Abstracts of wader theses

As a means of disseminating information about important new wader studies well in advance of formal publication, this series features abstracts from recent wader theses (bachelors, masters and doctoral). Thesis authors are invited to submit abstracts to the editor.

The foraging ecology, demographics and conservation of African Black Oystercatchers *Haematopus moquini* in Namibian nursery areas

(2001, M.Sc. thesis, Percy FitzPatrick Institute of African Ornithology, University of Cape Town, South Africa)

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The African Black Oystercatcher *Haematopus moquini* is one of the world's rarest and most range-restricted oystercatcher species: its global population stands at less than 5,000 individuals. African Black Oystercatchers are susceptible to human disturbance during the breeding season and are facing ever-increasing pressure from rapid coastal development. In 1998, the first juvenile oystercatcher nursery was discovered at Walvis Bay/Swakopmund, Namibia. The discovery of three additional nurseries in Namibia (two near Lüderitz and one at the Hoanib River mouth) and one in Angola (Baia dos Tigres) soon followed. They are all located outside (to the north of) the adults' breeding range and together support about 400 juveniles. Re-sightings of colour-ringed birds show that the nurseries include juveniles from all parts of the breeding range, though birds from Eastern Cape Province are under-represented at Walvis Bay/Swakopmund. Juveniles ringed as chicks in southern Namibia were also infrequent in their occurrence at Walvis Bay suggesting that they mainly utilise nurseries close to their natal sites, such as those near Lüderitz. This may mean that South African juveniles, having further to travel and arriving later in Namibia, must continue to nurseries further north. Juveniles first arrive at nurseries in May/June and by winter (Aug/Sep) numbers are highest. Primary moult patterns have been identified as an ageing tool for immatures and moult patterns in winter indicate that 50% of the Walvis Bay roost comprises first-year birds. A minimum of two years is spent at a nursery, whereupon some 2 year old birds and all 3 year old birds that have remained return to natal sites in early summer (the start of the breeding season). Re-sightings of colour-ringed juveniles suggest that 42% of South African juveniles disperse to a nursery. The remainder undertake short-distance movements (usually <150 km) and remain near natal sites. These juveniles are scattered along the coast and do not form discrete nurseries. I have been unable to find an equivalent example of a dichotomous post-fledging dispersal pattern in any other wader species. Neither body condition at fledging (hypothesis: only larger juveniles have enough of an energetic "cushion" to migrate to nurseries) nor hatching date (hypothesis: later-fledged juveniles are forced to migrate to nurseries because habitats near natal sites are already filled with older juveniles) were significantly different between short- and long-distance dispersers.

Research was carried out at the Walvis Bay/Swakopmund nursery during four visits between Aug 1999 and June 2000. The aim was to quantify seasonal and tidal patterns of habitat use and responses to changes in prey abundance, and to investigate whether nurseries provide favourable foraging conditions and high energetic returns for juvenile oystercatchers. In contrast to adults, juveniles at Walvis Bay displayed a wider dietary spectrum. Moreover foraging activity was opportunistic and in response to local changes in prey abundance and availability. A large proportion of their prey is washed up and therefore available at all stages of the tidal cycle. At Swakopmund, however, foraging activity followed a strict tidal regime. Habitat diversity was low and birds moved little between areas in response to prey abundance.

Focal animal observations revealed seasonal fluctuations in intake rates – most pronounced at Walvis Bay, where prey density correlates with the intensity and duration of wash-up events. At both sites, daily energy intake (DEI) compares well with DEI predicted for the African Black Oystercatcher by allometric equations relating DEI to body mass. At Swakopmund, nocturnal foraging was observed and diurnal intake rates were similar to those attained by adults in the breeding range. At Walvis Bay, non-tidal foraging allowed oystercatchers to meet energy demands during daylight hours. It is therefore very unlikely that they fed at night. Attempts were made to prove this, but with the night-viewing equipment available, this could not be established for certain. At this site, diurnal foraging activity peaked in the early morning and late afternoon and evening. The midday period was spent roosting, regardless of tidal state, and birds generally returned to the roost soon after sunset. Observations of colour-ringed birds showed no evidence of an age-related dominance hierarchy at the nursery. Intra-specific kleptoparasitism was infrequent, suggesting that feeding conditions at the nursery were not conducive to successful food stealing. Cape Gulls *Larus novaehollandiae* did on occasion steal prey from oystercatchers but for the majority of the study these losses represented less than 1% of oystercatcher intake rates.

