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Evaluation of sampling strategies for 1-km squares
for inclusion in the Breeding Bird Survey

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EVALUATION OF SAMPLING STRATEGIES FOR 1-KM SQUARES
FOR INCLUSION IN THE BREEDING BIRD SURVEY

CONTENTS

SUMMARY

1.   This report summarises the findings of an evaluation project assessing a number of possible
        sampling strategies for the Breeding Bird Survey. The main aim of the survey is to provide
        population indices that are representative of the United Kingdom as a whole and of particular
        regions and habitats for a large number of widespread and abundant species (excluding
        seabirds). This necessitates some form of random or stratified random sampling.

2.   Fieldwork trials, within the Pilot Census Project 1992-93, suggest that the proposed methods
        of fieldwork, based on randomly selected 1-km squares and time-efficient transect or point
        count approaches, were acceptable to volunteer fieldworkers and had great potential in
        meeting the aims of the survey.

3.   Four basic strategies were considered for the selection of 1-km survey squares and each was
        assessed at three levels of observer input. The latter comprised both volunteer and
        professional fieldworkers. The non-random distribution of volunteers across the UK
        necessitates the use of professional fieldworkers in remote areas. Their input was modelled
        at three levels, the lowest representing minimum, acceptable coverage (in terms of the survey
        aims).

4.   The four strategies were selection of squares:

        (1)   Proportional to observer density;
        (2)   Proportional to observer density based on a regular grid;
        (3)   Proportional to observer density and stratified by ITE land class with sampling
                proportional to the total number of squares in each class;
        (4)   Proportional to observer density and stratified by ITE land class with a constant
                number of squares per class.

        Note that the 32 ITE land classes were reduced to 8 within strategies 3 and 4 for practical
        reasons.

5.   Strategies were assessed separately by the selection of around 1000 squares to be surveyed
        by volunteers and comparison with data from the New Atlas of Breeding Birds in Britain and
        Ireland, the Pilot Census Project and moorland bird surveys, to estimate the range of species
        which would be monitored at given level of precision at the scale of the UK, individual
        countries and EC regions. The calibration curves necessary to make such comparison are
        described.

6.   The findings are discussed in relation to the aims of the Breeding Bird Survey. Overall, the
        four strategies were similar in the range of species monitored. The selection of squares based
        on a regular grid (2) performed worst of the four strategies. Stratification by land class (3
        & 4), which is a measure of landscape type, provided monitoring which was comparable with
        the simplest strategy (1), that is, stratification by land class did not significantly improve the
        range of species monitored over random sampling contrary to what might have been expected.
        This is probably because land class did not provide a sufficiently sensitive measure of bird
        habitats within the models we assessed.

7.   The results give a broad indication of likely species coverage within the Breeding Bird Survey
        under different sampling designs and at differing sampling intensities. The results should not
        be taken as a precise statement of likely coverage within the new scheme.

8.   We conclude that the selection of Breeding Bird Survey squares should be based on random
        sampling with sample sizes proportional to observer densities.

1 INTRODUCTION

1.1 Background

The British Trust for Ornithology (BTO) with the support of the Joint Nature Conservation Committee and the Royal Society for the Protection of Birds, is developing an extensive, annual monitoring scheme for breeding birds in the United Kingdom (UK) based upon a formal sampling strategy. The scheme is to be called the Breeding Bird Survey (BBS). Survey methods have been evaluated in two years of pilot work. This report centres on the formal sampling strategy for the BBS.

The BBS will involve large numbers of volunteer birdwatchers making standardised, annual counts in randomly selected one-kilometre squares (1-km) of the National Grid throughout the UK. We recognise, however, that the skewed distribution of observers, towards the south and east of Britain, will necessitate the use of professional fieldworkers in remote regions and this will form an integral part of the survey.

This report summarises the methodology and findings of an evaluation project assessing a number of different sampling strategies using pre-existing bird data. The following sections briefly describe the existing monitoring schemes and the specific aims of the Breeding Bird Survey.

1.2 Common Birds Census & Waterways Bird Survey

Over the last thirty years BTO has monitored breeding birds through the Common Bird Census (CBC) and the Waterways Bird Survey (WBS). The CBC has provided indices of population change across a range of common-widespread species of farmland and woodland since the early 1960s. The WBS is a complementary scheme which began in 1974 and provides information on a smaller number of species of rivers, streams and canals. Both methods use a territory mapping approach to estimate numbers of territorial birds on census plots which are chosen by the observers. The CBC/WBS data set has been, and will continue, to be extremely valuable in understanding the population dynamics of birds and addressing conservation issues. There are, however, limitations to this approach for monitoring breeding birds and BTO is keen to move forward in this area. The inevitable concerns are that the plot distribution is not representative of UK, because plots are not random samples of the countryside, and given the labour intensive nature of fieldwork and analysis expansion of the schemes is difficult.

1.3 Pilot Census Project

Against this background, the BTO undertook a Pilot Census Project in 1992 and 1993. The scheme was an extensive pilot study which tested a number of new methodologies in the context of monitoring widespread landbirds in the UK. Two counting methods were compared, line transects and a mixture of point counts and line transects. Birds were recorded in three distance categories or as in flight in both cases. The use of randomly chosen 1-km survey squares was also important feature of the pilot study. A total of 301 transect and 296 combined squares were censused in 1992, and 356 transect and 381 combined squares in 1993.

1.4 Breeding Bird Survey

The principal aims of the new census scheme are to produce:

(1)   National population trends for as many species as possible. Such information is of vital importance to bird conservation in the UK.

(2) Population trends for individual countries. Statutory responsibility for nature conservation lies with the three country councils, English Nature, Scottish Natural Heritage and Countryside Commission for Wales, and with the Department of the Environment in Northern Ireland, and information is therefore required at this level.

