

Movements of banded Arctic waders to and from New Zealand

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ABSTRACT

Between 1979 and 1998, 6975 Arctic waders of seven species (mainly Lesser Knots *Calidris canutus* and Bar-tailed Godwits *Limosa lapponica*) were caught by the Miranda Banders and the New Zealand Wader Study Group near Auckland. Of these, 1375 were marked with a white leg-flag on the tibia to denote capture in New Zealand. Thirty-two Lesser Knots and three Bar-tailed Godwits had already been banded overseas, mainly in Australia. Another two Lesser Knots and two Bar-tailed Godwits banded overseas have been found dead in New Zealand. Up to 135 Lesser Knots, 34 Bar-tailed Godwits, 2 Turnstones and 2 Red-necked Stints (*Calidris ruficollis*) bearing Australian leg-flags, and 2 colour-banded Bar-tailed Godwits from Alaska have been seen in New Zealand.

Of those birds banded or leg-flagged in New Zealand, up to 21 Lesser Knots, up to 17 Bar-tailed Godwits, and two Turnstones (*Arenaria interpres*) have been recovered or seen in six overseas countries. One Turnstone banded in New Zealand was caught in Australia and then recaptured back at its original banding site.

The migration routes taken by Lesser Knots, Bar-tailed Godwits and Turnstones visiting New Zealand have been deduced from these band recovery data.

KEYWORDS: Arctic waders, Lesser Knot, Bar-tailed Godwit, Turnstone, migration, band recoveries

INTRODUCTION

Banding of Arctic waders in New Zealand started at Miranda on the Firth of Thames (37°10'S, 175°20'E), in 1979, when Dick Veitch set up the 'Miranda Banders' in association with the Miranda Naturalists' Trust. The first catch was a modest one, but soon good numbers of Arctic and New Zealand native waders were caught in cannon-nets and occasionally in mist-nets. The Miranda Banders suspended operations in mid-1982, but was re-established in late 1986 by Stephen Davies and Adrian Riegen with the encouragement of the Australasian Wader Study Group and Dick Veitch. Since December 1991, white leg-flags have been attached to the tibia of 1375 waders. In 1993, the Miranda Banders changed its name to the New Zealand Wader Study Group to reflect the banding efforts by the group at sites other than Miranda.

Most Arctic waders visiting New Zealand form part of the East Asian - Australasian Flyway populations. This flyway is one of the least understood of the world's flyways, especially since the proposed main staging site on the northern shores of the Yellow Sea has not been visited by ornithologists (Wilson & Barter 1998). Minton (1996a, 1998) has deduced the migration pathways taken by Red-necked Stints (*Calidris ruficollis*) and Curlew Sandpipers (*C. ferruginea*), respectively, between

TABLE 1 – The number of Arctic waders caught in the Auckland area in 1979-98, the number of sites they were caught at, and the mean number caught on the occasions when they were caught. The final column gives the number of birds leg-flagged (white) since December 1991.

Species	Number caught	Number of sites	Number of catches	Mean catch	Number flagged
Lesser Knot	5342	6	32	166.9	718
Bar-tailed Godwit	1514	7	26	58.2	593
Turnstone	92	3	11	8.8	64
Curlew Sandpiper	19	2	4	4.8	0
Red-necked Stint	3	1	2	1.5	0
Pacific Golden Plover	2	1	2	1.0	0
Terek Sandpiper	1	1	1	1.0	0

Australia and the Arctic. Wilson and Barter (1998) have proposed migration routes taken by Great Knots (*Calidris tenuirostris*), Lesser Knots (*C. canutus*) and Bar-tailed Godwits (*Limosa lapponica*) from Australia northwards to the Arctic. In this paper, I review recoveries of all banded Arctic waders from New Zealand, highlight significant recovery records, and deduce the migration routes to and from New Zealand for Lesser Knots, Bar-tailed Godwits and Turnstones (*Arenaria interpres*).

METHODS

Between 1979 and 1998, Arctic waders were caught on 41 occasions at seven sites in the Auckland region. The most frequently used sites were Jordan's farm on the south-eastern side of the Kaipara Harbour, and Miranda in the Firth of Thames.

Almost all birds were caught by cannon-nets while the birds were at their high tide roosts on farmland (Jordan's) or shellbanks (Firth of Thames sites). In summer and autumn (October-April), flocks of Arctic waders were targeted with a mean summer-autumn catch of 170 Arctic waders, mainly Lesser Knots and Bar-tailed Godwits. In the winter of 1980, 501 Arctic waders were caught incidentally while trying to capture Wrybills (*Anarhynchus frontalis*), and on 4 July 1992, 595 overwintering Lesser Knots were caught. A few birds were caught in mist-nets set at night over suitable feeding habitat at Miranda, Karaka (Manukau Harbour) and Tapora (Kaipara Harbour).

All birds were banded with a metal band bearing a unique number, except for a few which had already been banded overseas. Since 1991, 1375 birds (718 Lesser Knots, 593 Bar-tailed Godwits and 64 Turnstones) have had a small white leg-flag, made of stiff plastic (Darvic), attached to the tibia to allow instant identification that the bird had been in New Zealand. With this marking method it is difficult to determine how many individuals are resighted unless two or more birds bearing the same colour-flag are seen simultaneously, but the reporting rate far exceeds that from banding alone (Minton 1996b).

TABLE 2 – Summary of the movements of Arctic waders from and to New Zealand.

From NZ to:	[———Australian states———]										TOTAL
	Vic	WA	NT	Qld	NSW	Irian Jaya	China	Japan	Russia	Alaska	
Lesser Knot	1			3		2	10		3		19
Bar-tailed Godwit								1	2		3
Turnstone				1							1

To NZ from:	[———Australian states———]										TOTAL
	Vic	WA	NT	Qld	NSW	Irian Jaya	China	Japan	Russia	Alaska	
Lesser Knot	21	3	1	5	1						31
Bar-tailed Godwit	1			1	1					2	5
Turnstone				1							1

The birds were aged from plumage and state of moult or feather wear (Barter & Davidson 1990), and where possible they were sexed from measurements (Bar-tailed Godwits) or plumage (Turnstones). Except in a few very large catches, when some birds were aged, banded and released, biometrical data was collected on the length of exposed bill, wing, tail and tarsus, and weight of the bird.

