

PRELIMINARY RESULTS OF WINTER DYE-MARKING ON THE FIRTH OF FORTH, SCOTLAND

by Michael W. Pienkowski and Hugh Clark

The estuaries of western Europe are areas of high biological productivity which are of major international importance as migration, moulting and wintering areas for arctic breeding waders from areas as widespread as Canada and Siberia. These estuaries are coming under increasing pressure for water storage, tidal power, deep-water docks, industrial development and disposal of power-station ash and other wastes. Proposed development of large areas have emphasised the need for general studies on waders, their biology and requirements (see, e.g. Dick et al 1976, Evans 1976, Prater 1976, Pienkowski 1979b), as well as leading to various studies aimed at predicting the effects on the birds and other wildlife of the loss of particular areas (eg Prater 1972, Pienkowski 1973, Evans 1974, Goss-Custard 1977, 1979).

The River Tees Estuary in NE England, studied in detail by the Zoology Department of Durham University (eg Evans et al 1979), has been one of the most markedly affected by reclamation, its intertidal area being reduced by 1974 to only 6% of the 2400 ha present last century. As oil-related industry develops and engineering schemes become ever more ambitious, the sizes of areas which can be reclaimed at any one time become huge. So much so that the intertidal area of the Forth estuary and inner Forth (about 2800 ha) is now becoming subject to reclamation proposals which would lead to losses of habitat comparable to those at Teesmouth within very few years although only about 25% has been reclaimed to date.

The importance of the Firth of Forth to shorebirds has been documented by the Birds of Estuaries Enquiry and other counts (eg Campbell 1978). The distribution of birds and their invertebrate prey has been investigated in the estuary by members of Stirling University's Department of Biology (eg Bryant and Lang 1975, McLusky 1978) and in the outer Forth by local ornithologists (eg Summers, Atkinson and Nicholl 1975, da Prato and da Prato 1978).

The next important question requiring an answer concerns the extent of movement of birds within and through the estuary; are there large seasonal turnovers or do peak counts reflect the total numbers of birds using the area? Do individual birds remain in one part of the Firth or depend on a seasonal or more frequent movement between component areas? Can the component areas be considered separately or do they form a single unit as far as waders are concerned? To answer these questions and others, marking of birds by methods visible to field observers is essential. To mark the birds they have to be caught. However waders on the Forth and other heavily reclaimed estuaries tend to roost on 'unnatural' sites and, because of the rapidly changing geography, have few 'traditional' roosting sites (see eg. Furness 1973a,b), making catching difficult. Because of the urgent need for studies on movements of waders of the Forth, we undertook, in collaboration with the Nature Conservancy Council and many local ornithologists, a trial programme in late winter 1978-1979 into the possibilities of catching waders on the Forth Estuary and the feasibility of a winter dye-marking scheme.

Results.

110 waders (mainly Dunlin *Calidris alpina* and Knot *Calidris canutus*) were caught by mist-netting on several dates in February at Dalmeny, just west of Edinburgh, and a larger catch of 319 Dunlins was made at Skinflats on 11 February. All these birds were dyed. The roosting patterns at other sites were also investigated and preparation for catching at these sites made. The help of local bird-watchers (as well as persons involved in the study) in looking for marked birds and counting the proportion marked in flocks was enlisted. The results are detailed by Pienkowski (1979a) and are summarised in Figures 1-3.

Even with the limited extent and duration of this preliminary study, the results demonstrate a marked difference in behaviour between Knots and Dunlins, this being similar to results elsewhere, eg The Wash (Minton 1975). Within two days of marking 19 Knots at Dalmeny on 5 February individuals were sighted at Torry Bay and Skinflats. Because the dye faded gradually, the second group of marked birds (18-19 February) could be distinguished from the earlier ones for some time after marking and it was apparent, despite only 8 being marked, that there was much mixing of the whole Knot population at Dalmeny and the upper parts of the Forth (Fig.1). There is also evidence of longer distance movements within the winter, with two sightings on the Forth in February and March of birds marked earlier in the winter on the Tees estuary, 225 km SE.

Sightings of Dalmeny-marked Knots were not made at Musselburgh until March and this may be related to the departure of Knot flocks from the Inner Forth at this time; but the evidence is insufficient for more definite conclusions. Knots wintering in Britain come from the breeding grounds in arctic Canada and Greenland and their movements during the non-breeding season may be very complex (Dick et al 1976).

Dunlins from both marking sites were much less mobile than Knots. Those from Dalmeny were not seen further up the Firth than Blackness (16km) which was also the seaward limit of Dunlins marked at Skinflats (14km). Dalmeny birds were seen only at Dalmeny and Cramond until 25 February when sightings were made at Ironmill Bay, near Crombie, and Musselburgh lagoons. This coincided with a period of high spring tides and local ornithologists have suspected for some time that, in such conditions, waders may move from the Dalmeny area to Musselburgh lagoons to roost (S.R.D. da Prato, pers. comm.). Subsequent sightings were made in the area of Blackness, Dalmeny, Cramond, Edinburgh, Musselburgh, Dalgety Bay and further afield (see below).

