birds again appeared to decline 1989-1990 as weed enchroachment became more extensive again.

Given the magnitude of these declines there should be serious concerns for the long term viability for these species on other braided rivers in Canterbury, many of which had lower populations than on the Ashburton when they were surveyed over ten years ago.

The significance of the Ashburton River to threatened bird species

In 1981, black-fronted terns were one of the most numerous wetland birds on the Ashburton River, and since then only one population in Nelson, Marlborough, West Coast, Canterbury and Otago, that on the Ahuriri River, was recorded as being larger (Robertson *et al.* 1983). Therefore the Ashburton population is of national significance. Of 14 major rivers in lowland Canterbury, the Ashburton had the highest population. Most other rivers supported less than 300 terns (O'Donnell & Moore 1983). Of 10 rivers surveyed in Otago, none supported more than 142 terns, and most considerably fewer (P. Child unpubl.), and a maximum of 14 were counted on an intensive survey of the Clutha River (Hughey *et al.* 1986). Likewise numbers on rivers of the MacKenzie Basin (except the Ahuriri) have ranged between 30 and 150 terns (Lalas 1979, Robertson *et al.* 1983, Robertson *et al.* 1984)

The black-fronted tern was once more widespread, with limited nesting occurring on the sea coast, lake shores and shingly areas of the Canterbury Plains (Stead 1932). Before 1932, Stead noted the decline of this species, and stated that habitat loss and predation were undoubtedly responsible. Judging from counts on the Ashburton, and other rivers, black-fronted terns appear to be still declining. In the early 1980s, the Ashburton had one of the largest black-fronted tern populations in New Zealand (O'Donnell & Moore 1983, Robertson *et al.* 1983, Robertson *et al.* 198, Hughey *et al.* 1986). Even greater declines have now been recognised in the MacKenzie Basin (R. Maloney pers. comm.). An understanding of the processes influencing black-fronted tern populations is needed urgently and appropriate management actions are required. Otherwise, black-fronted terns may move into the endangered category in the future.

Threats to wetland birds on the Ashburton River

Braided riverbeds have been modified by a variety of human activities including irrigation abstraction, the introduction and spread of many weed species, channel modifications, dam impoundments, water diversions, gravel extraction and effluent disposal (O'Donnell & Moore 1983). Historical information indicates that population size and distribution of various bird species, particularly the endemic riverbed specialists, have been greatly reduced (Stead 1932). Species declines have probably resulted from activities that modify natural flow regimes, habitat quality and quantity, and channel erosion and deposition processes.

The encroachment of introduced weeds onto the Ashburton River is considerable cause for concern. Over the last 10 years more and more of the riverbed has become covered with weeds, the worst species being broom. The increase in vegetation cover corresponds with an overall decline in some riverbed specialist birds in that time. If the wildlife values are to be maintained then weed control is essential. Without control, the areas of bare shingle required for breeding by many species especially waders, terns and black-billed gulls, will disappear and declines in these species may continue.

Wrybills have a clear preference for nesting on shingle clear of any vegetation (Hughey 1985). Nesting on the Ashburton was almost exclusively confined to the clear upper reaches of the river. If weed encroachment was not as extensive as it is on the lower reaches of the river, wrybill may well expand and recolonise the river. Management directed towards this end could only benefit this threatened species.

Increased channelisation, either through stabilisation of channels as a result of weed spread or water abstraction, or through active works and willow plantings, also poses a major threat. Channelisation restricts natural braiding patterns of the river, and changes shallow-water feeding habitat. Increased stabilisation is likely to increase the attractiveness of the river to generalist wetland birds, particularly shags, herons and waterfowl. Small braided channels with low water volume and slow flows may suit common waders such as pied stilts and pied oystercatchers. However, these conditions would make the river less suitable for riverbed specialists.