RESULTS

Band recoveries

A total of 6975 Arctic waders of seven species were caught by the Miranda Banders or the New Zealand Wader Study Group in the Auckland region between 1979 and 1998 (Table 1). Almost all were Lesser Knots (77%), Bar-tailed Godwits (22%) or Turnstones (0.9%), with very small numbers of Curlew Sandpiper, Red-necked Stint, Pacific Golden Plover (*Pluvialis fulva*) and Terek Sandpiper (*Xenus cinereus*). A total of 33 of the waders had already been banded overseas, and 23 of the birds have since been recovered overseas, including a Turnstone that was re-captured in Australia and then caught back in New Zealand (Table 2).

Of the 5342 Lesser Knots handled, 30 had already been banded in Australia. Two other Australian-banded Lesser Knot have been found dead in New Zealand, a bird found dead near Karaka (Manukau Harbour) and one in the Kaipara Harbour. Nineteen (0.35%) of the Lesser Knots banded in New Zealand have been recovered overseas: ten in China, four in Australia, three in Russia, and two in Indonesia. Full details of each banded bird is found in Appendix 1a.

Two of the 1514 Bar-tailed Godwits handled had already been banded in Australia. In addition, a Bar-tailed Godwit banded at Nudgee Beach, Queensland, was found dead on the Tamaki Estuary after hitting powerlines, and a Bar-tailed Godwit banded in the Pribolof Islands, off western Alaska, was found dead in Tauranga Harbour.

Two birds from mainland Alaska have been reported from colour-band combinations; one was banded on the Seward Peninsula in western Alaska and seen in four of the five subsequent summers at Miranda, the other was banded at Lake Kgun on the Yukon delta and seen by me at Miranda, even though it was reportedly banded as a Hudsonian Godwit (*Limosa haemastica*). Three (0.2%) of the birds banded in New Zealand have been recovered overseas: two in Russia and one in Japan. Full details of these nine birds are given in Appendix 1b.

One (1%) of the 92 Turnstones handled was later caught in Queensland, but then recaptured back at its banding site at Miranda (Appendix 1c).

Leg-flag sightings

Of the 718 Lesser Knots leg-flagged in New Zealand since December 1991, three (0.4%) have been seen overseas; one at Altona Beach, Victoria, in March, and two in South Korea in May. Up to eleven, but probably nine (1.5%) of the 593 leg-flagged Bar-tailed Godwits have been seen overseas. Six records are from Kyushu in southern Japan and may involve multiple sightings of the same bird: Ariaka Sea (32° 50'N, 130° 50'E) on 1 April 1992, Hakata Bay (33° 40'N, 130° 25'E) on 17 April 1995, Sone (33° 55'N, 130° 55'E) on 1 May 1995 and 7 May 1998; Ganossa, in Hakata Bay, on 6 April 1996; and Nakatsu (33° 36'N, 131° 13'E) on 29 April 1998. Five sightings, probably of three individuals, have been reported from South Korea: Kanghwa Island (37° 35'N, 126° 25'E) on 18 and 23 April and 9 May 1998, Namyang Bay (37° 05'N, 126° 45'E) on 25 April 1998, and at Aphaedo Mokpo (34° 50'N, 126° 30'E) on 4 May 1998. One white-flagged Turnstone was seen at Dongjin Estuary, South Korea (37° 25'N, 126° 44'E) on 5 September 1997.

It is difficult to determine the number of leg-flagged individuals seen in New Zealand because many birds carry the same flag colour. There have been 91 sightings of Lesser Knots throughout New Zealand that were marked in Victoria (orange), including one at the Chatham Islands (43° 45'N, 176° 27'W) in February 1998, 19 sightings of Lesser Knots marked in north-western Australia (yellow), including one at the Chathams in February 1998, and 15 sightings of Lesser Knots marked in Queensland (green). Two leg-flagged Turnstones have been seen in New Zealand; one from Queensland and one from Victoria. At least two individual Red-necked Stints leg-flagged in Victoria have been seen 13 times over five years at Lake Ellesmere (Minton 1996a).

DISCUSSION

The following discussion draws the band recovery and leg-flag sighting data together to deduce the likely migration routes and strategies used by Lesser Knots and Bar-tailed Godwits coming to (Fig. 1) and departing from (Fig. 2) New Zealand.

Lesser Knot

About 59,000 Lesser Knots visit New Zealand each year (Sagar *et al.* 1999). This represents about 20-25% of the East Asian - Australasian Flyway population (Watkins 1993). The subspecies *rogersi* which visits Australasia breeds on the Chukotski Peninsula of eastern Siberia (Heather & Robertson 1996).

Juveniles

About 6000 birds overwinter in New Zealand (Sagar *et al.* 1999) and many also stay on wintering grounds in Australia throughout the Northern Hemisphere summer. These are mostly first and second-year birds (Higgins & Davies 1996).

Of the 1881 new Lesser Knots banded in Victoria between 1975 and 1996, 21 have been recaptured in New Zealand, including birds 051-08574 and 051-08762 banded as juveniles (1st-year), which are now the two oldest Lesser Knots recorded in Australasia at 16 and 14 years respectively. Thirteen other Lesser Knots were banded as first- or second-year birds in Australia and five of them were recaptured in New Zealand in the same non-breeding season as they were banded in. Some of these Lesser Knots were in suspended moult when caught in Victoria and were heavier than adult birds in active moult, which indicates that they were planning to move on (Barter *et al.* 1988). To date, only one of the 5220 new Lesser Knots banded in New Zealand has been recovered in Victoria. This strongly suggests that few birds return to Victoria once they have finally reached New Zealand (Clive Minton, pers. comm.), and so they probably become regular migrants between New Zealand and the Arctic. For example, bird 051-15251 was caught as a juvenile in Victoria in November 1986, recaptured at Jordan's in February 1989 and then recaptured again at Miranda almost two years later, presumably after two return trips to the Arctic.

Two birds banded in south-western Australia in late March as second-year birds (still in moult and so unlikely to return to the Arctic) presumably made their way across southern Australia or directly to New Zealand (5250 km) where they were caught 14 months later. On 6 January 1999, two Lesser Knots (one aged as a second-year bird and the other not aged) were caught at Miranda, having been banded on Eighty Mile Beach in north-western Australia in August 1998. These birds may have used the same route or perhaps flown directly to New Zealand (5000 km), as none of many thousands of Lesser Knots banded or leg-flagged in north-western Australia has yet been seen in Queensland or New South Wales and only two have been seen in Victoria (Clive Minton, pers. comm.), although roosting flocks of Lesser Knots in eastern Australia are probably not so regularly watched as they are in New Zealand.

