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THE ODESSA CONFERENCE AND THE FUTURE

WETLAND INVENTORIES MADE EASY: DEVELOPING THE ODESSA PROTOCOL

A. Buck & N.C. Davidson, JNCC, Monkstone House, City Rd, Peterborough PE1 1JY, U.K.

The Odessa Protocol on international co-operation on migratory flyway research and conservation recommends simple questionnaire approaches to international data collection on site inventories of wader habitats and analyses of human activities potentially affecting their habitats. Using the example of methodologies being developed for UK coastal zone inventories by the Joint Nature Conservation Committee's Coastal Review Unit, ways of advising this international perspective will be suggested. Such work provides an opportunity for the Wader Study Group, in collaboration with national and international groups and individuals to move toward the Odessa Protocol to provide vital baseline information for the development of flyway conservation plans to waders.

MIGRATION AND FEEDING ECOLOGY

INLAND WADER COUNTS – A JOINT PROJECT BY BIOLOGICAL STATION "RIESELPELDER MÜNSTER" AND WADER STUDY GROUP

C. Sudfeldt, Biologische Station "Reiselfelder Münster", Münster, Germany.

The "Inland Wader Counts" is a Project organised by the Biological Station in Münster and supported by the Wader Study Group. To obtain new information on inland waders a scheme of regular wader counts was started in West Germany, Austria and Switzerland in 1979. Running for 14 years the project now includes about 250 counting sites in 14 European countries. The co-ordinators of the "Inland Wader Counts" want to encourage more people to start regular counts at sites that hold a reasonable number of waders. The aim is to install a central pool of data for clarifying questions about the migration phenology, habitat requirements and population changes of waders.

SPRING MIGRATION ECOLOGY OF BROAD-BILLED SANDPIPER LIMICOLA FALCINELLUS IN THE SIVASH, CRIMEA

V. Shiokin & I. Chernichko, Asov-Black Sea Ornithological Station, Melitopol, Ukraine. S. van de Sant, T. van der Have, Y. Verkuil, & J. van der Winden, Dept. of Plant Ecology & Evolution, Univ. of Utrecht, Utrecht, The Netherlands.

Waterbird counts during spring 1992 in the Sivash, Crimea, South Ukraine, revealed that the majority of the Scandinavian population of the Broad-billed Sandpiper Limicola falcinellus might stopover in spring in the extensive lagoon system of the Sivash. Apart from a large scale count during peak migration, two sites were counted intensively and sampled for macrozoobenthos biomass during spring. Some unique properties of one of these sites may explain the high densities of Broad-billed Sandpiper in comparison to other wetlands in the Black Sea and the Eastern Mediterranean. Together with data on the feeding ecology these results might shed more light on the peculiar migration system, which differs in many respects from other Palearctic wader species.

THE OCCURENCE OF DUNLIN CALIDRIS ALPINA AT THE ICELAND COAST DURING SPRING MIGRATION

R. Tiedmann, Institut für Haustierkunde, Kiel, Germany.

Two populations of Dunlin may be expected in Iceland during spring migration: the local breeding *C. a. schinzii* and *C. a. arctica* which breeds in eastern Greenland. In its most important Icelandic stopover area, situated in tidal lagoons in south east Iceland, the phenology of Dunlin occurrence is characterised by two distinct peaks in May. These possibly represent Icelandic lowland and highland breeders. Dunlin use these areas for intensive feeding, choosing selectively tidal flats with high benthic abundance. The phenology in other Icelandic coastal areas is briefly discussed. In literature, there are controversial statements about the occurrence of *C. a. arctica* during spring migration. In this context, biometric data are presented as well as first results of a genetic comparison on Dunlin from different sites in Iceland.

FEEDING ECOLOGY AND BEHAVIOUR

FORAGING EFFICIENCY AND AGGRESSION OF WADERS AT THE BERG RIVER ESTUARY: INFLUENCE OF SEASONAL DISPERSION

B. Kalejta, Fitzpatrick Institute of African Ornithology, Univ. of Cape Town, South Africa.

Aggressive interactions between waders, both migrants and residents, were studied at the Berg River estuary, South Africa, from December 1987 to March 1990. The importance of aggressive interactions in influencing dispersion patterns of waders was assessed. Migrant waders occupied intertidal mudflats sequentially: the most profitable mudflats were occupied first, and the less profitable ones were occupied later in the season when the numbers of birds on the estuary increased. Resident waders occupied mudflats least preferred by the migrants when the latter were abundant on the estuary and moved to more profitable sites in winter when migrant waders departed.

