Abstracts of wader theses

As a means of disseminating information about important new wader studies well in advance of formal publication, this series features abstracts from recent wader theses (bachelors, masters and doctoral). Thesis authors are invited to submit abstracts to the editor.

Foraging decisions in a digestively constrained long-distance migrant, the Red Knot (*Calidris canutus*)

(2004, Ph.D. thesis, University of Groningen, The Netherlands)

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This thesis is about foraging decisions in red knots (*Calidris canutus*). During their non-breeding season, knots are found at intertidal mudflats, where they mainly feed on armoured mollusc prey, which they typically swallow whole! Among waders, knots possess a relatively large muscular gizzard, which allows them to crush their hard-shelled prey 'internally'. This way of feeding comes at a price as large gizzards require large transport and maintenance costs. However, knots seem to have found a way out by flexibly reducing the size of their gizzard (and other nutritional organs) at times when feeding is impossible, such as during their long-distance flight (5,000–16,000 km) between their high-arctic breeding grounds and their coastal wintering grounds. However, such reductions (before departure) and enlargements (upon arrival) of the digestive system take time and therefore knots in their migratory period often have too small gizzards to (re)fuel at full speed. How red knots cope with this problem is the main theme of this work.

The use of ultrasonography enabled us to estimate gizzard mass in live knots. Apart from major ethical advantages, this allowed us to study experimentally and observationally how foraging behaviour is affected by the size of the gizzard.

By applying a diet model that takes a (flexible) digestive constraint into account, we predicted knots with relatively small gizzards to feed on easy-to-digest, soft-bodied prey (crustaceans) and knots with larger gizzards to feed on more abundant but harder-to-digest, hard-shelled prey (bivalves). As the model predicted birds with the smallest gizzards to obtain the lowest intake rates, we expected those birds to make the longest working days.

Indeed, knots lived up to our expectations. Radio-marked, free-living knots that had relatively small gizzards (i.e. those that were about to depart or had just arrived) were found in soft-bodied food patches, while birds with the largest gizzards were found in hard-shelled food patches. Diet composition varied accordingly (measured by detailed analysis of the faeces), with the softest diets found in knots with the tiniest gizzards. Finally, length of the foraging day declined with gizzard mass, with birds possessing the smallest gizzards stretching their working day to almost 17 h by moving along with the tide in an eastward direction.

In addition, we found that, within and between years, knots fine-tuned the size of their gizzard to the local quality of the prey. Knots possessed large gizzards when their bivalve prey contained little amounts of flesh relative to the amount of shell material, while they possessed smaller gizzards when prey contained relatively good amounts of flesh. However, we observed limits to these flexible adjustments of gizzard size. We calculated that in years with low prey quality the required size adjustments would be too large for some birds to be able to cope. In accordance with this prediction, our colour-marking programme revealed that birds with too small gizzards disappeared and likely died after such years. We were able to show that mechanical cockle-fisheries were the direct cause of the observed decline in prey quality.

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Population ecology and management of waders breeding on coastal meadows

(2004, Ph.D. thesis, Department of Ecology, Animal Ecology, Lund University, SE-223 62 Lund, Sweden)

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Many wader (Charadrii) populations are declining throughout Europe, but the underlying causes are often poorly known and diverse. To fully grasp the reasons behind declines in vulnerable wader populations, it is crucial to understand the demography. In my thesis, I have focused on the viability and management of waders occurring on coastal meadows in the Baltic Sea using Redshank (*Tringa totanus*) as a model species. I have collected data on demographic parameters in a Redshank population on Gotland. I also collected DNA samples of Redshanks from several populations in northern Europe to investigate population genetic structure.

By using two genetic methods, sequencing mitochondrial DNA and screening amplified fragment length polymorphisms (AFLP), I found some evidence in the Redshank of a recent expansion from a bottle-necked population. I also found significant genetic differentiation between suggested subspecies found in Europe but not between populations within the Baltic region. This indicates that Redshank populations in Europe constitute at least three separate management units.