One of the five birds recaptured from Queensland (051-91407) was caught only six weeks later in New Zealand when it was identified as a second-year bird; it had probably spent its first winter in Moreton Bay and then moved on with migrants passing through Queensland on their way to New Zealand.

Southward migration (August - November)

After breeding in far-eastern Siberia, the birds head south. Some stop on the Tugur Peninsula or northern part of Sakhalin Island on the south-western shores of the Sea of Okhotsk (54°N 140°E), as shown by recoveries of C-30036 and C-31115 in July and August – C 17481 was recovered from the same region, but no month was given. These recoveries, from what are known to be a major staging area for the species immediately after breeding (Wells and Mundkur 1996), were during the latter part of the breeding season and so could have been failed breeders returning south, or perhaps females, which leave the breeding grounds earlier than males or chicks (Higgins & Davies 1996).

To date, there have been no other recoveries of New Zealand-banded Lesser Knots between Russia and Australia; however, this is likely to be too great a distance (8-9000 km) to cover in a single flight, and so they probably stop on the shores of the Yellow Sea between China and Korea (2-3000 km away) to refuel. The next leg is a long one of 5-7000 km to Irian Jaya, the Northern Territory (051-56795), perhaps north-western Australia, or even to the Gulf of Carpentaria, a large area which is known to hold up to 79,000 Lesser Knots (Watkins 1993), but which is difficult to access and work. Some birds probably then fly directly to New Zealand (4-5000 km) without an extra stop, but some certainly go via eastern or southern Australia, where at least three adult New Zealand birds have been recaptured heading south (C-31444, C-45552 and C-49896). Other adults banded in Queensland, New South Wales and Victoria in spring or early summer have been recaptured in New Zealand, including at least three (051-15386, 051-15420 and 051-15556) caught within the same southern summer. Despite many thousands of Lesser Knots being banded in north-western Australia between Broome and Port Hedland, no New Zealand bird has yet been caught there.

Northward migration (March - May)

Most New Zealand birds leave during March (Battley 1999), flying north-westwards to Queensland and the southern coast of Irian Jaya, where they stop to refuel for several weeks in April. Recoveries that show this movement include C-31629 in Queensland, and C-22521 and C-45972 in April from the important wetland site of Wasur National Park near Merauke on the southern coast near the Papua New Guinea border (Wells and Mundkur 1996). Flight-range predictions calculated from pre-departure weights, fat and protein composition of birds recorded in New Zealand, and their likely flight speeds and routes given the meteorological conditions in the Tasman Sea at the time of departure suggest that Lesser Knot can fly directly from New Zealand to northern Queensland or Irian Jaya (Battley 1997).

Between Irian Jaya and eastern China, Lesser Knots are scarce, indicating that they probably fly that stage (5000 km mainly over ocean) non-stop. This means that they can reach the north-eastern coast of China or the Korean Peninsula from New Zealand with just one refuelling stop. Landfall in China appears to be near

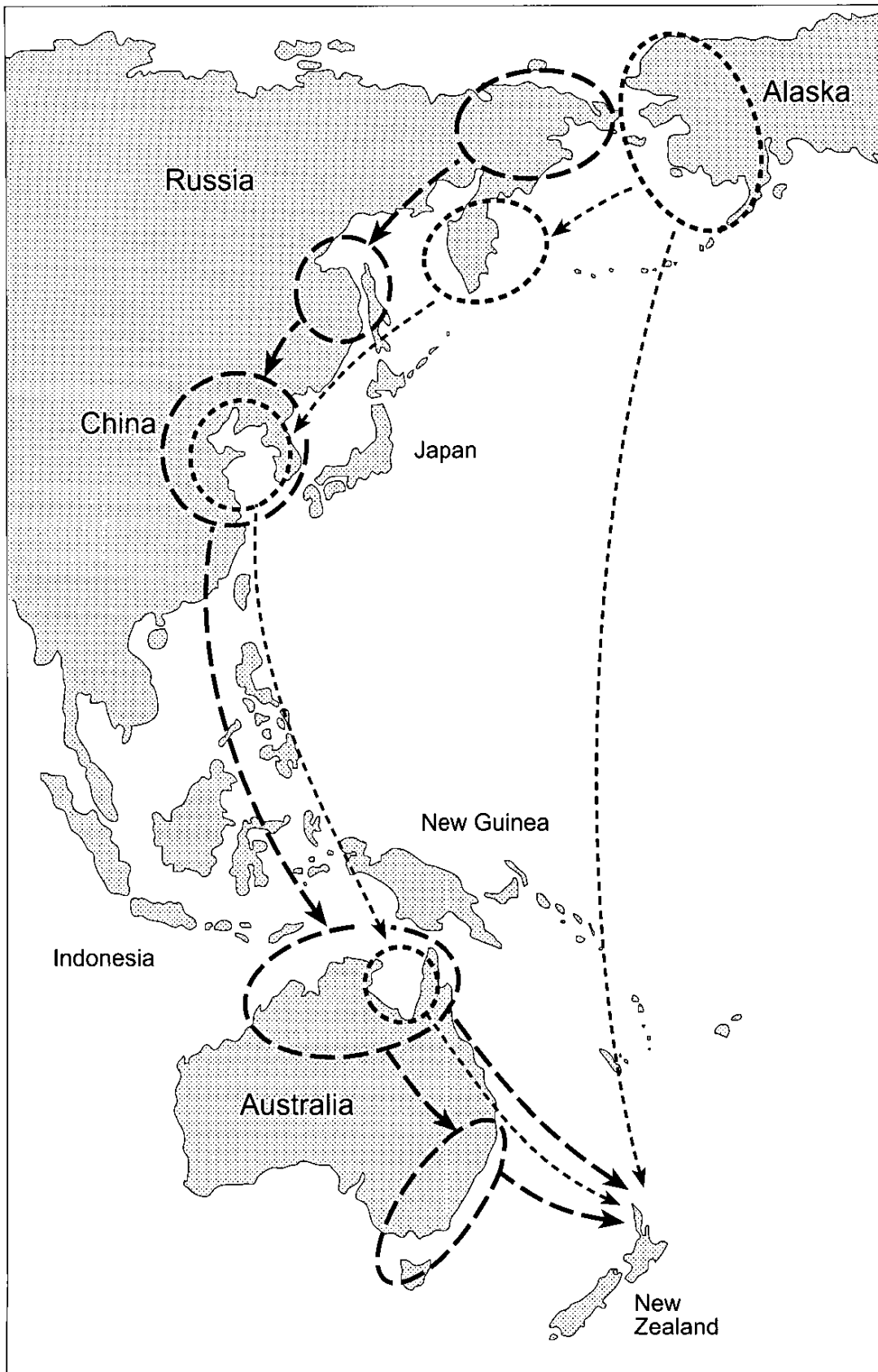


FIGURE 1 – The proposed southward migration routes from the Arctic to New Zealand taken by Lesser Knots (dashed arrows and rings) and Bar-tailed Godwits (dotted arrows and rings) between the Arctic and New Zealand in August - October.