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APPENDIX 1. WETLAND BIRDS USING THE SOUTH BRANCH, ASHBURTON RIVER, SPRING 1981-1990

Bird species	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
black shag	56	13	12	12	10	5	9	3	5	8
little black shag	6									
little shag	14	26	16	2	7	10	7	60	18	16
spotted shag	95					145			1200	500
white-faced heron	51	75	37	35	34	36	44	30	24	32
Australasian bittern			1							
royal spoonbill							1			
black swan				2						
Canada goose	46	59	38	52	29	48	59	117	122	212
paradise shelduck	25	20	28	41	34	25	44	9	20	7
mallard	308	586	418	42		473	387	422	295	184
grey duck	18	27	8			3	6		12	5
grey teal									2	6
NZ shoveler		2	1						6	
unidentified duck sp.	157	168	28	129	224	39				
pukeko	3	2		1				5		6
SI pied oystercatcher	412	244	233	191	203	248	179	131	221	183
spur-winged plover	265	186	179	100	131	307	201	152	248	264

banded dotterel	843	452	522	472	476	557	363	345	453	403
black-fronted dotterel	1	4	3	1	16	10	24	12	35	58
wrybill	5	3	15	14	4	10	3		3	6
bar-tailed godwit									9	
turnstone	11									
Siberian tattler										1
knot							3			
pied stilt	732	516	304	511	303	203	188	330	263	301
black stilt										1
black-backed gull	6808	4568	6932	5569	6694	6301	6338	4724	4924	3587
black-billed gull	7572	7650	7128	9913	3796	2152	10993	6496	2838	6577
red-billed gull				21			14		25	2
caspian tern				1					1	
black-fronted tern	642	462	433	280	56	72	220	402	41	112
white-fronted tern	11	2950	75	23		240	2000	802	250	32
welcome swallow		1		4	51		31	2	11	
NZ kingfisher		10	10	3	7	7	11	2	4	1

APPENDIX 2. WETLAND BIRDS USING THE NORTH BRANCH, ASHBURTON RIVER, 1981-1990

Bird species	1981	1982	1983	1984	1985	1986	1987	1989	1990
black shag	5	5	3	1	1		1		
little black shag			3	3					
little shag	4	1				6	4		
white-faced heron	13	12	7	8		16	5	6	9
Canada goose	7	4	7	5	5	35	18	30	16
paradise shelduck	9	13	28	1	10	28	7	37	6
mallard	116	263	153	118		149	155	122	30
grey duck	2	6							
unidentified duck sp.				7	41	51			
pukeko							2		
SI pied oystercatcher	94	65	65	82	81	69	59	46	43
spur-winged plover	59	29	82	47	45	81	91	45	30
banded dotterel	98	61	71	62	42	21	24	76	53
pied stilt	103	65	70	120	71	27	34	35	25
black-backed gull	3382	898	3474	2926	3781	2281	4543	2330	2517
black-billed gull	1532	2938	43	1532	6	20	35	45	670
black-fronted tern	120	142	45	111	2		11	4	59
welcome swallow							30		
NZ kingfisher	7		4	1	1	1		1	

Appendix 3. Summary of the distribution of wetland birds on the South Branch, Ashburton River, 1981-1990
(n=number of surveys on which present, Max=maximum number recorded, Mean=average number recorded)

	Section 1			Section 2			Section 3		
Bird species	n	Max	Mean	n	Max	Mean	n	Max	Mean
black shag	9	5	2	1	5	0.5	5	5	1.6
little black shag	0	0	0	0	0	0	0	0	0
little shag	0	0	0	1	1	0.1	1	5	0.5
spotted shag	0	0	0	0	0	0	0	0	0
white-faced heron	9	5	2.5	6	6	2	8	10	3.2
Australasian bittern	1	1	0.1	0	0	0	0	0	0
royal spoonbill	0	0	0	0	0	0	0	0	0
black swan									
Canada goose	8	9	4.7	3	8	1.3	5	17	3.5
paradise shelduck	9	29	12.2	4	5	1.6	5	8	2.5
mallard	4	19	4.1	8	30	14.3	7	70	28.8
grey duck	4	5	1.1	2	9	1.1	8	1	0.8
grey teal	1	2	0.2	0	0	0	0	0	0
NZ shoveler	0	0	0	1	1	0.1	0	0	0
unidentified duck sp.	1	6	0.6	1	1	0.1	3	22	6.3
pukeko	0	0	0	0	0	0	0	0	0
SI pied oystercatcher	10	56	35.5	9	27	9.6	9	35	16.4
spur-winged plover	8	31	11.1	7	39	10.2	9	30	13.3
banded dotterel	10	228	117.5	4	2	0.6	4	16	3.1
black-fronted dotterel	1	5	0.5	0	0	0	0	0	0
wrybill	9	14	5.2	0	0	0	0	0	0
bar-tailed godwit	0	0	0	0	0	0	0	0	0
turnstone	0	0	0	0	0	0	0	0	0
Siberian tattler	0	0	0	0	0	0	0	0	0
knot	0	0	0	0	0	0	0	0	0
pied stilt	7	27	7.8	8	25	7.8	8	28	9.2
black stilt	0	0	0	1	1	0.1	0	0	0
black-backed gull	10	412	212.8	7	85	2.6	9	609	255.6
black-billed gull	5	786	83.4	2	15	1.7	0	0	0
red-billed gull	0	0	0	0	0	0	0	0	0
caspian tern	0	0	0	0	0	0	0	0	0
black-fronted tern	10	46	24.4	1	24	2.6	4	5	1.5
white-fronted tern	0	0	0	0	0	0	0	0	0
welcome swallow	2	2	0.3	2	2	0.3	3	4	0.9
NZ kingfisher	0	0	0	1	4	0.4	0	0	0

