BTO Research Report No. 30

THE 'NEW ATLAS'

PILOT FIELDWORK

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A report on the 'New Atlas' pilot fieldwork (1987)
to the Atlas Working Group

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Contents **Page**

Also included in the text are two Tables & 23 Figures

Aims of the 'New Atlas of Breeding Birds in Britain & Ireland'

The 'New Atlas' intends to map the distribution and abundance of breeding birds in Britain and Ireland. The techniques used to map distribution will be similar to those used in the original'Atlas' (Sharrock 1976), however they will have to be modified to allow some form of quantification. The 'New Atlas' will show which species breed in each 10-km square of the National Grid, and will provide an estimate of abundance of each species in each square. It is hoped that these estimates of abundance will be absolute (not relative) wherever possible. Thus the technique that is used will have to be calibrated against absolute breeding densities.

The bird distribution and abundance data will ultimately be related to data on land-use and habitat, in an attempt to determine why birds are distributed the way they are throughout Britain. Whilst a discussion of the techniques used to obtain habitat data will not be discussed in this report, it is important to realise that any bird censusing technique which involves habitat interpolations cannot be used because of the non-independence of bird and habitat data. For example, one way to census woodpeckers would be to calculate their density in a piece of woodland, then determine their density for the whole 10-km square by multiplying through by the total amount of woodland in that square. Whilst this would give an estimate of their breeding density in that square, this figure could not be used when determining how the density of woodland effects the density of woodpeckers as the two sources of data are non-independent.

The pilot fieldwork of 1987

(a) Organisation:

A number of B.T.O. regional representatives throughout Britain were asked to find a team of volunteers to carry out a variety of census techniques in a 10-km square of their own choosing. Data were collected in 32 10-km squares, although in some cases not all censusing techniques were tried in each square. A number of C.B.C. (Common Birds' Census) workers also helped, and these were contacted directly.

(b) The aims of the pilot fieldwork:

The Atlas Working Group had previously recommended that one quantification technique that could be used was the Frequency Index (FI).

Volunteers would visit each, or a sample of, tetrad(s) (2km x 2km squares) in a given 10-km square and record all possible breeding species (those in potentially suitable breeding habitat). The frequency index for a particular species in a given square would then be calculated as:

[no. tetrads in which species recorded] ÷ [no. tetrads visited]

An obvious advantage of this technique is that volunteers are not expected to count birds, just make species' lists. The method would also suit fieldworkers carrying out local tetrad atlases (of which there are many).

A number of problems were immediately realised. Firstly, were FI's good indicators of absolute breeding density ? After all the FI is really a measure of how widespread a species is, not its abundance. Secondly, very common species would always have high FI's (often of 1), and thus variation in density throughout a species range could not be discerned. Thirdly, colonial and open-water species, being locally very abundant could not be censused this way, nor could rare species. The FI technique would be most suitable for territorial species of average abundance.

The idea of carrying out a pilot year of fieldwork was to determine:

(i) whether FI's were good indicators of abundance.
(ii) how FI's could be calibrated to absolute breeding densities.
(iii) for which species the technique was suitable.
(iv) alternative techniques for those species where the FI technique was unsuitable (point counts for very common species, and direct counts for colonial / open-water / rare species had previously been suggested by the Atlas Working Group).
(v) the details of the techniques (e.g. how long should be spent in each tetrad, and what was the best time to perform point counts).

(c) The pilot fieldwork techniques:

Pilot fieldwork was carried out by two distinct groups of people; those who were solely concerned with atlas pilot work, and C.B.C workers.

Atlas pilot fieldworkers carried out three separate censusing techniques in each 10-km square. These were as follows:

(i) Point counts: A maximum of 50 10-minute point counts were carried

out in each 10-km square, two in each tetrad, once early in the season (April - May) and once late (June - July). During each ten minute count, observers recorded every bird seen or heard up to an infinite distance. Counting stations were located as close as physically possible to the centre of each tetrad (at the intersections of the 1km x 1km boundaries). The time and date of each point count was recorded, as was the habitat surrounding the counting station. (See Appendix A for details).

(ii) Six-hour timed counts: Two six-hour timed counts were carried out in each 10-km square, once early (April - May) and once late (June - July). Observers counted every bird seen or heard during a six-hour walk through a 10-km square. The route was left entirely up to the discretion of the observer, but the same route was followed on each ocassion. (Appendix B).

(iii) Frequency indices: Within each 10-km square, each tetrad was visited for a minimum of three hours (in reality this was rarely exceeded), partly early and partly late in the season. A species list was drawn up for each tetrad. The FI could then be calculated for each species in each square. (Appendix C). For a number of 10-km squares (in Devon & Oxfordshire), FI's were calculated from local tetrad atlases.

Point counts were used for a number of reasons. Firstly, they could stand as a censusing technique (at least for very common species) in their own right. Secondly, based on the assumption that point counts probably gave the best estimates of relative abundance of the three techniques, they could be used to determine (by correlation) whether frequency indices and six-hour counts really were suitable measures of abundance. Finally, they could be used as a transfer standard to enable frequency indices to be calibrated to absolute breeding densities (obtained from Common Birds' Census plots, see later).

Six-hour counts were attempted mainly as a back-up in case the FI technique proved impractical.

Finally, a few volunteers were asked to determine how the length of time spent in a tetrad effected the number of species recorded. Each was asked to spend four 4-hour periods in a single tetrad (once in April, May , June & July), and to record the number of new species discovered in each 30-minute time period during each 4-hour visit. (Appendix D).

C.B.C.workers performed point-counts on their C.B.C. plots. Each was asked

to choose 10 counting stations spaced regularly on their plot (at least 100m apart), and to perform two 10-minute counts, once early (April 13th - May 17th) and once late (May 18th - June 30th). During each count all birds seen or heard up to an infinite distance (excluding those which fell more than 50m outside their plot boundary) were recorded. Ideally, the early and late dates should have been the same as those used in the atlas point counts, and birds falling more than 50m outside the plot boundary should have been included. However, point counts on C.B.C. plots were also being tried for another reason, and these rules were a compromise. (Appendix E).

Results

A total of 149 species were recorded during the atlas pilot fieldwork. The following analysis is based on data for 71 species; the remainder were recorded too infrequently to allow a useful analysis.

One of the main ideas of this analysis is to determine which census technique gave the best estimate of true breeding densities. Without being omniscient, it was impossible to know what the true breeding density of each species in each square was. So, for much of the analysis that follows, it is assumed that point counts gave the most realistic measures of variation in relative abundance within species, as they were performed systematically, and were open to less bias than the other two techniques. This assumption can only be tested once the 1987 C.B.C. analysis is finished, and this may take some months. To determine how good FI's and six-hour counts were as estimators of relative abundance, they have therefore been correlated with point count values.

(a) Frequency Indices:

A frequency index, based on visits to 25 tetrads / 10-km square has been calculated for each of the 71 species for a total of 25 10-km squares. Unfortunately, the FI's for eight of these 10-km squares were obtained from local tetrad atlases, and, as will be shown later, are not comparable. Because of this, two analyses are sometimes carried out, one including, and one excluding these eight.

For each species, FI values (based on at least 3 hours in each of 25 tetrads) were compared with mean point count values across 10-km squares. (The mean point count value was calculated by adding up the total number of individuals of the species recorded in each of the 25 counts in the 10-km square for early and late point counts separately, taking the mean of the early and late value, and dividing this figure by 25). Examples are shown for four species, Stock Dove, Collared Dove, Meadow Pipit and Greenfinch in Figures 1 - 4. The figures show clearly that for these species frequency indices were good indicators of relative abundance.

Figures 5 - 8 show the same graphs for four very common species, Pheasant, Skylark, Carrion Crow and Yellowhammer. Whilst all these correlations were still highly significant, they demonstrate the problem of using FI's as an indicator of relative abundance for very common species. Above a threshold value of abundance, FI's were always 1. These thresholds were 0.75, 2.0, 1.5, and1.1 counts / 10-minutes for Pheasant,

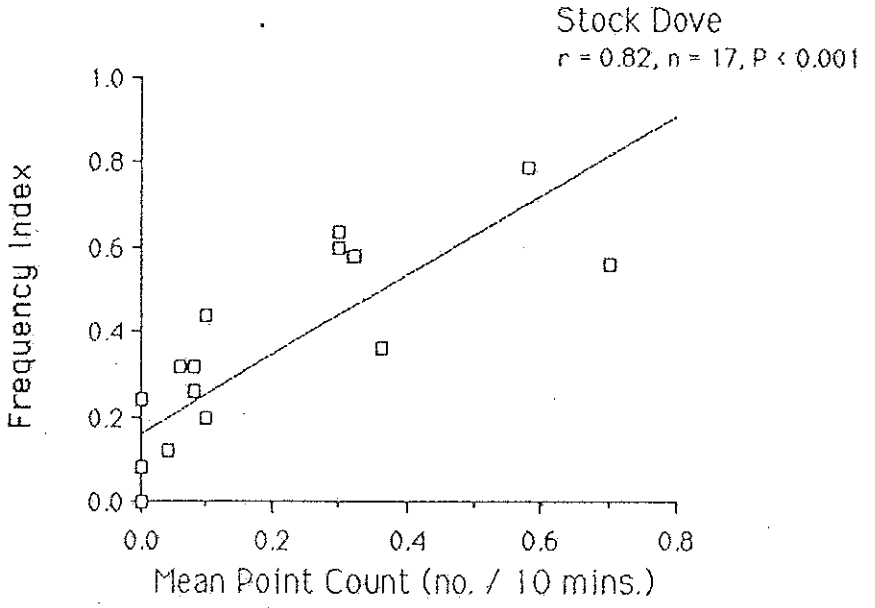


Figure 1. Stock Dove frequency indices and point counts. Each point refers to a single 10-km square.

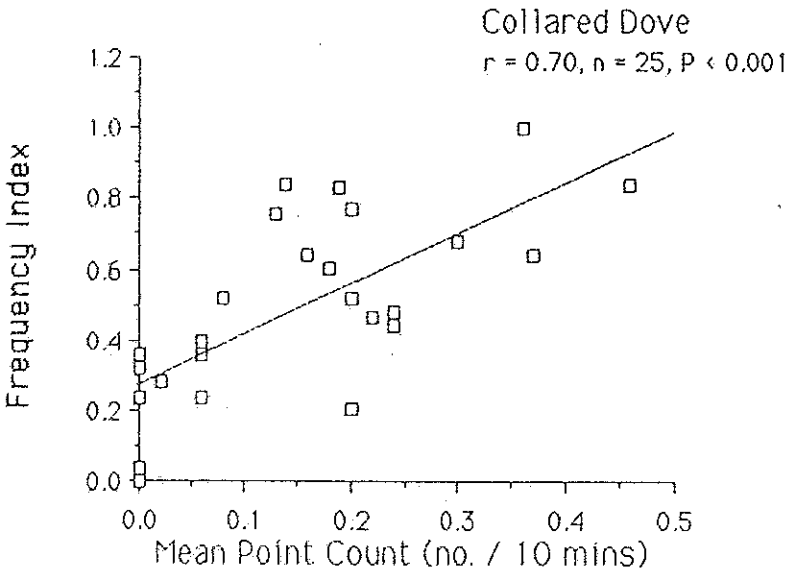


Figure 2. Collared Dove frequency indices and point counts. Each point refers to a single 10-km square.

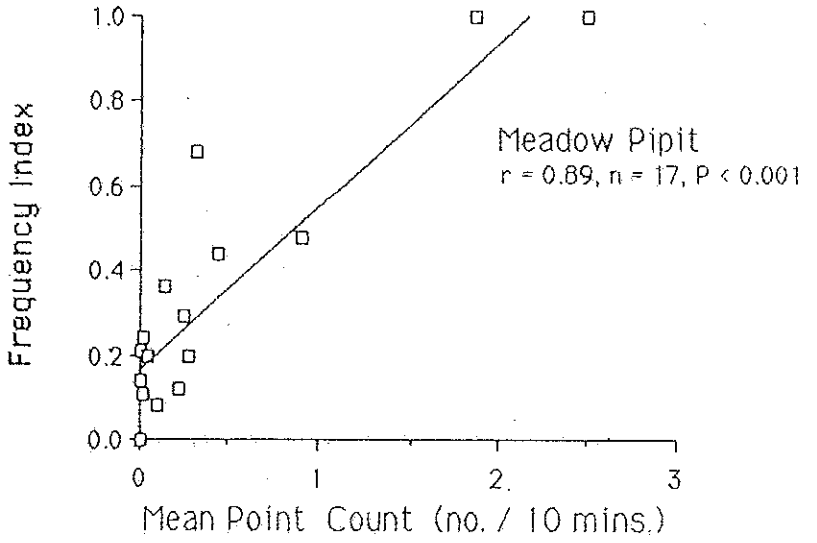


Figure 3. Meadow Pipit frequency indices and point counts. Each point refers to a single 10-km square.

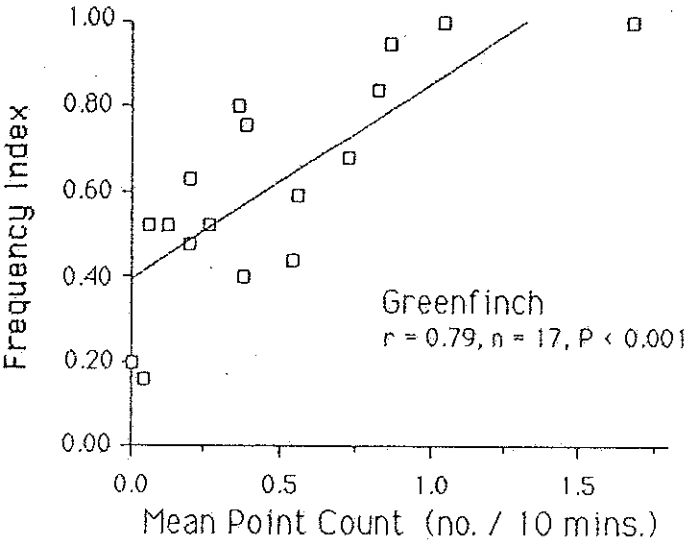


Figure 4. Greenfinch frequency indices and point counts. Each point refers to a single 10-km square.

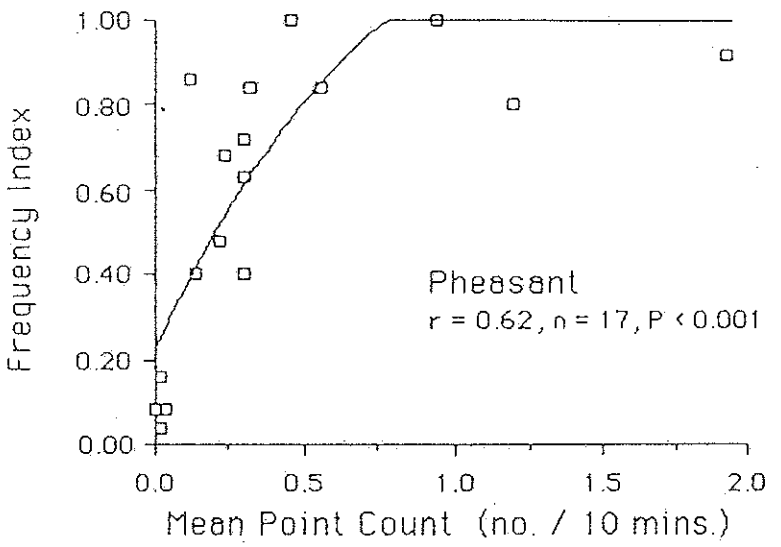


Figure 5. Pheasant frequency indices and point counts. Each point refers to a single 10-km square.

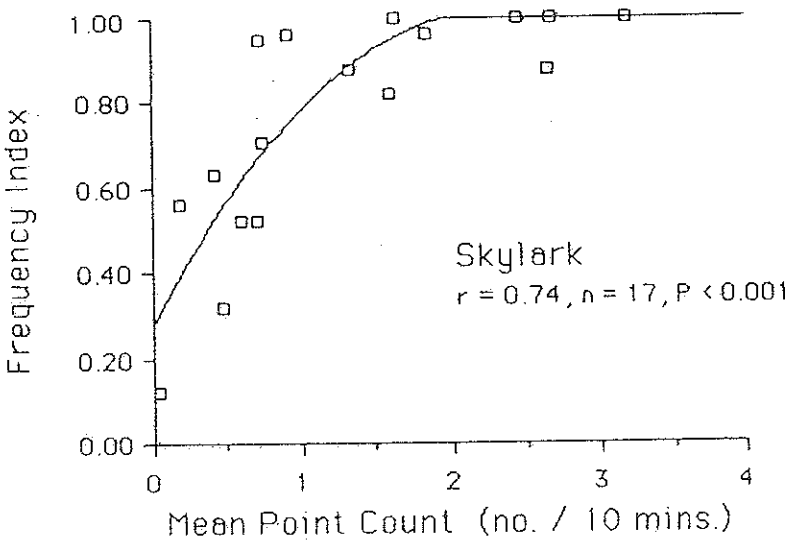


Figure 6. Skylark frequency indices and point counts. Each point refers to a single 10-km square.

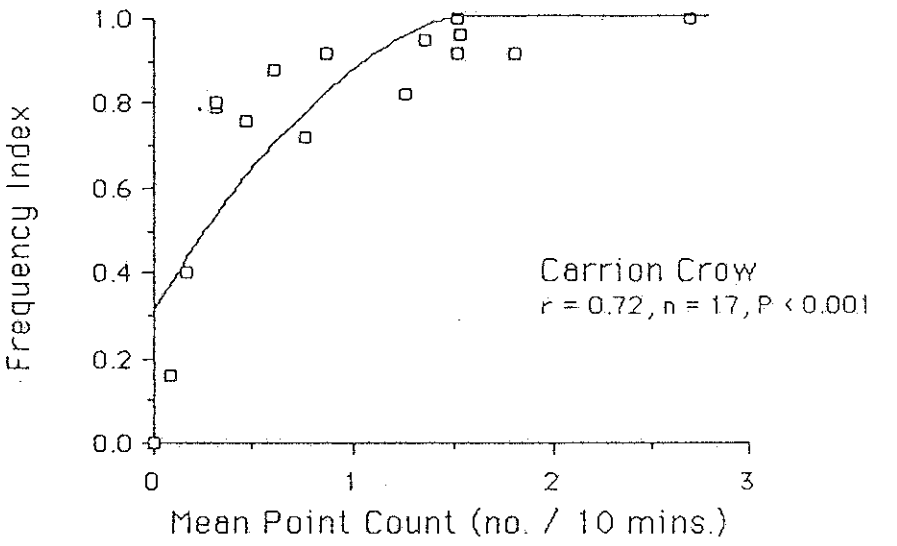


Figure 7. Carrion Crow frequency indices and point counts. Each point refers to a single 10-km square.