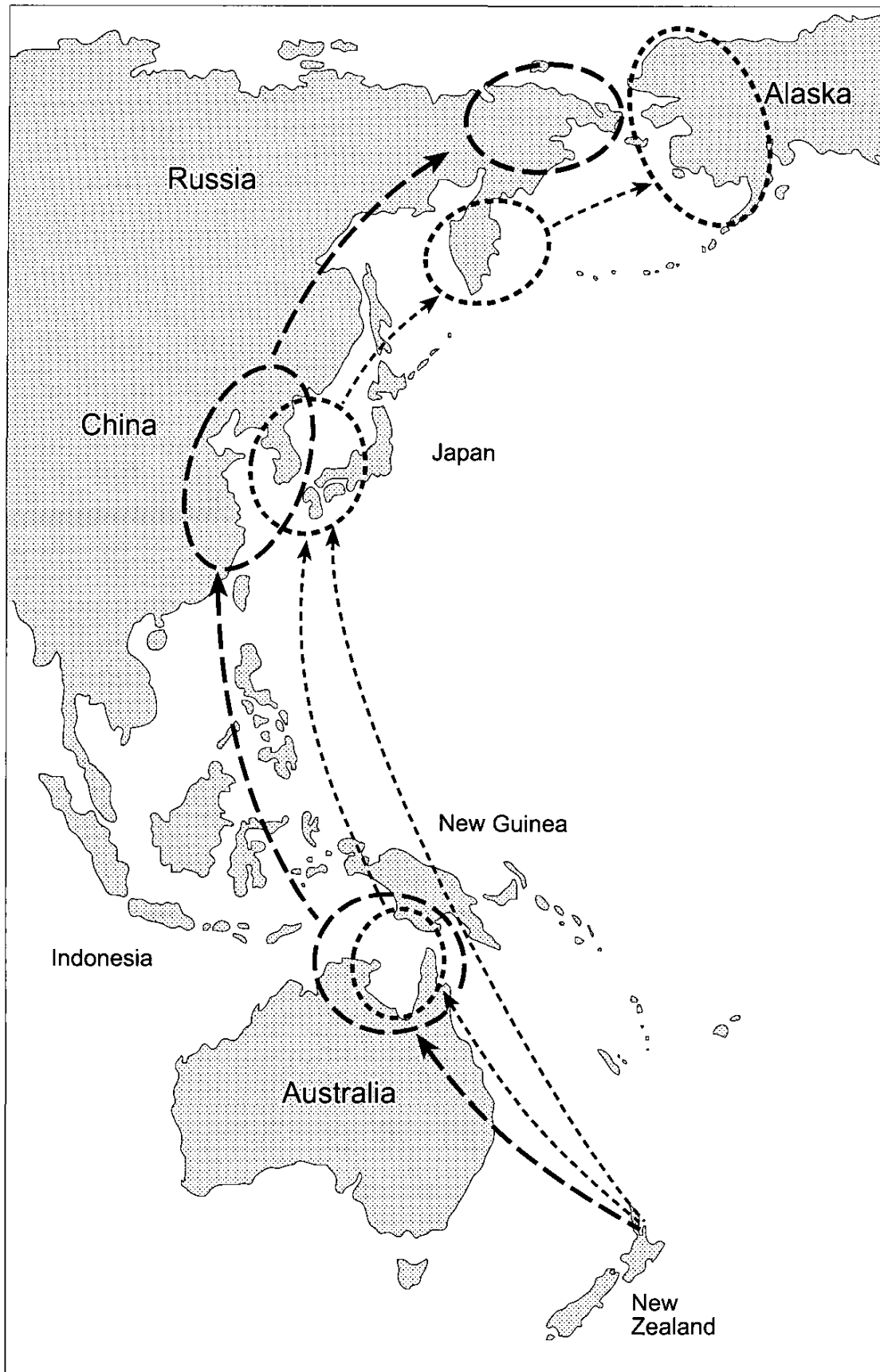


FIGURE 2 – The proposed northward migration routes from New Zealand to the Arctic taken by adult Lesser Knots (dashed arrows and rings) and Bar-tailed Godwits (dotted arrows and rings) in March - May.

Shanghai or further north as evidenced by ten recoveries from eastern China in April and May. The Shanghai area (31°N 122°E) has proven to be an important staging and refuelling area for many wader species travelling northwards from Australasia to Siberia, but birds seem to pass through quickly (Wilson & Barter 1998), and it is not such an important site on their southward journey. The extensive mudflats on the northern shores of the Yellow Sea, between China and the Korean Peninsula, are believed to be the most important staging site on the East Asian - Australasian Flyway, but the area is little known to ornithologists except around the mouth of the Yellow River in China (Wilson & Barter 1998). At least some Lesser Knots from New Zealand make landfall on the Korean Peninsula, as evidenced by the sightings of white-flagged birds in South Korea in May 1997 and May 1998.

Birds probably proceed from China-Korea directly to their breeding grounds on the Chukotski Peninsula of eastern Siberia. They arrive on their breeding grounds in late May (Higgins & Davies 1996) about 8-10 weeks after leaving New Zealand.

Synthesis

Some birds stay in Australia for their first winter but then move on to New Zealand at the beginning of their second year, after which they become regular migrants between New Zealand and the Arctic. Most of these birds have come from Victoria, but others from Western Australia, Northern Territory and Queensland are consistent with this pattern.

Lesser Knots apparently migrate to New Zealand in four or five flights: a short one stopping at the Sea of Okhotsk (2-3000 km), a short one (2-3000 km) to northeastern China or Korea, a long flight (5-7000 km) to Irian Jaya or northern Australia, and either a long flight (4-5000 km) to New Zealand, or a medium one (2-3000 km) to eastern Australia before a medium flight (2-2500 km) across the Tasman Sea.

