

RECOVERIES OF PARADISE SHELDUCKS BANDED IN THE TAIHAPE, NELSON, MARLBOROUGH, WAITAKI AND SOUTHLAND DISTRICTS

By MURRAY WILLIAMS

ABSTRACT

From 1962 to 1974, 10 590 Paradise Shelducks were banded while flightless at moulting sites in the Taihape district of North Island and in the Nelson, Marlborough, Waitaki and Southland districts of South Island, and from 1970 to 1974, 2400 ducklings in the Southland district. The areas over which these birds dispersed after completing their moult or fledging were determined from the return of 1420 bands by hunters. Two-thirds of more of the birds shot after having been banded at moulting sites near Taihape, in Nelson, and near Manapouri in Southland were recovered within 40 km of their banding site, whereas birds from other moulting sites in South Island dispersed more widely. The dispersal characteristics of males and females banded at the same site were similar, except that two-thirds of the female Southland ducklings shot were recovered within 40 km of their natal site but only 40% of the males. The dispersal characteristics of Paradise Shelduck populations seem to reflect the topography of their habitats, those in irregular hill-country farmland being less dispersive than those inhabiting the flatter tussock grasslands.

INTRODUCTION

Although the Paradise Shelduck (*Tadorna variegata*) is hunted in all but one of New Zealand's 26 Acclimatisation Society districts, in most of them it comprises less than 5% of the total waterfowl harvest. Only in three areas, Taihape-Waimarino, Gisborne-East Coast and Southern Lakes is the species the major game waterfowl, in 1978 comprising 33%, 32% and 48% respectively of the hunter's kill, while in Wanganui, West Coast and Nelson, it has comprised 10-13% of the harvest (Caithness 1979).

The history of Paradise Shelduck as a game bird records that in these six districts and also in Hawke's Bay, Wairarapa and along the eastern foothills of the Southern Alps from Marlborough to northern Southland, the species has at times been so over-harvested that either it has failed to recover or it has required a long period of protection before it has again become numerous enough to hunt (Williams 1971). Such excesses of the past are unlikely to occur again. Hunting is now more strictly controlled by limiting the number which a hunter may kill each day, by limiting hunting to specific parts of each Acclimatisation

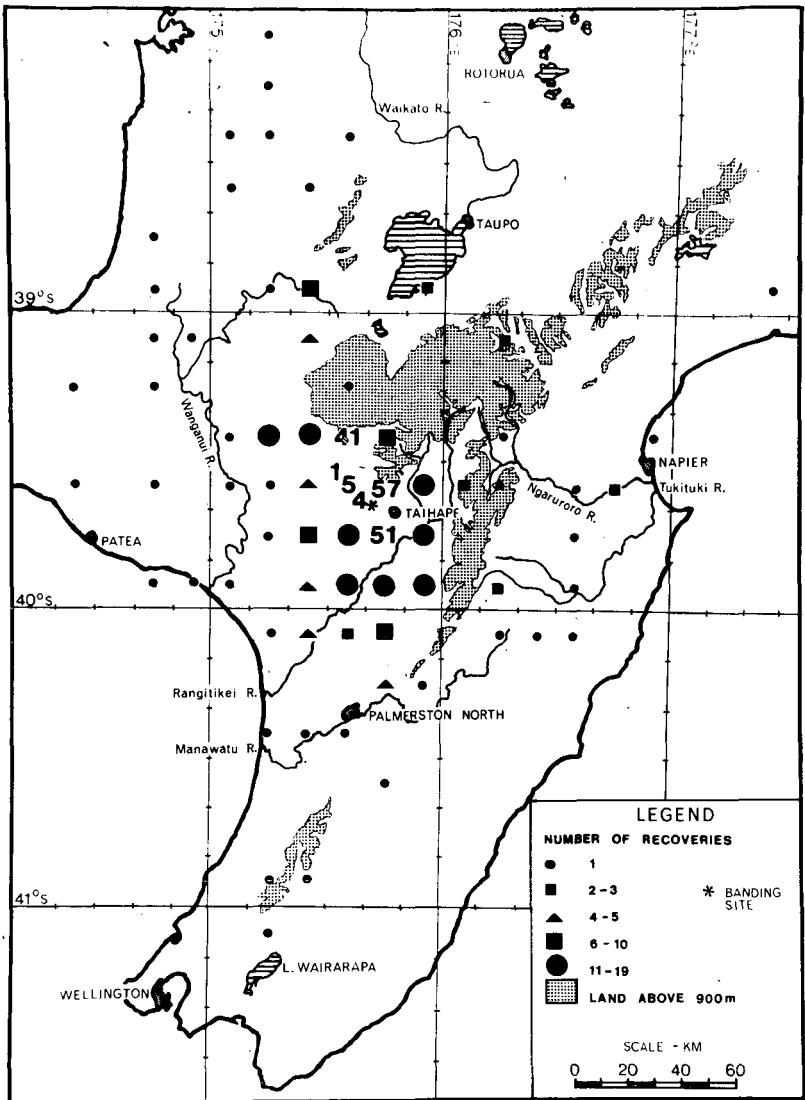


FIGURE 1 — The numbers of Paradise Shelducks, banded at Ruanui Station near Taihape between 1962 and 1974, reported shot within each 0°10' x 0°10' latitude-longitude square between 1962 and 1978.

