

## Arctic Shorebird Migration Workshop

### Estimating population specific differences in survival in a mixed population of staging Red Knot *Calidris canutus*

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Estimating population-specific demographic parameters for shorebirds is fraught with difficulties. 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 Patagonian/TdF population. Stable isotopes have great potential for separating mixed populations of shorebirds, especially where mixed populations from tropical and temperate areas occur. Their application in Delaware Bay is especially valuable due to concerns about massive declines in the long-distance, rather than short-distance migrants. Intensive re-sighting effort during each spring resulted in over half the individuals alive being re-sighted each year, thus enabling survival rates to be calculated with a precision that would not have been available from an analysis of re-trapped metal-ringed birds.

### Modelling the optimal flyway of arctic-breeding shorebirds using dynamic programming

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Optimal models of migration using dynamic programming were first conceived in the 1990s. Building such models is relatively easy. The hard part is estimating the parameters and testing if the model correctly predicts the migration schedule

of the bird species for which the model was parameterized. This paper describes the derivation of parameter estimates of a dynamic migration model for an arctic breeding shorebird, the Red Knot. An important parameter is the terminal reward, which describes the fitness consequences of arriving with a particular body condition at a particular time on the breeding grounds. We derived the terminal reward from field studies in Siberia. Other parameter values, like flight costs, maintenance metabolism and predation risk were derived from the literature. We did not include wind effects and this explains why model knots could not cover more than 3,420 km in a single flight whereas knots in the real world regularly fly further. The model correctly predicted the time of arrival, but migration was too slow, i.e. the birds departed too early from their wintering grounds. An interesting prediction of the model, that requires testing, is that knots breeding in Canada migrate via Iceland, whereas knots breeding on Greenland migrate via Norway. A sensitivity analysis indicated that this prediction was quite robust.

### Shorebird migration across the Pacific: satellite technology, skilled hands, and good karma

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That a suite of arctic-breeding shorebird species migrates across the Pacific Ocean is well known; how they accomplish such flights – presumed to be non-stop and greater than 10,000 km for some species – has largely been speculative. But with recent advances in satellite tracking technology, large shorebird species can now be fitted with satellite radios (Platform Transmitting Terminals or PTTs). In spring 2005, we tested PTTs on Bar-tailed Godwits in Alaska but the units stopped transmitting prior to the migration due to transmitter failure. However, birds were subsequently seen in New Zealand and eastern Australia, demonstrating they could complete such a flight carrying a PTT. Bolstered by this limited success, in spring 2006 we instrumented 7 Bar-tailed Godwits, 10 Bristle-thighed Curlews, and 1 Whimbrel with either redesigned battery-powered implantable or external mounted solar-powered PTTs. Units were programmed to begin a daily reporting cycle around the average departure date of the species. As of 16 August, all birds had left their nesting areas and moved to staging sites and the PTTs were all functioning. Tracking data have shown the southern Yukon–Kuskokwim River delta to be an important staging site for all three species, but two curlews subsequently moved to the Alaska Peninsula to stage. On 6 Aug, one of them embarked on its southern migration. On 13 Aug, after 160 h in the air, the curlew landed in French Polynesia, a great circle distance of 8,200 km from its starting point (9,200 km from its breeding site). Satellite tracking data indicated that not



only was the flight non-stop over at least 7,500 km, but that the bird apparently adjusted its flight path to find favourable winds en route, travelling at one point 1,000 km east of a direct route. On 16 Aug, as this abstract was written, the other curlew on the Alaska Peninsula had headed south over the Gulf of Alaska.

### Population scale drivers of individual arrival times in Icelandic Black-tailed Godwits

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In migratory species, timing of spring migration is a key process because early arrival on the breeding grounds can enhance breeding success. Arrival times can be influenced by individual factors, such as migration distance and winter and breeding habitat quality locations, and by annual variation in weather conditions. The Icelandic Black-tailed Godwit *Limosa limosa islandica* population is currently expanding into poorer quality breeding areas throughout Iceland. Using a dataset of arrival times in Iceland in different years for individuals of known breeding and wintering locations, we explore the relative importance of individual factors and weather patterns in determining arrival times. We show that between-individual variation is a stronger predictor of arrival time than weather, and that habitat quality is the strongest individual predictor of arrival, whereas migration distance does not influence arrival times. Timing of migration appears to be a key component of the intricate relationship between wintering and breeding grounds in this migratory system. Whilst annual variation in timing of migration is influenced by climatic factors, the pattern of individual arrival is primarily related to breeding and winter habitat quality. These habitat effects on arrival patterns are likely to operate through variation in individual condition and local-scale density dependent processes.

### Bird migration in the Beringia and beyond

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Bird migration was tracked by radar in the Beringia region in summer 2005. The data suggest that migration from Siberia was towards the Americas, as well as migration from North America towards Asia. Many birds involved are likely to be shorebirds. Large scale migration routes are discussed on the basis of the pattern of radar echoes as recorded in Beringia.

### Leaving the Arctic: how Sharp-tailed Sandpipers prepare for southward migratory flights of 10,000 km

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The coastal zone of Alaska is an important refuelling and staging area for a great number and variety of migratory High Arctic shorebirds. Many birds are on their way from the Nearctic tundra to areas further south in the Americas, but the coastal wetlands of Alaska also host shorebirds en route from N Siberia to Australia and New Zealand! Notably juvenile Sharp-tailed Sandpipers, born in Siberia, use the Yukon delta in large numbers to fuel and prepare for what might be a spectacular trans-Pacific flight. The Sharp-tailed Sandpipers may well make one of the longest uninterrupted flights in the avian world (approx. 10,000 km), and such flights necessitate storage of large fuel loads. We aimed to elucidate the ecological conditions that enable these birds to fuel up fast and efficiently, by studying their fuelling rates, diet choice and local movements, in relation to fuelling performance.

### Migratory fuelling of Sharp-tailed Sandpipers in Alaska

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Sharp-tailed Sandpipers breed in NE Russia and winter mainly in Australia. In autumn, the adults migrate due south over the Asian continent towards their wintering grounds. In contrast, first-year birds first make a long detour to coastal Alaska, where they prepare for what is likely to be a very long trans-oceanic flight. We studied the details of this fuelling phase in the Yukon delta, SW Alaska, during 3–13 Sept 2004 and 1–26 Sept 2005. A total of 357 Sharp-tailed Sandpipers (all juveniles) were trapped in mist-nets and walk-in traps. As males are clearly bigger than females, we sexed them on wing length, later confirmed by molecular sexing.

There was a significant surplus of males (61%), despite the fact that the trapping methods would be more likely to bias the sex ratio towards females. Fat score was a good predictor of body mass. Body mass increased throughout the study period, but was significantly higher in late September. Up to 12 Sept, body mass increased only slowly at 0.6% per day. From 13 Sept, fuelling rates were dramatically higher reaching 6.5% per day, which is among the highest ever found in waders of similar size.

The highest body masses, all found in the last days of September, were truly impressive, indicating that Sharp-tailed Sandpipers before departure have fuel stores of about 120–130% in proportion to lean body mass. This is far more than



the fuel loads of well-known long-distance migrants like Red Knots and is probably only matched by the Bar-tailed Godwits staging in the very same area. We conclude that the coastal areas of SW Alaska allow very high fuelling rates and that the first-year Sharp-tailed Sandpipers staging there most likely embark on very long trans-oceanic flights.

**Autumn departure of shorebirds from Alert,  
Ellesmere Island, Canada**

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Relatively little is known about the departure condition of shorebirds from breeding areas in the north-east Canadian High Arctic. This paper will present information on body masses and potential flight ranges of shorebirds departing from Alert, Ellesmere Island, following attempted breeding.

**Survival of the fattest:  
late spring body stores and survival in Red Knots  
*Calidris canutus islandica***

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Severe summer weather in Greenland and Arctic Canada in 1972 and 1974 caused very poor breeding success and elevated adult mortality in Red Knots *Calidris canutus islandica*. Those individual knots that are known to have survived these summers were in better than average nutritional condition shortly before departure from their late spring staging area in west Iceland. Furthermore, the condition index of both previously banded and subsequently reported birds captured in Iceland was positively related to the number of summers they were known to have survived. Body stores carried from the final spring staging area to the breeding grounds appear to offer Arctic-breeding shorebirds significant selective advantages: they are used for physical transformation from migration to breeding condition, and in years when weather is difficult may enable survival after arrival on the breeding grounds. Although it may be increasingly difficult to find other datasets comparable to the 1970s situation, for which large numbers of birds were caught and weighed just prior to severe summers, there are likely to be a larger number of banding datasets upon which our finding of correlations between condition and length of survival for both previously-banded birds (during 'normal' arctic summers) and those reported subsequent to ringing (with severe summers) offers potential for testing. It would be instructive to run comparable analyses to establish the extent to which this is a widespread phenomenon. Is it restricted to only Red Knots, to only high-arctic breeders, to only waders or also to other waterbirds, to only late – or also early spring staging areas, etc.?

**Finding optimal strategies for migration with  
density-dependent processes**

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We introduce a method for finding optimal migration strategies that can be used for a population of migratory birds in which density dependent processes are acting. We use an individual-based model of migration; simulating daily movements of birds between discrete stopover sites. At each site, food or energy intake is influenced by the density of other birds at the stopover site; mortality due to predation is influenced by both numbers of conspecifics at the site and by individual fuel stores of the migrating birds; and flight distance is affected by wind conditions and individual fuel stores. Movement between sites and foraging intensity are controlled by individual behavioural rules that determine how to combine information about the environment and the individual's state to produce decisions. We use a genetic algorithm to evolve optimal behavioural rules for a given terminal reward that depends on arrival time and arrival fuel. We determine how optimal behaviour is affected by density dependent processes; by types of information available; by the configuration of the stopover sites; and by the variability of fuel deposition rates and predation along the flyway. We run simulations with optimal rules to predict patterns of fuel deposition and conditions under which we expect to see overloads and site skipping.