Survival of Redshank nests was low in my study area due to predation, mainly by corvids and foxes. Nest success was not related to habitat characteristics at a local scale. I found no significant effects of distances to habitat edge or to nearest potential lookout for avian predators. Abundance of an aggressive species with active nest-defence did not have significant effects on nest survival rates, nor did vegetation concealment. Furthermore, nest success differed between years and was lower later in the season. On average, only 19% of nests survived until hatching, and only 13% of chicks survived until fledging.

Adult survival of Redshanks on Gotland was higher (80%) than most previous estimates (72–81%).

By using deterministic population matrix modelling, I found evidence of non-viability in the Redshank population on Gotland suggesting that management actions might have to be taken to prevent population decline. The results of the modelling indicate that it is important to preserve the already high adult survival but also to improve survival of nests and chicks simultaneously.

Finally, I evaluated trends over time of four wader species on the Baltic island of Öland and tested for spatial heterogeneity in population trends. Breeding densities of investigated species were positively related to grazing management and local changes in management affected the local change in wader densities. However, average grazing density increased over time whereas wader numbers generally remained constant or declined; thus, changes in grazing intensity could not explain changes in overall breeding numbers.

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Status of the Kentish Plover, 1984 to 2004, focusing on the Alvor Estuary, the Algarve, Portugal
(2004, M.Sc. thesis, University of Glamorgan, Wales, UK)

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The Kentish Plover *Charadrius alexandrinus* is a globally distributed shorebird that breeds on coasts and inland saline wetlands. Recent research has reported this species to be in decline with its range contracting over various parts of the world (including Portugal) possibly due to increasing pressure from human factors including development, recreation, tourism and habitat degradation, also other environmental factors such as climate change.

In order to evaluate the current status of the Kentish Plover and make it known and accessible to the wider public, I carried out an international literature review gathering existing information into a monograph of the species.

At the Alvor Estuary, southwest Algarve, Portugal, there is a breeding population of Kentish Plovers estimated at 53 pairs in 2004 (about 4.8% of the Portuguese population), which appears to be threatened and in decline. Breeding surveys from 1991 to 2004 showed a decline from 221 pairs in 1998 to 53 in 2004 and overall hatching success declined from 94% in 1992 to 37% in 1999. High tide counts from 1986 to 2003 also showed a decrease in numbers from the 1980s. Moreover there was a change of distribution between different areas within the estuary ($\chi^2 = 17$, $P < 0.01$).

An experimental human disturbance project was undertaken on Alvor Dunes during the peak of the tourist season to ascertain the effects of disturbance. Daytime disturbance was found to be high, occurring every 25.6 minutes during the study. Signposting applied to the site resulted in a significant reduction in overall potential disturbance to the site ($\chi^2 = 19.05$, $P = 0.01$).

The Kentish Plover population of the Alvor Estuary is threatened and probably still declining. Further long-term research is needed in order to fully understand the impact of human disturbance to facilitate effective management.

Professor Peter Evans Memorial Fund

The School of Biological and Biomedical Sciences at Durham University is launching an appeal to fund a scholarship in memory of a much loved and respected member of the Department: **Professor Peter Evans**. Members of the International Wader Study Group will be familiar with Peter's research on wader population dynamics and know that his research team was intimately concerned with mediating and restoring man's damage to the environment. Peter was an inspiring teacher and leaves a legacy of graduates and postgraduates who are doing their bit to conserve and preserve natural habitats for posterity. An endowment that promotes both education and nature conservation seems the most fitting commemoration of Peter's life and the Memorial Fund is intended to support a doctoral student's research in an applied ecological field. As Peter was passionate about both increasing educational opportunities in northeast England and conserving the natural habitat, the bursary will be used to fund a student carrying out research with potential ecological benefit to the region. The appeal aims to raise £100,000 over the next four years, making the first award in October 2008.

If you have worked with Peter in the past, or wish to commemorate a good friend, please take this opportunity to make a donation to the Memorial Fund. Cheques should be made out to The University of Durham (PRE Memorial Fund) and sent to the Development and Alumni Relations Office, University of Durham, The University Office, Old Elvet, Durham DH1 3LE. For further information (and Gift Aid forms for UK taxpayers) contact Tusi Butterfield at *J.E.L.Butterfield@durham.ac.uk*, phone ++44 (0) 191 384 1862.