Lesser Knots return from New Zealand to Siberia in three long flights over an 8-10 week period: firstly 4-5000 km to southern Irian Jaya and probably to the Gulf of Carpentaria, then 5-7000 km to north-eastern China or Korea, then 5000 km to Siberia.

Bar-tailed Godwit

About 102,000 Bar-tailed Godwit visit New Zealand annually (Sagar *et al.* 1999). This is approximately 25-30% of the East Asian - Australasian Flyway population (Watkins 1993). The main breeding grounds are disjunct, one in western Alaska and the other in Siberia near the Lena River delta. About 15,000 Bar-tailed Godwits overwinter in New Zealand each year (Sagar *et al.* 1999).

Even though there are far fewer band recoveries than for Lesser Knots, Bar-tailed Godwit travelling to and from New Zealand appear to follow a migration route slightly to the east of that taken by Lesser Knots, although some do pass

through Victoria en route to New Zealand. Three birds banded in Alaska have been found in New Zealand. Records from Russia are from the Kamchatka Peninsula rather than further west in the Sea of Okhotsk, suggesting that most of our birds may come from the Alaskan population. Sightings from Japan and South Korea also suggest a more easterly route than that taken by Lesser Knots through China. The wide distribution of Bar-tailed Godwits summering on islands in the south-western Pacific (e.g. Child 1979, Miles 1982, Skinner 1983) suggests that some Bar-tailed Godwits may use a route that takes them well to the east of Australia and Papua New Guinea, and it is possible that some New Zealand birds may follow that route.

Juveniles

Compared with Lesser Knots, only a small percentage of Bar-tailed Godwits spend their first winter in Australia before moving to New Zealand. Between 1975 and 1996 the Victorian Wader Study Group banded 1476 Bar-tailed Godwit (Clive Minton pers. comm.), and so far, the only clear evidence that any first-year birds overwintering in Australia subsequently move to New Zealand is the capture of a second-year bird (071-83884) in Victoria in autumn that was later caught in New Zealand. Birds of unknown age (081-35529 and 072-41326) banded in New South Wales and Queensland respectively, at times of year when waders are generally settled on wintering or summering sites, have later been found in New Zealand, and so may have been first-year birds when initially captured.

Southward migration (August - November)

The route used from Alaska to New Zealand is a mystery. The only record of a banded bird on southward migration is Y-3844 that was shot at Lake Bolshoe on Kamchatka Peninsula in early October, a time when some adults have already appeared in New Zealand. From the lack of sightings in well-watched areas of Japan and South Korea in August-October it appears that these are not important staging areas, and so it seems more likely that some Bar-tailed Godwits visit the estuaries in the Yellow Sea region between China and the Korean Peninsula, before heading southwards to stopover perhaps in Irian Jaya, the Gulf of Carpentaria or eastern Australia. Some of the leg-flagged birds of unknown age from Victoria that have been seen in New Zealand may have been adults on passage, but they were more likely juveniles (see above). It is possible that some or many birds migrate directly south from Alaska, through the Pacific. Large numbers of Bar-tailed Godwits remain in Alaska in early September (Robert Gill, pers. comm.) and this seems too late for them to then take a circuitous route to New Zealand via eastern Asia in time to arrive in late September or early October, as most birds do (Heather & Robertson 1996). However, no influx of passage migrants has yet been recorded from islands in the southern Pacific, where the monthly pattern of numbers seems much the same as that recorded in New Zealand estuaries (Miles 1982, Skinner 1983)

Northward migration (March - May)

Bar-tailed Godwits leave New Zealand in March and early April (Heather & Robertson 1996) and arrive in Alaska in May and early June. Our birds have not been recorded overseas until 1 April, and generally do not reach Asian stop-over sites until mid April - early May, which means that some must make a stop-over at an unknown destination (perhaps northern Australia or New Guinea) en route to Asia in late March - early April. Two banded birds (Y-5776 and Y-5882) have been recovered in May on northward migration, on Bering Island, Kamchatka, and in Japan respectively. Up to six leg-flagged birds have been seen in southern Japan in April or early May, along with 28 sightings of leg-flagged birds from Australia. Five leg-flag sightings (of probably three individuals) have been reported from South Korea between mid-April and early May, along with 37 sightings of Bar-tailed Godwits from Australia; however none has been reported from China, compared with 21 sightings of leg-flagged Australian birds (Wilson & Barter 1998). This supports the hypothesis of an Alaskan origin for most New Zealand birds, compared with a mixture of Siberian and Alaskan birds that visit Australia.

Synthesis

Although the evidence is scanty compared with that for the Lesser Knot, and there are still many important gaps in the data, I conclude from the above evidence that a few juvenile Bar-tailed Godwits overwinter in Australia before moving on to settle as regular New Zealand migrants. Adult Bar-tailed Godwits probably migrate the 11 000 km to New Zealand from their breeding grounds in western Alaska directly over the Pacific, or perhaps some travel the 14 500 km via one or two staging areas in north-eastern Asia and northern or eastern Australia. The return route is probably via northern Australia or New Guinea, and northern Asia (especially estuaries in Japan, Korea and the Kamchatka Peninsula), rather than directly across the Pacific, because the Asian route provides safe stop-overs in case feeding conditions are unsuitable on their breeding grounds because of a late spring thaw (Barter 1989).

Turnstone

About 5000 Turnstones visit New Zealand each year (Sagar *et al.* 1999) and this represents about 15-20% of the East Asian - Australasian Flyway population (Watkins 1993).

Only one white-flagged bird has been seen in Asia on its way to the high Arctic breeding grounds used by Turnstones (Heather & Robertson 1996), and it is difficult to draw many conclusions on the migration route of this species. However, bird D-99806 was a rare double catch, made even more remarkable when one considers that at the time only 18 Turnstones had been banded in New Zealand, and only a few more had been handled in Queensland (Peter Driscoll, pers. comm.). It, and a sighting of a Victorian-flagged bird shows that at least some Turnstones

migrate through eastern Australia on their southward journey. When D-99806 was first caught at Miranda on 28 October 1991, it weighed 94 g; when recaptured and leg-flagged in Moreton Bay, Queensland, on 19 September 1993 it weighed 98g, and it was the same weight 28 days later when recaptured at Miranda on 17 October. These are all low weights for the species (Higgins & Davies 1996) and indicate that the bird had only recently arrived on site each time - we know from field observations at Miranda that almost certainly the same bird (bearing a green leg-flag) was first seen on 15 October 1993, two days before it was recaptured. What was presumably the same bird was again seen at Miranda on 19 October 1996.

