



International Wader Study Group Annual Conference

Lisboa, Portugal, 1-4 October 2010

The conference was held in the magnificent building of the Museu Nacional de História Natural of Lisbon University, and organised by the Museum, with the Centre for Environmental and Marine Studies. Other sponsors were Museu da Ciência da Universidade de Lisboa, Migra Tagis project, Fundação para a Ciência e a Tecnologia, TAP Portugal, Delta Cafes, Camara Municipal de Lisboa, Herdade do Esporão, and Salinas do Samouco. Congratulations to the hard-working Organising and Editorial Committees, which included José Pedro Granadeiro, Teresa Catry, Ricardo Martins, Pedro Lourenço, José Alves, Carlos David Santos, Ricardo Lopes, Rosemarie Kentie, Tómas Gunnarsson and Nuno Cidraes-Viera.

There were 126 participants from 26 countries: Australia, Belgium, Canada, China, Denmark, Estonia, Finland, France (including one from the Indian Ocean island of Réunion), Germany, Hungary, Iceland, Indonesia, Ireland, Italy, Japan, Mexico, Morocco, the Netherlands (including one who insists that his country is Friesland), Norway, Poland, Portugal, Russia, South Africa, Spain, UK and USA.

As this was the 40th anniversary conference of the International Wader Study Group, it seems appropriate for me, as a founder member, to give a personal view of how some of the excellent set of spoken and poster contributions illustrate some changes during those years.

I had the pleasure of joining the Executive Committee's meeting prior to conference, the first time that I have done so since an occasion when IWSG's fifth chairman, Herman Hötker, was presiding. It was particularly encouraging to see how the dynamic team (leavened with a few old-timers) is carrying things forward with the sixth incumbent, Yvonne Verkuil, in the Chair, and especially with such an international team – gratifying for me, as the third Chairman when the move to internationalize the management of the group really got started.

One of the striking features is the degree to which improving technology has allowed increasing studies of individual variation. In IWSG's first 15 years, this was moving on from just numbered metal rings to identification in the field by colour-rings, flags and dyes, since when satellite tracking and now especially geolocators to track individuals' migrations have been added. The first talk of the conference on Temminck's Stints brought back to me my 1979 theoretical paper as to why these changed mates – at least the newly demonstrated wide variability in individual breeding performance fulfils one of our predictions!

In the same general area, the early years of IWSG predated Alec Jeffreys' discovery of genetic fingerprinting and the whole world of relationships at different scales that enables: no longer are we restricted to interpretation solely from physical measurements. Stable-isotope studies were also still in the future. Similarly, satellite imaging was not yet available, so all these interesting large-scale habitat analyses were not really practicable – and, in addition, the political situation meant that many areas used by shorebirds were not accessible. Even communication between different power-blocs was difficult. Many of us recall the invaluable work done, in the first half of IWSG's existence, by the Ornithological Station in Gdansk, Poland, which somehow managed to make the information flow between blocs.

The technology of communications has progressed. We heard of observations coordinated in real time over large distances. Mobile phones have been available for only some 20 years, and not everywhere at first. In the early years of the wader expeditions, you were on your own, unless you travelled to the nearest town to send a telegram (although in 1972, while in south Morocco, I did manage to send a postcard to Harry Green – later second Chairman of the Group – while he was taking part in a simultaneous wader study trip in NE Greenland).

The other huge change is computing power. In 1970, a machine with less power than a modern laptop occupied a large air-conditioned building and operated in batch-mode, rather than instant access via a keyboard and screen. One did not do even a simple regression analysis unless one really needed to! Now multi-factoral analyses of ecology and spatial patterns and modelling of complex population dynamics are almost routine.

Two highlights of the meeting were the special talks by Clive Minton, the first Chairman, on 40 years of IWSG, demonstrating the way that the group has innovated and embraced new techniques, and Theunis Piersma's celebration of 30 years of research at the Banc d'Arguin, Mauritania. This latter followed the first wader study expeditions to NW Africa, from 1971 in Morocco which I had the pleasure of leading – and on which we hope to include an entertainment in the 2011 IWSG conference. Amongst other things, the Moroccan work started to look at the variability of moult schedules – work that has since been developed to a superb degree by the Cape Town team and others.

As ever, IWSG looks forward while building on the past,

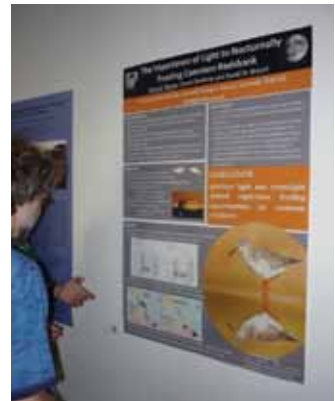
and many challenges are evident: Can we get geolocators with short-range transmitters, so that the bird does not have to be re-caught? How do we save critically threatened shorebirds, such as the Spoon-billed Sandpiper and uniquely vital needed staging areas, such as Bohai Bay, in the Yellow Sea, China – on which two subspecies of Red Knots depend? Can we do anything to reverse the devastation of wet meadows in Europe? How will climate change affect our coastal breeding and wintering waders?

And some things do not change: long hours in the field, slightly crazed enthusiasm for our study animals and their amazing migration systems, breeding biology and adaptation

to extreme environments, and an urge to safeguard them for the benefit of future generations.

The meeting concluded with field trips to parts of the hugely important Tejo Estuary, and sightings of waders at roost as well as many other features of the rich birdlife and glimpses of such special semi-natural ecosystems as the montados of cork oak trees, cropped for cork with crops and grazing below – and extremely rich for wildlife. Several participants made gallant attempts to support this sustainable use by consumption of excellent Portuguese wine!

Mike Pienkowski



Above left: Clive Minton, founding Chairman of the IWSG, giving his invited talk on the Group's first 40 years. Centre: long-serving IWSG members cut the 40th birthday cake: from left: Daphne Watson, Nigel Clark, Mike Pienkowski, Ann Pienkowski, Pat Minton, Clive Minton, Guy Morrison. The 15 kg cake and drinks were kindly supplied by the Group's fourth Chairman, Gerard Boere, who could not be present but sent his greetings. Above right: the winning poster.

Abstracts of Conference Talks

Breeding Ecology

Lost opportunities to sire offspring: the cost of parental care in Temminck's stint males

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Losing opportunities for extra matings constitutes an apparent price individuals pay when increasing their reproductive success through parental care. This trade-off between parental care and mating effort may depend on several environmental factors. Opportunities for extra matings may also depend on the sex-ratio and on the behaviour of other individuals in the local population. This situation may lead to the emergence of behavioural strategies with regards to breeding decisions. Using the unique breeding system of the Temminck's stint *Calidris temminckii* we examined the costs of parental care in terms of sired young. This species exclusively shows uniparental care, which is performed by either sex. However, both sexes also have the potential for multiple mating and may lose the chance of additional offspring by having parental care duties. Temminck's stint males were classified as incubators ($n = 73$) or non-incubators ($n = 47$). DNA samples were collected from young and, using molecular parentage methods,

the number of sired young was then compared between these groups. Sired young comprised a) total young and b) free young. Free young were defined as young that were incubated and cared by another individual. Incubating males were almost twice more likely to sire young than non-incubators. Additionally, incubators sired significantly more young; on average one extra young per year. In contrast, when comparing sired free young, non-incubators were far more likely than incubators to sire free young. Non-incubating males also sired significantly more free young than incubators. Our results suggest that incubators are overall more successful under current conditions. However, incubators could suffer long-term costs due to parental care. Non-incubators sire far more free young, so gain reproductive success without the costs of care. We further explore population conditions that contribute to variation in the relative success of incubating and non-incubating males.

Recruitment in Common Sandpipers *Actitis hypoleucos*

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For 33 years, an area capable of supporting over 20 pairs of Common Sandpipers has been monitored. The majority of adults were colour-ringed and watched regularly. The



chicks have also been ringed and observations of fledging made. Some breeding individuals have returned over many years. Some have vacated for a while and come back and others have been known to move elsewhere. The population has varied widely during this period but now seems to be in decline. There are other studies indicating a general decline of Common Sandpipers in UK, but in some places numbers are steady. This presentation looks at the role of long-lived and successful birds in providing nuclei for recruitment and from where recruits may come. It considers the trends that have occurred in the UK and the relation between the sandpiper populations of streams, rivers, reservoirs and lakes/lochs and the tension between site fidelity and the urgent need to breed for a species in which females only seem to stay in the breeding areas for about six weeks.

Population dynamics of Black-tailed Godwits

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Numbers of Black-tailed Godwits (*Limosa limosa limosa*) are declining in the Netherlands and the rest of Europe. Therefore reproductive parameters and adult survival of this vulnerable species were measured at two breeding sites in the Netherlands. The data on vital rates were inferred in a matrix population model and an elasticity analysis was performed, to determine which vital rates are most important in determining the population growth rate. As in most long-lived species, the population growth rate was most sensitive to adult survival. Next came post-fledging survival, proportion breeding, hatching success and chick survival, closely followed by nest success. Probability of a replacement clutch and duration of adult stage were least important. Adult survival is already high, has probably not decreased and is difficult to influence, which leaves little scope for improvement. Juvenile survival is also difficult to influence. Reproductive parameters, however, have decreased and can be influenced by proper management measures. It was calculated that for a population to remain stable, a reproductive output of at least 0.86 fledglings per breeding pair is needed. This can only be achieved by increasing several reproductive parameters at the

same time, with the main focus on the proportion breeding, chick survival and nest success.

Why do African Black Oystercatchers have a breeding season?

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The African Black Oystercatcher *Haematopus moquini* has a restricted coastal range, from the Eastern Cape of South Africa to southern Namibia. In South Africa, oystercatchers have a clearly defined breeding season, with most eggs being laid in midsummer, Nov–Jan. In the northern part of the range, around Lüderitz, Namibia, the breeding season is in early autumn, Feb–Apr. Most bird species breeding along the Benguela Upwelling System have extended and variable breeding seasons. For example, White-fronted Plovers *Charadrius marginatus*, which have the same breeding habitat as the oystercatchers, the narrow zone immediately above the high water mark, breed throughout the year. In South Africa, summer is the main breeding season. In Namibia, breeding of plovers is bimodal with peaks at the solstices, midsummer and midwinter.

Breeding adult African Black Oystercatchers are effectively prisoners to their territories throughout the year. Their food, mainly limpets and mussels in the intertidal zone, is present within the territories year round, and the abundance of this prey varies little through the year. Climate, especially along the Namib Desert coastline, is equitable, with minimal rain and little variation in temperature. Given the general lack of variability, it is not obvious why there should be such a short breeding season. This presentation considers various factors, such as food, tides and storms, which could drive African Black Oystercatchers to have a breeding season, and which could explain the difference between the timing of breeding in South Africa and Namibia.