(3) Population trends for particular regions and specifically the EC regions. The EC Birds Directive is a key piece of legislation in relation to bird conservation and monitoring work. It is therefore important that we are able to provide information within the eleven EC regions within the UK.

(4) Population trends within habitat types. Conservation of particular species and habitat types may be improved by our understanding of relationships between birds and habitat.

It is estimated that around one hundred bird species will be monitored routinely by the new scheme with distributional data collected on a further fifty. The scheme will not be designed to monitor seabirds or rare breeding birds. Seabirds are adequately monitored by the Seabird Group and the rare breeding birds by the RBBP and professional surveys organised by RSPB and the statutory conservation bodies. We anticipate that there will be a small number of scarce or patchily distributed species which will not covered adequately by the new scheme and which will require specifically designed surveys if they are to be monitored.

1.5 General considerations in the selection of a sampling strategy

The formal sampling strategy of the BBS will form an essential part of the survey design and will be central to its success. As described above, the survey aims to provide precise information on population changes for as many British breeding birds as possible as well as country, region, and habitat-based indices for as large a sample as possible. In doing this we need to take account of the distribution of voluntary observers across the UK who will be responsible for the majority of the fieldwork. We need a sampling strategy which will allow the maximum use of the available volunteers while avoiding results that are biased towards those parts of the UK which have most volunteer observers. The use of professional fieldworkers will be necessary in the more remote regions.

Stratification of the sample, that is, the division of a sample into several sub-populations (strata) based upon, for example, land class, region or observers, can be used to increase the precision of measures of between-year change among birds. Sampling theory suggests that to maximise precision we need to construct strata such that across-strata differences in population change are as large as possible whereas within-strata differences are as small as possible. Unfortunately, we do not have this level of information on bird populations in the UK and in addition this approach would be impractical for a large range of species. Stratification of sample squares can be achieved both as an integral part of the sampling strategy, as described below, or post-stratification by the use of proper criteria.

Potentially, the different aims of the scheme and different species to be covered creates a conflict of priorities. The problem is how we select the most appropriate sampling strategy in relation to our aims. The optimum sampling strategy will almost certainly vary among species, so for example, to gain precise measures of population change for Blackbird will require a very different sample from Ring Ouzel. In a related study of birds in the south Pennines, Stillman and Brown (submitted) found that there were major differences in the distribution of sampling effort required for optimal efficiency in measuring population sizes of different moorland species.

Given adequate pilot data we could design an optimal sampling strategy for the BBS to fulfil a single aim for one species, but to extend this approach to a large number of species and objectives is impractical (as described above). Thus, we evaluated a range of general sampling strategies and

assessed how each of these fulfilled the requirements of BBS. The suitability of different sampling designs was assessed in terms of the range of species covered and in terms of the precision with which they measure population changes.

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2   METHODS

2.1   Sampling strategies and the selection of squares

The evaluation project involved the selection of around 1000 1-km survey squares based on four strategies listed in Table 1, and comparison with data from the New Atlas of Breeding Birds in Britain and Ireland (Gibbons, Reid & Chapman 1993), the Pilot Census Project and moorland bird surveys, to estimate the range of species which would be monitored at given level of precision. The BBS will cover at least 1000 1-km squares in the first year and in the longer-term sample size will be between 2000-3000 squares.

Within this framework, a number of pieces of methodological work were required and these are described below. The nature of the work is such that methods are approximate, however, they provide the only pragmatic way of assessing different sampling strategies and any limitations that exist should not affect comparisons between strategies.

A total of 168 British breeding species were considered within the analyses (see below). This number represents around 80% of breeding birds of the UK. Species were chosen on the basis of the following criteria; (1) they were likely to be recorded from greater than 10 1-km squares out of a sample of 1000 random squares in the UK in the last five years, and (2) a substantial proportion of their population breeds away from coastal and marine sites (by reference to the New Atlas). This excludes both rare breeding birds and seabirds both of which are monitored adequately by other groups (see above).

2.1.1   Stratification by habitat type

We would expect species distributions and abundances to vary across habitat types so that stratification by habitat might have a significant influence on species coverage. If the number of squares within habitat classes is proportional to their occurrence in the UK, then this might increase species' coverage and indices will be highly representative of the area as a whole. Whereas, if the number of squares within classes is constant this would tend to over-represent rare habitats and increase the number of habitat specific species covered. A major problem, however, is how we measure habitat at the 1-km square level. The ITE land classification system provides the only pragmatic means for doing this, although it is only a broad guide to habitat type.

ITE land classes comprise 32 broad scale categories and each 1-km of the National Grid is assigned a single land class. Land classes are based on aspects of geography, topography, landscape, land use, soils and vegetation. They provide an indication of habitat types and are therefore of potential use in predicting bird distributions. The use of ITE Land Cover Map, which is based on highly detailed satellite imagery, was also considered but in this data set each 1-km square is described by a suite of up to 25 separate variables and reduction of this information into a useable form in this context was judged to be too time consuming. In addition, land cover may change through time, whereas land class would not.

Within those strategies using land class, we have reduced the 32 classes into 8 sub-groups, each of which comprises 4 similar land classes (Pienkowski 1993: Table 2). This proved necessary because of the large number of possible combinations of land classes and regions, many of which contained extremely small sample sizes (see below). The 8 sub-groups are subsequently referred to as Land Groups.

