

ABSTRACTS OF TALKS AND POSTERS AT THE WADER STUDY GROUP ANNUAL MEETING, IPSWICH, SUFFOLK, U.K. 2-4 SEPTEMBER 1988



Flight trajectories of waders leaving the Banc d'Arguin in spring

Theunis Piersma & Henrich Bruggemann, University of Groningen, P.O. Box 14, 9750 AA Haren, The Netherlands (Zoological Laboratory and Department of Marine Biology).

Waders leaving the Banc d'Arguin, Mauritania, in spring to fly to the stopover sites in western Europe, face hard northerly winds at ground level. Synoptic weather maps, however, show that at high altitudes favourable winds may sometimes be available. To find out whether and how the birds find and use the favourable high altitude winds, we have simultaneously recorded wind speeds and directions at altitudes up to 10 km and measured flight trajectories of wader flocks leaving the area between 20 April and 15 May 1988. For the wind measurements we used standard helium-filled weather balloons and a theodolite, recording azimuth and elevation every 30 second (a 90 m gain in height). For the flight trajectories we employed a specially adapted range-finder, recording distance, azimuth and elevation of the focal flock at 30 second intervals. Flocks departing from our fixed observation point in the Baie d'Aouatif could be followed for up to 24 minutes and up to altitudes of 1.6 km. The data allows us to calculate the details of departure directions, horizontal flight speeds and the speed of ascent.

Our wind data confirm that along the Mauritanian Sahara coast, winds generally become favourable for northwards migration at altitudes of 2 km or more. Wader flocks leaving the Baie d'Aouatif appeared to fly along fairly well defined, species-specific corridors. Grey Plovers and Dunlins generally headed northwards, leaving the bay east of the observation point. Redshanks also headed north but passed immediately overhead. Bar-tailed Godwits headed northwest and Whimbrels flew almost due west, their flocks making many twists and turns after departure. The species-specific differences are surprising since they all have the same goal: the Moroccan and West European estuaries. Over all observed wader species (cf. Figure 1), ground speeds averaged 24 km/hr. Since the birds were generally facing a headwind at the heights at which they were observed, the average air speed amounted to 41 km/hr. A comparison between species (Figure 1) showed that air speed was negatively correlated with the speed of ascent (or vertical speed, climb rate). Apparently, the trade-off point between gaining height and gaining distance differs between the various species. Oystercatchers and Common Sandpipers were particularly slow flyers. This may have been because the Oystercatchers may not have been leaving the area on migration. Common Sandpipers, however, had a different flight style and may truly be a slow flyer. At level flight the average wader was estimated to attain an air speed of 56 km/hr. We were able to follow many flocks to altitudes of more than 600 m, and some to heights of 1500 m but very few flocks showed signs of levelling off within this range in altitudes. This strongly suggests that the waders leaving the Banc d'Arguin in spring climb to heights of at least 2 km. This gives them the opportunity to take advantage of the favourable winds often occurring there.

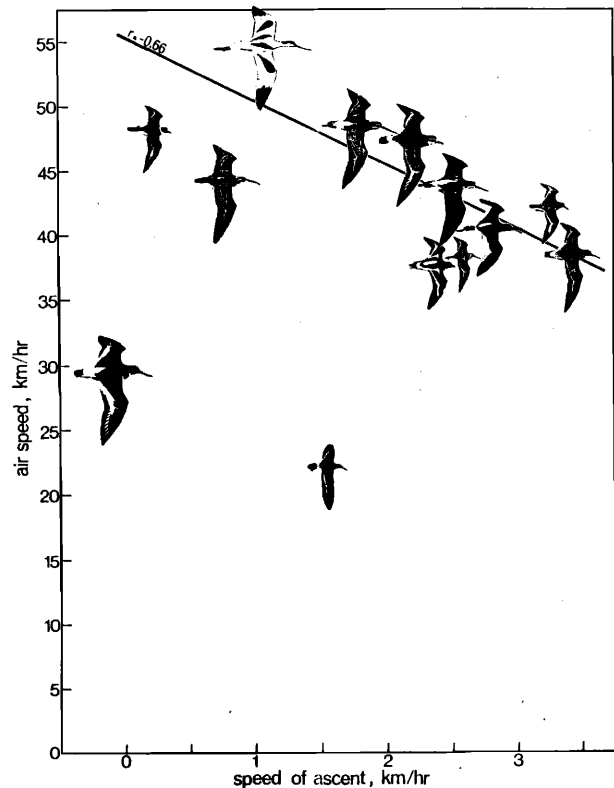


Figure 1. For wader flocks leaving the Banc d'Arguin in spring 1988, a comparison of the average values for each species shows that horizontal air speed is negatively correlated with speed of ascent. The data points for Oystercatcher and Common Sandpiper are not included in the correlation exercise for reasons given in the text. The line shows the reduced major axis calculated from the data points for (from left to right) Ringed Plover, Whimbrel, Avocet, Bar-tailed Godwit, Grey Plover, Turnstone, Greenshank, Dunlin, Redshank, Sanderling and Knot. The bird vignettes are to scale and are adapted from Hayman, Marchant & Prater (*Shorebirds*, Croom Helm).

