FIELD OBSERVATIONS ON METHODS USED TO COUNT WADERS BREEDING AT HIGH DENSITY IN THE OUTER HEBRIDES, SCOTLAND

by R.J. Fuller, G.H. Green and M.W. Pienkowski

The Wader Study Group (WSG) carried out a survey of breeding waders on the Southern Isles, Outer Hebrides, between 4 and 18 June 1983. Waders were counted using the transect method described by Reed and Fuller (1983). Immediately prior to this survey we performed several simple tests on the comparability of counts made by different observers. The aims were to check the applicability of the technique to the high densities of breeding waders and to assess whether individual survey workers were likely to differ significantly in their efficiency at detecting birds.

The tests were conducted in a way which allowed us to observe the behavioural responses of the waders to the field-workers. This note reports on these tests. Our own observations on behaviour are supplemented by the experiences (in 1983 and in previous years) of other Hebridean wader buffs. We hope that these observations, combined with the detailed information given in Reed and Fuller (1983), will result in a standard and comparable application of the transect technique in any future Hebridean surveys.

METHODS

In the tests, three or four observers (A,B,C,D) compared the numbers of waders they observed at exactly the same time on a defined piece of ground. The individual assessments were made entirely independently. Counts were made either by scanning from a fixed point, or by two observers walking on separate transect lines 100 m apart. In the latter case a third observer either remained in one spot or walked equidistant from, and at least 50 m behind, the others. The exact form of the test depended on the nature of the terrain, i.e. the extent of unimpeded visibility. In some cases transects were walked after fixed scans and the results compared. The third observer watched the behaviour of the birds in response to the other surveyors. On the transects, waders were counted only between the two transect lines. The length of transect walked was 250-500 m. Observations were made either as counts of individual birds or were interpreted in terms of "pairs" using the criteria given in Reed and Fuller (1983). All the tests were conducted on the island of Baleshare, North Uist, on the mornings of 30 May, 31 May and 1 June. Only observer A participated in the full WSG survey.

VARIATION BETWEEN OBSERVERS

Test 1. Fixed scan on saltmarsh followed by a transect.

Table 1. Numbers of individual birds recorded by four different observers during the fixed scan in Test 1.

		A	B	C	D
Oystercatcher	*Haematopus ostralegus*	6	6	6	6
Ringed Plover	*Charadrius hiaticula*	1	0	0	0
Lapwing	*Vanellus vanellus*	14	14	15	15
Snipe	*Gallinago gallinago*	1	0	0	1
Dunlin	*Calidris alpina*	1	0	0	0
Redshank	*Tringa totanus*	9	7	8	4
Total		32	27	29	26

Table 1 shows the numbers of individual birds recorded by four observers. With the exception of Redshank, which was under-recorded by observer D, there was very close agreement between observers. However, it appears that the counts were influenced by observer experience. A, who had greatest experience of Hebridean waders, recorded most birds while D, who had the least experience of counting breeding waders, recorded fewest. A transect was then walked by two observers across the saltmarsh. It immediately became apparent that Dunlin had been grossly under-estimated on the fixed scan. A minimum of 11 individual Dunlins were counted compared with just one bird (seen by A only) on the fixed scan. For the other species the transect counts were very similar to the fixed scan.

Test 2. Transect on blackland with three walking observers. The estimates of pairs (Table 2) agreed closely. The most experienced observer (A) recorded most pairs.

Table 2. Numbers of pairs recorded by three observers in Test 2.

	A	B	C
Oystercatcher	3	2	3
Ringed Plover	0	0	0
Lapwing	5	4	5
Snipe	1	1	0
Dunlin	0	0	0
Redshank	6	5	6
Total	15	12	14

Test 3. Fixed scan on damp machair grassland followed by a transect with three walking observers. The fixed scan counts (Table 3) were nearly identical. The transect produced a minimum of five Dunlins and two Snipe: both species were under-estimated by scanning. The other species were recorded in similar numbers to the scans.

Table 3. Numbers of individual birds recorded by three observers during the fixed scan in Test 3.