2.1.2 Sampling strategies

Four sampling strategies were identified for evaluation (Table 1). Stratification by observer density was used as a basis of each because this makes most efficient use of available observers and each

strategy was assessed at three levels of professional input (Table 1). By deliberately stratifying by the number of observers we retain the ability to produce measures of population change that are not biased by observer distribution while allowing more precise regional data to be gathered in those parts of the UK with higher observer densities and adequate precision in areas with low observer densities. The lowest level of input represents a minimum level of coverage to provide adequate monitoring across the UK (see below). Increasing levels of professional input demonstrates the improvement in species coverage given the additional fieldwork, however, the resourcing of this input will be dependent upon the priorities of the funding bodies.

The rationale for the choice of the four strategies is as follows:

Strategy 1. Proportional to observer density.

Simple random sampling with the number of squares within regions proportional to observer density.

Strategy 2. Proportional to observer density based on a regular grid.

Squares chosen on a regular grid across the UK also encompass a random sample of habitat/land use and thus may provide a representative sample for the BBS. Such an approach is used by the Botanical Society of the British Isles (BSBI) in monitoring selected 10-km squares and 2x2-km squares (tetrads) within them. There are over 300 BSBI squares chosen as a 1 in 9 sample of 10-km squares across the UK. The advantage of using this sample is that the same squares are used to monitor animal and plant groups. BSBI monitoring squares were also used as 'Key Squares' in the New Breeding Bird Atlas. The Key Squares Survey involved both timed visits and timed point counts to randomly chosen tetrads within 10-km squares. If BBS were to adopt this strategy, then the Key Square data would be extremely helpful in assessing species coverage and potential bias in terms of both distribution and abundance.

Strategy 3. Proportional to observer density and stratified by ITE land class with the number of squares sampled proportional to the total number of squares in each class.

Stratification by habitat type has the potential to increase the species range within the survey and the precision of estimates of between-year changes. By choosing squares in proportion to the occurrence of their habitat class across the UK one would create population indices that were highly representative of the region as a whole. Results are expected to be similar to a pure random selection (Strategy 1) with greater certainty of being representative because the number of squares is fixed across land classes.

Strategy 4. Proportional to observer density and stratified by ITE land class with a constant number of squares per class.

As described above, stratification by land class has the potential to increase the species' coverage within the survey and the precision of estimates of between-year changes. By choosing a constant number of squares per land class one is effectively over sampling the rare land classes across the UK. This might be beneficial by increasing the representation of habitat-specific birds and thus the range of species monitored. An added advantage is the sample sizes for habitat related work would be increased giving greater power to comparison among habitats.

2.1.3 Selection of sample squares

There are 128 BTO regions across the UK (each covered by one regional representative) and they comprise 32 ITE land classes. For the present purposes this produces an unworkable number of categories, particularly for those strategies that involved classification by observer density and land class. Therefore this sample was reduced to 34 EC NUTS2 regions (Figure 1) and eight groups of four land classes (referred to as Land Groups, Table 2). The numbers of squares available for sampling in each NUTS2/Land group combination are shown in Table 3. Northern Ireland and the Scilly Isles were excluded from all analyses because they are not covered by the ITE land classification.

Numbers of voluntary observers available to participate in the scheme were assumed to be proportional to the density of BTO members in each region. Current BTO membership was taken as a measure of observer density (calculated as observers per 10-km squares). Each strategy was evaluated with low, medium and high professional input. Numbers of squares to be sampled from each region were determined from a simple graphical model (Figure 2). To achieve this, we multiplied observer density within the 118 BTO regions (for which have land classes) by a constant (2.3) and set minimum levels of coverage at 0.002%, 0.003% and 0.004% of 1-km squares in these regions for low, medium and high professional input respectively. Additionally, we set a maximum of 30 squares per BTO region. Thus the coverage in a BTO region, at a given level of professional input, was set by either the minimum coverage or 2.3 x observer density whichever was the highest. Increasing the minimum level of coverage across regions brings with it the need for increased professional input in remote areas. The number of sample squares within the 34 NUTS2 regions was then determined by summing across the constituent BTO regions (Table 4).

A plot of the percentage of squares sampled against observer density (Figure 3) follows closely the ideal pattern set out in Figure 2. Numbers of squares sampled from each NUTS2 region at low, medium and high levels of professional input are presented in Table 4. These target numbers were the same for each of the four basic sampling strategies evaluated, although the actual numbers varied slightly from this due to rounding, and to Key Squares being absent from a few BTO regions (samples sizes were calculated as above, except that observer density was multiplied by 2.35 to achieve a comparable overall sample).

Procedures to select squares for each basic strategy were as follows. In all cases sampling was proportional to observer density.

1. Random sampling within NUTS2 regions

   The number of squares specified in Table 4 was selected at random from within each NUTS2 region.

2. Random sampling within NUTS2 regions but limited to Atlas Key Squares

   This was done in a similar way to Strategy 1 but all sample squares were drawn from within 10-km Atlas Key Squares. Numbers of squares sampled from each region differed slightly from Strategy 1 because some BTO regions contain no Key Squares (see below).

3. Sampling within regions stratified by land group, with sampling proportional to the number of squares in each group.

   Each region was processed in turn. The target number of squares to be sampled was determined from Table 4. The number of squares to be sampled from each land group was calculated by dividing the required sample in direct proportion to the total number of squares in each land group within the region. These real numbers were then rounded to the nearest

whole number. Rounding errors only caused very slight variations from the target numbers of squares to be sampled in the region as a whole and were ignored. Once these numbers of squares had been determined they were selected at random from within each region/land group combination.

The resulting distribution of sampling effort within individual NUTS2 regions is presented in Table 5. Sampling effort for the whole of Britain and for five regional subdivisions is given in Table 6. These tables give example data for medium professional input only.

4.   Sampling within regions stratified by land group, with an approximately equal number of squares sampled from each group.