**Can we use winter recovery data to determine  
where young Dunlin *Calidris alpina* migrating  
along the Norwegian coast come from?**

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There have been many studies of the migration of Dunlin *Calidris alpina* mostly based on ring-recovery data. Some may argue that such data have not much more to tell us than is already known. We looked at 2,109 recoveries from Dunlins ringed in Norway between 1938 and 2005. The aim was to see if this dataset could be used to discuss the origin of young Dunlins on autumn migration down the Norwegian coast. Most of the Dunlins taking this route are young. It is believed that the origin of some, if not most of them is western Siberia, as far east as the Yamal peninsula or even further east.

Recoveries from S Europe and N Africa were studied based on the assumption that Scandinavian populations migrate earlier than Siberian. We found that birds subsequently recovered in NW Africa had passed the Norwegian coast significantly earlier in the autumn than birds recovered in the Mediterranean. Median ringing dates for birds recovered as first winter were 24 Aug for birds recovered in Mauretania, 4 Sept for the W Mediterranean and 2 Oct for mid and E Mediterranean.



We then looked at the recoveries of Dunlins ringed as migrating young in Norway and later recovered along flyways and on breeding grounds. The Baltic flyway to W Siberia provided most of these recoveries, but there were also several recoveries north and east of the Black Sea, along the Mediterranean/Black Sea flyway and in the Yamal area. Recovery rate along the easternmost of these routes is probably very low, indicating that a significant number of the young birds migrating down the Norwegian coast may follow this route as adults. The birds ringed early and recovered in NW Africa must belong to the subspecies *schinzii* breeding in Scandinavia.

### Unknowns in population structure and migratory links of Palaearctic Bar-tailed Godwits

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Four or five subspecies are currently recognized in the Bar-tailed Godwit *Limosa lapponica*. One of them, *L. l. baueri*, occurs in the Palaearctic only on migration while visiting the Pacific coasts of Asia on the way from E Australia and New Zealand to Alaska. Up to six isolated breeding populations of Bar-tailed Godwits may occur in N Eurasia. However, flyways and wintering grounds have been determined for only three of these populations based on ring recoveries and sightings of colour-marked birds. We can only speculate about the migratory links of the other three populations. The taxonomic status of Bar-tailed Godwits inhabiting the Anadyr Lowland in Chukotka needs re-evaluation. Birds wintering in W Africa breed on the Taimyr Peninsula in north-central Siberia, and visit W Siberia probably only on migration. It is likely that godwits breeding on the W Siberian Plain use the Central-Asian Flyway. It is possible that the species has more subspecies than are currently recognised.

### The annual cycle of the Curlew Sandpiper

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The Annual Cycle of the Curlew Sandpiper *Calidris ferruginea* was published as International Wader Studies 19 in July 2006. Each of the 37 papers in this overview presented one aspect of the annual cycle of this species. In this presen-

tation, we start the process of synthesising these papers into an overall review. Curlew Sandpipers breed in the arctic tundra subzone across northern Asia, from about 70°E to 156°W in Alaska. Densities at breeding sites have large annual fluctuations. The non-breeding areas lie mainly in sub-Saharan Africa, India, Indian Ocean islands and Australia. The migration routes to and from these destinations intersect Eurasia from its western to its eastern limits. We also identify some of the major gaps in our current knowledge of the species.

### The spring migration of Red Knots *Calidris canutus* through Porsangerfjord, N Norway

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The paper reports on the results of the Porsangerfjord Knot research project for the years 2005 and 2006. The timing of migration, departure directions, biometrics, banding recoveries and sightings of colour marked birds proved that most, if not all, birds are of Nearctic origin (*C. c. islandica*). The population was estimated at 38,000 in 2005 and 32,000 in 2006. The timing of arrivals was later than at staging areas in Iceland and at Balsfjord, Norway, but timing of departures was similar. In 2005, peak arrivals were 17–18 May and peak departures 1–3 June; in 2006 peak arrivals were 19–20 May and peak departures 29–31 May. Arrival masses were similar to those in Iceland and Balsfjord at 143 g, but mean mass on 26 May, near departure time, was 162 g, much lower than at the other staging sites. Sightings of colour marked individual birds from East Greenland (1) and Alert, Ellesmere Island (2) indicate the breeding origins of Porsanger Knots. Fifty-seven birds banded and/or colour-marked in Europe outside Norway and two birds from Mauritania have been recorded. One out of 137 birds uniquely flagged in Porsangerfjord in 2006 was in Texel, Holland, on 17 July and was probably an early returning female. The distribution in Porsangerfjord is not the same from year to year. This possibly indicates annual changes in the quality and quantity of food resources. The distribution may also be affected by the several pairs of Peregrines which nest around the fjord and depredate knots. The late arrival compared with Iceland may arise because of the lower early spring temperatures, but with a similar departure date the birds cannot attain the same high departure masses as the birds that stage in Iceland. If Porsanger knots mainly breed in East and North Greenland, they have a shorter final flight to the breeding grounds than Icelandic birds which have to cross the Greenland icecap, probably to more westerly parts of the breeding range.



# Wet Grassland Meadowbird Workshop

## Introduction

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At the International Wader Study Group conference in the Netherlands at Kollumerpomp (2001), members held a workshop on farmland waders. This resulted in the production of a list of key issues requiring further work (see *WSG Bulletin* 96). Whilst the current workshop did not review that document in full, it demonstrated progress on some of the key issues. For example, there have been significant improvements in our understanding of the impact of nest predation and the increase in predator numbers. Three talks, including one experimental study, reviewed current knowledge of predator impacts on wader hatching success in the UK and Germany. The overriding message from these studies was that, at the nest stage, mammal predators are more important. For the chick phase, a very comprehensive study in the Netherlands has revealed that avian predators play a greater role (Theunissen *et al.* 2006, [http://www.sovon.nl/pdf/SOVON\\_Predatie\\_bij\\_weidevogels.pdf](http://www.sovon.nl/pdf/SOVON_Predatie_bij_weidevogels.pdf)). There have also been significant advancements in our understanding and testing of different habitat management options. Six talks were presented using a combination of experimentation, tests of habitat preferences and management case studies for a range of species and countries. In the UK, the key to managing lowland wet grasslands centres on the provision of wet features (pools and linear features) whilst avoiding areas of widespread flooding. On the Baltic coast, large-scale habitat restoration projects are being undertaken to increase populations of Dunlin and Ruff breeding in coastal meadows. In Germany, an analysis of the factors determining success of protected areas in conserving meadowbirds will be completed soon.

Although we have advanced some of the issues raised in the Kollumerpomp statement, there are many others that are still outstanding, for example, the causes of the rapid decline in the Dutch breeding Black-tailed Godwit population are still not fully understood and the gaps in monitoring identified for countries such as Iceland and Russia still need to be addressed.

Participants in the 2006 IWSG wet grassland meadowbird workshop agreed that the day had been well spent, with 18 talks and 80 participants. At the end of the workshop, the following question was posed:

### **WHAT ARE THE KEY ISSUES THAT THE INTERNATIONAL WADER STUDY GROUP STILL NEEDS TO ADDRESS TO IMPROVE BREEDING WADER POPULATIONS ON WET GRASSLANDS ACROSS EUROPE?**

The ensuing discussion is summarised below. Our hope is that by highlighting these issues IWSG members will be prompted to undertake at least some of the activities necessary to resolve these questions and knowledge-gaps.

### **Knowledge transfer**

1. Creation of a relevant grey literature bibliography. IWSG members could be invited to submit reference information from their own grey literature sources. These could then be collated, key subject matter listed and sources of these documents identified. It is suggested that this could form part of the IWSG website and where the authors agree or there are no copyright issues, PDF documents could be available for download.
2. Provision of summaries of the current level of understanding of key issues. It is possible that IWSG members through their work may already have summarised or collated reference sources for many of the key issues. IWSG could play a role in collating and publishing reviews on the website with pages covering different issues.
3. Communicating and engaging with policy-makers to ensure relevant research findings are accessible. For example, engaging with Birdlife partners to pass on new management information may ensure this information is used to influence agri-environment schemes.
4. Establishing communication routes between researchers and land managers: it was suggested that *Conservation Evidence.com* could be one mechanism to facilitate this. This is a searchable website which invites contributions which describe management techniques and evidence for their effectiveness. IWSG members could provide such case studies either as individuals or through the Wet Grassland Working Group.
5. Working with BirdLife partners on a country-by-country basis to highlight the current failure to comply with obligations under the EU Birds and Habitats Directives, which are evident from the continuing large-scale population declines in many species.
6. Considering ways in which information can be provided to developing countries to ensure minimal loss or degradation of the non-breeding grounds of European wet grassland waders.

### **Habitat management**

1. Continue to carry out trials of novel habitat management techniques and to report the results as widely as possible.
2. Developing protocols for assessing the success of habitat management. The success of the conservation manage-



ment of wet grassland can be assessed in a variety of ways. A process for assessing the success of management techniques (e.g. a flow diagram of management outcomes and targets) would be a helpful tool in ensuring future conservation funding.

3. Exploring the role of landscape-scale habitat management as a means of reducing predator impacts on breeding waders. There is a great deal of evidence for the role of predation in limiting wader productivity. Designing appropriate habitat mosaics is a possible mechanism to limit predation effects, but little is currently known about the effectiveness of such techniques. Comparative and experimental studies of landscape-scale impacts on predation levels could be very informative. In addition, there is also a need to understand more about the role of predation in limiting chick survival.
  4. Assessing the impact of agricultural chemicals. Agricultural chemicals (e.g. pesticides, herbicides, fertilisers and veterinary drugs) are widely acknowledged as potentially detrimental to breeding wader populations on wet grassland through e.g. reducing invertebrate abundance. Despite this, little is known of the implications for breeding waders and studies to quantify these effects are thus important.
  5. Evaluating the effectiveness of the efforts of different countries to conserve breeding wader populations. In addition to identifying which approaches have been most successful, this could also highlight countries where IWSG could attempt to encourage efforts to improve wader populations.
3. Habitat fragmentation, dispersal and landscape-scale management. Extending the application of methods of improving habitat structure for breeding waders into the wider countryside is now a realistic option in some countries, through mechanisms such as agri-environment schemes. Landscape-scale decisions about the locations at which such methods should be applied will be greatly informed by better understanding of the constraints on natal and breeding dispersal, and how these are influenced by habitat fragmentation.
  4. The impacts of climate change on meadow bird populations needs to be investigated.

