preferred to feed in meadows close to a roost, with low vegetation comprising grass mixed with herbs, either on a sandy or clayey soil, with an intermediate drainage level and in a more or less open landscape. Recently fertilised fields were highly attractive but scarce. The number of Ruffs feeding in meadows varied only with date (numbers decreased, as did overall numbers staging) and time of the day, as birds take siestas on roosts in Lake IJsselmeer. In the course of April, the proportion of birds feeding on insects increased. Females had lower prey intake rates than males, but higher pacing rates and equal pecking and probing rates. We suggest that aspects of feeding behaviour and feeding site choice can account for the rather different migration routes taken by each sex.

Breeding biology of the Stone-curlew in intensive agriculture habitat: a seven year study

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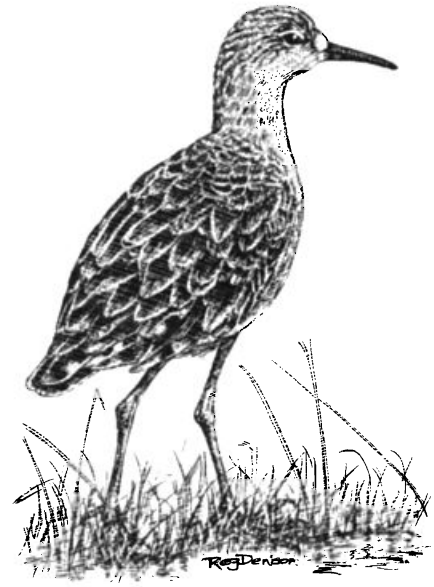
The Stone-curlew *Burhinus oedicnemus* uses three habitats in France: steppe areas, vineyards/fruit plantations, and agricultural habitat. Very few data are available from this latter habitat, although most of the French population occurs in cultivated landscapes. Here we present results from a seven-year study (still ongoing) on a very large study site (340 km^2) in central western France. This study site still holds a high density of Stone-curlews (total population: about 300–400 pairs). We present data on habitat selection, spatial distribution of pairs, breeding biology, breeding success and population trends. We discuss these results with regard to trends currently affecting agricultural habitat in cereal plains in France (and Europe), and discuss some management and conservation issues for this species.



Annual Conference — Abstracts of posters

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

- **1st prize: Neap-tide roost selection by waders: maximizing feeding opportunities or reducing risks of predation?** by Susana M. Rosa, Ana Encarnação, José P. Granadeiro & Jorge Palmeirim
- **2nd prize: Assessing the use of mudflats by waders: bias due to the response of birds to the tidal cycle** by Maria P. Dias, Ricardo J. Martins, José P. Granadeiro & Jorge M. Palmeirim
- **3rd prize: Predation of horseshoe crab eggs by migratory shorebirds in Delaware Bay, USA** by S. Gillings, P. Atkinson, R. Robinson, R. Stillman, R. Weber & S. Love

Coping with heat-stress during incubation: the influence of water proximity on nest desertion by Kentish Plovers *Charadrius alexandrinus*

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Kentish Plovers *Charadrius alexandrinus* are small shorebirds that readily nest on exposed sited in hot environments, where air temperatures at ground level may be >45°C during the hottest parts of the day. In these environments, leaving a nest unattended even for a short period may compromise nesting success. We examined whether the probability of nest desertion was affected by proximity to water. We found that this was the case. Nests located close to water were deserted less frequently (39.0% of 346) than nests located far from water (57.6% of 118). This was so in spite of the nests located close to water being more frequently placed in exposed sites (62.4% of 346) than were the nests in sites far from water (51.7% of 118). It seems likely that susceptibility to thermal stress changed in relation to proximity to water because in sites close to water it was possible to belly-soak, which would allow a more continuous nest attendance.

Evaluation of human impact on the use of the Cádiz Bay marshes by waders: application of Geographical Information System

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Management of the bird populations of the Natural Park of the Bay of Cadiz as a natural resource is a complicated process in which a whole range of factors have to be considered. In this work we have tried to reconstruct the evolution of the habitats of the wetland birds over the last 50 years.

During 2001/2002, the wintering population of all wetland birds combined was 72,886 individuals of 70 species and the breeding population, 3,140 pairs. The largest proportion of these birds used the salinas (saltpans) where average densities reached 27.0 indiv/m^2 in 1996 and 31.0 indiv/m^2 in 2002. Although the traditional salinas are falling into disuse or being converted for other purposes, they are areas of great importance for both wintering and breeding wetland birds.

The other main land-use in the Bay of Cadiz is extensive aquaculture and these areas are used by 44% of the breeding bird populations and 52 % of the wintering populations and are important feeding areas for birds. However, the development of intensive aquaculture (1125 ha) and the abandonment of salinas (1502 ha) have negatively affected many bird populations.

The results of this study represent a considerable asset for the conservation of the whole of the Cadiz Bay Natural Park because we now have accurate, spatially-referenced and up-to-date information offering a synoptic view of each part of the bay that allows us to identify the most sensitive and vulnerable areas.

Rescuing the Sociable Plover is an international problem

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In the 19th century the Sociable Plover *Vanellus gregarious* died out in the Ukraine. In the 20th century it practically disappeared from Russia. Now it is under threat of disappearance in its last stronghold, Kazakhstan (Intern. Act. Plan 2002). My analysis of the reasons for its disappearance has revealed the following main factors (Belik, in press): (1) Ploughing of virgin steppes during the 19th and 20th centuries; (2) Increased numbers of Corvids resulting from artificial afforestation and their intensive predation on plovers during the second half of the 20th century; (3) Recent humidifying of the steppe climate and spread of tall grasses across the steppes; and (4) The economic crisis in Russia and Kazakhstan since the early 1990s, which has led to a reduction of number of cattle and therefore reduced grazing and taller grass in the steppe pastures. Taking into account the very low numbers of Sociable Plovers and current trends, the species could become extinct within the next few decades. The usual methods of bird protection, such as legislative protection, creation of reserves etc., cannot help the Sociable Plover in Russia and Kazakhstan, as they do nothing to restore its habitat. Therefore possibly the only way to rescue the species is through its artificial resettlement in regions where suitable conditions for breeding still exist. One of such country could be Spain with its dry summer climate, extensive pastures, very low number of Corvids, and where ecologically similar steppe species live in safety.