Society district and by restricting the hunting season. Population trends are now monitored annually by counting shelducks at their moulting sites (Williams 1979 a, b). But some important questions remain. Over how wide an area should particular hunting regulations apply? Where do birds counted at a moulting site come from and disperse to? Answers to these questions would assist the regional and national management of shelducks.

Banding studies in the Gisborne-East Coast district (Williams 1979 b) showed that the birds banded at one moulting site tended to be shot nearby, most within a radius of 20 km, and that only if moulting sites were close together were birds from them shot at the same localities. These findings suggest that once areas of overlap are sorted out, birds from various moulting sites could be considered and managed as separate populations. The aim of this study was to determine, from an analysis of bands returned by hunters, whether shelducks banded near Taihape in North Island and at several South Island sites showed similar dispersal characteristics to Gisborne-East Coast birds.

Banding at Taihape started in 1962 and continued until 1974. Banding at sites in Southland, Nelson, Marlborough and in the Waitaki Valley near Lake Benmore took place between 1969 and 1974. This paper also includes an analysis of band returns from Paradise Shelducks banded as ducklings in Southland. They were banded to complement work at Southland moulting sites.

The birds were caught while flightless at their moulting sites, using the methods described by Williams (1972). All were banded with metal bands bearing a serial number and a return address. Banding was done in early January each year and all birds were designated as "adults," although most had probably not bred. At Gisborne (Williams 1979 b) about two-thirds of the birds caught in early January were juveniles (birds 12-15 months old and undergoing their first wing moult) and yearlings (one year older than juveniles). Breeding adults usually moulted in late January and throughout February.

Ducklings banded in Southland were caught by hand, before they had fledged, on various farm ponds and rivers.

RESULTS

Taihape

From 1962 to 1974, 2329 male and 2185 female Paradise Shelducks were banded in the Taihape district, and by 31 October 1978, 420 males (18.0%) and 289 females (13.2%) had been reported shot. Banding occurred at three sites: Ruanui Station (in all years), Haddon's Lagoon (1967, 1969, 1971-74) and at Harris' Lake (1972-74). All three sites were within 22 km of one another, and the locations at which birds banded at each site were recovered overlapped almost completely. Data from all three sites, therefore, have been combined.

More than half of the recoveries were made within 20 km of the banding site (Table 1) and almost 90% within 60 km. Fourteen

TABLE 1 — Numbers and cumulative percentage of Paradise Shelducks, banded at sites near Taihape, recovered dead at various distances from their banding site.

DISTANCE INTERVAL (km)	MALES		FEMALES	
	NUMBER	CUM.%	NUMBER	CUM.%
0 - 20	222	52.9	163	56.4
21 - 40	126	82.9	77	83.0
41 - 60	23	88.3	23	91.0
61 - 80	25	94.3	11	94.8
81 - 100	7	96.0	7	97.2
101 - 120	6	97.4	5	99.0
121 - 140	5	98.6	0	
141 - 160	1	98.8	2	99.6
161 - 180	2	99.3	1	100
181 - 200	2	99.8		
201 +	1	100		
TOTAL	420		289	

birds traversed the forested Ruahine Ranges and were shot in Hawke's Bay and one bird reached the southern extremity of the Gisborne population, near Wairoa. The most southern recovery came from near Lake Wairarapa (190 km from the banding site). A few birds were shot in inland Taranaki and in the King Country, and the most northern recovery was from the Hauraki Plains, 245 km from the banding site.

The distribution of recoveries of birds banded on Ruanui Station is shown in Fig. 1.

The most obvious feature of the distribution pattern is the lack of recoveries from the area north of Tongariro National Park and near Lake Taupo. Paradise Shelducks are common in this area and are hunted there, but clearly the birds do not come south of the mountains to moult at the Taihape sites.

There was no difference in the distances moved by males and females. The distribution of the distances moved by males and females (Table 1) were similar ($X^2 = 5.5$, 6df, $p = 0.5$), and for both sexes the medial distance was 0-20 km.

Since the majority of birds banded were probably juveniles, the hypothesis that juveniles move more widely than older birds was tested

by comparing the distance moved by birds recovered within one year of banding with that of birds recovered two or more years after banding. Of 207 males recovered within one year of banding, 51.7% were within 20 km of the banding site and 80% within 40 km, compared with 54.0% and 85.4% respectively of the 213 males recovered two or more years after banding. For females, 52.7% of 150 first-year recoveries were within 20 km and 81.3% within 40 km compared with 60.4% and 84.9% respectively for 139 later recoveries. None of these differences within or between sexes was significantly different; birds did not disperse more widely during their first year after banding.