### Population assessment

1. There is an urgent need to be able to carry out rapid assessments of wader productivity. Currently, productivity assessment is extremely labour-intensive, often involving radio tracking and other such methods which cannot easily provide estimates over large spatial and temporal scales. Diagnosing the causes of population declines and linking breeding and non-breeding processes will be greatly helped if productivity estimates could be gathered over much larger scales than is currently possible. The progress already made in the development of some of these methods is welcomed and IWSG will strongly support continued efforts to evaluate and disseminate the results of these studies.
2. There is still a major gap in knowledge about survival rates of meadow birds. Only a few species have been studied recently using modern methods.

### Large-scale processes

1. Seasonal connectivity and the links between breeding populations and migratory and winter processes. There is clearly a need to establish the mechanisms linking demographic processes in the breeding and non-breeding seasons. A key aspect of this work could involve linking researchers working on the same species at different locations throughout the migratory range, which could be facilitated by IWSG by publicising projects and encouraging collaborative work.
2. Population-scale impacts of predators. Most studies of predator impacts have wisely focussed on detailed studies of predator identity and effects on local populations. However, there is a growing need to assess the impact of predators at larger spatial scales, and especially to address the conditions under which predators focus on high-density breeding wader hotspots. Advice for site managers is urgently needed.

### The next steps:

The IWSG has a Wet Grassland Working Group, which was involved in the preparation of the workshop in Sweden (contact: [mark.smart@rspb.org.uk](mailto:mark.smart@rspb.org.uk)). The group works through e-mail communication. Discussions after the workshop helped to identify some actions that the Wet Grassland Working Group could take immediately. One of them is the creation of a bibliography of relevant grey literature and it may also be possible to review this literature to some extent. To create this grey literature resource, your help is needed. In the near future, we hope to e-mail a simple spreadsheet where members can type in details of grey literature that they may have authored or sources of relevant information. We hope to produce a simple and open list of references for the IWSG web-site within the next few months.



## Workshop talk abstracts

### **Mammals, waders and wetland management – a German perspective**

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Increased nest and chick predation by carnivores has been observed in central Europe in many medium-sized or large species of ground breeding birds. Management of meadow bird reserves should seek long-lasting solutions. In spite of a wide range of approaches, from habitat management to protecting single nests and control of predators, satisfactory results are still scarce. Based on results mainly from Germany, I will present some views on the role of some native and introduced species of carnivores as predators on wader nests, the likely causes of high predation rates, and the prospects for restoring predation-free source habitats.

### **Caught in the extinction vortex? Population decline and genetics in a metapopulation of Southern Dunlins**

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Habitat fragmentation has resulted in population declines of many species. The remaining small and isolated populations are threatened by extinction for several reasons, including genetic factors such as inbreeding and loss of genetic diversity. We examined the interaction between population decline and genetics in a fragmented population of Southern Dunlins *Calidris alpina schinzii* breeding on coastal pastures in SW Sweden. During 12 years, we recorded one re-colonization and six extinctions of local populations, suggesting that the entire metapopulation is threatened by extinction. In parallel, pedigrees and molecular markers revealed an increased frequency of matings between related individuals in the population (including incestuous inbreeding). Furthermore, we found evidence of inbreeding depression and other negative effects of reduced genetic diversity: genetically similar pair members suffered increased hatching failure, and young that died prematurely were more homozygous than those that hatched. Individual genetic diversity also predicted long-term survival of the offspring. Our results suggest that the incessant decline of the Baltic population of Southern Dunlins has substantial genetic consequences, further increasing the extinction risk of this endangered wader.

### **Northern Lapwing nest predation: the impact of different predator species and options for mitigation**

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Whilst the severe declines of Northern Lapwings in the UK and elsewhere in Europe are considered to be driven by

changes in agricultural practices, concern is mounting that the effects of predation may hinder population recovery, even in locations where habitat is apparently suitable. The impact of predation may have intensified through a variety of mechanisms. These include a reduced ability to deter avian predators by lapwings nesting at low densities; changes in habitat availability resulting in a higher proportion of lapwings nesting in habitats associated with high predation rates, and changes in the densities or foraging behaviour of predators. Lapwings have a wide range of potential predators and for conservation managers to ensure that predation does not compromise population recovery, it is important to establish the relative impact of different predator species, and assess the options for mitigation if impacts are unacceptably large. Here we review the literature and present preliminary field data from the UK to assess the relative importance of the common predators of nests of lapwing and other waders in lowland wet grassland and similar habitats. We also examine the predation probability of lapwing nests in lowland wet grassland in relation to environmental variables to assess the options for habitat-mediated mitigation measures.

### **The use of meadows at night by wintering Eurasian Woodcock**

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Eurasian Woodcocks *Scolopax rusticola* relies mainly on open habitats at night in winter. Sixty-five radio-tagged woodcocks were monitored during three winters in W France. Fields were used on 85% of nights but there were large differences between individuals: 43% used fields every night while others only occasionally. However, all birds used fields intensively during the 10 days before departure on migration. Meadows, especially wet ones and old grazed pastures, were preferred to maize or wheat fields. Earthworm biomass in such places was five times higher than in cultivated fields and twelve times higher than in neighbouring woodlands. Activity sensors in the radio-tags indicated that the birds spent 23% of night time foraging in meadows (3.5 hours). The amount of time spent foraging at night in meadows depended on time foraging the previous day in woodlands, temperature and the age of the birds. There was a continuum of strategies in relation to night time movements: 33% of birds remained faithful to a single "core" area (c.4.5 ha) while 67% used several cores (mean 4.3 ha, spaced by 383 m). However the benefit of excellent foraging opportunities in meadows is counterbalanced by a higher predation risk by terrestrial mammals. It appears essential to include the management of meadows to provide essential food supply when designing protected areas for wintering woodcocks.



### Designing wet features for waders

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Waders and wet grassland habitats have suffered severe declines in recent decades. Nature reserves are effective conservation islands for breeding waders, but management of the wider countryside is needed to aid population recovery. Across Europe, large amounts of grazing marsh that are intensively managed as agricultural land could hold huge nature conservation potential if they were managed more sympathetically. However, conservation-friendly management needs to also be compatible with farming needs. One of the key features required by breeding waders is shallow areas of flooding. Implementation of managed wet features could provide a solution to this conflict, as they can be constructed and maintained with relatively little disruption to farming practises such as livestock management. This study aims to assess the design and density of wet features that are sufficient to influence Northern Lapwing *Vanellus vanellus* ecology and demography but also acceptable to farmers within the Broads Environmentally Sensitive Area (ESA), England.

### Wet grassland waders under Frisian Polder-circumstances

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Since the early 1970s, a lot of effort has been put into protecting the waders of European grasslands. This is also true of the province of Fryslân in the Netherlands. In this talk, I will discuss past, present and future efforts to organize the protection of wet grassland waders in Fryslân. First, I will focus on changes in the numbers of waders breeding in Fryslân and make comparisons with other areas. In the second part of the talk, I will concentrate on the organisation of protection amongst stakeholders.

### The impact of predator removal on upland breeding waders

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Among conservationists, predator removal is often considered a controversial management technique. An eight-year experiment in N England aims to quantify any effects of predator removal, as conducted by gamekeepers seeking to increase Red Grouse numbers, on numbers and breeding success of key upland ground-nesting birds. The experiment has been running since 2000 comparing two sites with predator removal and two without. The data collected so far indicate higher breeding success on sites with predator removal for the three most abundant wader species, Eurasian Curlew, Eurasian Golden Plover and Northern Lapwing. The numbers of breeding birds has also increased on some sites for lapwing and golden plover. The experiment will finish in 2008 by

which time enough data will have been collected to undertake robust analysis. At this interim stage the data are suggestive of predator removal benefiting a range of upland breeding waders.

### Efficiency of conservation measures for wet grasslands

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In W Europe, the populations of most meadow bird species have declined rapidly over recent decades despite the implementation of extensive conservation programs. In many cases protection measures have not been successful in a sustainable way. A project supported by Deutsche Bundesstiftung Umwelt (DBU) has been set up to determine under which conditions and at which sites certain conservation measures have been successful. It also investigates the economical efficiency of such measures. The first results of the project will be presented.

### Next to extinction?

### Trends in population size and breeding success of meadow birds in Central Europe

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Meadow bird communities are one of the most endangered in Europe. Monitoring data reveal that the population sizes of most grassland-breeding waders have declined over recent decades; particularly Eurasian Oystercatcher, Northern Lapwing, Dunlin, Ruff, Common Snipe, Eurasian Curlew, and Black-tailed Godwit. These declines have been especially pronounced in the Netherlands, which is the most important country for several meadow bird species, but they have also occurred in Germany and other European countries. Only Redshank shows no overall negative trend. On a regional scale, however, not all meadow bird communities show the same trend. Coastal populations, for instance, have been found to be relatively stable. The distribution of several formerly common species has become patchy. Literature data have been used to investigate trends in the breeding success of grassland breeding waders. These show that the breeding success of lapwings and Black-tailed Godwits (species with strongly negative population trends) has declined over several decades whilst that of oystercatchers, curlews and Redshanks (species with more stable populations) shows no clear trend.

### Monitoring breeding wader populations in the coastal meadows of West Estonia, 1999–2006

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The coastal meadows of W Estonia belong to the North



European group of maritime salt marshes. These grasslands are much influenced by the neotectonic land uplift (2–3 mm per year) and more brackish conditions than in W Fennoscandia. The grasslands have a long history of use for grazing and to a lesser extent for haymaking. The rapid decline of traditional management after World War II, which took place elsewhere in Europe, was postponed in Estonia for several decades due to Soviet agricultural practices. Species-rich coastal communities were preserved until re-privatization of land in the early 1990s. In the course of the latest economical transition, extensive use of coastal meadows practically ceased. Management of coastal areas was started again in 1996 (Matsalu NP) and since 2000 in several other protected areas. The total area of Estonian coastal grasslands was estimated at 288 km<sup>2</sup> in the 1950s, but only 80 km<sup>2</sup> in 2000 (Luhamaa *et al.* 2001).

