Group in the UK of between 100 and 500 godwits). Like those reported by Stanyard the affected birds were found to be sitting down in the keeping cages even though these were high enough for the birds to stand. Although most gradually improved after release one bird did not recover and the fate of several others is uncertain.

The main difference between this and other godwit catches was the length of time taken in covering the birds after firing the net. (Only 5 of a team of eleven people were immediately available and the covering material was located about 200 metres from the net.) Further differences were that the leading edge of the net reached the sea, necessitating lifting ashore (the large UK catches of godwits have been on fields) and a larger mesh size which allowed the birds greater freedom to struggle so they became more entangled in the net than usual. However, the birds were extracted reasonably quickly from the net and banding (ringing) and processing proceeded expeditiously in warm (25°C) dry conditions.

This experience supports earlier conclusions, including those of van Heerden (1977). In particular they suggest that (a) 'straining' is the prime cause of 'cramp'. Minimising this during and after capture is the most important potential remedy; (b) the condition has probably taken effect before the birds are placed in keeping cages. (Tall keeping cages are not therefore considered a total remedy although they probably help recovery and reduce the chance of further development of the condition which might occur if the birds strained against the confines of small low cages); and (c) it is vital that birds which exhibit cramp on release are not immediately recaptured and replaced in keeping cages. Chances of recovery are probably maximised if the birds are left to recover quietly and gradually without further harrassment. Subsequently someone walking slowly on the down-wind side of the bird may help provide the extra stimulus for final recovery - the bird making the effort to fly off. The presence of other normal birds being released and flying away near cramped birds seems to encourage the recovery process.

## SOME CONCLUSIONS

One can conclude from these notes that waders prone to capture myopathy (Curlew, Whimbrels Numenius phaeopus, Bar-tailed Godwits and perhaps certain other long-legged species) must be extracted from the net (cannon or mist) in which they are captured as rapidly as possible and transferred to tall (so the birds can stand) hessian (or similar cloth) cages where the light is subdued but not so dark that the birds crouch. If the extraction time from a cannon net is to exceed a few minutes the catch must be covered immediately with lightweight dark cloth which subdues the birds and reduces their efforts (straining and struggling) to escape. Also generally, but particularly if birds are showing signs of cramp, release should be considered as an important part of the ringing process and should not be left to an unsupervised inexperienced member of the team.

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Dr. C.D.T.Minton, 45 Bodenham Road, Hereford, England. (Temporary address: 19 Mary St., Melbourne, Victoria 3193, Australia.)

G.H.Green, Windy Ridge, Little Comberton, Pershore, Worcs. WR10 3EW, England.

## THE EFFECT OF THE HARD WINTER OF 1978/79 ON THE WADER POPULATIONS OF THE YTHAN ESTUARY

(Abstract of contribution to the WSG Nottingham Meeting)

by Stephen Baillie

The 1978/79 winter was the most severe since that of 1962/63, with 45 days on which the soil was frozen at a depth of 5cm. Soil temperatures have been taken as an index of weather conditions as many Ythan waders supplement their food intake by field feeding over the high tide period in mid-winter. Unfortunately mud temperatures from the estuary are not available. The cold weather came in two prolonged spells, one in the first half of January and the second from late January to mid February. Towards the end of the first of these spells a heavy mortality of a number of bird species was recorded on the Ythan estuary by means of beached bird surveys. Further slightly less severe mortality was recorded from then until late February. The worst effected species were Redshank Tringa totanus and Oystercatcher Haematopus ostralegus with 55 and 38 respectively found dead in January and February. These figures represent about 7% of the December count totals for these species. This must be taken as a minimum estimate as it is unlikely that all those birds which died were found.

Weights and subsequent carcass analysis of the birds found dead indicated that they had died of starvation. Redshank showed highly significant decreases in fat, water and lean dry weight when compared with a sample of birds collected in the autumn. The only parameters showing no significant decrease were gut weight and the lipid indices for liver and kidney. The liver lipid values probably indicate that metabolism was still taking place there at the time of death.

Estuary counts made during the 1978/79 winter and comparison with counts for previous years indicated that many birds which did not die left the area during the cold spell and returned subsequently. Ringing recoveries showed two Redshank movements south, one to the Firth of Clyde and one to North Berwick. Redshank numbers in March had not fully recovered from the cold weather, being lower than in the previous four years. Oystercatcher numbers had fully recovered by March, and were in line with the steep trend of increase which has been apparent over the last ten years.