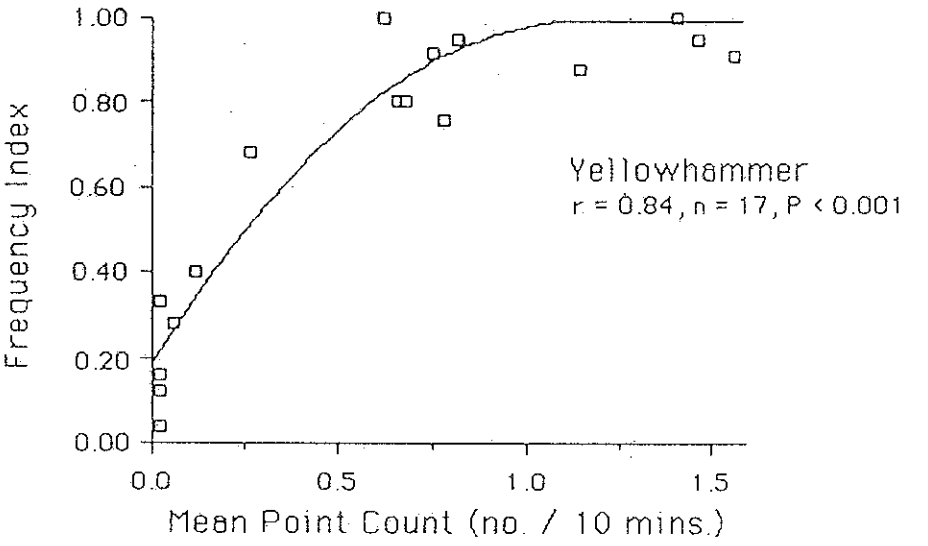


Figure 8. Yellowhammer frequency indices and point counts. Each point refers to a single 10-km square.

Skylark, Carrion Crow and Yellowhammer respectively; above these values the FI did not indicate relative abundance.

Table 1 shows the correlations for all 71 species. Because of the curvelinear (asymptotic) nature of some of the relationships, those species with non-linear responses have been ln transformed to improve the correlations. 65 (92%) species showed significant correlations. Those species with non-significant correlations were mainly open-water birds (Little Grebe, Canada Goose, Mallard, Tufted Duck and Coot); however, this was probably as much to do with point count error as problems with the FI method.

It is likely that rarer species with much lower mean FI values, for which there was insufficient data to do any analyses, would have lower correlations. However within these 71 species this was not the case (Figure 9).

Reducing the number of tetrads visited:

During the 'New Atlas' Fieldwork, it is extremely unlikely that all 25 tetrads will be visited in each 10-km square. However, an FI value can be calculated from visits to any number of tetrads. Obviously, as the number of tetrads visited is reduced, the error associated with the FI will increase. At its worse, species recorded in a 10-km square when all 25 tetrads are visited may not be recorded at all if only 5 tetrads are visited. One way of testing this is to compare, for a given species, the FI obtained if 5 random tetrads are visited, with the FI value obtained if all 25 tetrads are visited in the same 10-km square.

This analysis has been done for 20 species (listed beside Figure 10) by calculating FI's based on visits to the 5 tetrads A, I, L, U, & X. Across these species, the mean FI (calculated from 17 10-km squares) from visits to 5 tetrads correlated very well with that from visits to all 25 (Figure 10). However, the 'New Atlas' will be interested in variation within species and not between species. Taking each of these 20 species separately, and comparing (across 17 10-km squares) the FI's obtained from 5 and 25 tetrads, they again correlated well for most species. However, for less common species (those whose FI was less than 0.1) the correleations were less satisfactory (Figure 11). This suggests that FI's based on visits to only 5 tetrads per 10-km square were only suitable for species whose mean FI's were at least 0.1 (i.e. recorded, on average, in 2 or 3 tetrads per 10-km).

Table 1. Frequency Index and Six-hour timed count correlations with point counts (see below for explanation of abbreviations)

	All cases	Exclude	All cases	Exclude	All cases
Species	FI v PC	FI v PC	lnFI v lnPC	lnFI v lnPC	6H v PC
Little Grebe	0.36	0.45			0.57**
Heron	0.51**	0.47	0.47	0.63	0.05
Mute Swan	0.55**	0.53*			0.20
Canada Goose	0.33	0.44	0.49	0.61	0.39
Mallard	0.07	0.04	0.28	0.10	0.31
Tufted Duck	0.29	0.22			0.66***
Buzzard	0.86***	0.79***			0.95***
Kestrel	0.71***	0.75***	0.69**	0.68*	0.28
R.L.Partridge	0.79***	0.86***	0.72*	0.83*	0.75***
Grey Partridge	0.65***	0.76***			0.43*
Pheasant	0.50*	0.62**	0.71***	0.85***	0.89***
Moorhen	0.52**	0.54*	0.24	0.31	0.37
Coot	0.19	0.04			0.64***
Lapwing	0.60**	0.70**	0.63**	0.73**	0.06
Curlew	0.77***	0.76***			0.65***
Redshank	0.71***	0.71**	0.51	0.51	0.74***
Feral Pigeon	0.50**	0.76***			0.44*
Stock Dove	0.58**	0.82***			0.54**
Wood Pigeon	0.53**	0.64**	0.79***	0.82***	0.67***
Collared Dove	0.70***	0.69**			0.32
Turtle Dove	0.72***	0.80***	0.67*	0.84*	0.61**
Cuckoo	0.34	0.45	0.50*	0.73**	0.02
Swift	0.36	0.34			0.56**
Gr. Woodpecker	0.60**	0.70**			0.34
G.S.Woodpecker	0.41*	0.55*			0.43*
Skylark	0.58**	0.74***	0.78***	0.87***	0.55**
Swallow	0.36	0.42	0.45*	0.55*	0.29
House Martin	0.47*	0.60**	0.51**	0.57*	0.13
Tree Pipit	0.66***	0.92***			0.84***
Meadow Pipit	0.85***	0.89***	0.77***	0.76**	0.92***
Yellow Wagtail	0.92***	0.75***			0.54**
Grey Wagtail	0.49*	0.64**			0.50
Pied Wagtail	0.47*	0.67**	0.39	0.58*	0.44*
Dipper	0.53**	0.20			0.24
Wren	0.63***	0.69***	0.73***	0.77***	0.59**
Dunnock	0.50*	0.71**	0.66***	0.83***	0.37

Robin	0.68***	**0.78*** **	0.70***	0.75***	0.12
Wheatear	0.93***	**0.95*** **			0.93***
Blackbird	0.61***	0.66**	0.78***	**0.82*** **	0.48*
Song Thrush	0.41*	**0.58***			0.32
Mistle Thrush	0.63***	**0.65****			0.23
Sedge Warbler	0.44*	0.40			**0.48***
L.Whitethroat	0.38	**0.55***			0.35
Whitethroat	0.59**	**0.69****	0.65**	0.68*	0.25
Garden Warbler	0.61***	**0.68****			0.13
Blackcap	0.47*	0.51*	**0.57****	0.56*	0.53**
Chiffchaff	0.58**	0.47	0.52*	0.46	**0.62****
Willow Warbler	0.50**	0.66**	0.79***	**0.85*** **	0.16
Goldcrest	0.62***	0.61**	0.68**	0.55	**0.69*** **
Sp.Flycatcher	0.47*	**0.73*** **			0.00
L-tailed Tit	0.56**	**0.72****			0.31
Marsh Tit	**0.75*** **	0.51*			0.05
Coal Tit	0.65**	0.64**	0.53*	0.67**	**0.87*** **
Blue Tit	0.48**	0.50*	**0.64*** **	0.60**	0.52**
Great Tit	0.40*	0.45	0.67***	**0.74*** **	0.50**
Nuthatch	0.66***	0.81***	0.52	0.51	**0.85*** **
Jay	**0.83*** **	0.74***	0.58*	0.31	0.64***
Magpie	0.64***	0.67**	0.82***	**0.84*** **	0.79***
Jackdaw	0.58**	0.70***	0.53**	**0.73*** **	0.39
Rook	0.39	0.51*	0.47*	0.56*	**0.58****
Carrion Crow	0.65***	0.72**	0.81***	**0.84*** **	0.61**
Starling	0.13	0.12	0.35	**0.54***	0.02
House Sparrow	0.56**	0.62**	0.67***	**0.80*** **	0.52**
Tree Sparrow	0.63***	**0.66****			0.23
Chaffinch	0.50*	0.44	**0.60****	0.53*	0.43*
Greenfinch	0.61***	**0.79*** **	0.55**	0.77***	0.29
Goldfinch	0.52**	**0.74*** **	0.48*	0.53	0.39
Linnet	0.46*	**0.64****	0.34	0.45	0.31
Bullfinch	0.50**	**0.71*** **	0.13	0.24	0.25
Yellowhammer	0.68***	0.84***	0.82***	**0.89*** **	0.65***
Reed Bunting	0.37	0.50*			**0.58****
Mean	0.55	0.61			0.46
S.D.	0.17	0.19			0.24
N	71	71			71

Maximum value of FI v PC (All or excluded cases, In or not):

Mean	0.69
S.D.	0.16
N	71

Key to Table 1:

All cases (n = 25) = Data from every 10-km square used.
Excluded (n = 17) = Exclude those 10-km squares from which FI data were collected during fieldwork for a local tetrad atlas (Devon & Oxford).
FI = Frequency Index (based on visits to all 25 tetrads)
PC = Point Count (based on counts in all 25 tetrads)
ln = data log transformed
* $P \leq 0.05$
** $P \leq 0.01$
*** $P \leq 0.001$
Figures in **bold** are the highest correlations for that species

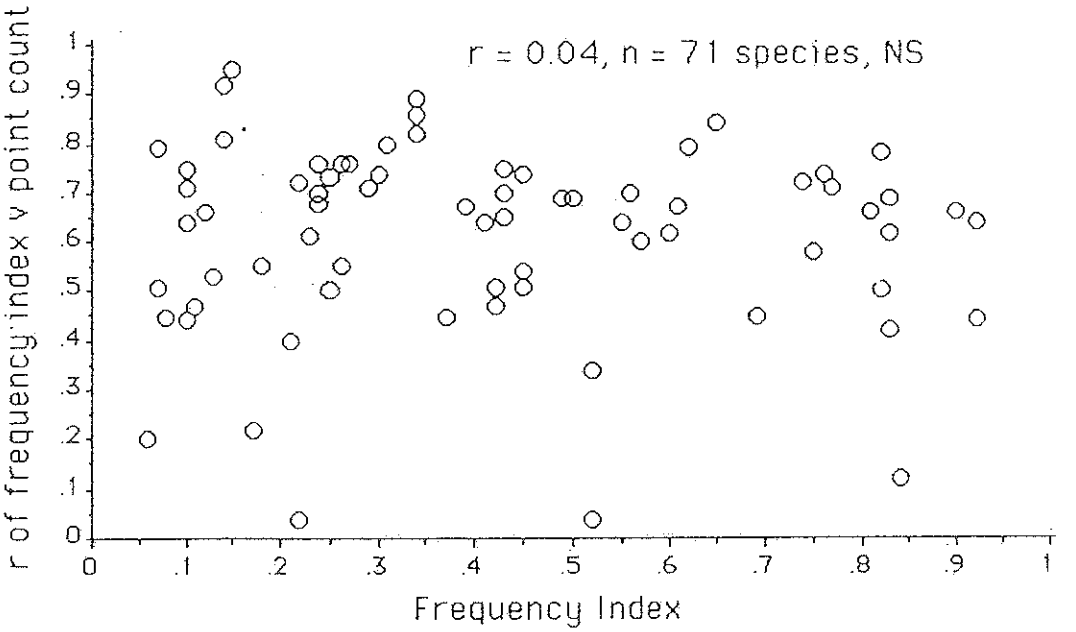
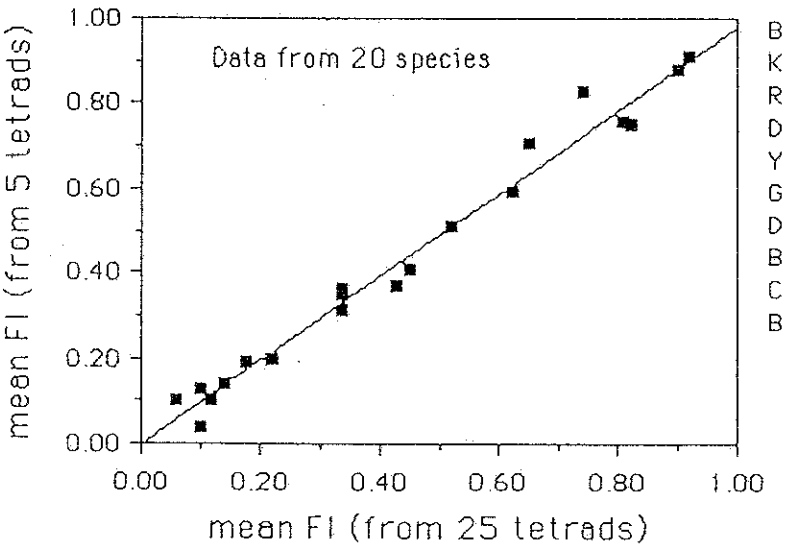


Figure 9. The correlation between frequency index and point count (from Table 1) versus frequency index for 71 species. Frequency indices based on 17 10-km squares.



Blackbird, Coot, Greenfinch, Kestrel, Meadow Pipit, R.L.Partridge, Robin, Stock Dove, Willow Warbler, Yellowhammer, Canada Goose, Mallard, Grey Wagtail, Dipper, Lesser Whitethroat, Blackcap, Nuthatch, Carrion Crow, Chaffinch, Corn Bunting.

Figure 10. An interspecific comparison of frequency indices obtained from 5 & 25 tetrads.

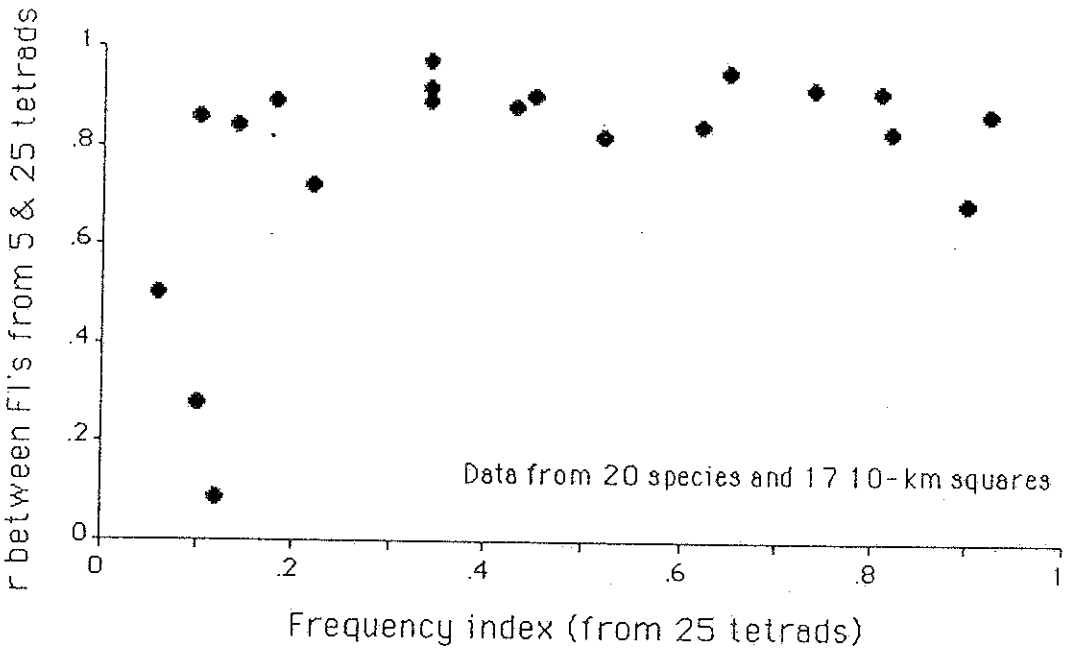


Figure 11. The correlation between FI's based on 5 & 25 tetrads, versus frequency index (from 25 tetrads)

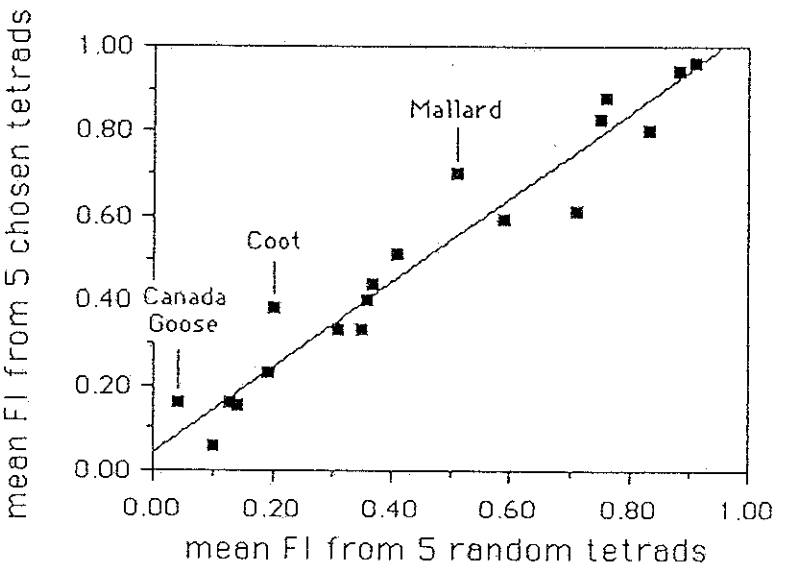


Figure 12. An interspecific comparison of FI's based on 5 random and 5 chosen tetrads.