Generally it appeared that the Walvis Bay/Swakopmund nursery provides a favourable environment for inexperienced juvenile African Black Oystercatchers. Foraging habitats are abundant, offering diverse prey items that are accessible and easily handled. Because nurseries are located outside the breeding range, there is no competition from adults and juveniles are able to improve their foraging efficiency without interference. There was no evidence that the Walvis Bay/

Swakopmund nursery was at carrying capacity. Stretches of rocky coast, with abundant food, between Swakopmund and Walvis Bay are under-utilised by oystercatchers and provide an important resource should primary foraging areas fail. If conservation measures to boost oystercatcher productivity that have been implemented in the South African breeding range are successful, more juveniles may migrate to utilise the nurseries in future.

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The ecology of Golden Plovers *Pluvialis apricaria* in the Peak District

(1999, PhD thesis, University of Manchester, UK)

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The pre-breeding distribution of Eurasian Golden Plovers *Pluvialis apricaria* around Snake Summit in the Peak District, UK, was positively associated with *Eriophorum* cover. Such areas were favoured for nesting, and may support high densities of prey for young chicks. Older chicks tended to move to areas with more *Empetrum* or *Vaccinium* cover. This was associated with an increase in the exploitation of caterpillars. The most important food for chicks was tipulid larvae, comprising about 70% of the diet. These appeared to be readily available along the eroded track of the former Pennine Way, where high densities of breeding pairs were distributed. No evidence was found to suggest that disturbance associated with the Pennine Way negatively affected Golden Plover distribution or breeding success.

Predation rates of nests appeared high, particularly during laying, resulting in a 61% nest failure rate. Chick mortality was 68% during the first 8 days after hatching. Most deaths were due to starvation or exposure, and survival was dependent upon hatching size and weather. Subsequent chick survival was greater, and 18% of chicks fledged in an average of 37 days. Reproductive output appeared sufficient to balance adult mortality during the study.

During incubation, off-duty adults 'commuted' to pasture to feed. Males fed at night on areas about 2.5 km from the nest. Females, feeding during the day, flew to different fields about 6.9 km from the nest. Tipulid larvae were the main prey, and birds selected fields with the greatest tipulid biomass. Sward height significantly affected field use, with adults favouring fields with less than 5 cm of grass, and avoiding those with greater than 10 cm sward height. Flocks demonstrated faithfulness to certain fields from year to year, and within a season.

The Golden Plover population around Snake Summit appeared to be regulated by a density-dependent mechanism. However, the population tended to decline after severe winters, suggesting that adult mortality rates in cold weather can have a significant impact upon population size.

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Behavioural ecology of Oystercatchers (*Haematopus ostralegus*) – risks and opportunities for a shorebird in inland habitats

(1998, PhD thesis, University of Cologne, Dept. of Zoology, in cooperation with the Institute of Avian Research "Vogelwarte Helgoland", Wilhelmshaven, Germany)

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Colonisation of new areas is a fundamental mechanism of the evolution of life. In recent centuries, several animal and plant species have expanded their ranges from their original, natural habitats into areas dominated by human activity. Species moving from tidally influenced coastal regions into non-tidal inland habitats, like the Oystercatcher, are of special interest. The Oystercatcher, a typical shorebird, has enlarged its breeding area significantly into inland regions in Europe during recent decades. Nevertheless, inland breeding Oystercatchers spend only part of the year in those habitats. They still spend the winter in coastal or estuarine areas. Therefore, those birds have to change their diet composition and must adapt their behaviour and activity pattern to tidal or non-tidal habitats twice a year.

Behaviour patterns, especially feeding ecology and time-budgets of inland breeding Oystercatchers, were examined by direct behavioural observations of individually marked birds, radio-tracking with automatic recording of feeding activity, radio-controlled nest balances and comparative determination of prey abundance using soil samples. Energy budgets were calculated on the basis of literature data from studies of Oystercatchers breeding on the coast, to assess possible benefits or disadvantages of typical ecological situations in inland habitats.