The migratory system of Knots in Iceland

J.R. Wilson, Granveien 46, 1911 Flateby, Norway

Knots *Calidris canutus* breeding in Greenland and N.E. Canada leave Britain in late April and early May and weigh between 180 and 226g. Arrival weights at Icelandic staging areas were between 110 and 160g. The staging period was 2-3 weeks, the birds leaving between 25 and 30 May. Rates of mass increase while staging were 2.3 ± 1.0 g/day ($n=12$, $r=1.0 - 4.1g$). Departure weights are between 180-230g. The last birds to leave are large and heavy and are probably females. About 0.1% of birds in Iceland in May are first-year. These probably remain to summer

there. Mean weights at the same dates in the years of 1970 to 1972 varied, indicating a variation in the timing of arrival. Birds arrived earlier in Iceland than in N. Norway and the weights at any given date were higher (including at departure). Autumn migration of adults in Iceland begins in mid-July and is mostly over by mid-August. Arrival weights in the autumn can be as low as 100g, but are probably normally 120-140g. Departure weights are 135-170g, i.e. much lower than when making the equivalent journey in spring. At this time they are flying south into areas of food abundance and mild climate and probably do not need large fat reserves. Turnover of individual Knots is rapid, probably 7-10 days at this time, with birds arriving and departing continually throughout the passage period.

There was severe weather in N.W. Greenland in June of 1972 and of 1974. Birds appeared near settlements and were shot, resulting in an unusually high number of recoveries and the wintering population in Britain decreased by about one third at this time. The majority (90%, n=20) of birds caught in Iceland between 15 and 25 May 1970-1972 and which were known to have survived the 1972 or 1974 severe weather, were heavier than average. This suggests that only birds with large fat reserves at departure from Iceland survive when weather conditions are very severe. Migration systems in the arctic (and elsewhere) may be constantly evolving towards survival for the worst conditions and fat loads are probably higher than actually required in most years. A model showing how the timing and mechanics of migration may have evolved is presented.

Migration and arrival patterns of shorebirds at Alert, Ellesmere Island, N.W.T.

N.C. Davidson & R.I.G. Morrison*, Nature Conservancy Council, Northminster House, Peterborough, PE1 1UA, UK. (*Canadian Wildlife Service, 1725 Woodward Drive, Ottawa, Ontario, K1A 0H3, Canada.)

Banding studies were carried out at Alert during the period of arrival of shorebirds on their high arctic breeding grounds in late May and early June of 1986, 1987 and 1988. Recoveries and morphometric analysis have confirmed and extended earlier work, showing that Ellesmere Island populations of Knots *Calidris canutus* and Turnstones *Arenaria interpres* migrate to wintering areas on the northern European seaboard. Ellesmere Island Knots are indistinguishable morphometrically from European wintering populations and from Knots caught on migration in Iceland and northern Norway, the two major routes used by the birds to reach Nearctic breeding grounds.

Weights of banded birds and preliminary data from biochemical analysis of specimens obtained during the arrival period indicate that Knots reach Alert with substantial reserves of both muscle protein and fat, though the amounts retained after migration may vary between years. In 1986 and 1987, weights of Knots declined after arrival, reflecting a loss of both protein and fat. Time/activity budgets in 1987 showed that early migrants spent much time resting and that little feeding occurred during severe weather and high winds in early June. Feeding and display activities both increased as snow melt proceeded and habitat became available. Early season food was scarce and consisted mainly of plant material; the garbage dump was used for foraging, particularly in 1986. Body reserves thus appear

important for early season survival in high arctic shorebirds; the contribution of such reserves to the physiological requirements of breeding is the subject of further investigation.

Why are birds locked up in chains?

N. Holmgren & S. Lundberg, Department of Ecology, Ecology Building, University of Lund, S-223 62 Lund, Sweden.

The concept of ideal despotic distribution in the appearance of territorial behaviour was applied to the evolution of bird migration patterns. The significance of two different mechanisms of asymmetric competition were analysed; body size dominance and dominance by prior occupancy. It is argued that differences between heritable traits (eg. body size) are reduced between populations in territorial species. Genetic differences between populations are predicted to be most pronounced in chain-migrating species where birds arriving early have an advantage against those arriving later.

The occurrence of species with widely separated breeding and wintering areas is explained theoretically by intraspecific competition. In this case, each migration pattern is exclusively connected to one of the two competition mechanisms.

Do we need to ring more Dunlin?

N.A. Clark, British Trust for Ornithology, Beech Grove, Tring, Hertfordshire, HP23 5NR, UK

Present knowledge of Dunlin migration routes and wintering areas, concentrating on the *alpina* race, is reviewed. Key questions are yet to be answered: What is the eastern limit to the breeding range? Do birds breeding in different parts of the range follow different migration routes and separate out on the wintering grounds? Have there been substantial changes in the size of the *alpina* population in the past 20 years? What factors limit Dunlin populations?

Assessments were made of the information available on the following topics: Juvenile ratios, migration routes and moulting areas of both adults and juveniles, population estimates and biometric/plumage variation.

It was concluded that existing data could potentially answer some of these questions, but that further ringing was important to monitor Dunlin populations especially since there is evidence that populations are declining over at least part of the wintering range.

Seasonal and diurnal variations in the feeding intensity of waders on the Ria Formosa, Portugal

Leslie Batty, U/E Ciências e Tecnologias dos Recursos Aquáticos, Universidade do Algarve, Campo de Gambelas, Apartado 322, 8004 Faro Cedex, Portugal

The salt-pans of the Ria Formosa provide feeding and/or roosting areas for at least 30% of the waders that use this tidal lagoon system. The fact that the salt-pans are available for feeding at high tide means that waders can feed round the clock if necessary,

but ringing activities and both diurnal and nocturnal observations have shown that there is a marked seasonality in wader feeding intensity which contrasts with most published accounts of waders in northern Europe.

Nocturnal feeding in both salt-pans and adjacent inter-tidal areas is a normal occurrence during autumn migration, is rare in the winter months from November-February, and becomes more frequent again in March.

Diurnal feeding intensity of Kentish Plovers *Charadrius alexandrinus* on the salt-pans was at its lowest in the early afternoon from March-October, but very high throughout the day in November-December. A similar, but less clear-cut pattern was found in the Dunlin *Calidris alpina*. Most accounts of nocturnal feeding in northern Europe report that it is most intense during the winter months and least intense or absent in the early autumn and the spring.