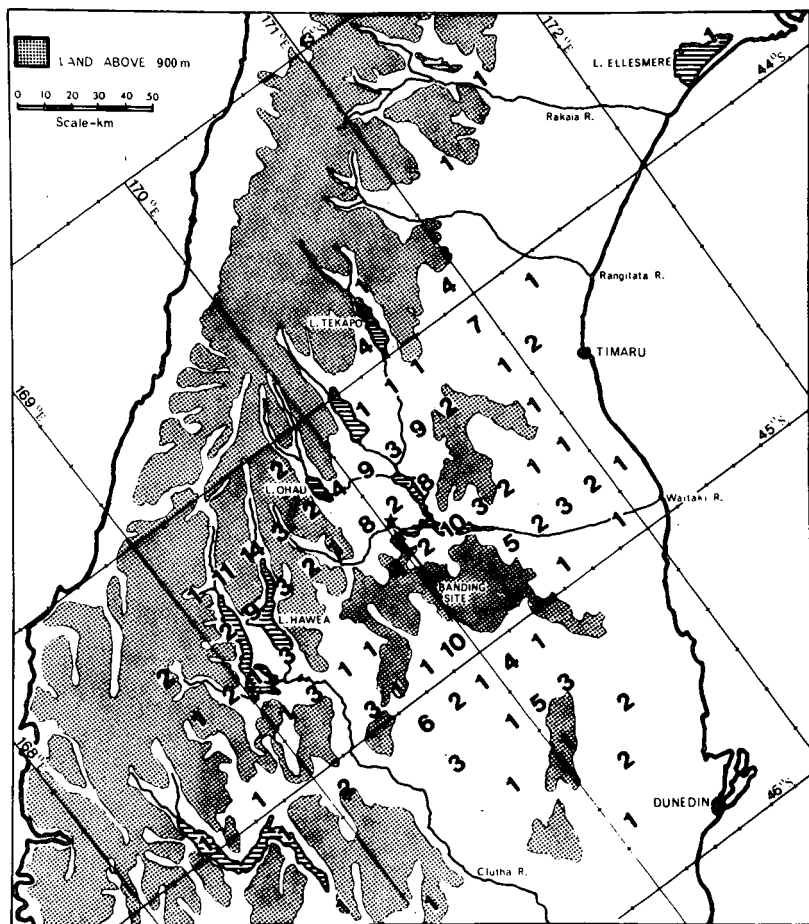


FIGURE 2 — The numbers of Paradise Shelducks, banded at Benmore Station between 1970 and 1974, reported shot within each 0°10' x 0°10' latitude-longitude square between 1970 and 1978.

The data were examined to determine whether, as was the case in the Lake Repongaere population near Gisborne (Williams 1979 b), the distribution of distances moved changed as the banding study progressed. No such change could be detected. Although the proportion of total recoveries made within 0-20 km of the banding site varied between years from a low of 32% in 1966 to a high of 68% in both 1969 and 1971, there was no significant overall trend. Moreover, the percentage of total recoveries made within 0-40 km varied only between 73% and 87%. These variations between years probably reflect local variations in weather during the hunting season and therefore the hunters' opportunity to shoot birds, rather than true changes in dispersion. Thus, I conclude that the Taihape birds were well spread throughout the district when banding was begun and, unlike the Lake Repongaere population, were not colonising additional areas.

Waitaki

During 1970-1974, 1248 male and 1066 female Paradise Shelducks were banded on Benmore Station near Omarama, and by 31 October 1978, the bands of 158 males (12.7%) and 86 females (8.1%) had been returned. The locations of recovery are known for all but three birds.

TABLE 2 — Numbers and cumulative percentage of Paradise Shelducks, banded on Benmore Station, recovered dead at various distances from the banding site.

DISTANCE INTERVAL (km)	MALE		FEMALE	
	NUMBER	CUM.%	NUMBER	CUM.%
0 - 20	13	8.2	10	11.6
21 - 40	32	28.5	20	34.9
41 - 60	49	59.5	26	65.1
61 - 80	27	76.6	14	81.4
81 - 100	28	94.3	8	90.7
101 - 120	3	96.2	3	94.2
121 - 140	2	97.5	0	
141 - 160	1	98.1	2	96.5
161 - 180	0		3	100
181 - 200	1	98.7	0	
201 +	2	100	0	
TOTAL	158		86	

Recoveries were made over a wide area of the central South Island (Fig. 2), the most northern being from near Lake Coleridge in North Canterbury, the most southern from near Dunedin. Most of the banded birds were shot within the Waitaki River catchment, especially near the main lakes of Ohau, Pukaki, Tekapo and Benmore, while another main area of recovery was around Lakes Hawea and Wanaka. The third major area of recovery was in the upper Manuherikia River valley, bounded by the Dunston Mountains, Hawkdun Range and Rough Ridge.

The distribution of distances moved by males and by females was similar ($X^2 = 4.28$, 5df, $p = 0.4$) (Table 2), the medial and modal distance moved was 41-60 km for both sexes, and there were no differences in the proportions of males and females which travelled beyond 80 km ($X^2 = 0.76$, $p = 0.4$) and beyond 100 km ($X^2 = 1.12$, $0.3 > p > 0.2$).