The same analysis has been repeated using visits to 15 (instead of 5) random tetrads. Unfortunately, this anaylsis has only been done for 10 species so far (based on tetrads A, C, E, G, I, K, L, M, N, P, R, T, V, X, Z), but for all of these the correlations between the FI's from visits to15 and 25 tetrads were very high (mean r = 0.97, S.D. = 0.03; compared with mean r = 0.86, S.D. = 0.1, for the same 10 species calculated from visits to 5 tetrads). This suggests that visiting more than 15 tetrads does not improve the value of the FI greatly.

One further problem with visiting only 5 tetrads / 10-km square is that a species which is, for example, only ever recorded in 1, 2, 3, 4 or 5 tetrads / 10-km square, will always have an FI of 0.2. Thus these species will show no variation in density throughout their range, even though variation does exist (as measured by visiting 25 tetrads). Further error will be introduced into the final maps if the information for some squares is based on only 5 tetrads visited, while others are based on more than this. For example, a species which occurs in a single tetrad would have an FI of 0.04 if all 25 tetrads were visited, but an FI of 0.2 or 0 if only 5 tetrads were visited, depending on whether it was in one of the 5 tetrads or not. An FI of 0.2 is equivalent to the species being present in 5 tetrads when all 25 tetrads are visited.

Random versus chosen tetrads:

For each 10-km square we hope to obtain a list of all the species that breed there, and an estimate of abundance for each of those species. Unfortunately, these two requirements may be in conflict. To maximise the number of species seen, an observer should choose which tetrads to visit, based on his own experience or by looking at O.S. maps. To obtain reliable estimates of abundance, however, an observer should visit random tetrads (such as A, I, L, U & X used in the above examples). When all 25 tetrads are visited, this conflict of interests does not arise, but it becomes increasingly more important as fewer tetrads are visited.

An analysis of this problem has been tackled in the following way. For each of the 17 10-km squares I have chosen (from O.S. maps) those 5 tetrads which I thought would yield the greatest number of species. For 20 species (those listed beside Figure 10), I have calculated an FI based on visits to 5 randomly chosen tetrads (A, I, L, U & X), and an FI based on visits to those 'best' 5 tetrads. Figure 12 shows how the mean FI values from 5 chosen tetrads compare with those from 5 random tetrads. From this limited amount of analysis, the only type of species whose chosen tetrad FI value deviated systematically from the random were the

open-water species (Canada Goose, Mallard & Coot). The reason for this was that I biased my 'visits' towards those tetrads with water-bodies, and thus overestimated the FI values of the species that inhabit open-water. Theoretically, this sort of bias could be taken into consideration when calculating FI's.

Within each of these 20 species FI's based on 5 chosen tetrads were equally as good a predictor of FI's based on all 25 tetrads, as were those based on 5 random tetrads. The mean correlation coefficent of 5 chosen versus 25 was 0.80 (S.D. = 0.15, n = 20 species), while that of 5 random was 0.78 (S.D. = 0.23, n = 20 species). These were not significantly different (paired t-test, t = -0.36, n = 20, N.S.). This suggests that, at least for these species, FI's based on tetrads chosen by the fieldworker will be just as good a predictor of FI's based on visits to all 25 tetrads, as will those based on visits to 5 randomly chosen tetrads.

How long should be spent in each tetrad, and how many tetrads should be visited in each 10-km square ?

Figure 13 shows how the amount of time spent in a tetrad over the pilot field season influenced the number of species recorded in that tetrad. 50% of the species that would be seen after 16 hours in a tetrad were seen in less than 2 hours, and 90% after 8 hours. The time spent in each tetrad during pilot fieldwork was about 3 hours; this yielded 70% of species.

Figure 14 shows how increasing the number of tetrads visited (with 3 hours spent in each) increased the number of species seen. 65% of species were seen in the first 5 tetrads, and 93% had been seen in the first 15. Again, this suggests that visiting more than 15 tetrads is not very productive.

The longer that is spent in each tetrad, the greater the FI value for each species will become. Although there is no direct evidence to test this, Figure 15 shows how FI values calculated from 75 10-km squares from five local tetrad atlases (in which much longer than 3 hours would be spent in each tetrad) compare with those from the atlas pilot fieldwork (3 hours / tetrad). If the FI values were the same, the regression line would pass through the origin; it did not, the intercept on the y-axis was 0.13. As the slope of the regression was nearly 1 (m = 0.96), this suggests that, for the average species, frequency indices from tetrad atlases were 0.13 greater than those from pilot fieldwork.

If too long is spent in each tetrad, the FI will be less useful as it will not

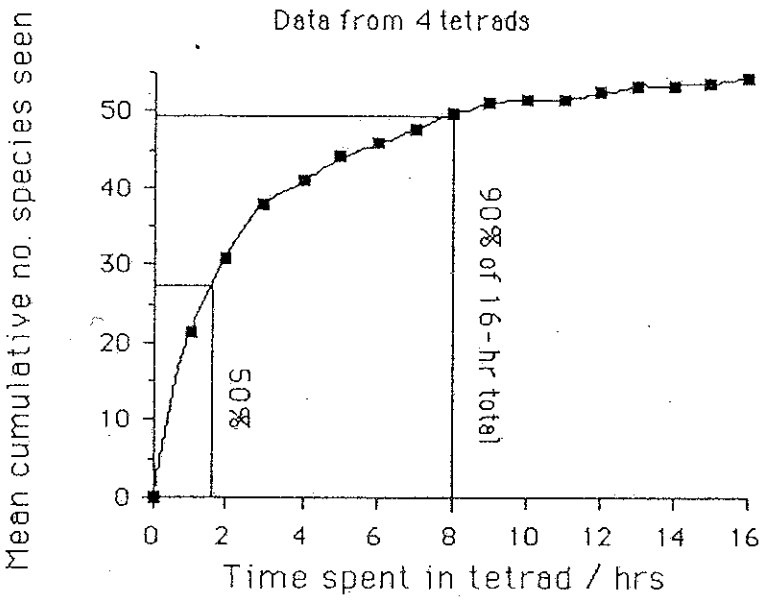


Figure 13. Cumulative number of species seen versus time spent in tetrad.

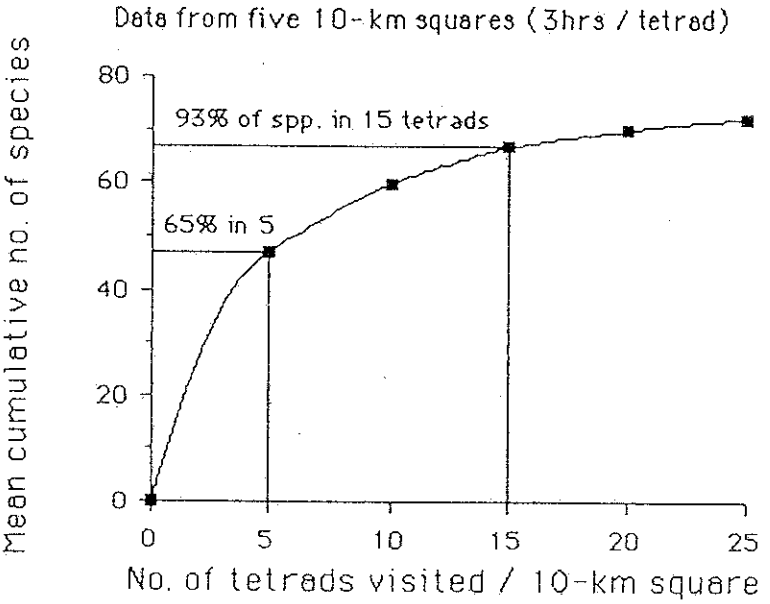


Figure 14. Cumulative number of species seen versus number of tetrads visited / 10-km square.

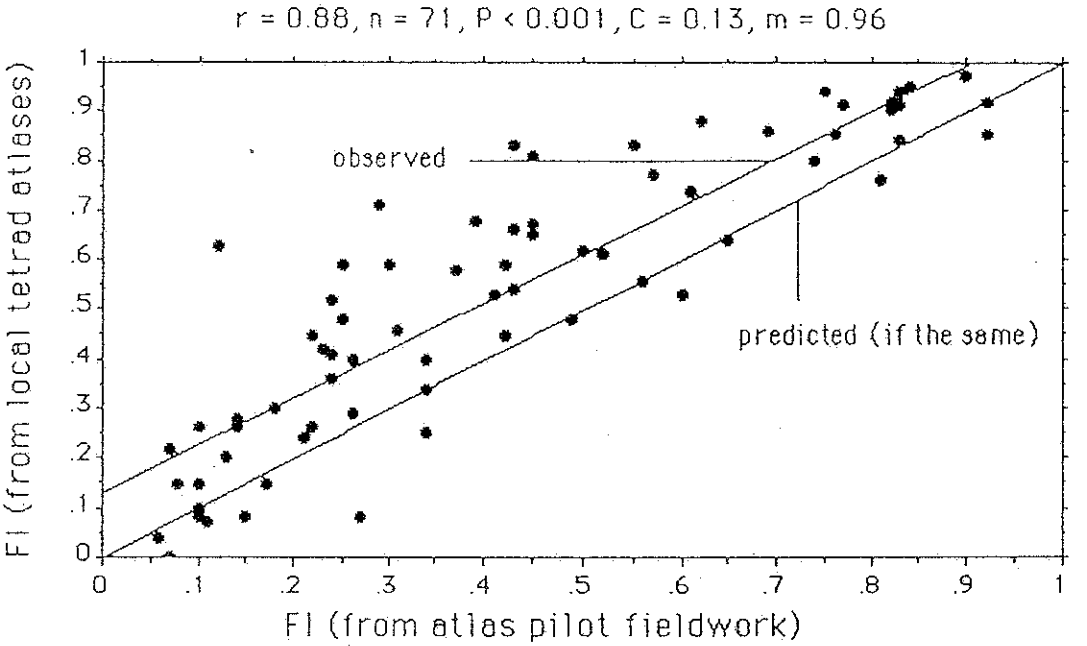


Figure 15. An interspecific comparison of frequency indices obtained from local tetrad atlases and the pilot fieldwork.

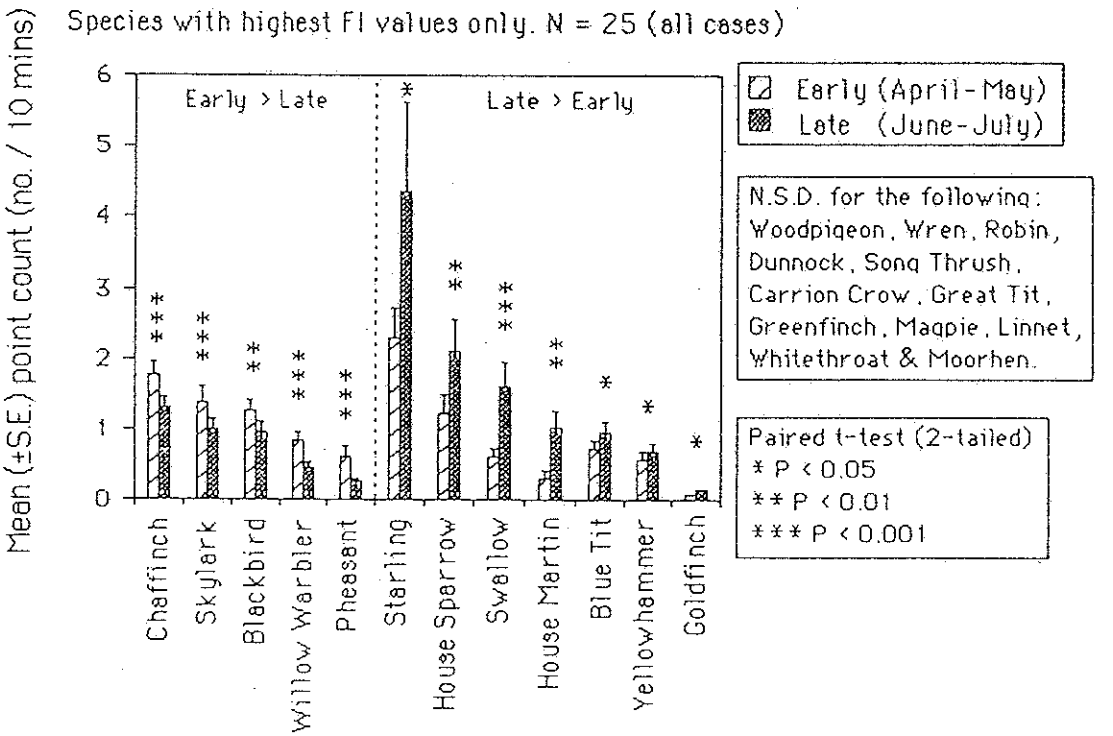


Figure 16. Early versus late point counts.

reflect relative abundance at high densities for an increasing number of species (i.e. more species will look like Figures 5 - 8). I suggest that three hours per tetrad is a suitable time period, although two to four hours is more realistic.

A related problem to this is how should FI's be calculated if more than one observer visits the same 10-km square. If the results of more than one observer were amalgamated, this would again increase the FI value for each species in that square. This could be a great problem in heavily populated areas where the same square is visited often. The only way around this is to ensure that every observer visits at least 5 tetrads so an FI can be calculated for each species. If more than one observer visits the same square, the FI that will eventually go into the Atlas will be the mean of all the FI's for that species in that square. A number of observers could become a 'team' and fill in an Atlas card jointly, providing they ensure they do not cover the same tetrads in a 10-km square.

Finally, approximately 15 local tetrad atlases are being organised / are presently being undertaken. Local atlas FI's will not be comparable with those obtained for the 'New Atlas' (Figure 15). There are two ways around this; (i) either ensure the FI's they submit to the 'New Atlas' are based on only three hours per tetrad (which I suspect will be entirely impractical), or (ii) reduce their FI values by an amount which could be calculated for each species (Figure 15 shows this value to be 0.13 for the average species). I suggest the latter would be much simpler for all concerned.

(b) Point counts:

Which species should be censused by point counts ?

It is not intended that point counts be used as a technique for censusing all species; this would be impractical as some species are not picked up on point counts at all, and volunteer fieldworkers, in general, do not like carrying them out. However, for some very common species (as shown in Figures 5 - 8), the FI method is unsuitable. Point counts could be used for these species. I suggest a list of 20 - 25 species; any more than this would become too complicated (large recording sheets, uncertainty over identification of rarer species etc.). To choose these species I have ranked all 71 in three separate ways; (i) Decreasing order of FI from pilot fieldwork (i.e. the species with the highest FI value at the top), (ii) Decreasing order of FI from local tetrad atlases, and (iii) Decreasing order of curvelinearity of the relationship between frequency indices and mean point counts. To do this I have looked at the shapes of the graphs (as in

Figures 1 - 8). Those species which asymptoted rapidly (e.g. as in Figures 5 - 8) were given a high rank, those which were more linear (Figures 1 - 4) were given a lower rank. As would be expected, species with higher mean FI's had higer ranks ($r_s = 0.81$, $n = 65$, $P < 0.001$). The results of this analysis are shown in Table 2.

To decide on the list of species to be censused by point counts, I have taken those species that were common to either two or three of the top 25 species ranked by each of these methods. This gave the following list of 24 species:

Chaffinch	Woodpigeon	Blackbird	Starling
House Sparrow	Swallow	Wren	Blue Tit
Robin	Willow Warbler	Dunnock	Skylark
Song Thrush	Carrion Crow	Great tit	Magpie
House Martin	Linnet	Yellowhammer	Greenfinch
Pheasant	Whitethroat	Goldfinch	Moorhen

With the possible exception of Moorhen, all of these species are suitable for censusing by point counts. However, Swallow, House Martin, Starling, House Sparrow and, to a certain extent, Wood Pigeon and Pheasant form into flocks at times, thus making them difficult to count, and giving the ocassional very large values. It may also be worth including Lapwing in the list of species to censused by point counts, as it showed a very curvelinear response (Table 2) even though its mean FI values were low.

When should point counts be done ?

Point count values varied with the season for 12 of these 24 species (Figure 16). They were significantly higher early in the season (April - May) for Chaffinch, Skylark, Blackbird, Willow Warbler and Pheasant, and significantly higher late in the season (June - July) for Starling, House Sparrow, Swallow, House Martin, Blue Tit, Yellowhammer and Goldfinch. The only way to overcome this problem is to ask fieldworkers to spread their point counts out over the season as best they can.

Point count values (across species) also varied with time of day (Figure 17; moorhen and flocking species excluded). They were at their highest just after dawn, decreased towards 0900 (B.S.T.), and remained constant thereafter until midday. Because of the great variation in point count values, I suggest they are not done early in the morning, but between 0800 & 1200. Figure 18 shows that 83% of point counts during the pilot fieldwork were performed between these times anyway.

Table 2. Which species should be censused by point counts ?