	A	B	C
Oystercatcher	0	0	0
Ringed Plover	2	2	2
Lapwing	6	6	6
Snipe	0	0	0
Dunlin	1	1	1
Redshank	4	4	3
Total	13	13	12

Test 4. Fixed scan on damp machair grassland followed by a transect with three walking observers. The scan recorded only two species. The counts (A,B,C respectively) were Lapwing (4,4,4) and Redshank (2,0,1) individuals. On the transect, however, one pair of Ringed Plovers and at least three Dunlins were seen.

Test 5. Fixed scan on cultivated machair followed by a transect with two walking observers and one observer at a fixed point. The scan counts are given in Table 4 and show very little observer variation. The transects produced very similar numbers, except that one pair of Dunlins was recorded.

Table 4. Numbers of individual birds recorded by three observers during the fixed scan in Test 5.

	A	B	C
Oystercatcher	2	3	3
Ringed Plover	4	3	3
Lapwing	2	2	2
Snipe	0	0	0
Dunlin	0	0	0
Redshank	1	1	1
Total	9	9	9

Test 6. Fixed scan on cultivated machair followed by a transect with two walking and one stationary observers. The fixed scans produced only Ringed Plovers: two observers counted two birds, the other counted one. The transects revealed two Ringed Plovers and three Dunlins.

Overall comparison of observers

By summing the numbers of birds counted on the different fixed scans it is possible to gauge the overall extent of variation between the three observers (Table 5). The overall agreement is generally good although observer A recorded approximately 10% more birds than B and C.

Table 5. Numbers of individual birds recorded by different observers during all fixed scans, combined.

	A	B	C
Oystercatcher	8	9	9
Ringed Plover	9	7	6
Lapwing	26	26	27
Snipe	1	0	0
Dunlin	2	1	1
Redshank	16	12	13
Total	62	55	56

Although these samples are small (negligible for Dunlin and Snipe!) they do not suggest any major divergence in recording efficiency between the three observers. Each of the three were very experienced at locating and counting breeding waders, although A was the most experienced under Hebridean conditions. Most of the WSG survey workers were very experienced counters. So, based on the present results it seems unlikely that large variations occurred in the efficiency of observers at detecting birds. Care was taken to ensure that each WSG count team contained one very experienced worker. However, there may have been detailed differences in the recording techniques of individual workers, for example in the proportions of birds recorded as single individuals, pairs or groups (Webb et al. 1983, Fuller et al. in prep.). Snipe and Dunlin are the most difficult species to count (see below) and one might expect the greatest inter-observer variation for these species.

BEHAVIOURAL PROBLEMS IN CENSUS WORK

In the following sections we have discussed primarily the problems of each species as they affect the application of the transect method described by Reed and Fuller (1983). In this method two observers walk, line abreast, on parallel transect lines 100m or 150m apart, plotting the positions and activities of all waders seen on 1:10,000 maps.

Oystercatcher *Haematopus ostralegus*

This is perhaps the easiest species to count. The main problems are occasional birds which mob and follow observers for a considerable distance, thus risking double counting. Two individuals of a pair may stand some distance apart. This may lead to some over-estimation when "a pair" is classified on the basis of a single bird. Oystercatchers sometimes indulge in behaviour which can be confusing to a wader counter. For example some coastal pairs present on suitable breeding habitat will fly or run perhaps 100m on to adjacent intertidal flats without any attempt to mob the human intruder. Possibly such birds are failed breeders or are in the process of relaying. Birds or pairs may occasionally peel off from apparent non-breeding groups and mob the observer: in such cases it was usually

assumed that such individuals were breeders which had temporarily joined the flock. There is also a possibility that very small flocks of non-breeders are sometimes counted as breeding birds. In open country Oystercatchers can be counted from a considerable distance, and scanning well ahead (say up to 250m where possible) when walking transects may be the best way to obtain accurate counts.

Ringed Plover *Charadrius hiaticula*

The main problems with this species arise at high density when it becomes impossible to keep track of all individuals, which may collectively mob the observer. Under such conditions the chance of double counting must be high, particularly as observers sometimes draw the birds along with them as they walk the transect. At very high densities we consider that an appropriate technique is to scan 50-100 m ahead and count all the birds visible, then walk on rapidly and repeat the process. In such cases it seems more important to keep the overall numbers of birds in perspective rather than attempting to plot the position and movements of each individual. Ringed Plovers can be inconspicuous on daisy-covered, sandy and gravelly substrates, and therefore very careful scanning of the census area is extremely important.