Almost 46% of the recoveries were made within the first year after banding and the distribution of these recoveries was compared with the distribution of birds recovered two or more years after banding by examining what proportions of each sample were obtained beyond the medial (60 km) radius. For males, 32 (43.8%) of 73 males recovered in the year of banding had travelled more than 60 km compared with 37.6% of 85 later recoveries. These proportions are similar ($X^2 = 0.62$, $p = 0.4$). For females, 20 (51.3%) of 39 year-of-banding recoveries moved more than 60 km compared with 21.3% of 47 later recoveries. The proportions are significantly different ($X^2 = 8.45$, $0.01 > p > 0.001$), and if most of the birds were juveniles when banded, this indicates widespread movement of pre-territorial females, a distinct contrast with findings at Gisborne (Williams 1979 a).

Comparing males with females, similar proportions of the year-of-banding recoveries were made more than 60 km from the banding site ($X^2 = 0.56$, $p = 0.4$). However, of the recoveries made more than one year after banding, the difference in the proportions of the male and female samples recovered beyond 60 km was almost statistically significant ($X^2 = 3.74$, $p = 0.053$), suggesting greater movements by males, perhaps as a result of following females to their natal areas.

Southland

During 1969-73, 1585 male and 1457 female Paradise Shelducks were banded at several sites in northern Southland, and by 31 October 1978 the bands of 114 males (7.2%) and 81 females (5.6%) had been returned. The location of recovery is known for all birds.

The recoveries have been analysed as two sets: those of birds banded at sites near Manapouri (Lake Luxmore, Lake Thomas, Lake Echo and Lake Freestone) and those of birds banded at Von Lake. This is because the patterns of movement suggest the two moulting populations are at least partly separate and because few birds banded at one site were subsequently recaptured moulting at the other (8.2%

of 134 recaptures of Manapouri birds were made at Von Lake and 9.5% of 63 recaptures of Von Lake birds were made at Manapouri sites).

Manapouri sites: The distributions of distances moved by males and females (Table 3) were similar ($X^2 = 4.06$, 3df, $0.3 > p > 0.2$) and their patterns of dispersal (shown for both sexes combined in Fig. 3) were also similar ($X^2 = 2.22$, 5df, $p = 0.8$). The medial and modal distance interval for both sexes was 0-20 km, and the proportions of the total recoveries of each sex that were made within 40 km of the banding site were also similar ($X^2 = 2.38$, $0.2 > p > 0.1$).

Recoveries made in the year of banding were, on average, from localities closer to the banding site than those made more than one year after the bird was banded. Of 25 males shot in the year of banding, 18 (72%) were within 20 km of the banding site compared with 43.5% of the 46 males shot later, a statistically significant difference ($X^2 = 5.30$, $p = 0.02$). Females showed a similar tendency; 16

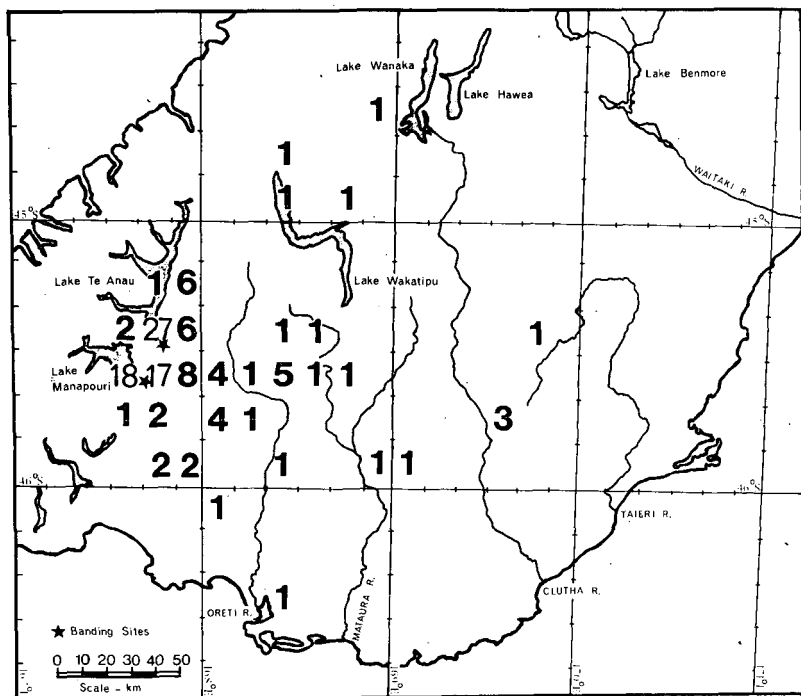


FIGURE 3 — The numbers of Paradise Shelducks, banded at sites near Manapouri between 1969 and 1973, reported shot within each $0^{\circ}10' \times 0^{\circ}10'$ latitude-longitude square between 1969 and 1978.

TABLE 3 — Numbers and cumulative percentage of Paradise Shelducks, banded at sites near Manapouri, recovered dead at various distances from their banding sites.