Management of Grassland Meadows for Waders

Here today, gone tomorrow: Predation issues and practical solutions

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There have been widespread and severe population declines of breeding waders on lowland wet grasslands in Europe. These declines have mostly been associated with the loss and degradation of breeding habitat mainly through changes in agriculture such as drainage and intensification of grassland management. However, there is a growing body of evidence which shows that levels of predation on wader nests may be

unsustainably high, such that even when habitat management produces ideal conditions, the recovery of populations may be prevented by these high predation levels. Analyses of the factors important in determining predation levels in Northern Lapwing *Vanellus vanellus* show that survival is higher when nests are distant (>50 m) from field edges, when densities of nesting lapwing are higher and where predator abundance is lower. Predator control is one way of reducing predator abundance, but success, measured as the improvement in wader breeding success and population size, is dependent on a number of factors. In addition, interactions between predators are also likely to occur, thus reducing the abundance of one predator species, through predator control, may allow another predator species to thrive. Manipulating breeding habitat to discourage nesting near field edges and encourage nesting at high densities may result in significant reductions



in nest predation. We present results from a large-scale field experiment where we use the known habitat requirements of nesting lapwings and Redshank *Tringa totanus* to manipulate lowland wet grassland fields in an attempt to alter the breeding distribution and reduce predation. In this presentation, (i) we review the evidence for the relative importance of different predator species on the survival of wader chicks and nests and (ii) we present evidence from studies by the Royal Society for the Protection of Birds testing the efficacy of lethal and non-lethal methods for reducing the impacts of predators on lowland wet grassland breeding waders.

Influence of landscape and habitat on the distribution of breeding wader mammalian predators and their alternative small mammal prey

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Predation is an important factor limiting the population size of many ground-nesting waders, such as Northern Lapwing *Vanellus vanellus* and Redshank *Tringa totanus*. These waders have multiple predator species impacting upon their breeding success. However, the predators may also interact with one another, either through competition or through the existence of alternative predator–prey relationships at higher trophic levels. Studies of this model system have the potential to increase understanding of predator–prey relationships and to inform the management of breeding wader habitats throughout Europe. Whilst Red Fox *Vulpes vulpes* has been identified as the main predator of Northern Lapwings and Redshanks, the potential predation impact of other mammals, such as Stoat *Mustela ermine* and Weasel *M. nivalis*, is poorly known. In addition, while predators of waders are typically generalist feeders; all include small mammals in their diet. Therefore the influence of alternative prey sources may be paramount, and their abundance and condition may affect the level of predation experienced by wading birds. Within lowland wet grasslands, habitat manipulation is one of the key management tools available for conserving breeding wader populations. One likely mechanism through which these manipulations will influence mammalian predators is by altering levels of small mammal prey available in the habitat. To understand the influence of habitat and vegetation structure on small mammal and predator densities on lowland grassland, the relationships between the relative abundance of small mammals and their mammalian predators and (i) habitat availability, (ii) habitat patch connectivity, and (iii) local habitat complexity, as well as combinations of these habitat variables, were investigated at Berney Marshes RSPB reserve, Norfolk, UK. The results of these studies will be presented together with consideration of the potential for habitat management to influence these predator–prey relationships.

Management risks for waders in grazed coastal meadows

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Grazing is an important management tool in EU's agro-

environmental schemes that are designed to halt population declines in grassland bird species, and has successfully increased suitable habitat. However, grazing can depress reproductive success through nest trampling or increased nest predation, but its negative effects are generally considered low when using the recommended stocking rates. By simulating wader nests with artificial nests, we experimentally quantified and examined the causes of variation in trampling rates inflicted by livestock at recommended densities on managed Baltic coastal meadows. Secondly, we examined whether livestock presence increases nest predation in the endangered southern Dunlin *Calidris alpina schinzii*. Trampling rates of artificial nests were high. Extrapolating to natural nests, only 21% of Dunlin nests would have survived a three week incubating period if nesting had started early in the grazing season. Trampling rates decreased significantly with time following the onset of grazing. Predation rates of natural Dunlin nests did not depend on the presence of livestock and were lower than trampling rates. Due to extensive trampling shortly after the onset of grazing, the timing of grazing plays a crucial role in determining breeding success on managed meadows. While grazing is critical for habitat restoration, it may also pose a threat to the viability of some populations, particularly southern Dunlin. The negative effects may be even more serious if pastures attract birds, and hence potentially operate as ecological traps. Therefore, management plans should evaluate the significance of both negative and positive effects of grazing in terms of local reproduction and adjust management accordingly.

Is land management driving the unusually high densities of breeding waders at an upland livestock farm in Scotland?

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In the midst of severe declines in breeding wader populations on farmland areas across the UK, wader numbers at an upland livestock farm (Townhead) in Scotland increased from just 13 wader territories in 2003 to a peak of over 130 breeding pairs in 2008. This increase appears to be linked to land management practices at the farm. The management system at Townhead Farm involves cultivation of a forage brassica (tyfon *Brassica campestris sensulato* L. x *B. rapa* L), which is rotated round the farm. At the time of tyfon cultivation the ground is enriched with lime and fertiliser, which may be having a positive effect on the abundance of soil macro-invertebrate prey for breeding waders. Overwinter grazing of tyfon creates a vegetation structure that is attractive for nesting Northern Lapwings in spring. Naturally wet areas, which are left uncultivated, are likely to be of critical importance; particularly for chick rearing. An agricultural trial has been established to investigate the effect of land management on soil macro-invertebrates, soil properties and vegetation structure. Wader food resources and soil properties have also been assessed in several fields at Townhead Farm. Location of Northern Lapwing nest sites and information obtained through radio-tracking of chicks will be used to assess the relative importance of areas which have undergone tyfon management compared to uncultivated wet areas.



Spatial and temporal patterns in wader community composition on British estuaries

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British estuaries are of great importance for many Arctic-nesting wader species during winter, spring and autumn passage. However, despite their ecological importance, estuaries are amongst the most threatened environments. Regular monitoring of estuarine birds is carried out in order to assess the importance of individual sites for waterbirds but also provides data to assess population trends. Although our understanding of individual species is rapidly increasing with this monitoring scheme and other behavioural and ecological studies, the understanding of community level dynamics and processes lags well behind. In this study, long-term datasets on wader distribution from the Wetland Bird Survey are analysed to investigate patterns of community composition, relative abundance and functional diversity across UK estuaries in relation to spatial and temporal environmental gradients. It is important to understand the variation in functional diversity across space and time because different functional trait distributions may imply the operation of different community assembly rules, such as environmental filtering or niche partitioning. Our preliminary results indicate clear spatial patterns in functional diversity, with co-occurring species being more similar in their functional traits than would be expected by chance across south-eastern estuaries. This suggests that environmental conditions have the strongest influence on assembling communities across these sites. Conversely, in the north-west of the country, wader communities are more functionally diverse than would be expected by chance, and hence niche partitioning and limiting similarity are suggested to be the more important drivers of community structure. We will discuss these patterns, the evidence for whether they may be changing through time and the implications for understand-

ing the overall functional role, breadth and environmental response of estuarine wader communities.

Geographical trends in the timing of moult of Little Stints *Calidris minuta* in Africa south of the equator

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In Grey Plover *Pluvialis squatarola*, a Palearctic migrant wader with populations that moult at different latitudes, the date when adults start to moult is related to migration distance and the latitude at which they moult. However, the duration of moult is the same at all southern latitudes. We set out to determine if this is also valid for populations of Little Stints that moult in the southern hemisphere. Attributes of the primary moult of 3,131 adult Little Stints ringed at four locations between 15°S and 35°S in southern Africa during 1971–2010 were analysed using the Underhill–Zucchini moult model. In adults that showed continuous moult of all 10 primaries we found clear latitudinal trends in both moult starting dates and duration. At the southernmost location, moult started on average 27 days later (27 Oct) and lasted up to 38 days less (105 days) than at the northernmost location (30 Sep, 143 days). But the average end of moult was only 11 days apart (9 Feb in the south and 20 Feb in the north). This suggests a flexible moult strategy in Little Stints, with longer moult further north, where more time is available because of the earlier arrival and shorter migration distance, than in the south. The end of moult is constrained at all latitudes by the departure for the breeding grounds.

Foraging Ecology

Feeding rate of migrant sandpipers foraging on small invertebrates at the Elton Lake

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The abundance of small invertebrates, mostly chironomid larvae, determines the distribution of the majority of migrant waders on steppeland water bodies both at the regional and local levels. Migratory waders probably endeavour to maximize their intake rate on inland stopover areas. The main question we tried to answer was: how does the feeding rate of migrant waders relate to the food supply? For this purpose we analysed the dynamics of pecking and probing in Little Stint *Calidris minuta*, Dunlin *Calidris alpina* and

Curlew Sandpiper *Calidris ferruginea* in relation to food abundance and size at Elton Lake, Russia (49°0'N, 46°42'E) during southward migration. All species studied showed very similar feeding rates at the same level of food abundance. On average, the pecking rate varied between 1.5 and 8 pecks sec⁻¹ depending on prey density, and the probing rate was about 1 probe sec⁻¹ independently of food abundance. Also, the probing rates of Little Stint and Dunlin increased slightly at higher densities of larger chironomids (mass >1 mg, length >5 mm). Taking into account the mass of prey, migrant sandpipers could consume 3–14 g of fresh food during one hour of continuous pecking and up to 14 g during one hour of continuous probing. Because waders forage at Elton Lake during all daylight hours (16 h) without roosting, daily intake may reach 50–200 g of fresh food. Thus, conditions are good for sandpipers to fatten for onward migration.



Choosing the best foraging microhabitats: individual skills constrain the choices of Dunlins

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Estuarine mudflats are among the most important foraging grounds for waders during the non-breeding season. During low tide these habitats consist of a complex mosaic of shallow pools and dry areas. In this study, we carried out close-range focal observations to determine foraging parameters of Dunlins *Calidris alpina*, foraging in the mudflat microhabitats of the Tagus estuary, Portugal. Birds foraging in wet patches mostly targeted the siphons of the bivalve *Scrobicularia plana*, while in dry patches they mostly fed on mudsnails *Hydrobia ulvae*. Surface visibility of prey, rather than their abundance in the sediment, explained the microhabitat-related differences in prey selection. Birds using dry patches obtained 40% less energy intake than those using wet patches, still many extensively used this poor microhabitat. Because siphons retract quickly when the sediment is disturbed, birds often failed to catch them. We found that birds that were less efficient in capturing siphons in wet patches tended to spend more time foraging on mudsnails in dry patches. This suggests that lack of skills in siphon cropping represents a major foraging constraint for Dunlins wintering in the Tagus estuary. It may even cause them to forage during high tide in order to fulfil their daily energetic requirements.