Each region was processed in turn. The target number of squares to be sampled was determined from Table 4. An initial estimate of the number of squares to be sampled from each land group was calculated by dividing the required sample by the number of land groups present in the region. Where insufficient squares were available in some land groups all available squares were sampled. An additional number of squares to be selected was calculated as the differences between the required sample size and the number of squares that were now allocated for sampling. This number was divided across those land groups which still had available squares in proportion to their abundance. These additional squares always formed a small proportion of the total sample selected from any region.

Finally the real numbers of squares required from each land group were rounded to the nearest whole number. Rounding errors only caused very slight variations from the target numbers of squares to be sampled in the region as a whole and were ignored. Once these numbers of squares had been determined they were selected at random from within each region/land group combination.

The resulting distribution of sampling effort within individual NUTS2 regions is presented in Table 7. Sampling effort for the whole of Britain and for five regional subdivisions is given in Table 8. These tables give example data for medium professional input only.

Total numbers of squares used to evaluate each strategy at low, medium and high levels of professional input are given in Table 9. For information, an example of the numbers of squares to be sampled within the 34 county/regional divisions by voluntary and professional fieldworkers at the three levels of professional input is presented in Table 10. The numbers are derived from Strategy 1 (see Table 9). Professional input is concentrated in Scotland and Wales and in more remote areas in England. The number of squares dedicated to professionals increases from 155 at low input to 436 at high input. These modelled values were set so that they reflected potential input and gave a range of values to assess the likely benefits of professional help.

2.2   Assessment of species coverage and precision for given samples of squares

2.2.1   Calibration of bird counts with Atlas data

The Atlas provides information on the probability of recording a species within 10-km squares of the National Grid. Data collection involved extensive fieldwork in the breeding seasons of 1988-1991. This probability is termed the 'frequency index' and is the proportion of tetrads (2x2-km squares) visited within each 10-km square that contained a given species (i.e. no. tetrads positive for species/no. tetrads visited within each 10-km square). There are 25 tetrads within each 10-km square of which at least 8 were surveyed during Atlas fieldwork. The index scales from 0-1.

The relationship between atlas data and bird counts made in 1-km squares, was calibrated on a species-by-species basis. This calibration would then allow atlas data to be used to estimate the

number of registrations expected from transects of a 1-km square within a particular 10-km square. Four independent data sets were available for this purpose:

1. Upland survey data collected by the Nature Conservancy Council from 1027 1-km squares and provided by Dr Andy Brown and Dr Richard Stillman. Data come from the Eastern Highlands and South Pennines and were collected between 1989 and 1990. Counts were based on two site visits.

2. Upland survey data collected by the RSPB from 1140 1-km squares and provided by Dr Lennox Campbell. Data were collected in Sutherland, Perthshire, Lanarkshire, Yorkshire, Peak District, the Forest of Trawsden and Morayshire between 1980 and 1983. Counts were based on two site visits.

3. Pilot Census Project data collected from 303 1-km squares throughout the United Kingdom in 1992. Counts are based on two transect visits, one early, and on late in the breeding season.

4. Pilot Census Project data collected from 360 1-km squares throughout the United Kingdom in 1993. Counts are based on two transect visits, one early, and on late in the breeding season.

Calibration curves were computed on a species-by-species basis for each data set in turn. The analyses included zero counts. Regressions were fitted through the origin as follows:

$$\text{Log}_{10} \text{ (bird count + 1)} = b * \text{arcsin} \sqrt{\text{frequency index}}$$

Where b is the slope of the regression line. Up to four calibrations were calculated for each species, depending on its presence within each of the data sets (Table 11). The calibration slope for a given species was taken as the mean species' slope across data sets (where there were multiple values for 110 species) or the species' slope (9 species). Adequate data were not available for the remaining species (49 in all) and each was assigned the mean species' slope calculated across other species. Calibration slopes were assessed by visual inspection as well as by reference to the summary statistics. Species calibrations are presented in Table 11. The four different data sources provided relatively similar estimates for species' slopes in the majority of cases (Table 11).

2.2.2 Estimation of precision

The estimation of the precision with which we are able to measure between-year changes in population sizes is central to the assessment of each sampling strategy. The threshold level of precision was set at an ability to detect a 50% between-year change (i.e. a standard error of between-year change of <0.25) and for the species to be recorded on more than 20 1-km squares.

The following calibrations were assessed:

a. The relationship between the number of bird registrations and the standard error (i.e. precision) of between-year changes across species was assessed using PCP data. This calibration then allowed an estimated number of bird registrations within a hypothetical sampling strategy to be translated into an approximate measure of the precision of a between-year change. The regression equation was:

$$\text{Log}_{10} \text{ (standard error)} = a + b * \text{Log}_{10} \text{ (number of bird registrations)}$$

Where a is the intercept and b is the slope. This cross-species relationship was then applied to all species (Figure 4).

b. The possibility of using PCP data to assess the precision of individual species was also explored. Excluding species recorded from less than ten squares in each year produced a sample size of 63 species. The precision of between-year change was then estimated taking account of the variance of counts across plots and the estimated number of squares occupied within a given sampling strategy (using a formula for the between-year, standard error given by Baillie et al. 1986). Comparison with method (a) showed that this approach produced consistently smaller estimates of precision about between-year changes (for around 90% of species), that is, estimates were more precise. To illustrate, the average standard error for 20 randomly chosen species using method (a) was 0.109, whereas that for the same species using method (b) was 0.042. Estimates derived from method (b) were on average 40% smaller than those from method (a).

