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Brown, A.F. & Shepherd, K.B. 1991. Breeding birds of the south Pennine moors. *JNCC Report* No. 7, Peterborough.

This report presents the results of an extensive survey of breeding moorland birds carried out in 1990 in the English Pennines south of Skipton and covering approximately 725 kilometre squares of unenclosed moorland. A method standardising the amount of time spent in each kilometre square was used to count 29 species, including seven breeding waders species.

Data are presented as tables and in summary maps, accompanied by species texts drawing together any available historical data. A general discussion reviews the conservation significance and protected status of the birds and moorland habitats surveyed. General trends in numbers and the possible significance of recreational disturbance are also considered.

This is a useful report in that, unlike many other similar surveys which have only surveyed small selected plots, it covers all suitable habitat within an extensive area and can therefore be used to identify and contrast areas of relatively high and low ornithological importance.

Brown, A.F. 1991. An annotated bibliography of moorland breeding bird and breeding wader surveys, 1970-1990. *JNCC Report* No. 8, Peterborough.

This useful report brings together for the first time a comprehensive summary of the large number of extensive surveys of breeding waders (and for moorland areas other key species) that have been carried out in the United Kingdom since 1970. Although the results of some of these surveys have been properly published, most have been presented only as limited circulation reports and are thus largely unknown or unavailable for general study.

Over 200 reports and papers are covered with a brief note on the type of data obtained, summary population estimates for principal species and any relevant habitat information. Maps, copied from the original reports, are appended to show the locations of the main areas surveyed. Some additional data on dates and frequency of visits are also included along with a selection of breeding wader density data.

Whilst this report is an important reference point for anyone interested in British breeding waders, it also uncomfortably highlights the fact that a considerable volume of potentially valuable data remains unpublished and unavailable, in which respect this reviewer is as guilty as any!

Len Campbell

Both reports are available from Biotopes Branch, Joint Nature Conservation Committee, City Road, Peterborough PE1 1JY, UK.

Flying in the face of reason

Bird migration is a puzzling phenomenon - why, for example, do some coastal birds traverse half the world whereas their conspecifics migrate only a fraction of this distance. New Dutch studies (Piersma *et al.* 1991, Zwarts *et al.* 1990a, b; Swennen 1990, Klaasen *et al.* 1990; Piersma & Jukema 1990; Zwarts & Dirksen 1990; Zwarts 1990; Zwarts & Blomert 1990) have now determined the costs and benefits of different migration strategies by examining the same species at different latitudes. They show how an understanding of prey selection and energetics is necessary to explain why birds winter in tropical rather than temperate regions, and how the timing of migration depends upon the subtleties of the behaviour of the tropical prey.

Over the past two decades, Dutch ornithologists have carried out detailed observations on waders in the Wadden Sea which, with an annual peak count of two million waders, is the most important mudflat in Europe. Although some waders winter on the Wadden Sea, many of the birds present during spring and autumn spend the winter on the Banc d'Arguin, an area of tidal mudflats in Mauritania, West Africa. The Banc d'Arguin holds over two million waders, which is more than a third of the waders that use the estuaries of the East Atlantic. In some species different populations or subspecies winter at these very different latitudes (Piersma *et al.* 1991). For several years the researchers from the Wadden Sea have also migrated south to study the consequences of wintering in the tropics compared with staying in temperate latitudes, and a recent volume of *Ardea*, "Homeward Bound", is devoted to their results[1].

The traditional explanation for migrating south is that the winter food supply is higher in the tropics. Early work (Engelmoer *et al.* 1984) showed however that, contrary to all expectations, there is a remarkably low density of prey at the Banc d'Arguin yet a high density of wading birds. The more detailed surveys (Zwarts *et al.* 1990a) confirm that a low standing crop of food is present and that the bird densities are atypically high, almost four times greater than the average for temperate wintering areas. The estimated consumption of invertebrates by birds over the winter exceeds the standing crop.

[1] Ens, B.J., Piersma, T., Wolff, W.J. & Zwarts, L. (eds.). 1990. *Homeward Bound: Problems waders face when migrating from the Banc d'Arguin, Mauritania, to their northern breeding grounds in spring.* Special edition of *Ardea* 78 (1/2). 364pp. ISBN 9070202.

The paradox of this imbalance can be resolved by considering the diet (Zwarts *et al.* 1990a). Almost all bird species at the Banc d'Arguin feed on remarkably small prey; for example, for a range of wader species, the average mass of worms taken is 3-10 times lower than that of the smallest worms taken in Europe. As such small prey can have a much faster turnover, a low standing crop can sustain the high consumption. The striking exception to this pattern is the Giant Bloody Cockle *Anadara senilis*, which is eaten by Oystercatchers *Haematopus ostralegus* (Swennen 1990): the fresh mass of a Giant Bloody Cockle can equal that of an Oystercatcher.