Amongst both Redshanks and Oystercatchers found dead there was a higher proportion of young birds than in autumn cannon-netted samples. The proportion of first year Redshank on the Ythan in autumn was about 40% which is relatively high compared with other sites. Considerable confidence may be had in this figure as it is based on consistent results from three fairly large cannon-netted samples. Spring trapped samples of Redshank on the Ythan and at Fraserburgh, a rocky shore site in N.E. Scotland, contained very few young birds, suggesting that the majority of first year birds had died during the cold spell. Weights of first year Redshank in autumn were about 10g lighter than those of adults, suggesting that a difference in condition at the beginning of the winter might be responsible for the differential mortality. However carcass analysis of an autumn caught sample of Redshank revealed no difference in the fat and water content of adults and juveniles, but a significant difference in lean dry weight. It is not known which component of lean dry weight was involved except that it was not the pectoral muscles. It seems likely that the difference in mortality might be due to differences in foraging ability between young birds and adults, and this possibility now requires to be investigated.

The full results of this study are currently being prepared for publication. The work was carried out jointly with Chris Spray who helped with the field work and Nick Davidson who carried out carcass analysis. We are grateful to all those who helped with counting and cannon-netting.

Stephen Baillie, Culterty Field Station, Newburgh, Ellon, Aberdeenshire, AB4 0AA, Scotland.

## WADER RINGING ON THE SEWAGE FARMS OF MÜNSTER, FEDERAL REPUBLIC OF GERMANY

by OAG Münster

For more than 11 years waders have been ringed at Münster sewage farms. The habitat for waders has changed during this period. The object of this report is to give brief descriptions of the area and of the study of waders there.

### The Site

Münster sewage farms were established around 1900. They are situated on flat land at the edge of the town. In the early years following their establishment the sewage was often used to fertilize the soil of the fields and only temporary spots of open water and mud appeared. The supply of water increased after 1962; simultaneously the area used for purification was enlarged and the water was often held in one hectare basins at a depth of 5 to 20 cms. Permanent water and mud-filled ponds were present in every season after 1965. The site reached its maximum size in 1969 and 1970 when sewage was distributed over an area of about 600 ha; about 240 ha were constantly flooded.

The sewage farms are a mosaic of small ponds separated by small dykes and roads. The roads give a view of nearly all the ponds in the farms, even from a car. The opportunity of watching birds from a car has proved to be very popular and several thousand ornithologists visit the sewage farms annually. The roads also facilitate field studies of waders. Various plants grow at the edges of the ponds - mainly reeds and primary colonizers. Some basins are totally overgrown by these plants.

Because they are shallow and contain large amounts of nutriments in the water the ponds contain many invertebrates. A sample area of one $m^2$ may contain up to 50 000 chironomid larvae and several hundreds of thousands daphnia. These huge quantities of small animals are an excellant food resource for waders and ducks. From 1960 the sewage farm developed into one of the most significant inland resting and moulting grounds for these species in Germany. It is not a coastal site so the species which occur differ in some ways from those of estuaries and seashore. Species like Oystercatcher Haematopus ostralegus and Knots Calidris canutus, which are common coastal waders, do not occur in great numbers at the sewage farm, whereas freshwater-associated species are common, for example up to 4000 Snipe Gallinago gallinago, 1500 Ruffs Philomachus pugnax, 350 Wood Sandpipers Tringa glareola, 220 Green Sandpipers Tringa ochropus, 170 Greenshanks Tringa nebularia and 150 Spotted Redshanks Tringa erythropus occur each day during migration periods.

The sewage farms are also important for resting and breeding ducks. For example up to 900 Garganeys Anas querquedula could be seen in summer, with a maximum of 32 breeding pairs. Breeding waders are Oystercatcher, Lapwing Vanellus vanellus, Little Ringed Plover Charadrius dubius, Snipe, Black-tailed Godwit Limosa limosa and Redshank Tringa totanus.

The positive development of the site did not last long. In 1971 the supply of water was reduced by half and plants started to overgrow the dried-up ponds. The site deteriorated drastically when in 1975 the water was reduced again because of the construction of a new purification plant. Only 17 ha of open water remained for the resting waders.

It was the plan and intention of the Münster town authorities that the purification plant should replace the old sewage farms which would then be available for agricultural and industrial use. Since the publication of these plans in 1968 the members of the OAG Münster have been trying to save at least a part of the former sewage farms. This was done by informing the inhabitants of Münster, the politicians and the administrative representatives in Northrhine-Westfalia about the outstanding importance of the site for migrating waders and ducks. This work succeeded and in 1976 233 ha of the sewage farm were leased by the government of the federal state of Northrhine-Westfalia. The "Biologische Station" - an association founded by the members of the OAG Münster (that means Ornithological Working Group of Münster) - was asked to carry out habitat management in the new reserve, mainly removal of vegetation which had overgrown the ponds. Thus the activities of the