

Research news and comment

This series features news and comment on wader research and provides an informal means of discussing the implications of recent studies. It is the place for comment and debate, airing views, floating theories and stimulating research in new directions. Tamás Székely (Dept of Biology and Biochemistry, University of Bath, Claverton Down, Bath BA2 7AY, UK, phone: 44 1225 383676, fax: 44 1225 386779; t.szekely@bath.ac.uk) acts as co-ordinator. Contributions can be sent either to him or to the Editor.

REVIEW

R.C. Ydenberg, R.W. Butler, D.B. Lank, B.D. Smith & J. Ireland. 2004.
Western sandpipers have altered migration tactics as peregrine falcon populations have recovered.
Proceedings of the Royal Society: Series B: 271(1545): 1263–1269.

Long distance migrant waders often use stopover sites to rest and refuel for the next leg of their journey where they are attacked by predators. Waders are particularly vulnerable at such sites, since the fat stores that are essential for migration handicap their flight performance such as take-off, acceleration, and manoeuvrability. Do waders balance the benefits of resting and refuelling against the risk of mortality by predation?

A new study by a Canadian team suggests that Western Sandpipers *Calidris mauri* show sophisticated responses to increased predation danger. Ydenberg *et al.* studied this species at two sites, the Fraser Estuary and Sidney Island, in the Strait of Georgia, Canada, where they stopover during both northward (April–May) and southward (July–August) migration. Predation danger for waders differs between these two sites. Avian predators (such as Merlins *Falco columbarius* and Peregrines *F. peregrinus*) are most successful when mounting a surprise attack and often use the cover of shorelines to conceal their approach. This attack strategy makes small sites such as Sidney Island more dangerous for sandpipers than larger ones like the Fraser Estuary. Large sites provide vast expanses of mudflat on which waders can safely feed far from the shoreline, but small sites do not afford that opportunity so they are more exposed to surprise attacks by falcons.

In the last century, North American and European raptor populations declined as a result of persecution and poisoning through the widespread use of DDT in agriculture. With the advent of bird protection legislation and the banning of DDT in 1973, many avian predator populations have recovered providing an opportunity to investigate the effects of increasing predation danger on the behaviour of migratory birds.

Theory predicts that to reduce vulnerability to predation at dangerous stopover sites, migrants should lower fuel reserves, shorten length of stay, and shift from long distance flights using few sites to short distance flights using several sites. Ydenberg *et al.* therefore tested the hypothesis that the migratory strategy of Western Sandpipers had been changed though the increased predation danger by Peregrines in that body mass and length of stay at stopover sites had fallen.

First, Ydenberg *et al.* showed that Peregrine numbers have increased in the Strait of Georgia thereby raising predation danger. This increase was particularly strong during northward migration and during the southward migration period of juvenile sandpipers, but not during the earlier

southward migration of adults. Second, they showed that the body mass of Western Sandpipers had been affected by the danger. In an earlier paper the group reported that Western Sandpipers at Sidney Island were lighter in body mass during southbound migration than those on the Fraser Estuary. The difference was found in every age and sex class and was not due to any structural size difference in birds using the sites. However, the current paper shows that in the mid-1980s the body mass of southbound migrants at the two sites was almost identical, and that the difference in mass that has since arisen has been the result of a steady fall in mass on Sidney Island that dates from about the onset of Peregrine recovery. At Sidney Island, the body mass of Western Sandpipers fell at a rate of 0.154 g/y. during the southbound migration whereas body mass at the safer Fraser Estuary site did not change over the same period.

Thirdly, Ydenberg *et al.* compared the body mass of adults on the Fraser Estuary between northward and southward migration, predicting a strong decline with year during northward migration which has become more dangerous. This was found to be so: during the southward migration of adults, annual body mass has not changed since 1978, but has fallen by 0.135 g/y. for northbound migrants. Thus, whereas in 1978 northbound migrants were on average 2 g heavier than southbound migrants, by 2001 they were 1 g lighter. It is likely that these mass differences are attributable to changes in fuel load as there were no differences in the structural size of the birds during the study period.

Finally, Ydenberg *et al.* tested their prediction that there would be a trend to a shorter stopover of Western Sandpipers at the more dangerous Sidney Island site. They found that this was indeed the case: the length of stay of southbound migrants there declined by 68% between 1992 and 2001.

Ydenberg *et al.* clearly show support for their hypothesis that Western Sandpipers have adjusted their behaviour, by altering body mass and length of stay, at migration stopover sites in response to an increasing abundance of Peregrines.

These results have important implications for the interpretation of data on population trends in shorebirds generally. Across North America and elsewhere, many species have reported to be in decline; for instance the number of Red Knots *C. canutus* counted in Delaware Bay has declined by around 80% over the past 20 years (Clark *et al.* 1993, Baker *et al.* 2004). Similarly, Western Sandpipers censused at Sidney Island have declined by 18% per year since 1992, a total drop of 83%. However, Ydenberg *et al.* suggest that



these apparent declines may not always be real, since they may result from shorter durations of stay.

Using an arrival-stopover-departure model, Ydenberg *et al.* estimated the true number of Western Sandpipers stopping at Sidney Island taking into account the declining length of stay they observed. In this way, they showed that there had been almost no change in the actual numbers using the site and that the steep decline in the numbers censused can almost entirely be explained by the shorter stopover time. Thus for showing population trends, counts at stopover sites may be very misleading and only censuses on the breeding or wintering grounds may be reliable. For the Red Knots in Delaware Bay, this does not appear to be the case because numbers have also fallen steeply in their South American wintering grounds (Morrison *et al.* 2004). However, this may not be true of other declining stopover populations, so it may

be crucial to verify trends either by taking length of stay into account at stopover sites or by counts on the wintering or breeding grounds.

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Clark, K.E., Niles, L.J. & Burger, J. 1993. Abundance and distribution of migrant shorebirds in Delaware Bay. *Condor* 95: 694–705.

Morrison, R.I.G., Ross, R.K. & Niles, L.J. 2004. Declines in wintering populations of red knots in southern South America. *Condor* 106: 60–70.

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