Conclusions

Understanding wader migration and movements from banding is a slow process and, as can be seen, relies heavily on field observers and other people catching waders, either fellow banders or hunters. Often these people do not operate in the most important areas used by waders and language creates a major impediment to communication of recovery data. The East Asian - Australasian Flyway is one of the least understood of the world's flyways, especially since the probable main final staging site on the northern shores of the Yellow Sea (Wilson & Barter 1998) has not been visited by ornithologists. Good progress is, however, being made with increased reports in recent years of banded or leg-flagged birds from Japan, South Korea and China. The Australasian Wader Study Group, in particular, is very active; they support people from East Asian countries to participate in wader banding programmes in Australia, and have held training courses in China (and hopefully soon in other East Asian countries) which should result in more field observers in those countries. This should lead to more recoveries and sightings of banded or leg-flagged birds. Also, miniaturisation of radio-telemetry equipment has now made it possible to attach satellite transmitters to waders, albeit to larger species at this stage - the first such study was started in 1997 by the Queensland Wader Study Group with Eastern Curlews (*Numenius madagascariensis*; 900g).

Many more Arctic waders need to be banded in New Zealand for the migration routes and strategies to be fully understood. Although New Zealand is a signatory to the RAMSAR convention, to date there has been no governmental support to gather the type of vital data reported here on the likely routes taken and particular wetlands used as stopover sites by migratory waders that visit New Zealand. For its part, the New Zealand Wader Study Group will continue to band Arctic waders in the Auckland region with the goal of improving our understanding of wader populations and their movements. We hope that banding programmes will soon start in other parts of the country.

ACKNOWLEDGEMENTS

I am very grateful to all New Zealand Wader Study Group volunteers who have helped over the years. The Miranda Naturalists' Trust has provided financial and moral support. The Ornithological Society of New Zealand paid for new cannon-nets through its Projects Assistance Fund. Dick Veitch supplied all the early Miranda Banders data. Various landowners, but especially the Jordan families and the late Allan Lane allowed unlimited access to their farms. Mark Barter (AWSG), Clive Minton (VWSG) and Peter Driscoll (QWSG) provided technical help and freely shared their banding data. The Banding Office of the Department of Conservation processed many of the band recoveries. Stephen Davies shared the running of the Miranda Banders and the New Zealand Wader Study Group, and helped to prepare this paper. Two anonymous referees and Hugh Robertson helped to shape this paper.

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APPENDIX 1

Band	Place	Lat & Long	Date	Age	Observer	Status	Dist. (km)	Time	Min. age	
a - LESSER KNOT										
Between Victoria and New Zealand - 21										
051-02342	Queenscliff Jordan's, Kaipara	38 10S 144 40E 36 30S 174 20E	31.10.82 23.02.89	Ad	VWSG Miranda Banders	Caught/released	2613	6y 04 m	9y	
051-08574 C-54303	Queenscliff Miranda, Firth of Thames	38 10S 144 40E 37 10S 175 10E	05.04.81 20.10.96	1st	VWSG NZWSG	Caught/released	2687	15y 06m	16y	
051-08762 C-54301	Stockyard Point Miranda, Firth of Thames	38 22S 145 32E 37 10S 175 10E	24.07.83 20.10.96	1st	VWSG NZWSG	Caught/released	2610	13y 03m	14y	
051-15251 C-45327	Queenscliff Jordan's, Kaipara Miranda, Firth of Thames	38 10S 144 40E 36 30S 174 20E 37 10S 175 10E	08.11.86 23.02.89 03.11.90	Juv	VWSG Miranda Banders Miranda Banders	Caught/released Caught/released	2613 103	2y 03m 1y 09 m	3y 4y	
051-15348	Werribee Jordan's, Kaipara	38 00S 144 30E 36 30S 174 20E	18.01.87 18.12.94	Juv	VWSG NZWSG	Caught/released	2613	7y 11m	7y	
051-15386	Queenscliff Jordan's, Kaipara	38 10S 144 40E 36 30S 174 20E	08.11.86 28.02.87	Ad	VWSG Miranda Banders	Caught/released	2613	0y 03m	3y	
051-15420	Queenscliff Jordan's, Kaipara	38 10S 144 40E 36 30S 174 20E	01.10.88 23.02.89	Ad	VWSG Miranda Banders	Caught/released	2613	0y 04m	3y	
051-15556	Queenscliff Jordan's, Kaipara	38 10S 144 40E 36 30S 174 20E	01.10.88 23.02.89	Ad	VWSG Miranda Banders	Caught/released	2613	0y 04m	3y	
051-16166	Queenscliff Jordan's, Kaipara	38 10S 144 40E 36 30S 174 20E	03.06.84 28.02.87	Juv	VWSG Miranda Banders	Caught/released	2613	2y 08m	3y	

APPENDIX 1 Cont'd

Band	Place	Lat & Long	Date	Age	Observer	Status	Dist. (km)	Time	Min. age
051-16176	Queenscliff Karakā, Manukau	38 10S 144 40E 37 00S 174 50E	03.06.84 19.05.85	Juv	VWSG A. Riegen	Found shot	2652	0y 11m	1y
051-18305	Queenscliff Jordan's, Kaipara	38 10S 144 40E 36 30S 174 20E	19.10.85 28.02.87	Ad	VWSG Miranda Banders	Caught/released	2613	1y 04m	4y
051-40690	Stockyard Point Jordan's, Kaipara	38 22S 145 32E 36 30S 174 20E	14.01.96 29.11.97	1st	VWSG NZWSG	Caught/released	2610	1y 10m	2y
051-42655	Yallock Creek Taramaire, Firth of Thames	38 13S 145 28E 37 09S 175 19E	12.01.91 04.07.92	Juv	VWSG Miranda Banders	Caught/released	2617	1y 06m	2y
051-42981	Stockyard Point Taramaire, Firth of Thames	38 22S 145 32E 37 09S 175 19E	11.08.91 04.07.92	2nd	VWSG Miranda Banders	Caught/released	2610	1y 05m	3y
051-42994	Stockyard Point Jordan's, Kaipara	38 22S 145 32E 36 30S 174 20E	11.08.91 22.12.91	2nd	VWSG NZWSG	Caught/released	2547	0y 04m	2y
051-53018	Stockyard Point Taramaire, Firth of Thames	38 22S 145 32E 37 09S 175 19E	11.08.91 04.07.92	2nd	VWSG Miranda Banders	Caught/released	2610	1y 05m	3y
051-59681	Stockyard Point Taramaire, Firth of Thames	38 22S 145 32E 37 09S 175 19E	04.07.92 18.12.93	1st	VWSG NZWSG	Caught/released	2610	1y 05m	3y
051-60302	Queenscliff Jordan's, Kaipara	38 10S 144 40E 36 30S 174 20E	18.10.97 29.11.97	3+	VWSG NZWSG	Caught/released	2687	0y 01m	3y
051-60350	Queenscliff Jordan's, Kaipara	38 10S 144 40E 36 30S 174 20E	18.10.97 29.11.97	3+ 2nd	VWSG NZWSG	Caught/released	2687	0y 01m	2y
061-31435	Werribee Jordan's, Kaipara	38 00S 144 30E 36 30S 174 20E	27.01.79 02.03.80	Juv	VWSG Miranda Banders	Caught/released	2613	1y 02m	1y