The Dunlins marked at Skinflats were similarly site-faithful. The larger number marked here allow some tentative quantification of the data (Fig.2). Marked birds formed about 5% of Skinflats flocks. (This suggests that the total number of Dunlins using Skinflats at the time of marking was about 6000, a figure which is compatible with the information given by Campbell (1978)). There was some indication of higher proportions near the ringing site than near Kincardine Bridge. The difference between Skinflats and other areas was more marked. At the adjacent area, Kinneil, marked Dunlins formed less than 1% of the flocks on average. Despite a comparable intensity of observations on the north side of the estuary, no yellow-marked Dunlins were seen in feeding flocks there and only 7 at roosts on 25 February and 2 on 7 April. Maximum proportions are given in Fig 2 showing that only at the Longannet site, opposite Skinflats, did the proportion of dyed birds approach that near the marking site.

On Skinflats, the proportion of marked Dunlin out of bird-sightings recorded did not change during the six weeks between marking and the disappearance of most birds: 54/1221 (4.4%); 74/1399 (5.3%); 15/272 (5.5%); 36/835 (4.3%); 14/300 (4.7%); 25/1600 (1.6%). Also of a flock of about 500 still present on Skinflats on 22 April, about 20 (4%) were dyed. This suggests that there were no large influxes of Dunlins to this area in this period of the late winter.

With only a small number of birds marked in this pilot study, we did not expect sightings outside the Forth but a few of these provided useful information concerning the late winter/spring departure. One sighting on 10 March at Seahouses, Northumberland, may have been part of the large exodus of most Dunlins from the Upper Forth which occurred about this time. The sightings of Dunlins on 3 March at Musselburgh and Tynninghame, E.Loithian may also have been part of a departure. There is some doubt as to whether these two birds were from Dalmeny or Skinflats although the latter seems slightly more likely from the descriptions. Further sightings came from Norfolk on 18 April and Denmark on 4-5 March (Fig.3).

Dunlins wintering in Britain are of the nominate race which breeds in N.Scandinavia and U.S.S.R. The ringing dates of several Scandinavian birds which we controlled on the Forth are consistent with the passage of this population through that area and measurements of the birds caught also conform to this race (Hardy and Minton in press, Pienkowski and Dick 1975).