Habitat choice and breeding success of Northern Lapwing *Vanellus vanellus* in the Marais de Brouage, western France

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Aspects of the breeding biology of the Northern Lapwing were studied from 1990 to 2001 in western France in a 12,000 ha wetland area. Trends in Lapwing numbers showed an increase between 1990 and 1995, followed by a period of stability. Habitat selection studies revealed a recent and strong tendency for breeding on arable land (c.15 % of the area) versus pastures (c.85 %), with 60% of nests or colonies in Maize fields. Vegetation height in Lapwing colonies at the time of settlement in the breeding areas was on average 4.5 (±6.1) cm (n = 145 colonies), and varied significantly between years and habitat type (pasture versus arable). Lapwings strongly selected fields that had lower vegetation height than random control fields. They also significantly avoided grazed pastures, with 8 % of colonies in grazed pastures at settlement compared to 62 % in grazed pastures over the whole breeding season. Between 1998 and 2001, vegetation height on control pastures increased, and this was apparently related to a decrease in grazing pressure, resulting from a decreasing percentage of grazed fields, and a lower stocking density for those fields that were grazed. First settling date was on average 28 March, but this varied significantly with year. Hatching success depended significantly on habitat, being higher in pastures (75 %, n = 40 nests) than arable land (56%, n = 124 nests). The main cause of failure was agricultural work in arable land and to a lesser extant, predation at the egg stage. The average number of fledglings per successful pair varied between 1.27 and 2.0 over the years, a variation less than overall productivity, which ranged from 0.32 to 0.86. This suggested that breeding failure occurred mostly during incubation and/or during the early chick-rearing period. Lapwing population productivity in this study site, is less than the expected value for a sustainable population (0.8 to 1).

Melanin-based plumage colouration and flight displays in plovers and allies

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Plovers and allies exhibit an impressive diversity of melanin-based plumage patterns ranging from non-melanised to completely melanised species. We used phylogenetic comparative methods to test whether melanisation has evolved in relation to sexual selection for attracting mates, or in relation to selection for signalling territory defence, or in relation to natural selection for camouflage.

According to sexual selection theory, melanised plumage may have evolved to amplify the courtship displays of males. As predicted by this hypothesis, we found that males with aerial displays had more melanised plumage than males of ground-displaying species. In addition, sexual dimorphism in melanisation was greater in species with display flights than in species with ground displays.

Alternatively, melanisation may have evolved through social interactions to signal competitive ability in territory defence. We did not find evidence for this hypothesis, since breeding density was unrelated to the melanisation of either sex.

Finally, melanised plumage may camouflage the incubating parent. The latter hypothesis was not supported, since melanisation was unrelated either to the darkness of the nest substrate, or the extent of vegetation cover.

Taken together, our results are most consistent with the sexual selection hypothesis, and suggest that melanised plumage has evolved to enhance the aerial displays of male plovers.

Chick energetics of African Black Oystercatchers *Haematopus moquini*

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Many studies have focused on the energetic requirements of birds during incubation and chick rearing in a range of positions on the altricial–precocial spectrum. In altricial species the chick-rearing period is often the most energetically expensive period for adult birds because food needs to be collected and transported to the nestlings. In most species of the sub-order Charadrii, the chicks are precocial and the burden of collecting food is shifted to the chicks resulting in greater energy requirements for activity and for thermoregulation and, thus, greater energetic demands. The oystercatchers Haematopodidae are exceptions, in that the chicks hatch as developed as other charadriid chicks, but are parent-fed, because the prey capture and handling process is too complex for the chicks. The burden of collecting food is shifted back to the adults. These "semi-precocial" chicks may, therefore, be able to grow at a faster rate than self-feeding precocial chicks. This study explores the ecological consequences of this developmental mode for African Black Oystercatchers *Haematopus moquini*. Fieldwork, on Robben Island, South Africa, included the determination of chick energetics using doubly labelled water methods, time budgets and growth rates.

Diet of Kentish Plover chicks in two salinas in Cádiz Bay Natural Park: do they show selection?

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Knowledge of a species' diet is the first step to understanding many aspects of its feeding ecology, such as habitat and prey selection or niche width. In the Cádiz Bay Natural Park, salinas (saltpans) are important breeding habitats for Kentish Plovers *Charadrius alexandrinus*, supporting a great number of pairs and their broods. Kentish Plover chicks are precocial so begin to feed by themselves soon after hatching. However, the role of the salina as feeding habitat for the chicks is poorly known. The aim of this study was therefore to make a first assessment of salinas as a feeding habitat for the chicks.

We investigated the diet of Kentish Plover chicks in two salinas in the Cádiz Bay Natural Park. The work was carried out in an actively worked salina and in another that had been recently restored. From the two salinas, 16 and 9 faeces respectively were collected from ringed chicks and the non-digested parts were analysed. In order to compare prey ingested with prey available, we sampled the density of macroinvertebrates in each salina. In the actively worked salina, the most abundant invertebrate was *Artemia salina* (10,939 m^{-2}) followed by coleoptera larvae (10,970 m^{-2}), and *Quironomus* sp (2,840 m^2). In the restored salina, the density of all invertebrates was lower and the most abundant were the gastropods *Hydrobia ulvae* and *Hydrobia minoricensis* (343 and 127 m^{-2} respectively) followed by *Quironomus* sp larvae (145 m^{-2}) and *Scrobicularia plana* (93 m^{-2}). The coleoptera *Octhebius* sp did not occur at high density in either habitat, with 2,700 m^{-2} in the actively worked salina and 0.7 m^{-2} in the restored one. Despite this, however, the only prey appearing all faeces from both salinas was the coleoptera *Octhebius* sp., suggesting strong positive selection for this prey in Kentish Plover chicks. We discuss to what extent this result may be related to the detectability of this particular prey in the faeces, as opposed to other potential prey. We also discuss the value of *Octhebius* sp. in relation to the nutrient requirements of the chicks and the fact that targeting this prey may avoid the ingestion of salty water.

Migration of waders across the Strait of Gibraltar: Preliminary results

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"Los Lances" Beach, in the Strait of Gibraltar, is the most southerly stopover site of Europe for waders migrating along the East Atlantic Flyway. The MIGRES SEABIRD program monitors waders passing the Strait of Gibraltar. More than 13,000 waders of 28 species were counted at Los Lances between January and December 2002. Peaks of migration were observed in April and November. Many waders stayed in the area during the winter. Scolopacidae species dominated the wader community; mainly Sanderling *Calidris alba* (48.9%) and Dunlin *Calidris alpina* (17.4%). In addition, important numbers of Charadriidae were also recorded throughout the year, especially Ringed Plover *Charadrius hiaticula* (6.5%) and Kentish Plover *Charadrius alexandrinus* (18.9%). We describe the phenology of the main wader species at Los Lances Beach, pointing out age-related differences in the autumn migration of Dunlin, in which adults arrive earlier than juveniles.

A new approach to measuring the impact of human disturbance

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Waders include a large number of migrant species that depend on intertidal areas to obtain their trophic resources to survive. During recent decades, not only have many of their coastal habitats disappeared as a result of human activities, but there has also been a large increase in the amount of human-related disturbance. This paper proposes a simple mathematical model based on the birds behaviour during the low-tide period, which can evaluate each species' response to disturbance and allow us to predict the consequences of increased disturbance.