It is suggested that high daytime temperatures in the long Algarvian summer may suppress prey detectability so that nocturnal feeding is more profitable for migrating birds during that period, whereas the mild conditions in winter enable birds to find all their energy needs for that season during the daylight hours when prey is more active than in the summer.

Research continues in order to further elucidate these patterns and their underlying causes.

Some trophic and biometric aspects of Black-winged Stilts in non-breeding season

P.J. Dubois, Ligue Francaise Pour la Protection Des Oiseaux, La Corderie Royale, B.P. 263, 17305 Rochefort, Cedex, France

As part of the WSG's Black-winged Stilt project, an Ligue Francaise Pour la Protection des Oiseaux team visited the Atlantic coast of Morocco in Sept-Oct 1986, concentrating particularly on the salt pans of Sidi-Moussa/Oualidie. The aim was to study some aspects of the non-breeding ecology of the Black-winged Stilt *Himantopus himantopus*. Time budgets and foraging strategy (following the methods of Altmann and of Goss-Custard and Rothery, respectively) were studied for both adult and immature birds and morphometric data were collected.

There were marked differences in the time budgets of males and females. Females spent more time foraging, especially in *sensu stricto* feeding, whilst the males spent more time resting, walking and in alertness and antagonistic flying. There were also differences between the time allocated to various activities by adults and immatures. Immatures spent much longer walking whilst adults spend more time feeding.

The best water depth for foraging by adults was more than 10 cm. Here the "searching rate" (SER) and the "Feeding success rate" (FSR) were optimal ($p < 0.001$). Immatures, though they have a tendency to optimize the foraging strategy at the best water depth, do not show optimal fitness in this foraging strategy ($p < 0.05$).

Wing length and tarsus length show a statistical difference ($p < 0.001$) between males and females. These measurements can be used together with the bill length in a discriminant analysis which clearly identified the two

sexes. These biometrics are useful particularly for sub-adult birds which are not always easy to sex. The morphometrics of immatures were similar to those of adults but there is a difference ($p < 0.001$) in the length of the primaries. There was also a pronounced weight difference between adults and immatures, probably as a result of the less optimal foraging strategy of the latter. There were no size differences between birds caught in Morocco and birds caught in France, so they probably belong to the same population.

In autumn 1986, 26% of the birds were immatures ($n = 1090$) and the sex-ratio was balanced (49% males: 51% females). In January-February 1987, Tinarelli found an identical sex-ratio (49.2/50.8) at the same site but fewer immatures (19.8%, $p < 0.001$).

Overall these data provide information on the less efficient foraging strategy of immatures and suggest that the lower efficiency of foraging by immatures may influence first-winter survival.

The Tamar Avocets *Recurvirostra avoetetta*

P.J. Reay, Department of Biological Sciences, Plymouth Polytechnic, Drake Circus, Plymouth, Devon PL4 8AA, U.K.

Recent poor coverage of the Tamar estuary (SW England) for the British Trust for Ornithology's Birds of Estuaries Enquiry, has resulted in this historically important Avocet wintering area being undervalued. Yet, since the first regular wintering of Avocets in the UK started there in 1947/48, the numbers have continued to increase at this site and have been above the nationally important level of 50 birds since 1960/61. Record counts in excess of 100 birds have been achieved in the last two winters. A study was initiated in November 1987 to examine more closely the numbers, distribution and behaviour of the Avocets on the Tamar and to compare them with the Exe and Suffolk wintering groups. Problems in obtaining valid census data have been highlighted but in spite of this, a pattern of distribution and abundance for 1987/88 has been established. In particular, this included a distinct movement of most of the birds from the main feeding area above Weir Quay (14 km from estuary mouth) down river to Landulph Saltash (7-8 km from the estuary mouth) during periods in January and early February. These movements correlated well with strong westerly winds and increased river flow-rates but it is not yet known whether they were related to the need for shelter from the strong winds, or to changes in the suitability of the Weir Quay feeding area (decreases in salinity and water temperature, and changes in mud consistency could arise from increased river flow-rates, and might affect either the Avocets directly or their food organisms). Studies on activity during daylight hours (318 observations, December to March) showed no influence of the time of day on the percentage of birds feeding, but there was a strong tidal influence. The value peaked at 85% 2-3 hours after low water, and fell to less than 2% within an hour of high water; the overall mean was about 62%. There was a difference in the time at which peak feeding occurred in the water and on mud. In the water, peaks occurred on mid-ebb and mid-flood, whereas on mud, peak feeding was immediately after low water. The rate of feeding was higher in water than on mud, with average numbers of swallowing movements per minute of 38 in the water ($N=70$) and 28 on mud ($N=110$).

The ecology of the Curlew *Numenius arquata* in the breeding season: sexual dimorphism and feeding strategy

J.L. Mulder & A.H. Swaan, Jan van Polanenstraat 6, NL-1962 XC Heemskerk, The Netherlands

The ecology of the Curlew was studied in two breeding areas, a sand-dune area on the coast of Holland and a boreal bog area in mid-Sweden. Body weights and incubation duties by the two sexes were automatically monitored, and time budgets were obtained from full-day observations through the entire breeding season.

Many of the breeding haunts of the Curlew have relatively poor food supplies at the onset of the breeding season. These areas may be selected by Curlews because there may be relatively few predators. Increased food supplies in the form of insects during late spring may also be important. Indeed, insects are the main food of the chicks, which forage on their own, gaining 400g in 5 weeks. The relatively large size of the Curlew poses problems during the breeding season and is more likely to be a result of adaptation to food conditions in estuaries, where the Curlew spends the largest part of the year. The strong size dimorphism and a differentiation of breeding season duties between the sexes may have evolved as solutions. The ecology of the Curlew during the breeding season is discussed in this context.