	Section 4			Section 5			Section 6		
Bird species	n	Max	Mean	n	Max	Mean	n	Max	Mean
black shag	6	3	1	7	51	7	6	3	1.2
little black shag	0	0	0	0	0	0	1	6	0.6
little shag	10	13	4.5	9	43	7.6	7	14	4.9
spotted shag	0	0	0	0	0	0	3	1200	184.5
white-faced heron	10	23	10.2	10	20	8.9	10	25	13.5
Australasian bittern	0	0	0	0	0	0	0	0	0
royal spoonbill	0	0	0	0	0	0	1	1	0.1
black swan	0	0	0	0	0	0	0	0	0
Canada goose	10	41	28.9	8	34	11.5	8	52	15.7
paradise shelduck	9	32	9.4	7	4	2	7	9	2.7
mallard	9	201	63.9	8	159	49.3	8	275	154.9
grey duck	4	4	0.9	2	5	0.9	5	12	3.2
grey teal	0	0	0	0	0	0	2	6	0.8
NZ shoveler	0	0	0	1	2	0.2	1	6	0.6
unidentified duck sp.	1	24	2.4	3	99	19.3	6	168	46.8
pukeko	0	0	0	2	1	0.2	5	6	1.5
SI pied oystercatcher	10	117	48.2	10	108	64.9	10	104	52.6
spur-winged plover	10	79	46.4	10	90	50.8	10	130	73.9
banded dotterel	10	129	59.3	10	173	118.6	10	301	193
black-fronted dotterel	1	1	0.1	1	2	0.2	8	56	13.1
wrybill	0	0	0	0	0	0	2	4	0.5
bar-tailed godwit	0	0	0	0	0	0	1	9	0.9
turnstone	0	0	0	0	0	0	1	11	1.1
Siberian tattler	0	0	0	0	0	0	1	1	0.1
knot	0	0	0	0	0	0	1	3	0.3
pied stilt	10	130	49.1	10	314	172.5	10	252	120.2
black stilt	0	0	0	0	0	0	0	0	0
black-backed gull	10	2989	1869.1	10	1500	755.7	10	4644	2514.8
black-billed gull	9	2040	234.2	10	6299	3338.9	10	7591	2853.3
red-billed gull	0	0	0	0	0	0	4	25	6.2
caspian tern	0	0	0	0	0	0	2	1	0.2
black-fronted tern	9	182	43.4	10	332	120.4	10	216	79.7
white-fronted tern	0	0	0	0	0	0	9	2950	638
welcome swallow	2	11	1.5	3	16	2	3	20	5
NZ kingfisher	6	5	1.7	7	6	1.9	5	4	1.5