Food supply affecting aggressive and spacing behaviour of migrating Little Stints

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The aggressive behaviour of migrant Little Stints *Calidris minuta* in relation to the availability of their food supply was studied at stopover areas that consist of inland water bodies in European Russia, including the Caspian Region. The birds' intensity of aggression is the main behavioural parameter that controls the local density of foragers. There are two levels of aggressiveness depending on the method of food detection. A change from probing to visual detection of moving prey causes a sudden increase of aggressiveness and territoriality. We show how the density and size of the food resources (Chironomidae and Ephydriidae larvae) lead to switches between foraging methods. The mobility of the prey seems to be the main stimulus of bird aggressiveness. In order for the birds to become territorial, the density of moving prey has to be much higher than that of benthic prey. When benthic preys are absent, territoriality appears even if visible moving preys are not numerous. The changing territoriality that prevailed among Little Stints ensured them effective access to the available visible food in unstable environments. An increase in food supply reduced the aggressiveness of birds

that foraged on both visible and benthic prey. The presence of large larvae had a big impact on the dynamics of aggressiveness. The interdependence between aggression intensity and density of foragers may reflect competition for food among migrating Little Stints. In general, the ecological factors that control aggressiveness and territoriality in Little Stints may also apply in other migrating wader species. These factors are: prey mobility, patchy distribution of prey, restricted foraging area and abundance of large prey.

Estimating feeding rates: which way is the best?

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Feeding rate is a key parameter in foraging ecology studies, yet there are no standardized methods to measure it. The accuracy of feeding rate estimates obtained by five minutes of focal observation, time spent to find three prey items and other commonly used methods was tested using video footage of Black-tailed Godwits *Limosa limosa* foraging on mudflats of the Tagus Estuary, Portugal. The estimates were obtained based on several video clips from two mudflats with differences in prey density. Using video clips of birds taking peppery furrow shell *Scrobicularia plana*, ragworm *Hediste diversicolor* or mudsnail *Hydrobia ulvae* on the two mudflats provided a wide range of feeding rate estimates. Several random starting points were used on each clip and all methods tested were applied to each starting point. The accuracy and efficiency of each method for estimating feeding rates are analysed and discussed.

Monitoring roosting and foraging flights of shorebirds in the western Wadden Sea by radar

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We have used newly-developed, track-while-scan radar equipment to study shorebird flights between high-tide roosts and foraging grounds at the Balgzand intertidal flats in the western part of the Dutch Wadden Sea. Bird movements were monitored continuously during both night and day from Feb to Aug 2010. The long continuous observations period allowed us to study the precise timing and number of bird flights in relation to the diurnal and tidal cycles. The radar was capable of tracking birds flying at very low altitudes just above the tidal flats, using an adaptive clutter filtering technique. To validate the radar observations we made GPS-clocked field observations of line transect crossings of flying birds. In total, nine days of validation counts in Mar, May and Aug resulted in a dataset of a few thousand field observations of flying birds that were matched to their corresponding radar tracks. The validation dataset enabled us



to estimate the detection probability in relation to bird size, flight altitude and distance. Individual waders like Eurasian Oystercatchers and Eurasian Curlews could be detected up to a distance of 2 km; while flocks of birds could be tracked up to 4 km. Recorded tracks were automatically extracted

from the radar data and stored in a database for subsequent analysis. Our first analysis focused on differences in roosting/foraging flights between day and night. We also discuss effects of the relative shift between the diurnal and tidal cycle on the timing of bird flights.

Immunocompetence and Disease

Vector-borne diseases detected on migratory shorebirds caught in two major Portuguese wetlands

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Vector-borne pathogens are widely distributed agents, frequently associated with migratory birds. Birds can spread and introduce pathogens and parasites between different environments and migratory shorebirds are an excellent model to study the spread of vector-borne pathogens as they are extremely dependent on wetland areas. These areas are considered to be of high risk for vector-borne disease transmission since they provide good conditions for vector breeding (e.g. mosquitoes, ticks). To understand which types of pathogens are transmitted on Portuguese wetlands, we analyzed the infection status of four different species of migratory shorebirds (Black-tailed Godwit *Limosa limosa*, Black-winged Stilt *Himantopus himantopus*, Redshank *Tringa totanus* and Little Stint *Calidris minuta*) that use the two main wetland habitats of the Tagus and Sado estuaries (saltpans and rice-fields). Preliminary results confirmed the presence of mosquito-borne diseases (e.g. haematozoan

parasites and flaviviruses), and also tick-borne diseases (e.g. Lyme borreliosis and tularemia) on the birds sampled on both estuaries. While mosquito-borne diseases were detected mainly in the summer, which is coincident with their main activity period, tick-borne pathogens were mainly detected during the winter. Some European tick species, like *Ixodes ricinus* are considered important Lyme disease vectors and known to be active in the autumn and/or winter, thereby not excluding the existence of a local transmission cycle.

Down-regulation of basal metabolic rate in an immune-challenged migratory shorebird coping with food-limited conditions

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Investment in immunity is commonly viewed as a costly activity in birds. Despite recent studies that have focused on the energetic cost of mounting an immune response and its concomitant physiological trade-offs, nothing is yet known about the energetic cost of cellular-mediated immune responses (CMI) in non-passerine species or the resulting metabolic adjustments experienced by immune-challenged birds under resource limitation. Here, we measured daily basal metabolic rate (BMR), inflammatory response, and body mass in *ad libitum* (AL) and food-limited (FL) Little Ringed Plovers *Charadrius dubius* challenged with phytohemagglutinin (PHA) in order to assess the energetic cost and the CMI response at different nutritional states. We found that both mass-independent BMR and inflammatory response increased significantly in AL-birds. Conversely, FL-birds experienced a mass-independent BMR down-regulation and the inflammatory response was diminished relative to AL-birds. Our results suggest that both the observed BMR down-regulation and the diminished inflammatory response in FL-birds could be mechanisms to save energy and thus be able to maintain the body mass above a critical level.



Why young birds forage at nutritionally poor and dangerous places: classical food-safety trade-offs mediated by variation in foraging ability

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Food-safety trade-offs are generally studied in the context of energy state. Animals in low energy states tend to accept the highest danger levels in return for higher energy gains. However, successful foraging requires animals to be able to find and handle food items efficiently and adequately compete with other foragers at the same time. Individuals will differ in the extent to which they have mastered both types of skill. Here we examine how individual differences in competitiveness and foraging skills affect the trade-off between food and safety in Red Knots *Calidris canutus canutus*. Why do some young knots select feeding areas that are poor in food and low in safety? At Banc d'Arguin, Mauritania, a tropical area of intertidal mudflats on the West African coast where this study was carried out, Red Knot feed at low tide, mostly on seagrass meadows. During high tide they have to retreat to the “dangerous” shoreline to roost. Surprisingly, some birds remained in near-shore foraging areas even during low tide, and these birds tended to be young. To quantify habitat use of different classes of birds in habitats that differ in predation danger, food densities, and substrate complexity we distinguished (1) a bare zone very close (0–40 m) to the approaching raptor concealing dune ridge and relatively poor in buried bivalve food and (2) the seagrass beds somewhat further (40–250 m) offshore that were thus safer and also richer in food. Observations of age-related agonistic interactions, energy intakes rates, and indices for energy state (abdominal profile index), showed that, due to limited skills in foraging and competitiveness, young birds achieved higher intake rates in near-shore bare habitat where they fed in “easier” substrate, with fewer competitors, but with higher predation danger

and lower food abundance. Observations in spring, when adults fuel up for migration, show higher numbers of birds foraging in near-shore foraging sites, despite the fact that, due to their higher fat loads, these birds must suffer reduced escape ability. We conclude that the young birds that feed on the nutritionally poor and dangerous bare near-shore habitat, due to their limited skills in foraging on seagrass and competition with dominant conspecifics, achieve higher feeding success in bare than in seagrass habitat. In spring, the trade-off between energy gain and safety shifts towards accepting higher risks for greater energy gains, although during this time predation danger may have somewhat relaxed.

Habitat heterogeneity and persistent demographic structuring in Red Knots wintering at Banc d'Arguin, Mauritania

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The quality of non-breeding habitats has large-scale effects on the fitness of migratory birds. Spatial segregation according to age or sex during the non-breeding period is a well known phenomenon in migratory species. It has been discussed that either dominance behaviour or habitat specialisation is driving habitat segregation. We discovered, that in a comparatively small wintering site (less than 16 km²), a socially foraging shorebird, the Afro-Siberian Red Knot *Calidris canutus canutus*, shows a remarkable stable differentiation in sex and age between two high tide roost and adjacent foraging areas less than 2 km apart. The birds were highly site-faithful to “their” site, and only a small proportion of birds switched sites between winters. The movements that took place were directed from the site with more females and adults to the site with more males and juveniles. Red Knots at the site with more females and adults had longer bills. Surprisingly, survival was also higher at that site. We discuss the mechanisms driving this habitat segregation and how individuals might be able to move nevertheless.



Bearing on the wintering grounds: Navigators and deck boys in migrating ruffs

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Despite their wide breeding and wintering ranges, the Ruffs of the world are genetically homogeneous. Individual ruffs often seem to switch between migratory routes. Is there anything to say about the mechanisms of navigation related to the switching between flyways? We correlated southward migration directions with counts on the wintering grounds using direct autumn ring recoveries of Ruffs from 1932 to 2009 (mostly W European data from EURING and Russian bird ringing centre databases). We extended Ruff recovery vectors up to the intersection with the line of the main wintering areas determined from winter count data. We did this under two assumptions about direct flights: that Ruffs either fly on the orthodromal (the great circle) or loxodromal (fixed bearing) axes and that they always avoid large water bodies. We found a strong correlation between Ruff recovery directions extended along the loxodrome and counts on wintering grounds. Nevertheless, many simulated routes did not end at known wintering grounds. Taking the extended recovery routes literally, we suggest that routes into “oblivion” represent the flights of birds that were making this migration for the first time either as young birds or adults that for some reason decide to look for new places, whilst routes ending at known wintering grounds mainly represent birds that have been there before with only a certain proportion of the inexperienced individuals. The idea of “lost kids” seems more plausible, as juveniles are known to travel separately from adults at least at the beginning of the route, while adults would perhaps join conspecifics from the breeding grounds that would guide them to other wintering grounds. Most of the “lost kids” would end up at the wintering grounds nevertheless. For example, the western branch of the stream of migrants would be confronted with the coast of the Atlantic coming down to Senegal along the shoreline. Even so, some of them cross the ocean and winter in Peru. Who are these vagrants is the question for further research.