R	Species	FI(P)	Species	FI(A)	Species	RC
1	Chaffinch	0.92	Blackbird	0.97	Starling	4
2	Woodpigeon	0.92	Starling	0.95	Swallow	4
3	Blackbird	0.90	House Sparrow	0.94	Chaffinch	4
4	Starling	0.84	Song Thrush	0.94	House Sparrow	4
5	House Sparrow	0.83	Blue Tit	0.92	Woodpigeon	3.5
6	Swallow	0.83	Woodpigeon	0.92	Magpie	3.5
7	Wren	0.83	Wren	0.91	House Martin	3
8	Blue Tit	0.82	Dunnock	0.91	Carrion Crow	3
9	Robin	0.82	Robin	0.90	Linnet	3
10	Willow Warbler	0.81	Greenfinch	0.88	Willow Warbler	3
11	Dunnock	0.77	Great Tit	0.86	Whitethroat	3
12	Skylark	0.76	Skylark	0.85	Lapwing	3
13	Song Thrush	0.75	Chaffinch	0.85	Yellowhammer	3
14	Carrion Crow	0.74	Swallow	0.84	Pheasant	3
15	Great Tit	0.69	Linnet	0.83	Great Tit	3
16	Yellowhammer	0.65	Mistle Thrush	0.83	Blue Tit	3
17	Greenfinch	0.62	Goldfinch	0.81	Wren	3
18	Magpie	0.74	Carrion Crow	0.80	Skylark	3
19	Pheasant	0.60	House Martin	0.77	Blackbird	3
20	House Martin	0.57	Willow Warbler	0.76	Moorhen	2.5
21	Jackdaw	0.56	Magpie	0.74	Dunnock	2
22	Linnet	0.55	Bullfinch	0.71	Robin	2
23	Mallard	0.52	Pied Wagtail	0.68	Song Thrush	2
24	Swift	0.52	Moorhen	0.67	Chiffchaff	2
25	Whitethroat	0.50	Kestrel	0.66	Goldfinch	2
26	Collared Dove	0.49	Blackcap	0.65	Turtle Dove	2
27	Moorhen	0.45	Yellowhammer	0.64	Rook	2
28	Goldfinch	0.45	Tree Sparrow	0.63	Nuthatch	1
29	Blackcap	0.45	Whitethroat	0.62	Stock Dove	1
30	Kestrel	0.43	Mallard	0.61	Redshank	1

Key to Table 2:

R = Rank, decreasing orders; 1 = highest. Top 30 species only shown.

FI(P) = Frequency index form Pilot fieldwork.

FI(A) = Frequency index from Tetrad Atlases.

RC = Rank of curvelinearity (i.e. extent to which the frequency index versus mean point count curve asymptoted; see text for more detail). 4 = highly curvelinear, 0 = linear.

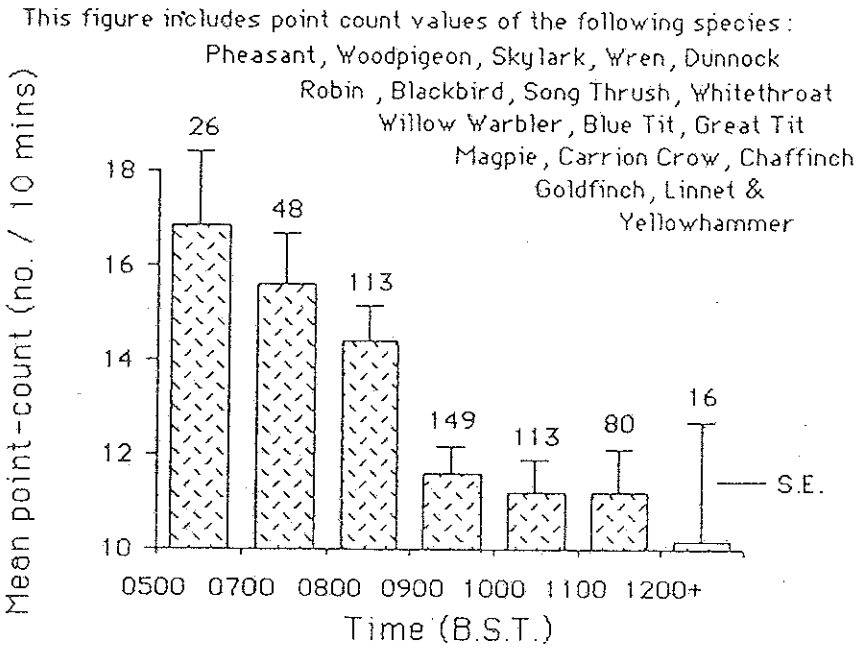


Figure 17. Point counts and time of day.

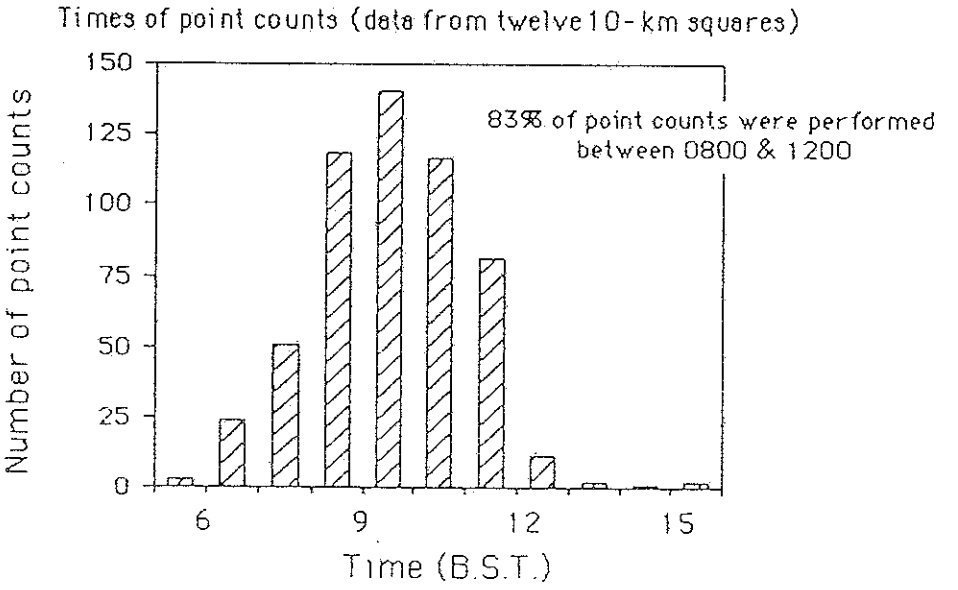


Figure 18. Times of point counts during pilot fieldwork.

How many point counts per 10-km square ?

For the robin, the mean point count from only 5 tetrads (5 counts repeated twice) correlated well (r = 0.79) with that from 25 tetrads (Figure 19). This was true for 16 out of 17 species analysed this way (again moorhen, and flocking species excluded), their mean correlation being 0.74. Figure 20 shows how increasing the number of counts increased these correlations. From this figure there seems little point in counting in more than 15 tetrads.

The worse problems with counting in less than 15 tetrads, is that some of these 17 species will not be recorded at all in some 10-km squares. In the robin example (Figure 19), robin was not recorded at all in 4 10-kms when counts were only performed in 5 tetrads, even though it was present (as recorded when counts were made in 25 tetrads). On average, if only 5 counts are performed in each 10-km square, 20% of those will not record these species at all (Figure 21). This value drops to 4% if counts are made in 15 tetrads.

(c) Six-hour timed counts:

39 out of the 71 species (55%) showed significant correlations between six-hour counts (the mean value of the early & late count) and mean point counts (Table 1). For these species at least, six-hour counts were good estimators of relative abundance. For some species, such as the Pheasant, the correlations were surprisingly high (Figure 22).

There are two main advantages of six-hour (or any length) counts; firstly their simplicity, and secondly the count value can vary from 0 to a very large number (thus correlations will always be linear), whereas frequency indices vary from 0 to 1 (correlations are often non-linear). Their great disadvantage, however, is that the route chosen by the observer is heavily biased towards good areas; this could present problems if we hope to relate bird distribution and abundance to habitat. Furthermore, given that fewer species showed correlations between six-hour counts and point counts than did frequency indices (Table 1), it may prove more difficult to calibrate timed counts to absolute breeding densities.

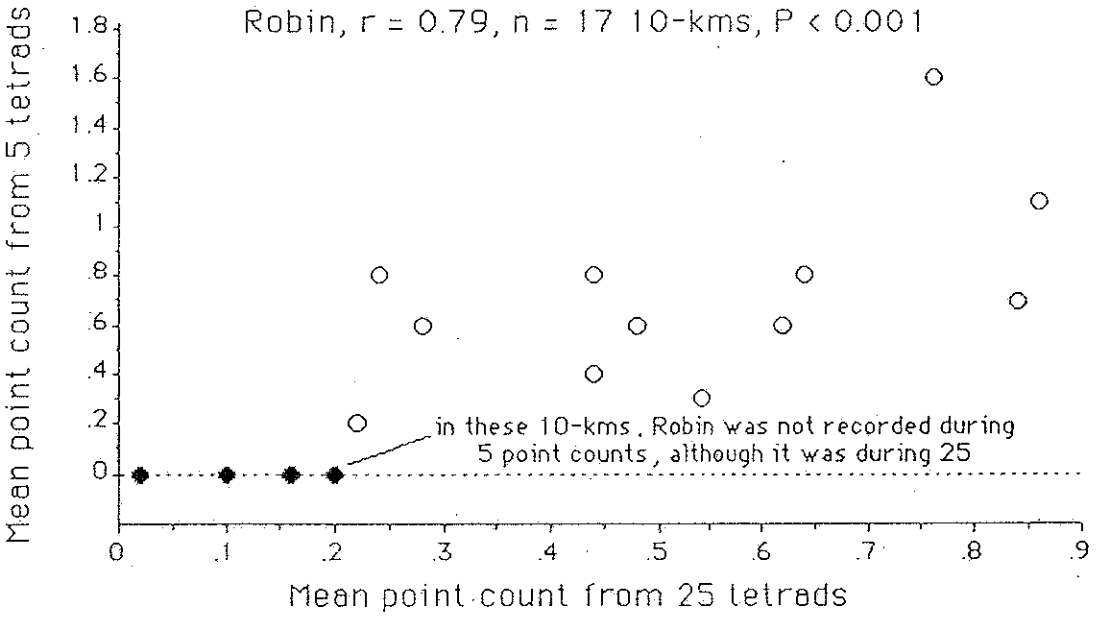


Figure 19. Mean point counts from 5 & 25 tetrads for the robin.

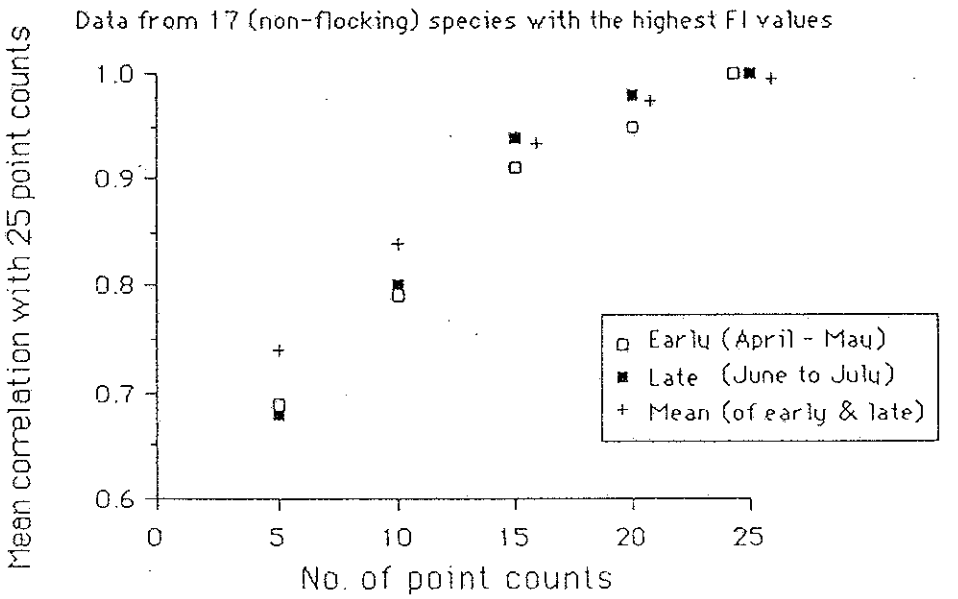


Figure 20. Mean correleations between 5 - 20 point counts and 25 point counts.

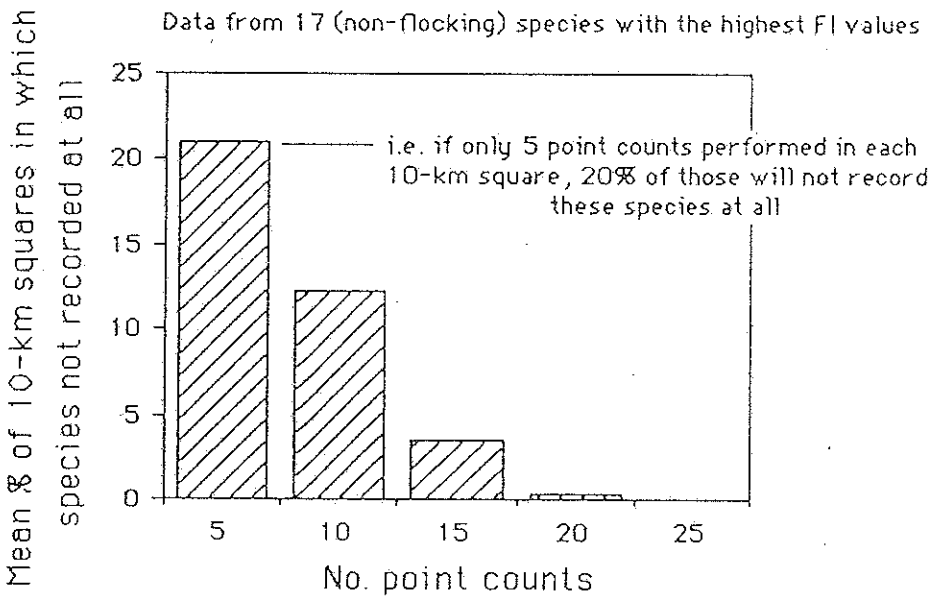


Figure 21. How the number of point counts influenced whether or not species were recorded.

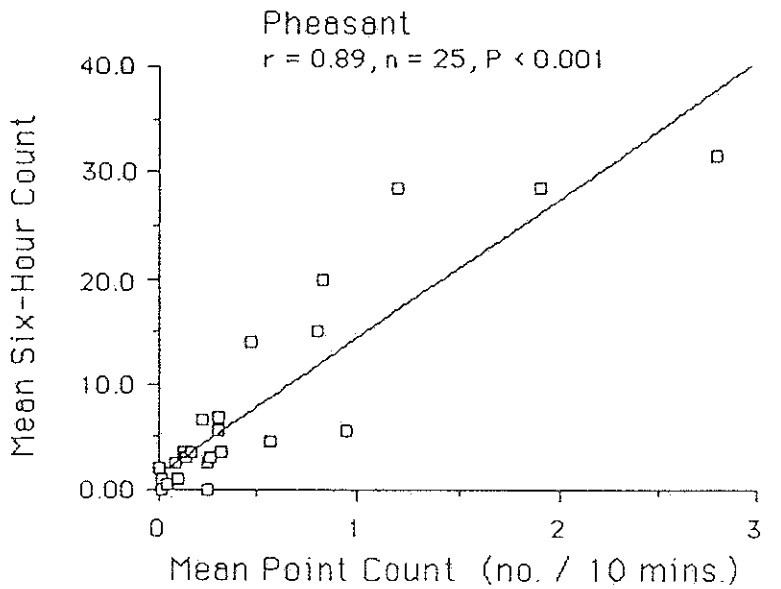


Figure 22. Pheasant mean six-hour and point counts. Each point refers to a single 10-km square.

Calibration from relative to absolute breeding densities;

The atlas pilot fieldwork has shown that correlations between frequency indices and point counts existed for 65 out 71 species covered (this list could be increased with more fieldwork). Thus if the relationship between point counts and absolute breeding density can be determined for each species, frequency indices could be related to absolute breeding density by using point counts as a transfer standard, a sort of common denominator.

For this reason, C.B.C. workers were asked to carry out point counts on their plots. Once the C.B.C. maps are analysed, we should be able to relate point count values to absolute breeding densities (albeit crudely) for those species covered by the C.B.C. It should then prove possible to calibrate frequency indices to absolute breeding density. The more linear the relationships, the easier this will be. Those species that will be censused by point count during the 'New Atlas', can be directly related to absolute breeding density from the C.B.C. correlations.

Six-hour (or any length) timed counts could also be calibrated in this manner, although during the pilot fieldwork correlations between six-hour counts and point counts only existed for 39 species. This could possibly be improved by larger sample sizes (i.e. data from more 10-km squares).

This indirect calibration technique (using point counts as a transfer standard) has to be used because it was not possible to relate FI's directly to absolute density from C.B.C. plots. This was tried for 32 species across fifteen10-km squares using exisiting C.B.C. data and FI's calculated from tetrad atlases; however, not a single species yielded a significant correlation. The problem was one of scale; the biggest C.B.C. plots are only 1/100th the size of a 10-km square, and cannot be representative of the whole square.

When using point counts as a transfer standard, it does not matter how they are performed, providing they are always carried out in exactly the same way. Theoretically, they could be carried out with the observer blindfold, providing they are blindfold on C.B.C. plots and whilst counting in 10-km squares. During the pilot year, similar instructions (they should have been exactly the same, but this was impractical) were given to both these types of fieldworker. Instructions could not be exactly the same, only as close as possible. On C.B.C. plots counting stations were separated by at least 100m, during counts in 10-km squares, they were seperated by 2km. This does not matter, providing all birds are counted up to the same

distance (in this case infinity). Unfortunately, C.B.C. workers only counted up to 50m outside their plots; it is hard to see how this problem can be overcome. Finally, the dates for the two sorts of point count were slightly different. This will probably not matter greatly. If it does, C.B.C. point counts could be repeated.

Clearly, this type of calibration will only work for those species which are censused by the C.B.C. Alternative methods will be required for other species. It is not yet clear what these will be.

Which species, which method ?

Assuming the frequency index technique is adopted as the general method for the 'New Atlas', it is necessary to decide which species can be monitored by this technique, and which by others (direct counts and point counts).

It was suggested in the results that species with FI's of approximately 0.1 or less were not censused accurately when only 5 tetrads / 10-km square were visited. Given that some parts of Britain and Ireland will inevitably be covered this crudely, species with FI's of less than 0.1 should not be censused by the frequency index method; these species should be counted directly. Unfortunately, approximately 50% of the total number of potential breeding species (110/225) fall into this category. Considering that approximately 30 species are colonial and would be counted directly anyway, and that the 23 most common species will be censused by point counts, this would leave only 60 to 70 species that could be censused by the FI technique.

Unfortuantely, in this analysis, FI's were calculated from local tetrad atlases which mostly covered parts of lowland England, so the FI's for more northern and upland species are probably great underestimates, but could not be calculated any other way.