NOTORNIS 46

BANDED ARCTIC WADERS

APPENDIX 1 Cont'd

Band	Place	Lat & Long	Date	Age	Observer	Status	Dist. (km)	Time	Min. age
Between Western Australia and New Zealand - 3									
050-10307	Pelican Pt, Perth Okaro Bay, Kaipara	31 50S 115 40E 36 16S 174 06E	30.10.73 20.03.76	1+	B. Lane B.S. Cooksey	Dead	5330	2y 05m	3y
051-28849	Albany Taramaire, Firth of Thames	35 05S 117 53E 37 09S 175 19E	16.03.91 04.07.92	2+	V. Smith Miranda Banders	Caught/released	5082	1y 04m	3y
051-28862	Albany Taramaire, Firth of Thames	35 05S 117 53E 37 09S 175 19E	16.03.91 04.07.92	2+	V. Smith Miranda Banders	Caught/released	5082	1y 04m	3y
Between Northern Territory and New Zealand - 1									
051-80879	Finniss Beach Jordan's, Kaipara	12 53S 130 19E 36 30S 174 20E	14.09.95 26.10.96	2+	R.E. Chatto NZWSG	Caught/released	5104	1y 01m	2y
Between Queensland and New Zealand - 5									
051-31296	Brisbane River Jordan's, Kaipara	27 22S 153 10E 36 30S 174 20E	21.10.90 07.03.93	2+	QWSG NZWSG	Caught/released	2245	2y 05m	4y
051-56717	Brisbane River Jordan's, Kaipara	27 22S 153 10E 36 30S 174 20E	21.10.90 07.03.93	2+	QWSG NZWSG	Caught/released	2245	2y 05m	4y
051-56741 C-46153	Moreton Bay Taramaire, Firth of Thames Miranda, Firth of Thames	27 22S 153 09E 37 09S 175 19E 37 10S 175 10E	17.11.90 04.07.92 20.10.96	Juv	P. Driscoll Miranda Banders Miranda Banders	Caught/released Caught/released	2342 0	1y 08m 4y 03m	2y 6y
051-56795	Nudgee Beach, Brisbane Miranda, Firth of Thames	27 20S 153 05E 37 10S 175 10E	03.05.93 20.10.96	1+	QWSG NZWSG	Caught/released	2352	3y 05m	3y
051-91407	Nudgee Beach, Brisbane Miranda, Firth of Thames	27 20S 153 05E 37 10S 175 10E	01.09.96 20.10.96	1+ 2	QWSG NZWSG	Caught/released	2352	0y 1m	2y

APPENDIX 1 Cont'd

Band	Place	Lat & Long	Date	Age	Observer	Status	Dist. (km)	Time	Min. age
Between New South Wales and New Zealand - 1									
051-48030	Kooragang Island Jordan's, Kaipara	32 52S 151 46E 36 30S 174 20E	04.12.88 22.12.91	1+	J.W. Hardy NZWSG	Caught/released	2106	3y 00m	3y
Between New Zealand and Victoria - 1									
C-49896	Taramaire, Firth of Thames Queenscliff	37 09S 175 19E 38 10S 144 40E	20.10.96 18.10.97	Unk	NZWSG VWSG	Caught/released	2687	1y 00m	1y
Between New Zealand and Queensland - 3									
C-31444	Jordan's, Kaipara Bribie I., Moreton Bay	36 30S 174 20E 27 03S 153 08E	23.02.89 17.10.93	Ad	Miranda Banders QWSG	Caught/released	2260	4y 08m	6y
C-31629	Miranda, Firth of Thames Fraser Island	37 10S 175 10E 25 30S 152 40E	17.08.80 31.03.81	Ad	Miranda Banders Sutton	Dead, hit light	2491	0y 07m	3y
C-45552	Miranda, Firth of Thames Nudgee Beach, Brisbane	37 10S 175 10E 27 20S 153 05E	03.11.90 04.09.93	Ad	Miranda Banders QWSG	Caught/released	2260	2y 10m	4y
Between New Zealand and Irian Jaya, Indonesia - 2									
C-22521	Miranda, Firth of Thames Merauke	37 10S 175 10E 08 40S 140 50E	08.06.80 04.04.82	Ad	A. Mahusa	Alive & well	4679	1y 10m	4y
C-45972	Miranda, Firth of Thames Wasur National Park	37 10S 175 10E 08 12S 140 20E	03.11.90 mid.04.90	Ad	via I. Craven (WWF)	Taken for food	4770	1y 05m	3y