DISTANCE INTERVAL (km)	MALES		FEMALES	
	NUMBER	CUM.%	NUMBER	CUM.%
0 - 20	38	53.5	29	53.7
21 - 40	16	76.0	18	87.0
41 - 60	7	85.9	3	92.6
61 - 80	4	91.5	0	
81 - 100	1	92.9	2	96.3
101 - 120	3	97.2	0	
121 - 140	2	100	1	97.2
141 - 160	0		1	100
TOTAL	71		54	

TABLE 4 — Numbers and cumulative percentage of Paradise Shelducks, banded at Von Lake, recovered dead at various distances from their banding sites.

DISTANCE INTERVAL (km)	MALES		FEMALES	
	NUMBER	CUM.%	NUMBER	CUM.%
0 - 20	3	8.1	1	4.5
21 - 40	12	40.5	9	45.4
41 - 60	12	72.9	7	77.2
61 - 80	1	75.6	1	81.8
81 - 100	1	78.3	1	86.3
101 - 120	6	94.6	1	90.9
121 - 140	1	97.3	2	100
141 - 160	1	100		
TOTAL	37		22	

(66.7%) of 24 females shot in the year of banding were within 20 km of the banding site compared with 43.3% of 30 females shot later, a difference that is almost statistically significant ($X^2 = 2.92, 0.1 > p > 0.05$).

Von Lake sites: The distributions of distances moved by males and females (Table 4) were similar ($X^2 = 0.03, 2df, p = 0.60$), and their locations of recovery appeared similarly distributed, although the small sample precluded statistical testing (Fig. 4 shows the distribution of both sexes combined). For both sexes, the modal distance of movement was 21-40 km, the medial distance 41-60 km.

The samples were small when subdivided according to the time of recovery after banding, but by inspection there appeared to be no differences in the distribution of recoveries made within the year of banding and later.

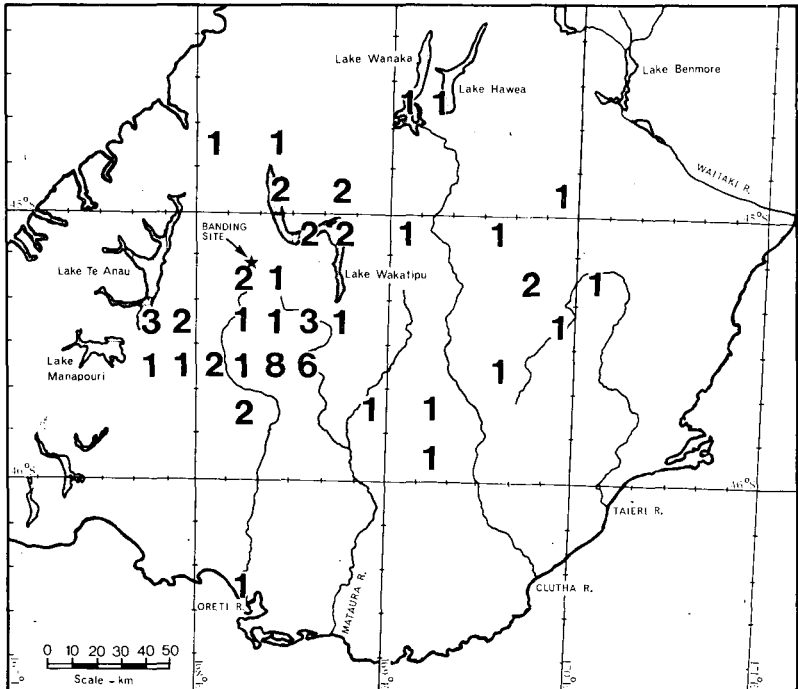


FIGURE 4 — The numbers of Paradise Shelducks, banded at Von Lake between 1970 and 1973, reported shot within each 0°10' x 0°10' latitude-longitude square between 1970 and 1978.

TABLE 5 — Numbers and cumulative percentage of Paradise Shelduck, banded as ducklings at various sites in northern and western Southland, recovered dead at various distances from their site of banding.

DISTANCE INTERVAL (km)	MALES		FEMALES	
	NUMBER	CUM.%	NUMBER	CUM.%
0 - 20	20	18.5	44	50.0
21 - 40	22	38.9	15	67.0
41 - 60	11	49.1	5	72.7
61 - 80	12	60.2	4	77.2
81 - 100	16	75.0	4	81.7
101 - 120	14	88.0	7	89.7
121 - 140	5	92.6	5	95.4
141 - 160	3	95.4	3	98.4
161 - 180	3	98.1	1	100
181 - 200	1	99.1		
201 +				
TOTAL	108		88	

These data suggest that the birds moulting at Manapouri sites are, to a large extent, separate from those moulting at Von Lake. Approximately 80% of the Manapouri birds were recovered within 40 km of their moulting site and 81% of all Manapouri recoveries were made to the west of a N-S line drawn through the moulting site. By contrast, only 42% of the Von Lake birds were recovered within 40 km of the moulting site and only 17% of the recoveries were made to the west of Von Lake. Manapouri birds were mainly shot in the Te Anau-Manapouri area with a few other recoveries coming from the upper Oreti and Mataura valleys. Recoveries from north of Lake Wakatipu and east of the Clutha River were negligible. Few Von Lake birds were shot near Te Anau and Manapouri; instead, their main areas of recovery were in the Garston district, at Lake Wakatipu and east of the Clutha River.