Greenshank turnover at a migratory staging site

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Traditional methods of designating protected sites often rely on counts of birds representing a snapshot in time. This may be appropriate for breeding sites; however, they are especially likely to underestimate the importance of staging sites, which feature a high turnover of individuals. By combining count data, with data obtained from the re-sighting of individuals, it is possible to estimate the total number of birds passing through a staging site during any given migration period. We demonstrate this methodology using a population of colour-marked Greenshank *Tringa nebularia* which passes through the Farlington Marshes Hampshire Wildlife Trust reserve and has been intensively monitored over a number of years. Our results demonstrate that on average Greenshank remain at the site for 10 weeks, before continuing their migration and that up to 50 % more birds may use the site than are recorded through peak counts. Furthermore, the results reveal that the year to year fluctuation in numbers passing through this site varies far more than that is apparent from peak counts. We suggest potential explanations for this variation and discuss our findings in the context of designated sites.

Wingtip shape correlates with fat loads in first-year Common Snipes *Gallinago gallinago* during autumn migration

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We examined the relationship between wing morphology and body mass/fat load in first-year Common Snipes *Gallinago gallinago*. The study took place in the years 2008–2009 at Jeziorsko reservoir, central Poland. Over 500 first-year Common Snipes were caught and measured during autumn migration. During standard ringing procedures the length of all primaries was measured. Size-constrained component analysis was used to calculate the following wing morphology indices: isometric size, wingtip roundness and wingtip convexity. We found a relationship between body mass of first-year snipes and their wing morphology. Controlling for the effects of year, date and body size, body mass was significantly correlated with the isometric size of the wing and wingtip roundness. Common Snipes with shorter wings and more rounded wingtips showed significantly higher body mass. After controlling for the effects of year and date, we found that wingtip convexity was positively correlated with fat store mass. We also found that birds with more convex wingtip stayed longer at the reservoir. Roundness and convexity of wingtip are known to be positively related with flight maneuverability and take-off performance in birds, thus improving the ability to avoid predators. On the other hand, they decrease the efficiency of long-distance flights. We hypothesize that higher fat loads in snipes with more rounded and convex wingtips reflect their increased demand for energy during the migratory flight in comparison with snipes having more pointed wingtips. A non-exclusive hypothesis is that snipes with more rounded and convex wingtips could benefit



from attaining higher fat loads for their migration without an excessive increase in predation risk.

Feeding conditions determine interannual staging site fidelity of inland waders on their autumn migration

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Staging site faithfulness is a well-known phenomenon among different groups of migratory birds, including waders. However, few quantitative data exist to draw any general conclusions on the extent to which stopover site fidelity occurs in shorebirds, particularly for inland species that do not depend on tidal habitats. The scarce information which exists suggests low return rates in this group of waders. Food availability was suggested to play a role in the determination of stopover site fidelity. We aim to test this hypothesis in two species of inland waders: Wood Sandpiper *Tringa glareola* and Common Snipe *Gallinago gallinago* on their autumn migration. Birds were trapped during 1993–2009 at the Jeziorsko reservoir, central Poland. 7,075 Wood Sandpipers and 4,068 Common Snipes were caught and ringed during the whole study period. From 1995 refuelling rates of re-trapped birds were calculated as the difference in the weights of an individual between the last and the first capture at the site divided by the number of days between both encounters. The annual mean refuelling rates were assumed to indicate the feeding conditions at the site. We also calculated population refuelling rates, i.e. mass gain of the population across the migratory season. We calculated return rates (apparent survival ϕ) and recapture probability (p) according to the Cormack–Jolly–Seber (CJS) capture–recapture model. We found a positive correlation

between mean annual refuelling rates and return rate in Wood Sandpiper, whereas no such relationship was found in Common Snipe. There was a significant correlation between the return rate of first-year Wood Sandpipers and the population refuelling rate. There was no such correlation in adult birds. There was also no relationship between the return rate of first-years and the population refuelling rate in Common Snipe.

A low cost 1.5 g daylight level and activity data recorder for tracking birds over long periods of time

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We have developed an instrument suitable for study of variation in individual migrating bird travel routes, schedules and strategies including stopover locations, times and durations. The method is based on astronomy. Locations are estimated from ambient light level records. The instrument periodically records ambient light level with reference to an internal clock–calendar, and from these data the UTC (Coordinated Universal Time) of local sunrise and sunset are estimated on a daily basis. Day length on a particular date depends on latitude, while actual sunrise and sunset times are related with longitude. This gives two daily fixes. Furthermore light intensity records allow determination of the following events: duration of the pre-nesting period, laying rhythm (intervals between eggs), time of incubation onset, incubation strategy (timing and duration of recesses) and time of departure from nest. The instrument is also configured to detect and record the history of time spent in sea water against time spent flying or on land. For seabirds, this can provide time-budget data related to activity and feeding behaviour. Deployment is most often on leg rings. The weight of the instrument is in the region of 1.5 g and it will record for two years. Most recent data collection algorithms are presented in the communication, together with accuracy information, interpretation of data and examples of deployment results. So far our instruments have been used on a number of species including geese, albatrosses, penguins, shearwaters, gannets, skuas, fulmars, shags, ducks, terns and waders. This equipment has proved to be very easy to use. It is available for collaborative projects.

Genetics and Geographic Variability

Rapid changes in the distribution of phenotypes in an expanding shorebird population

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Within-species morphological variation may facilitate or constrain adaptation to changing environmental condi-

tions, depending on the extent to which variation reflects local adaptation. High levels of local adaptation may limit a species' capacity to respond to environmental change, and the mechanisms of selection for morphological traits may influence the rate at which they can adapt. The Icelandic Black-tailed Godwit *Limosa limosa islandica* population has increased rapidly over the last century and colonised new locations on both winter and breeding grounds. Male morphology in breeding sites across Iceland varies strongly in relation to the timing of colonisation of those sites. Male morphology also varies in relation to habitat quality; smaller males with proportionately longer wings tend to occupy the habitat in which breeding success, breeding densities and the relative abundance of females are higher, suggesting strong selection on male morphology through increased male–male competition. The population-wide spatial structuring of male morphology in relation to habitat quality suggests that variation in female preferences and male–male competition across



habitats of varying quality could have strongly influenced the rate and pattern of the population expansion through evolutionary feedbacks.

Unsolved issues of geographical variability and intraspecific taxonomy in waders of Eastern Europe and Northern Asia

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By the end of the 20th century, a general opinion had been formed among many ornithologists that most issues of wader systematics were already solved, especially after a fundamental study by Engelmoer and Roselaar was published in 1998. This resulted in a sharp decline in research efforts in this field of ornithology. However, discrepancies among bird lists in various handbooks and the description, during the last decade, of two wader subspecies new for science clearly indicates that the field of wader systematics is still active. This field is essential for many other fields in ornithology as well as for bird conservation. This study aims to list inadequately studied wader species in respect of their geographical variability and intraspecific taxonomy, and to highlight the most obvious research needs. The lack of study skins for comparisons from particular areas is often the main reason for the existing gaps in our knowledge. Genetic studies have raised a new interest in intraspecific variability; this approach is very helpful in many respects, but it is not a panacea, and the classical methods are still very important.

Two allopatric Common Snipes meet in the Azores Islands

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For decades the Common Snipes *Gallinago gallinago* occurring in the Azores were assumed to belong to the Eurasian subspecies, *G. g. gallinago*. Observations on bagged birds ($n = 154$; during 2003–2008 from the islands of Pico and S. Miguel) pointed to the regular occurrence of Wilson's Snipe, *G. g. delicata*, in the archipelago during autumn and winter. Field observations suggest that the Eurasian Common Snipe is the subspecies breeding in the Azores. Recently we confirmed the presence of Wilson's Snipe on Flores island in

February, a period when snipes were already displaying in the archipelago. These taxa appear to have diverged recently and, despite their allopatric breeding ranges, hybridization might be occurring in the Azores. Although recently recognised as different species, on the basis of their winnowing display sounds and morphology, the latter needs more accurate studies. Using Principal Component Analysis and ANOVA, we evaluate the variation in external (e.g. structural size, wing shape, outermost tail feather dimensions and depth of white tip to secondaries) and skeleton (wing and leg components size) morphometrics, within and between each taxa, on birds captured in the Azores and on the European mainland. Eurasian Common Snipe is larger (in structural size), and differences previously described in respect of tail and bill lengths are more likely related to this. Wilson's Snipe has narrower white tips on the secondaries and less variability in this trait when compared with Eurasian. Both taxa also differ in the dimensions of the outermost tail feather. How these differences are influencing the interaction between both snipes in Azores is a matter for future studies.

Population structure and genetic identity of Western Sandpipers wintering in northwestern Mexico

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We studied Western Sandpipers *Calidris mauri* at seven wintering sites in Mexico, ranging from the Colorado River Delta in Baja California to Huizache-Caimanero in Sinaloa, separated by over 1,600 km. Previous work has established that Western Sandpipers are differential migrants by sex, age, and body size. We tested the consistency of these latitudinal patterns. As expected, males predominated at northern wintering sites in Baja, and females at the southern wintering sites in Sinaloa. Contrary to our expectations the distribution of age classes did not vary with latitude. For the morphological data, bill and wing length, but not tarsus, increased in both males and females from north to south. Body mass for both sexes did not vary with latitude, but it differed among sites. Moreover, a 513 bp fragment of the control region of mtDNA was sequenced for 343 individuals from locations along Baja Peninsula and Sinaloa, on the Pacific coast, and Yucatan Peninsula, on the Atlantic coast. Thirty two variable positions defined 68 haplotypes. The two most common haplotypes occurred in 38% and 22% of all individuals and in all locations. Genetic differentiation among wintering populations from the Pacific and Atlantic coasts was low but significant, suggesting differences in wintering ground preferences.



What will be their final fate? Red Knots (*Calidris canutus piersmai* and *C. c. rogersi*) depend on a small threatened staging area in Bohai Bay, China

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We counted Red Knots *Calidris canutus* repeatedly during their northwards migration through Bohai Bay, China, in the NW Yellow Sea, identifying birds to subspecies level using plumage characters, and systematically searched for colour-banded birds from the non-breeding grounds. We modelled migratory turnover, and revised flyway population estimates using recent published counts from the non-breeding grounds. Two Russian-breeding subspecies occurred at our study site, *C. c. rogersi* (migrating to Chukotka), and *C. c. piersmai* (migrating to the New Siberian Islands); they co-occur on non-breeding grounds in Australia and New Zealand, but differed markedly in timing of migration. We conservatively estimate that our study site, comprising only 20 km of coastline, was used by over 38% of the Red Knot flyway population, including c.41% of the *piersmai* subspecies world population, which is estimated to be only 49,000–60,000 birds, and c.31% of the *rogersi* population estimated to be 51,000–62,000 birds. Unfortunately, in the last 10 years, approximately 453 km² of offshore area, including 156 km² intertidal flats, have been claimed along the coast of Bohai Bay for two industrial projects. We present the results of counts conducted during 2006–2009 to evaluate the impacts of land claim on Red Knots and other shorebirds, e.g. Eurasian Curlew *Numenius arquata*, Curlew Sandpiper *C. ferruginea* and Broad-billed Sandpiper *Limicola falcinellus*. Their

increase in numbers suggests that shorebirds have become concentrated on the remaining tidal flats. We predict that shorebird, especially Red Knot and Curlew Sandpiper, densities on the residual areas will continue to increase and that at the same time those flyway populations with a particular dependence on the bay's resources will decline. To evaluate the future of these fragile shared international resources, it is vital to continue population monitoring and promote an immediate conservation action plan for the remaining coastal wetlands in this region.