Before egg-laying much time is spent by male and female Curlews on (agricultural) grassland outside the breeding territory, foraging on earthworms. As soon as egg-laying begins, the male does not leave the breeding habitat anymore and becomes largely responsible for vigilance and protection of eggs and young. The female determines the timing and duration of her own incubation bouts whereas the male has to accept these. The male incubates during the night (risk of predation may have played a role here), and so can forage through that part of the day during which the female is incubating. His smaller size enables him to more or less maintain body mass. The female continues to make foraging trips away from the breeding territory, to prevent too much weight loss. As soon as the chicks hatch, both parents have more time to forage: after a few days the chicks no longer need to be brooded. The female, however, generally leaves the breeding

habitat entirely when the chicks are two weeks of age; this is perhaps again induced by her food requirements.

The breeding range of the Curlew in the northern boreal region may well be limited by the occurrence of natural or agricultural grassland along rivers, areas providing good feeding habitat. We presume that the related Whimbrel *Numenius phaeopus*, with its smaller size, is capable of restricting its foraging to its breeding habitat in bogs and on tundra.

The effects of improvement of upland, marginal grassland on breeding waders

D. Baines, Department of Zoology, University of Durham, South Road, Durham DH1 3LE, UK

Agricultural improvement (drainage, reseeding and increased inorganic fertilisation) of upland grasslands in the north Pennines resulted in decreased breeding densities of Snipe, Redshank, Curlew and Lapwing. Breeding success was lower for all species on improved areas relative to unimproved. Causes of lower breeding success in Lapwing were investigated in detail.

The effects of re-seeding heathland on breeding Whimbrel *Numenius phaeopus* in Shetland

M. Grant, Department of Zoology, University of Durham, South Road, Durham DH1 3LE, UK

Recent increases in the extent of reseeding of heathland in Shetland have caused concern among conservation bodies over the possible threat that this represents to the islands' breeding Whimbrel population, which makes up c.80% of the British total. A 3-year study was initiated to identify the effects of these changes on breeding Whimbrel.

During the study, heathland was found to provide the major nesting habitat, with few nests occurring in reseeded areas. Reseeding usually resulted in fundamental changes in vegetation composition and structure and most "reseeded" lacked certain habitat attributes which were identified as being important in the selection of nest sites.

'Reseeded', however, were used extensively as feeding habitat by adults during pre-laying and also, to a limited extent, as chick-rearing habitat. Benefits of improved feeding conditions for adults during pre-laying may include the possibility that females would lay larger eggs, which could in turn increase chick survival. Movements of broods into "reseeded" were generally limited to those which had nested relatively close to this habitat. Improved feeding conditions for chicks, rather than increased cover, were probably the major factor causing such movement but use of "reseeded" did not appear to result in increased chick survival.

Reseeding of heathland has both detrimental and beneficial effects for Whimbrel. The extent to which benefits offset losses is not known but these are likely to vary according to such factors as food supply and nesting densities on the heathland prior to reseeding.



Age-related reproductive variation in Redshank

P.S. Thompson, British Trust for Ornithology, Beech Grove, Tring, Hertfordshire, HP23 5NR, UK

Timing of breeding, breeding-site fidelity and breeding performance was studied in a population of Redshank breeding in NW England between 1983-85. Older, more experienced Redshank nested earlier in the season and tended to pair with birds of a similar age. Experienced females laid significantly larger eggs and had a greater hatching success. Egg size was significantly and positively correlated with chick size. Older birds were more site faithful than younger, inexperienced birds and previously successful breeders more site faithful than unsuccessful breeders. The previous year's breeding success influenced the following year's breeding site dispersal which in turn influenced site fidelity. Birds which nested successfully in the previous year were less likely to divorce and disperses a shorter distance the following spring. Females nesting with a new mate dispersed significantly further than faithful pairs and males nesting with a new mate, particularly when they had nested unsuccessfully in the previous year. The relationship between breeding success, breeding dispersal and breeding-site fidelity is discussed and the importance of habitat loss to waders highlighted.

Waders at the 'Ria de Aveiro'

*R. Rufino, A.S. Luis, * A. Araujo & R. Neves, CEMPA-SNPRCN, R.Filipe Folque 46, 50 1000 Lisboa, Portugal (*Universidade de Aveiro, Aveiro, Portugal).*

From November 1986 to May 1988, wader counts were carried out almost fortnightly at the Ria de Aveiro (Aveiro), on the north-west coast of Portugal, some 300 km north of Lisbon.

The numbers counted at the Ria de Aveiro, the third most important estuarine area for wintering waders in Portugal, are compared with those recorded further south, at the Tejo estuary (Lisbon) and at the Ria Formosa (Faro) and the timings and volume of migration are discussed. Annual and between-year variations in numbers are discussed for each species.

This work was carried out as a co-operative study between CEMPA-SNPRCN Secretary of State for the Environment and the University of Aveiro.

A possible explanation for the variations in breeding success of waders and Brent Geese on the Taimyr Peninsula

R.W. Summers, Leenane, Gong Lane, Burnham Overy Staithe, King's Lynn, Norfolk, UK

There are large cyclic variations in the production of young in Siberian-breeding Knots, Sanderlings, Curlew Sandpipers, Turnstones and Brent Geese. These synchronous variations are correlated with changes in the abundance of lemmings and Arctic Foxes, which vary on a 3 year cycle. As a result, a prey-switching hypothesis is proposed to explain the variations in the breeding success of the birds. Years of good breeding are thought to result when foxes prey on lemmings when these are abundant; poor years result when foxes switch to birds' eggs and chicks when the lemming numbers decline. The hypothesis would need to be tested by an experiment on the

Taimyr Peninsula. Other factors, such as snow cover in June, may explain the residual variation and may be the main factor affecting populations of waders in other breeding areas.