APPENDIX 4. WETLAND BIRD NUMBERS BY RIVER SECTION, SOUTH BRANCH ASHBURTON RIVER, SPRING 1981

Bird species	I	II	III	IV	V	VI	TOTAL
black shag	1		2	2	51		56
little shag				13	1		14
spotted shag						95	95
little black shag						6	6
white-faced heron	4	6	5	23	9	4	51
Canada goose	1			41		4	46
paradise shelduck	8		8	3	4	2	25
mallard		18	52	149	35	54	308
grey duck	5			4		9	18
duck sp			22		99	36	157
pukeko						3	3
SI pied oystercatcher	56	4	35	117	96	104	412
spur-winged plover	11	8	30	79	52	85	265
banded dotterel	228		16	129	169	301	843
wrybill	5						5
pied stilt	27	2	28	130	293	252	732
turnstone						11	11
black-backed gull	36	15	568	2989	1500	1700	6808
black-billed gull	7			15	5000	2550	7572
black-fronted tern	46		5	128	332	131	642
white-fronted tern						11	11
TOTALS	435	53	771	3822	7641	5358	18080

APPENDIX 5. WETLAND BIRD NUMBERS BY RIVER SECTION, SOUTH BRANCH ASHBURTON RIVER, SPRING 982

Bird species	I	II	III	IV	V	VI	TOTAL
black shag	3		2	1	7	0	13
little shag			5	7	6	8	26
white-faced heron	2	4	10	14	20	25	75
Canada goose		2		32	23	2	59
paradise shelduck	7	3	6	2	2		20
mallard		14	67	201	159	145	586
grey duck		9		1	5	12	27
duck sp						168	168
NZ shoveler					2		2
pukeko					1	1	2
SI pied oystercatcher	37	13	19	60	67	48	244
spur-winged plover	5	9	15	48	69	43	186
banded dotterel	182	2	5	56	96	110	452
black-fronted dotterel						4	4
wrybill	3						3
pied stilt		4	9	58	314	131	516
black-backed gull	27	21	203	626	538	3153	4568
black-billed gull	9			125	5095	2430	7650
black-fronted tern	25		1	48	220	168	462
white-fronted tern						2950	2950
NZ kingfisher		4		3	3		10
welcome swallow	n.c.				1		1
TOTALS	300	85	342	1282	6628	9398	18034

APPENDIX 6. WETLAND BIRD NUMBERS BY RIVER SECTION, SOUTH BRANCH ASHBURTON RIVER, SPRING 1983

Bird species	I	II	III	IV	V	VI	TOTAL
black shag	2			3	6	1	12
little shag				2		14	16
white- faced heron	3	2	2	7	12	11	37
Australasian bittern	1						1
Canada goose	6			24		8	38
paradise shelduck	19			4		5	28
mallard	6	26		76	35	275	418
grey duck		1				7	8
NZ shoveler		1					1
duck sp			20			8	28
SI pied oyster catcher	49	6	9	61	45	63	233
spur-winged plover	18	8	5	62	29	57	179
banded dotterel	137	1		55	129	200	522
black-fronted dotterel						3	3
wrybill	14					1	15
pied stilt	7	9	4	44	131	109	304
black-backed gull	88	10	10	1930	250	4644	6932
black-billed gull	28			2040	4600	460	7128
black-fronted tern	34			182	82	135	433
white-fronted tern						75	75
NZ kingfisher				3	3	4	10
TOTALS	412	64	50	4493	5323	6079	16421

.PPENDIX 7. WETLAND BIRD NUMBERS BY RIVER SECTION, SOUTH BRANCH ASHBURTON RIVER, SPRING 984

Bird species	I	II	III	IV	V	VI	TOTAL
black shag	1	5	5	1			12
little shag				1	1		2
white-faced heron	3		1	7	15	9	35
black swan	2						2
Canada goose	9	2		20	21		52
paradise shelduck	29		1	11			41
mallard		6	10	26			42
duck sp.					72	57	129
pukeko					1		1
SI pied oystercatcher	41	8	6	27	62	47	191
spur-winged plover	10	4	4	29	21	32	100
banded dotterel	102	1		59	169	141	472
black-fronted dotterel				1			1
wrybill	14						14
pied stilt	16	25	5	48	260	157	511
black-backed gull	60	35	225	1990	464	2795	5569
black-billed gull				69	6299	3545	9913
red-billed gull						21	21
caspian tern						1	1
black-fronted tern	19	24	4	36	156	41	280
white-fronted tern						23	23
NZ kingfisher				1	2		3
welcome swallow			4				4
TOTALS	306	110	265	2326	7543	6869	17419