Bird monitoring has been carried out in the coastal meadows of W Estonia throughout 1999–2006. Altogether there are 20 census plots totalling 1,805 ha in 4 counties. Each year 12–14 permanent census plots have been surveyed. Plots were set up in meadows with high or medium nature conservation value as determined during the countrywide inventory of semi-natural meadows in 1993–1995 (Leibak & Lutsar 1996). The modified mapping census of land birds used in Swedish coastal meadows (Öland & Gotland islands) was applied (Ottoson *et al.* 1989). During field work, the plots sampled were divided into sub-areas according to the boundaries of existing management regimes. Each plot was visited 2–3 times between mid-May and mid-June.

Altogether 11 wader species bred in the sampled meadows. Of these, only seven were common enough for the production of annual population indices (average number of breeding pairs >20). Four species – Redshank *Tringa totanus* (32.4 % of the breeding community of waders), Northern Lapwing *Vanellus vanellus* (26.0%), Eurasian Oystercatcher *Haematopus ostralegus* (11.1%) and Dunlin *Calidris alpina schinzii* (11.0%) – were clearly dominant in the community. Population indices were also calculated for Ringed Plover *Charadrius hiaticula* (7.3 % of the breeding community of waders), Common Snipe *Gallinago gallinago* (4.0 %) and Black-tailed Godwit *Limosa limosa* (3.6%).

Since 2002, breeding waders (with exception of Common Snipe) have shown a continuous declining trend, which has been most dramatic in Black-tailed Godwit, Ringed Plover and Dunlin. The main reasons for these declines are insufficient or incorrect management of meadows, habitat fragmentation and high predation rates. The future of the populations of Dunlin and Ruff *Philomachus pugnax* in Estonia will depend almost entirely on the continuation of the traditional use of semi-natural meadows. Lapwings and Black-tailed Godwits are more flexible in their requirements and sometimes colonize other habitats.

### Spring stop-over of European Black-tailed Godwits in Portuguese rice fields

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European Black-tailed Godwits *Limosa limosa limosa* breed in N Europe and winter in W Africa. During northward migration, they make an extended stop-over in the Iberian

Peninsula, refuelling on Portuguese and Spanish rice fields. Despite being a declining population, available information on its ecology is focused mainly on the breeding grounds. Little is known about them on their wintering grounds or during migration, a critical part of their yearly cycle. We monitored the main rice field areas in the two most important Portuguese wetlands, the Tejo and the Sado estuaries, analysing the phenology and abundance of Black-tailed Godwits, and evaluating their habitat preferences throughout the range of different types of rice field. We also performed focal observations of foraging behaviour and collected faeces in order to analyse diet composition. Godwits were present in these areas from early January until early March, with the largest numbers in February. The maximum count of nearly 45,000 represents almost 50% of the total population of the subspecies. Godwits seem to prefer ploughed rice fields, particularly the ones that are partially flooded. Their main food is rice seeds, which allow them to achieve very high intake rates, probably higher than the intake rates of godwits foraging on mudflats.

### Survival in meadow birds

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An overview of survival data of meadow birds based on literature is given. The four main meadow waders are discussed: Eurasian Oystercatcher, Northern Lapwing, Redshank and Black-tailed Godwit. Survival does not seem to have declined over recent decades. However, there are some gaps in the data: there are no recent survival data (after 1988) available for lapwing, little data were collected in the 1960s when meadow bird populations peaked and most data on oystercatcher and Redshank come from coastal breeding populations, not from populations breeding on grasslands. In addition, comparison of data is difficult, as different techniques have been used to calculate survival. A list with relevant literature is provided.

### Adult survival and breeding site fidelity in two Dutch Black-tailed Godwit populations

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Numbers of Black-tailed Godwits breeding in the Netherlands have been declining since the 1970s, and attempts to stop this decline seem to have been ineffective. In the 1980s, a study was conducted on the survival rates of colour-ringed Black-tailed Godwits. However, there were no further colouring studies until 2002 and ringing chicks has become less popular, decreasing the reliability of survival analyses based on ringing recoveries. To obtain recent estimates of survival rates, 99 adult Black-tailed Godwits were colour ringed during 2002–2004 as part of an extensive population study at two sites in the western part of the Netherlands. Breeding site fidelity has also been estimated in relation to breeding



success. Differences in survival rates, resighting probabilities and breeding site fidelity between males and females and between the two areas are discussed, as well as consequences for conservation measures, and results are compared to historical data.

### **Assortative mating by breeding plumage in Black-tailed Godwits**

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Theory of sexual selection predicts that both sexes choose their mates most cautiously in long lived, monogamous species with a considerable degree of biparental care. Black-tailed Godwits are long-lived, monogamous shorebirds and both partners take part in incubation and caring for chicks. Sexes are dimorphic with respect to both size and breeding plumage. Their breeding plumage is astonishingly variable with respect to coloration and the degree of winter feather retention. In a unique approach, we use digital web cameras at Black-tailed Godwit nest sites to capture images of both incubating partners. From these images, we scored several plumage variables which we used for analysis. We compare these variables with ones scored on birds in the hand, from photographs and in the field, in order to gain a set of plumage variables that gives reliable results which are comparable between all the named situations. We then analyze the plumage variables with regard to body mass, size and time of year. We find that godwits mate assortatively with regard to plumage. We further look at whether pairs in which the sexes are more similar to each other are also more compatible, especially with regard to timing of breeding.

### **Managing lowland wet grassland for Redshank: what, where and how!**

Jen Smart<sup>1,2</sup>, Jenny Gill<sup>2</sup>, Bill Sutherland<sup>2</sup> & Andrew Watkinson<sup>2</sup>

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Globally, wetland ecosystems are amongst the most threatened habitats due to large-scale drainage for agriculture and a significant proportion of coastal wetlands are currently threatened by sea-level rise. Wetland loss and degradation has been implicated in the widespread decline of breeding waders in Europe. In the UK, lowland wet grassland is an important wetland habitat for breeding waders and managing the remaining grassland resource to benefit waders requires a detailed understanding of breeding wader habitat requirements. We quantify the habitat features which are important in determining breeding and nest site location in Redshank *Tringa totanus* on grazing marshes in east England. We show that many of the features important to Redshank can be easily manipulated through management and we discuss this in relation to improving the management of grassland in the wider countryside.

### **The wetter the better: managing wet grassland to benefit breeding waders**

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Populations of breeding waders on wet grassland have been in serious decline across Europe due to large-scale drainage of wetlands and agricultural intensification. The Royal Society for the Protection of Birds, Europe's largest conservation charity, has owned Berney Marshes, a wet grassland nature reserve, since 1985. The main aim of the management has been to increase the number of wintering waterfowl and breeding waders on the site. In this presentation I will show how the practical management work at Berney Marshes over the past 20 years has affected breeding wader populations.

### **The LIFE-project Rehabilitation of the Baltic coastal lagoon habitat complex: can loss of breeding habitat explain the dramatic decline of Baltic Dunlin and Ruff in the coastal meadows of Denmark and the Baltic?**

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This project includes the evaluation of habitat management by a specialist team at 55 project and reference sites in Denmark, Estonia, Germany, Lithuania and Sweden in order to improve conditions for Baltic Dunlin, Ruff, Natterjack Toad and Green Toad.

Ruffs have declined dramatically in the Baltic. Field visits during the first project year in Denmark, Estonia and S Sweden revealed that good breeding habitat for Ruff is in short supply in coastal and nearby alluvial meadows. Therefore loss of breeding habitat may well explain the decline of Ruff.

Baltic Dunlins have also declined. Visits to a large number of Dunlin sites showed a more diverse pattern than in Ruff. In the Danish Baltic and in Estonia overgrowing of coastal meadows is widespread. However, in Estonia there were high densities of breeding Dunlins in the fairly limited areas with well-grazed coastal meadows. In contrast Dunlins were absent from apparently similar sites in W Denmark, suggesting that loss of breeding habitat is probably not the main cause of recent declines.

At Tipperne in W Denmark, data on nest and brood survival indicates that predation is not the principal cause of the decline in breeding Dunlins there. In most other sites, little is known about the impact of predation on the eggs and chicks of Ruffs and Dunlins, because it is difficult to find and monitor sufficient nests and broods.

Experience from Tipperne indicates that caution is needed in studies that use indirect methods of measuring predation rates, such as dummy nests, thermologgers or data from other, 'easier' species. The impact of predation seems to differ between meadowbird species depending on the characteristic anti-predator behaviour of each, such as camouflage, aggressiveness and distraction display. Over-estimation of predation rates using thermologger nests can be large, and a control study of natural nests is vital.



## Annual Conference – Abstracts of talks

### 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

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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

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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

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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.**

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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***

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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**

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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**

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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

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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?**

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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**

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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-ringed 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?**

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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**

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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**

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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

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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

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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

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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

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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**

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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**

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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**

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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

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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

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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).



