

Estimating population specific differences in survival and resighting rates in a mixed population of staging Red Knot *Calidris canutus*

Philip W. Atkinson, Allan J. Baker, Karen A. Bennett, Nigel A. Clark, Jacquie A. Clark, Kimberly B. Cole, Amanda Dey, Simon Gillings, Patricia M. Gonzalez, Brian A. Harrington, Clive D.T. Minton, Ron Porter, Ines de Lima Serrano, Jason Newton, Lawrence J. Niles, Robert A. Robinson & Humphrey P. Sitters

British Trust for Ornithology, The Nunnery, Thetford, Norfolk IP24 2PU, UK. phil.atkinson@bto.org

Estimating population-specific demographic parameters for shorebirds is fraught with difficulty. The often dispersed nature of their distribution in the non-breeding season makes it relatively easy to estimate site-specific survival and recruitment rates, but numerous studies at different sites would be needed to generate a robust estimate of the population as a whole. Perhaps more attractive is estimating these parameters at staging sites through which a large proportion of a population may pass. However, these sites may be used by a number of different populations, thus confounding the estimates.

In this study, we estimated survival of three different groups of Red Knot that pass through Delaware Bay on spring migration from wintering areas in Patagonia and Tierra del Fuego, northern Brazil and the south-eastern USA. Individually-marked birds were allocated to a population using stable isotopes in flight feathers. $\delta^{15}\text{N}$ values separated the two northern populations from the southern one and $\delta^{13}\text{C}$ values were used to separate the Brazil and SE USA populations and also subdivide the Patagonia/Tierra del Fuego population. Stable isotopes have great potential for separating mixed populations of shorebirds, especially where they originate from both tropical and temperate areas. Their application in Delaware Bay is especially valuable due to concerns about massive declines in the long-distance, rather than short-distance migrants. Intensive effort each spring results in over half the individually marked birds that are alive being resighted each year. This has allowed survival rates to be calculated with a precision that would not have been possible using retraps of birds with metal-rings.

Seasonality in long time series of wader counts at two North Adriatic wetlands

Chiara Campomori¹, Ariele Magnani¹,
Elena Rusticelli² & Lorenzo Serra¹

¹Istituto Nazionale per la Fauna Selvatica, Via Ca' Fornacetta 9, I-40064 Ozzano Emilia BO, Italy
ccampomori@gmail.com

²Statistician Health Division/OECD, rue du Conseiller-Collignon 2, 75016 Paris, France

The Cervia salines and the Ortazzo brackish marshes are two nearby areas (13 km apart) on the North Adriatic coast. At both sites, monthly waterbird censuses were carried out

during ten (1995–2004) and eight (1997–2004) years, respectively. In order to evaluate the possible existence of seasonal patterns in the waders' occurrence, the X-11 ARIMA methodology for the decomposition of time series in both their stochastic and deterministic components has been applied. This statistical technique, implemented in the user-friendly interface DEMETRA developed by EUROSTAT, allows distinction between intra-year fluctuations which have a seasonal character and recur similarly every year and wider fluctuations which should be rather attributed to a long-term trend-cycle component. For this purpose, the method performs different statistical diagnostics to enable the nature, the robustness and the stability of the seasonality to be verified, and based on those to conclude whether the seasonality is identifiable or not. Altogether 23 wader species that occurred regularly in at least one of the two wetlands have been studied. At Cervia, 11 species showed clearly identifiable seasonality, 2 showed probable seasonality and 10 showed no identifiable seasonality. Similarly at Ortazzo marshes 11 species showed clear seasonality, 2 probable and 10 none. Only 8 species had identifiable seasonality at both sites. We compared the occurrence of these species and found that five showed significant correlations (Rs) between the patterns of seasonal occurrence at the two sites (*Himantopus himantopus*, *Phiolmachus pugnax*, *Tringa stagnatilis*, *T. nebularia* and *Actitis hypoleucos*), but three showed no significant correlation (*Tringa erythropus*, *Calidris ferruginea* and *C. alpina*). For a further 15 species, no correlation test was possible because five did not show significant seasonality (*Haematopus ostralgus*, *Pluvialis apricaria*, *P. Squatarola*, *Numenius phaeopus* and *N. arquata*), five had significant seasonality at Cervia but not at Ortazzo (*Calidris minuta*, *Recurvirostra avosetta*, *Vanellus vanellus*, *Charadrius hiaticula* and *Limosa limosa*) and the remaining five showed significant seasonality at Ortazzo but not at Cervia (*Tringa totanus*, *Tringa glarola*, *Charadrius dubius*, *Ch. alexandrinus* and *Gallinago gallinago*). The main results of the analysis can be summarised as follows: (i) the statistical validation of seasonal patterns at a single site requires the analysis of long-term data series, (ii) seasonality is strongly affected by habitat, so the description of phenology for a given area requires data from a set of sites representative of various habitats. Hence, DEMETRA has been shown to be a promising tool for developing a better description of the seasonal component of long-term data series (e.g. counts or ringing records). It should soon receive more attention from ornithologists, as it is a quick and straightforward method of analysis that can easily show where there is statistical significance.