PPENDIX 8. WETLAND BIRD NUMBERS BY RIVER SECTION, SOUTH BRANCH ASHBURTON RIVER, SPRING 1985

Bird species	I	II	III	IV	V	VI	TOTAL
black shag	3		5		2		10
little shag				2	4	1	7
white-faced heron	1	1	3	3	7	19	34
Canada goose	8		3	14	2	2	29
paradise shelduck	16	3		6		9	34
duck sp.	6	1	15	24	18	160	224
SI pied oystercatcher	42	13	14	27	52	55	203
spur-winged plover	31		10	31	12	47	131
banded dotterel	85			25	133	233	476
black-fronted dotterel	5					11	16
wrybill	4						4
pied stilt	16	15	10	21	117	124	303
black-backed gull	290	85	609	2770	700	2240	6694
black-billed gull		1		10	3710	75	3796
black-fronted tern	11				23	22	56
welcome swallow	1	2	1	11	16	20	51
NZ kingfisher				2	1	4	7
TOTALS	519	121	670	2946	4797	3022	12075

PPENDIX 9. WETLAND BIRD NUMBERS BY RIVER SECTION, SOUTH BRANCH ASHBURTON RIVER, SPRING
)86

Bird species	I	II	III	IV	V	VI	TOTAL
black shag	1			1	2	1	5
little shag		1		6	3		10
spotted shag						145	145
white-faced heron	2	4		12	2	16	36
Canada goose	3		2	32	11		48
paradise shelduck		5	5	9	2	4	25
mallard	19	30	70	36	58	260	473
grey duck				3			3
duck sp.						39	39
SI pied oystercatcher	30	12	11	51	108	36	248
spur-winged plover	18	22	11	49	77	130	307
banded dotterel	92			72	173	220	557
black-fronted dotterel						10	10
wrybill	6					4	10
pied stilt	1	7	9	53	84	49	203
black-backed gull	250	34	126	2833	962	2096	6301
black-billed gull				3	1603	546	2152
black-fronted tern	19			10	28	15	72
white-fronted tern						240	240
NZ kingfisher				5	2		7
TOTALS	441	415	234	3175	3115	3811	10891

PPENDIX 10. WETLAND BIRD NUMBERS BY RIVER SECTION, SOUTH BRANCH ASHBURTON RIVER, SPRING 1987

Bird species	I	II	III	IV	V	VI	TOTAL
black shag	5		1	2		1	9
little shag				3	3	1	7
white-faced heron	5		3	17	7	12	44
royal spoonbill						1	1
Canada goose	8		4	32	8	7	59
paradise shelduck	26	4	3	4	4	3	44
mallard	11	3	42	28	71	232	387
grey duck	1				4	1	6
grey teal	2						2
SI pied oystercatcher	23	2	14	49	51	40	179
spur-winged plover			12	57	73	59	201
banded dotterel	61			62	69	171	363
black-fronted dotterel						24	24
wrybill	3						3
knot						3	3
pied stilt	6	5	6	37	95	39	188
black-backed gull	300		115	2308*	1097	2518	6338
black-billed gull		15		37	3350	7591	10993
red-billed gull						14	14
black-fronted tern	16			5	137	62	220
white-fronted tern						2000	2000
NZ kingfisher				3	6	2	11
welcome swallow			4	4	3	20	31
TOTALS	467	29	204	2648	4978	12801	21127

APPENDIX 11. WETLAND BIRD NUMBERS BY RIVER SECTION, SOUTH BRANCH ASHBURTON RIVER, SPRING 988

Bird species	I	II	III	IV	V	VI	TOTAL
black shag						3	3
little shag				7	43	10	60
white-faced heron	2		4	10	4	10	30
Canada goose			17	41	34	25	117
paradise shelduck	3			4	2		9
mallard		7	8	83	71	253	422
pukeko						5	5
SI pied oystercatcher	16	2	19	23	55	16	131
spur-winged plover			18	26	42	66	152
banded dotterel	53		1	47	119	125	345
black-fronted dotterel						12	12
pied stilt				38	250	42	330
black-backed gull	412		125	2033	570	1584	4724
black-billed gull				41	363	6082	6496
black-fronted tern	6		4	16	160	216	402
white-fronted tern						802	802
NZ kingfisher					2		2
welcome swallow	2						2
TOTALS	494	9	196	2369	1715	9251	14044