## Annual Conference – Abstracts of posters

During the conference, Petra de Goeij organised the usual poster competition and participants voted for the one they preferred. The results were:

- ☆ **First prize:** *Age-independent telomere length as a molecular marker for individual quality in a wader* by Angela Pauliny, Richard H. Wagner, Jakob Augustin, Tibor Szép & Donald Blomqvist
- ☆ **Second prize:** *Effects of winter habitat quality on timing of migration* by Jose Alves, Becca Hayhow, Tomas Gunnarsson, Peter M. Potts, William J. Sutherland & Jennifer A. Gill
- ☆ **Joint third prize:** *Day- and night-activity in waterbirds and in their benthic prey* by Wiebke Esser & Michael Exo
- ☆ **Joint third prize:** *Time budgets of Northern Lapwing chicks during the first days after hatching* by Lucyna Woloszyk, Włodzimierz Meissner & Paulina Piasecka

### Interhabitat connectivity of two feeding patches of waterfowls at Palau Island Marine Reserve, Sta Ana, Cagayan Philippines

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“Linkages in the landscape” is an emerging concept in Protected Area Management, featuring the role of corridors and connective strips in enhancing biodiversity flow and interactions between and among similar or distinct ecozones. The Philippines is richly endowed with diverse flora and fauna, as well as ecosystem types. As an archipelagic country consisting of 7,100 islands, it has been a good wintering and foraging grounds of many wader species from the north and south hemispheres. However, Protected Area Zoning in the country is said to be far from ideal because of too regimented spatial delineation of buffer zones, oftentimes without direct relationship to the structural and functional interactions of life forms between interconnected ecosystems.

The poster highlights the importance of considering the connectivity of two types of wader habitat as a basis for assessing the appropriateness of the zoning plan for Palau Island Marine Reserve. The two feeding sites were characterized through vegetation analysis, benthic faunal assessment and waterfowl count. Social survey was also carried out to assess the demographic pressures and politico-institutional factors that affect the ecological integrity of the waterfowl habitats. The eastern part of the island is a suitable overwintering site for waterfowl because of the vast intertidal flats that provide good feeding grounds and roosting sites. Their habitat is vulnerable to human disturbance as these zones are also used for livelihood activities of the local communities. Social survey revealed that the current socio-economic, cultural and politico-institutional conditions of the island have less bearing on the integrity of the waterfowl habitat. However, if present trends of demographic pressure persist, coastal marine resources could be degraded and eventually people will shift to farming and other land-based resource livelihood activities, thus affecting the waterfowl habitats.

### Effects of winter habitat quality on timing of migration

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Timing of arrival on the breeding grounds can be of great importance to migratory species, as early arrival can improve access to higher quality resources and breeding locations, and can increase the potential number of breeding attempts. Recent work on the Icelandic Black Tailed Godwit *Limosa limosa islandica* has shown that winter habitat quality is the strongest individual predictor of arrival times, and that individuals occupying good breeding habitats also tend to occupy good winter habitats. Variation in arrival times could thus be influenced by breeding and/or winter habitat quality. Using a unique dataset of individual colour-ringed godwits and with the help of keen observers across the range, we were able to determine the wintering location of many individuals of this highly philopatric subspecies. Here we explore the habitat quality experienced by individuals wintering at four distinct locations across the range and its implications for the timing of spring arrival in Iceland. In addition, we explore the migratory routes of birds from these four locations and how the timing of arrival in Iceland varies with migratory route.

### Decreasing trend of shorebirds at Japanese stop-over sites in the East Asian Australasian flyway

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In Japan, 40% of the former area of tidal flats has been lost in the past 50 years. Nationwide surveys of shorebirds have been conducted in Japan since 1973. The most recent survey, conducted in 2004 by the Ministry of Environment at c.100 sites, recorded 57 species (79,284 birds) during northward



migration, 55 species (40,615 birds) during southward migration, and 42 species (53,430 birds) in the non-breeding season. In the last five years, the number of individuals of dominant species has not shown any increasing or decreasing trend, but the maximum number of Dunlin shows a decreasing trend (contrary to the lack of any trend in one-day census data). A comparison of monitoring data from 1973–1985 and 2000–2003 shows estimated decreases in total numbers of shorebirds of at least 40% during northward migration (with significant decreases in Kentish Plover, Great Knot, Ruddy Turnstone, Eurasian Curlew and Spotted Redshank) and at least 50% during southward migration (with significant decreases in Kentish Plover and Dunlin). On the other hand, numbers of a few species increased significantly during northward migration (Eurasian Oystercatcher and Black-winged Stilt) and during southward migration (Eurasian Oystercatcher, Black-winged Stilt, Greater Sandplover, Grey Plover, and Sanderling). Habitat degradation and land reclamation in Japan are likely to be among the reasons for the observed decreasing trends of many shorebirds.

**Effect of vegetation height in grassland on breeding Northern Lapwings  
*Vanellus vanellus* distribution:  
the choice between pasture and arable lands**

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Although Northern Lapwings are abundant in Europe, the number of breeding birds has been decreasing for several decades, in France as well as in the rest of W Europe. However, in W France, in a 12,000 ha wetland area, this trend seems to be the reverse. Absent as a breeder in the marsh of Brouage until the 1970s, lapwings colonised and the population grew until 1996, before stabilizing. This trend may be linked to the absence of cold winters in the region since 1986, and to the settlement of wintering birds, but also to an improvement in the habitat quality of pastures. However, in more recent years pasture management has been reduced in intensity, and at the same time there has been a change in the breeding distribution of lapwings. Now, they tend to nest on arable land rather than pasture. The aim of our study in 2006 was to determine whether the two events were linked by using data collected since 1996, and so to show whether there is a relationship between vegetation height in grassland and whether lapwings breed there or re-distribute to arable land.

**Unusual occurrence of summering  
Red Knot *Calidris canutus* on a  
small rocky island in the western Irish Sea**

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Rockabill, at 53°30' N 6°00'W, lies approximately 6 km off

the north County Dublin coast in the west central Irish Sea. It comprises two small, granite islands totalling 0.9 ha, of which >50% of the main island is covered by a lighthouse and associated buildings. The island supports around 2,500 pairs of three species of tern as well as breeding Kittiwakes and Black Guillemots and is looked after by a warden from the beginning of May to early August each year. Few waders occur during most of June and July, apart from small flocks of Ruddy Turnstones and Purple Sandpipers on the intertidal rocks, which are dominated by barnacles and mussels. Small numbers of other waders, presumably on passage, occasionally join the turnstone/Purple Sandpiper flocks, such as Dunlin, Red Knot and Sanderling.

In 2006, the first three knots were seen on 9 May, three days after our arrival. This was the beginning of a remarkable occurrence of knots throughout the summer. Up to the end of July, we saw knots on 91 occasions. Mean flock size was 218, and we recorded a total of 19,859 bird/days. The maximum flock size was 170 in May, 1,500 in June and 700 in July. Most were in grey non-breeding plumage, though 9% were wholly or partly red. The activity of these birds on 18,010 bird/days was recorded. Only 2.9% were foraging, whereas 40.5% were roosting. The remainder (56.6%) were first recorded in flight, which often lasted for remarkably long periods (10–60 min), before the birds departed from or landed on the island. In our presentation, we explore the relationship between the occurrence of knots on Rockabill and diurnal and tidal cycles, and give a preliminary indication of potential prey availability. Such numbers of knots have not been recorded previously in mid summer in Ireland and why an offshore rocky island 25 km to the northeast of Dublin Bay and 40–45 km to the south-east of Dundalk Bay, their two principal wintering grounds on the east coast of Ireland, became an area of intense activity remains something of a mystery.

**Breeding success of waders in the Bug and  
Narew valleys, E Poland**

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The river valleys of E Poland (the Biebrza, Narew and Bug) have traditionally supported large breeding populations of grassland waders, mostly Northern Lapwing, Black-tailed Godwit, Common Snipe, Redshank, but also Ringed Plover, Ruff and Great Snipe. Over the last decade, however, numbers have declined considerably across the whole region. On the Bug river, the population of Ringed Plovers breeding on riverside pastures has declined by c.50% since the mid 1990s. Bug populations of lapwing and Black-tailed Godwit apparently crashed after 2002. These findings triggered research aimed at determining possible reasons for the declines. In 2004–2006, the nesting success of waders was studied on multiple plots in the Bug and Narew valleys. Additionally, nesting success of Ringed Plovers breeding along the Bug was analysed using a series of breeding records dating back to 1992. Generally, in 2004–2005, nest success of all species studied was extremely low at an average of 7%. This was mostly due to predation by mammals, chiefly Red Fox, and



to a lesser extent by Hooded Crows. Population viability analysis showed that, currently, nest predation alone is sufficient to drive local wader populations towards rapid extinction. Moreover, a 14-yr dataset for Ringed Plover shows that clutch predation was much lower in the early 1990s and increased to the current level around 1995–1997.

**Monitoring of colour banded Red Knots  
*Calidris canutus rufa* that stop over in  
Peninsula Valdés, Argentina**

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The Red Knot is a long distance migrant that stops over on the beaches of Peninsula Valdés, Argentina, during northward migration from Tierra del Fuego to the Canadian Arctic. As part of a monitoring program of the *rufa* knot population, we have surveyed the beaches and mudflats of two bays on Peninsula Valdés: Fracasso (San Jose Gulf) and Colombo (Nuevo Gulf).

Information on the re-sighting of ringed birds was used to evaluate site fidelity, stopover duration and migratory movements. The area was visited during the migration seasons of 2004–2006. Using binoculars, telescopes and digital photographs we made complete surveys of the study areas and scans for colour bands. Information on individually marked birds showed that 25% of those seen in 2004 were seen again in 2005, while 90% of birds seen in 2005 and 58.3% seen in 2004 were seen again in 2006. Three birds with individual colour combinations were observed in each of the three consecutive seasons and five birds were seen in both study areas on the same day. The latter would suggest that the whole of Peninsula Valdés, or an even bigger area, is used by individual birds as a single feeding/stopover site. Each year the same individually marked birds stayed for the whole stopover period of about a month indicating that it is much the same flock that stops over annually. Maximum counts were close to constant during April (2,000 in 2004, 300 in 2005 (when we made only two visits) and 700 in 2006) decreasing strongly at the beginning of May when they leave to continue their migration northwards. On the one hand the results indicate site fidelity for a group of birds; on the other a decrease in numbers over the years which may reflect a decline in the total population.