One way of partially getting around this problem is shown in Figure 23. This shows the relationship between the FI of a species (calculated from 75 10-km squares in local tetrad atlases) and its national index of abundance (log10 scale). All 74 non-colonial species with abundance indices of 0, 1, 2, & 3 fell below the FI = 0.1 line, so all should be censused by direct counts. Some species with national abundance indices of 4 & 5 also fell below the line, but to include 4's (let alone 5's) would bring the number to be censused by direct counts up to nearly 100 (excluding colonial and open-water species); this seems to defeat the idea of using frequency indices at all. For this reason I suggest that only 0's, 1's, 2's, & 3's, open-water birds and colonial birds are censused by direct counts. Clearly it is a risk to leave the 4's in with those species that will be censused by FI's, but at least some of the 4's & 5's that fell below the line in Figure 23 were probably abundant elsewhere (i.e. outside the realms of the local tetrad atlases).

The 'Seabird Register', a national census of seabirds, has just finished its final year of fieldwork. To make use of this data we need approval from

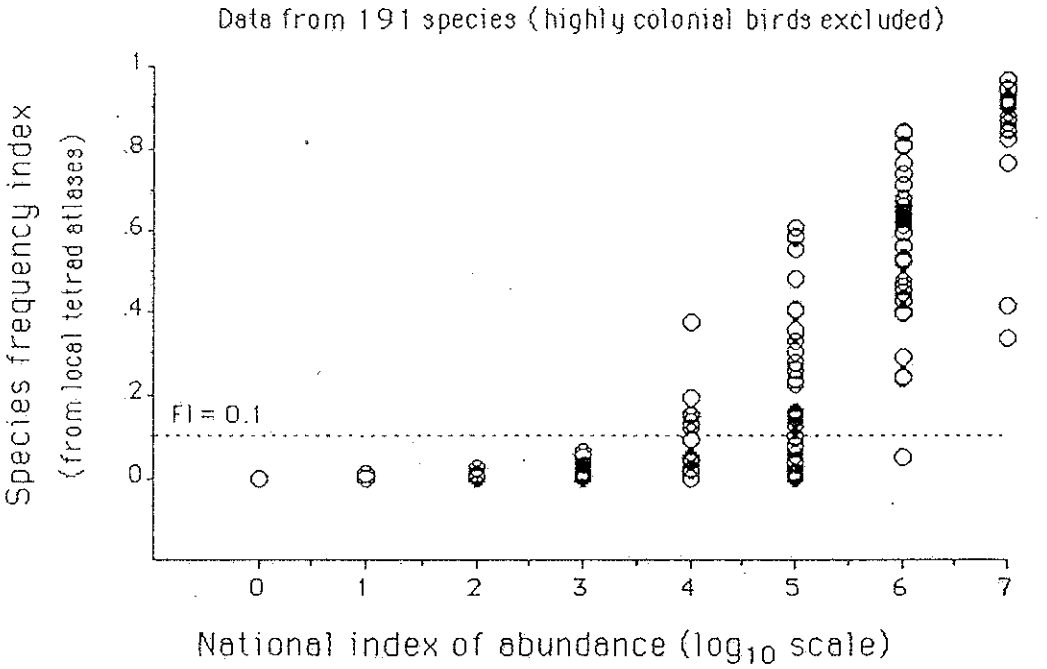


Figure 23. Interspecific comparison of frequency indices with abundance indices.

National Indices of Abundance

0	has bred but does not breed regularly
1	1 - 10 pairs in Britain & Ireland
2	11 - 100 pairs
3	101 - 1000 pairs
4	1001 - 10,000 pairs
5	10,001 - 100,000 pairs
6	100,001 - 1 million pairs
7	over 1 million pairs

the Nature Conservancy Council (which we have been given), and the Seabird Group (who have been approached, but have not yet replied). I suggest we use this data if possible, as there seems little point repeating it and probably making a worse job of it. All the data are grid referenced, so could be converted into Atlas format. Should we do this, it would be important to make sure exactly which species they have covered, and to what extent the data includes inland seabird sites. We may still have to census inland gull colonies, which would be done by direct counts (hopefully of number of nests).

Open water birds (ducks, geese, swans, divers, grebes and coot - 31 species in total) should be censused by direct counts. The Wildfowl Trust have suggested, for the ducks, that only males are counted (females are often incubating), and that a single count should be made in each tetrad (before the end of May, after this males may move long distances and go into moult). Because mallards are so abundant and are not restricted to open bodies of water, it may be sensible to census this species by frequency index.

Excluding the colonial seabirds, there are only seven other colonial species; Grey Heron, Swift, House Martin, Sand Martin, Reed Warbler, Jackdaw & Rook. I suggest that it is impractical to census Swift, House Martin, Reed Warbler & Jackaw by direct counts, and FI's should be used for these species. Grey Heron and Sand Martin, should be censused by direct counts of nests. Rooks could be censused by either method, but given that the pilot fieldwork has demonstrated a correlation between FI and number of nests in a 10-km square ($r = 0.70$, $n = 15$, $P < 0.005$), I suggest the FI method is used for Rooks.

As already discussed, point counts should be used for (at least) 23 very common species.

If these suggestions are put into practice, approximately 90, non-seabird, species will be counted directly, 25 seabird species will be counted directly (or not at all), 23 species will be censused by point counts, and the remainder (110) wil be censused by frequency index (the latter being a maximum figure).

Summary and recommendations:

I suggest two possible methods:

(i) The frequency index method (+ point counts + direct counts).
(ii) Timed counts (similar to the 'Winter Atlas').

The frequency index method:

1. ≥ 5 tetrads / 10-km to be visited. No point visiting > 15 tetrads (as FI's more or less identical.
2. Observer to choose tetrads to be visited (for most spp. this will probably give same result as visiting random tetrads).
3. Minimum of 2 and maximum of 4 hours / tetrad (nocturnal visit could be extra providing only nocturnal spp. recorded).
4. Each observer (or observing 'team') to visit ≥ 5 tetrads (allows FI's to be calculated). If > 1 observer (or 'team') visit same square, calculate mean FI's (across observers) for each spp.
5. Reduce FI values submitted from local tetrad atlases by an amount that can be calculated for each spp. (0.13 for the average sp.).
6. 23 very common spp. to be censused by point counts. 10-mins, unlimited distance, done between 0800 & 1200, 1 per tetrad visited (again no point doing more than 15), point counts within a 10-km to be spread over season (April - July).
7. All species with a National Index of Abundance of ≤ 3 ($\log_{10}$ scale), to be counted directly. Quite risky excluding 4's.
8. Ducks (except mallard ?) to be censused by single direct count of males in each tetrad visited before end of May. Similarly, single count of geese, swans, divers & grebes - but at anytime during the season.
9. 25 spp of seabirds to be censused by direct count, or not at all if Seabird Register data used.
10. Grey Heron & Sand Martin - direct count of nests in visited tetrads.
11. In total ~ 110 spp. (max) to be censused by frequency index, 23 by point count, and rest by direct count.

The timed count:

1. Walk around 10-km square.
2. Observer to choose own route.
3. Record numbers of all species.
4. Record time in field.
5. For spp. where time in field effects no. indivs. seen (whether sig. or

not) adjust to 6-hr day.
6. Where > 1 card / 10-km, calculate mean (or median, depending on shape of distribution).

Timed count is very much less complicated than frequency index, and is therfore well worth considering.

Categories of breeding:

1. Reduce three categories of breeding to two, 'Seen' & 'Breeding'.
2. Seen = seen in possible breeding habitat (equivalent to old √).
3. Breeding = everything else (possibly excluding S, singing male present on > 1 day).
4. Tick in column 1 for 'Seen', tick in column 2 for 'Breeding' (i.e. abandon all original codes.

Comments received from pilot fieldworkers:

Below is a list of unabridged comments received from atlas pilot fieldworkers.

General:

"Hopefully the B.T.O. will get their act together before the proper survey next year."
"I enjoyed the survey..."
"The work has been most enjoyable, ...although somewhat gruelling."
"....I'm not convinced by the revised methodology - but then I'm often not convinced by B.T.O. adjusted scores ! In scientific birdwatching I think they come close to fiction."
"A mammoth task..."
"It has been most interesting...."
"I enjoyed the work...."
"The whole exercise seems to me a waste of time and money...."

Frequency indices:

"....very enjoyable and rewarding exercise."
"....would be quite easy to track down any rare bird."
"I can't say they give me much satisfaction, ...there are so many birds I didn't see but I know to be present."
"....a lot of work but I enjoyed it."
"Counting the tetrads was just a leisurely stroll...."

Direct counts:

"....counting of Jackdaws and Rooks was difficult."
"....major problem I found was counting swallows, martins and mallards."

Six-hour timed counts:

"No problems apart from flock counts."
"....a huge time commitment...."
"....exhausting...."
"I found this the more satisfying of the methods."
"....puts the onus on the observer to choose representative habitats."
"....must give a more accurate picture overall."
"....great concentration required, and I could not keep it up for six hours at

a stretch."
"....in no way representative of the numbers in the tetrads I walked through."

Point counts:

"....guidance must be given regarding the recording of flocks."
"Some tetrads were definitely boring, whilst others were enjoyable and interesting."
"....were very simple and interesting, surprisingly so...."
"Here is the dreaded Pointless Count results - I thought this was a total waste of time....perhaps there is some merit in it but I'm blowed if I can see it."
"Boring and time consuming...."
"....very time consuming and relies on a reasonable knowledge of bird song."
"....is ten minutes long enough."
"....in most I had recorded everything within five minutes."
"....30 minutes needs to be spent at each point."
"....to include a complete species list (with storm petrel, dotterel, scarlet rosefinch etc.) seemed a bit daft."
"....a greater onus on the calibre of the observer."
"....gave a reasonably representative sample of habitats in the area."
"10 counts as a maximum per morning was really a bit of a joke."
"At some points I had views of several miles....whereas at others I had virtually no view."
"Tetrad R is badly affected by the new by-pass construction."
"....does not give an accurate picture."
"....I would have moved sites in two tetrads 1/4 mile each...."
"....tried in five tetrads, ...the results were so poor I went no further."
"....two observers are needed."

APPENDIX A

Instructions and recording sheets for performing point counts during Atlas pilot fieldwork.

NOTES FOR PERFORMING POINT COUNTS DURING ATLAS PILOT FIELDWORK

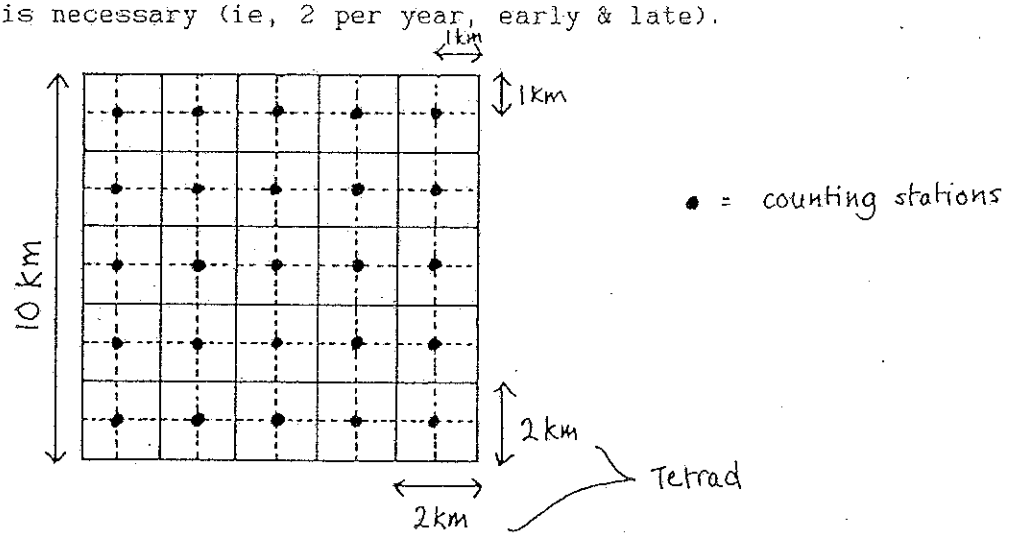
The theory

Point counts (in which an observer remains stationery at one spot for a predetermined period of time, during which all birds seen or heard are recorded) give an estimate of relative abundance of a species. These estimates can ultimately be corrected to absolute breeding densities.

How to do the point-counts

1. Choice of place to do the counts:

25 counts should be performed per 10km square, 1 in each tetrad. The counts should be performed at (or as close to as physically possible, bearing in mind ease of access and the difficulties you may have in obtaining permission) the junction of the 1km x 1km square boundaries (the thinnest blue lines on 1:50 000 OS maps); see diagram below. Remember the exact position of each point (counting 'station') as a repeat visit is necessary (ie, 2 per year, early & late).



2. Habitat recording:

Make a note on the enclosed sheet of the habitats surrounding the counting stations, up to a distance of 100m from the station

3. When to do the counts:

Each point must be visited, and counts made, twice per season, once early (April 1st - May 31st) and once late (June 1st - July 31st).

Point-counts should only be made during the morning, but try and avoid the first hour after dawn as song rate varies greatly at that time.

Do not count if there is a strong wind, hard rain, nor unusually low temperature.

4. The duration of the count:

Each count should last exactly 10 minutes at each point. Determine exactly where you are going to count from (the 'station'), walk towards it, and start to count as soon as you reach it. If you flush any birds (e.g. woodpeckers) up to 100m from the station whilst approaching it, record these as being present at that station.

5. What do you record ?

Record all birds seen and heard up to an unlimited distance (i.e. as far as you can see and hear in that habitat). Record each species separately. Do not count a bird if you are unsure of its identification, and do not to count the same bird twice. We suggest you record your observations in a note-book, and transfer them to the enclosed recording sheets when you get back home. It would be useful for you to draw up a piece of paper (or page in your note-book) which covers the sort of species you might expect to see / hear during point-counts in your area, and to use this for recording in the field. To minimise the risk of counting the same bird twice, it may be an idea to mark your observations of individuals onto a page of your notebook in which you have drawn four quadrants which correspond to your field of view (two in front & two behind).

6. How many counts per morning ?

Bearing in mind travel time between points, we suggest 10 counts per morning as a maximum, but we leave this up to your discretion.

7. Filling in the record sheets:

You are provided with two record sheets, one for the early counts, and one for the late counts. Each row of the sheets refers to a species, and each column to a specific tetrad in which you will have performed a point-count. Write down the number of individuals of each species you recorded in each tetrad point-count in its relevant 'box'. The space provided is very small, so write carefully (preferably with a coloured ball-point or felt-tip pen) and double-check that you have it in the correct 'box'.

For each of the two record sheets, give, in the relevant place on the front cover, the following information: the 10km square in which you performed the point-counts, the approximate dates of the counts, the name of the largest town/village in the 10km square, and your name and address.

At the end of the season (a.s.a.p. after 31st July 1987) submit your records to the organiser of the pilot-fieldwork in your region. If you do not have an organiser, send all the record sheets (counts and habitats) to Dr. David W. Gibbons, B.T.O., Beech Grove, Tring, Herts, HP23 5NR.

..... 1. 10km x 10km square	1987 Pilot 2. Year	..... 3. Approximate dates of early counts	EARLY COUNTS 4. Which counts?
5. Largest town/village or dominant feature (eg lake) in square	British Trust for Ornithology Irish Wildbird Conservancy Scottish Ornithologists' Club NEW BREEDING BIRD ATLAS POINT-COUNTS		7. Address ....
6. Name (Block letters)	Please read instructions before filling in card. Return a.s.a.p. after 31st July to your local organiser. If you have no local organiser send to: B.T.O., Beech Grove, Tring, Herts HP23 5NR		

TETRAD (2km x 2km) DESIGNATION

E	J	P	U	Z
D	I	N	T	Y
C	H	M	S	X
B	G	L	R	W
A	F	K	Q	V

		TETRAD (2km x 2km square) DESIGNATION																								
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z
Sparrowhawk	SH			·																						
Buzzard	BZ																									
Golden Eagle	EA																									
Osprey	OP																									
Kestrel	K.																									
Merlin	ML																									
Hobby	HY																									
Peregrine	PE																									
Red Grouse	RG																									
Ptarmigan	PM																									
Black Grouse	BK																									
Capercaillie	CP																									
Red-legged Partridge	RL																									
Grey Partridge	P.																									
Quail	Q.																									
Pheasant	PH																									
Golden Pheasant	GF																									
Lady Amerh. Pheasant	LX																									
Water Rail	WA																									
Spotted Crake	AK																									
Corncrake	CE																									
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Ringer Plover	RP																									
Kentish Plover	KP																									
Dotterel	DO																									
Golden Plover	GP																									
Lapwing	L.																									
Temminck's Stint	TK																									
Purple Sandpiper	PS																									
Dunlin	DN																									
Ruff	RU																									
Snipe	SN																									
Woodcock	WK																									
Black-tailed Godwit	BV																									
Whimbrel	WM																									
Curlew	CU																									
Redshank	RK																									
Greenshank	GK																									
Green Sandpiper	GE																									
Wood Sandpiper	OD																									

		TETRAD (2km x 2km square) DESIGNATION																								
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z
Red-throated Diver	RH			·										·												
Black-throated Diver	BV																									
Little Grebe	LG																									
Great Crested Grebe	GG																									
Slavonian Grebe	SZ																									
Black-necked Grebe	BN																									
Fulmar	F.																									
Manx Shearwater	MX																									
Storm Petrel	TM																									
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Goosander	GD																									
Ruddy Duck	RY																									
Honey Buzzard	HZ																									
Red Kite	KT																									
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Common Sandpiper	CS																									
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Whinchat	WC																									
Stonechat	SC																									
Wheatear	W.																									
Ring Ouzel	RZ																									
Blackbird	B.																									
Fieldfare	FF																									

		TETRAD (2km x 2km square) DESIGNATION																									
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z
Song Thrush	ST																									
Redwing	RE																									
Mistle Thrush	M.																									
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Reed Warbler	RW																									
Dartford Warbler	DW																									
Lesser Whitethroat	LW																									
Whitethroat	WH																									
Garden Warbler	GW																									
Blackcap	BC																									
Wood Warbler	WO																									
Chiffchaff	CC																									
Willow Warbler	WW																									
Goldcrest	GC																									
Firecrest	FC																									
Spotted Flycatcher	SF																									
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Treecreeper	TC																									
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6. Name (Block letters)	Please read instructions before filling in card. Return a.s.a.p. after 31st July to your local organiser. If you have no local organiser send to: B.T.O., Beech Grove, Tring, Herts HP23 5NR		

TETRAD (2km x 2km) DESIGNATION

E	J	P	U	Z
D	I	N	T	Y
C	H	M	S	X
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Corn Bunting	CB																									

HABITAT CODES FOR USE WITH POINT-COUNTS

WOODLAND & SCRUB: 00 Broad-leaved woodland. 01 Coniferous woodland. 02 Mixed woodland. 03 Scrub.