It was not possible to determine which approach was the more accurate with the data available. An assumption of method (b) is that bird counts are similar on PCP squares and all other squares selected across the UK. It seems likely that the southern and eastern bias of PCP squares produces higher bird counts within squares than would be the case across the UK which has the effect of increasing the apparent precision of monitoring. For this reason, and because method (b) covers a relatively small number of species, method (a) is used throughout. Method (a) assumes that precision depends only upon the number of registrations and not other species-specific characteristics. The latter would include the detectibility of species and variability of counts across squares. Counts for certain species might be highly variable because that species was gregarious in its feeding or breeding behaviour. Thus results are derived from method (a).

2.3 Processing of data and the production of results

The results were derived in the following manner. First, we randomly selected around 1000 1-km squares based upon one of the four strategies (precise details are given at 2.1.2). Second, we used the Atlas data set to tell us which species were likely to be present and the calibration curve from 2.2.1 to translate the Atlas frequency index for a species into an estimate of the bird count in that square. In the majority of cases the calibration curve was species specific (see 2.2.1). Third, we used the cross-species calibration curve from 2.2.2 (a) to translate the bird count into an estimate of the precision of a between-year change for a particular group of data, so for example, precision within Britain, or for individual countries. Species listed in Tables 12-20 are those which achieved the threshold precision which was set at an ability to detect a 50% between-year change and for the species to be recorded on more than 20 1-km squares (see 2.2.2).

3   RESULTS

The number of species monitored above the threshold precision by country, strategy and at three levels of professional input is presented in Table 12. Total species coverage within regions (countries and Britain) were surprisingly similar for each of the strategies. Differences among strategies were relatively minor, however, Strategy 2 appeared to perform worst. Random stratification, Strategy 1, provided species coverage comparable with stratification by habitat within Strategies 3 & 4. These general patterns hold for individual countries as well as for Britain as a whole.

Comparison among the three levels of professional input demonstrate increased species coverage with increased effort (Table 12). The level of increase tends to be small at a British scale, for example, the increase in species number is less than 10% moving from low to high professional input. At the level of individual countries the gain in species coverage varies from around 5%, 10% and 30% for England, Wales and Scotland respectively. This demonstrates a considerable improvement in species coverage with increasing levels of professional input in Scotland. One must also recognise that the new species monitored within each country may be of considerable conservation importance (see below).

Species coverage by region for each strategy and level of professional input is given in Tables 13-16, which include lists of marginal species which are covered only by specific strategies at a given level of professional input. Lists of marginal species for each region help to clarify the potential of professional fieldworkers since the majority are of the birds are of conservation importance, i.e. Red Data Bird species. At this level, the increase in coverage of marginal species from low to high professional input can be greater than 50%. The subset of marginal species varies both in number and composition among countries, the largest number is in Scotland (n=30) followed by Wales (n=12) and England (n=11).

Species coverage by strategy for each region and level of professional input is given in Tables 17-20, for the full list of 168 species. For a given strategy the tables allow comparison of species coverage among regions and levels of professional input and importantly showing which species are not covered by particular strategies.

The analysis was repeated using a precision threshold set at an ability to detect a 25% between-year change (rather than 50% above) (Table 21). The analysis produced similar findings although the absolute number of species monitored within a given strategy was considerably smaller. For example, within Strategy 1 a total of 70 and 77 species would be monitored in Britain at low and high professional input compared with 111 and 120 species above (Table 10). Comparison among the four strategies confirmed the similarity of species coverage using different strategies.

Results described above appear to be relatively robust to the precise set of 1-km squares selected. Separate runs for individual sampling strategies in which we resampled the Atlas data set (by repeatedly drawing independent sets of squares) produce highly comparable findings.

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4 DISCUSSION

4.1 Evaluation of sampling strategies

The formal sampling strategy for the BBS is crucial to the scheme's success in meeting its long-term aims. The methodologies described in this report allow for an informed evaluation of competing strategies using existing bird data. Methods are limited by the nature and breadth of data available. Overall, the four strategies considered provided comparable levels of species coverage across individual countries and in Britain as a whole. Selection of squares based on a regular grid performed marginally worst of the strategies while stratification by broad habitat details, that is, land group provided monitoring which was comparable with the simplest strategy based on random sampling. In conclusion, the selection of BBS squares should be based on random sampling with sample sizes proportional to observer densities to make most efficient use of manpower.

Simple random sampling has a number of advantages because it allows additional squares to be provided readily when volunteers are available and the scheme to be expanded to cover new regions and countries as appropriate, without for example the necessity for detailed information on land use. Random sampling is used increasingly in bird surveys and there is growing awareness and understanding of its importance on the part of Regional Organisers and voluntary observers.

The models we describe could be refined in a number ways. For example, species calibrations with the Atlas data could be improved by consideration of additional data sets so that the individual species calibrations were more precise and such curves were available for a greater number of species (see Table 11). The limitation is the existence of detailed data at the level of the 1-km squares to compare with the Atlas data. The estimation of precision, by considering the relationship between bird registrations and the standard error of between-year changes (Figure 4) could be improved by generating such plots on a species-by-species basis, rather than across species as described above. Again this is problematic because of the availability of appropriate data. We might also consider the use of more sophisticated and complex calibration models, however, given the level of information available and the approximate nature of the analysis this approach was considered unwise.

Perhaps the most serious limitation of the evaluation project relates to the level of information used to predict species occurrence and abundance. The only pragmatic way to achieve this was to use Atlas data which comprises summary data at the level of the 10-km square were used to predict presence and abundance of birds in 1-km squares (see Methods). It is unavoidable that heterogeneity at the level of the 1-km squares is lost in this process which will have the effect of reducing the sensitivity of the analysis and thus minimise possible differences between sampling strategies.