The study was performed in the lower Rhine area between the cities of Rees and Emmerich (Northrhine–Westphalia) in Germany, about 130 km from the North Sea coast. Within the study area of 55 km^2, 22–28 breeding pairs of Oystercatchers were recorded per year between 1992 and 1995. By means of individual marking with coloured rings, the fate of individuals and breeding pairs was observed over several years. From records of ringed birds from outside the study area, assumptions about the wintering areas were made: adult birds were found in the Dutch delta region, whereas young, non-breeding birds migrated further west to estuaries in northern France.

The breeding birds stayed in the study area from the end of February until the beginning of August, eggs were found from the end of April until the end of June, mainly on maize and sugar beet fields. Breeding success ranged between 0.1

and 0.3 young per pair and year. The majority of breeding failures was caused by predation of eggs and chicks, often by corvids. Field cultivation and insufficient food availability during chick rearing were further reasons for unsuccessful reproduction for some pairs. Only from eggs laid early in the season (end of April–beginning of May) were pairs able produce viable offspring, i.e. young birds that could be observed until they migrated from the study area.

Oystercatchers breeding on the coast are active during day and night, as is known from the literature, whereas the birds in the inland study area were active only during daylight. They spent the night inactive at roosts, predominately on the banks of the river Rhine. Nocturnal brooding was performed almost exclusively by males. During daytime, females incubated approximately 60% of the time, a figure also found in coastal breeding Oystercatchers. The reason for inactivity at night may be a higher predation risk from land-predators such as foxes or martens. Incubation of the eggs by only one bird during the night reduces conspicuous activity on bare or only sparsely vegetated arable fields.

The temporal pattern of feeding activity was highly variable during daylight hours, but no feeding activity was recorded during the night. The total time spent feeding per day depended on prey availability. On pasture, with a high earthworm abundance, Oystercatchers were observed foraging for an average of 5.4 hours (n = 10 days) of the daylight period. Later in the season, when earthworm availability was reduced due to dry weather conditions, individuals foraging on macrozoobenthos on the banks of the river Rhine expanded their feeding time to an average of 12 hours per day (n = 10 days). This arose because smaller prey items were taken that required a much longer handling time. During the incubation period, Oystercatchers in the lower Rhine area spent on average 23% of the daylight period foraging. This figure increased to 38% during chick rearing, because food for the young was collected by the adults as well for themselves. All these figures were highly variable, and depended on the quality of each territory (i.e. availability of food) in a specific year, as well as weather and farming activities.

On grassland and pasture, prey density, i.e. earthworms (*Lumbricidae*) and leatherjackets (*Tipula* sp.), was correlated with the amount of precipitation. Earthworms were the predominant food source for the Oystercatchers and it is suggested that their abundance in the upper soil layers (which depends on the weather) is a limiting factor in breeding success. Other prey organisms like fresh-water molluscs were only used as supplementary food, depending on their spatial and temporal availability. Energy budgets, estimated on the basis of time-budgets and feeding intake rates, demonstrated that the energy expenditure for reproduction of inland breeding Oystercatchers is of the same order of magnitude as coastal breeders.

In summary: the colonisation of inland habitats during the breeding season was accomplished by Oystercatchers without major behavioural change. Where endogeic invertebrates like earthworms or insect larvae were available, Oystercatchers foraged on them using a similar feeding technique to that used for polychaetes on intertidal mudflats. However, inland breeding Oystercatchers changed their daily activity pattern to predominately daytime activity, compared to birds living in coastal habitats with typical tidal activity patterns.

The advantage of the colonisation of inland breeding habitats for Oystercatchers is probably the opportunity it affords to occupy a breeding territory more quickly and to start breeding earlier in an individual's lifetime than in coastal habitats where there is a significantly higher density of territories. Occupation of a high quality breeding territory in coastal habitats requires a waiting period of several years and a much higher expenditure in aggressive behaviour. The disadvantage of the inland territories within the study area is the unpredictable availability of food during the breeding, especially the chick-rearing period. At inland sites, the opportunity to start reproduction as a younger bird may enable an Oystercatcher to achieve a higher overall reproductive output within its lifetime. Inland territories, however, are more affected by farming activities and predators than coastal habitats, especially islands. Future studies may show whether inland habitats that are used for intensive agriculture are suitable to sustain populations of shorebirds like Oystercatchers

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