**Day- and night-activity in waterbirds and  
in their benthic prey**

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In tidal areas shorebirds adjust their activity patterns according to the tidal cycle. Nocturnal activity is not only widespread and common among waterbirds (Anseriformes and Charadriiformes), but in most species essential to meet daily

energy demands. However, although several studies have emphasized the importance of nocturnal feeding, quantitative data are scarce and sometimes contradictory. We investigated day and night abundance and foraging activity of several waterbirds (Redshank, Pied Avocet, Grey Plover, Dunlin, Eurasian Oystercatcher, Shelduck, Mallard and Black-headed Gull) in relation to predation risk, food availability, habitat type and moon phase. Observations were carried out in the Lower Saxonian Wadden Sea during spring and autumn migration using a light intensifier at night. Total abundance did not differ between day and night in any wader species, but gulls were more abundant during the day and ducks during the night. However, some species exhibited different habitat preferences during night and day, probably related to differences in predation risk. In all species but gulls foraging activity was higher during the night due to higher food availability and decreased predation risk. Feeding activity did not differ between full- and new-moon phases. Visual observations indicated that the polychaetes *Hediste diversicolor* and *Heteromastus filiformis* were significantly more active during the night. The data suppose both the preference hypothesis (that night-feeding is preferred) as well as the supplementary hypothesis (that night-feeding only occurs to supplement day feeding).

**Some aspects of Black-tailed Godwit  
*Limosa limosa islandica* ecology  
in the national nature reserve of 'Marais d'Yves',  
Charente-Maritime, France**

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The "Marais d'Yves" is one of the national nature reserves of the "Pertuis charentais", which are among the most important wetlands in western France. It is a major site for many migratory water birds, particularly in winter. The reserve includes three main habitats: dune, lagoon and wet grassland. In 1992, Black-tailed Godwits of the subspecies *islandica* started wintering at this site. Since then, the population has shown an exponential increase both on the reserve and nationally. During two winters (2001/2002 & 2002/2003) a detailed survey was undertaken to understand how the species uses the site. We counted the roost on 40 occasions, in relation to tide height, the birds' arrival time, the water level in the lagoon, weather conditions and the birds' precise location. When the godwit flocks fed near the shore, foraging scans (248) were carried out: each bird was observed for two minutes and we counted the number of prey taken, differentiating between round prey (bivalves) and long prey (worms). Godwits fed in a specific strip of the tidal zone, an area that became rapidly submerged by the rising tide. Nine feeding sites in three main areas were identified. During the two winters, there were many differences in their use by the birds: one site might be used regularly in one year and almost deserted the next. The scans showed that the Black-tailed Godwits fed almost exclusively on round/bivalve prey.



### Thermoregulatory consequences of moult in Red Knots *Calidris canutus islandica*

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Moult is considered to be energetically expensive for birds. However energy increment for feather synthesis is reported to be relatively low compared with overall daily energy expenditure. Since the plumage of the birds creates an insulation preventing heat loss, thermoregulatory costs should be taken into account as well. Recent studies on Red Knots show the difference in insulating properties of the summer (breeding) and winter plumage, which results in higher thermal conductance (Tc) in summer. So far no detailed study on Tc – the inverse of insulation – during the peak of moult intensity has been performed. We took respirometry measurements of basal metabolic rate – BMR, and Tc from nineteen Red Knots kept in captivity up to eleven years. Birds followed their natural annual cycle and natural photoperiod. To study within-individual changes, we measured BMR and Tc in three periods: in full summer plumage, during the peak of moult intensity and in full winter plumage. Analyses on mass-corrected values show that BMR in moulting birds is significantly higher than in the same individuals in winter plumage and might reflect an increase in energy demands for protein synthesis. The estimated cost of feather synthesis – the increase of metabolic rate over the BMR level – was almost 7%. We did not find any peak of Tc during the highest moult intensity, when the insulating layer is disrupted. Tc during moult was similar to the level in winter. Thus thermoregulatory costs seem to be unaffected by the loss and regrowth of the plumage or by the intensity of its replacement. This suggests that birds can maintain Tc at a constant level between the main post-breeding moult and winter. Theoretically, taking into account only the insulating properties of the plumage, knots would have little difficulty moulting at low temperatures. Overall, our results support the propositions that the cost of feather synthesis is rather low energetically and that there is no detectable thermoregulatory cost during the peak of moult.

### Grey phalarope re-uses a former Dunlin nest

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In the summer of 2006, a Grey Phalarope *Phalaropus fulicarius* nest was found at Zackenberg, NE Greenland, the first one since the beginning of the BioBasis monitoring programme in 1995. The nest cup was already marked from the previous season, since it had been constructed by a pair of Dunlin *Calidris alpina*, which successfully hatched four chicks. Little is known about nest re-use in phalaropes, however Dunlins frequently re-use nests in subsequent seasons at Zackenberg. I am interested to know about other cases of nest re-use in

phalaropes – both inter- and intra-specific – as well as any information on nest choice by phalaropes and other waders.

### The effect of low-level farmyard manure application on invertebrates and soil properties in lowland wet grassland and the implications for breeding waders

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Studies observing poor wader breeding success along with anecdotal evidence from RSPB reserves suggest that invertebrate biomass availability may be low on some areas of lowland wet grassland. This project aims to investigate the potential to increase the availability and abundance of invertebrates, particularly earthworms, to breeding waders through the application of low levels of farmyard manure on lowland wet grassland sites. The effect of farmyard manure spread at rates of 5, 10 and 15 tonnes ha<sup>-1</sup> on soil invertebrates, epigeal invertebrates and both soil and vegetation properties has been studied in an experimental trial across four RSPB reserve sites over three years. Further studies to investigate the relationship between, farmyard manure, soil invertebrate levels and lapwing foraging response were also carried out in spring 2006.

### Managing predation on ground-nesting birds: experimental test of nest enclosures

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Ground-nesting birds have declined world-wide partly due to high nest predation. A non-lethal method for decreasing predation uses protective cages at nests. Such nest enclosures are receiving increased attention from conservation managers in several parts of the world. Evaluations have so far mainly looked at the effect of enclosures on hatching success and adult predation, but several other important traits can also be affected. Here, we test the effect of nest enclosures in two common European shorebirds: Northern Lapwing *Vanellus vanellus* and Redshank *Tringa totanus*, measuring several traits such as hatching success, incubation length, hatching synchrony, hatchability, partial clutch loss, chick condition, and adult predation. In both species, protected nests had significantly higher hatching success than unprotected nests. Taking into account incubation time, nest abandonment, hatchability and partial clutch loss, protected nests still hatched more chicks than unprotected controls. In lapwings, but not in Redshanks, protected nests were incubated longer, but this did not impair the condition of lapwing chicks. Protected Redshanks, however, suffered increased predation on incubating adults, which often sit on the nest until a predator is close by. Our results show that caution must be exercised in the use of nest enclosures, particularly in Redshanks and other species with similar incubation behaviour. Enclosures should, however, be considered as a management tool in shorebirds that leave their nest when an approaching predator is still far away.



### Alternative agri-environmental schemes for the protection of meadow birds – examples from Schleswig-Holstein and Lower Saxony, Germany

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In the grassland area “Meggerkoog” situated in the river valleys of the Eider, Treene and Sorge, Schleswig-Holstein, a new and flexible form of agri-environmental scheme was implemented for the protection of meadow birds. Farmers get a single compensation payment of €150–300 for adapted management, if broods of Northern Lapwing, Black-tailed Godwit, Redshank or Eurasian Curlew are located on their fields.

The new flexible compensatory payment received a high take-up rate by local farmers within a few years. In several projects the Michael-Otto-Institut of the NABU studied the effectiveness of the new programme. The results of a 7-year study of the effectiveness of the programme will be presented.

Besides the regular agri-environmental programmes, in some areas of Lower Saxony (e.g. “Stollhammer Wisch”, located on the east side of the Jadebusen, Schneckenbruch, an inland site near the city of Osnabrück) additional measures for clutch and chick protection have been started in recent years. Wader nests are marked with small sticks, both on meadows and arable fields. Farmers are thus able to detect the nests and protect them while working in the fields (mowing, sowing etc.). For each clutch not being destroyed by agricultural activities, farmers get a bonus of up to €30. For the protection of chicks, the speed of mowing machines is restricted to 8 km/h. Mowing practices are also restricted in other ways. The success of these measures is documented.

### Population numbers and habitat use of the Black-winged Pratincole *Glareola nordmanni* in central Kazakhstan

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The breeding population of the Black-winged Pratincole *Glareola nordmanni* is endemic to the Eurasian steppe biome. The species has been up-listed to 'Near Threatened' in the world Red Data book (IUCN update 2006) due to a historical and accelerated recent population decline. We collected quantitative data on Black-winged Pratincole abundance, breeding biology and habitat use between April and July 2006 in Central Kazakhstan in order to improve the generally limited knowledge on this species. Our study area

(31,500 km<sup>2</sup>) is situated near Korgalzhyn, Akmolinskaya oblast' east of Lake Tengiz (49°40'–51°00'N, 68°35'–71°15'E). We surveyed the area intensively for breeding colonies, estimated breeding success and characterised habitat use, recording habitat type, cattle presence, vegetation height, distance to water and distance to settlement at the colony sites. We estimated that about 1,500 pairs were breeding in our study area which represents approximately 1% of the species' known breeding range. There is no indication that habitat availability or population density differed significantly in other parts of the species' distribution in Kazakhstan in 2006. Therefore we suggest that the current world population estimate for the Black-winged Pratincole of 10–15,000 pairs (Belik & Lebedeva 2004) is an underestimate. Our results on habitat use quantify general statements for the first time. They suggest that the availability of water and the presence of livestock are important factors in nest site selection.

Belik, V.V. & E.A. Lebedeva (eds.) 2004. International single species action plan for the conservation of the Black-winged Pratincole *Glareola nordmanni*. AEW Technical series, report no. 4.