Within-season breeding dispersal and mate-switching in a Ringed Plover population

Przemek Chylarecki

Museum & Institute of Zoology, Polish Academy of Sciences, Warszawa, Poland. pch@miiz.waw.pl

Dispersal within the breeding season was studied using radio-tracking in a facultatively double-brooded population of



Ringed Plover nesting along the Bug river, E Poland. Within-season dispersal is a regular feature of breeding strategy in this population. 48% of birds ($n = 52$) marked sitting on early-season clutches departed from their breeding sites in May and the first half of June, just before and during the peak of laying of replacement and second clutches. Females, whose early clutches failed during incubation, were particularly prone to disperse. Three birds that departed were found to have settled 2–93 km from the first breeding site and attempted to breed. Females tended to disperse and switch mates while deserted males tended to stay on or return to their initial breeding sites and mate with new females. Birds dispersing in search of new mates and breeding sites in the middle of breeding season differed biometrically from those staying on the site throughout the breeding season. Dispersers were in better condition, had shorter wings and (females only) shorter bills. They also tended to lay smaller first clutches. In the study population, within-season breeding dispersal is a conditional strategy adopted by some birds, apparently to track temporal changes in the availability of suitable breeding habitats typical of undisturbed river systems.

**Hard or soft-shelled prey?
Migration strategy determines resource use by
Red Knot *Calidris canutus*
on their final stopover in Delaware Bay.**

Nigel A. Clark¹, Philip W. Atkinson, Allan J. Baker, Karen A. Bennett, Nigel A. Clark, Jacquie A. Clark, Kimberly B. Cole, Amanda Dey, Simon Gillings, Patricia M. Gonzalez, Brian A. Harrington, Clive D.T. Minton, Ines de Lima Serrano, Jason Newton, Lawrence J. Niles, Robert A. Robinson & Humphrey P. Sitters

¹British Trust for Ornithology, The Nunnery, Thetford, Norfolk IP24 2PU, UK. nigel.clark@bto.org

Many kinds of shorebird undergo remarkable physiological changes just prior to undertaking long-distance migrations, reducing the size of their digestive organs and increasing the size of organs needed for prolonged flight. Such phenotypic flexibility is crucial to overcome the physiological challenges of long-distance migration, but may be a disadvantage by limiting the pace of migration, as birds may have to spend time regrowing these organs to take advantage of food resources on stopover sites. We explore this issue using Red Knot passing through Delaware Bay on spring migration. Here they rapidly put on mass before flying directly to the Arctic breeding areas. Using stable isotopes in flight feathers to identify wintering area, we found that short-distance migrants, wintering in the southeastern USA, were able to arrive early enough to feed on *Mytilus edulis* spat, a hard-shelled prey. Longer-distance migrants from northern Brazil and Patagonia/Tierra del Fuego mostly avoided *Mytilus* and fed in areas with a high abundance of Horseshoe Crab *Limulus polyphemus* eggs and we hypothesise that this was because there was insufficient time to regrow their digestive organs sufficiently to feed on other prey and leave on time. Reductions in the availability of crab eggs, caused by the harvest of adults in a long-term bait fishery, will have the most severe impact on long distance migrants. Severe declines (>70%) have been observed amongst the Red Knot wintering in southern South America, but not amongst the birds wintering in SE USA.

**Spatial pattern of MHC Class II variation
in the Great Snipe *Gallinago media***

Robert Ekblom, Stein Are Sæther, Pär Jacobsson, Peder Fiske, Tobias Sahlman, Mats Grahn, John Atle Kålås, Jacob Höglund

SOF, Uppsala Universitet, Döbelnsgatan 20D, 75237 Uppsala, Sweden. robert.ekblom@ebc.uu.se

The genes of the MHC (major histocompatibility complex) code for proteins involved in antigen recognition and triggering of the adaptive immune response, and are therefore likely to be under selection from parasites. These selection regimes may vary in space and time. Here we report a strong geographic structure in MHC class IIB genes of a migrating bird, the Great Snipe. Genetic differentiation in the MHC between two ecologically distinct distributional regions (Scandinavian mountain populations versus East European lowland populations) was still present after statistically controlling for the effect of selectively neutral variation (microsatellites). This suggests a role for selection in generating this structure and that it represents local adaptation to different environments. Differentiation between populations within the two regions was negligible. We also found evidence that spatial structure might be influenced by sexual selection in this lekking bird. In the mountain region, males possessing alleles that were common in this region relative to the lowland region had higher mating success than other males. MHC variation is often thought to be maintained by some form of balancing selection, but the nature of this selection remains unclear. Our results support the hypothesis that spatial variation in selection regimes contributes to the high polymorphism.

Natal philopatry and close inbreeding in Dunlins

Barbara Ganter & Hans-Ulrich Rösner

Schückenstraße 14, 25813 Husum, Germany
barbara.ganter@t-online.de

We report data from a 16-year study of a population of arctic-breeding Dunlin *Calidris alpina* in northernmost Norway. The breeding population in the study area consists of 35–60 pairs. During the study, more than 1,800 newly-hatched chicks were ringed, and more than 80 of these returned to the natal area to breed. Both males and females returned, albeit with different frequency, and we compare dispersal distances from the natal nest and subsequent breeding success between sexes. In this small population we observed a number of cases of close inbreeding, i.e. mothers breeding with sons or full sibs breeding together. Hatchability of eggs in clutches of these inbreeding pairs was significantly lower than in the overall population. We did not find any evidence of inbreeding avoidance.