Our study area of about 3 ha at low tide is on the intertidal mudflats of Cadiz Bay Natural Park, NW of Cadiz, Spain. The study took place from November 1997 to March 1998. We carried out 117 censuses during 12 complete low-tide periods. We recorded the number of birds and the number of shell-fishermen. We used a chi-square test to compare the number of birds in places where shell-fishermen were present with the number of birds in the same places when shell-fishermen were absent. In order to develop the model, we needed to know not only the numerical response to disturbance, but also the turnover in order to obtain a balance between the entry and exit flow of birds in the study area.

Four abundant species of different size and feeding technique were selected for detailed study: *Calidris alpina* (tactile-small), *Charadrius alexandrinus* (visual-small), *Limosa lapponica* (tactile-big) and *Pluvialis squatarola* (visual-big). We found a significant difference between censuses with and without shell-fishermen for each of the four species. However, they also showed different responses to disturbance. We found that *Pluvialis squatarola* is the most affected by disturbance and *Charadrius alexandrinus*, the least. We also found that bird exit is greater than bird entry during disturbance and that the opposite occurs before and after disturbance. In general, the model we have developed is easy to use and gives results on the response of the birds to disturbance throughout the tidal cycle that are intuitively correct. Moreover, the observed responses allow us compare, in an absolute way, not only responses between different species, but also the responses of one species in different seasons and places.

Changes in the use of Fracasso beach, Peninsula Valdes, Patagonia, Argentina, as a stopover site by shorebirds

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From 1994 to 2002, we studied the way in which Red Knots *Calidris canutus rufa*, White-rumped Sandpipers *C. fuscicollis* and Two-banded Plovers *Charadrius falklandicus* use Fracasso beach, Patagonia, Argentina and investigated their diets. Simultaneously we monitored the availability of the benthic invertebrate food stocks. We discovered many changes in the course of the years. In March 1998 an extraordinary rainfall had strong erosive effects and changed the substrate from medium-sized to fine muddy sediments. This habitat change appeared to have great consequences. Up to 1997, Red Knots fed and roosted on Fracasso Beach and their abundance was correlated with the abundance of their prey, the clam *Darina solenoides*. From 1999, they stopped using Fracasso Beach as a roosting site and they only fed there during ebb tides before commuting to another beach 20 km away. In 2002 and 2003, no Red Knots were observed. White-rumped Sandpipers and Two-banded Plovers continued to use the beach, but their abundance was no longer correlated with the densities of the clam *Darina* but became correlated with the densities of the polychaete worm *Travisia olens*.

Coastal Waders wintering in France – Trends over 20 years: 1983–2002

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Nearly one million waders are counted every year in France during the mid-winter count. Twenty five coastal sites are of international importance for at least one wader species. Trend analyses have been carried out using the TRIM 3 software for the 1983–2002 period. Nine species are increasing: Eurasian Oystercatcher *Haematopus ostralegus*, Ringed Plover *Charadrius hiaticula*, Grey Plover *Pluvialis squatarola*,

Sanderling *Calidris alba*, Purple Sandpiper *C. maritima*, Redshank *Tringa totanus*, Turnstone *Arenaria interpres*, Black-tailed Godwit *Limosa limosa* and Dunlin *C. alpina*. Although these species have increased over the whole 20 years, 1983–2002, some of them declined in the early part of this period: Redshank (1983–87), Black-tailed Godwit (1983–90) and Purple Sandpiper (1983–89). Numbers of four species have been stable or have fluctuated: Pied Avocet *Recurvirostra avosetta*, Red Knot *C. canutus*, Bar-tailed Godwit *L. lapponica* and Eurasian Curlew *Numenius arquata*. Red Knots increased until 1994, since when numbers have fluctuated. Bar-tailed Godwits declined until 1993 and then increased until 1997. Eurasian Curlew showed strong increases during the cold winters of 1987 and 1997. Ruff *Philomachus pugnax* is the only species to have decreased significantly over the 20 year period.

In France, the numbers of most wintering waders are increasing at coastal sites. This is largely the result of site protection. Many major estuaries and mudflats have been designated (at least partially) as nature reserves and hunting reserves, where shooting is prohibited. Designation has resulted in strong increases in wader numbers during the ensuing years. This suggests that in general, wetlands are not at carrying capacity in France and trends observed at the national level may not be related to international trends, and thus, do not reflect the status of the species. Despite positive trends, all wader species are vulnerable because of their concentration in few sites.

Assessing the use of mudflats by waders: bias due to the response of birds to the tidal cycle

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The importance of particular intertidal mudflats for feeding waders is often inferred from their distribution during a restricted part of the tidal cycle (in most cases, around low water). However, over the whole period of tidal exposure, most waders move about within an estuary using different parts of it for feeding. This means that the distribution of birds during any particular part of the period of tidal exposure may not reflect their use of the estuary throughout the entire cycle. We compared data on distribution and abundance for the six most common wader species of the Tagus Estuary, Portugal, provided by low-tide counts with equivalent estimates based on half-cycle counts. The data were collected during the winter on a superficially homogenous mudflat divided into 12 plots of increasing distance from the saltmarsh (i.e. subject to different periods of tidal exposure). For most plots, low-tide counts resulted in serious underestimates of use (up to 9 times lower than full cycle counts). The magnitude of this bias was influenced by both the behaviour of birds in relation to the tide edge, and the exposure period of the feeding areas. We suggest that the best way of evaluating wader usage of intertidal areas is to combine counts carried out at different stages of the tidal cycle, thereby reducing this bias.

Waders of the wetlands of the south Bulgarian Black Sea Coast, 1996–2002

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During 1996–2002, regular monitoring of the waterbirds of the wetlands of the southern Black Sea coast of Bulgaria has been undertaken on a monthly basis by a team from the Bulgarian–Swiss Biodiversity Conservation Program "Bourgas Wetlands Project". This presentation includes population dynamics charts for the wader species of the four Bourgas Lakes – Lake Pomoriysko, Lake Atanasovsko, Lake Vaya and Lake Mandra. The results (given in the charts by season) show the importance of Lakes Atanasovsko and Pomoryisko for migrant and breeding wader species along the Western Black Sea Coast. Comparison with older data is also given.

Behavioural effects of disturbance by shell-fishermen on waders at a sandy beach in south-west Spain: preliminary results

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We studied the effects of disturbance by shell-fishermen on the behaviour of waders at a sandy beach in Cádiz Bay, southwest Spain. Eurasian Oystercatcher *Haematopus ostralegus*, Bar-tailed Godwit *Limosa lapponica* and Sanderling *Calidris alba* were the most abundant waders. We defined two foraging sites with different exposure time (near to the beach and a sandy island). We measured disturbance duration and the displacement distance of the birds when shell-fishermen approached. We also counted and mapped the distribution and numbers of waders and men during complete tidal cycles. Finally, we recorded the aggregation factor or percentage of the surface area occupied by each bird species in each foraging site.