Long term trends, distribution and status of Black-tailed Godwit *Limosa limosa* in France

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The two subspecies of the Black-tailed Godwit *Limosa limosa* that occur in Europe are only seen together at a few sites in Iberia in late winter and in the Netherlands during northward migration. The rest of the time, *L. l. islandica* mostly winters in estuarine bays in Western Europe, while *L. l. limosa* winters in W Africa. The coast of France is described as one of the main wintering areas for *islandica* and is possibly used for stopover by *limosa*. Nevertheless, the role and the impor-



tance of the French sites remain unclear over the complete biological cycle of both subspecies. This study compiles and updates information on the numbers and the distribution of Black-tailed Godwits staging or wintering along the coasts of France. In recent years, the estuarine bays along the Atlantic and Channel coast have supported around 28% (c.20,000 individuals in 2009) of the increasing *islandica* population in winter. Nevertheless, 92% of this number is concentrated in only seven bays. On the central Atlantic coast, significant stopovers of *limosa* are recorded in February and March but only at a very few sites and in a totally different habitat to that used by *islandica*. The *limosa* subspecies is also observed at inland sites and on the Mediterranean coast during this period. In autumn, very few *limosa* are seen in France, but *islandica* arrives via the United Kingdom to its core wintering sites. Numbers vary between the main wintering sites and individual bird movements as shown by re-sightings of colour marked birds indicate a complex dynamic of the population along the French Atlantic coast. Moreover, the age and sex ratios of birds caught over the last ten years indicate that the populations that use the French sites have particular characteristics when compared with those of the remainder of *islandica*'s wintering area.

History and status of Red Knot in France

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Although the Red Knot *Calidris canutus* is one of the most extensively studied shorebirds in Europe, the strategy of those individuals that overwinter or stage in France has not yet been described in detail. We investigated the status and the phenology of the subspecies *islandica* and *canutus* from capture and recovery data in France over 44 years. We determined the long term trend for *islandica* from counts in wetland areas since the mid 1970s. France hosts about 9% of the European wintering Red Knot population, *islandica*, with numbers peaking in mid-winter. Ninety percent of the national total is concentrated in only six bays. A significant passage of the *canutus* subspecies is recorded in May but only on the central Atlantic coast. During autumn migration, the occurrence of the two subspecies is unclear with the first *islandica* arriving for winter in the same sites used by *canutus* for stopover on their migration to Africa. A large predominance of juveniles has been recorded among the flocks that occur during autumn and early winter and a high proportion of those are *canutus*.

The coast of Vendée and Charente-Maritime, with its network of nearby estuarine bays, seems to be a key area for juveniles of both subspecies. In winter, Red Knots are concentrated in a very limited number of sites, mainly along the Channel and central Atlantic coasts. We studied the distribution of wintering knots in relation to the quality of the main sites at which they occur. This was based on extensive surveys of the abundance and quality of the knots' benthic prey and the relative areas of suitable mudflats. These data on the availability of mollusc food stocks allowed us to reach a better understanding of the foraging strategy of Red Knots which we found often takes just one main prey species that differs between sites.

Variation in the distribution and abundance of Pied Avocets *Recurvirostra avocetta* wintering in W Europe

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To understand the changes in abundance and distribution of animals is a major goal for ecologists and conservation biologists. Numerous studies have shown large scale changes in animal distribution in relation to human activities, and more recently many have been focused on the effects of climate change. For example, a recent study has shown a shift northwards or north-eastwards in the wintering distribution of several species of waders, including Eurasian Oystercatcher, Grey Plover, Red Knot, Dunlin, Bar-tailed Godwit, Eurasian Curlew and Redshank, during the last three decades. In the East Atlantic Flyway, the Pied Avocet breeds along the coast of the Baltic, the North Sea, England, France, Portugal and Spain. The population was estimated at 28,670–32,031 pairs at the end of 1990s. These avocets winter in coastal areas from S England and the Netherlands to Gambia and Guinea with midwinter counts of 73,000, including 46,000 in Europe. In this study we used midwinter counts from the Netherlands, England, France, Portugal and Spain to assess changes in the distribution and abundance of avocets since 1988. We showed that numbers wintering in England and the Netherlands increased, reaching 12,000 in 2008, while numbers were stable in SW Europe over the same period. Overall, numbers wintering in W Europe increased slightly from 46,000 to 51,600 between 2004 and 2008. Using monthly counts, we also studied the phenology of the species in these countries during the non-breeding season. We discuss the environmental causes and individual processes involved in these changes across the wintering range.



Are African Black Oystercatchers good indicators of large-scale trends in intertidal communities? A stable isotope study

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The African Black Oystercatcher *Haematopus moquini* is a resident shorebird confined to the coasts of Namibia and South Africa, where it feeds exclusively in intertidal zones. Globally, oystercatchers are known for their specialized feeding habits; however, their potential as bio-indicators has not yet been investigated. The southern African coastline is influenced by the Benguela Upwelling System in the west and the Agulhas Current in the south, resulting in major differences in ocean productivity. We investigated biogeographic trends in stable isotope composition of the African Black Oystercatcher to test whether the observed patterns in isotopic signatures of the primary food of filter-feeders have deeply penetrating effects, transmitted to top-predators. Blood samples and feathers of oystercatchers were collected from breeding adults and chicks feeding at 13 rocky shore locations throughout the range of the species, between East London, on the south-east coast of South Africa and Halifax Island, off Luderitz, S Namibia. Main prey species (mussels and limpets) were collected at all sampling sites. Oystercatchers and their prey showed an overall westward enrichment in $\delta^{15}\text{N}$ values reflecting a shift at the base of the food web, from oligotrophic conditions on the east coast to eutrophic conditions on the west coast. The $\delta^{13}\text{C}$ values of oystercatcher tissues did not show clear geographic gradients but rather reflected variations in prey assemblages along the coastline. Blood and feathers of adults displayed strong geographic correlations based on their $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ composition, suggesting high fidelity to diet and/or feeding area throughout the year. We suggest that African Black Oystercatchers are excellent indicators of local and biogeographic trends on the southern African coastline, both in terms of intertidal community structures and oceanic conditions throughout the year.

The impact of climate change on Eurasian Oystercatchers

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Studying how climate change impacts a shorebird population requires a very long study period. If the impact includes changes in the frequency of rare and catastrophic events, an even longer study period is required. We have succeeded in following a population of individually marked Eurasian Oystercatchers *Haematopus ostralegus* breeding on the island of Schiermonnikoog, in the Dutch Wadden Sea, since 1983. Two catastrophic events impacted oystercatchers: severe winters and occasional flooding during the breeding season. Severe winters cause mass mortality among wintering oystercatchers, so the fact that the frequency of severe winters has decreased is positive for oystercatchers. However, in our study area, the density of ragworm *Hediste diversicolor* is generally high following a severe winter and since this is an important food species during the breeding season, reproductive success is often high following severe winters. Consequently, a lower frequency of severe winters can also be considered as negative for the oystercatchers. Model simulations indicate that the net effect of a decrease in winter severity is nonetheless positive. Another climate-related catastrophic problem is the risk of flooding during the breeding season, causing high losses of eggs and chicks. This risk has increased throughout the entire Wadden Sea during the last 40 years. Extrapolation of this trend suggests that reproductive output will not suffice to compensate for mortality in the future. Indeed, this year the breeding season progressed very well and we were preparing ourselves to colour-mark an unprecedented number of fledglings, until a summer storm at the end of June swept away most nests and chicks. Although mechanized cockle fishing was stopped in our area and intertidal mussel beds have returned in the eastern part of the Dutch Wadden Sea following a ban of the fishery on intertidal mussel beds, the future for the saltmarsh breeding oystercatchers seems bleak.



Abstracts of Conference Posters

During the conference, the Conference Coordinator, Jutta Leyrer, organised the usual poster competition and delegates voted for the one they preferred. The results were:

First prize

The importance of light to nocturnally feeding Redshank *Tringa totanus* by Ross Dwyer, David M. Bryant & Stuart Bearhop.

Second prize

Footprints of guanaco *Lama guanicoe* as resting sites at high tide for small-sized shorebirds overwintering in Tierra del Fuego, South America by Juan G. Navedo, Jorge S. Gutiérrez, José A. Masero, Cristián Suazo, Juan M. Sánchez-Guzmán, Macarena Castro, Graciela Escudero, Andrés Barbosa, Ricardo Morán & Casimiro Corbacho.

Third prize

When the impact of fairly intense agricultural practices is not fully negative: the case of a Stone-curlew population in northern Italy by Chiara Caccamo, N. Emilio Baldaccini, Enrica Pollonara, Dimitri Giunchi.

Energetic cost of primary and secondary antibody response to sheep red blood cells in the Little Ringed Plover *Charadrius dubius*

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Few studies have assessed the energetic cost of primary and secondary antibody response by measuring basal metabolic rate (BMR) in birds. We carried out a detailed study on the energetic cost of the primary and secondary antibody response in Little Ringed Plovers *Charadrius dubius* challenged with sheep red blood cells (SRBC). The preliminary analysis showed an increase of BMR during both primary and secondary antibody response. We found that primary immune response lasted longer and had a lower peak of energy expenditure compared with the secondary immune response. This study provides experimental evidence that primary and secondary immune responses may have different dynamics and costs in energy terms.

Assessing relative habitat quality for migrating shorebirds: the effect of diet on predictive models based on plasma metabolites levels in Black-tailed Godwit *Limosa l. limosa*

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A growing number of studies are confirming the value of plasma metabolite analysis as a very useful physiological

tool to assess relative habitat quality for refuelling. The effect of diet on the metabolic profile appears to be a particularly important factor in comparative studies of refuelling rates in shorebirds. In this study we analysed the effect of diet in predictive models of body mass change based on plasma metabolite levels in captive Black-tailed Godwits *Limosa l. limosa* during the pre-migration period. A preliminary analysis showed a significant effect of diet (vegetal versus animal prey) in predictive models, which were highly significant.