**Habitat preferences of Wood Sandpipers in
Scotland**

B. Kalejta-Summers

RSPB, Etive House, Beechwood Park, IV2 3BW
Inverness, UK. bozena@waders.fsworld.co.uk,
bozena.summers@rspb.org.uk

The Wood Sandpiper is a rare species in Scotland, recorded in only 50 locations since 1959. Only five of those sites have



been regularly used by the birds in the last thirty years. The main aim of this project was to assess the habitat preferences of Wood Sandpipers and provide management recommendations to enhance potential breeding habitats. In this first year of the study, the habitat preferences during the pre-laying, nesting and brood rearing periods were studied at two sites by measuring vegetation structure, cover and composition in habitat utilised by the birds compared with those of the general habitat. An effort was also made to look at all the sites where Wood Sandpipers have been recorded breeding. The features of these sites (altitude, distances to the nearest loch, river, forest, road, length of the edge of the forests, lochs, length of the rivers, roads, etc.) were measured to identify the common characteristics of the sites and to understand why Wood Sandpipers select certain sites but not others. The last part of the project is to co-ordinate a national survey across Scotland for breeding Wood Sandpipers to assess population size. This will involve visits to all the sites where Wood Sandpipers have been recorded plus some random sites near to existing sites.

Individual sound recognition of the roding Eurasian Woodcock *Scolopax rusticola*

Oleg I. Kenunen

Saint-Petersburg State University, Universitetskaya emb. 7/9, 199034 Saint-Petersburg, Russian Federation. Oleg.Kenunen@mail.ru

The aims of this study included: (1) describing the woodcock's song as a physical process; (2) distinguishing its key characteristics; and (3) assessing the possibility of using these characteristics for the recognition of individuals.

In order to identify song characteristics that would facilitate individual recognition, a detection algorithm was formulated. The following methods were used in the analysis: digital frequency filtering; discrete Fourier transform; periodogram plotting; the MUSIC method; amplitude demodulation and others. Frequency modulation in the high frequency syllable was fitted to the polynomial function of the second degree. For the analysis of time characters of the low frequency syllables sequence, a vector consisting of a hundred elements with values 0 or 1 in dependence on the presence or absence of low frequency components in corresponding time was put in accordance with each song. Polynomial characters together with the vector corresponding to the sequence of low frequency syllables, and also the frequency of impulse modulation and song duration were used as key characters for individual recognition. Using records from different points made it possible to distinguish recordings of different males. The analysis of 60 songs produced by 11 males with the use of the discriminant analysis demonstrated unmistakable recognition of males on the basis of the song characters mentioned.

Conserving declining species using incomplete demographic information: what help can we expect from the use of matrix models?

Chris Klok & Lia Hemerik

Alterra, PO Box 47, 6700 AA Wageningen, The Netherlands. chris.klok@wur.nl

Due to human activities, the populations of many waders have shown major declines and some are currently threatened with extinction. Conservation management of these species can benefit from the use of simple population models such as matrix models. However, for many species, data on survival and reproduction are scarce. Therefore, we set up a general framework based on a matrix model with three parameters: reproduction, juvenile (= first year) survival and adult survival in which incomplete data can be analysed. The population growth rate and the elasticity of the survival and reproduction parameters have been determined analytically. From these, we made as a visual diagnostic tool (a general framework), plots of the growth rate and the elasticity pattern and their dependence on actual values for the reproduction parameter and juvenile and adult survival. To illustrate the use of this framework we plot and discuss literature data on survival and/or reproduction of a few bird species with a juvenile stage of one year in the light of our modelling results.

Breeding biology of the Sociable Lapwing *Vanellus gregarius* in central Kazakhstan and implications for conservation management

Koshkin, M.A.¹, Sheldon, R.D.², Kamp, J.³, Khrokov, V.V.¹ & Donald, P.F.²

¹*Association for the Conservation of Biodiversity in Kazakhstan, ul. Beibitshilik, 18, office 203, 01000 Astana, Republic of Kazakhstan. esey@mail.ru*

²*The Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire SG19 2DL, United Kingdom*

³*University of Oldenburg, Landscape Ecology working group, Hindenburgstr. 3, 26122 Oldenburg, Germany*

The Sociable Lapwing is a critically endangered species that has undergone a large population decline in recent years. Estimates suggest that the population is now only 200–600 pairs (AEWA 2004), though recent sightings of large flocks on migration suggest it might be considerably higher. It is believed to be concentrated in Kazakhstan with small numbers in south-central Russia.

We studied the species' ecology in 2005 and 2006 in the Akmolinskaya oblast' in central Kazakhstan, east of Lake Tengiz (49°40'–51°00'N, 68°35'–71°15'E) and have collected data on breeding distribution, nest survival, causes of nest



loss, and chick survival. Breeding colonies appear to be concentrated around human settlements where there is short vegetation due to livestock grazing. We located and monitored 252 nests. In 2005 and 2006 respectively, 46 nests out of 85 (54%), and 93 out of 167 (55%), hatched at least one chick. The main causes of nest loss differed between years, with predation being the dominant cause in 2005 and trampling in 2006. Evidence from nest cameras suggests that sheep are the main cause of trampling. We calculated daily nest survival rates and modelled them as a function of distance to nearest settlement, nearest permanent water feature and nearest predator perch. None of these were significant predictors. Chicks were located, whenever possible, in the nest scrape and uniquely colour-ringed on the tibia. Following colour-ringing chicks was found to be a more effective method of quantifying chick survival than radio-tracking. Chick survival was high, with about one chick fledging per breeding female. This level of chick productivity exceeds that needed by closely related species, such as Northern Lapwing *Vanellus vanellus*, to maintain a stable population. Our results suggest that the demographic parameter driving population decline may not be associated with the breeding grounds, but with factors affecting sites used on migration or in winter. The conservation implications for the species are discussed in the light of these findings.