Preliminary results show that the minimum distance at which birds are disturbed and the distance they are displaced increase with bird body size. However, disturbance duration was lower in Oystercatcher and similar in Bar-tailed Godwit and Sanderling. At low water, the aggregation factor decreased at the foraging site nearest to the beach, but increased at the island site. We discuss these results in terms of differential site-selection by waders during the tidal cycle and the distribution of the shell-fishermen. We make some suggestions on ways in which the conservation of waders can be reconciled with this traditional human activity.

Relationship between tides and activities in two shorebirds species in The Marshes of La Algaida, Cádiz

Daniel Garcia, María de Alba, Anabel Cabrera, Giovanna Lunar, Almudena Ruiz, Rosario Ruiz & Maria A. Torres

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Following habitat restoration work, the Marshes of La Algaida (Parque Natural de Doñana) are the subject of a scientific project with the title: "Monitoring the Ecological Restoration of The marshes of La Algaida". This project began in 2000 and the principal object is to monitor the recovery of the ecological processes, functions and interactions that allow the maintenance of a self-sufficient marshland ecosystem. Colonization by typical shorebirds species of tidal and non-tidal wetlands was immediate and, right from the start, they used the study area for both feeding and roosting. The purpose of our study was to investigate resource partitioning in two shorebirds species, *Calidris alpina* and *Charadrius alexandrinus*. Our hypothesis is that the two species partition the allocation of their resources between them because of the need to avoid competition. We therefore compared the use of space, the behaviour and the time budgets of both species. First, we established whether there were any differences between the behaviour of each species that related to the area in which it was found (i.e. whether it behaved differently in a preferred habitat and whether there was any difference in this respect between the two species). Second, we compared those records with the tidal regime to establish whether the behaviour of each species is related to the movement of the tide. The results show that *Calidris alpina* does not use this area to feed, only to rest, so they do not compete for the use of habitat. In *Charadrius alexandrinus*, we found that there is a direct relationship between activity and site. We also found a relationship between the state of the tide and the sites they used and the activity in which they were engaged.

Predation of horseshoe crab eggs by migratory shorebirds in Delaware Bay, USA

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The eggs of horseshoe crabs *Limulus polyphemus* form the main diet of migratory shorebirds refuelling in Delaware Bay, eastern USA during their spring migration. Concern over population trends and horseshoe crab fisheries has prompted research into the factors governing the refuelling rates of shorebirds, especially the declining Red Knot *Calidris canutus rufa* population.

In May 2002, we began a study of foraging behaviour in a suite of shorebird species as a means of understanding functional relationships between prey abundance, availability and intake rates as part of an individual-based model aimed ultimately at predicting the rate of body mass gain. We employed a feeding tray experimental design, using known starting densities of eggs and videoing foragers for a set interval followed by quantifying the remaining eggs. Experiments in 2002 involving surface eggs revealed constant peck rates across prey densities (ranging from 0–25000 eggs/m^2) but eggs consumed per peck, and hence intake rate, increased to a plateau with increasing density. Results will also be presented from experiments in 2003 involving buried eggs and will show the rate and depth of depletion by different species.

Breeding waders of the Shatsckiy National Park, Ukraine

Igor Gorban

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The Shatsckiy National Park is situated in the Western Ukraine and borders with Poland and Belorussia. Because of its unique natural landscapes, it is characterized by a high diversity of wader species and has received the international status of a natural swamp area reserve and is also an International Bird Area (N001 UA). In the 1950s, a series of regular and occasional ornithological surveys were initiated in the Shatsckiy lakes area, focused mainly on waders. These surveys have shown that several waders that were numerous in the past have shown major declines, especially over the last 20 years. In particular, *Philomachus pugnax*, *Tringa glareola* have disappeared from the region altogether. On the other hand, *Charadrius hiaticula* has been recorded as breeding for the first time in Ukraine. Today, 12 wader species are observed in the Park regularly. Of these, the populations of *Limosa limosa*, *Numenis arquata*, *Vanellus vanellus* have decreased considerably.

In order to assess the current breeding status of waders, special surveys have been conducted to map their breeding territories. For four species of high conservation priority – *Gallinago media*, *Tringa totanus*, *Limosa limosa*, *Numenius arquata* – the reasons for dramatic population decreases have been studied. Only for *Gallinago media* has a small population increase been detected. However, it is characteristic of this species that its population size shows strong fluctuations. After a sharp decline as a result of swamp drainage from the end of the1960s, this species increased from the mid-1990s, and especially after the rainy summer of 1997. The revival of the almost extinct breeding population of *Gallinago media* can be explained by the restoration of water-meadows and swamps carried out in the National Park under the ECONET Action Fund Project in collaboration with the Ukrainian Ministry for the Preservation of Natural Resources. At the present time, the only wader included in the National Red Data Book is *Numenius arquata*, the population of which has declined strongly. However, we are now recommending that *Gallinago media* and *Tringa ochropus* shall be added. Both of these species are observed only rarely in the Shatsckiy Park or the Ukraine as a whole.

Defining habitats for waders at a broad scale: an example from the Tagus estuary, Portugal

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The occurrence of shorebirds in estuarine areas is often modelled using the physical characteristics of their feeding sites. However, at a broad scale, the interactions among these factors can pose difficulties in clearly defining the characteristics of wader habitats. In this study we applied a novel analytical approach, in order to characterize the habitats of different wader species using the Tagus estuary, Portugal. The mudflats were surveyed at 228 sampling sites, covering the majority of the intertidal area of the estuary (ca. 60 km^2). At these sites we recorded several physical variables, as well as the numbers of all wader species.

The first step of the analysis consisted in summarising the (combinations of) physical conditions found in the mudflats, by means of a principal component analysis (PCA) over the variables set. The result enables a visual interpretation of the available habitats, the relative importance of different factors in defining them, and also the degree of association among them. The second step involved the association of the scores for the sampling points in the first two principal components (which define the "habitats space"), with presence/absence information available for each wader species. These binary data were then modelled from the PCA scores, using generalised additive models. The predictions of this model generated a smooth surface of probability of occurrence, over the range of available habitats. The occurrence of most species could be explained in terms of habitats representing combinations of grain size, amount of surface water, presence of oyster beds and inundation periods. Other variables such as penetrability, shallow water pools or sediment roughness did not define new habitat conditions, and their contributions were usually made along the already existing gradients. This method provides a valuable tool for defining habitats for estuarine organisms, by synthesizing the physical gradients found in large intertidal areas.