Southland Ducklings

During 1970-74, officers of the Southland Acclimatisation Society banded 1219 males and 1181 females at various sites throughout the northern and western parts of the Southland district and by 31 October 1978 bands had been returned from 108 (8.9%) males and 88 (7.5%) females. One of the aims of banding ducklings was to determine their pattern of dispersal after fledging.

The distributions of the distances moved by males and females (Table 5) are significantly different ($X^2 = 24.7$, 5df, $p < 0.001$): males moved further than females. The medial and modal distance of movement by females was 0-20 km; the medial distance for males was 21-40 km and their modal distance was 61-80 km.

Birds recovered in their year of banding had, on average, travelled further than those shot later. Only 3 (7.7%) of 39 males shot in their year of banding were within 40 km of their banding site compared with 39 (56.5%) of 69 males shot later ($X^2 = 25.0$, $p < 0.001$); similarly, only 13 (37.1%) of 35 females shot in their first year of life were within 40 km of their banding site compared with 46 (86.8%) of 53 shot later ($X^2 = 23.5$, $p < 0.001$). Significantly fewer males than females were shot within 40 km of their banding

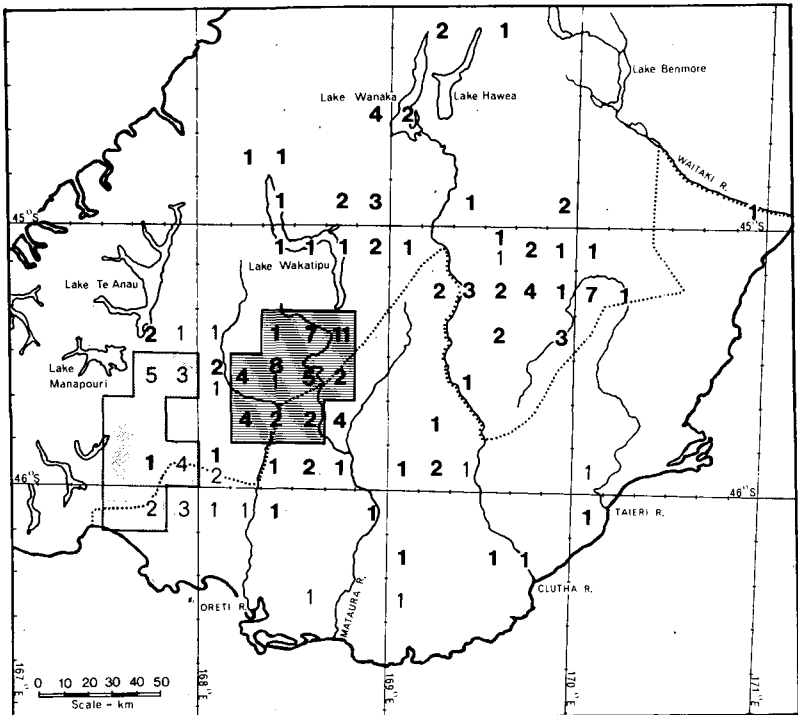


FIGURE 5 — The numbers of Paradise Shelducks, banded as ducklings in the Southland district between 1970 and 1974, reported shot within each $0^{\circ}10' \times 0^{\circ}10'$ latitude-longitude square between 1970 and 1978. Recoveries of ducklings banded in the Garston area (striped) are shown by bold numbers and those banded in the Waiau Valley area (stippled) by light numbers. In the area south of the dotted line, hunting was not permitted during all or part of the recovery period.

site both in the year of banding ($X^2 = 9.4, 0.01 > p > 0.001$) and later ($X^2 = 23.9, p < 0.001$). These data show that both sexes disperse widely in their first year and both sexes, females more so, tend to return to their natal areas.

The pattern of dispersal as revealed by the band returns (Fig. 5) does not show the spread of the species throughout the south-eastern portion of Southland and Otago, for Paradise Shelducks cannot be legally hunted there. However, the recoveries show clearly a difference in dispersal of birds banded in the Garston district and those banded in the Waiau River valley. Garston birds were shot mainly in their area of banding, in the higher country east of Roxburgh and between the Taieri and Manuherikia valleys, with a third but lesser area of recovery about Queenstown and Lake Wakatipu. Ducklings banded in the Waiau valley were recovered mostly within the Waiau catchment and only five (17%) of 29 recoveries were east of the Oreti River.