We did not explicitly test the sensitivity of our evaluation model. To assess the sensitivity of our results it would have been possible to have used Monte Carlo simulation to estimate the accuracy of our precision estimates for individual species. This would have involved either sampling from the parameter estimates and then various of the calibration curves (assuming these to be normally distributed) or using a resampling approach to rebuild the calibration curves on each simulation. Such an analysis would almost certainly have shown that the precision with which we are able to predict whether individual species will be covered adequately is poor. Given the very approximate nature of the evaluation model we did not consider that this approach would be worthwhile. The main emphasis of this project should be placed on the relative numbers of species covered by different sampling strategies. The results should not be taken as a precise statement of likely coverage within the new scheme. Evaluation of exactly which species will be covered adequately will only be possible after one or two years of full scale BBS fieldwork.

An alternative approach to the methods described here would have been to have based the whole analysis on resampling of BBS-type data. This would only have been possible with two years of BBS data and so this was not feasible within the present project. It was felt that the Pilot Census Project

data were too limited in terms of the number of plots counted, their geographic distribution, and the number of species recorded, to base the whole analysis upon such a sample. BBS squares could have been divided into the appropriate strata and we would need to ensure we had adequate numbers in each stratum. We could then draw a desired sample, with replacement, and assess precision directly. Repeat samples could then be drawn if we needed to assess the precision of individual results. This approach may be developed once the first year or two of full scale data gathering have been completed. It would then allow for more precise assessments of how the coverage of key individual species could be improved by increasing levels of volunteer and professional data gathering.

4.2 Introduction of the Breeding Bird Survey

The results described above have been used as a basis for the sampling design of the BBS. The latter will be based on a purely random sample of 1-km squares stratified by observer density. To select squares we reduced the 128 BTO regions into 83 new regions by amalgamation of the smaller ones. This proved necessary because a number of BTO regions were extremely small. Sampling from fewer, larger regions provides a more representative sample than across many smaller BTO regions. Thus we amalgamated BTO regions containing less than 1500 1-km squares with adjacent regions. The number of squares to be surveyed within the new regions was then calculated by multiplying observer density by a constant and setting a minimum level of coverage (see 2.1.3). Specifically, observer density was multiplied by 5, with a minimum of 0.005% of squares covered within each new region, and a maximum of 40 squares per new region (except where BTO regions had been combined). Thus we created a list of sample sizes required by regions which we were able to select at random from a master list of all 1-km squares in the United Kingdom.

A complication arose because we wished to allow those taking part in the Pilot Census Project (see 1.4) to continue their 1-km squares within the BBS if at all possible. Pilot Census Project squares were chosen as a random sample from within BTO regions and were thus compatible with the proposed design of the new scheme. However, Pilot Census squares which were not covered out of sequence were not considered for inclusion. For this reason, the final BBS squares within each region comprised, first, the consecutive squares issued as part of the Pilot Census Project and, second, new squares selected at random from new regions on the master list. A total of nearly 2000 1-km square coordinates were chosen for survey in 1994 and distributed to Regional Organisers. Organisers were advised that squares must be covered in sequence. Additional squares were provided to those organisers who were able to allocate all their original squares. Extra squares were generated by randomly selecting within new regions from the master list.

ACKNOWLEDGEMENTS

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Table 1   Sampling strategies to be assessed within the evaluation project.

Stratification(s):	Professional input:		
1. Proportional to observer density	Low	Medium	High
2. Proportional to observer density - regular grid	Low	Medium	High

3. Proportional to observer density
    + stratified by ITE land class
    with proportional numbers of
    squares per class
	Low	Medium	High

4. Proportional to observer density
    + stratified by ITE land class
    with a constant number of squares
    per class
	Low	Medium	High

Table 2   **Grouping of land classes.**

Description of the Land-class Groups used, with the ITE Land-classes from which the groupings were derived.

Land-class Group 1: Southern lowlands
    1.   Undulating country, varied agriculture, mainly grassland
    2.   Open, gentle slopes, often lowland, varied agriculture
    3.   Flat arable land, mainly cereals, little native vegetation
    4.   Flat, intensive agriculture, otherwise mainly built-up

Land-class Group 2: South-west and coasts
    5.   Lowland, somewhat enclosed land, varied agriculture and vegetation
    6.   Gently rolling enclosed country, mainly fertile pastures
    7.   Coastal with variable morphology and vegetation
    8.   Coastal, often estuarine, mainly pasture, otherwise built-up

Land-class Group 3: Midland lowlands
    9.   Fairly flat, open intensive agriculture, often built-up
    10.   Flat plains with intensive farming, often arable/grass mixtures
    11.   Rich alluvial plains, mainly open with arable or pasture
    12.   Very fertile coastal plains with very productive crop

Land-class Group 4: Central coastlands
    13.   Somewhat variable land farms, mainly flat, heterogeneous land use
    14.   Level coastal plains with arable, otherwise often urbanised
    15.   Valley bottoms with mixed agriculture, predominantly pastoral
    16.   Undulating lowlands, variable agriculture and native vegetation

Land-class Group 5: Low moorlands
    17.   Rounded intermediate slopes, mainly improvable permanent pasture
    18.   Rounded hills, some steep slopes, varied moorlands
    19.   Smooth hills, mainly heather moor, often afforested
    20.   Mid-valley slopes, wide range of vegetation types

Land-class Group 6: Northern uplands
    21.   Upper valley slopes, mainly covered with bogs
    22.   Margins of high mountains, moorlands, often afforested
    23.   High mountain summits, with well-drained moorlands
    24.   Upper, steep, mountain slopes, usually bog-covered

Land-class Group 7: Northern lowlands
    25.   Lowlands with variable land use, mainly arable
    26.   Fertile lowlands with intensive agriculture
    27.   Fertile lowland margins with mixed agriculture
    28.   Varied lowland margins with heterogeneous land use

Land-class Group 8: North-western seaboard
    29.   Sheltered coasts with varied land use, often crofting
    30.   Open coasts with low hills dominated by bogs
    31.   Cold exposed coasts with variable land use and crofting
    32.   Bleak undulating surfaces mainly covered with bogs

Table 3   Numbers of 1km squares in Britain by NUTS2 region and land group.