Crop mosaics provide enhanced breeding opportunities for Lapwings *Vanellus vanellus* on arable farmland

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As a breeding species, the Lapwing *Vanellus vanellus* has declined by almost 50% in lowland Britain over the last 20 years, largely as a result of the increasing dominance of winter-sown crops and the loss of unimproved grassland. Although, non-cropped habitats, such as fallows may help population recovery, strong contributions to population regeneration will certainly be required from land allocated to commercially viable crops (i.e., at low cost to the farmer or tax payer). Here we show evidence of high densities of birds breeding in peas and sugar beet within cereal dominated landscapes. We discuss the conditions associated with successful pairs in the context of crop heterogeneity and crop management.

Analysis of the migratory dates of waders in the Aviles estuary

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In recent years, there have been an ever-increasing number of studies on the effects of climate change on the phenology of migratory birds. Among waders, already there is evidence that the breeding latitudes of Ruff *Philomachus pugnax* have moved north. In order to look for possible changes in the migration phenology of waders, we have analysed the dates of first arrivals and the peak migration in spring and autumn of waders in the Aviles estuary, north Spain, over a 15-year period. We selected for study the ten most common species on the estuary: *Charadrius hiaticula*, *Pluvialis squatarola*, *Calidris alpina*, *Calidris canutus*, *Calidris ferruginea*, *Calidris alba*, *Calidris minuta*, *Limosa lapponica*, *Numenius phaeopus* and *Tringa totanus*.

In autumn, we found that three species had significantly changed trends: *Calidris canutus* (advanced arrival), *C. alba* (retarded arrival) and *Pluvialis squatarola* (retarded peak). No other species showed a significant change. Although we found that the peak passage of arctic species was synchronized in spring (except for *Limosa lapponica*), we did not find the same in autumn, neither did we find that first arrivals were synchronised in either season. These results appear to indicate that there is no clear tendency for a change of migration phenology affecting all wader species passing through the north coast of Iberia.

Individually marked Eurasian Oystercatcher population at the White Sea: results of a four-year study

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Individual colour-ringing of the White Sea Eurasian Oystercatchers *Haematopus ostralegus* was started in the Kandalaksha Nature Reserve in 1991 by Rob Lambeck of the Netherlands (altogether he ringed 53 of which 13 were in the author's study area). A few of these birds were still recorded in the summer of 2003.

Since 2000, individual colour-ringing and monitoring the breeding performance of colour-ringed birds has been carried out by the author on the islands of the Northern Archipelago, Kandalaksha Bay. In four years, 62 breeding adults and 62 grown up chicks were colour-ringed. Colour-ringing has been carried out on a group of 13 islands all situated within a radius of 4–5 km. Specific attention has been paid to monitoring the Oystercatcher population of Devichya Luda Island which is 2 km long and 0.5 km wide. There the population has ranged from 29 to 45 breeding pairs in different years and over 50% of the breeding adults as well as most of their chicks are individually colour-ringed. Over 80% of nesting adults have been recorded at the same breeding localities in subsequent years. Some of the islands are

more and some less favourable for breeding Oystercatchers and the reasons are described.

Overall, the social structure of the breeding population on Devichya Luda Island has been stable from year to year (as shown by annual territory maps). The oldest known bird that was still breeding on the island in 2003 (and individually colour-ringed in 2002) was hatched on the same island in 1979, 34 years ago. Records of individually marked White Sea Oystercatchers in Europe during the non-breeding season are surprisingly few. Most are from the Netherlands, but there are also some from Denmark and France.

Effect of stress caused by different predators on the sexual behaviour of the Pied Avocet *Recurvirostra avosetta*

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Birds are considered as being more exposed to predators during the breeding season. Predators may represent a direct threat to adults, which are more vulnerable when engaged in various reproductive activities such as copulation, laying and brooding eggs, care of chicks, etc. The reproductive process involves an increase in activities that render birds more detectable to predators. It also decreases the time and attention they can give to vigilance. Moreover some predators also try to take advantage of the opportunity represented by eggs and chicks.

The establishment of breeding colonies in birds (as in the Avocet) facilitates a decrease in predator-associated mortality by improving vigilance and/or through risk dilution. This is achieved by collective anti-predator defence behaviours such as alarm calls, flying or flocking on the ground in dense groups, or even by attacking the predator.

We have found that the reaction intensity of Avocets depends mainly on the predator species involved. Our observations, made over several years in the Natural Reserve of Séné (Réserve Naturelle des Marais de Séné, Morbihan, France), indicate that there can be some unusual reactions by Avocets that have been stressed by a raptor. In addition to the classic reactions already mentioned, it appeared to us that the proportion of Avocets engaged in copulation was particularly high after a raptor had flown over the colony. These unpublished observations, but confirmed by other naturalists in the reserve, are worth further investigation in order to confirm and quantify the phenomenon. This is the aim of this poster, which shows the different reactions of Avocets to different predators on their sexual activity. The possible adaptive advantages of this behaviour are discussed.

Shorebird distribution on the mudflats of Aiguillon Bay, France: analysis using a GIS method

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The national nature reserve of Aiguillon Bay is the third most important French site for wintering waders and the second for Shelduck *Tadorna tadorna*. Although the number of waders and Shelducks has been relatively stable for 25 years, its importance has decreased relative to the rest of the French coast. One aim of the reserve managers is to estimate the carrying capacity of the bay by establishing the quantity of the food resources (benthic molluscs, annelids) and understanding their population dynamics. In parallel, the use of the mudflats by shorebirds is being analysed with different methods.

This poster presents the method used to analyse the distribution of shorebirds at low tide, when the whole of the mudflats are accessible. We present the first results of monthly shorebird counts conducted between October 2002 and February 2003. For each count, the number of individuals and the location of groups are reported on a 1:25,000 map. We then used a GIS to register each group as a field with the parameters "species" and "number of individuals". To analyse cumulative data for the whole winter season, we created a regular hexagonal grid and calculated the number of birds of each species present in each hexagon as the sum of the field for each month weighted by the proportion of the field intersected by the hexagon. For all species together, we observed a relatively homogeneous distribution across the whole site. However, this obscured two different types of distribution: gregarious species that favour particular zones on the mudflats (Avocet *Avosetta recurvirostra*, Black tailed Godwit *Limosa limosa* and Knot *Calidris canutus*) versus other species that are more dispersed across the bay (Dunlin *Calidris alpina* and Shelduck). Our results show the relevance of this method in describing the distribution of shorebirds at low tide. However, the number of monthly counts needs to be increased in order to define more precisely the use shorebirds make of each zone of the bay.

Waterbird conservation in the salinas of the Sado Estuary, Portugal

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For several decades, the salinas (or saltworks) of the Sado Estuary, near Setúbal, Portugal, have been subject to an intense process of abandonment and destruction. Many have been completely transformed into rice fields or fish farms and others are in an advanced state of degradation or lost (e.g. flooded with sea water, filled with solid waste or turned into reservoirs). Currently, only a small number of salinas are functioning for salt production and offer habitat for waterbirds.