The consequences of cycles in breeding success for the conservation of waders and geese

William J. Sutherland, School of Biological Sciences, University of East Anglia, Norwich NR4 7TJ.

Evidence is accumulating that Turnstones, Sanderlings, Curlew Sandpipers and Brent Geese all show regular cycles in breeding success with peaks every three years. This pattern has been attributed to the variation in arctic fox predation caused by changes in their main prey, the lemming. This idea has caused considerable interest and controversy amongst goose and wader researchers and further research in the Taimyr Peninsula is badly needed to resolve the mechanism. Regardless of the actual mechanism, this predictable cycle in breeding success has implications for conservation, monitoring and further research.

1. Consequences for conservation arguments. It has been suggested that species with highly variable breeding success are particularly prone to dramatic population changes (due to a chance run of good or poor years) and thus need particularly careful protection. If however, the variation in breeding success follows a fairly predictable cyclic patterns, then a run of poor years is unlikely and the argument no longer applies.

2. Consequences for monitoring. It was previously thought that the variation in breeding success was largely due to variation in the weather in the arctic. Thus a run of years of bad weather will result in a run of poor breeding seasons. If the breeding success did fluctuate randomly then it would be difficult to distinguish between a chance series of poor seasons and a population decline caused by some serious environmental change. If however, the breeding success usually follows a fairly predictable cycle then a series of poor seasons suggest serious environmental change and warrants investigation.

It is also possible to be more precise about particular years. As an example, a letter in a British newspaper called The Guardian stated correctly that there were practically no young Brent Geese on the north Norfolk coast in 1986. The author suggested this might be attributable to radiation-induced sterility caused by Chernobyl. From the extrapolation of the known cycles, 1986 was expected to be a poor breeding season and there was no need to invoke such a dramatic explanation. If, however, such a breeding failure took place in a year which was expected to be successful then this would cause more concern and justify the search for alternative explanations.

3. Consequences for understanding populations. Much of the interest in the ecology of waders in winter is related to predicting the consequences of the loss of intertidal habitat due to barrages and reclamation. Many of the conservation arguments rest upon the idea that habitat loss will force birds to exist in higher densities which will affect the survival rate, the distribution of the birds or abundance of the prey. The large differences in population size caused by these cycles might be used to quantify the manner by which population

density affects these attributes. Thus it would be useful to measure adult survival, juvenile survival, prey depletion, or the distribution of adults and juveniles in years of high breeding success and compare it with years of poor breeding.

Summary. There is good evidence, for some wader species, that the proportion of young birds shows clear cycles with peaks at three year intervals. Such cycles have been shown in Curlew Sandpipers, Sanderlings and Turnstones. It would be very interesting if wader researchers examined their data to see if other species behave in the same manner. Further work is also needed to determine which populations cycle and which do not. Even fairly small samples could be analysed by dividing data into years of high and low lemming numbers and comparing the proportion of juveniles in each. It would also be useful to compare adult mortality, juvenile mortality, prey densities or the distribution of adults and juveniles in years of successful breeding and compare with years of failed breeding.

The "Nordstrander Bucht" after the construction of the new dike

H. Hotker, Volquart-Pauls-Str 18, 2250 Husum, FRG

In May 1987, the completion of the new sea-dike isolated Nordstrand Bay (3 345 ha) from the Schleswig-Holstein part of the Waddensea. Formerly the area had been of major importance for migrating geese, ducks and arctic waders. Indeed, 14 species fulfilled the "Ramsar criteria". More than 1% of their flyway populations could regularly be found at the site. One year after isolating the Bay from the tides saw great changes in birdlife. Most of the 14 "Ramsar species" decreased in numbers and the waders in particular no longer use the site as a feeding ground. Numbers of breeding birds have been so far less affected.

There are proposals to declare the enclosed area a nature reserve. This reserve will include a saltwater habitat with a reduced intertidal level (20 cm) and extensive freshwater wetlands. Different options for the future of the reserve are presented and discussed. The main alternatives are: management for geese and breeding waders by grazing, or natural succession without any agricultural practices in part of the area.

Habitat loss due to the completion of a storm-surge barrier and consequences for waders: the first year

R.H.D. Lambeck & P.L. Meininger, Delta Instituut voor Hydrobiologisch Onderzoek, Yerseke, The Netherlands (* Rijkswaterstaat, Dienst Getijdewateren, Middelburg, The Netherlands).*

The huge hydraulic engineering projects in the Oosterschelde estuary (SW Netherlands), consisting of an 8 km long storm-surge barrier in the western mouth and secondary dams in the east and in the northern branch, were completed by the closure of the northern dam in April 1987. The loss of intertidal habitat in the Oosterschelde has been about 30%, somewhat less than was expected, owing to a more suitable average tidal amplitude: the final reduction was only 0.25 m instead of the predicted 0.5 m. The 20-30% decline in tidal volume, however, has initiated a long-term process of erosion of

the mudflats (the area has a so-called "sand hunger"). An additional loss of 10-15% of the intertidal area is predicted during the next 30 years.

In the first season of the 'new' Oosterschelde, numbers of practically all of the eight dominant wader species were lower than in previous years. In contrast, there were no obvious changes in the population of the adjacent Westerschelde estuary. Data from other European areas should clarify whether general population trends are responsible.