Molecular ecology of breeding systems and new genetic markers: a case study in the Kentish plover *Charadrius alexandrinus*. Should parents cooperate in raising their young?

Clemens Küpper, Andras Kostolanyi & Tamas Szekely

*Department of Biology and Biochemistry, University of Bath, Claverton Down, Bath, BA2 7AY, UK
C.Kupper@bath.ac.uk*

Care enhances the survival of the young, but is costly for the parents. Therefore it is in the interest of each parent to delegate the work of raising offspring to the other parent. Relatedness between pair-members is expected to increase their cooperation due to indirect fitness gains. However, the benefit of inbreeding may be reduced by genetic deficiencies in the young ('inbreeding depression'). We are investigating the costs and benefits of parental relatedness in a small wader, the Kentish plover. This cosmopolitan wader has a flexible breeding system: either both parents care for the brood, or one parent (either the female or the male) deserts the brood, and re-nests with a new mate. These behaviours suggest strong conflict between males and females over care which may be detrimental for the young. We will present results from multilocus DNA fingerprinting showing how parental relatedness may influence young survival. To overcome the limitations of fingerprinting and increase the sample size, we developed new genetic markers to measure relatedness between male and female parents. One major advantage of microsatellites over multilocus DNA fingerprinting is the requirement of only a few DNA molecules for a genetic analysis. However few microsatellite markers have been available for shorebirds. We have characterised 36 polymorphic microsatellite markers, the largest number of microsatellites isolated in a single shorebird species. The new markers cross-amplify in four other *Charadrius* species. The availability of these additional molecular markers offers new

insights into the biology of waders, and we strongly encourage wader biologists to make use of these advances.

Differential use of stopover habitat in the Afro-Siberian Red Knot *Calidris canutus canutus* during spring migration

Jutta Leyrer^{1,2}, Maarten Brugge¹, Anne Dekinga¹, Anne Evers^{1,3}, Klaus Günther⁴, Casper Kraan¹, Theunis Piersma^{1,2}, Gregor Scheiffarth⁵ & Bernard Spaans¹

¹*Marine Ecology and Evolution, Royal Netherlands Institute for Sea Research NIOZ, PO Box 59, 1790 AB Den Burg, The Netherlands*

²*Animal Ecology Group, University of Groningen, PO Box 14, 9750 AA Haren, The Netherlands*

³*University of Lüneburg, Department of Ecology and Environmental Chemistry, Scharnhorststr. 1, 21314 Lüneburg, Germany*

⁴*Schutzstation Wattenmeer, Hafenstr. 3, 25813 Husum, Germany*

⁵*Institute of Avian Research, Vogelwarte Helgoland, An der Vogelwarte 21, 26386 Wilhelmshaven, Germany*

How well migrants satisfy energetic and other needs during migration determines the success of their migration, which is measured in terms of survival and reproductive performance. During migration most of the time and energy is spent at stopover sites. Hence, good quality stopover areas are vital for successful migration. In late May/early June 2006, we studied habitat use of the Afro-Siberian Red Knot at their major stopover site, the Wadden Sea in Schleswig-Holstein, Germany. Surprisingly, we could distinguish two areas used by the knots differing in food supply, high tide roost characteristics, and body condition of the birds present. The differential habitat use within this stopover site needs to be further examined. On the basis of colour-ring observations, we are able to link individual habitat choice in the German Wadden Sea to habitats used at the West African wintering grounds (Banc d'Arguin, Mauritania) and/or stopover sites at the French Atlantic coast. These first results allow us to search for the occurrence of carry-over effects of the use of potentially different habitat quality during migration. In the next few years, we will continue to study differences in individual habitat choice within and across seasons, in order to evaluate their impact on the timing and, hence, success of the migration.

How to survive in a non-tidal area: Siberian Red Knots on the southern Baltic coast

Włodzimierz Meissner

*Avian Ecophysiology Unit, Dept. of Vertebrate Ecology and Zoology, University of Gdansk, Al. Legionow 9, 80-441 Gdansk, Poland.
w.meissner@univ.gda.pl*

For Red Knots, the sandy coast of the southern Baltic seems to be a low quality stopover site, because of unpredictable feeding conditions and low mollusc densities. Observations in Puck Bay suggest that they feed mainly on *Nereis* sp., *Gammarus* sp., small sized *Hydrobia* sp. and various small insects taken from wet sand. Among 1,471 knots ringed at



Rewa only 27.8% of juveniles and 10.5% of adults were retrapped within a few days of first capture, suggesting that the majority depart with small energetic reserves after only a short stay. In spite of poor feeding conditions, the fuel deposition rate of Siberian knots (adults: 2.4 g/day, juveniles: 2.7 g/day) is similar to that observed in autumn in the Dutch Wadden Sea and on the Baltic coast of SE Sweden. It is suggested that knots are able to accumulate fat stores despite low food quality and density because the lack of tides allows them to forage for longer periods without interruption. Moreover they do not pay the additional energetic cost of a large gizzard, which at this stage of autumn migration is still small. Feeding on hard-shelled *Hydrobia* may serve as a signal to increase gizzard mass and shorten the time needed to reach the gizzard size needed for feeding on hard-shelled molluscs in tidal areas.