FIELD' VEGETATION: 10 Bracken. 11 Chalk downland & similar grassland. 12 Lowland dry heath. 13 Upland heather moor. 14 Upland grassland.

WETLANDS: 20 Bog. 21 Fen & marsh. 22 Reedbed. 23 Water-meadow & wash.

WATER BODIES: 30 Lowland river or stream. 31 Upland river or stream. 32 Ditch. 33 Canal. 34 Pond. 35 Pool or tarn. 36 Lake or reservoir. 37 Other water body.

OPEN HABITATS (NON-COASTAL): 40 Exposed 'mud'. 41 High montane. 42 Cliff & Crag.

COASTAL: 50 Mud. 51 Saltmarsh. 52 Coastal grazing marsh. 53 Brackish pools & lagoons. 54 Gravel & pebbles. 55 Sand (beach & dunes). 56 Cliff.

MISCELLANEOUS: 60 Farmland (arable). 61 Farmland (grazing). 62 Farmland (mixed). 63 Grass with scattered trees (parkland, golf-courses etc.). 64 Sewage farms. 65 Buildings. 66 Gardens / allotments. 67 Waste land.

Enter below the habitat code for the land surrounding the counting station in each tetrad for a distance of up to 100m. Try to give only a single category (e.g. 61), but at most two (e.g. 61, 30 - the first code being, in your opinion the most important with respect to the bird fauna).

.....	L.....	X.....
.....	M.....	Y.....
.....	N.....	Z.....
.....	P.....	
.....	Q.....	
.....	R.....	
.....	S.....	NAME.....
.....	T.....	10KM SQUARE.....
.....	U.....	
.....	V.....	
.....	W.....	

POINT-COUNTS PERFORMED DURING ATLAS PILOT-FIELDWORK: DATE AND TIME

NAME..... 10-KM SQUARE.....

ADDRESS.....

TETRAD	EARLY COUNT				LATE COUNT		
	Date		Time		Date		Time
A							
B							
C							
D							
E							
F							
G							
H							
I							
J							
K							
L							
M							
N							
P							
Q							
R							
S							
T							
U							
V							
W							
X							
Y							
Z							

Please return to your local organiser a.s.a.p. If you have no local organiser, please return to Dr. D. Gibbons, B.T.O., Beech Grove, Station Rd., Tring, Herts, HP23 5NR.

NOTES:

Please fill in the date and time of each point-count you performed in each tetrad, assuming you recorded this information. It does not matter if you did not.

EARLY COUNTS were those performed during April 1st - May 31st, and LATE COUNTS were those performed during June 1st - July 31st.

Please fill in date and time as in the following examples; 24/5/87 and 0730.

Please leave the column in between Date & Time blank.

APPENDIX B

Instructions and recording sheets for performing six-hour timed counts during Atlas pilot fieldwork.

NOTES FOR PERFORMING TIMED (SIX-HOUR) COUNTS DURING ATLAS PILOT FIELDWORK

The fieldwork and recording methods are very simple, and are modified from the procedures used during the recent 'Winter Atlas'. You are asked to record how many birds of each species you see (or hear) during two six-hours periods in the field in the same 10km square. These counts will be used to give a figure for the relative abundance of each species in that square.

1. Performing timed-counts:

During the six-hour counts try and cover as many of the representative habitats in your 10km square as possible. Walk, or cycle slowly, counting all birds seen and heard. Birds recorded during, and time spent in travelling between what you consider to be more interesting sites should be recorded. The aim is to get representative counts, not see as many species as possible in the 6 hours.

Make sure the counts last exactly 6 hours (not more or less as used in the 'Winter Atlas'). Try and perform as much of the counts as possible in the morning. Do not count if there is a strong wind, hard rain, nor unusually low temperatures

Remember the route taken as the same route has to be covered twice. One six-hour count should be performed early in the season (April 1st - May 31st), and one late in the season (June 1st - July 31st).

2. Some problems which may be encountered:

Colonial species; If, during your six-hour count, you come across a breeding colony, estimate (by counting) the number of nests that are being (or have been used) that season. Stop the clock whilst performing the nest estimate, and restart it once you have finished. Fledged young; Try not to count birds which are obviously fledged young. Ignore birds that are not in suitable breeding habitat (e.g. flocks of gulls).

3. Filling in the record sheet:

We suggest you write your records into a note-book and transfer them to the 'Six-hour timed-count' record sheet when you get home. Each row on the record sheet refers to a species, and there are two columns marked 'Early' & 'Late' which are for the two separate counts. Ignore the two empty columns. We suggest you write in a coloured ball-point or felt-tip pen as this will improve clarity of the records as the space available for entries is limited.

Fill in all the 'boxes' marked 1, 3, 4, 5, 6 & 7 with the relevant information. At the end of the season submit your record card (a.s.a.p. after 31st July) to the organiser of the pilot-fieldwork in your area. If there is no local organiser, send the card to Dr. David Gibbons, B.T.O., Beech Grove, Tring, Herts, HP23 5NR.

1. 10km x 10km square	2. Year	3. Date of EARLY count	4. Date of LATE count
.....	1987 Pilot	.....	.....

5. Largest town/village or dominant feature (eg lake) in square	British Trust for Ornithology Irish Wildbird Conservancy Scottish Ornithologists' Club NEW BREEDING BIRD ATLAS SIX-HOUR TIMED COUNTS	7. Address
.....		.....
		.....
6. Name (Block letters)		.....
.....	Please read instructions before filling in card. Return by 31st July to your local organiser. If you have no local organiser send to: B.T.O., Beech Grove, Tring, Herts HP23 5NR	

		COUNT			
		EARLY	LATE		
Red-throated Diver	RH				
Black-throated Diver	BV				
Little Grebe	LG				
Great Crested Grebe	GG				
Slavonian Grebe	SZ				
Black-necked Grebe	BN				
Fulmar	F.				
Manx Shearwater	MX				
Storm Petrel	TM				
Leach's Petrel	TL				
Gannet	GX				
Cormorant	CA				
Shag	SA				
Bittern	BI				
Grey Heron	H.				
Mute Swan	MS				
Whooper Swan	WS				
Greylag Goose	GJ				
Canada Goose	CG				
Egyptian Goose	EG				
Shelduck	SU				
Mandarin	MN				
Wigeon	WN				
Gadwall	GA				
Teal	T.				

		COUNT			
		EARLY	LATE		
Mallard	MA				
Pintail	PT				
Garganey	GY				
Shoveler	SV				
Red-crested Pochard	RQ				
Pochard	PO				
Tufted Duck	TU				
Scaup	SP				
Eider	E.				
Common Scoter	CX				
Goldeneye	GN				
Red-breasted Merganser	RM				
Goosander	GD				
Ruddy Duck	RY				
Honey Buzzard	HZ				
Red Kite	KT				
Marsh Harrier	MR				
Hen Harrier	HH				
Montagu's Harrier	MO				
Goshawk	GI				
Sparrowhawk	SH				
Buzzard	BZ				
Golden Eagle	EA				
Osprey	OP				
Kestrel	K.				

		COUNT			
		EARLY	LATE		
Merlin	ML				
Hobby	HY				
Peregrine	PE				
Red Grouse	RG				
Ptarmigan	PX				
Black Grouse	BK				
Capercaillie	CP				
Red-legged Partridge	RL				
Grey Partridge	P.				
Quail	Q.				
Pheasant	PH				
Golden Pheasant	GF				
Lady Amerh. Pheasant	LX				
Water Rail	WA				
Spotted Crake	AK				
Corncrake	CE				
Moorhen	MH				
Coot	CO				
Oystercatcher	OC				
Avocet	AV				
Stone-curlew	TN				
Little Ringer Plover	LP				
Ringer Plover	RP				
Kentish Plover	KP				
Dotterel	DO				

		COUNT			
		EARLY	LATE		
Golden Plover	GP				
Lapwing	L.				
Temminck's Stint	TK				
Purple Sandpiper	PS				
Dunlin	DN				
Ruff	RU				
Snipe	SN				
Woodcock	WK				
Black-tailed Godwit	BW				
Whimbrel	WM				
Curlew	CU				
Redshank	RK				
Greenshank	GK				
Green Sandpiper	GE				
Wood Sandpiper	OD				
Common Sandpiper	CS				
Red-necked Phalarope	NK				
Arctic Skua	AC				
Great Skua	MX				
Mediterranean Gull	MU				
Little Gull	LU				
Black-headed Gull	BH				
Common Gull	CM				
Lesser Black-backed Gull	LB				
Herring Gull	HG				
Great Black-backed Gull	GB				
Kittiwake	KI				
Sandwich Tern	TE				
Roseate Tern	RS				
Common Tern	CN				
Arctic Tern	AE				
Little Tern	AF				
Black Tern	BJ				
Guillemot	GU				
Razorbill	RA				
Black Guillemot	TY				
Puffin	PU				
Rock Dove/Feral Pigeon	DV				
Stock Dove	SD				
Woodpigeon	WP				
Collared Dove	CD				
Turtle Dove	TD				
Ring-necked Parakeet	RI				
Cuckoo	CK				
Barn Owl	BO				
Little Owl	LO				
Tawny Owl	TO				
Long-eared Owl	LE				
Short-eared Owl	SE				
Nightjar	NJ				

		COUNT			
		EARLY	LATE		
Swift	SI				
Kingfisher	KF				
Hoopoe	HP				
Wryneck	WY				
Green Woodpecker	G.				
Great Spotted Woodpecker	GS				
Less Spotted Woodpecker	LS				
Woodlark	WL				
Skylark	S.				
Shore Lark	SX				
Sand Martin	SM				
Swallow	SL				
House Martin	HM				
Tree Pipit	TP				
Meadow Pipit	MP				
Rock Pipit	RC				
Yellow Wagtail	YW				
Grey Wagtail	GL				
Pied Wagtail	PW				
Dipper	DI				
Wren	WR				
Dunnock	D.				
Robin	R.				
Nightingale	N.				
Bluethroat	BU				
Black Redstart	BX				
Redstart	RT				
Whinchat	WC				
Stonechat	SC				
Wheatear	W.				
Ring Ouzel	RZ				
Blackbird	B.				
Fieldfare	FF				
Song Thrush	ST				
Redwing	RE				
Mistle Thrush	M.				
Cetti's Warbler	CW				
Grasshopper Warbler	GH				
Savi's Warbler	VI				
Sedge Warbler	SW				
Marsh Warbler	MW				
Reed Warbler	RW				
Dartford Warbler	DW				
Lesser Whitethroat	LW				
Whitethroat	WH				
Garden Warbler	GW				
Blackcap	BC				
Wood Warbler	WO				
Chiffchaff	CC				
Willow Warbler	WW				

		COUNT			
		EARLY	LATE		
Goldcrest	GC				
Firecrest	FC				
Spotted Flycatcher	SF				
Pied Flycatcher	PF				
Bearded Tit	BR				
Long-tailed Tit	LT				
Marsh Tit	MT				
Willow Tit	WT				
Crested Tit	CI				
Coal Tit	CT				
Blue Tit	BT				
Great Tit	GT				
Nuthatch	NH				
Treecreeper	TC				
Golden Oriole	OL				
Red-backed Shrike	ED				
Jay	J.				
Magpie	MG				
Chough	CF				
Jackdaw	JD				
Rook	RO				
Carrion Crow	C.				
Hooded Crow	HC				
Raven	RN				
Starling	SG				
House Sparrow	HS				
Tree Sparrow	TS				
Chaffinch	CH				
Brambling	BL				
Serin	NS				
Greenfinch	GR				
Goldfinch	GO				
Siskin	SK				
Linnet	LI				
Twite	TV				
Redpoll	LR				
Crossbill	CR				
Scottish Crosbill	CY				
Scarlet Rosefinch	SQ				
Bullfinch	BF				
Hawfinch	HF				
Lapland Bunting	LA				
Snow Bunting	SB				
Yellowhammer	Y.				
Cirl Bunting	CL				
Reed Bunting	RB				
Corn Bunting	CB				
.....					
.....					
.....					

APPENDIX C

Instructions and recording sheets for obtaining frequency indices during Atlas pilot fieldwork.

NOTES FOR OBTAINING FREQUENCY-INDICES DURING ATLAS PILOT FIELDWORK

The theory

Each 10km x 10km square is divided into 25 tetrads (2km x 2km squares). If each of these tetrads is visited during the breeding season, and presence / absence for a particular species is recorded for each tetrad, then the number of tetrads in which a species was present, as a percentage of the total number of tetrads in a square (25) will give a measure of relative abundance (a frequency index) of that species in that square. For example if a species was present in 10 out of the 25 tetrads, its frequency index would be 40% for that 10km square. This value could later be corrected to an absolute breeding density. The technique will not work, however, for colonial species (or those living in very isolated habitats, e.g. open-water birds and reed-bed birds), or very rare species.

Determining Frequency Indices in practice

You are supplied with two forms

(1) a *"Worksheet"* (2 sheets of A4)
(2) a *10km x 10km square Record Card* (1 sheet of A4)

You should have one of these for each 10km square (or part of a 10km square) you visit. We suggest you take the worksheet out into the field (attached to a clipboard, and covered in something waterproof), and leave the record card at home, as this simply summarises the worksheet. Fill in the boxes numbered 1, 5, 6 & 7 on the worksheet and the record card.

The worksheet:

This requires two sorts of information:

(a) proof of breeding, divided into the standard three grades of evidence of breeding, at the 10km square level. This information is placed in the first three columns of the worksheet.

(b) presence / absence information (equivalent to "possible breeding" category) for all species at the tetrad level. This information is placed in the remaining columns of the worksheet.

For each species there are therefore 3 columns for level of evidence of breeding, 25 columns for presence / absence (one for each tetrad), and a final column which summarises the number of tetrads in which each species was found.

Visit each of the tetrads in your 10km square during the breeding season (1st April - 31st July 1987) and record (with a simple tick ✓) whether each species was present (in suitable breeding habitat) in each tetrad. If it was not, leave the column blank. Because this technique is unsuitable for some species (colonial and very rare ones), the rows referring to these species are highlighted (with the use of bold

vertical lines), and for these species we require direct counts of individual birds seen or heard (or nests multiplied by two if this is easier, e.g. colonial species such as rooks). We do not expect you to count the total number of, for example, mallards in each tetrad, merely the number you actually recorded whilst in the tetrad. If, however, you visit, say, a lake try to count all the mallards as best you can (ditto reed-warblers in reed-beds etc.)

For clarity, we suggest you use a coloured ball-point or felt-tip pen.

You are encouraged to visit each tetrad at least twice (early and late in the season) because some species are more obvious at certain times of year, and because some species arrive late to their breeding areas. We suggest you spend a minimum of 3 hours in each tetrad in total over the season.

After you have visited each tetrad, tick it off on the tetrad diagram on the worksheet so that you know which tetrads you have visited.

Record, at the level of the whole 10km square (not each tetrad) the level of proof of breeding for each species encountered. The definitions for the three levels (possible breeding, probable breeding, and confirmed breeding, PossB, ProbB & ConfB on the worksheet respectively) are shown on the attached sheet which you should take out in the field with you.

We appreciate that the space provided for entries on the worksheet are small, but it has been reduced to the acceptable minimum to reduce costs. Take extreme care when filling in the worksheet that you place the entries in the correct row & column.

Compiling you records at the end of the season

At the end of the season (July 31st), for each species add up the number of tetrads in which it was recorded, and write the total in the last column of the worksheet. For the highlighted species (colonial / rare birds) add up the individual counts and write the total in the last column instead. Fill in box 3 on the worksheet; the number here should be 25 (i.e. all tetrads visited). Now simply summarise the worksheet by transfering this information to the record card, along with the level of evidence of breeding for each species. Make very sure that the details (boxes numbered 1, 2, 3, 5, 6 & 7) for the worksheet and its corresponding record card are exactly the same.

Send your worksheets and record cards a.s.a.p. after the end of the season (31st July) to the local organiser of the pilot-fieldwork in your area. If there is no local organiser, send them direct to Dr. David Gibbons, at the B.T.O., Beech Grove, Station Rd., Tring, Herts HP23 5NR.