In 2001, a LIFE-Nature project was approved, in order to promote conservation of the salinas in this protected area. The objects are to encourage the reactivation of traditional salt exploitation, the management of water levels and the conservation of the salinas as a habitat for their bird communities. Among the actions planned as part of the LIFE project are two studies that are being carried out during the current year. One focuses on the *Himantopus himantopus* breeding population (present situation and threats) and the other on the availability of food in the salinas for waders. Data have been collected on the breeding success and productivity of *Himantopus himantopus* in specific salinas in order to establish favourable management prescriptions and all the main colonies have been counted. The evaluation of food availability is being conducted in salinas under different environmental conditions (in active salt production, abandoned, subject to flooding with sea water and under water management plans), in order to obtain data on invertebrate prey diversity and abundance. Data are also being gathered for the habitat management plan now being prepared.

Use of the Aiguamolls de L'Empordà Natural Reserve, NE Spain, by migrant shorebirds: stability and fluctuation of the available habitat

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The distribution of the shorebirds in the Aiguamolls de l'Empordà Natural Reserve is determined by the availability of suitable habitat in the different ponds, lagoons, marshes and beaches. The coastal lagoons, such as La Rogera, are the principal habitat for certain East Atlantic Flyway migrants (*Haematopus ostralegus*, *Calidris alba*, *C. canutus*, *Limosa lapponica*) while others use the beaches and brackish marshes (*Pluvialis squatarola*, *Charadrius alexandrinus* or *Numenius phaeopus* and *N. arquata*). The beaches and marshes are also an excellent alternative habitat for *Recurvirostra avosetta*, *Tringa totanus*, *T. nebularia*, and to a lesser extent, *Ch. hiaticula* and *C. alpina*. In contrast, *Himantopus himantopus*, *C. minuta*, *C. ferruginea*, *Philomachus pugnax*, *Gallinago gallinago*, *L. limosa* and *T. glareola* only occur in small numbers and are mainly restricted to the less salty and freshwater environments.

La Rogera lagoon is a self-contained ecosystem that is unaffected by variations in water levels elsewhere in the reserve. This means that it always provides good wetland habitat for shorebirds. Bearing in mind the unpredictability of the Mediterranean environment, the stability of the available habitat appears to be a major reason why the reserve is so attractive to shorebirds. Moreover, artificial ponds with controllable water levels have been constructed that enrich and complement the habitat on offer. These ponds are managed so that they have boggy and muddy extensions, which increase both the habitat types available and shorebird feeding opportunities. These new areas are a major attraction for migrant shorebirds, particularly Charadridae and those Scolopacidae that feed in water less than 5 cm deep (*C. minuta*, *C. alpina* and *Actitis hypoleucos*). Such areas can support shorebird densities of up to 53.6 ha^{-1}, but if they dry up, they are unproductive and useless. When they are re-flooded, they do not become productive again until a period has elapsed that is about three times the period that they have been dry.

Together, the stable environments, the artificial controllable systems and the coastal areas create a wide array of opportunities for the migrant shorebirds that stop at the Aiguamolls de l'Empordà Natural Reserve – Mediterranean marshes where man has left his mark.

The migration of shorebirds through the Aiguamolls de L'Empordà Natural Reserve, NE Spain: evidence of the effect of the north wind (Tramuntana) on migration phenology

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The stability of the available habitat appears to be one the main factors explaining the attractiveness to shorebirds of the Aiguamolls de l'Empordà Natural Reserve, NE Spain. However, located in the Mediterranean, it suffers from long, hot, dry summers that damage this stability. These conditions have a major effect on the habitats and the resources they have to offer and so, indirectly, affect the composition of the shorebird community. During autumn migration, when juveniles dominate, the numbers of most shorebird species are more than double numbers in spring. This particularly applies to the following: *Recurvirostra avosetta*, *Charadrius hiaticula*, *Calidris alba*, *C. ferruginea*, *Philomachus pugnax*, *Limosa limosa*, *Tringa erythropus*, *T. totanus*, *T. nebularia* and *T. glareola*. In contrast, *Ch. dubius*, *C. minuta*, *C. alpina*, *Numenius arquata*, *T. ochropus* and *Actitis hypoleucos* are more abundant in spring than in autumn. During summer, the main breeding species are *Himantopus himantopus* and *Ch. alexandrinus*, and in winter there are significant numbers of *Vanellus vanellus* and *Gallinago gallinago*.

Both spring and autumn migrations are characterised by the dominance of different species for short periods. No species dominates throughout a whole season. During autumn migration the dominant species are *G. gallinago*, *L. limosa* and *Ph. pugnax* and *Ph. pugnax* is the most abundant of the Scolopacidae. During spring migration, dominance is shared between *G. gallinago*, *Ch. dubius*, *H. himantopus*, *V. vanellus*, *C. minuta*, *C. ferruginea* and *T. glareola*. Ph.pugnax is very scarce. *C. minuta* and *T. glareola* are the most abundant of the Scolopacidae, together with *G. gallinago* (for which it is difficult to distinguish between wintering birds

and spring migrants). Other East Atlantic Flyway species (*Haematopus ostralegus*, *C. alba*, *C. canutus*, *L. lapponica*) and those that mainly use beaches and brackish marshes (*Pluvialis squatarola*, *Ch. alexandrinus* or *N. phaeopus* and *N. arquata*) only represent between 5–10% of the total number of shorebirds. In both periods the dominant family is Scolopacidae.

At any one time, the community of migrant shorebirds in these Mediterranean marshes is determined as much by local weather as by the phenology of the species. The north wind (tramuntana) appears to be an important factor that remodels the phenological profiles. It is actually a NNW wind that is cold, dry and sometimes violent and extremely important in the region. It blows often, but especially in spring, and with gusts of sometimes more than 100km/h. Peaks numbers of *Ch. hiaticula*, *T. glareola* and A. hypoleucos during 9–16 May 1995, those of *C. alpina*, *T. totanus* and *A. hypoleucos* during 17–23 April 2000 and those of *Ch. dubius*, *Ph. pugnax*, *T. erythropus*, *T. totanus*, *T. nebularia*, *T. ochropus* and *T.glareola* in April 2001 all coincided with periods of strong northerly winds. A similar example is the arrival of 40 *L. lapponica* on 1 September 2001, another day characterised by strong northerly winds. The rule is proved: the combined action of abundant migration and strong northerly winds, gives rise to sudden peaks in the migration phenology of shorebirds.