Trends in wader populations in the East Atlantic flyway as shown by numbers of autumn migrants in W Denmark, 1964–2003

Hans Meltofte¹, Jan Durinck, Bent Jakobsen,
Claus Nordstrøm & Frank F. Rigét

¹National Environmental Research Institute,
Dept. of Arctic Environment, PO Box 358,
DK-4000 Roskilde, Denmark. mel@dnu.dk

Many wader populations are estimated to be declining. These estimates are mainly based on mid-winter counts, where much bias may occur in the form of varying geographical coverage, varying methods, birds changing wintering sites from year to year or over longer time, and counting error. Other trend estimates derive from breeding area data, which often are very uncertain due to the extreme geographical dispersal of most breeding distributions. Here we present data on 17 wader species passing Blåvandshuk in W Denmark on autumn migration during a 40-year period. Visible migration of birds including waders is highly sensitive to differing weather conditions, but the data are unaffected by the biases mentioned for mid-winter counts. The populations involved mainly originate from north boreal and arctic breeding sites from Greenland/Canada in the west to central Siberia in the east. One species stands out showing significantly decreasing trends, namely Eurasian Oystercatcher *Haematopus ostralegus*. The decrease in these oystercatchers of Norwegian origin corresponds to decreases on the wintering grounds associated with overexploitation of bivalve stocks. Most other species showed relatively stable, fluctuating or increasing trends, and according to our data, most north boreal and arctic wader populations on the East Atlantic flyway seem to have been doing well during the last 40 years.

Breeding waders in Ireland: meadows, machair and mountains

S. Newton, D. Suddaby, S. Cummins & A. Copland

BirdWatch Ireland, Unit 1 Springmount,
Newtownmountkennedy, Co. Wicklow, Ireland.
snewton@birdwatchireland.ie

Ireland has one of the lowest diversities of breeding waders in northern Europe. Regular breeding species in the last 40 years include Eurasian Oystercatcher, Ringed Plover, Eurasian Golden Plover, Northern Lapwing, Dunlin, Common

Snipe, Eurasian Woodcock, Eurasian Curlew, Redshank and Common Sandpiper. In this period one species has been lost, Red-necked Phalarope, and three others breed occasionally in small numbers: Black-tailed Godwit, Whimbrel and Greenshank. Of the regular species, many declined between the two breeding atlases of Britain and Ireland (1968–72, 1988–91) and subsequently two, Northern Lapwing and Eurasian Curlew, were Red-listed in 1999, indicating a >50% decline in population and/or range over 25 years. Range retractions have continued to the point where the Irish Countryside Breeding Bird Survey now records only Eurasian Curlew and Common Snipe in sufficient survey squares (>30) to produce population indices and trends. In the case of Eurasian Curlew many of the contributed observations are likely to refer to early migrant birds moving through farmland habitats and are not representative of the breeding population. Northern Lapwing, formerly the most widespread farmland species, is now detected in only 20 out of 300 randomly selected survey sites. Thus, most breeding waders do not occur in the general agricultural landscape but are found on localised areas of wet grassland, mountains, bogs, coasts and islands, where agricultural pressure is less intense.

Three series of breeding wader surveys have been undertaken in the last 20 years:

- On north-western machair (calcareous coastal grassland) in 1985, 1996 and partial resurveys in 2005 and 2006.
- Shannon Callows (winter flooded grassland along the River Shannon and tributaries in central Ireland) in 1987, partial resurvey 1997, 2002, partial 2006.
- The Upland Bird Survey (2002–2004) covered the mountainous and blanket bog breeding range of the Eurasian Golden Plover and Dunlin in the north-west.

In common with the Western Isles of Scotland, Irish machair and associated wetlands support significant numbers of Eurasian Oystercatcher, Ringed Plover, Northern Lapwing and lesser numbers of Dunlin, Common Snipe and Redshank. The overall trends recorded between 1985 and 1996 suggest increases in Eurasian Oystercatchers and Ringed Plover, a decrease in Dunlin and stability in Northern Lapwing and Redshank populations. However, this broad pattern is complicated by the desertion of some sites due to agricultural intensification and the creation of golf courses, caravan parks and holiday homes. Recent work has documented a shift to some offshore islands, especially for Dunlin and Northern Lapwing, where development pressure is less and fewer predators (Red Foxes and corvids) are present.

The Shannon Callows primarily support Northern Lapwing, Redshank, Eurasian Curlew and Common Snipe. Once winter floods recede, waders commence breeding on land that is grazed or left as hay meadows. Very little change in land use has been recorded but most species seem to be in serious decline. In two recent years, 2002 and 2006, summer re-flooding of meadows following heavy rainfall has dramatically reduced nesting success and recent work (2006) suggests that egg predation by Red Fox and Hooded Crow is a serious issue.

The north-western uplands and bogs have only been systematically surveyed once. In 2002–2004, less than 150 pairs of Eurasian Golden Plover were located, which is certainly at the low end of the range of population size estimates derived from the two breeding atlases. Most were recorded in Donegal (both mountains and bogs), the Ox Mountains of



Sligo/Mayo, the Nephins in Mayo and lowland blanket bog in south Connemara. Small numbers of Dunlin also nest in pockets of wetter habitat within this range.