NOTORINIS 46

BANDED ARCTIC WADERS

APPENDIX 1 Cont'd

Band	Place	Lat & Long	Date	Age	Observer	Status	Dist. (km)	Time	Min. age
Between New Zealand and China - 10									
C-31141	Jordan's, Kaipara Chongming Dao, Shanghai	36 30S 174 20E 31 40N 121 50E	28.02.87 00.05.87	Ad	Miranda Banders China NBBC	Caught/released	9313	0y 03m	2y
C-31161	Jordan's, Kaipara Maiogang, Shanghai	36 30S 174 20E 30 52N 121 52E	28.02.87 00.04.94	Ad	Miranda Banders Wang Tain Hou	Taken for food	9350	7y 02m	8y
C-31498	Jordan's, Kaipara Shanghai Region	36 30S 174 20E 30 40N 121 20E	23.02.89 16.04.90	Ad	Miranda Banders Tian Hou & Sixian	Killed	9259	1y 02m	3y
C-45638	Miranda, Firth of Thames Maiogang, Shanghai	37 10S 175 10E 30 52N 121 52E	03.11.90 16.04.92	Ad	Miranda Banders Waterbird & Flyway	Taken for food	9350	1y 05m	3y
C-45844	Miranda, Firth of Thames Yangtze River, Shanghai	37 10S 175 10E 30 50N 121 50E	03.11.90 14.04.91	Ad	Miranda Banders E China WG	Taken for food	9390	0y 05m	2y
C-45131	Jordan's, Kaipara Jiuduansha, Shangahi	36 30S 174 20E 31 10N 122 00E	23.02.89 17.04.98	Ad	Miranda Banders ECNU, China	Hunted	9313	9y 02m	11y
C-46086	Jordan's, Kaipara Chongming Dao, Shanghai	36 30S 174 20E 31 40N 121 50E	22.12.91 10.04.95	Ad	NZWSG Qian Fawen	Taken for food	9270	3y 04m	5y
C-46818	Miranda, Firth of Thames Jiuduansha, Shangahi	37 10S 175 10E 31 10N 122 00E	04.07.92 17.04.98	Unk	Miranda Banders ECNU, China	Hunted	9313	5y 09m	6y
C-49403	Jordan's, Kaipara Jiuduansha, Shangahi	36 30S 174 20E 31 10N 122 00E	07.03.93 17.04.98	Ad	NZWSG ECNU, China	Hunted	9313	5y 01m	8y
C-???39	Auckland area Guoyuan, Shangahi	37 00S 175 00E 30 52N 121 50E	00.00.00 17.04.98	Unk	NZWSG ECNU, China	Hunted	9300	??y ??m	?y

APPENDIX 1 Cont'd

Band	Place	Lat & Long	Date	Age	Observer	Status	Dist. (km)	Time	Min. age
Between New Zealand and Russia - 3									
C-17481	Jordan's, Kaipara Tugur Peninsula	36 30S 174 20E 54 11N 137 20E	02.03.80 00.00.85	1+	Miranda Banders Acad. of Science	Shot	10860	5y 00m	5y
C-30036	Jordan's, Kaipara North Sakhalin Island	36 30S 174 20E 53 40N 142 40E	28.02.87 24.08.90	Ad	Miranda Banders P.S. Tomkovich	Shot	10490	3y 06m	5y
C-31115	Jordan's, Kaipara Tugur Peninsula	36 30S 174 20E 54 00N 137 20E	28.02.87 10.07.90	Ad	Miranda Banders P.S. Tomkovich	Shot	10690	5y 05m	6y
b - BAR-TAILED GODWIT									
Between Victoria and New Zealand - 1									
071-83884 Y-4462	Corner Inlet Jordan's, Kaipara	38 42S 146 23E 36 30S 174 20E	24.03.92 23.10.94	2nd	VWSG Miranda Banders	Caught/released	2471	2y 07m	3y
Between Queensland and New Zealand - 1									
072-41326	Nudgee Beach, Brisbane Tamaki Estuary	27 20S 153 05E 36 55S 174 51E	03.05.93 07.03.94	1+	QWSG via C.R. Veitch	Killed/powerlines	2220	0y 10m	1y
Between New South Wales and New Zealand - 1									
081-35529 Y-3905	Kooragang Island Miranda, Firth of Thames	32 52S 151 46E 37 10S 175 10E	04.12.88 03.11.90	1+	J.W. Hardy Miranda Banders	Caught/released	2191	1y 11m	2y

NOTORNIS 46

BANDED ARCTIC WADERS

APPENDIX 1 Cont'd

Band	Place	Lat & Long	Date	Age	Observer	Status	Dist. (km)	Time	Min. age
Between Alaska and New Zealand - 3									
635-26006	St George Is, Pribilof Tauranga Harbour	56 30N 169 20W 37 33S 175 57E	31.05.66 20.10.67	Ad	US Nat Museum F.H. Rowson	Skeleton	10700	1y 05m	3y
794-34919	Seward Peninsula Miranda, Firth of Thames	65 27N 164 42W 37 10S 175 10E	16.06.90 31.12.94	Ad	R. Gill P. Agnew	Band sighting	11560	4y 06m	6y
	Miranda, Firth of Thames	37 10S 175 10E	31.12.96		P. Agnew	Band sighting	0	2y 00m	8y
	Miranda, Firth of Thames	37 10S 175 10E	26.01.98		A. Habraken	Band sighting	0	1y 01m	9y
	Miranda, Firth of Thames	37 10S 175 10E	17.10.98		A. Habraken	Band sighting	0	0y 09m	10y
1393-18532	Kgun Lake, Yukon Delta Miranda, Firth of Thames	63 00N 164 00W 37 10S 175 10E	06.08.93 16.10.93	Ad	US Fish & Wildlife A. Riegen	Band sighting	11500	0y 02m	2y
Between New Zealand and Japan - 1									
Y-5882	Jordan's, Kaipara Akita Prefecture, Honshu	36 30S 174 20E 39 27N 140 34E	18.12.94 24.05.96	Ad	NZWSG A. Mitamura	Killed/powerlines	9040	1y 05m	4y
Between New Zealand and Russia - 2									
Y-3844	Jordan's, Kaipara Bering Island, Kamchatka	36 30S 174 20E 56 00N 167 00E	27.12.88 12.05.91	Ad	Miranda Banders P.S. Tomkovich	Shot	10320	2y 05m	5y
Y-5776	Jordan's, Kaipara L. Bolshoe, Kamchatka	36 30S 174 20E 52 30N 156 23E	21.12.91 02.10.92	Ad	NZWSG N. Gerasimov	Shot	9940	0y 10m	4y
c - TURNSTONE									
Between New Zealand and Queensland and return - 1									
D-99806	Miranda, Firth of Thames St Helena Is, Moreton Bay Miranda, Firth of Thames	37 10S 175 10E 27 23S 153 13E 37 10S 175 10E	28.10.91 19.09.93 17.10.93	Ad	Miranda Banders QWSG NZWSG	Caught/released Caught/released	2220 2220	1y 11m 0y 01m	4y 4y

142

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NOTORNIS 46