This pattern of recovery corresponds closely to that shown earlier for adults banded at moulting sites near Manapouri and at Von Lake. Some birds banded as ducklings were retrapped at these moulting sites. Analysis of these captures showed that all 30 ducklings banded in the Waiau valley area and recaptured during the moult were caught at the Manapouri sites. By contrast, of 74 birds originally banded in the Garston area and recaptured during their moult, 68 (92%) were caught at Von Lake, the other six near Manapouri.

TABLE 6 — Numbers and cumulative percentage of Paradise Shelducks, banded at Tarndale and Lake Matiri, recovered dead at various distances from their banding site (both sexes combined).

DISTANCE INTERVAL (km)	TARNDALE		LAKE MATIRI	
	NUMBER	CUM.%	NUMBER	CUM.%
0 - 20	2	4.4	6	24.0
21 - 40	2	8.9	10	64.0
41 - 60	25	64.4	7	92.0
61 - 80	10	86.6	2	100
81 - 100	2	91.0		
101 - 120	2	95.6		
121 - 140	1	97.8		
141 - 160	1	100		
TOTAL	45		25	

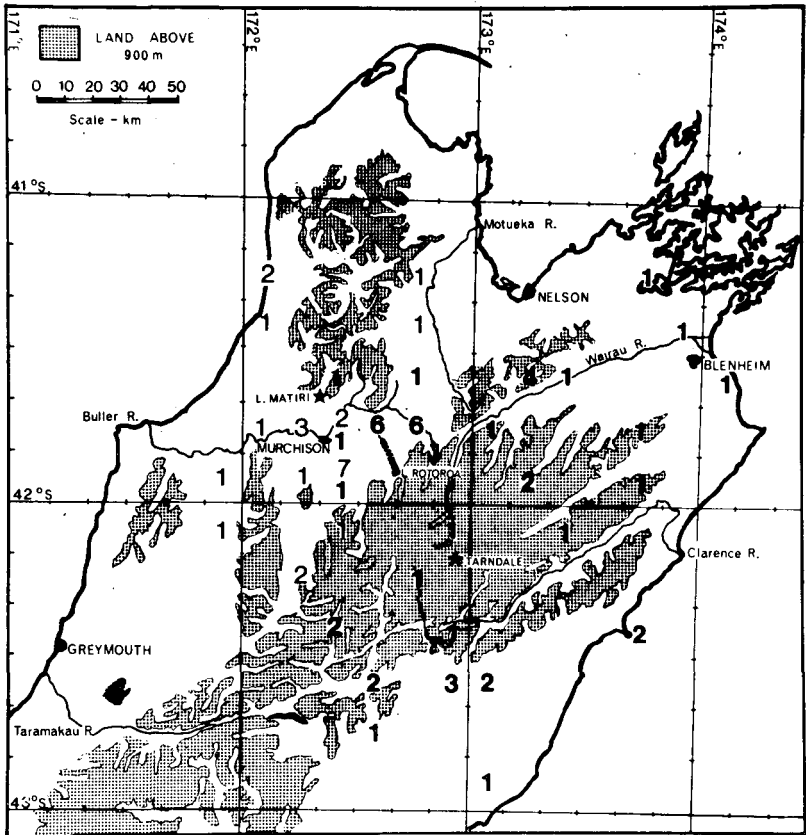


FIGURE 6 — The numbers of Paradise Shelducks, banded at Lake Matiri in 1973 (light numerals) and at Tarndale in 1973 and 1974 (bold numerals), reported shot within each $0^{\circ}10' \times 0^{\circ}10'$ latitude-longitude square between 1973 and 1978.

Nelson-Marlborough

By 31 October 1978 the bands of 45 (7.8%) of 576 moulting Paradise Shelducks banded at Tarndale in 1973 and 1974 and 25 (17.4%) of 144 banded at Lake Matiri in 1973 had been returned to the banding office.

Birds moulting at Lake Matiri were very difficult to catch and, after three years of effort, the programme there was abandoned and with it, the work at Tarndale. Data, therefore, are few and in compiling the distribution of distances moved (Table 6), I have combined data for both sexes.

Tarndale moulters dispersed widely (Fig. 6). The most southern recovery was from near Glentui in the Ashley River valley, the most northern from near Havelock at the head of Pelorus Sound. The medial and modal distance of movement was 41-60 km, but these figures are no doubt influenced by the very light hunting pressure over Molesworth Station, the area immediately adjacent to the moulting site. These widespread recoveries suggest that the Tarndale moulting site may be the main, if not the only, moulting site in the Marlborough district.

The few recoveries of Lake Matiri birds (Fig. 6) constitute a similar percentage of the total banded to that obtained in Taihape and Gisborne. Almost two-thirds of the recoveries were made within 40 km of the moulting site and none more than 80 km away. They remained west of the main divide and close to Murchison and thus were separate from the Tarndale birds, which remained east of the main divide. The only exceptions were those birds shot in the headwaters of the Motueka River and in the Hope Saddle area — they were Tarndale moulters. No birds banded at Lake Matiri in 1973 were caught moulting at Tarndale in 1974.