NUTS2NUM	NUTS2NAM	LGROUP1	LGROUP2	LGROUP3	LGROUP4	LGROUP5	LGROUP6	LGROUP7	LGROUP8	TOTAL
1	EAST ANGLIA	11224	386	1481	0	0	0	0	0	13091
2	ESSEX	3453	142	0	0	0	0	0	0	3595
3	GREATER LONDON	1405	95	0	0	0	0	0	0	1500
4	KENT	3639	458	0	0	0	0	0	0	4097
5	SURREY/SUSSEX	5051	360	0	0	0	0	0	0	5411
6	HANTS & IOW	3967	347	0	0	0	0	0	0	4314
7	BEDS/HERTS	2275	0	825	0	0	0	0	0	3100
8	BERKS/BUCKS/OXON	4492	0	1808	0	0	0	0	0	6300
9	AVON/GLOS/WILTS	5463	1293	611	3	139	0	0	0	7509
10	DORSET/SOMERSET	4706	1072	0	0	288	0	0	0	6066
11	DEVON/CORNWALL	949	9103	0	0	736	0	0	0	10788
12	SHROPS/STAFFS	21	6	5178	287	1207	0	0	0	6699
13	WEST MIDLANDS	293	1	1196	8	2	0	0	0	1500
14	HEREF/WORCS/WARKS	3376	87	832	178	127	0	0	0	4600
15	LEICS/NORTHANTS	67	0	4933	0	0	0	0	0	5000
16	DERBY/NOTTS	1	0	3461	8	824	7	0	0	4301
17	LINCS	1283	202	5208	119	0	0	0	0	6812
18	HUMBERSIDE	123	127	2652	929	1	0	0	0	3832
19	SOUTH YORKS	0	0	490	33	371	0	6	0	900
20	WEST YORKS	0	0	2749	59	1476	108	108	0	4500
21	NORTH YORKS	28	58	2811	267	1514	989	279	0	5946
22	CLEVELAND/DURHAM	0	4	1171	398	292	595	724	0	3184
23	NORTHUMB/TYNE & WEAR	0	8	565	224	318	1462	2821	0	5398
24	CUMBRIA	0	755	281	1669	1927	1186	1453	0	7271
25	LANCASHIRE	0	151	103	1755	842	10	121	0	2982
26	MERSEYSIDE	0	115	0	860	1	0	0	0	976
27	CHESHIRE	1	25	709	1559	99	0	2	0	2395
28	GT MANCHESTER	0	0	38	918	324	0	20	0	1300
29	N & C WALES	272	4117	778	3309	9349	44	1	0	17870
30	SOUTH WALES	990	1662	50	114	971	0	0	0	3787
31	SW SCOTLAND	0	507	19	2687	4252	5166	6902	3796	23329
32	GRAMPIAN	0	0	0	0	93	3849	5234	49	9225
33	SE SCOTLAND	0	34	163	85	1744	7738	8634	28	18426
34	HIGHLANDS	0	0	0	0	763	15270	5464	12547	34044
		53079	21115	38112	15469	27660	36424	31769	16420	240048

Table 4   Numbers of squares sampled from each NUTS2 region at low, medium and high levels of professional input.

NUTS2NUM	NUTS2NAM	LOW	MEDIUM	HIGH
1	EAST ANGLIA	82	82	85
2	ESSEX	41	41	41
3	GREATER LONDON	30	30	30
4	KENT	14	14	16
5	SURREY/SUSSEX	45	45	45
6	HANTS & IOW	29	29	29
7	BEDS/HERTS	49	49	49
8	BERKS/BUCKS/OXON	64	64	64
9	AVON/GLOS/WILTS	59	59	59
10	DORSET/SOMERSET	17	20	25
11	DEVON/CORNWALL	22	33	43
12	SHROPS/STAFFS	34	37	41
13	WEST MIDLANDS	30	30	30
14	HEREF/WORCS/WARKS	27	29	31
15	LEICS/NORTHANTS	30	30	31
16	DERBY/NOTTS	38	38	38
17	LINCS	22	23	27
18	HUMBERSIDE	14	17	20
19	SOUTH YORKS	22	22	22
20	WEST YORKS	38	38	39
21	NORTH YORKS	18	20	24
22	CLEVELAND/DURHAM	18	19	21
23	NORTHUMB/TYNE & WEAR	11	16	22
24	CUMBRIA	22	28	34
25	LANCASHIRE	41	41	41
26	MERSEYSIDE	57	57	57
27	CHESHIRE	52	52	52
28	GT MANCHESTER	19	19	19
29	N & C WALES	47	58	73
30	SOUTH WALES	21	21	21
31	SW SCOTLAND	46	70	94
32	GRAMPIAN	19	28	38
33	SE SCOTLAND	48	62	78
34	HIGHLANDS	68	103	136
		====	======	====
		1194	1324	1475

Table 5 Strategy 3. Sampling proportional to abundance of land groups. Medium professional input. Numbers of squares selected for sampling by NUTS2 region and land group. SQWANT = squares wanted. ALL = total number of squares. INT = actual squares chosen. LGRP1 = land-class group one.

