Ecology of migrant shorebirds in New Zealand, focussing on Farewell Spit, North-West Nelson

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Dedicated to the memory of R. B. (Dick) Sibson (1911-1994),
who did so much to encourage so many in the
study of waders in New Zealand

ABSTRACT

Migratory shorebirds are a dynamic component of New Zealand's coastal fauna, alternating between distant breeding and non-breeding grounds. The Red Knot *Calidris canutus*, Bar-tailed Godwit *Limosa lapponica* and Pied Oystercatcher *Haematopus ostralegus finschi* were studied on Farewell Spit, North-West Nelson. The first two species breed in the Arctic and migrate to New Zealand for the non-breeding season. Over the southern summer they experience low thermostatic costs and generally improving prey conditions over the summer. Oystercatchers are resident over autumn and winter, so experience rising costs and declining prey quality in some species. One bivalve species, *Macomona liliana*, shows seasonal depth changes in the sediment, and so is largely inaccessible even to a long-billed bird such as the oystercatcher.

Despite this, oystercatchers feed for less time than is available, and achieve intake rates sufficient to cover estimated needs. The energy needs of the Arctic waders rise as they prepare to migrate, and they achieve at least part of this by increasing the duration of feeding. Knots during spring tides in the premigratory period feed for the entire low-water period. Godwits are apparently less stressed, underutilising nocturnal feeding opportunities over summer. They are thought to increase feeding time by using this night-time feeding.

The high energy demands for migrating birds come from the need to deposit nutrients for migration, and knots around the Auckland region are estimated to increase in mass from 115 to 185 g prior to migration. Fat deposition is not the only physiological preparation, however, and a sample of knots shot from Northland (illegally, recovered by DoC) revealed complex interactions between organs. Large amounts of fat were deposited, mostly in a subcutaneous layer but also in the abdominal cavity. Muscle protein was also deposited in flight and heart muscles, presumably to prepare for the extreme effort involved in trans-oceanic flights. At the same time, digestive organs decreased in mass. This is interpreted as freeing up muscle protein which is then deposited in organs for use during flight.

Knots and godwits migrated from Farewell Spit in March. Most departures occurred in the evening and on rising tides. The former probably allows for the use of multiple navigational cues, while the latter may maximise feeding opportunities immediately before the flight. Most departures occurred after the passage of a low-pressure system or with the approach of a high-pressure system. This enabled favourable winds to be gained, so that the mean wind vector was a small tailwind. Thus, while departure directions were intermediate between the expected directions for flights to either Australia or northern New Zealand, it is probable they were able to fly across the

top of a high-pressure system and gain wind assistance for a direct flight to Australia. However, the variability in flight range estimates depending on assumptions of travel-speed and protein deposition makes predicting migration routes difficult.

Numbers of godwits have increased on Farewell Spit over the past decade, while oystercatchers have remained static Knots have shown a slight decline. Knot numbers are independent of national census counts so are presumably determined largely by factors operating on Farewell Spit itself. A possible mechanism that could give to a slowly declining population could be if a certain sector of the population fails to deposit sufficient nutrients to successfully migrate and return. If site-fidelity is very high (as it generally is in waders) then a long-term decrease could ensue.

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Acknowledgements

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My first introduction to the world of wader research came about as a result of the 20th International Ornithological Congress in Christchurch in 1990. It was the end of my second year at university, and I was convinced that studying waders was the way to a truly interesting existence. What better way to gain insight into how to go about it than to pick the brains of those who already know? It was for this reason that I pounced upon Theunis Piersma, from the Netherlands Institute for Sea Research, when I saw him appear the top of a flight of stairs. (My ability to do this so convincingly had him bemused for the next four years, as he had no recollection of having his name-tag on at the time.) I introduced myself, explaining my desire to work on waders, but it was three days before we got to meet again properly. In typical Piersma fashion his opening line was "So, why don't you come out to the Netherlands next year to do some work with us?" I hummed and ha-ad for

about three seconds, before replying "Sure, why not." That northern autumn spent on the sandflats on the Dutch Waddensea and the labs of the NIOZ proved the perfect grounds for learning the basic ropes of waderology, especially as it coincided with the annual conference of the Wader Study Group. That this contact has maintained and developed itself since then has been beyond my highest expectations. ("So, Phil, do you want to go to Ghana?". "Ummm, sure, why not?"). Many thanks to Tunafish, Petra de Goeij and Ingrid Tulp for their hospitality during my stays in The Netherlands. Theunis has been a constant source of inspiration, reprints, preprints and manuscripts. I greatly value our regular contact and look forward to much more! I still have the goal of writing a paper on waders without a Piersma reference in it, just for the challenge...

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