Numbers of the most-studied species, the Oystercatcher, peaked in October, instead of midwinter and gradually decreased, which suggests that the site was at capacity. Birds that lost their feeding areas in the enclosed part of the northern branch initially concentrated in the tidal area adjacent to the dam. Later in the season, some of these Oystercatchers dispersed into the central and eastern parts of the Oosterschelde. The birds that stayed behind had low winter weights illustrating the exhaustion of local food resources. Equally low weights were found in the western part of the Oosterschelde. An intensive cockle fishery here will, however, have been an interfering factor.

The winter 1987/88 was extremely mild and wet, allowing additional feeding by Oystercatchers in the meadows. A few frosty days led to the immediate departure of some birds, as shown by recoveries of ringed birds in France. The data suggest capacity problems which probably would have resulted in serious mortality under severe winter conditions.

Predicting the effect of marsh reclamation on overwintering waders on the Wash

M. Yates, J.D. Goss-Custard, S. McGrorty, S. Durrell, K. Lakhani & W.E. Rispin,* ITE, Monks Wood Experimental Station, Abbots Ripton, Huntingdon, Cambs., PE17 2LS, UK (* ITE, Furzebrook Research Station, Wareham, Dorset, BH20 5AS, UK)*

The likelihood of continued marsh reclamation around the Wash, eastern England, is of major concern to conservationists, mainly because of its effects on overwintering waders. The Department of the Environment has commissioned ITE to describe the distribution of the waders' feeding areas, their prey and the sediments of the Wash and to provide a model which helps predict the cumulative effects of piecemeal reclamation.

This talk deals briefly with the distribution of the birds, their prey and how this relates to sediments and discusses the development of a model relating bird numbers to shore width.

Nature Conservancy Council estuaries review

N.C. Davidson, Nature Conservancy Council, Northminster House, Peterborough, PE1 1UA, UK

Many British estuaries are of national and international nature conservation importance, for their habitats and the birds and other animals which they support. There are many activities, changes and pressures that affect the ecosystems and nature conservation importance of British estuaries. Many effects arise directly or indirectly through man's use and influence on estuaries.

The Estuaries Review (ER) is a new initiative by the NCC which aims to develop a strategy for the promotion of nature conservation in estuaries, through the maintenance and appropriate enhancement of good wildlife habitat, species populations and earth science features. The strategy will seek to reduce the rate of losses of estuarine habitat to adverse development.

The ER will produce a reference document on nature conservation on estuaries, of use to Government Departments, Local Authorities, developers and potential developers, estuarine interest groups, NCC officers and the general public.

This document will:

- review and summarise the distribution, characteristics and nature conservation importance of estuaries in Britain;
- describe the types of activities and changes occurring on estuaries and their effects on estuarine ecosystems;
- examine ways of minimising the effects of adverse activities; and
- identify activities and developments consistent with maintaining or enhancing natural estuarine ecosystems.

The document will help to identify at an early stage whether a development is likely to damage an estuary or whether it can be made compatible with estuarine conservation. The focus on the opportunities for maintaining and enhancing estuaries will help fulfill the UK's commitment to the "wise-use" of wetlands, made as part of the "Ramsar" Convention.

The ER will run for 2 years, from September 1988. Preparatory work has begun in August 1988. The work in the first year of the ER is to collate and compile information and to produce the draft scientific document. In the second year work will focus on consultation on the draft document and the estuarine nature conservation strategy. The ER will be compiled by collating and summarising existing sources of information.

Preparation of the ER is part of the responsibilities of NCC's Chief Scientist Directorate and is under the overall direction of the Assistant Chief Scientist (Earth & Marine Sciences) Dr. Keith Duff, with scientific guidance from Dr. Pat Doody (Head of Coastal Ecology Branch), Dr. Roger Mitchell (Head of Marine Science Branch), and Dr. Mike Pienkowski (Head of Ornithology Branch). The ER is a team of three: Dr. Nick Davidson (Co-ordinator & Ornithology), Lawrence Way (Coastal Ecology) and Dr. Dan Laffoley (Marine Ecology).

The initial priorities of the ER team are:

- to define and identify the estuarine sites to be included in the review; and
- to establish a computerised database for the filing and analysis of information on the wildlife interest, nature conservation importance, and past, present and proposed activities and changes on estuarine sites in Britain.

There are many different definitions for an estuary, dependent on a variety of key factors such as coastal morphology, salinity variation, tidal range and presence of intertidal habitats. In addition the ER must cover sites subject to types of change or damage, such as barrages, docks and harbours, industrial land-claim and marinas and associated recreational activities. The ER will cover

estuaries *sensu stricto* such as rias, bar-built estuaries, coastal plain estuaries and some sea-lochs. The ER will include also other tidally-influenced soft shores, including those protected by bars, barrier islands and spits, inlets and bays and areas with a gentle offshore slope.

A site is included if it has intertidal soft habitats (sandflats, mudflats, saltmarsh) and >2 km of tidal channel (estuaries and inlets), or soft shores >0.5 km wide (bays, sheltered shores).

For each selected site, information will be collected on the area between HW spring tides and to 10 m chart datum contour and on associated terrestrial habitats where these are linked by physical processes such as sediment transport (e.g. sand-dunes) or utilised by mobile fauna such as birds feeding and roosting on pastures.

To produce the draft document in the time allocated, much of the initial data collection and reviewing must be done from existing computerised and paper databases held by NCC. To incorporate relevant information not available from these central sources, however, the ER team plans to consult widely both within the NCC and with research institutes, universities and polytechnics, and other nature conservation organisations. Information may be sought on specific sites and/or more generally on activities and changes to estuaries. Such consultations will take place mainly during 1989, once initial collation of central sources has been achieved.

The role of the RSPB in estuary conservation

P.I. Rothwell, Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire, SG19 2DL, UK

The RSPB has a strategic role to play in the conservation of our estuaries and has a history of defending sites of importance at planning inquiries, in the Houses of Parliament and through attempts to influence national and international conservation legislation. Current causes for concern are barrage proposals on four important sites and marinas, road crossings and land-claim on many others.