APPENDIX 12. WETLAND BIRD NUMBERS BY RIVER SECTION, SOUTH BRANCH ASHBURTON RIVER, SPRING 1989

Bird species	I	II	III	IV	V	VI	TOTAL
black shag	1				1	3	5
little shag				3	7	8	18
spotted shag						1200	1200
white-faced heron	3	1	1	3	6	10	24
Canada goose	4	8	6	40	12	52	122
paradise shelduck	11			3	4	2	20
mallard	5	25	11	31	27	196	295
grey duck	4		8				12
grey teal						2	2
NZ shoveler						6	6
SI pied oystercatcher	32	27	21	35	56	50	221
spur-winged plover	12	39	9	18	43	127	248
banded dotterel	123	2	6	34	75	213	453
black-fronted dotterel						35	35
wrybill	3						3
bar-tailed godwit						9	9
pied stilt	5	4	12	31	83	128	263
black-backed gull	410	40	320	670	934	2550	4924
black-billed gull	4			2	778	2054	2838
red-billed gull						25	25
caspian tern						1	1
black-fronted tern	28			3	9	1	41
white-fronted tern						250	250
NZ kingfisher						4	4
welcome swallow		1				10	11
TOTALS	645	147	394	873	2035	6936	11030

PENDIX 13. WETLAND BIRD NUMBERS BY RIVER SECTION, SOUTH BRANCH ASHBURTON RIVER, SPRING
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Bird species	I	II+III	IV	V	VI	TOTAL
black shag	3	1		1	3	8
little shag			1	8	7	16
spotted shag					500	500
white-faced heron			6	7	19	32
Canada goose	8	150	13	4	37	212
paradise shelduck	3			2	2	7
mallard		4	9	37	134	184
grey duck	1		1		3	5
grey teal					6	6
pukeko					6	6
SI pied oystercatcher	27		32	57	67	183
spur-winged plover	6	10	65	90	93	264
banded dotterel	112		21	54	216	403
black-fronted dotterel				2	56	58
wrybill	6					6
Siberian tattler					1	1
pied stilt		1	31	98	171	301
black stilt		1				1
black-backed gull	255	150	772	542	1868	3587
black-billed gull	786			2591	3200	6577
red-billed gull					2	2
black-fronted tern	40		9	57	6	112
white-fronted tern					32	32
NZ kingfisher					1	1
TOTALS	1247	317	960	3550	6430	12504

APPENDIX 14. WETLAND BIRD NUMBERS BY RIVER SECTION, NORTH BRANCH ASHBURTON RIVER, SPRING 1981

Bird species	I	II	III	TOTAL
black shag			5	5
little shag			4	4
white-faced heron	2	5	6	13
Canada goose		5	2	7
paradise shelduck		9		9
mallard	28	42	46	116
grey duck		1	1	2
SI pied oystercatcher	10	34	50	94
spur-winged plover	9	4	46	59
banded dotterel	40	48	10	98
pied stilt	24	33	46	103
black-billed gull	1360	10	162	1532
black-backed gull	141	2810	431	3382
black-fronted tern	103	13	4	120
NZ kingfisher			7	7
TOTALS	1717	3014	820	5551

APPENDIX 15. WETLAND BIRD NUMBERS BY RIVER SECTION, NORTH BRANCH ASHBURTON RIVER, SPRING 1982

Bird species	I	II	III	TOTAL
black shag			5	5
little shag			1	1
white-faced heron		8	4	12
Canada goose	4			4
paradise shelduck	2	11		13
mallard	36	166	61	263
grey duck	6			6
SI pied oystercatcher	15	32	18	65
spur-winged plover	2	9	18	29
banded dotterel	9	50	2	61
pied stilt	8	24	33	65
black-backed gull	136	739	23	898
black-billed gull	2265	476	197	2938
black-fronted tern	112	29	1	142
TOTALS	2595	1544	363	4502