Bill tip organ of waders

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In some waders (Charadriidae, Haematodidae, Rostratulidae, etc.) mechanoreceptors (Herbst corpuscles, HC) simply lie between bone and rhamphotheca. In this case HC perceive vibrations of the whole bill surface. In Scolopacidae, the bone surface is sculptured by numerous pits, so the bill surface is divided into separate sensory areas. HC in each pit perceive vibrations separately. The number of pits can increase the resolution of the bill tip organ. The larger the external opening of the pit, the larger is the ratio of its surface area to perimeter, and, hence, the easier and with greater amplitude its covering membrane detects even weak disturbances. HC are believed to be specialized in perception of vibration signals which are perpendicular to their long axes. HC are placed at the bony walls of the pit. Regardless of the position of the external source of vibration, the signal enters the pit through the rhamphotheca, so it is always perpendicular to HC axes. Probably, HC are able to distinguish amplitudes of vibration which attenuates while passing deeper down the pit. The numerous Grandry corpuscles lying under the rhamphotheca membrane register the pressure of ground reaction. Presumably, the deeper front pits are covered with thick but small



membranes and bear up to ten layers of HC for estimation of amplitudes of intense vibrations, while the shallower rear pits covered with thin but larger membranes register the vibration, but estimate its amplitude only if it is low. The ability of HC to register external vibration can also be influenced by the bird's foraging behaviour. In Calidridinae and snipes, high frequency head quivering is characteristic when these birds are probing the ground. The bill and its mechanoreceptors are subject to their own instantaneous accelerations, which can be positive or negative relative to the direction of the incoming external vibration. The instantaneous acceleration and amplitude of the signal perceived by HC are in fact the result of interference between the external and their own vibrations. Presumably, the bird's brain is able to synthesize a complex dynamic tactile image, and to enhance its quality through active adjustment of the bill vibration frequency and the blood pressure in the pits.

Black-tailed Godwit hatching success depends on extensively managed grasslands in the Hetter, Germany

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The Hetter is a grassland dominated nature reserve of 650 ha, close to the Netherlands border in Northrhine–Westfalia (NRW), Germany. It is part of the Special Protection Area "Unterer Niederrhein" which includes about 25,000 ha and is one of the largest and most important breeding, roosting and wintering sites for birds in NRW. The Hetter holds up to 20 % of the Black-tailed Godwit *Limosa limosa* breeding population of NRW. The site is managed by both the NABU-Naturschutzstation e.V. and the Naturschutzzentrum im Kreis Kleve e.V. These organizations carry out a LIFE project to protect the Black-tailed Godwit and other meadow birds in the Hetter. Between 1970 and 1995 the local population of Black-tailed Godwit declined from 180 to 50 territories. From then on the number of territories became stabilized at a low level between 25 and 50. We assume that this stabilization is due to the development of less intensively managed fields of grassland. Today about 100 ha are managed extensively. The rest of the grasslands are privately owned. These fields were managed conventionally, including late dragging, soil rolling and mowing up to four times per year, often starting as early as the end of April. Territory mapping suggest an equal importance of both systems of management. The number of nests found indicates that Black-tailed Godwits strongly prefer fields that are extensively managed. Hatching success in 2009 and 2010 was surprisingly high: out of 30 nests only 2 were lost due to predation. In both years, many adults were found alarming in the fields four weeks after hatching, or even later, indicating that many young fledged. We discuss population dynamics, breeding success and the impact of the extensively managed fields. We describe future plans for the project.

Characterization of major histocompatibility complex (MHC) class I genes in the long-distance migrant Red Knot *Calidris canutus*

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Red Knots are migratory birds whose flyways span the globe. During their flights they encounter habitats that may vary in pathogenic load. How Red Knots deal with environmental heterogeneity in health threats is still unknown. Major histocompatibility complex (MHC) genes code for receptors on cell surfaces which allow the presentation of antigens to immune cells and the initiation of the immune response. Variability in this gene complex may indicate relative preparedness to recognize and respond to pathogens which has increased the interest in the study of MHC genes. The MHC encompasses two main subgroups. Class I molecules are expressed on all nucleated cells and are associated with defence against intracellular pathogens. Class II molecules are expressed on specialist cells of the immune system and are associated with defence against extracellular pathogens. Most studies of MHC in non-model avian species have focused on MHCII. However the importance of MHCI for defence against intracellular threats such as viruses, as well as possible interactions between class I and II subgroups in wild animals facing multiple infections remain to be studied. To characterize MHCI in Red Knots, we isolated MHCI gene copies using a PCR-based approach combining primer-walking on a splinkerette DNA library, and direct sequencing and cloning of genomic DNA. Several unique sequences of MHCI were found hinting at multiple loci. Two versions, which included all 8 exons of MHCI were extracted with long-template cloning. To verify the expression of these versions, we are now screening a cDNA library from the spleen. Next we will look for evidence of positive selection at these two loci and compare characteristic structural features of knot MHCI genes to those of other bird species.

When the impact of fairly intense agricultural practices is not fully negative: the case of a Stone-curlew population in northern Italy

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In recent years European populations of the Stone-curlew *Burhinus oedicephalus* have undergone a large decline. However, it is difficult to evaluate the size of this negative trend, since the species is quite difficult to monitor given its elusiveness and crepuscular habits. In fact, some data seem to indicate that, for example, Spanish populations have recently shown a noticeable increase. A similar trend has been observed in the Taro River Regional Park (Parma, Italy), which hosts one of the best monitored Italian breeding populations. In this area Stone-curlew abundance has increased in the last ten years and the density of breeding pairs is among the highest ever reported for the species (even <40m between simultaneously active nests). This high density could be at least partially explained by the different habitats used by birds for breeding and foraging. In the study area Stone-curlews mostly nest in the gravel river-bed, a fairly well conserved natural habitat, which however provides only part of the food resources needed for breeding. During the night, birds regularly commute between the river-bed and the farmlands



nearby where they forage in recently mown crops and in piles of manure. The study area is characterized by a high density of farms (most of them outside the boundary of the protected area) involved in the production of “Parmigiano–Reggiano” cheese. Intensive farms do not provide suitable breeding sites for Stone-curlew; however, both the presence of forage crops which are regularly mown in spring and summer (at least 2–3 cuts) and the use of manure as a fertilizer make large numbers of invertebrates available. Stone-curlews are thus able to take advantage of even fairly intensive farmland, as long as well preserved natural areas are also present in the vicinity. Potentially the conservation of this species in this habitat mosaic could be achieved through the synergistic management of both natural and human-modified habitats.

**Patterns of habitat use of Northern Lapwings
Vanellus vanellus wintering in Mediterranean
pseudo-steppe areas in SW Iberia**

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Extensive pseudo-steppe areas in SW Iberia are considered highly valuable for steppe birds due to the important populations of these threatened species that find refuge there both during the breeding and non-breeding season (the latter case including some wader species, namely Northern Lapwing *Vanellus vanellus* and Eurasian Golden Plover *Pluvialis apricaria*). In this context, 20 large areas in Extremadura (SW Spain) have been considered as Important Birds Areas (IBAs) for this steppe avifauna. Breeding habitat selection is well known for most species, but little is known about habitat selection during the non-breeding season. In the present study we monitored the winter habitat selection of Northern Lapwing in pseudo-steppe areas of Extremadura by 500 m line transect surveys (n = 440). The distribution of land-uses (cereal crops, pastures, fallow, ploughed, stubble, vine and olive, etc.), a related land-use diversity index, livestock stocking rates (ovine and bovine), and also landscape variables (topography, accessibility, farmhouses, etc.) were recorded in each area, and related to lapwing abundance. Two different farmland systems were considered, based on distinct land-use distributions and livestock species: pasture (or livestock production) areas and agricultural areas. No differences in landscape variables were recorded between the two productive systems. Lapwings showed significantly higher abundance in pasture areas devoted to livestock farming than in agriculture-dominated areas. Factors affecting lapwing abundance were analysed by stepwise multiple regression and the conservation implications of the results are discussed both at a regional and biogeographic scales.

**Molecular sex-typing in shorebirds:
an essential molecular method for research in
evolution, ecology and conservation**

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Knowing the correct sex of individuals is essential both for

research in evolutionary ecology and for practical conservation. Recent molecular advances have produced cheap, quick and reliable methods for sexing birds including chicks, juveniles, immatures and adults. Shorebird researchers have not yet fully utilised these advances. We have overviewed work in this area to date and here outline the major applications of molecular sex-typing in shorebird research, highlighting research avenues that may prove productive in future. We outline our essential guide on how to carry out molecular sex-typing using current methods. Taken together we encourage shorebird researchers to make better use of molecular sex-typing techniques in studies of conservation, migration, foraging ecology and breeding behaviour.

**The importance of light to nocturnally
feeding Redshank *Tringa totanus***

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Many shorebirds feed at night, but due to problems in obtaining detailed observations at night, little is known about the relative importance of this behaviour. Using radio telemetry, we studied the behaviour of wintering Redshanks on the Forth estuary, Scotland. Individuals used areas of anthropogenic light, in a similar way to moonlight, to facilitate nocturnal feeding. Although prey was primarily found by touch at night, birds switched to foraging by sight when light levels were adequate. Our findings support the hypothesis that birds prefer to forage at night, however due to visual constraints, this behaviour is opportunistic and dependent upon background light levels.

**Gastro-intestinal microbiota of Red Knots *Calidris
canutus rufa* and Ruddy Turnstones *Arenaria
interpres* during staging in Delaware Bay, USA**

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How do migratory birds stay healthy while undertaking marathon journeys and which threats do they face along the way? To answer this larger question it is important to understand what microorganisms threaten shorebirds, how the distributions of these microorganisms vary in time and space and how patterns of immune function and pathogen pressure are linked. In this study we begin to tackle these questions by examining gastro-intestinal microbiota in shorebirds during staging in Delaware Bay. Red Knot and Ruddy Turnstone are two wader species that stop in Delaware Bay during spring migration to fuel up for the remainder of their journey towards their breeding grounds in the high-Arctic. During these two to three weeks in Delaware Bay they forage intensively in dense, often mixed species flocks, on eggs of the horseshoe crab *Limulus polyphemus*, which spawn in large numbers on the



beaches during this period. The high bird density potentially increases disease transmission between individuals through direct contact, or indirectly through the ingestion of food contaminated with faeces of others. In this study we aim to give an overview of the bacteria that Red Knots and Ruddy Turnstones carry, both commensal and pathogenic, and the occurrence of these bacteria in their foraging environment. To achieve this we sequenced bacterial DNA extracted from knot and turnstone faecal samples and cloacal swabs. In addition we used culture based methods to screen the birds and their foraging environment for known avian pathogens.

Estimating egg age by the floating method – safe in the Arctic?

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For many years now, the egg floating method has been used as a reliable way to estimate the age (developmental stage) of incubated eggs in wild birds. To our knowledge only one study has looked at a possible effect on hatchability. We decided to see if the method affected hatchability on eggs in a high Arctic setting. Eggs of Sanderling, Dunlin and Ruddy Turnstone were monitored throughout the incubation period at Zackenberg, NE Greenland. A few eggs of other wader species were also monitored. Results are compared to 12 years hatching data from the BioBasis monitoring programme at Zackenberg.