Interactions within conspecifics accounted for 91% of all aggressive encounters. Aggressive indices of migrant waders varied seasonally and, for most species, were higher during the austral winter than summer. Visual foragers were more aggressive than tactile foragers, and resident species were more aggressive than migrant species. Aggression rates of tactilely-foraging Curlew Sandpipers were negatively correlated with their own density, and their feeding success decreased as their aggression level increased. Aggression rates of visually-foraging Grey Plovers were positively correlated with the biomass of nereid worms in the substratum. There was also a positive correlation between the aggression rates of Grey Plovers and their own density but only in the post-migration period.

The dispersion of migrant waders within the Berg River estuary during the austral summer is determined primarily by feeding conditions at preferred foraging sites rather than density-dependant factors and competition. Competitive interactions, however, probably take place during the winter.

NONBREEDING TERRITORIALITY AMONG GREY PLOVERS *PLUVIALIS SQUATAROLA* AT THE ZWARTKOPS ESTUARY, SOUTH AFRICA

Jane K. Turpie, Fitzpatrick Institute of African Ornithology, Univ. of Cape Town, South Africa.

Most Grey Plovers at the Zwartkops estuary defended territories throughout the austral summer. Territories were first established during the arrival period, when the foraging densities of Grey Plovers exceeded 4.6 birds/ha, and were maintained throughout the season. Mean territory size decreased over the season, and was significantly inversely related to the total number of Grey Plovers on the estuary rather than to resource patterns. Individual variation in territory size was inversely to resource density, particularly towards the premigration period. Territorial encounter frequency decreased from September to March, possibly due to neighbour familiarity, and was also reduced by avoidance behaviour. Defence costs were highest for the owners of smaller, richer territories, but the owners of larger territories had to forage for longer during the low tide period. Of the population, 35% was estimated to be nonterritorial. These birds achieved a decreasing proportion of the energy intake rate of territorial birds over the season, and may have had to depart later on northward migration.

FINAL COUNTDOWN OF WADERS DURING STARVATION IN RELATION TO SIZE, RESERVE- AND COST-LEVELS: INSURANCE POLICIES IN A BIOLOGICAL SYSTEM

I. Tulp & T. Piersma, NIOZ, Den Burg (Texel), The Netherlands.

The vagaries in food availability and weather expose waders wintering in the temperate zone to the risk of starvation. The northerly winterers show peaks in bodily nutrient reserve levels when the putative risk is at its height in midwinter. The

correlations between winter severity and nutrient reserve levels within and among species have invariably been interpreted as indicating longer 'survival spans upon complete starvation'. We have examined this interpretation by looking at:

1) the interaction between final-nutrient status and thermostatic costs at the time death in Knots *Calidris canutus*, 2) theoretical and empirical trajecto ries of nutrient loss during starvation in Knots, and 3) the difference between final-nutrient status in sedentary and actively migrating Dunlins Calidris alpina. Since waders die at lower body massess under warm weather conditions than in the severe cold, the 'survival spans' of the average winterers at different latitudes are more similar than expected at first sight. This suggests that the winter nutrient levels are indicative of a relatively constant risk of death from starvation, wherever the bird eventually dies.

THE WINTER FEEDING ECOLOGY OF AVOCETS *RECURVIROSTA AVOSETTA* ON A MUDFLAT IN TAGUS ESTUARY (PORTUGAL)

F. Moreira, University of Lisbon, Lisboa, Portugal.

The diet and behaviour of Avocets *Recurvirostra avosetta* feeding on a mudflat in Tagus estuary (Portugal) were studied during one winter. Birds used the mudflat differentially, the upper shore having much higher feeding densities than the lower shore. The distribution of Avocets in these areas was density-dependent, i.e., feeding densities in the upper shore were not proportional to the number of birds in the bay but reached a ceiling as the latter increased. There were differences in feeding behaviour between these two areas. In the lower shore, where there was a much lower biomass of prey available, pecking rates were higher and aggressive behaviour did not occur. In the upper shore, pecking rates were lower and aggressive behaviour was frequent, although it was not related to bird density. Nevertheless, estimated intake rates (biomass of prey ingested per unit time) were three times higher in the upper shore.

