ASPECTS OF CENSUSING BREEDING LAPWINGS

by John and Catrina Barratt

Most breeding wader surveys rely upon mapping numbers of breeding pairs or apparent territories from observations recorded from a small number of visits (e.g. Reed, Langslow and Symonds 1983, Reed and Fuller 1983) and few studies have compared these results with the known breeding population of the area. Jackson and Percival (1983) made nest searches and compared their results with the numbers of pairs recorded on a single transect survey of the same site made during the Wader Study Group/Nature Conservancy Council survey of the Hebridean machair (Green 1983). They found some differences between the results obtained by the two methods, particularly with Ringed Plovers *Charadrius hiaticula* and Dunlins *Calidris alpina* (which they studied in detail), and listed several possible sources of error when only such transect data was used. Jackson and Percival (1983) lacked transect data for Lapwings *Vanellus vanellus*, but they, and Fuller, Green and Pienkowski (1983) suggested that Lapwings were best surveyed when incubating eggs. Populations of species that do not occur in high densities, for example Golden Plover *Pluvialis apricaria*, can be adequately assessed using the territory mapping technique (Reed and Langslow 1984). However where species occur in high densities, for example Redshank *Tringa totanus*(Hale 1956), this is not always possible. Lapwing may also come into this category. Fuller *et al.* (1983) discussed observer variability, and the behavioural responses of waders, when counting breeding waders at high density. However they did not discuss the problems of territory definition in very high density breeding populations.

As part of a larger survey (Barrett and Barrett 1984), we collected data on a dense breeding population of Lapwings. In this paper we compare the results of frequent visits to this population with population assessments made by nest and brood searching. This comparison is then used to establish the best period during the breeding cycle in which to obtain a reliable population estimate by standard census techniques.

METHODS

The study area consisted of a strip of dry grassland and bracken adjacent to Loch Brora, Sutherland, Scotland (Figure 1). This strip was approximately 2.1 kms long and no wider than 300 m. A minor road bisected it throughout its length. No point was more than 170 m from the road, and the whole area could be observed from a car. The site was visited at least once a week throughout the breeding period. Birds which appeared to be incubating were located by observation from a car. One observer then checked the nest, the location of which was then plotted on an Ordnance Survey map (scale 1:10 000). There were no major topographical features which could have concealed incubating birds and we consider that all birds which completed a full clutch were recorded. It was possible that some birds may have deserted before a full clutch was complete, but we have no evidence for this. As soon as possible after hatching, chicks were ringed (with BTO rings) and their positions, and that of subsequent recaptures, were plotted on the maps.

In addition to the nest searching and ringing visits, 14 census visits were made between 14 April and 19 July 1984, usually during the early morning. One person walked over the area whilst the other observed from a car. Each person recorded observations on a 1:10 000 map and at the end of the visit the results were compared. For each visit, the higher of the two counts was used as the estimate of the total number of birds seen. No attempt was made to estimate actual numbers of pairs from the results of the census visits.