..... 1. 10km x 10km square	1987 Pilot 2. Year	..... 3. Total number of tetrads visited	..... 4. Card number (office use)
5. Largest town/village or dominant feature (eg lake) in square	British Trust for Ornithology Irish Wildbird Conservancy Scottish Ornithologists' Club NEW BREEDING BIRD ATLAS WORKSHEET	7. Address	
6. Name (Block letters)	Please read instructions before filling in card. Return a.s.a.p. after 31st July to your local organiser. If you have no local organiser send to: B.T.O., Beech Grove, Tring, Herts HP23 5NR		

TETRAD (2km x 2km) DESIGNATION

E	J	P	U	Z
D	I	N	T	Y
C	H	M	S	X
B	G	L	R	W
A	F	K	Q	V

		PossB	ProbB	ConfB	TETRAD (2km x 2km square) DESIGNATION																							No. Tet rec. in
					A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	
Red-throated Diver	RH																												
Black-throated Diver	BV																												
Little Grebe	LG																												
Great Crested Grebe	CG																												
Slavonian Grebe	SZ																												
Black-necked Grebe	BN																												
Fulmar	F.																												
Manx Shearwater	MX																												
Storm Petrel	TX																												
Leach's Petrel	TL																												
Gannet	GX																												
Cormorant	CA																												
Shag	SA																												
Bittern	BI																												
Grey Heron	H.																												
Mute Swan	MS																												
Whooper Swan	WS																												
Greylag Goose	GJ																												
Canada Goose	CG																												
Egyptian Goose	EG																												
Shelduck	SU																												
Mandarin	MN																												
Wigeon	WN																												
Gadwall	GA																												
Teal	T.																												
Mallard	MA																												
Pintail	PT																												
Garganey	GY																												
Shoveler	SV																												
Red-crested Pochard	RQ																												
Pochard	PO																												
Tufted Duck	TU																												
Scaup	SP																												
Eider	E.																												
Common Scoter	CX																												
Goldeneye	GN																												
Red-breasted Merganser	RX																												
Goosander	GD																												
Ruddy Duck	RY																												
Honey Buzzard	HZ																												
Red Kite	KT																												
Marsh Harrier	MR																												
Hen Harrier	HH																												
Montagu's Harrier	MO																												
Goshawk	GI																												

		PossB	ProbB	ConfB	TETRAD (2km x 2km square) DESIGNATION																							No. Tet rec. in
					A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	
Sparrowhawk	SH																												
Buzzard	BZ																												
Golden Eagle	EA																												
Osprey	OP																												
Kestrel	K.																												
Merlin	KL																												
Hobby	HY																												
Peregrine	PE																												
Red Grouse	RG																												
Ptarmigan	PK																												
Black Grouse	BK																												
Capercaillie	CP																												
Red-legged Partridge	RL																												
Grey Partridge	P.																												
Quail	Q.																												
Pheasant	PH																												
Golden Pheasant	GF																												
Lady Amerh. Pheasant	LH																												
Water Rail	WA																												
Spotted Crake	AK																												
Corncrake	CE																												
Moorhen	MH																												
Coot	CO																												
Oystercatcher	OC																												
Avocet	AV																												
Stone-curlew	TN																												
Little Ringer Plover	LP																												
Ringer Plover	RP																												
Kentish Plover	KP																												
Dotterel	DO																												
Golden Plover	GP																												
Lapwing	L.																												
Temminck's Stint	TK																												
Purple Sandpiper	PS																												
Dunlin	DN																												
Ruff	RU																												
Snipe	SN																												
Woodcock	WK																												
Black-tailed Godwit	BV																												
Whimbrel	WK																												
Curlew	CU																												
Redshank	RK																												
Greenshank	GK																												
Green Sandpiper	GE																												
Wood Sandpiper	OD																												

		PossB	ProbB	ConfB	TETRAD (2km x 2km square) DESIGNATION																								No. Tet rec. in
					A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	
Common Sandpiper	CS																												
Red-necked Phalarope	RX																												
Arctic Skua	AC																												
Great Skua	NY																												
Mediterranean Gull	XU																												
Little Gull	LU																												
Black-headed Gull	BH																												
Common Gull	CK																												
Lesser Black-backed Gull	LB																												
Herring Gull	HG																												
Great Black-backed Gull	GB																												
Kittiwake	KI																												
Sandwich Tern	TE																												
Roseate Tern	RS																												
Common Tern	CN																												
Arctic Tern	AE																												
Little Tern	AF																												
Black Tern	BJ																												
Guillemot	GU																												
Razorbill	RA																												
Black Guillemot	TY																												
Puffin	PU																												
Rock Dove/Feral Pigeon	DV																												
Stock Dove	SD																												
Woodpigeon	WP																												
Collared Dove	CD																												
Turtle Dove	TD																												
Ring-necked Parakeet	RI																												
Cuckoo	CK																												
Barn Owl	BO																												
Little Owl	LO																												
Tawny Owl	TO																												
Long-eared Owl	LE																												
Short-eared Owl	SE																												
Nightjar	NJ																												
Swift	SI																												
Kingfisher	KF																												
Hoopoe	HP																												
Wryneck	WY																												
Green Woodpecker	G.																												
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Less Spotted Woodpecker	LS																												
Woodlark	WL																												
Skylark	S.																												
Shore Lark	SX																												
Sand Martin	SM																												
Swallow	SL																												
House Martin	HM																												
Tree Pipit	TP																												
Meadow Pipit	MP																												
Rock Pipit	RC																												
Yellow Wagtail	YW																												
Grey Wagtail	GL																												
Pied Wagtail	PW																												
Dipper	DI																												
Wren	WR																												
Dunnock	D.																												
Robin	R.																												
Nightingale	N.																												
Bluethroat	BU																												
Black Redstart	BX																												
Redstart	RT																												
Whinchat	WC																												
Stonechat	SC																												
Wheatear	W.																												
Ring Ouzel	RZ																												
Blackbird	B.																												
Fieldfare	FF																												

		PossB	ProbB	ConfB	TETRAD (2km x 2km square) DESIGNATION																							No. Tet rec. in
					A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	
Song Thrush	ST																												
Redwing	RE																												
Mistle Thrush	M.																												
Cetti's Warbler	CW																												
Grasshopper Warbler	GH																												
Savi's Warbler	VI																												
Sedge Warbler	SW																												
Marsh Warbler	MW																												
Reed Warbler	RW																												
Dartford Warbler	DW																												
Lesser Whitethroat	LW																												
Whitethroat	WH																												
Garden Warbler	GW																												
Blackcap	BC																												
Wood Warbler	WO																												
Chiffchaff	CC																												
Willow Warbler	WW																												
Goldcrest	GC																												
Firecrest	FC																												
Spotted Flycatcher	SF																												
Pied Flycatcher	PF																												
Bearded Tit	BR																												
Long-tailed Tit	LT																												
Marsh Tit	MT																												
Willow Tit	WT																												
Crested Tit	CT																												
Coal Tit	CT																												
Blue Tit	BT																												
Great Tit	GT																												
Nuthatch	NH																												
Treecreeper	TC																												
Golden Oriole	OL																												
Red-backed Shrike	ED																												
Jay	J.																												
Magpie	MG																												
Chough	CF																												
Jackdaw	JD																												
Rook	RO																												
Carrion Crow	C.																												
Hooded Crow	HC																												
Raven	RV																												
Starling	SG																												
House Sparrow	HS																												
Tree Sparrow	TS																												
Chaffinch	CH																												
Brambling	BL																												
Serin	NS																												
Greenfinch	GR																												
Goldfinch	GO																												
Siskin	SK																												
Linnet	LI																												
Twite	TV																												
Redpoll	LR																												
Crossbill	CR																												
Scottish Crosbill	CY																												
Scarlet Rosefinch	SQ																												
Bullfinch	BF																												
Hawfinch	HF																												
Lapland Bunting	LA																												
Snow Bunting	SB																												
Yellowhammer	Y.																												
Cirl Bunting	CL																												
Reed Bunting	RB																												
Corn Bunting	CB																												

..... 1. 10km x 10km square	1987 Pilot 2. Year	..... 3. Total number of tetrads visited	..... 4. Card number (office use)
5. Largest town/village or dominant feature (eg lake) in square	British Trust for Ornithology Irish Wildbird Conservancy Scottish Ornithologists' Club NEW BREEDING BIRD ATLAS 10km x 10km SQUARE RECORD CARD	7. Address	
6. Name (Block letters)	Please read instructions before filling in card. Return a.s.a.p. after 31st July to your local organiser. If you have no local organiser send to: B.T.O., Beech Grove, Tring, Herts HP23 5NR		

		PossB	ProbB	ConfB	No.Tet rec.in
Red-throated Diver	RH				
Black-throated Diver	BV				
Little Grebe	LG				
Great Crested Grebe	GG				
Slavonian Grebe	SZ				
Black-necked Grebe	BN				
Fulmar	F.				
Manx Shearwater	MX				
Storm Petrel	TM				
Leach's Petrel	TL				
Gannet	GX				
Cormorant	CA				
Shag	SA				
Bittern	BI				
Grey Heron	H.				
Mute Swan	MS				
Whooper Swan	WS				
Greylag Goose	GJ				
Canada Goose	CG				
Egyptian Goose	EG				
Shelduck	SU				
Mandarin	MN				
Wigeon	WN				
Gadwall	GA				
Teal	T.				

		PossB	ProbB	ConfB	No.Tet rec.in
Mallard	MA				
Pintail	PT				
Garganey	GY				
Shoveler	SV				
Red-crested Pochard	RQ				
Pochard	PO				
Tufted Duck	TU				
Scaup	SP				
Eider	E.				
Common Scoter	CX				
Goldeneye	GN				
Red-breasted Merganser	RM				
Goosander	GD				
Ruddy Duck	RY				
Honey Buzzard	HZ				
Red Kite	KT				
Marsh Harrier	MR				
Hen Harrier	HH				
Montagu's Harrier	MO				
Goshawk	GI				
Sparrowhawk	SH				
Buzzard	BZ				
Golden Eagle	EA				
Osprey	OP				
Kestrel	K.				

		PossB	ProbB	ConfB	No.Tet rec.in
Merlin	ML				
Hobby	HY				
Peregrine	PE				
Red Grouse	RG				
Ptarmigan	PM				
Black Grouse	BK				
Capercaillie	CP				
Red-legged Partridge	RL				
Grey Partridge	P.				
Quail	Q.				
Pheasant	PH				
Golden Pheasant	GF				
Lady Amerh. Pheasant	LM				
Water Rail	WA				
Spotted Crake	AK				
Corncrake	CE				
Moorhen	MH				
Coot	CU				
Oystercatcher	OC				
Avocet	AV				
Stone-curlew	TN				
Little Ringer Plover	LP				
Ringer Plover	RP				
Kentish Plover	KP				
Dotterel	DO				

		PossB	ProbB	ConfB	No. Tet rec. in
Golden Plover	GP				
Lapwing	L.				
Temminck's Stint	TK				
Purple Sandpiper	PS				
Dunlin	DN				
Ruff	RU				
Snipe	SN				
Woodcock	WK				
Black-tailed Godwit	BW				
Whimbrel	WM				
Curlew	CU				
Redshank	RK				
Greenshank	GK				
Green Sandpiper	GE				
Wood Sandpiper	OD				
Common Sandpiper	CS				
Red-necked Phalarope	NK				
Arctic Skua	AC				
Great Skua	NX				
Mediterranean Gull	MU				
Little Gull	LU				
Black-headed Gull	BH				
Common Gull	CM				
Lesser Black-backed Gul	LB				
Herring Gull	HG				
Great Black-backed Gull	GB				
Kittiwake	KI				
Sandwich Tern	TE				
Roseate Tern	RS				
Common Tern	CN				
Arctic Tern	AE				
Little Tern	AF				
Black Tern	BJ				
Guillemot	GU				
Razorbill	RA				
Black Guillemot	TY				
Puffin	PU				
Rock Dove/Feral Pigeon	DV				
Stock Dove	SD				
Woodpigeon	WP				
Collared Dove	CD				
Turtle Dove	TD				
Ring-necked Parakeet	RI				
Cuckoo	CK				
Barn Owl	BO				
Little Owl	LO				
Tawny Owl	TO				
Long-eared Owl	LE				
Short-eared Owl	SE				
Nightjar	NJ				

		PossB	ProbB	ConfB	No. Tet rec. in
Swift	SI				
Kingfisher	KF				
Hoopoe	HP				
Wryneck	WY				
Green Woodpecker	G.				
Great Spotted Woodpecker	GS				
Less Spotted Woodpecker	LS				
Woodlark	WL				
Skylark	S.				
Shore Lark	SX				
Sand Martin	SM				
Swallow	SL				
House Martin	HM				
Tree Pipit	TP				
Meadow Pipit	MP				
Rock Pipit	RC				
Yellow Wagtail	YW				
Grey Wagtail	GL				
Pied Wagtail	PW				
Dipper	DI				
Wren	WR				
Dunnock	D.				
Robin	R.				
Nightingale	N.				
Bluethroat	BU				
Black Redstart	BX				
Redstart	RT				
Whinchat	WC				
Stonechat	SC				
Wheatear	W.				
Ring Ouzel	RZ				
Blackbird	B.				
Fieldfare	FF				
Song Thrush	ST				
Redwing	RE				
Mistle Thrush	M.				
Cetti's Warbler	CW				
Grasshopper Warbler	GH				
Savi's Warbler	VI				
Sedge Warbler	SW				
Marsh Warbler	MW				
Reed Warbler	RW				
Dartford Warbler	DW				
Lesser Whitethroat	LW				
Whitethroat	WH				
Garden Warbler	GW				
Blackcap	BC				
Wood Warbler	WO				
Chiffchaff	CC				
Willow Warbler	WW				

		PossB	ProbB	ConfB	No. Tet rec. in
Goldcrest	GC				
Firecrest	FC				
Spotted Flycatcher	SF				
Pied Flycatcher	PF				
Bearded Tit	BR				
Long-tailed Tit	LT				
Marsh Tit	MT				
Willow Tit	WT				
Crested Tit	CI				
Coal Tit	CT				
Blue Tit	BT				
Great Tit	GT				
Nuthatch	NH				
Treecreeper	TC				
Golden Oriole	OL				
Red-backed Shrike	RD				
Jay	J.				
Magpie	MG				
Chough	CF				
Jackdaw	JD				
Rook	RO				
Carrion Crow	C.				
Hooded Crow	HC				
Raven	RN				
Starling	SG				
House Sparrow	HS				
Tree Sparrow	TS				
Chaffinch	CH				
Brambling	BL				
Serin	NS				
Greenfinch	GR				
Goldfinch	GO				
Siskin	SK				
Linnet	LI				
Twite	TW				
Redpoll	LR				
Crossbill	CR				
Scottish Crosbill	CY				
Scarlet Rosefinch	SQ				
Bullfinch	BF				
Hawfinch	HF				
Lapland Bunting	LA				
Snow Bunting	SB				
Yellowhammer	Y.				
Cirl Bunting	CL				
Reed Bunting	RB				
Corn Bunting	CB				
.....					
.....					
.....					

There are 14 categories, placed here in order from least good to best evidence. Only the highest evidence obtained need be entered for each species.

Possible breeding

Enter in first column

V Bird recorded in the breeding season[1] *in possible nesting habitat*,[2] but no other indication of breeding noted.[3]

Probable breeding

Enter in second column

S Singing male present (or breeding calls heard) on more than one date in the same place.

T Bird (or pair) apparently holding territory.

D Courtship and display; or agitated behaviour or anxiety calls from adults, suggesting probable presence of nest or young nearby; or brood-patch on trapped female.

N Visiting probable nest-site.

B Nest-building (including excavating nest-hole).[4]

Confirmed breeding

Enter in third column

DD Distraction display or injury feigning.

UN Used nest found.

FL Recently fledged young.[5]

FS Adult carrying faecal-sac.

FY Adult(s) with food for young.[6]

ON Adult(s) entering or leaving nest-site in circumstances indicating occupied nest.[7] This code should be used for occupied colonies of colonial nesters (e.g. rookeries, heronries, Sand Martin colonies).

NE Nest and eggs (or bird sitting and not disturbed, or egg-shells found away from nest).[8]

NY Nest with young,[9] or *downy* young of ducks, game-birds, waders, etc.[10]

NOTES

[1] Take 1 April to 31 July as the breeding season for most resident species and 1 May to 31 July for summer visitors. Consult the *Handbook* for exceptions, such as pigeons and doves, April-August; owls (other than Short-eared), February-July; Raven, February-May; Mistle Thrush, March-June; Crossbill, January-mid-May; Corn Bunting, April-August; Yellowhammer, April-August.

[2] If in doubt about possible nesting habitat, consult *Handbook of British Birds*, *Field Guide*, or other standard work.

[3] Summering non-breeding gulls (on refuse tips, for example), Herons where you *know* there is no heronry, Gannets where you *know* there is no gannetry, migrant waders, etc., should *not* be included.

[4] This is at present placed in col. 2 instead of col. 3 because in a number of species (e.g. Wren, gulls and waders making nest-scrapes, immature or sterile birds of prey building or scraping but not laying) it is not definite evidence of breeding. The final Atlas will take account of the fact that for many species it *is* good evidence of breeding.

[5] This code should be used with extreme caution in the cases of such species as Rook, Starling and the hirundines which often move a large distance from the nest soon after fledging (some of them may still be fed by the adults long after fledging).

[6] This class of evidence should be used with caution in those birds (e.g. gulls and many birds of prey) which continue to feed their young long after they have fledged. Care should also be taken to avoid confusion with courtship feeding (=D in col. 2). Note also that some species (e.g. terns) may carry food long distances to their nest, which may be in a neighbouring 10-km. square.

[7] Not merely prospecting birds (=N in col. 2). Types of evidence would be: bird entering hole and remaining inside; bird leaving hole (or high nest) after having been inside (or on) for a considerable time; pair changing over at nest.

[8] A Cuckoo's egg = NE for Cuckoo *and* NE for the fostering species.

[9] A young Cuckoo in the nest = NY for Cuckoo *and* NY for the fostering species.

[10] Since parents may often lead downy young for considerable distances, care should be taken if such records are close to the edge of a square.

THE 10KM SQUARE & THE TETRAD

The 10km grid square

Each 10km grid square has a unique designation consisting of letters (two in Britain and one in Ireland) followed by two numbers. The letters indicate the 100km square. The first number is always the easting grid and the second the northing. On the 1:50 000 British Ordnance Survey Maps, the 10km squares are shown by the thicker blue lines. The correct letters can be obtained from the diagram alongside, and the numbers are printed along the border of the map. On the 1:25 000 maps, each of the First Series maps covers two 10km squares, while each of the Second Series maps covers one. These maps are ideal for Atlas work. In the Republic of Ireland, the grid is shown on the ½":1 mile OS map.

The tetrad

Each 10km grid square is divide into 25 tetrads, each of which is designated by a letter (see front covers of 'worksheets' & 'point-count record cards'). Note that no tetrad has the letter O as this could be confused with zero.