THE DIET OF WINTERING CURLEWS IN THREE COASTAL SITES FROM SOUTHERN SPAIN

A. Perez-Hurtado, F. Hortas, & M. I. Gil, Laboratorio de Biologia Marina, Departo. Fisiologia y Biologia Animal, Universidad de Sevilla, Spain.

Curlew diets are well known in Northern Europe estuaries. However, there is little information about the diet of this species in Southern Europe. In this work we describe the diet of wintering Curlews by pellet analysis from three coastal sites of Southwest Spain: Isla Cristina marshes, Odiel marshes and Cadiz Bay. A comparison and discussion of diet composition, prey sizes and a biometric analysis of pellets is made. Finally a review of Curlew diets is made.

DISTRIBUTION AND BREEDING BIOLOGY

USING QUATTRO PRO 3.0 TO ANALYZE TAMAR COMPLEX WILDFOWL AND WADER DATA

S. W. McMahon, P. J. Reay & D. N. Price, Department of Biological Sciences, Univ. of Plymouth, Plymouth, U.K.

Quattro Pro is a commercially available spreadsheet program with integrated database management and graphic presentation capabilities. Marketed by Borland International, the package is for DOS-based PCs and is more usually used by companies for budget projection, financial record keeping and statistical analysis. Such a program has enormous potential once a method of entering bird data for an area such as an estuary has been devised.

The Tamar Complex lies within the south western peninsula of Great Britain and is covered on a monthly basis by the Birds of the Estuary Enquiry (BoEE). The complex has around 65 species present over the year, about ten of these being recorded every month and the rest being winter visitors or passage migrants. Data from when the BoEE scheme began in 1969, to the present day, have been entered onto spreadsheets, information being gleaned from the BoEE counts, personal logbooks and bird reports. From January 1989 to December 1991 a more detailed study was undertaken, breaking the complex into 13 sites. By linking spreadsheets, the data could be analysed statistically and also presented graphically. Maximum and minimum counts were found and means, averages and standard deviations calculated easily by using the macro facility. The results of the analysis are presented to emphasise the diversity and numbers of species present within the various sections. Tamar Complex data were entered with the intention of printing each batch of information onto one easily read sheet, but once entered, the program can be manipulated into several forms thus providing numerous ways of presenting the same data. The package also includes a slide show facility which is particularly useful when checking through a series of graphs.

BREEDING DENSITY, SEASONALITY AND NEST SUCCESS OF WADERS (CHARADRII) AND BRENT GEESE *BRANTA BERNICLA BERNICLA* AT PRONCHISHCHEVA LAKE, NORTHEASTERN TAIMYR, RUSSIA, IN A PEAK LEMMING YEAR

L. G. Underhill, R. P. Prys-Jones, V. Karpov, H. Lappo, H. Schekkerman, R. W. Summers, E. E. Syroechkovski, & M. W. J. Van Roomen, Schweizerische Vogelwarte & Avian Demography Unit, Univ. of Capetown, South Africa.

During summer 1991, lemmings occurred at high densities in arctic tundra at Pronchishcheva Lake in the north-eastern Taimyr Peninsula. Lemming predators such as Snowy Owls, gulls and skuas bred well. Arctic Foxes were observed rarely in the study area, but bred in the immediate vicinity. A total of 73 nests of nine species of wader were found within a 14 km² study area, and Dark-bellied Brent Geese nested in association with Snowy Owls. The overall density of wader nests was estimated to be 7 per km². Only two wader nests and no Brent Goose nests were lost to predation, and the Mayfield estimate of the daily probability of predation for waders was 0.0022.

MESO-SCALE GEOGRAPHIC GRADIENTS IN THE DISTRIBUTION OF BREEDING SHOREBIRDS IN ARCTIC ALASKA

Declan Troy, TERA, Anchorage, USA.