DISCUSSION

This study shows that the Paradise Shelduck at Taihape, as in the Gisborne-East Coast district (Williams 1979 b), is a sedentary species, whereas in parts of its South Island range it disperses more widely. More than 70% of the shelducks that were shot after being banded at moulting sites in North Island hill country were recovered within 40 km of the moulting site, a similar result to that obtained for birds banded at Manapouri and Lake Matiri (Table 7). In contrast, the medial recovery distance interval for birds banded at three South Island sites, Tarndale, Benmore and Von Lake was 41-60 km. What factors promote this difference in dispersal?

The most likely factor is habitat. Birds from the Tarndale, Benmore and Von Lake moulting sites dispersed widely over tussock grassland areas. These areas lack abrupt topographical changes; they are mostly flat, have little improved pasture, and have only occasional stock ponds. In these areas the principal breeding habitats of shelducks are the water courses (small streams to large shingle riverbeds) and the small swampy tussock-clad terraces alongside. Flocks of pre-breeding juveniles roam widely, preferring the few areas of developed pasture (Bisset 1976) and often moving from one major watershed to another in search of suitable grazing.

In the Gisborne-East Coast and Taihape areas of the North Island, around Lake Matiri in Nelson and, to a lesser extent, the Waiiau valley of Southland, where most of the Manapouri moulters remain, the topography is more irregular with large hillsides and extensive areas of improved hill country pasture. Small stock ponds are common and serve as the principal breeding habitat for Paradise Shelducks. The prebreeding juveniles tend to remain most of the

TABLE 7 — Comparison of the dispersal characteristics of Paradise Shelducks banded at various moulting sites. Gisborne data re-worked from Williams (1979 b).

MOULTING SITE	TOTAL RECOVERED	MODAL RECOVERY INTERVAL (km)	MEDIAL RECOVERY INTERVAL (km)	PERCENT RECOVERED WITHIN 40 km OF MOULTING SITE
GISBORNE - Parehaka	76	0 - 20	0 - 20	81
- Tiniroto	101	0 - 20	0 - 20	69
- Burkes	245	0 - 20	21 - 40	73
- Repongaere (1970-1975)	192	21 - 40	21 - 40	70
TAIHAPE - All sites	709	0 - 20	0 - 20	83
NELSON - L. Matiri	25	21 - 40	21 - 40	64
MARLBOROUGH - Tarndale	45	41 - 60	41 - 60	9
WAITAKI - Benmore	244	41 - 60	41 - 60	29
SOUTHLAND - Manapouri	125	0 - 20	0 - 20	76
- Von Lake	59	41 - 60	41 - 60	41

year at a single site (Williams 1979 a) and do not roam far in search of future breeding territories.

My conclusion is that the dispersal characteristics of shelduck populations may be predetermined by the habitat. The management implications of this are that in hill-country habitat, counts of moulting flocks and thus monitoring of the hunter's impact apply to small areas — probably a radius of no more than 30-40 km from the moulting site — and for sensitive management, hunting regulations could be varied over such small areas. But in the tussock grassland communities of the eastern foothills of the Southern Alps, hunting regulations should apply over a much wider area.

The banding of ducklings in the Southland area has shown the value of being able to define areas of dispersal of the age class which probably forms the bulk of the hunter's bag but which is not available to be captured at a moulting site. Although some Southland ducklings dispersed widely, others showed only limited dispersal, even during their first year of life. This difference may also be related to habitat. Ducklings banded in the Waiau River valley, hill country with extensive improved pasture, showed only limited dispersal; those banded at Garston dispersed widely over the flatter tussock grasslands — a parallel with the dispersal characteristics of Manapouri and Von Lake moulters. Although not analysed in such fine detail at Gisborne (Williams 1979 a), the same pattern seems not to hold for ducklings

from the northern part of Gisborne-East Coast. There, in hill-country farmland, ducklings dispersed beyond the range shown by adults that moulted in the same area. Clearly, in future, as well as defining the limits of dispersal of moulting populations, the wildlife manager should give more attention to the first-year age class.

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MURRAY WILLIAMS, *Wildlife Service, Department of Internal Affairs, Private Bag, Wellington.*



SHORT NOTES

RARE TERNS UNDATED

Mention of the sighting of rare birds without a precise date can be very frustrating because the time of the occurrence may be highly significant and the occurrence itself may gain in significance as it slips further into the past.

Recently I have re-read a couple of tantalising references. Perhaps someone with curiosity, time and the instincts of a Sherlock Holmes would care to do a little 'digging.' There may be relevant diaries in public libraries or museums.

(a) Stead E. F. (1932 *Life Histories of N.Z. Birds*, p. 25) writes of *Chlidonias albistriata* [sic] "I have seen it on the Waiouru plains and have often wondered that it was not a more plentiful bird in that locality." Yet in 1879 (Buller W. L., *History of N.Z. Birds* 2nd edition, p. 72) Captain Mair discovered a flourishing colony on the sandbanks of the upper Whangaehu, south-east of Mt Ruapehu. Were some still nesting there when Stead noted their presence in that same locality? What was the year and the season of Stead's visit? Were the birds he saw descendants of those upon which Mair had reported? Were the