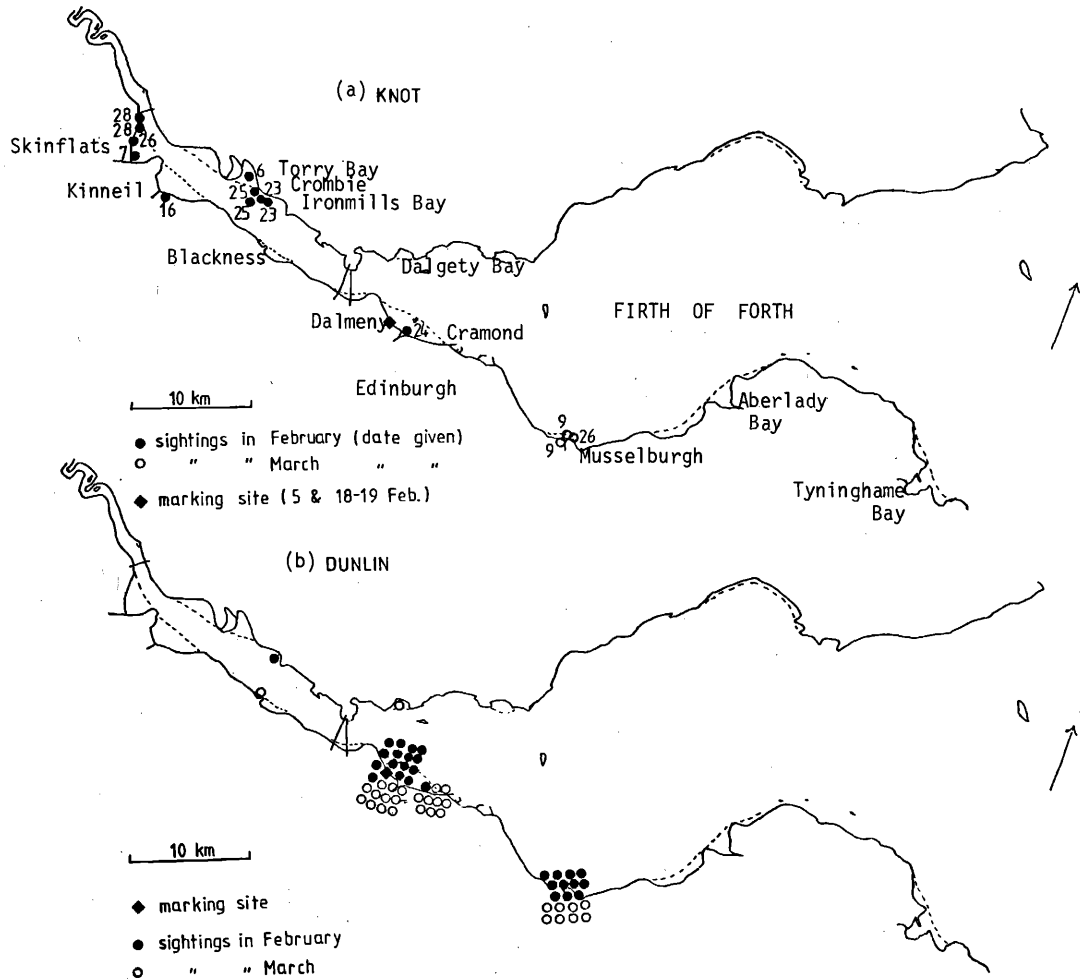


Figure 1. Sightings in the Firth of Forth of (a) Knots and (b) Dunlins marked at Dalmeny

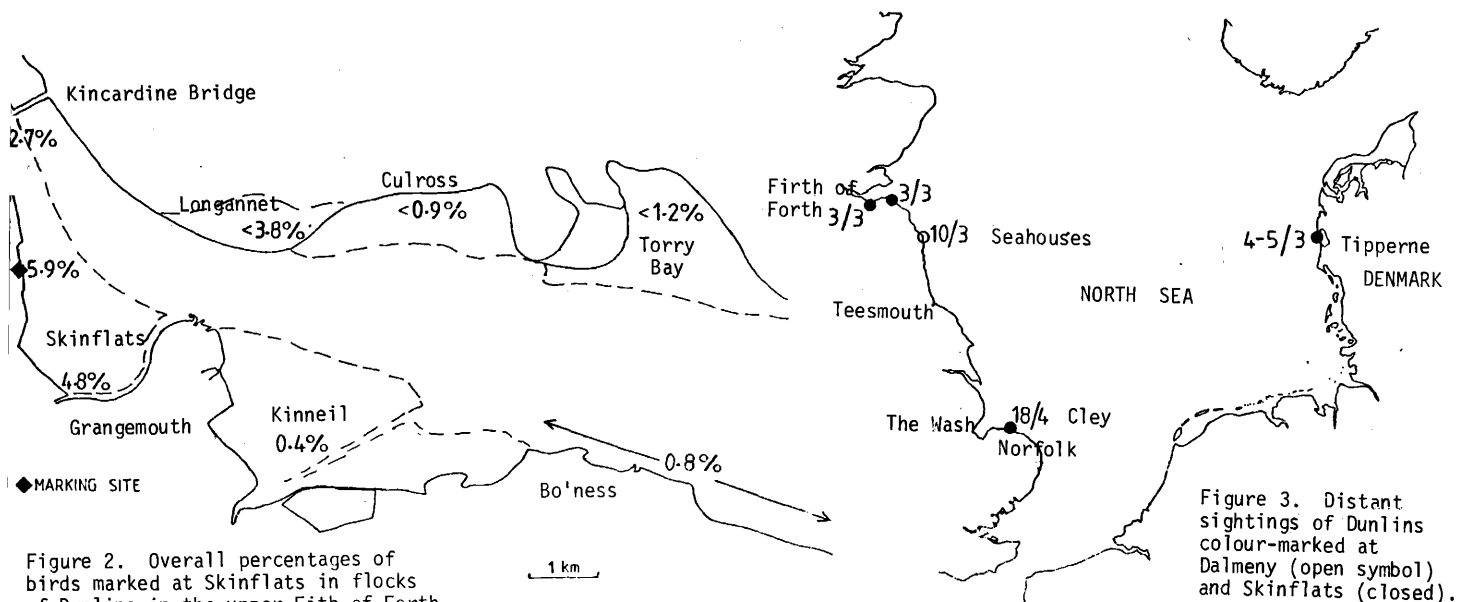


Figure 2. Overall percentages of birds marked at Skinflats in flocks of Dunlins in the upper Firth of Forth

Figure 3. Distant sightings of Dunlins colour-marked at Dalmeny (open symbol) and Skinflats (closed).

The work in early 1979 has shown colour-dyeing to be a valuable technique in investigating winter movements. We are now embarking on a much more detailed investigation in the current winter to attempt to quantify the movements of birds and their usage of different parts of the estuary. The Nature Conservancy Council are again involved and have appointed Fraser Symonds to work full-time on the project. We would welcome sightings of marked birds from away from the Forth and detailed counting of proportions of marked birds in flocks at the Forth and adjacent estuaries (see elsewhere in this Bulletin).

Clearly the use of conspicuous dye marks and temporary leg flags is a valuable method in this work but equally clearly the number of sites that can be studied at any one time is limited and co-operation is essential. The sites with large and immediate reclamation proposals, such as the Forth and the Tees, should be given priority, so that urgently needed information for conservation and planning can be obtained as quickly as possible.

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