Common Snipe remain the only truly widespread breeding wader in Ireland, but despite the cessation of direct subsidies for agricultural land drainage such activity continues and remaining pockets of wet grassland are often infilled with building waste. There has been no recent systematic work on Eurasian Woodcock or Common Sandpiper, though the forthcoming (3rd) breeding atlas (2008–2011) will help assess the status of these species. On a positive note, breeding waders have discovered newly 'created' habitat following the industrial mining of peat on inland raised bogs for electricity generation. Such 'cutaway' bogs are being restored as farmland or for recreation and conservation in the midlands and these are being colonised by Northern Lapwing, Redshank, Common Snipe, Eurasian Curlew and occasionally Ringed Plover.

Uncertainty about the size and status of Red Knot populations in the Americas is a problem for conservation

Lawrence J. Niles¹, Humphrey P. Sitters, Amanda D. Dey, Allan J. Baker, R. I. Guy Morrison, Daniel E. Hernandez, Kathleen E. Clark, Brian A Harrington, Mark K. Peck, Patricia M. Gonzalez, Philip W. Atkinson, Nigel A. Clark, Karen A. Bennett, Clive D. T. Minton, Kevin S. Kalasz, Jim Fraser & Sarah Karpanty

¹Endangered & Nongame Species Program, New Jersey Division of Fish & Wildlife, 501 E. State St., PO 400, Trenton, NJ, 08625-0400.
Larry.Niles@dep.state.nj.us

There are major gaps in our knowledge of the size and subspecific status of American Red Knot populations. One of the few certainties is that most *rufa* winter in Tierra del Fuego, where numbers have declined from 67,500 in 1985 to 17,500 in 2005. The only other known substantial wintering populations are those of Maranhão, N Brazil, (7,575 in Feb 2005) and Florida (about 7,500), but their subspecific status is uncertain.

In late May 35,000–50,000 knots occur in Alaska and it is thought that they are *roselaari* which breeds in Alaska and on Wrangel Island and winters in the Americas. However, it is not possible to account for such numbers in winter. Possibly these birds include *rogersi* which breed in NE Siberia and winter in Australasia. Alternatively they are the birds that winter in Florida and/or Brazil and/or unidentified sites on the American Pacific coast.

Genetic studies have shown that the Florida population has not shared genes with that of Tierra del Fuego *rufa* for over a thousand years, but whether that means they are *roselaari* is not clear. Banding data show that at least some Florida and Maranhão birds migrate through Delaware Bay in spring. Possibly they are *roselaari* en route for Alaska. However, stable isotope analysis of feathers and banding data show that the knots breeding on the southern edge of the *rufa* range (Southampton Island, Hudson Bay) include birds from both the northern wintering area (the Brazil/Gulf region) and from Tierra del Fuego.

In 2006, 73 birds were radio-tagged during northward migration on the Atlantic coast of the U.S. and an attempt was made to relocate them on their arctic breeding grounds. The

wintering site of these birds could be determined from stable isotope analysis and it was hoped that this might show whether birds from different wintering populations bred separately. Previous, relatively successful attempts to relocate radio-tagged knots in the Arctic had been based on birds caught in Delaware Bay, but only one of the Atlantic coast birds was found in 2006 suggesting that some might have a different breeding range.

These questions are of conservation importance as there may be more distinct populations of Red Knots in the Americas (or perhaps subspecies) than previously thought. As some would be very small, they would be particularly vulnerable to extinction through stochastic events and low adaptive genetic variation.

Significance of Red Knot *Calidris c. canutus* stopovers on the French Atlantic coast during spring migration between Banc d'Arguin and the Wadden Sea

Frédéric Robin¹, Pierrick Bocher¹, Jutta Leyrer^{2,3}, Francis Meunier⁴ & Theunis Piersma^{2,3}

¹Centre de Recherche sur les Ecosystèmes Littoraux Anthropisés (CRELA) UMR 6217, CNRS-IFREMER-Université de La Rochelle, F-17042 La Rochelle, France. pbocher@univ-lr.fr

²Department of Marine Ecology and Evolution, Royal Netherlands Institute for Sea Research (NIOZ), PO Box 59, 1790 AB Den Burg, Texel, The Netherlands

³Animal Ecology Group, Centre for Ecological and Evolutionary Studies, University of Groningen, PO Box 14, 9750 AA Haren, The Netherlands

⁴Ligue pour la Protection des Oiseaux, Réserves Naturelles Baie de l'Aiguillon/RN Marais d'Yves/RN Moeze-Oléron/ RN Lilleau des niges/ RN Marais de Mullembourg, La corderie Royale BP 90263 F17305 Rochefort, France

The nominate subspecies of the Red Knot, *canutus*, is a long-distance migrant which breeds on the Taymir peninsula in Siberia and winters mainly on the mudflats of Banc d'Arguin in Mauritania. Every spring, the population of about 220,000 migrates between these sites, flying a distance of about 8,500 km. Red Knots leave Banc d'Arguin in late April–early May and fly direct to the Wadden Sea of Schleswig-Holstein, Germany, the main stopover area during spring migration. They refuel at this site until they reach sufficient body mass to fly to the breeding grounds. However, a variable proportion of the population makes an additional stop in mid May at a small number of mudflats along the centre of the Atlantic coast of France. These birds do not stay very long, but can occur in high numbers (up to 60,000). Twenty-six years after the first study on spring migration of Red Knot (subspecies *canutus*) was carried out as a co-operative Wader Study Group project, we carried out precise surveys of Red Knot stopover in 2005 and 2006 in order to estimate precisely the number of birds achieving this stopover, their peak presence and the local distribution of birds on different sites. Their diet and the food harvestable at every site were also described. Red Knots arrived massively on the French coast a few days later than in the 1980s, around mid May and mainly used Aiguillon Bay (up to 43 000 birds present). Just as during the previous study, birds arrive with low body masses (100 g).