### Development of breeding plumage in Ruffs *Philomachus pugnax* migrating in spring through southern Belarus

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We studied the development of breeding plumage in 641 male Ruffs during spring migration, 2004–2006, through S Belarus, with special emphasis on the growth rate of ruff and tuft feathers. During northward migration, male Ruffs arriving at our study site at the end of March or beginning of April showed a mixture of winter and striped feathers. The first adults with full breeding plumage were recorded in the last ten days of April and their proportion gradually increased thereafter. However, individuals with at least some traces of winter or striped plumage were caught during the whole study period. Second year birds were less advanced in the development of breeding plumage than adults. Of all 55 second year males trapped, only 20% were in full breeding plumage. There was no significant change in the mean length of the ruffs and tufts of males caught during the main migration period in subsequent years. However, there was a significant, positive correlation between date and the length of the ruff and tuft in both age-classes. During spring migration, the length of the ruff increased by 1.6 mm/day in adults and 1.5 mm/day in second years, whereas the tuft grew 1.1 mm/day in adults and 1.0 mm/day in second years. The growth rates of the ruff and tuft in adults and second years were the same, but during the whole spring migration period adults were more advanced in breeding plumage development than second years.



### Sex differences in biometrics of adult Terek Sandpipers *Xenus cinereus* breeding in S Belarus: preliminary results

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Terek Sandpiper is a monomorphic species, but morphometric data of males and females has been based only on museum specimens which are prone to shrinkage. We aimed to provide the biometric characteristics of live Terek Sandpipers of both sexes from the isolated westernmost population breeding in the Pripyat valley, S Belarus (52°04'N, 27°44'E). Terek Sandpipers were caught on the floodplain meadows of the Pripyat river between April and July 2005. A set of standard measurements was taken from each bird and blood samples were taken from 25 for the purposes of molecular sexing. The birds were sexed by DNA analysis, based on amplification of the CHD gene with PCR technique (Griffiths *et al.* 1998). Four more birds were sexed as females by the presence of an egg in the cloaca. In all measurements, females (n = 14) were larger than males (n = 15). For wing, nalospi and tarsus-plus-toe lengths the differences between the sexes were statistically significant (Mann-Whitney U-test:  $p < 0.05$ ); for total head and bill lengths the differences were nearly significant ( $p < 0.1$ ) (note small sample). Tarsus length did not differ significantly between the sexes ( $p > 0.1$ ). The distributions of values of each measurement showed considerable overlap between males and females. Body size factor obtained by the PCA method, which combines wing length and total head length, differed between the sexes (Mann-Whitney U-test:  $p < 0.05$ ), but this would only allow correct sexing of the largest females and the smallest males. Therefore we recommend that the molecular method is the only reliable method of sexing in this species. The results of the molecular sexing of Terek Sandpipers in our study area will be used in future studies of their breeding biology.

### The value of the liman and lagoon systems of the southern Ukraine as stopover sites for arctic waders using the Black Sea/Mediterranean flyway

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In southern Ukraine, most migrant sandpipers stopover at the Sivash lagoons despite the existence of what appear to be attractive feeding conditions in nearby 'limans' (limans are narrow, fairly shallow bodies of water near river mouths and are characteristic of parts of the Black and Azov Seas). It appears that this avoidance of limans is connected with differences between the migration strategies of different age groups. Low numbers of sandpipers using limans may arise because they are relatively small and are not suitable for large flocks. However, limans are commonly used by small flocks of young sandpipers during both southward and northward migration. This may be because young birds migrate relatively short distances at a

time and limans provide a network of sites with sufficient feeding conditions to support such a strategy.

It is likely that the main reason why most arctic waders choose to stopover on the large lagoons of the Sivash rather than the limans is nothing to do with food resources, which are probably similar, but the large area available for feeding, which allows large flocks to feed together. This probably reduces the risk of predation through greater communal vigilance, especially at times when their ability to fly is impaired during wing moult. The lagoons of the Sivash are wind-flats, i.e. the water is so shallow that almost all wind conditions lead to the exposure of extensive feeding areas. Between them, the Sivash lagoons and the limans of the Black and Azov Seas play a vital role in supporting large numbers of arctic migrant waders.

### Nest site fidelity in Black-tailed Godwits

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The Black-tailed Godwit *Limosa limosa limosa* was one of the most common breeding meadowbird species in the Netherlands. The green pastures and meadows of the Dutch lowlands held up to 90% of the breeding population. However, more than 80% of the breeding godwits have disappeared over the last 50 years, and this has led to the upgrading of Black-tailed Godwits to "near-threatened" on the IUCN red list. Changes in agricultural management and the accompanying loss of suitable breeding habitat seem to explain this drastic decline. Black-tailed Godwits show high nest-site faithfulness. The combination of habitat fragmentation and short dispersal distances may be an important, but perhaps rather overlooked factor contributing to the population decline. We studied nest site fidelity in a colour ringed population in The Netherlands. The birds were caught and individually colour ringed as adults on their nests in 2004 and 2005. In 2006, we placed small, battery-powered web-cams at the nest sites to read the colour ring combinations of incubating birds. Here we show how dispersal distance and mate fidelity are related to reproductive success.

### Age-independent telomere length as a molecular marker for individual quality in a wader

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Telomeres are dynamic DNA-protein structures that form protective caps at the ends of eukaryotic chromosomes. Although initial telomere length is partly genetically determined, subsequent accelerated telomere shortening has been linked to ageing processes and elevated levels of oxidative stress. Telomeres vary widely in length between individuals of the same age, suggesting that individuals differ in their exposure or response to telomere-shortening stress factors. We examined relative telomere length and its relationship with various fitness components in a population of southern Dunlins *Calidris alpina schinzii* breeding in SW Sweden. In this long-lived species, telomere length does not predict lon-



gevity, as has been found in a more short-lived bird species (Sand Martin). However, we show that relative telomere length correlates negatively with body size (tarsus length) in males, but not in females. This is consistent with previous suggestions that the sexual dimorphism in this and related species of shorebirds has evolved through female mate choice favouring small size in males. In addition, we find that lifetime reproductive success in males, measured in two ways, increases with relative telomere length. Our results therefore imply that individuals with longer than expected telomeres for their age are of higher quality.

### Estimation of resources harvestable by mollusc-eating shorebirds wintering on the central Atlantic coast of France

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The mudflats on the coasts of Vendée and Charente are among the most important wintering sites for shorebirds in France. Every year they support around 135,000 individuals of 12 common species. The two main areas are Aiguillon Bay and Marennes-Oléron Bay which are 40 km apart. Aiguillon Bay is located at the junction of the Charente and Vendée coastlines and is surrounded by salt marshes and includes 30 km<sup>2</sup> of intertidal mudflats. Marennes-Oléron Bay is on the Charente coastline just south of Aiguillon Bay. This bay (150 km<sup>2</sup>) is enclosed by Oléron Island in the west and the French mainland in the east, with intertidal areas bordering both the island and the mainland coast. These are mainly bare very soft sediments but some places are sandier and covered with seagrass. Four species of bivalves (*Cerastoderma edule*, *Macoma balthica*, *Abra tenuis*, *Scrobicularia plana*) and one species of gastropod (*Hydrobia ulvae*) are common and can be recorded at very high densities. They therefore represent an important food supply for wintering shorebirds between September and March, especially for species like Red Knot *Calidris canutus* and Black-tailed Godwit *Limosa limosa*. In order to estimate the mollusc resources harvestable for birds at both sites, we sampled sediments in mid-winter 2004, 2005 and 2006. Distributions and densities of molluscs were determined by taking cores on four predetermined grids with stations 250 m apart. Each year 308 sampling stations were visited. Molluscs were identified, counted, weighed (ash free dry mass) and energetic content for birds was estimated. In this study we compare mollusc availability for Red Knots and Black-tailed Godwits during the three winters and between subsites and sites. Results on food availability are then compared with the number of individuals wintering at each site in order to explain and predict the distributions of both species on the mudflats.

### Advancement of pre-breeding moult in Wood Sandpipers

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The moult into breeding plumage of the Wood Sandpiper *Tringa glareola* on spring migration was studied between 27 April and 18 May, 2005 and 2006, at Kwieciewo (53°57'N, 20°19'E) in NE Poland. Birds caught were aged as second-year (2K) or older than first-year (2+) (not all second-year birds can be separated from adults) and the quantity of new breeding plumage was estimated, in nine % cover classes, for five regions of the upper body. A drop of blood was taken from each bird for molecular sexing based on amplification of the CHD gene with PCR technique (Griffiths *et al.* 1998). The aim of the study was to describe the advancement of moult into breeding plumage at this late stage of their spring migration and determine whether there was any difference between the sexes. Among birds aged as 2+, in both 2005 (n = 79) and 2006 (n = 55), there was almost no differences in the progression of moult between females and males, except for more advanced moult of scapulars in females 2006 (U-test: p < 0.01). In both sexes, moult was the most advanced in the scapulars and on the back, where the median coverage by breeding plumage was 21–40% or 41–60%, but in respect of both parts of the body there were some birds that lacked new feathers entirely and others that had almost complete breeding plumage. In the lesser and median coverts in each year, new feathers covered <20% in both sexes, but in 2005 a few males renewed these coverts almost entirely. On the head in both sexes, new feathers covered 21–40% and 0–20% (medians) in 2005 and 2006, respectively, but among each sex there were individuals that had moulted the head completely. Only in head moult was there significant progress with date – in females in 2005 (Rs = 0.42, p < 0.01, n = 40), and in males in 2006 (Rs = 0.33, p < 0.05, n = 41). The lack of clear differences between the sexes in the progress of moult at this late stage of spring migration suggests that in Wood Sandpipers, unlike other waders with greater sexual dimorphism, strategies of energy investment in developing breeding plumage may not differ between males and females.