Since 1981, shorebird distribution and abundance have been studied on more than 200 study plots on the Arctic Coastal Plain near Prudhoe Bay, Alaska. The study region encompassed an area approximately 50 km (west-east) by 20 km (coast to inland) near the Beaufort Sea. The aggregate data set was analysed for the presence of gradients in abundance in relation to location within the study region. The species examined included Lesser Golden Plover, Semipalmated Sandpiper, Pectoral Sandpiper, Dunlin, Stilt Sandpiper, Buff-breasted Sandpiper, Red-necked Phalarope and Red Phalarope. Significant gradients in nest densities were found for Dunlin (increase towards the west and towards the coast). Stilt Sandpiper (inland and west), Buff-breasted Sandpiper (west), Red-necked Phalarope (east and inland) and Red Phalarope (coast). Analyses based on densities of birds during the breeding season found the same patterns as with the addition of Semipalmated Sandpiper (inland) and Red Phalarope (west). Location of the plots accounted for up to 30% of the variability in bird/nest densities. The coastal abundance gradient may be related to a strong gradient in temperature, and perhaps snow melt, due to proximity to the Beaufort Sea. The importance of the east-west gradients were greater than expected and their cause is under study. During the post-breeding season the coastal effect became more important that the east-west gradient and a general coastal movement was evident in use of plots.

MOULT IN WADERS WINTERING ALONG THE SOUTHEAST COAST OF INDIA

S. Balachandran & S. A. Hussain, Bombay Natural History Society, Hornbill House, Bombay, India.

Moult data from 12,000 waders of 12 species ringed between 1985-1991 in south India during the different periods of the migratory season were analysed to estimate the duration and timing of primary moult. Variation in timings of moult between different wintering regions for the same species are discussed. Estimated duration from Indian wintering grounds have been compared with other wintering sites especially in South Africa and Australia. Significant differences in duration between the Indian wintering sites and passage sites from elsewhere are recorded. The differences in timing and duration of moult in different geographical populations and age groups are discussed.

Moult pattern in Little Stint *Calidris minuta* are

complex – in some years adults undergo a second partial moult of the outer primaries in spring, while in other years they suspend and then moult the outer primaries (for the first time) in spring. Strategies may be an adaptation to ensure tha t the wing is fresh for the return migration. Partial primary moult in "first year" birds have been noticed in all wader species studied for moult. A complete primary moult was recorded during their "first winter" in Little Stint, Common Sandpiper *Tringa hypoleucos*, probably in Wood Sandpiper *Tringa glareola* and Red-necked Phalarope *Phalaropus lobatus*. Summering first year birds undergo a "second moult" to renew some primaries during their "second winter" as was confirmed by retraps. The majority of waders arrive in India having already started to moult – this is particularly noticeable in species such as Marsh Sandpiper *Tringa stagnatilis*, Wood Sandpiper, Black-tailed Godwit *Limosa limosa*, and Ruff *Philomachus pugnax*, suggesting that the above species may have commenced their moult during the breeding season. Relationships between various stages of moult and weight are discussed. Arrested moult is more common during monsoons, which may be the result of short of food supply.

BREEDING BIOLOGY

RECONNAISSANCE AND BREEDING SITE SELECTION BY SPOTTED SANDPIPERS

L. W. Oring, Ecology, Evolution and Conservation Biology, Univ. of Nevada, USA.

During an 18 year study of the breeding biology of Spotted Sandpipers Actitis macularia, it was noted that known breeders and fledglings wandered among breeding sites, and that "strangers" were frequently seen on breeding areas. When these "strangers" or "transients" were colour-ringed, we found that many returned as breeders in subsequent years. We hypothesised that transients were undergoing "reconnaissance," i.e., acquiring information for future use. Transients arrived in two peaks, one about a week after the arrival of breeders, the other about a week prior to breeder departure. Female transients returned as breeders significantly more often than did male transients. The number of female transients returning to breed was positively associated with the number of male breeders in the year of reconnaissance. We conclude that transients gather information used in future decision making regarding choice of breeding sites and, because of intense female-female competition in this sex-role reversed species, this information is of more use to females than to males.

ADULT SURVIVAL AND NUMBERS IN A COASTAL BREEDING POPULATION OF REDSHANK *TRINGA TOTANUS* IN NW ENGLAND, UK.