Evidence of biofilm grazing in several *Calidris* shorebirds

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Biofilm grazing has been demonstrated for Western Sandpipers *Calidris mauri* during spring migration on Roberts Bank, an intertidal mudflat in the Fraser River estuary, British Columbia, Canada. However, there is no indication of how widespread this foraging mode may be in this and other species at different sites and migratory stages. Using evidence from the microstructure of tongues and bills, video recordings

of foraging behavior and stable isotopes, we extended the search for biofilm grazing in other *Calidris* shorebirds. We collected data from (1) Dunlin, *C. alpina*, during winter at two sites, the Banzu intertidal sandflat, Tokyo Bay, Japan, and the Boundary Bay intertidal sandflat, British Columbia, Canada; (2) Red-necked Stint, *C. ruficollis*, during fall migration at two stopover sites, Komuke and Furen intertidal mudflats in Hokkaido Island, Japan, and during spring migration at Osaka Nankou Bird Sanctuary intertidal flat in Osaka, Japan; and (3) Western Sandpiper during spring migration at the Boundary Bay intertidal sandflat, British Columbia. Evidence of biofilm grazing was found for all species and sites, although the contribution of biofilm to total diet was variable. The results suggest that a variety of small sandpiper species have the ability to use biofilm as a food resource in different areas and seasons.

Shoreline bird populations wintering on non-estuarine coasts of Portugal in 2009/2010: results of the first national census

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During the winter 2009/2010 the Portuguese non-estuarine coast was surveyed, with the collaboration of a large number of volunteers. The purpose of this project was 1) to obtain population estimates of shoreline birds (waders, gulls, cormorants, etc.); 2) to interpret the spatial distribution in relation to habitat characteristics; and 3) to highlight the importance of coastal habitats for biodiversity conservation among the general public. The mainland coast was divided using a 5×5 km grid, resulting in c.200 squares. In the Madeira and Azores archipelagos counts were carried out in selected sectors, due to logistical constraints. A single count was carried out from 1 December to 15 February, within the six hours centred on low water. All birds using the coastal tidal areas (including piers, seawalls, marinas and ports), were recorded. Counts covered 95% of the mainland squares, and 10% of the coast of Madeira (including Porto Santo) and Azores (eight out of the nine islands). Altogether over 47,500 birds were recorded. Gulls were the most abundant group (c.38,600 individuals of 10 species) followed by waders (7,250 of 15 species; c.6,500 on mainland). The six most commonly recorded species were, in decreasing order of abundance, Lesser Black-backed Gull *Larus fuscus*, Yellow-legged Gull *Larus michahellis*, Sanderling *Calidris alba*, Ruddy Turnstone *Arenaria interpres*, Black-headed Gull *Larus ridibundus* and Great Cormorant *Phalacrocorax carbo*. Waders were not evenly distributed, showing higher abundances in the north, and also with high densities near the Tagus river mouth. In Portugal, non-estuarine coastal habitats support the major portion of the national wintering populations of Sanderling, Ruddy Turnstone and Purple Sandpiper *Calidris maritima*, and hold nationally important numbers of Kentish Plover *Charadrius alexandrinus*.



Patterns of habitat use by wintering and breeding species within two major actively worked saltpan systems in Portugal

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The number of actively worked saltpans in Portugal has declined in recent decades, including in the Mondego estuary and Aveiro Lagoon, central Portugal. This has caused loss or degradation of suitable supratidal and breeding habitat for many wader species. To understand the extent to which waders make use of saltpans, we selected the main wintering (Dunlin *Calidris alpina*) and breeding (Black-winged Stilt *Himantopus himantopus*) species and used data assembled in the Mondego estuary and Aveiro Lagoon systems in 2006 to assess the variability in habitat use at the macro-scale (i.e., between sites). The breeding parameters analysed were breeding phenology, nest characteristics and microhabitat use, and nest/fledgling survival. The winter parameters were macrohabitat, microhabitat use and behaviour. Because Aveiro has fewer working saltpans left than Mondego, they were all used as breeding habitats, while in Mondego only a small proportion of the available saltpans was used. Breeding reached higher densities in Aveiro while no differences between the two systems were observed in nest or fledgling survival. Nevertheless, in both systems chicks had higher survival rates than nests. Larger pans were preferred in both systems while the small pans, where salt is extracted, were not often selected. Most nests were built in the margins of the tanks, especially among vegetation and at a considerable elevation, even when taking into account fluctuating water levels. During winter, only a small proportion of the available saltpans was used by Dunlins in Mondego, and in both systems larger pans were preferred to smaller ones. Saltpans were used in similar proportions in both systems for resting and feeding. In conclusion, despite their differences in shape and location, the working saltpans of both areas were used in the same way by waders for breeding and wintering. This is a relevant issue, because any management/protection measures devised for one site can be easily extended to the other.

Hidden haemosporidian infections in Ruffs migrating through NW Europe

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Inland shorebirds use areas with high densities of mosquitoes, and consequently with a hypothetical high risk of mosquito-borne diseases. Yet they have surprisingly low levels of active infections of some of these pathogens, at least when they are migrating through northern latitudes. That is the case for Haemosporidian infections, which are parasites from the Apicomplexa phylum transmitted either by mosquitoes (*Plasmodium*) or by biting midges and hippoboscids flies (*Haemoproetus*). Shorebirds can show high levels of active Haemosporidian infection in some of their African wintering quarters, but almost no superficial blood infection was detected elsewhere along the migration route. So what happens to these parasites? Are birds able to clear these infections or will the parasite hide in internal organs during migration? To answer this type of question, we looked at the infectious status of seven internal organs and muscles (spleen, liver, kidneys, heart, lungs, brain and pectoral muscles) of 53 apparently healthy Ruffs *Philomachus pugnax* collected over a period of ten years in Frislan, the Netherlands, during spring migration, and 18 weak and sick individuals that were caught after the breeding season. We found out that Ruffs carry haemosporidians in their internal organs and muscles while migrating through NW Europe, but at a relatively low rate (<10%). We could only detect six individuals infected with either *Plasmodium* or *Haemoproetus* (4 during spring migration and two after the breeding season). Compared to spring infectivity that mainly comprised single organ infections, after the breeding season we found that the haemosporidians were more widespread, infecting as many as six different organs. This study represents one of the first attempts to describe infections by Haemosporidians, other than in superficial blood in wild, healthy migrant individuals that were not experimentally infected.

Migration strategies in waders: data from 20 years of fieldwork at Jeziorsko reservoir, central Poland

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In general, waders follow two migratory strategies in terms of time- and energy-minimization. Time-minimizers are characterized by a high speed of migration and a small number of stopover sites, which is connected with efficient refuelling and maximization of fat load necessary for long constant flight. In contrast, energy-selected migrants travel in small steps between numerous stopover sites, refuel slowly and attain relatively small fat reserves. We compared mean departure loads (percent of lean body mass, calculated for the heavier half of all caught birds), potential flight range (km) and refuelling rates (% of lean body mass (LBM) per day) of 15 wader species caught throughout 20 years (1989–2008) during autumn migration at Jeziorsko reservoir, central Poland. The smallest departure loads were recorded in typical energy-minimizers: Common Snipe (25% LBM) and



Northern Lapwing (26% LBM). The highest departure loads (over 50% LBM) were found in time-minimizers wintering in Africa south of the Sahara: Curlew Sandpiper and Common Sandpiper. Three other representatives of this group (Ruff, Wood Sandpiper and Green Sandpiper) had a potential flight range in excess of 2,000 km with mean departure loads of >40% LBM. Time-minimizers wintering in the Mediterranean region showed intermediate values for departure loads and flight range.

Footprints of guanaco *Lama guanicoe* as resting sites at high tide for small-sized shorebirds overwintering in Tierra del Fuego, South America

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The bays of San Sebastián (Argentina) and Lomas (Chile) in Tierra del Fuego support large numbers of overwintering White-rumped Sandpipers *Calidris fuscicollis* and Two-banded Plovers *Charadrius falklandicus*. There, both of these small-sized migratory shorebirds cope regularly with strong winds, which increase conductance, so thermoregulatory costs are probably high. These costs may vary between resting sites at high tide because of differing degrees of protection from exposure to wind. We reported large numbers of both species using footprints of a large mammal, the guanaco *Lama g. guanicoe*, to rest at high tide. Guanacos commonly use these soft-sediment areas, so their footprints are widespread across both bays, especially in the upper part of the non-vegetated intertidal areas that are only covered by water during spring tides. Mean wind speed inside the footprints was 38 % lower than wind speed experienced by small-sized shorebirds (5 cm height) outside them, while mean air temperature was similar inside and outside the footprint. Small-sized shorebirds resting inside guanaco footprints may significantly reduce their daily energy expenditure. Furthermore, as footprints are present in intertidal areas, these birds should save energy by reducing the distance travelled between foraging and resting areas compared with birds resting on supratidal vegetated sites. We also address the question that birds using guanaco footprints reduce the probability of being surprised by attacking predators (e.g. Aplomado Falcons *Falco femoralis*) compared with other conspecifics resting in supratidal vegetated marshes.

Phenology and distribution of wintering populations of shorebirds in the Diawling National Park, Mauritania

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The phenology of wintering waders in the Diawling National Park (PND), Mauritania, was analysed using counts carried out during 2004–2009. For the rare or accidental species, the analysis was based on bibliographic information reporting the main winter observations at the PND. The distribution of the various wintering populations is presented by projecting the average values per site on a map of the PND. The particular role that the Mauritanian coast plays in the wintering of East Atlantic Flyway waders is discussed. The national average count for each species is presented and its trend over the last few decades is analysed. Variations in the abundance of each studied species were used to determine their phenology during migration and winter at this significant wetland. For several species, it was possible to explain the temporal spread of the passage by the presence of distinct sub-populations.

Experimental assessment of mating opportunities in Kittlitz's Plover *Charadrius pecuarius* in Madagascar

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There is a complex relationship among mating systems, parental care and population sex ratio, and theoretical studies are beginning to tease apart their interactions. Empirical assessments of these, however, are poorly understood. We carried out a temporary removal experiment in a common African plover, the Kittlitz's Plover *Charadrius pecuarius* in Madagascar. This small plover has a polygamous mating system and uniparental brood care by the female. We made predictions based on previous experiments carried out on Kentish Plover *Ch. alexandrinus* about the relationship between mating opportunities and mating systems: (i) Kittlitz's Plovers should have higher mating opportunities than Kentish Plovers and (ii) both the male and female Kittlitz's Plovers should find a new mate quickly. However, the results did not confirm these expectations, since (i) there were no differences in re-mating time between the species; (ii) male Kittlitz's Plovers spend less time finding a new mate than females, where in Kentish Plover the opposite occurs. The area of minimum convex polygons occupied during the breeding season was not significantly different between males and females. However, females move their territories significantly greater distances between first and second breeding attempts than males. These results suggest that either the adult population is female-biased, or that more females are engaged in care provisioning than males in Kittlitz's Plovers. Testing these alternative hypotheses will be needed to identify the causes and implications of the mating system, mating opportunity bias and adult sex ratio.