To reach a mass which enable them to continue to the Wadden Sea, Red Knots fed intensively on bare and muddy flats; they avoided seagrass areas. They mainly selected the bivalve *Macoma balthica* and complemented diet with the mudsnail *Hydrobia ulvae*. This intensive feeding allowed them to reach a departure mass of 125 g in 5–6 days. The choice of the stopover sites seems to be associated with the presence of high quality foods such as *Macoma*. Fast refuelling enables them to leave the French stopover areas within a week, but the reason for this additional stopover by part of the population still presents a puzzle. We aim to investigate whether part of the population suffers from inadequate fuelling rates before take-off from Mauritania, perhaps in combination with the unavailability of favourable tailwinds during the northward flight.

Polymorphic introns lead to sexing errors in a monomorphic wader

B.K. Sandercock, A.E. Casey & S.M. Wisely
*Kansas State University, Division of Biology,
 116 Ackert Hall, 66506 Manhattan, Kansas, USA
 bsanderc@ksu.edu*

Sex identification is essential for addressing basic questions in population biology, behavioural ecology, and animal physiology. Many species of waders are monomorphic in body size and coloration, and cannot be easily sexed by external features. We have used two sets of primers based on the CHD gene for genetic sexing of Upland Sandpipers *Bartramia longicauda*. Blood samples were collected from the wing vein of birds in the field, stored in lysis buffer, and DNA was extracted with Qiagen kits. Sexing was conducted with the P2/P8 (Griffiths *et al.* 1998 *Mol. Ecol.* 7: 1071–76) and 2550F/2718R primers (Fridolfsson & Ellegren 1999 *J. Avian Biol.* 30: 116–21). Unexpectedly, results from the P2/P8 primers indicated that 4 of 90 nests were attended by putative female–female pairs. Closer inspection of PCR products revealed that 4 males were polymorphic for the Z-intron amplified by the P8 primer and had a ~70 bp insertion that lead two bands on the agarose gels, the typical pattern for females. Our results indicate that the P2/P8 primers can lead to missexing of monomorphic waders, the errors are in the opposite direction to missexing caused by allelic dropout, and that polymorphisms will be difficult to detect because they occur at low frequency.

The effects of helicopter activities near Den Helder airport

Cor Smit, Martin de Jong & Dick Schermer
*IMARES, PO Box 167, 1790 AD Den Burg,
 The Netherlands. cor.smit@wur.nl*

Due to European environmental legislation, new plans or projects that potentially have a negative effect on nearby Natura2000 sites have to undergo an appropriate assessment. In this case the effects of an increase in the number of civil helicopter flights to and from Den Helder Airport (bordering the Wadden Sea) have been studied. The results show relatively mild effects from civil helicopters (that need an addi-

tional permit before an extension of the number of extra flights can be granted) and somewhat more intense effects from military helicopters (who are not yet subject to the assessment procedure). The fact that the airstrip is used by both military and civil helicopters obstructs an assessment of the effects of civil helicopters alone. Additional questions are: When should effects be considered as significant? and How should cumulative effects be dealt with? This is an example of the problems that arise when the effects of human activities in Natura2000 sites have to be evaluated. Probably every country will have developed its own methods on how to tackle such questions. The Dutch view on how to deal with such questions has not yet been developed in detail.

Are shorebirds successfully breeding on the southern coast of Norway? A case study of Eurasian Oystercatchers

K.M.C. Tjørve & E. Tjørve

*Lista Bird Observatory, Fyrveien 6, 4563 Borhaug,
 Norway. kmctjorve@yahoo.co.uk*

Eurasian Oystercatchers have a wide breeding distribution. Although inland breeding has been recorded for some populations in the UK and Europe, on the southern coast of Norway they breed exclusively on the rocky, pebble and sandy shores on both the mainland and small islands. We conducted a study of breeding oystercatchers found in the archipelago between Lista and Lindesnes, southern Norway. These oystercatchers experience different levels of human disturbance and thus we attempted to determine whether pairs experiencing lower levels of disturbance were capable of fledging more offspring during the 2006 breeding season.

Fifty-two breeding attempts were found; four (8%) of these were relays after an initial nest was lost. Thirty-six (69%) nesting attempts failed to produce chicks. This included all four relays. The number of eggs laid was not determined in this study but of 36 hatchlings (from 16 nesting attempts), 28 fledged (from 15 nesting attempts). Those hatchlings that did not fledge disappeared when the chicks were less than three weeks. Therefore the majority of nesting attempts failed during incubation but once chicks were hatched, the nesting attempt had a relatively good chance of fledging at least one chick.