APPENDIX 16. WETLAND BIRD NUMBERS BY RIVER SECTION, NORTH BRANCH ASHBURTON RIVER, SPRING 983

Bird species	I	II	III	TOTAL
black shag		1	2	3
little black shag			3	3
white-faced heron	2	2	3	7
Canada goose		7		7
paradise shelduck	22	6		28
mallard	8	36	109	153
SI pied oystercatcher	20	23	22	65
spur-winged plover	17	21	44	82
banded dotterel	33	38		71
pied stilt	2	9	59	70
black-backed gull	258	3180	36	3474
black-billed gull		9	34	43
black-fronted tern	11	32	2	45
NZ kingfisher		1	3	4
TOTALS	373	3365	317	4055

APPENDIX 17. WETLAND BIRD NUMBERS BY RIVER SECTION, NORTH BRANCH ASHBURTON RIVER, SPRING 1984

Bird species	I	II	III	TOTAL
black shag			1	1
little black shag			3	3
white-faced heron	1	1	6	8
Canada goose		5		5
paradise shelduck		1		1
mallard		63	55	118
SI pied oystercatcher	8	51	23	82
spur-winged plover	4	14	29	47
banded dotterel	27	35		62
pied stilt	8	64	48	120
black-backed gull	109	2475	342	2926
black-billed gull	8	1480	44	1532
black-fronted tern	16	35	60	111
NZ kingfisher		1		1
TOTALS	188	4225	611	5024

APPENDIX 18. WETLAND BIRD NUMBERS BY RIVER SECTION, NORTH BRANCH ASHBURTON RIVER, SPRING 1985

Bird species	I	II	III	TOTAL
black shag		1		1
Canada goose	2	2	1	5
paradise shelduck	10			10
duck sp		10	31	41
SI pied oystercatcher	22	17	42	81
spur-winged plover	15	9	21	45
banded dotterel	18	16	8	42
pied stilt		18	53	71
black-backed gull	175	3300	306	3781
black-billed gull	6			6
black-fronted tern		2		2
NZ kingfisher	1			1
TOTALS	249	3375	462	4086

APPENDIX 19. WETLAND BIRD NUMBERS BY RIVER SECTION, NORTH BRANCH ASHBURTON RIVER, SPRING 1986

Bird species	I	II	III	TOTAL
little shag			6	6
white-faced heron	3	9	4	16
Canada goose	2	33		35
paradise shelduck	6	22		28
mallard	23	85	41	149
duck sp		51		51
SI pied oystercatcher	11	25	33	69
spur-winged plover	8	35	38	81
banded dotterel	9	12		21
pied stilt	8	4	15	27
black-backed gull	400	1841	40	2281
black-billed gull			20	20
NZ kingfisher			1	1
TOTALS	470	2117	198	2785

APPENDIX 20. WETLAND BIRD NUMBERS BY RIVER SECTION, NORTH BRANCH ASHBURTON RIVER, SPRING 1987

Bird species	I	II	III	TOTAL
black shag			1	1
little shag			4	4
white-faced heron		2	3	5
Canada goose	3	13	2	18
paradise shelduck	4	3		7
mallard	7	68	80	155
pukeko			2	2
SI pied oystercatcher	3	22	34	59
spur-winged plover	7	22	62	91
banded dotterel	1	23		24
pied stilt		10	24	34
black-backed gull	210	3827	506	4543
black-billed gull	5	7	23	35
black-fronted tern		11		11
welcome swallow		5	25	30
TOTALS	240	4013	766	5019

APPENDIX 21. WETLAND BIRD NUMBERS BY RIVER SECTION, NORTH BRANCH ASHBURTON RIVER, SPRING 1989

Bird species	I	II	TOTAL
white-faced heron	2	4	6
Canada goose	2	28	30
paradise shelduck	23	14	37
mallard	38	84	122
SI pied oystercatcher	27	19	46
spur-winged plover	29	16	45
banded dotterel	26	50	76
pied stilt	7	28	35
black-backed gull	380	1950	2330
black-billed gull	17	28	45
black-fronted tern	2	2	4
NZ kingfisher		1	1
TOTALS	553	2224	2777