In order to raise the profile of estuaries amongst the public, elected representatives and national and international conservation bodies, the RSPB is planning a five-year action programme aimed at the conservation of our most important sites.

It is hoped that this co-ordinated campaign will be backed by increased resources from RSPB and others and will enable a predictive and targeted approach to estuarine conservation.

The BTO estuaries programme

R.P. Prys-Jones, British Trust for Ornithology, Beech Grove, Station Road, Tring, Hertfordshire, HP23 5NR, UK

Until recently, BTO involvement with coastal habitats was almost entirely encompassed by the Birds of Estuaries Enquiry (BoEE). Over the past five years, however, the scope of BTO studies on shorebirds has expanded considerably to include both country-wide, membership-based projects complementing the standard BoEE counts and focussed investigations on particular

estuaries by full-time research staff, funded by an array of commercial companies and government bodies. Current efforts towards maximizing the utility of the Estuaries Programme data-base in both research and conservation contexts will involve continuing a high level of BoEE coverage, systemization of associated environmental information for sites covered and integration with computerized ringing, retrap and recovery information.

The Suffolk Wildlife Trust estuaries project

C. Beardall, Suffolk Wildlife Trust, Park Cottage, Saxmundham, Suffolk, IP17 1DQ, UK

The five estuaries of Suffolk provide winter feeding grounds for over 44 000 waders and wildfowl, eight species of which are present in internationally important numbers. All of the Suffolk estuaries (with the exception of the Deben and parts of the Alde and Blyth) are protected under the Wildlife and Countryside Act 1981 as Sites of Special Scientific Interest and the Stour, Orwell, and parts of the Ore qualify as both Ramsar sites and Special Protection Areas (under the EC Directive on the Conservation of Wild Birds). Despite national and international protection, Suffolk's estuaries are still threatened by many commercial and recreational activities that conflict with their long-term conservation.

In October 1987 the Suffolk Wildlife Trust initiated an Estuaries Project to study all aspects of the ecology of Suffolk's estuaries and investigate the impact of activities that may potentially affect their wildlife interest.

All relevant data gathered in the past, concerning any aspect of the Suffolk's estuaries, have now been collated and a bibliography for Suffolk compiled. Specific areas requiring further study have been identified and a programme of field research initiated. The current programme includes a detailed breeding wader survey covering all the saltmarsh and grassland associated with the estuaries, feeding counts of wader and wildfowl on the Orwell and Deben and detailed botanical and invertebrate surveys on all intertidal mudflats and saltmarsh.

We have recently produced a report on the "Wildlife and Conservation of the Suffolk Estuaries" summarising the results of the first year's research. The report assesses the environmental impact of past and present reclamation schemes, recreational schemes, recreational activities, wildfowling and punt-gunning, bait-digging, shell-fisheries, industrial and domestic discharges, oil and tributyl tin pollution, channel dredging and other dock activities. The current ecological health of the estuaries is reviewed and viable proposals for future research and management improvements are suggested.

Relationships between egg size and female body size in the Lapwing - some preliminary results

D. Blomqvist & O.C. Johansson, Department of Zoology, University of Gothenburg, PO Box 25059, S-400 31 Gothenburg, Sweden

For several shorebird species a positive, but relatively weak, correlation between egg size and female body size has been reported. In order to investigate if such a relationship exists for Lapwings *Vanellus vanellus* a study

was performed at two localities near Gothenburg on the Swedish west coast in 1988. Each study area consisted of a shallow marine bay surrounded by grazed shore meadows and arable land. Fifteen female Lapwings were trapped on the nests while incubating and the following measurements were taken: body weight, length of bill, bill-neck, tarsus and wing. Egg length and breadth were measured and mean egg volumes for each clutch were calculated. There was no difference in mean egg volume between the two localities but for all nests the variation in egg volumes was significantly larger between than within clutches. Thus, a certain female laid eggs of approximately the same size but significant differences among females existed. There was a significant positive correlation between mean egg volume and female body mass, but only 27% of the variation in egg volume was explained by this variable. When nest site habitat was incorporated in the analysis, however, 59% of the variation in egg volume could be explained by female weight. This model resulted in two significant reverse trends: a positive relationship for shore meadow breeders and a negative relationship for birds breeding on ploughed cereal fields. Due to the small sample size it is doubtful if the last trend (n=6) is a casual relationship: if the habitats are treated separately the correlation is non-significant for the birds breeding on arable land. There were no significant correlations between egg size and the other body measurements. It should be noted that laying date did not influence egg size in this study. Our results confirm that the variation in egg size is only partly explained by female body size and they also indicate differences between female Lapwings breeding in various habitats. The possible lack of correlation for females breeding on arable land implies that small females are capable of laying large eggs. It is possible that the explanation of this can be found in differences in food resources between nest site habitats or in age/experience-related factors.