Effects of traditional shellfishing on foraging activity, feeding rate and habitat use of migrating Eurasian Curlews *Numenius arquata*

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In coastal areas, shorebirds are often subject to human disturbance associated with harvesting practices such as shellfishing and baitworm digging. We studied the foraging activity, feeding rate and intertidal habitat use of Eurasian Curlews *Numenius arquata* in the presence and absence of shellfishermen working by hand. We found that foraging activity was significantly lower when shellfishermen were present that when they were absent. However, the feeding rate and distribution pattern of Curlews were similar in both situations. This study provides a base of information for site-managers of coastal areas.

Habitat use and feeding activity of waders and Shelduck in Aiguillon Bay, France

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The aim of this study was to investigate shorebird use of an intertidal mudflat in space and time. It was carried out in Aiguillon Bay, the third most important French site for wintering waders and the second for Shelduck *Tadorna tadorna*. The study forms part of a scientific program designed to establish the carrying capacity of the bay for waders and other estuarine birds and to optimise the management of the site as a nature reserve. Here, we present results from a weekly record of the feeding activity of the six principal study species (Avocet *Recurvirostra avosetta*, Black-tailed Godwit *Limosa limosa*, Bar-tailed Godwit *L. lapponica*, Red Knot *Calidris canutus*, Dunlin *C. alpina* and Shelduck) for the period January to May 2003.

In three areas of the bay, containing different composition and abundance of invertebrate prey, we scanned the number of birds and activity of each species hourly during the period of tidal exposure. We compared feeding density (= number of individuals that were feeding, per unit area) between species, areas and seasons (where winter is before 15 March and spring is after that date).

The mean feeding density for the six species was 9.5 individuals / ha in winter compared with 5.2 in spring. For these two seasons, the feeding density was greatest for Dunlin. Feeding density was not significantly different between the three study areas for all species combined for each season separately. However, the feeding density of godwits in winter was greater in the St-Clement zone than in the two others. The opposite was the case for Red Knots. There was also a significant difference in feeding density between areas for Shelduck in winter.

At this stage, it is difficult to link the feeding density of the birds with the density of the benthic food resource because of incomplete data for the latter. However, the great spatio-temporal variability of abundance in the major species of bivalves (*Scrobicularia plana* and *Macoma balthica*) and gastropods (*Hydrobia ulvae*) observed over a period of 18 months could explain the variability of space use by shorebirds. However, it is clear that before the distribution of the

birds of the Aiguillon Bay can be fully understood, a study of their diets will be essential.

Management of coastal salinas as a means of improving breeding habitats for waders

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The number of salinas (saltpans) available as habitat for waders in Cadiz Bay has suffered a dramatic decrease since the early 20th century, from more than 150 to only four active, traditionally managed coastal salinas today (3% of the surface area of the Bay). Despite this, the active or restored salinas support 59% and 36% of the Cádiz Bay breeding Avocets *Recurvirostra avosetta* and Kentish Plovers *Charadrius alexandrinus*, respectively.

We describe several management actions carried out in one abandoned salina and a restored one in Cadiz Bay Natural Park. These were: restoration of walls and crystallisation ponds, management of water levels and supplementation of the substrate. Although the sites chosen for this work were not, or only marginally, occupied by breeders in previous years, the number of nests significantly increased the following season. These results suggest that development of management plans for the salinas could become a valuable means of improving the quality of these potential breeding habitats for waders.

Declining Kentish Plover populations: The case of Cadiz Bay Natural Park, SW Spain

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European Kentish Plover *Charadrius alexandrinus* populations have suffered a general decrease during recent decades. In comparison, the breeding and wintering populations of Spain have been far less affected. Nevertheless, the species has already been catalogued as "endangered" in Andalucia. Our study reviews these trends in Europe and Spain, and more locally in Andalucia and the Cadiz Bay Natural Park. This Bay has recently been declared a RAMSAR site, and is especially important for Kentish Plovers in both the wintering and breeding seasons, with 49% and 11% of national counts respectively. However, these important populations have declined and the impact of human activities on their habitat is generally accepted as the main reason. In order to test this assumption, aerial photographs have been analysed digitally and this has shown a general decrease in the area of salina habitat (saltpans) since 1940. Moreover, mapping surveys of Kentish Plovers indicate a clear preference for this habitat. We found that 43% of wintering and 36% of breeding Kentish Plovers chose active or managed salinas against other habitats such as intensive aquaculture (14.2 % in winter) or abandoned salinas (5.4 % in winter). Therefore, maintaining and restoring salinas are essential to the recovery of the species.

The wintering population of Eurasian Oystercatchers in the estuaries of Galicia, NW Spain: conservation status, distribution and relationship with biotic and abiotic factors

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The wintering population of Eurasian Oystercatchers *Haematopus ostralegus* on the estuaries of Galicia, NW Spain, amount to 79% of the total Galician population, which in turn amount to 67% of the Spanish population. We studied the conservation status of the species, its distribution and its relationship with several biotic and abiotic factors during 1996–1999.

We found a significant positive relationship between the numbers of Oystercatchers and (1) the total intertidal area, (2) the sheltered-intertidal area. We found a significant negative relationship between the number of Oystercatchers and the accessibility of intertidal habitat to humans. However, we did not find any significant relationship between the number of Oystercatchers and the availability of bivalves nor with the amount of human use of the intertidal habitat.

Neap-tide roost selection by waders: maximizing feeding opportunities or reducing risks of predation?

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Tidal cycles determine the availability of mudflat feeding grounds for waders. During the rising tide, waders are displaced from their feeding areas on the mudflats and are forced to move to high-tide roosts. During spring tides, all the mudflat area is covered by water and all birds gather in supra-tidal sites. However, during neap tides, a narrow band of upper mudflats remain available and waders can choose to roost there or at the supra-tidal sites.

In our study area on the Tagus estuary, Portugal, the waders roost on nearby saltpans on spring tides. However, on neap tides, the great majority choose to roost on the upper mudflats, and not in the saltpans. We examined two potential explanations for this choice: (1) that staying on the upper mudflats enables them to continue feeding over the high-tide period or (2) the risk of predation by avian predators is lower on the upper mudflats than on the saltpans.

The risk of predation was evaluated on the basis of the number of avian predators that appeared above the roosts and the number of flock alarm flights. Disturbance by avian

predators was significantly higher on the saltpans than on the mudflats. Although remaining on the mudflats extended the potential feeding period, we found that food availability in the mud that remained exposed at high water was low and less than 13% of birds continued feeding. Consequently, the ability to feed did not seem to be the main reason for choosing to remain on the mudflats. Therefore risk of predation is likely to be the main factor determining the choice of high-tide roost site.