Lapwing *Vanellus vanellus*

Although large and conspicuous, Lapwings are difficult to count by the transect technique due to their great mobility. Birds respond to observers by group mobbing and may move several hundred metres. This obviously raises a potential problem of double-counting. Lapwings are not always attracted towards the observer; we have observed movements of birds to a position approximately 100 - 200 m away from the transect walkers. These observers were walking through an area containing Lapwing chicks yet the majority of adults mobbed some distance away. Presumably this is a form of anti-predator distraction although the circumstances (e.g. density, age of chicks, habitat) under which the birds perform it is unknown. We feel that the best way to overcome the problem is to count Lapwings well ahead on the ground before they are disturbed. Obviously this is possible only in level terrain. Lapwing is one species which is probably best censused before June, preferably early in May when the majority of birds are sitting on eggs. However, in remote areas like the Outer Hebrides one is unlikely to afford the luxury of repeated visits between early May and mid June. Where June visits are unavoidable, the count for this species should be made as early in the month as possible, before the birds have started to flock and flying juveniles confuse the picture.

Snipe *Gallinago gallinago*

The transect technique does not estimate numbers of Snipe adequately because most birds flush and are seen only when the observer is very close to them (Reed and Fuller 1983). Unlike the previous three species, Snipe also sit very tightly on their eggs. Drumming or "chipping" birds are probably the best basis for assessing the population but single counts are unreliable because the numbers drumming seem to vary greatly with weather and time of day. Birds that are flushed sometimes start drumming and this may lead to double counting of individuals. Three or four evening or night-time visits in calm weather, and careful plotting of drummers, may be the best way to obtain an estimate.

Dunlin *Calidris alpina*

After Snipe, this is the most difficult wader to count on the machair. When incubating the bird sits tightly but even when attending young it can be inconspicuous. The only way to count Dunlin with any hope of accuracy is to traverse the breeding grounds carefully, continually scanning all ground immediately to the sides and in front of the observer. In contrast with Lapwing and Oystercatcher, long-distance scans are useless and the whole area must be walked carefully. In areas of extremely high density the distance between transect walkers should ideally be no more than 100m. In these high density areas it is impossible to follow individual birds without losing track of the overall numbers (cf. Ringed Plovers). Under such conditions careful scanning no more than 30-50m ahead and then walking on and scanning again seems to work well.

Redshank *Tringa totanus*

Once the birds have chicks they become extremely conspicuous due to their mobbing behaviour. It is important to walk the entire survey area thoroughly: a distance between transects of 150m is adequate. Viewing from a distance will not elicit this conspicuous mobbing, so long-distance scanning is of little use. When disturbed the birds can be counted readily in the air or on the ground. In patches of high density it is better to obtain a total count of mobbing individuals than to attempt to plot individual positions. Redshanks do not appear to follow the walking observer very far. N. Buxton and M. Moser made observations on the response of Redshanks to a transect walker and found that birds tended to confine their mobbing to the areas of marsh from which they rose up initially. Redshanks were seen taking their chicks considerable distances - movements of at least 400m were observed. This may be a particular problem with this species and it should be borne in mind that transects carried out in June may be counting the birds in chick-rearing, rather than nesting, habitats.

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REFERENCES

Reed,T.M. & Fuller,R.J. 1983. Methods used to assess populations of breeding waders on machair in the Outer Hebrides. Wader Study Group Bull. 39: 14-16.

Webb,A., Reed,T.M. & Williams,T.D. 1983. The Hebridean wader survey: did the observers record in the same way? Wader Study Group Bull. 39: 24-26.

R.J.Fuller, British Trust for Ornithology, Beech Grove, Tring, Herts HP23 5NR, UK.
G.H. Green, Windy Ridge, Little Comberton, Pershore, Worcs WR10 3EW, UK.
M.W. Pienkowski, Department of Zoology, University of Durham, South Road, Durham DH1 3LE, UK.