P. S. Thompson, Dept. of Biologcal Sciences, Univ. of Durham, Durham, U.K.

The results of a long-term capture-mark -recapture ringing programme carried out on a coastal breeding population of Redshank between 1974 and 1988 are presented. Since the study began, between 102 and 222 adult Redshank were captured from 116–173 nests. A total of 569 female and 515 male Redshank have been captured and marked in a 1.04 km^2 area of saltmarsh. The return frequencies of these birds has allowed adult survival rates and population size to be estimated using the Jolly-Seber mark – capture –recapture method.

Both sexes were less likely to be recaptured in subsequent years as were birds captured for the first time compared with those which had been captured previously. Older birds were more frequently recaptured than were young birds. There was no significant difference in male and female adult survival rates, with a mean survival of 0.72 (females) and 0.75 (males). The breeding population fluctuated annually with estimated breeding densities of between 122–285 pairs/km^2. Variation in breeding numbers (males), but not survival, was partially attributable to winter weather conditions. A decline in breeding numbers within part of the study area is believed to be associated with the re-distribution of breeding birds, rather than to a real decline in the number of birds using the study area as a whole. Breeding densities of Redshank in saltmarshes are known to be high. As little is known about the breeding success (particularly fledging success) of these birds, it is essential that work now be carried out in order that as much information for the conservation and management of these important breeding areas is available.

FACTORS INFLUENCING PRODUCTIVITY IN A BREEDING WHIMBREL *NUMENIUS PHAEOPUS* POPULATION

M. C. Grant, Dept. of Biological Sciences, Durham University, Durham, U.K.

Breeding success of Whimbrel *Numenius phaeopus* was studied on five study sites in the Shetland Islands from 1986 to 1988, using individually colour-ringed adults. In each year the survival of clutches to hatching was relatively high (75–80%) and chick mortality during the 28 day fledging period was the main cause of breeding failure. Over 80% of all chick mortality occurred within 14 days of hatching, but the relative importance of different direct causes of this mortality (e.g. starvation and predation) could not be determined. Chick survival increased with chick weight at hatching (and hence egg size), decreased with later laying, and varied between different study sites. Although there was a higher proportion of late laying pairs on those sites with poor chick survival persisted after controlling for effects of laying date. Differences between study sites in (i) nesting density, (ii) chick food apply, and (iii) egg predation rates were not associated with inter-site variation in chick survival. In each year of study between 0.75 and 0.91 fledglings per breeding pair were produced, when data from the different study sites were combined. Given that adult survival over the study period was at least 89%, it is suggested that productivity is in excess of that required to balance adult mortality. This result is consistent with the current increase of the Whimbrel population in Shetland.

BREEDING AND THE FUTURE

BREEDING SUCCESS AND HABITAT SELECTION OF THE KENTISH PLOVER *CHARADRIUS ALEXANDRINUS* AT THE LAKE NEUSIEDL, AUSTRIA

B. Braun, Graz, Austria.

The poster shows the distribution of breeding –pairs in a year with much water and in a year with little water. The breeding success of two breeding seasons and the reasons for loss of eggs are shown. The density of vegetation in the surrounding of the nests is shown. Finally the reasons for the decrease of the Kentish Plover are discussed.

HABITAT REQUIREMENTS OF BREEDING WADERS ON LOWLAND GRASSLAND SITES

Mark O'Brien, RSPB, 17 Regent Terrace, Edinburgh, Scotland.

A survey of wader numbers on lowland grassland sites in England and Wales in 1989 indicated that numbers of both Lapwing and Snipe had declined during the 1980s. Reserves, land managed by the RSPB or NCC, also showed a decline in Lapwing numbers and little change in Snipe or Redshank numbers. Wader densities tended to be higher on reserves than unprotected areas. A number of Environmentally Sensitive Areas (ESAs) were created in the late 1980s on large lowland grassland sites such as the Somerset Levels, Norfolk Broads grazing marshes and Suffolk river valleys. This provided farmers with an option to control certain types of management systems – the second tier controlling factors considered to be important for breeding waders included water levels and the use of fertilisers. A survey of the distribution of wader numbers within the Norfolk Broads ESA was undertaken at the start of the scheme. The density of waders within different tiers were compared. Also changes in wader numbers between this survey and a previous survey undertaken in the early 1980s prior to the instigation of the ESA were considered as were changes recorded during the first four years of the scheme. Finally, habitat selection by breeding waders on reserves is used to recommend suggestions for further improvements to the ESA management categories.