Importance of the rice paddies of the Guadiana floodplains, Extremadura, Spain, for wading birds of the East Atlantic Flyway

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We studied the importance for wading birds of the rice paddies of the upper floodplains of the River Guadiana. The study area is the middle basin of the Guadiana as it passes through Extremadura, W. Spain. This region has been transformed through irrigation since the mid 20th century, and now a considerable proportion of its area (currently 17,000 ha) is devoted to rice growing. It has become an important area for the many waterbirds that use this agricultural habitat as a staging area. Although the turnover rate of migrating populations is unknown, there are concentrations (mainly roosts) that far surpass the figures at which they would be regarded as of international importance; examples include *Grus grus* and *Limosa limosa* with counts of 13,000 and 25,000, respectively. Other wader populations of interest are those of *Gallinago gallinago*, *Calidris alpina*, and *Vanellus vanellus*. During the breeding season, *Himantopus himantopus* and *Glareola pratincola* also attain population sizes of international interest. We discuss the importance to waders of the geographical location of these artificial wetlands, as well as that of similarly anthropogenic habitats for other groups of water birds in this region.

Ruffs grow coloured primaries during the breeding period

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Ruffs *Philomachus pugnax* have a non-breeding (basic), a breeding (alternate) and a supplemental breeding plumage. The latter has a full development in males only and needs high plasma testosterone levels to be achieved. The colourful ruff and tuft feathers of breeding males attracted Italian bird collectors and ornithologists of the XXth Century. Ettore Arrigoni Degli Oddi and Tertulliano Pierotti collections include some of the largest series of male morphs stored in Italian museums.

The number of males that cross Italy in full breeding plumage during spring migration has always been very small. Their rarity induced past bird-catchers to keep some individuals in captivity for a few weeks, waiting for them to turn into supplemental breeding plumage. Then, they were killed and sold to collectors. These birds were usually kept in outdoor aviaries, and primaries of one wing were plucked to prevent escapes. Two of these captive-moulted birds are stored in the collection of INFS. We observed that primaries grown during the supplemental breeding moult were not black but mottled reddish-brown, white, grey and black, mirroring colours and patterns of the showy mantle and scapular feathers. The two specimens had similar primary colour and pattern, despite the fact that one bird was a satellite breeder (white ruff and tufts) and the other was a resident one (black ruff and tufts).

To investigate factors determining the origin of mottled primaries and the relationship of this character with sex, breeding and supplemental breeding plumages, we repeated the experience of past bird-catchers. Four adult females and one adult male were kept in captivity and some contour feathers, rectrices and remiges (scattered primaries, secondaries and tertials) were plucked in April–May. Females were held for 16 months (two breeding seasons: April 1999–July 2000), the male for 4 months (April–July 2000). Three females re-grew some plucked primaries with a mottled pattern (one in June 1999, two in June 2000), similar to male museum specimens. A female did not grow primaries during both breeding seasons, and the male did the same in 2000. High levels of sexual hormones probably inhibited the growth of most plucked feathers in May–June. The primaries that grew between July and April, i.e. during the post- and pre-breeding moults, were black. These data suggest that mottling on primaries grown during the breeding season does not depend on high levels of testosterone. Hence this pattern cannot be related to the supplemental breeding plumage. That castrated males develop a plumage similar to that of nuptial females suggests that mottling on primaries is more likely to be determined by factors controlling the development of the breeding (alternate) plumage in both sexes. Thyroxine (T4) has a seasonal cycle, affects feather size, shape, colour pattern and pigment deposition. It might therefore be a candidate for explaining the mottled primaries and the breeding (alternate) plumage of Ruffs.

Extremely high aggression of waders on steppe water bodies in southwest Siberia

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Extremely high aggression in various waders was observed during their southward migration on several steppe water bodies in southwest Siberia in August 2002. Among the 24 wader species recorded, eight demonstrated aggressiveness and four, territoriality.

Most aggression by Broad-billed Sandpipers *Limicola falcinellus* and Wood Sandpipers *Tringa glareola* was interspecific. In addition, Ringed Plovers *Charadrius hiaticula* attacked Little Ringed Plovers *Ch. dubius* much more often than conspecifics. The rate of aggressive encounters recorded for some waders, such as Little Stint *Calidris minuta* and Ringed Plover, was much higher than for the same species at other stopover areas in Europe and the southwest Caspian Sea. Little Stints were the most aggressive waders – they

were recorded attacking five other species including the relatively large Wood Sandpiper and Curlew Sandpiper *Calidris ferruginea*. Waders displayed the highest level of aggression on water bodies with the highest abundance and variety of food – Chironomids, Corixids and extraordinarily numerous very small (<0.25 mm) Copepods and Ostracods.

Underwater nesting? The implications of sea-level rise for breeding redshank in coastal zones

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Rising sea levels are amongst the most certain of climate change impacts, and for low-lying coastal areas, the threats are particularly severe. In East Anglia, S.E. England, this is exacerbated by downward isostatic land movements following the last glacial period. The key implications of sea-level rise for coastal breeding species are (i) a loss or decline in the availability and suitability of intertidal breeding habitats, principally saltmarsh and (ii) potential losses of other coastal habitats such as grazing marsh, as a result of landward migration of intertidal habitats and sea defence strategies. Mitigation for the loss of these habitats may not be possible in the coastal zone, and so habitat creation and management at inland sites may be an important option. However, at present the relative quality of intertidal, coastal and inland habitats for breeding species is not known, making effective mitigation strategies difficult to devise.

The Redshank *Tringa totanus* is a key coastal breeding species in the UK and it has been estimated that 45% of the breeding population currently nests on saltmarsh (Brindley *et al.* 1998) with the remainder breeding on coastal and inland grazing marshes. This habit of breeding on both coastal and inland habitats makes the Redshank an ideal species for a comparative study of breeding habitat quality and the potential consequences of replacing coastal sites with inland sites.

Here, I present a comparison of Redshank breeding densities and preliminary measures of Redshank nest success and productivity on saltmarsh and coastal and inland grazing marshes in East Anglia.

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Request for information on agri-environment schemes for breeding Northern Lapwing *Vanellus vanellus*

I am currently undertaking a review of agri-environment scheme management prescriptions for breeding Lapwing. I am attempting to determine how successful they are in delivering benefits for the species. To date I have reviewed most of the UK schemes and now plan to extend the review to other European countries. The type of information I need include:

- ❑ Details of the management prescriptions
- ❑ Whether breeding Lapwings are known to use the areas covered by the agreement
- ❑ Whether there are known benefits to Lapwings, e.g. increased nest survival, provision of chick foraging habitat etc.
- ❑ The cost of the management prescription
- ❑ Whether there are any benefits for other species

Any other useful information will be welcome. My aim is to write a comprehensive review of habitat management for Lapwings using agri-environment schemes to be published towards the end of 2004.

Contact me at Reserves Ecology, Conservation Management, Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire, SG19 2DL, UK; phone ++44 (0) 1767 680551; e-mail: robert.sheldon@rspb.org.uk

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