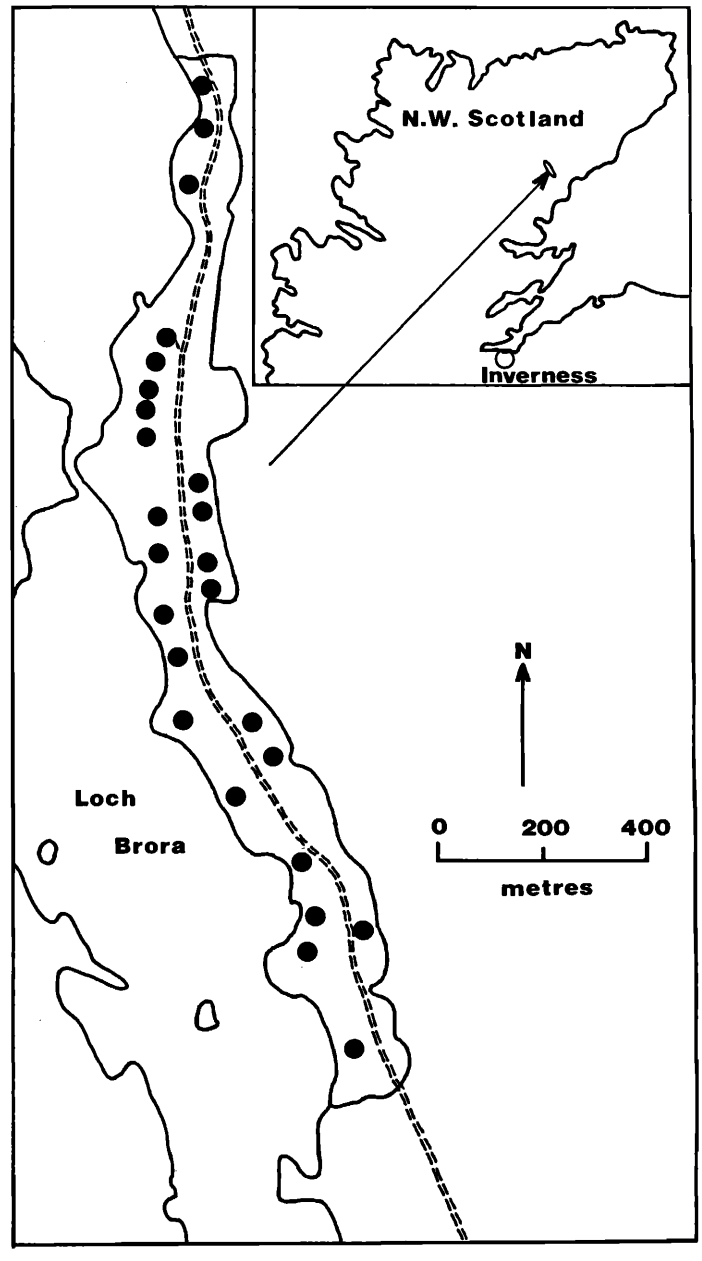

Figure 1. Location of the study area, and the distribution of nest sites (●).

RESULTS

Figure 2 shows the numbers of adult Lapwings observed on each census visit, with the exception of the visit on 9 July when a large mixed flock of adults and large, fledged, juveniles was counted. Between mid-April and early May 25 nests with full clutches were located (see Figure 1). Of these, 16 successfully produced young, while 9 failed at some time during incubation. The successful clutches hatched between 17 and 23 May. Between 3 and 22 May, 7 nests were locates in areas where nests had previously failed. It was not possible to say whether these resulted from the original failed pairs re-laying, or from new birds taking over the vacated "territories". The first fledged juveniles were seen on 19 June. After this there was a marked decline in the number of adults counted on the site. The second batch of clutches hatched in early and mid-June. Some flocking of adults and fledged juveniles was observed on 9 July, but dispersal following fledging was usually rapid. There was some evidence of adult birds departing before juveniles, as unaccompanied juveniles were seen during this period.

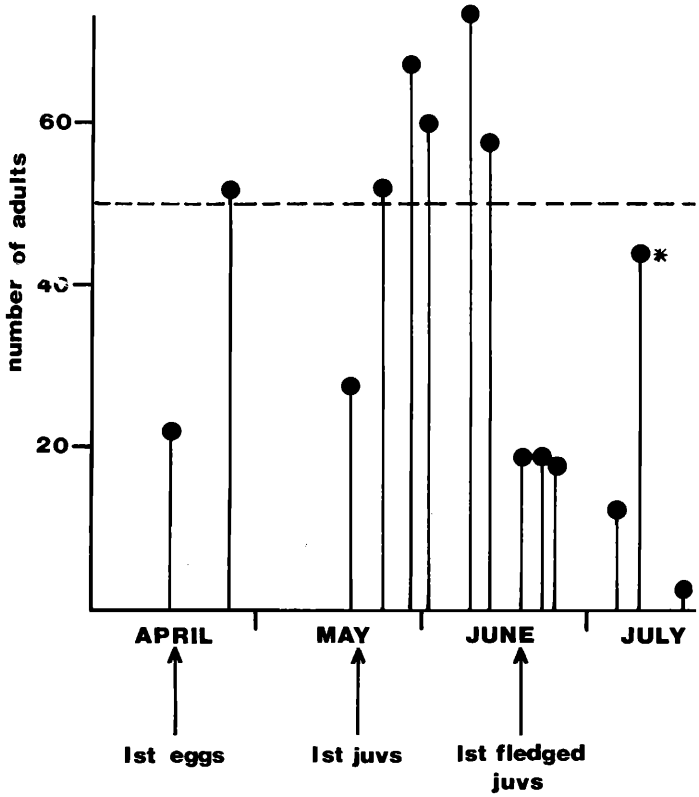

Figure 2. Numbers of adult Lapwings observed on census visits. The horizontal broken line is the breeding population of 25 pairs estimated from nest searches. * marks a count that included a flock of adults and large, fledged, juveniles.

DISCUSSION

If we assume that the site held a maximum of 25 active Lapwing "territories" at any one time (the maximum number of nests being incubated at the same time), the true visit efficiency (Svensson 1978) of the census visits can be calculated. Often more than 50 adults were seen, thus giving visit efficiencies of over 100%. This suggests that:

a) disturbance may have attracted Lapwings from other areas;
b) failed breeders, or non-breeders, may have been present on the site at times; and
c) some nests and/or clutches may have been missed.

Visit efficiency varied from 44-102% in the incubating period and from 56-102% in the hatching period. Following hatching there were always more adults than expected from the number of known nests. At the onset of fledging, visit efficiency declined markedly.

A major problem when censusing Lapwing in other than small, discrete, populations is that when disturbed, they come together and form flocks of alarmed birds. Such behaviour often attracts individuals from considerable distances away. Fuller *et al.* (1983) noted the problem of mobility and suggested that in the Outer Hebrides Lapwings were best censused before June, and ideally in early May when most birds were incubating eggs. (The best dates for surveys elsewhere will depend on the timing of breeding seasons.) This high level of mobility makes it very difficult to estimate the actual numbers of pairs and almost impossible to define territories. Indeed, to use the I.B.C.C. method ((International Bird Census Committee 1969), which relies upon territorial behaviour leading to clusters of observation points on a map combining all the census visits for each species) is meaningless. In many areas, Lapwings are semi-colonial (e.g. Fuller 1981). In this study, transferring all the bird registrations from each visit onto a single map gave a very confused picture and few territories could be defined. Mapping of incubating birds indicated that nests were as little as 50 m apart (Figure 1). This suggests that territories, if they existed, were very small.