If waders at the Banc d'Arguin have to feed on small prey from a low standing crop, why should they fly so far to feed there? One of the main advantages of migrating south is that in the warmer climates less energy is expended in temperature regulation. From environmental measurements, the thermostatic costs for a Knot *Calidris canutus* in West Africa were estimated at half the costs of a bird on the Wadden Sea (Piersma *et al.* 1991). And studies (Castro 1989) of Sanderling *Calidris alba* in a range of sites show that the energy requirements vary markedly between latitudes. For instance, in Panama energy requirements were estimated at twice basal metabolic rate, but in New Jersey this value was about double again.

The daily energy expenditure of a range of captive birds in the Banc d'Arguin, measured using doubly labelled water (Klaasen *et al.* 1990), indicated that, when corrected for thermoneutral conditions, the maintenance metabolic rate is on average 42% higher for birds wintering in the Wadden Sea than for those wintering in the Banc d'Arguin. It seems moreover that birds do not adjust their expenditure according to local conditions. In some species, such as Turnstone *Arenaria interpres*, different populations winter at different latitudes. Three Mauritanian Turnstone were flown to the Netherlands and kept with three captured during winter in the Wadden Sea (Klaasen *et al.* 1990). The birds from the tropical wintering grounds maintained a lower daily energy expenditure (158 kJ d^{-1}) than did those from the temperate site (215 kJ d^{-1}), and the differences in metabolism were maintained in the captive birds when re-measured over a year later. Such persistent differences will restrict the ability of birds to change wintering grounds and are likely to have consequences for the range of habitats that they can use at other times of the year.

One effect of the low density of prey seems to be a reduction in the birds' ability to gain the fat and protein necessary to migrate north in the spring. A review of all the measurements of mass gain in waders demonstrates that the rate of gain is usually much lower in birds departing from tropical wintering areas than for the temperate sites (Piersma & Jukema 1990). And studies (Zwarts & Dirksen 1990; Zwarts 1990; Zwarts & Blomert 1990) of Whimbrels, *Numenius phaeopus*, show how their spring migration schedule is intimately geared to the annual cycle of their tropical prey species. The main prey of Whimbrel in the Banc d'Arguin is the Fiddler Crab *Uca tangeri*, which the birds usually capture either by dashing at the crabs that are feeding too far from their burrows or by standing motionless above a crab burrow waiting for the inhabitant to emerge. From late March onwards, during spring tides, the crabs leave their burrows to form herds at low water and, with no burrows to retreat into, they can easily be caught.

In the spring the Whimbrels must start gaining the stores of fat and protein necessary to fuel their migration to the European staging areas, but they cannot start increasing in weight until the switch in crab behaviour at the end of March. So the timing of fat accumulation is dictated by the prey (Zwarts & Dirksen 1990). The activity of the crabs is dependent upon the lunar cycle, and this work suggests that the time at which birds can start increasing in mass will vary from year to year. This is likely to affect the date at which they can depart. In accordance with this idea, the variation in date at which Whimbrel arrive in the Netherlands was found to be positively correlated with the timing of the lunar cycle.

Once the Fiddler Crabs have formed herds the Whimbrel are able to feed at a high rate, consuming 2-3 mg s^{-1} ash free dry mass over short periods. But the amount the birds can consume is constrained by the indigestible exoskeletons of the crabs which act as a digestive bottleneck (Zwarts 1990; Zwarts & Blomert 1990). As a result they have to pause for digestion and the maximun crude intake is then reduced to 1 mg s^{-1}, which means that they can only increase their body mass by 1.1% d^{-1}. With this slow rate of mass accumulation they cannot gain sufficient reserves to fly to their European stopover sites before the end of April.

Most of these wading birds breed in the Arctic and the work described in the *Ardea* volume "Homeward Bound" illustrates how the birds are dependent upon a combination of tropical, temperate and arctic regions. The populations of many species of waders breeding over a vast area of tundra can only persist because of the capacity of the Banc d'Arguin to sustain the high concentrations of wintering birds. Conversely, the studies show that the slow rate of fat accumulation in the Banc d'Arguin, combined with the need to replenish reserves again in temperate areas, means that this tropical wintering area is most suitable for birds which breed in the high Arctic where it is possible to breed only during a short, though intense, season (Drent & Piersma 1990).

Although many birds winter in the productive estuaries of Europe, these sites are even more important as intermediate fattening grounds in which birds can replenish the reserves that enable them to continue their migration between Arctic breeding grounds and tropical wintering sites. The Wadden Sea and the estuaries of Britain are by far the most important European staging areas. Unfortunately much of the intertidal habitat of the European estuaries has already been destroyed and a large proportion of the remainder is threatened; of the internationally important estuaries in Britain, over 50% face further habitat loss by direct land claim (Davidson *et al.* 1991). At the moment the Arctic breeding grounds and tropical wintering grounds seem relatively safe. But it remains to be seen whether there is the commitment to conserving the European estuaries.