All nest positions were assessed according to proximity to gull colonies and level of human disturbance (boat traffic, proximity to houses and whether or not people go ashore on the island). Four nesting attempts close to gull colonies with low disturbance failed. Five nesting attempts near gull colonies fledged young. These were in low disturbance (3 nests) and low traffic with houses (2 nests) areas. Despite our hypothesis that birds nesting in areas of low disturbance would be the most successful in fledging chicks, we found that the most frequent failure of nesting attempts occurred in these areas. Birds nesting in low traffic areas with a relatively close proximity to houses were the most successful in fledging chicks. This crude analysis of the influence of disturbance on the breeding success of Eurasian Oystercatchers on the southern coast of Norway suggests that further research is required to determine why pairs breeding in close proximity to houses are successful in fledging young.



Evaluation of wader diversity in saltmarshes: the importance of species detectability and seasonal change

Frédéric Touzalin¹ & Guillaume Gelinand²

¹*Laboratoire évolution et diversité biologique, Université Paul Sabatier, 118 route de Narbonne, 31 062 Toulouse cedex 4 et Bretagne Vivante-SEPNB, Réserve Naturelle des Marais de Séné, Brouel-Kerbihan, 56860 Séné, frederic.touzalin@wanadoo.fr*

²*Bretagne Vivante-SEPNB, Réserve Naturelle des Marais de Séné, Brouel-Kerbihan, 56860 Séné.*

There is no doubt that global change due to human activities is having dramatic consequences on biodiversity on an unprecedented scale. Understanding the causes of these changes, and evaluating and predicting their consequences are major objectives of modern ecology. Consequently estimation of species richness, the first step in biodiversity evaluation, is crucial in dealing with the conservation and the management of ecosystems. However, at a local scale, species richness varies throughout the year and depends on several environmental factors. In addition evaluation of biodiversity depends on survey quality, species detectability, habitat coverage. In this study we used a capture–recapture approach based on counts and presence–absence data from two saltmarshes in western France to estimate species richness and rates of change in bird communities throughout the year. This method is based on the use of capture–recapture models for closed animal populations that allow for heterogeneity in detection probabilities among species and evaluation of different rates of change in species richness; as well as local extinction rate, turnover and colonization rate. Comparison of results using monthly counts leads us to distinguish between five different periods in a bird's occupancy of an area, each having different biological and environmental meanings.

Ageing and sexing of Common Snipe *Gallinago gallinago* is more problematic than we thought

Włodarczyk, R.¹, Janiszewski, T.¹, Kaczmarek, K.², Remisiewicz, M.³, Minias, P.² & Kleszcz, A.²

¹*Department of Teacher Training in Biology and Biodiversity Studies, University of Lodz, Banacha 1/3, 90-237 Lodz, Poland. wradek@biol.uni.lodz.pl*

²*Students Ornithological Section, University of Lodz, Banacha 1/3, 90-237 Lodz, Poland*

³*Avian Ecophysiology Unit, Dept. of Vertebrate Ecology and Zoology, University of Gdansk, Al. Legionow 9, 80-441 Gdansk, Poland*

The Common Snipe is a species in which differences between the sexes and age groups have been well studied. Devort

(1989) showed that sex could be determined in 85% of birds on the basis of the colour and length of the two outermost tail feathers (CICB & OMPO 2000). Age determination can be difficult due to individual variation in the pattern of the wing coverts. All useful ageing criteria relate to contrast between newly moulted feathers and old ones within the upper wing coverts. In September, however, adults that have finished their post-breeding moult cannot be distinguished from juveniles.

Using data collected at Jeziorsko reservoir Poland during 1989–2005 we identified a new ageing criterion and evaluated the value of the outermost tail feathers in sex determination. In adults, we found that more than 90% that had completed moulting their primaries and secondaries showed contrast in their humeral coverts. This criterion enabled us to improve the ageing of birds with no sign of active wing moult that appeared in August and September. Up to 30% of such birds could be aged using on this basis. The CICB & OMPO (2000) key to sex determination is based on the length of a plucked tail feather. In order to adapt this feature to field studies we measured tail feather length before plucking and the full length after plucking. Plucked feathers were used to obtain vane and total feather length measurements. Tail feathers of both adults and juveniles show a significant correlation between total feather length (TFL) and vane length ($r = 0.97$ for adults and $r = 0.98$ for juveniles). The relationship between these measurements is linear and allows us to predict TFL from vane length alone. However, we found that the method of taking the feather measurement influences the results. Mean vane length taken before and after plucking shows significant differences (mean before = 51.6, mean after = 50.5; $t = 12.1$, $p < 0.001$). The tool used for measuring the tail feather (stopped rule v callipers) also impacts the results and can be responsible for an error of up to one millimetre. We finally analyse the distribution of vane length in order to check whether this can be regarded as sexually dependent. Vane length distribution is not bimodal but shows three separate peaks. Such a pattern is not consistent with TFL being a good discriminator of sex. Analysis of tail feather colour showed that only 64–78% of birds had consistent sex determinants (feather length and colour). This means that sexing snipes using both criteria separately will give the wrong result in 20–35% of birds. Finally we used a genetic procedure for sex determination. Results obtained from CDH gene analysis showed that length of outermost tail feather cannot be used as a reliable sexing criterion, at least not in field studies (30% of sex determination based on vane length was wrong and 50% based on the colour of the tail feathers).