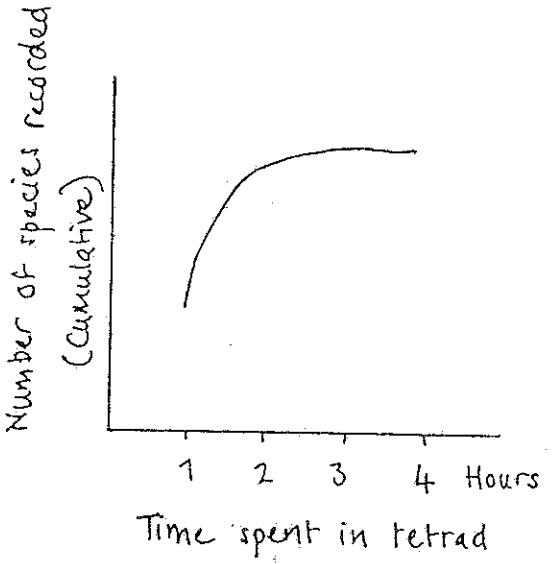
APPENDIX D

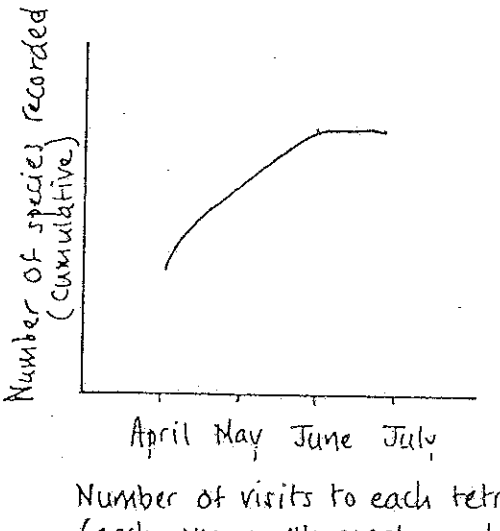
How long to spend in each tetrad and how many visits ? Instructions for Atlas pilot fieldwork.

HOW LONG TO SPEND IN EACH TETRAD & HOW MANY VISITS ?

The theory:

One of the aims of the 'New' Breeding Bird Atlas is to estimate breeding densities of each species of bird in each 10km square. One possible technique we shall use to do this is the 'Frequency Index' technique. As explained in the accompanying sheet (which I have enclosed for your information - do not actually do this, others are doing it -), this relies upon visiting tetrads (2km squares) and recording species presence / absence in suitable breeding habitat. However, the number of species recorded will clearly increase with the amount of time the observer spends in the tetrad, and the number of visits made to the tetrad each season. What we want to know is how does it increase ? Typical examples are shown below:





In these examples, there would be no point in remaining in the tetrad for longer than two hours, nor in revisiting it during July. Unfortunately, these are only examples; what we want you to do is to help determine the true shapes of these curves.

The fieldwork:

The fieldwork you are required to do is simple. Choose a tetrad (or tetrads depending on how much fieldwork you can do) which contains a variety of habitats. Visit each tetrad once in April, once in May, once in June, and once in July, and spend four hours in the tetrad each time. Try not to miss out on any of the visits, nor spend more or less than 4 hours in each tetrad. Mornings are probably the best time to visit the tetrad, although we leave this to your discretion. Try to make each visit a continuous 4-hour period if possible, even though it means you may miss some species (e.g. owls).

During each visit, wander around the tetrad visiting each of its representative habitats. You may find you've covered the tetrad in only 2 hours; if you do this, repeat your path again to ensure you spend 4 hours in the tetrad. Record in your notebook each species as you come across it for the first time during that visit. Make a note of the passing of each half-hour period in such a way that its clear which species were first recorded during which half-hour block. At the end of the season (a.s.a.p. after the 31st July 1987), compile your results in the same manner as shown in the enclosed example (with a separate sheet for each tetrad), and send them to Dr. David W. Gibbons, B.T.O., Beech Grove, Tring, Herts HP23 5NR.

Example of the way to compile you results:

NAME OF OBSERVER..... DAVID GIBBONS

ADDRESS..... B.T.O. BEECH GROVE

.....

10KM SQUARE & TETRAD VISITED..... SP91 B

TIME SINCE START OF VISIT	MONTH			
	APRIL	MAY	JUNE	JULY
0 - ½ hr	Blackbird Song thrush Chaffinch Greenfinch Dunnock Great Tit Blue Tit	Chaffinch Willow Warbl. Blackbird Swallow Dunnock Wood Pigeon Greenfinch Great Tit	Reed Warbler Chiffchaff Dunnock Blackbird Chaffinch Great Tit Blue Tit Turtle dove	Swallow Blackbird Dunnock Chaffinch Swift House Sparrow Great Tit
½ - 1 hr	Yellowhammer Rook Coll'd Dove Wood Pigeon RL Partridge	Blackcap Song Thrush Robin Wren Mistle Thrush Whitethroat	House Martin Robin Wren Blackcap	Willow Warbl. Garden Warbl. Magpie Treecreeper Wood Pigeon
1 - 1½ hr	Green Woodpk Kestrel	Crow	Coll'd Dove Linnet RL Partridge Kestrel	Moorhen Canada Goose Greenfinch
1½ - 2 hr		Goldfinch Linnet	Rook	
2 - 2½ hr	Magpie		Jay	Coal Tit L. Sp. Woodp.
2½ - 3 hr	Nuthatch Reed Bunting	Tree Sparrow		Yellowhammer
3 - 3½ hr		Reed Bunting	Sp. Flycatch.	
3½ - 4 hr	Willow Tit		Song Thrush	Nightingale

APPENDIX E

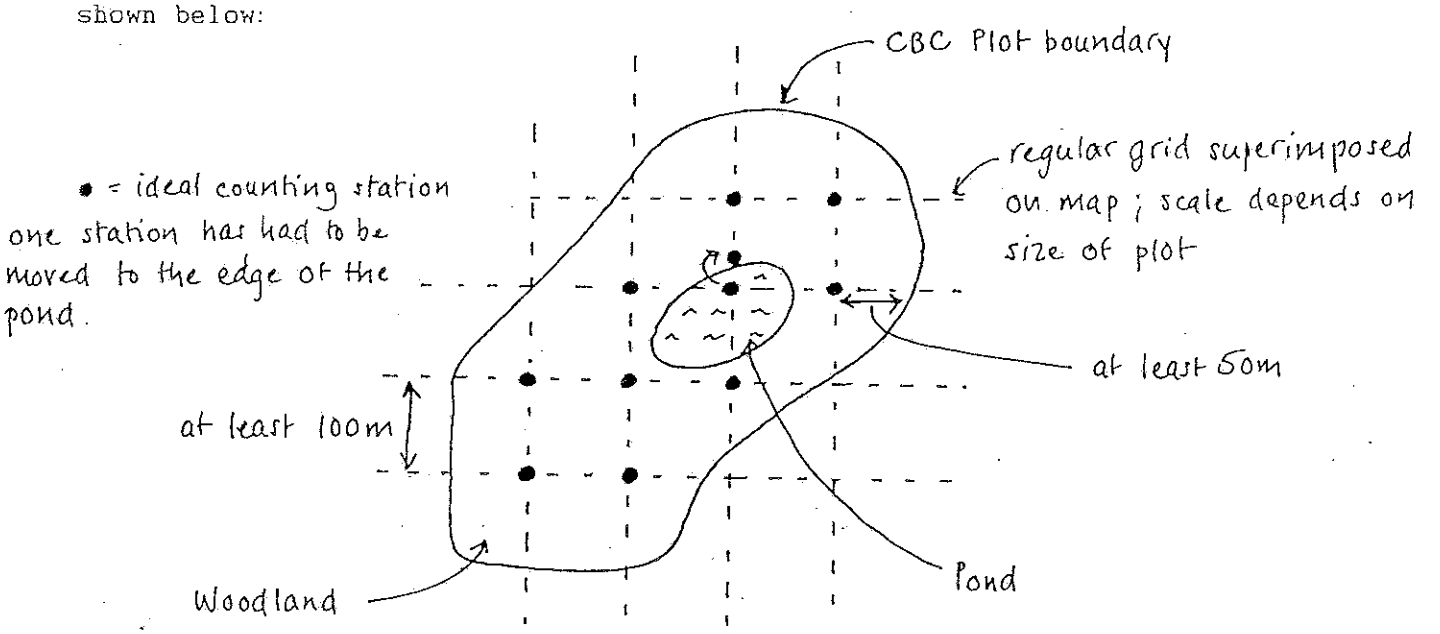
Instructions and recording sheets for performing point counts on Common Birds' Census plots.

INSTRUCTIONS FOR PERFORMING POINT-COUNTS ON CBC PLOTS

1. Choice of places to do the counts:

Choose ten places ('counting stations') at which to count. The choice of position should fit in as well as possible with the following conditions:

(i) The stations should be as regularly spaced over your plot as possible. This is best done by drawing the positions in on a map of your plot; an example is shown below:



Where regular spacing is impossible (e.g. the stations fall in the centre of a wheat field) choose a point which is as close as physically possible to the regularly placed point on your map (e.g. at the nearest field edge).

(ii) Do not specifically choose obvious landmarks (e.g. intersections of hedges) to count from, as this may well bias the results.

(iii) All counting stations should be at least 50m in from the edge of your plot.

(iv) All counting stations should be at least 100m apart.

We appreciate that on some plots it may be impossible to meet all these conditions, but try to fulfill as many as possible.

2. When to do the counts:

Each of the ten counting stations should be visited twice during the season, once early in the year (April 13th - May 17th) and once late (May 18th - June 30th). As each point has to be visited twice, remember the exact position; perhaps even leave a small, discrete, plastic marker. Point-counts should only be made during the morning, but try and avoid the first hour after dawn as song

rate varies greatly during that time. Point-counts and CBC's must not be done simultaneously (unless conducted independently by two observers), rather put aside two mornings to do point-counts only. Do not count if there is a strong wind, hard rain, nor unusually low temperature.

3. The duration of the count:

Each count should last exactly ten minutes at each counting station. Determine exactly where you are going to count from, walk towards it, and start to count as soon as you reach it. If you flush any birds (e.g. woodpeckers) up to 100m from the station whilst approaching it, record these as being present at that station.

4. What do you record ?

Record all birds seen and heard ('contacts'). Record all contacts up to 25m from the counting station, and from 25m to infinity separately. Do not count birds that are seen or heard more than 50m outside the CBC plot. It would be worthwhile to pace out 25m before starting the mornings' point-counts to give you some idea of where the 25m boundary should lie. Record all species separately. Do not count a bird if you are unsure of its identification, and do not count the same bird twice. We suggest you record your observations in a note-book, and transfer them to the enclosed recording sheets when you get back home. It would be useful for you to draw up a piece of paper (or page in your note-book) which covers the sort of species you expect to record during point-counts on your plot, and to use this for recording in the field. To minimise the risk of counting the same bird twice, it may be an idea to mark your observations of individuals onto a page of your notebook in which you have drawn four quadrants which correspond to your field of view (two in front & two behind).

5. Filling in the record-sheet:

Each major row of the record-sheet refers to a species. The most common ones are written down for you, with spaces left for any others you might record. Each major row is divided into two minor rows, one for near counts (less than 25m) and one for far counts (25m to infinity). Each major column of the sheet refers to each of the ten counting stations (numbered 1 to 10). Each major column is divided into two minor columns, one for the early counts, and one for the late counts. At the end of each series of counts (early or late) transfer your records from your note-book to the record-sheet. All we require for each row / column is the total number of contacts of each species at each counting station early and late in the season. Rows for species that were not recorded should be left blank.

At the end of the season (a.s.a.p. after June 30th) fill in all the questions at the top of the record-sheet (name, plot number, etc.) and send it to Elizabeth Murray, B.T.O., Beech Grove, Tring, Herts, HP23 5NR.

We would also like to receive any brief comments you may have; e.g; Did you enjoy performing point-counts ? Did you find it hard to decide where your counting stations should be located ? Was ten point-counts in a morning too many ?

COMMON BIRDS CENSUS PLOT POINT-COUNTS; RECORD SHEET

PLOT NUMBER (where known).....

NAME OF PLOT.....

.....

NAME OF OBSERVER.....

.....

TYPE OF PLOT (please circle where known)

WOODLAND FARMLAND SPECIAL

ADDRESS OF OBSERVER.....

.....

.....

Please return (a.s.a.p. after 30th June 1987) to Elizabeth Murray at the B.T.O.

SPECIES RECORDED	CODE	DISTANCE	COUNTING STATION 1 EARLY	1 LATE	2 EARLY	2 LATE	3 EARLY	3 LATE	4 EARLY	4 LATE	5 EARLY	5 LATE	6 EARLY	6 LATE	7 EARLY	7 LATE	8 EARLY	8 LATE	9 EARLY	9 LATE	10 EARLY	10 LATE
Sparrowhawk	SH	0 - 25m																				
		over 25m																				
Kestrel	K.	0 - 25m																				
		over 25m																				
Red-legged Partridge	RL	0 - 25m																				
		over 25m																				
Grey Partridge	P.	0 - 25m																				
		over 25m																				
Pheasant	PH	0 - 25m																				
		over 25m																				
Moorhen	MH	0 - 25m																				
		over 25m																				
Lapwing	L.	0 - 25m																				
		over 25m																				
Stock Dove	SD	0 - 25m																				
		over 25m																				
Woodpigeon	WP	0 - 25m																				
		over 25m																				
Collared Dove	CD	0 - 25m																				
		over 25m																				
Turtle Dove	TD	0 - 25m																				
		over 25m																				
Cuckoo	CK	0 - 25m																				
		over 25m																				
Little Owl	LO	0 - 25m																				
		over 25m																				
Tawny Owl	TO	0 - 25m																				
		over 25m																				

SPECIES RECORDED	CODE	DISTANCE	COUNTING STATION 1 EARLY	1 LATE	2 EARLY	2 LATE	3 EARLY	3 LATE	4 EARLY	4 LATE	5 EARLY	5 LATE	6 EARLY	6 LATE	7 EARLY	7 LATE	8 EARLY	8 LATE	9 EARLY	9 LATE	10 EARLY	10 LATE
Green Woodpecker	G.	0 - 25m																				
		over 25m																				
Great Spotted Woodpecker	GS	0 - 25m																				
		over 25m																				
Less Spotted Woodpecker	LS	0 - 25m																				
		over 25m																				
Skylark	S.	0 - 25m																				
		over 25m																				
Swallow	S	0 - 25m																				
		over 25m																				
Tree Pipit	TP	0 - 25m																				
		over 25m																				
Meadow Pipit	MP	0 - 25m																				
		over 25m																				
Yellow Wagtail	YW	0 - 25m																				
		over 25m																				
Grey Wagtail	GL	0 - 25m																				
		over 25m																				
Pied Wagtail	PW	0 - 25m																				
		over 25m																				
Wren	WR	0 - 25m																				
		over 25m																				
Dunnock	D.	0 - 25m																				
		over 25m																				
Robin	R.	0 - 25m																				
		over 25m																				
Nightingale	N.	0 - 25m																				
		over 25m																				
Redstart	RT	0 - 25m																				
		over 25m																				
Blackbird	B.	0 - 25m																				
		over 25m																				
Song Thrush	ST	0 - 25m																				
		over 25m																				
Mistle Thrush	M.	0 - 25m																				
		over 25m																				
Grasshopper Warbler	GH	0 - 25m																				
		over 25m																				
Sedge Warbler	SW	0 - 25m																				
		over 25m																				

SPECIES RECORDED	CODE	DISTANCE	COUNTING STATION 1 EARLY	1 LATE	2 EARLY	2 LATE	3 EARLY	3 LATE	4 EARLY	4 LATE	5 EARLY	5 LATE	6 EARLY	6 LATE	7 EARLY	7 LATE	8 EARLY	8 LATE	9 EARLY	9 LATE	10 EARLY	10 LATE
Reed Warbler	RW	0 - 25m																				
		over 25m																				
Lesser Whitethroat	LW	0 - 25m																				
		over 25m																				
Whitethroat	WH	0 - 25m																				
		over 25m																				
Garden Warbler	GW	0 - 25m																				
		over 25m																				
Blackcap	BC	0 - 25m																				
		over 25m																				
Wood Warbler	WO	0 - 25m																				
		over 25m																				
Chiffchaff	CC	0 - 25m																				
		over 25m																				
Willow Warbler	WW	0 - 25m																				
		over 25m																				
Goldcrest	GC	0 - 25m																				
		over 25m																				
Spotted Flycatcher	SF	0 - 25m																				
		over 25m																				
Long-tailed Tit	LT	0 - 25m																				
		over 25m																				
Marsh Tit	MT	0 - 25m																				
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Willow Tit	WT	0 - 25m																				
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Coal Tit	CT	0 - 25m																				
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Blue Tit	BT	0 -25m																				
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Great Tit	GT	0 - 25m																				
		over 25m																				
Nuthatch	NH	0 - 25m																				
		over 25m																				
Treecreeper	TC	0 - 25m																				
		over 25m																				
Jay	J.	0 - 25m																				
		over 25m																				
Magpie	MG	0 - 25m																				
		over 25m																				

SPECIES RECORDED	CODE	DISTANCE	COUNTING STATION 1 EARLY	1 LATE	2 EARLY	2 LATE	3 EARLY	3 LATE	4 EARLY	4 LATE	5 EARLY	5 LATE	6 EARLY	6 LATE	7 EARLY	7 LATE	8 EARLY	8 LATE	9 EARLY	9 LATE	10 EARLY	10 LATE
Jackdaw	JD	0 - 25m																				
		over 25m																				
Rook	RO	0 - 25m																				
		over 25m																				
Carrion Crow	C.	0 - 25m																				
		over 25m																				
Raven	RN	0 - 25m																				
		over 25m																				
Starling	SG	0 - 25m																				
		over 25m																				
Tree Sparrow	TS	0 - 25m																				
		over 25m																				
Chaffinch	CH	0 - 25m																				
		over 25m																				
reenfinch	GR	0 - 25m																				
		over 25m																				
oldfinch	GO	0 - 25m																				
		over 25m																				
innet	LI	0 - 25m																				
		over 25m																				
edpoll	LR	0- 25m																				
		over 25m																				
ullfinch	BF	0 - 25m																				
		over 25m																				
Hawfinch	HF	0 - 25m																				
		over 25m																				
Yellowhammer	Y.	0 - 25m																				
		over 25m																				
Reed Bunting	RB	0 - 25m																				
		over 25m																				
Corn Bunting	CB	0 - 25m																				
		over 25m																				
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