Figure 2 shows that there was great variation in the number of Lapwings seen on census visits. With the additional information from observations from the car, ringing of chicks, and nest observations, some of these variations can be interpreted. Few off-duty adults were present in the early stages of incubation, and many of these birds fed away from the nest site. After hatching, the number of attendant adults increased, and these seemed more liable to attract other adults when alarmed. This attendance declined as the number of surviving chicks fell, and the chicks became independent.

Galbraith and Furness (1981) suggested that one visit during the incubation period should be sufficient to obtain a good estimate of breeding pairs. However we found that at this time, off-duty birds might be away from the area resulting in an underestimate of the number of pairs present, unless all the nests were located or incubating birds observed (a difficult task on uneven ground). Single visit censusing does not take into account failed or repeat clutches, nor non-breeding birds which might be feeding on the site.

In contrast to Galbraith and Furness' (1981) results we found overestimation (assuming 25 pairs to be the population) by as much as 46% to be the problem after the initial hatching period. Galbraith and Furness assumed rapid local movements of family parties out of nesting fields after hatching. In our study there was little movement of chicks (as shown by ringing), with chicks feeding in the vicinity of the nest site throughout the pre-fledging period (Barrett and Barrett 1984).

Disturbance during this period resulted in the attraction of other birds to the site, producing overestimates of population size. Counts after fledging gave very reduced census efficiencies, because birds quickly dispersed from the breeding grounds. Fuller (1981) found counts during this period impossible largely as a result of a large influx of presumed continental birds to his study area.

The results of this study show that only accasionally was the visit efficiency close to 100% (it is often well above or below). Multiple visits during the breeding season merely added to the confusion. We suggest that the following procedure will give the most reliable estimates of breeding pairs, assuming that exhaustive nest searching is out of the question. Two or three visits should be made to the site at weekly intervals during the latter half of the incubating period (when attendant adults are most likely to be present) and over the hatching period (when birds from elsewhere are less likely to be attracted). We found that during this period very few "additional" birds were present. The maximum number obtained in the counts should then be used as a basis on which to assess the population. From our data for this period, the two maximum counts (of 51 birds each) were very close to our estimated population of 25 pairs. Two or three counts during this period might also overcome, in part, the problem of overlooking birds whose nesting attempt had failed, though the presence of these repeat clutches, and late breeders, will always give some inaccuracy.

If only one visit is possible, then counts of incubating adults should be attempted. This should be carried out from a distance to cause minimal disturbance to birds. This may be possible in many areas, as vegetative growth is unlikely to be so advanced at this time as to obscure incubating birds. However, on undulating ground accurate counts of sitting birds are probably not feasible. Workers on the Outer Hebrides (Fuller *et al.* 1983) also suggested counting Lapwings by this method, but the method was not verified because their survey was made in June, after most eggs had hatched.

ACKNOWLEDGEMENTS

Our thanks to Dr. T.M. Reed and Dr. N.C. Davidson for helpful comments on a draft of this note.

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REQUEST FOR INFORMATION

Bar-tailed Godwits with colour marks

In the spring of 1984 the Vrije Universiteit of Amsterdam (Netherlands) started a research programme on Bar-tailed Godwits *Limosa lapponica* in the Dutch Wadden Sea. The aim of this research is to investigate a supposed correlation between spring condition and subsequent breeding success. The spring condition is measured as the increase in body weight, whilst breeding success is estimated as the percentage of juveniles against adults in the autumn.

In spring, March-May, very large numbers of Bar-tailed Godwits gather in the Wadden Sea for pre-breeding moult and fat deposition. However, we do not yet know from which wintering areas these birds come, or when the birds pass through. To examine this, birds caught in the successive catching periods have been marked differently. Several combinations of single and multi-coloured flags below the tarsus were used. Birds may carry one flag only on the right leg or one on the left leg *and* one on the right leg. The colours of these flags can be red, blue, or green and yellow horizontal stripes with or without a red or blue tip.

In the autumn a group of birds pass through the Wadden Sea rapidly without moulting. Many of these presumably move on to Southern Morocco and Mauritania, since rapid passage of adults in breeding plumage is also evident on the northern Moroccan coast. A group of birds staying in the Wadden Sea move to Great Britain after moulting. This implies that birds from different wintering areas might have different moulting strategies. It is also known that males moult earlier than females. Therefore information on the plumage state and sex (females are noticeably bigger than males) are invaluable for our study.

Anyone who sees a colour marked Bar-tailed Godwit, is kindly asked to report the sighting to the *WSG Colour-marking Register, Department of Zoology, University of Durham, South Road, Durham DH1 3LE, U.K.*, giving full details on the combination of the flags, date, place, sex, plumage and if possible the size of the flock in which the marked bird was seen.

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