### Between-year variation in the biometrics of male and female Wood Sandpipers *Tringa glareola* during spring migration

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The biometrics of Wood Sandpipers were studied during spring migration (27 April – 17 May) in NE Poland at two sites 50 km apart: in 2002–2003 at Nisko (53°50'N, 20°20'E) and in 2004–2006 at Kwieciewo (53°57'N, 20°19'E). Birds caught were ringed, aged as 2nd year (2K, n = 83) or older than 1st year (2+, n = 316; i.e. not all 2nd year birds could be identified), and standard measurements taken. The birds were sexed by analysis of DNA from blood samples collected in the field, based on amplification of the CHD gene with



PCR technique (Griffiths *et al.* 1998). The aim of the study was to study between-year variation in biometrics between males and females. Inter-year variation in biometrics differed substantially between females ( $n = 149$ ) and males ( $n = 167$ ) in age 2+. In females, differences between years were well pronounced in the total head and wing lengths (in both – K-W test:  $p < 0.01$ ), but not in tarsus + toe length (K-W test:  $p > 0.1$ ). Conversely, in males inter-seasonal differences (excluding 2004, due to small sample) were the greatest in tarsus + toe length (K-W test:  $p < 0.01$ ), and in total head length (K-W test:  $p < 0.05$ ), but only nearly significant in wing length (K-W test:  $p = 0.06$ ). On average, females had the longest total head length in 2004 and the shortest in 2002; while in males it was longest in 2002. Females had the shortest wing in 2002, but males in 2003. A possible explanation of these inconsistencies could be varied proportions of 2K year birds among 2+ males and females. This is supported by inter-year variation in the proportion of 2K birds among females and males caught (G-test,  $p < 0.05$ ). In 2004, for example, females that could be aged as 2K were only 9% of all females caught, but in 2005 they were 34%.

### Habitat use by three wader species in a wintering area of NE Italy: preliminary results

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This study investigates the movements of three wader species in a coastal area of Friuli Venezia Giulia region, NE Italy, during the 2005/06 winter. From December 2005 to April 2006, seven Eurasian Curlews *Numenius arquata*, five Grey Plovers *Pluvialis squatarola* and seven Dunlins *Calidris alpina* were tagged with radio-transmitters and followed on three different days per month, during a complete tidal cycle (high-low-high tide). Also, the monthly distribution of all birds of each species in the main roosts was quantified, and was compared to the distribution obtained from the radio-tracking data. Analysis of these preliminary results suggests that Eurasian Curlews are strongly site-faithful in winter, with 94.7% of fixes close to the catching sites. On the other hand, Grey Plovers and Dunlins were characterised by higher mobility, and were only seldom found near the catching sites (34% and 24.1% respectively). Three tagged individuals (two Dunlins and one Grey Plover) were found in the Venice lagoon (100 km distant) at times when there was a strong decrease of numbers in the study area. There were some other instances where radio-signals were lost and located again only after several weeks. To date, these results suggest that Eurasian Curlews are localized in winter and have low mobility, whereas Grey Plovers and Dunlins tend to move more often and sometimes over considerable distances, exploiting different wintering areas throughout the N Adriatic. The study also demonstrates a strong association ( $N = 26$ ,  $r_s = 0.73$ ,  $p < 0.0001$ ) between the number of Grey Plovers and Dunlins present in a roost, when monitoring on the same day each month and all roosts in sequence.

### Revising the breeding population estimate and distribution of the Critically Endangered Sociable Lapwing *Vanellus gregarius*

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The breeding population of Sociable Lapwing *Vanellus gregarius* is believed to be concentrated in Kazakhstan with small populations in south-central Russia. According to published data the population has undergone a significant and rapid decline in the second half of the 20th century. Population size was estimated at not more than 10,000 birds in the early 1990s (Collar *et al.* 1994, Tucker & Heath 1994). A few years later the population had declined to not more than 1,000 breeding pairs (BirdLife International 2001), and recent estimates suggest that the total breeding population is as low as 200–600 breeding pairs (AEWA 2004). Consequently, the species has been recently categorised as Critically Endangered according to the IUCN Red List. However, these population estimates are largely based on anecdote. As part of an intensive autecological research programme on the species we are planning an ambitious survey programme to quantify the true breeding population in at least a major part of the species' range. Here we report on the first phase of revising the breeding population estimate in central Kazakhstan.

AEWA. 2004. *International Single Species Action Plan for the Conservation of the Sociable Lapwing*. AEWA, Technical Series No. 2.

BirdLife International. 2001. *Threatened Birds of Asia: the BirdLife International Red Data Book*. BirdLife International, Cambridge, UK.

Collar, N.J., Crosby, M.J. & Stattersfield, A.J. 1994. *Birds to Watch 2: the World List of Threatened Birds*. BirdLife International, Cambridge, UK (BirdLife Conservation Series 4).

Tucker, G.M. & Heath, M.F. 1994. *Birds In Europe: their Conservation Status*. BirdLife International, Cambridge, UK (BirdLife Conservation Series 3).

### Estimation of the population size of Afro-Siberian Red Knots *Calidris canutus canutus* by colour-ringing

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Individuals of the Afro-Siberian population of the Red Knot were colour-ringed on their main wintering-area, the Banc d'Arguin in Mauritania during midwinter in 2002–2005.



From the numerous resightings of these marked birds in the catching area, the annual survival could be estimated, and with that, the number of marked birds alive. In the main spring-staging area of this population, the Wadden Sea of Schleswig Holstein, the density of these colour-ringed birds was determined around the end of May. Assuming a random dispersion of the colour-ringed birds over the spring staging area, the population-size can be estimated from the ring density and the known number of colour-ringed birds in the population. We estimated the population of adult birds in May 2006 to be around 305,000 (95% CI: 201,000–367,000).

### Fattening knots do better in the cold

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In Red Knots *Calidris canutus*, the migratory fattening period is accompanied by hypertrophy of the pectoral muscles in preparation for endurance flight. Because birds in the cold counterbalance heat loss through shivering thermogenesis, we asked the question whether this muscle hypertrophy would confer thermoregulatory side-benefits. We acclimatised Red Knots to different controlled thermal environments and studied within-individual variation in body mass, pectoral muscle size and thermogenic capacity ( $M_{sum}$ ) throughout a three-month period covering migratory gain and loss of mass. The change in body mass during this period was associated with a change in pectoral muscle thickness and differed among treatments. The change in mass and muscle size affected the change in thermogenic capacity with birds showing the largest increase in body mass and muscle thickness also exhibiting the largest increase in  $M_{sum}$ . This led to treatment-specific enhancement in cold endurance. Birds acclimatised to thermoneutral conditions were able to sustain colder temperatures, and this made them indistinguishable from cold-acclimatised birds at the peak of migratory fattening. We conclude that the gain of mass and muscle hypertrophy, in preparation for endurance flight, does confer functional side-benefits in terms of thermogenic capacity, and that this occurs independently of thermal acclimatisation.

### Different migration strategies used by two inland wader species

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Waders show a wide range of migration patterns. Piersma

(1998) proposed dividing them into two main groups based on migration strategy: one tries to reduce time spent on migration; the other tries to minimize energy expenditure on migration.

This paper analyses the autumn migration strategies of Wood Sandpipers and Common Snipes using the same stop-over site and facing similar feeding conditions. The study was carried out at Jeziorsko reservoir, central Poland (51.40°N, 18.40°E) where 3,935 Common Snipes and 4,806 Wood Sandpiper were caught and ringed during autumn in the years 1997–2005. Of these, 129 snipes and 224 Wood Sandpipers were trapped twice during a single season. We recorded: fat load, length of stay, body mass increase and theoretical flight range.

The two species show different patterns. Wood Sandpipers occurred in two peaks (adults and juveniles separately) whereas age-classes of snipe did not show a difference in timing. About a half of the Common Snipes were in active moult and in 2005 >30% of adults were moulting flight feathers. In contrast, only two Wood Sandpipers have ever been caught at Jeziorsko reservoir in flight feather moult and <1% have been found in partial active body moult.

Wood Sandpipers gained weight at an average of 1.15 g/day, snipe at only 0.30 g/day. The species differed significantly in their mean weight (Wood Sandpiper: 66.3 g; Common Snipe: 102.0 g,  $p < 0.001$ ). To control for this difference, mass changes were converted into % lean body mass (LBM) gained per day. The relationship between mass change and stopover duration (days) was estimated for both species: Common Snipe mass change =  $0.296 * \text{stopover duration} - 0.338$  ( $R^2 = 11\%$ ,  $p < 0.001$ ) Wood Sandpiper mass change =  $2.103 * \text{stopover duration} + 1.114$  ( $R^2 = 33\%$ ,  $p < 0.001$ )

The average % LBM gained per day (the coefficients in the equations) was significantly higher for Wood Sandpiper than for Common Snipe ( $t = 8.40$ ,  $p < 0.001$ ). The maximum observed weight gain was also higher for Wood Sandpiper (5.67 g/day or 10.4% LBM/day) than for Common Snipe (3.66 g/day or 3.76% LBM/day).

Data from retraps was used to evaluate differences in stopover duration. The median period between captures differed significantly between species: five days for Wood Sandpiper and eleven days for Common Snipe. The maximum recorded periods were 31 and 42 days respectively.

Common Snipes had significantly smaller fuel loads (4% of LBM) than Wood Sandpipers (21% of LBM;  $p < 0.001$ ). Similarly maximum fuel loads were 54% and 81% respectively. Therefore Wood Sandpipers, having more fat reserves, had a greater potential flight range (estimated at 2,925–3,512 km) than Common Snipes (1,884–2,919 km).

In summary, Wood Sandpipers at Jeziorsko appear to minimise time spent on migration whereas Common Snipes minimise energy expenditure.



**Time budgets of Northern Lapwing chicks during the first days after hatching**

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This study was carried out between the end of April and the end of June 2006 in the seasonally-flooded valley of the Pripjat' river near Turov, S Belarus (52°04'N, 27°44'E). We investigated the time budget of lapwing chicks by direct observations from a hide, three times daily for three hours. To minimize disturbance to the chicks, the distance between

the hide and the focal birds was at least 10 m. All types of behaviour by the chicks were recorded and analyzed. We calculated mean percentage time spent on each behaviour. The first days of the chicks' life appeared to be their most important period due to the slow development of thermoregulation. During the first four days, the chicks were brooded, mainly by the female, for 32–48% of the time. In this period, foraging comprised 10–15% of their time budget. As the chicks grew older, brooding bouts decreased to 17% and foraging bouts increased to 78%. The proportions of time spent brooding and foraging depended on the age of the chicks and ambient temperature. In adverse weather conditions, small chicks may need so much brooding that they have little time to feed.