William J. Sutherland

REFERENCES

Castro, G. 1989. *Ecophysiology of sanderling migrating to four different latitudes.* Thesis Univ. Pennsylvania, Philadelphia.

Davidson, N.C., Laffoley, D.d'A.,Doody, J.P., Way, L.S., Gordon, J., Key, R., Drake, C.M., Pienkowski, M.W., Mitchell, R. & Duff, K. 1991. *Nature conservation and estuaries in Great Britain.* NCC, Peterborough.

Drent, R. & Piersma, T. 1990. An exploration of the energetics of leap-frog migration in Arctic breeding waders. In Gwinner, E. (ed.) *Bird Migration* Springer-Verlag, Berlin Heidelberg. pp399-412.

Engelmoer, M., Piersma, T., Altenburg, W. & Mes, R. 1984. The Banc d' Arguin (Mauritania). In Evans, P.R., Goss-Custard, J.D. & Hale, W.G (eds.) *Coastal waders and wildfowl in winter.* CUP, Cambridge. pp293-310.

Klaassen, M., Kersten, M. & Ens, B.J. 1990. Energetic requirements for maintenance and premigratory body mass gain of waders wintering in Africa. *Ardea* 78: 209-220.

Piersma. T. & Jukema. J. 1990. Budgeting the flight of a long-distance migrant: changes in nutrient reserve levels of bar-tailed godwits at successive spring staging sites. *Ardea* 78: 315-338

Piersma, T, Drent, R and Wiersma, P. 1991. Temperate versus tropical wintering in the world's northernmost breeder, the knot: metabolic scope and resource levels restrict subspecific option. *Acta XX Congr. Int. Ornithol.* Christchurch. Pp 761-772.

Swennen, C. 1990. Oystercatchers feeding on giant bloody cockles on the Banc d' Arguin, Mauritainia. *Ardea* 78: 53-62.

Zwarts, L., Blomert, A.-M., Ens, B.J., Hupkes, R. & Van Spanje, T.M. 1990a. Why do waders reach high feeding densities on the intertidal flats of the Banc d'Arguin, Mauritania? *Ardea* 78: 39-52.

Zwarts, L. & Dirksen, S. 1990. Digestive bottleneck limits the increase in food intake of whimbrels preparing for spring migration from the Banc d' Arguin, Mauritania. *Ardea* 78: 257-278.

Zwarts, L. 1990. Increased prey availability drives premigration hyperphagia in whimbrels and allows them to leave the Banc d' Arguin, Mauritania in time. *Ardea* 78: 279-300.

Zwarts, L. & Blomert, A.M. 1990. Selectivity of whimbrels feeding on fiddler crabs explained by component specific digestibilities. *Ardea* 78: 193-208.

Zwarts, L. Ens, B.J., Kersten, M. & Piersma, T. 1990b. Moult, Mass and flight range of waders ready to take off for long-distance migrations. *Ardea* 78: 339-364.

MAJOR DECLINE SUSPECTED IN WINTERING WADERS IN THE UK

Preliminary analysis has indicated that, in the 1992/93 winter, waders of several species were present in lower numbers than for many years. Of the ten species examined, seven had declined since the previous year, with three showing a January index of more than 20% below the corresponding figure of the previous year (Dunlin and Sanderling had declined by 26% and Curlew by 21%).

Curlew and Redshank had reached an index level in January 1993 that was lower than at any time since 1987. Knot and Oystercatcher indices were up around 10%, with Knot reaching its highest value since 1972.

These initial calculations will be refined by using the more sophisticated Underhill index and the full report of the result of the Birds of Estuaries Enquiry (now part of the Wetland Bird Survey) for both the 1991/92 and 1992/93 winters will appear in a future issue of this *Bulletin.*

Ray Waters, WeBS National Organiser

WADER WORKING GROUP IN HUNGARY

The Hungarian Wader Working Group was formed in 1991 with several aims. Its principal objective was to keep in continuous contact with those Hungarian birdwatchers with an interest in waders. Additionally the Group has the objective to bring together and disseminate information on waders circulatuing in both Hungary and other countries. Our journal, named *Partimada'r* (*Wader*) appears twice a year, and contains news, information of recent records, studies on migration, behaviour and monitoring. Ecological studies have started to become more wise-spread in Hungarian wader research, which is a new trend. Members of the Group take part in the monitoring of breeding wader populations, and a new Pied Avocet study will be started in 1994. The Group is also contributing to the Slender-billed Curlew project managed by BirdLife International.

Our future aim is to collaborate more closely with specialists and organisations in neighbouring countries so as to contribute to each other's projects. As for almost every organisation, both in eastern and western Europe, our Group needs help in future work. Anyone who is interested in the Group, our work or journal should contact György Szimuly, H-2890 Tata, Vértesszölösi Út 7., Hungary.

György Szimuly