Characterization of the Kentish Plover *Charadrius alexandrinus* breeding population at the Samouco saltworks

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The Samouco saltworks complex, located on the south bank of the Tagus estuary, is the most important breeding area for the Kentish Plover in the Tagus estuary (approximately 31% of the estuarine population). *C. alexandrinus* is listed as of Least Concern in Portugal but is declining in Europe. Therefore, it is a priority to carry out a long-term study of the Portuguese breeding population. Between 2005 and 2010, the breeding population at the Samouco saltworks was estimated in a low tide census and nests were identified. The number of pairs and the breeding period was estimated and nests were counted; breeding success was calculated based on the incubation time. To follow and study the breeders we started a colour-ringing scheme in 2007. The breeding population arrives at Samouco saltworks from late March to early April, reaching the highest numbers during May and June (67.7±16.4 (SD) birds). Breeding activity is more intense during the first fortnight of May and in June (48 and 34 nests in 2007, respectively) and ends in August. The total number of nests in the first three years was relatively stable, reaching 198 (±20.5 (SD)) nests, but dropped to 57 and 105 nests in 2009 and 2010. This trend was also observed in the number of pairs, which ranged from 101 in 2005 to 152 in 2007. In 2009 and 2010, the breeding population was <50 pairs. Breeding success at Samouco was 30% and failure reached 44%, mainly due to egg predation by crows and dogs. The breeding population was not stable because the number of individuals breeding in consecutive years was low (6.5% and 7.4% in 2009 and 2010, respectively). At least 6.3% of this population is resident and only 2.8% of the offspring returns to nest.

Determinants of habitat use in Black-tailed Godwits migrating through rice fields

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The inland rice fields of the Iberian Peninsula represent a key stopover area for large populations of many species of migrant waterbirds in the East Atlantic Flyway. Therefore studies of the characteristics of this habitat that are selected by waterbirds are essential for the development of suitable conservation strategies. In this study of Black-tailed Godwits *Limosa limosa* we assessed their use of rice fields and habitat selection during migration by testing the effect of factors such as human disturbance, presence of suitable roosting areas, predation risk, food availability and crop management. We carried out systematic bird censuses in the area, sampled food availability for godwits and carried out an analysis of different types of habitat availability throughout the whole study area. By radio tracking godwits, we also determined the

home range size of males and females, mapping all the locations on digital maps with the aid of a GIS program. Suitable foraging sites strongly determined the distribution of godwits among the rice fields; they showed no sex differences in their home ranges. We did not find a significant effect of human or predator presence on habitat use. However, a factor leading to increased habitat use was the presence of suitable roost sites among the rice fields; rice pans that were far from these roosting areas were less used for feeding. Utility wires seemed to act as a barrier to the location of the roosts.

Have Dutch Ruffs moved or died? A survival analysis based on re-sightings of nearly 5,500 individually colour-ringed birds

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Previously considered one of the most common waders in the World, the Ruff *Philomachus pugnax* has shown remarkable population changes over the last two decades. While birds migrating through the Netherlands and breeding across N Europe have shown a sharp decline, numbers have increased in the W Siberian breeding grounds and at a Belarus staging site that is possibly connected with those breeding areas. Rather than indicating a global population decline, this suggests a large scale population shift towards the east. To contribute to an understanding of what has been happening to Ruffs in the Netherlands and elsewhere, we here focus on variation in annual survival, which is likely to have a greater influence on population change than fecundity. In our study area covering 400 km² of agricultural landscape along Lake IJsselmeer in SW Fryslân (N Netherlands), numbers of staging Ruffs declined by 6% per year between 2001 and 2010. To estimate annual survival rates, between 2004 and 2010, 5,472 Ruffs were individually colour-marked. Our intensive colour-ring reading efforts were concentrated on stopover during northward passage during March–May. Occasionally, colour-ringed birds were re-sighted outside the Frisian study area at staging, breeding or wintering grounds during the rest of the year; however, encounter probabilities remained low. We used mark–recapture methods and more precisely “Joint models” to obtain estimates of annual survival. Such models decompose apparent survival estimates into true survival (S) and site fidelity (F) and will allow us to take emigration patterns and the heterogeneity of re-sightings into account. We will present the first estimates of the annual survival in Ruffs staging in the Netherlands, and consider whether their disappearance over recent decades reflects emigration or increased mortality.

Molecular characterization of MHC II class B in Red Knots

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The high variability of MHC genes and their role in immune recognition makes them relevant to several aspects of the ecology and evolution of organisms. Red Knots *Calidris canutus* comprise six subspecies that undertake marathon annual migrations of up to 15,000 km between high Arctic breeding grounds and marine wintering environments. The parasite hypothesis of shorebird migration predicts that restriction of species to these parasite-poor environments reflects their susceptibility to parasites and pathogens, and thus they have to migrate great distances to find such habitats. Alternatively, good resistance to pathogens allows them to visit multiple stopover sites. We characterized MHC IIB genes using a primer walking technique and direct sequencing of three loci. We designed locus-specific primers to screen the allelic variability in exon 2, which includes the peptide-binding region for detection of extracellular pathogens. At least one locus was found in a cDNA library, suggesting that it is expressed. Single locus assays showed that Red Knots have surprisingly high allelic diversity in MHC IIB genes, and sites of two loci in exon 2 are under positive selection. This suggests that host-pathogen interactions play an important role in Red Knot population dynamics.

**Shift in winter distribution in Pied Avocets
Recurvirostra avosetta in W Europe:
An individually based approach**

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Numerous studies have demonstrated recent changes in the distribution and the abundance of flora and fauna as an effect of human activities and climate change. During the last few decades, several species of waders wintering in W Europe have shown a northward shift in their winter range, but approaches based on population counts are generally unable to explain processes behind these changes. Studying population dynamics through individual data is the basis of demographic studies and a keystone for conservation and management. In NW Europe, Pied Avocets breed along the coast of the Baltic Sea, the North Sea, England and France. These avocets winter in coastal areas from the South of England and the Netherlands to Gambia and Guinea with midwinter counts of 73,000, including 46,000 in Europe. A recent analysis has shown a large increase in the number of birds wintering in the Netherlands and England, but the demographic processes involved in this change are unclear. To understand this phenomenon at the scale of the population we analysed data from individually-marked birds. Since 1996, 1,620 avocets, mainly chicks, have been captured and

marked with individual combinations of coloured legs rings at four main breeding colonies on the Atlantic coast of France. With the help of an extensive network of volunteer observers throughout the European range, locations have been obtained for more than 300 birds during winter (Dec–Feb). Similarly, the main breeding colonies in France have been monitored. We distinguished two wintering areas, North (the Netherlands, England and France) and South (Portugal, Spain and W Africa). This study explores three main questions: 1) Is there a change in the proportion of birds migrating to southern wintering areas? 2) Are these changes related to variations in individual behaviour or changes in recruitment of juveniles in northern and southern wintering populations? 3) What are the advantages of wintering in northern areas in terms of survival and arrival date at breeding colonies?

**Islands of the European Wadden Sea:
predator-free paradise for breeding waders?**

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The Wadden Sea may be regarded as a retreat area for many wader species suffering population declines in traditional breeding sites in Central and NW European grasslands. This might be true, for example, in Northern Lapwing *Vanellus vanellus*, Black-tailed Godwit *Limosa limosa* and Redshank *Tringa totanus*. Within the Wadden Sea ecosystem, island breeding sites are either preferred over mainland sites (e.g. Eurasian Oystercatcher *Haematopus ostralegus*), or support increasing breeding populations (e.g. lapwing and Black-tailed Godwit), or allow for higher reproductive success (e.g. Redshank) compared to mainland sites. It is assumed that lower predation on islands due to the absence of mammalian predators (e.g. Red Fox *Vulpes vulpes*) is one of the key factors underlying these phenomena. Still, there is little consistent evidence supporting this assumption. Considering Wangerooge Island (Lower Saxony, Germany) as an example, Redshanks achieve much higher reproductive success than on the mainland whereas lapwings have hardly any breeding success on the same island. In a first approach towards this topic, we compared hatching success, breeding success and predation in two common species breeding on Wangerooge Island: the lapwing that uses coastal grassland habitats and the oystercatcher that uses salt marsh habitats. First results of this study will be presented and discussed.

**Forensic ecology used to determine synchrony of
mortality in Arctic tern chicks**

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Recent breeding failure and population declines among



many N Atlantic Arctic Tern *Sterna paradisaea* populations are widely suspected to be linked to a lack of sufficient prey resources. Resource limitations for tern chicks are often characterised by low growth rates and highly visible mass mortality within colonies. The extent to which resource limitation drives large-scale patterns of breeding failure may be explored by quantifying the spatial scale of synchrony of mortality across colonies. We have developed a method to explore the synchrony of chick mortality, in which time of death is estimated from growth rates of blowfly larvae on chick carcasses. These techniques are used to explore the synchrony of chick mortality among colonies, and the implications for the relative importance of large- and local-scale variation in climatic and resource conditions in driving breeding success.

Chick carcasses were collected from 12 colonies in W Iceland in 2008–2009, along with measures of breeding success and chick growth rates. Persistent food shortage throughout the season was indicated by low breeding success and growth rates of chicks across colonies. However, geographic variation in growth rates suggested between-colony differences in food type or abundance, with inshore colonies typically experiencing greater success than colonies with more exposed feeding grounds. This information and forensic analyses of the extensive chick mortality that was evident in both years are used to assess 1) the scale of synchrony of mortality, 2) the role of regional and local-scale variation in climatic conditions and 3) the evidence for widespread resource limitation driving Arctic tern productivity.

Welcome to Scotland!

International Wader Study Group Conference 24–26 September 2011

The IWSG Conference 2011 will be held at the Ben Wyvis Hotel, Strathpeffer, in the Scottish Highlands, and hosted by the Highland Ringing Group. HRG is a group of amateur ornithologists who carry out long-term ringing studies of waders in the Moray Firth, the most northerly complex of large estuaries on the East Atlantic Flyway.

The main part of the conference will run from Saturday 24 September to Sunday 25 September, when there will be excursions in the afternoon. Monday 26 September will be devoted to workshops. The venue can hold a maximum of 120 people, so early registration is recommended. Registration for the conference opens on the 1 March 2011 and submissions for presentations and posters will be welcomed from that date.

Please check the IWSG website (www.waderstudygroup.org) regularly to receive further information on the venue, travel, registration and deadlines.