Relationships between egg size and female body size in the Lapwing - some preliminary results

D. Blomqvist & O.C. Johansson, Department of Zoology, University of Gothenburg, PO Box 25059, S-400 31 Gothenburg, Sweden

For several shorebird species a positive, but relatively weak, correlation between egg size and female body size has been reported. In order to investigate if such a relationship exists for Lapwings *Vanellus vanellus* a study was performed at two localities near Gothenburg on the Swedish west coast in 1988. Each study area consisted of a shallow marine bay surrounded by grazed shore meadows and arable land. Fifteen female Lapwings were trapped on the nests while incubating and the following measurements were taken: body weight, length of bill, bill-neck, tarsus and wing. Egg length and breadth were measured and mean egg volumes for each clutch were calculated. There was no difference in mean egg volume between the two localities but for all nests the variation in egg volumes was significantly larger between than within clutches. Thus, a certain female laid eggs of approximately the same size but significant differences among females existed. There was a significant positive correlation between mean egg volume and female body mass, but only 27% of the variation in egg volume was explained by this variable. When nest site habitat was incorporated in the analysis, however, 59% of the variation in egg volume could be explained by female weight. This model

resulted in two significant reverse trends: a positive relationship for shore meadow breeders and a negative relationship for birds breeding on ploughed cereal fields. Due to the small sample size it is doubtful if the last trend ($n=6$) is a casual relationship: if the habitats are treated separately the correlation is non-significant for the birds breeding on arable land. There were no significant correlations between egg size and the other body measurements. It should be noted that laying date did not influence egg size in this study. Our results confirm that the variation in egg size is only partly explained by female body size and they also indicate differences between female Lapwings breeding in various habitats. The possible lack of correlation for females breeding on arable land implies that small females are capable of laying large eggs. It is possible that the explanation of this can be found in differences in food resources between nest site habitats or in age/experience-related factors.

Long-term number fluctuations of Curlew Sandpiper on southern Baltic

Jadwiga Gromadzka, Ornithological Station,
80-680 Gdansk 40, Poland

Curlew Sandpipers *Calidris ferruginea* appear regularly at the Baltic during their autumn migration, although this region is on the periphery of their main migration route. Underhill (1987) and Summers & Underhill (1987) have studied long-term fluctuations in the age structure of Curlew Sandpipers wintering in Southern Africa and from that have estimated breeding success.

Study area. For many years Curlew Sandpipers have been ringed in the area of southern Baltic in Sweden on the Oland Island (Ottenby, 56°22' N, 16°24' E) and in Poland at the Gulf of Gdansk (Vistula mouth, 54°20' N, 18°56' E). Birds have been caught in walk-in traps almost every year. In the years 1969-86 1 450 Curlew Sandpipers were ringed at Ottenby and 1 476 at the Vistula mouth.

Main question: do results of trapping at any site on the migration route reflect fluctuations in the age structure of the wintering population?

Results. The percentage of juvenile Curlew Sandpipers trapped during autumn in Poland and Sweden varies between years. The pattern of these changes is similar to that recorded in South Africa for most years ($r = 0.48$, $p = 0.07$ for Poland-S.Africa and $r = 0.79$, $p = 0.003$ for Sweden-S.Africa). In some years, however, estimates for these three localities differ greatly. The percentage of juveniles at migration sites is usually higher than at the wintering site. Why? Perhaps this reflects different preference for migration routes by juveniles and adults?



KNOT GAINS WEIGHT DURING FLIGHT FROM WEST AFRICA TO EUROPE

Theunis Piersma

On 1 May 1988 Piet Duiven and Meinte Engelman captured a Siberian Knot *Calidris canutus canutus* with a clapnet in the village of Iouik, Banc d'Arguin, Mauritania. The bird weighed 154 g and was ringed with Paris M6050. On 14 May, before departure from the Banc d'Arguin, it weighed 99 g. After the flight to the Netherlands, where it arrived on 19 May it weighed 121 g. It had gained more than 20 g! There surely have been few Knots, or indeed other migrant waders, who gained 20 g during a 4 500 km long flight (see Figure 1)!

Of course, the weight pattern of this Knot was exceptional for good reasons. After capture it was taken into captivity (in a cage measuring 1.5 x 3 x 1.5 m, which it shared with 6 Turnstones *Arenaria interpres*), and it initially lost more than 50 g while adapting to the new food (trout pellets) and life in confinement. Before departure from Iouik, it had reached a weight as low as 99 g, and therefore it was decided to feed the birds en route. During the actual transport in especially adapted, well aerated, wooden bird-boxes the birds were not fed. However (unbeknown to the hotel managers!), the birds spent the nights in bathrooms at the stopover sites. One night was spent in Sabah Nouadhibou (3 cm water in the bath, with an *ad lib* food supply), another night in a hotel in Las Palmas! Having safely arrived in The Netherlands the Knot was weighed again: 121 g! It is now living with conspecifics in a large cage at the Zoological Laboratory in Haren. Figure 1 makes clear that the weight gain during transport nicely parallels a corresponding weight increase of free-living con-specifics in the Wadden Sea.

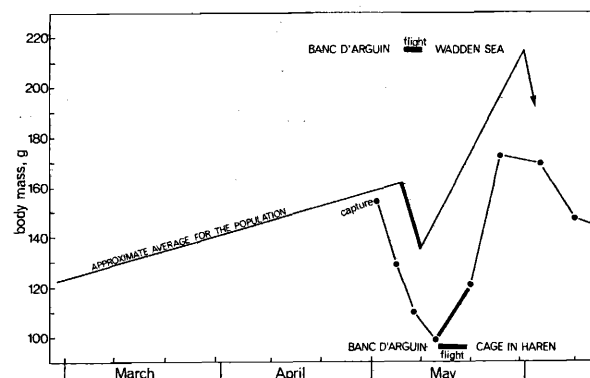


Figure 1. Weight changes of a captive Siberian Knot (dots) during its simulated migration from Mauritania to The Netherlands in spring 1988. For comparison the approximate weight changes of the free-living Siberian Knots on the Banc d'Arguin and in the Wadden Sea are also shown (data from Piersma, Bredin & Prokosch in prep.).

(This work is part of the research carried out by Theunis Piersma of the Zoological Laboratory, University of Groningen, on the feeding ecology, energetics and migrations of the two subspecies of Knots visiting the Wadden Sea. The work is carried out with the required (e.g. transport) licenses.)

Theunis Piersma, Gasthuistraat 32, 1791 GL, Den Burg, Texel, The Netherlands.