NUTS2NUM	NUTS2NAM	LABEL	SQWANT	TOTAL	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8
1	EAST ANGLIA	ALL	82	13091	11224	386	1481	0	0	0	0	0
1	EAST ANGLIA	INT	82	81	70	2	9	0	0	0	0	0
2	ESSEX	ALL	41	3595	3453	142	0	0	0	0	0	0
2	ESSEX	INT	41	41	39	2	0	0	0	0	0	0
3	GREATER LONDON	ALL	30	1500	1405	95	0	0	0	0	0	0
3	GREATER LONDON	INT	30	30	28	2	0	0	0	0	0	0
4	KENT	ALL	14	4097	3639	458	0	0	0	0	0	0
4	KENT	INT	14	14	12	2	0	0	0	0	0	0
5	SURREY/SUSSEX	ALL	45	5411	5051	360	0	0	0	0	0	0
5	SURREY/SUSSEX	INT	45	45	42	3	0	0	0	0	0	0
6	HANTS & IOW	ALL	29	4314	3967	347	0	0	0	0	0	0
6	HANTS & IOW	INT	29	29	27	2	0	0	0	0	0	0
7	BEDS/HERTS	ALL	49	3100	2275	0	825	0	0	0	0	0
7	BEDS/HERTS	INT	49	49	36	0	13	0	0	0	0	0
8	BERKS/BUCKS/OXON	ALL	64	6300	4492	0	1808	0	0	0	0	0
8	BERKS/BUCKS/OXON	INT	64	64	46	0	18	0	0	0	0	0
9	AVON/GLOS/WILTS	ALL	59	7509	5463	1293	611	3	139	0	0	0
9	AVON/GLOS/WILTS	INT	59	59	43	10	5	0	1	0	0	0
10	DORSET/SOMERSET	ALL	20	6066	4706	1072	0	0	288	0	0	0
10	DORSET/SOMERSET	INT	20	21	16	4	0	0	1	0	0	0
11	DEVON/CORNWALL	ALL	33	10788	949	9103	0	0	736	0	0	0
11	DEVON/CORNWALL	INT	33	33	3	28	0	0	2	0	0	0
12	SHROPS/STAFFS	ALL	37	6699	21	6	5178	287	1207	0	0	0
12	SHROPS/STAFFS	INT	37	38	0	0	29	2	7	0	0	0
13	WEST MIDLANDS	ALL	30	1500	293	1	1196	8	2	0	0	0
13	WEST MIDLANDS	INT	30	30	6	0	24	0	0	0	0	0
14	HEREF/WORCS/WARKS	ALL	29	4600	3376	87	832	178	127	0	0	0
14	HEREF/WORCS/WARKS	INT	29	29	21	1	5	1	1	0	0	0
15	LEICS/NORTHANTS	ALL	30	5000	67	0	4933	0	0	0	0	0
15	LEICS/NORTHANTS	INT	30	30	0	0	30	0	0	0	0	0
16	DERBY/NOTTS	ALL	38	4301	1	0	3461	8	824	7	0	0
16	DERBY/NOTTS	INT	38	38	0	0	31	0	7	0	0	0
17	LINCS	ALL	23	6812	1283	202	5208	119	0	0	0	0
17	LINCS	INT	23	23	4	1	18	0	0	0	0	0
18	HUMBERSIDE	ALL	17	3832	123	127	2652	929	1	0	0	0
18	HUMBERSIDE	INT	17	18	1	1	12	4	0	0	0	0
19	SOUTH YORKS	ALL	22	900	0	0	490	33	371	0	6	0
19	SOUTH YORKS	INT	22	22	0	0	12	1	9	0	0	0
20	WEST YORKS	ALL	38	4500	0	0	2749	59	1476	108	108	0
20	WEST YORKS	INT	38	37	0	0	23	0	12	1	1	0
21	NORTH YORKS	ALL	20	5946	28	58	2811	267	1514	989	279	0
21	NORTH YORKS	INT	20	19	0	0	9	1	5	3	1	0
22	CLEVELAND/DURHAM	ALL	19	3184	0	4	1171	398	292	595	724	0
22	CLEVELAND/DURHAM	INT	19	19	0	0	7	2	2	4	4	0
23	NORTHUMB/TYNE & WEAR	ALL	16	5398	0	8	565	224	318	1462	2821	0
23	NORTHUMB/TYNE & WEAR	INT	16	16	0	0	2	1	1	4	8	0
24	CUMBRIA	ALL	28	7271	0	755	281	1669	1927	1186	1453	0
24	CUMBRIA	INT	28	28	0	3	1	6	7	5	6	0
25	LANCASHIRE	ALL	41	2982	0	151	103	1755	842	10	121	0
25	LANCASHIRE	INT	41	41	0	2	1	24	12	0	2	0
26	MERSEYSIDE	ALL	57	976	0	115	0	860	1	0	0	0
26	MERSEYSIDE	INT	57	57	0	7	0	50	0	0	0	0
27	CHESHIRE	ALL	52	2395	1	25	709	1559	99	0	2	0
27	CHESHIRE	INT	52	52	0	1	15	34	2	0	0	0

NUTS2NUM	NUTS2NAM	LABEL	SQWANT	TOTAL	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8
28	GT MANCHESTER	ALL	19	1300	0	0	38	918	324	0	20	0
28	GT MANCHESTER	INT	19	19	0	0	1	13	5	0	0	0
29	N & C WALES	ALL	58	17870	272	4117	778	3309	9349	44	1	0
29	N & C WALES	INT	58	58	1	13	3	11	30	0	0	0
30	SOUTH WALES	ALL	21	3787	990	1662	50	114	971	0	0	0
30	SOUTH WALES	INT	21	20	5	9	0	1	5	0	0	0
31	SW SCOTLAND	ALL	70	23329	0	507	19	2687	4252	5166	6902	3796
31	SW SCOTLAND	INT	70	71	0	2	0	8	13	16	21	11
32	GRAMPIAN	ALL	28	9225	0	0	0	0	93	3849	5234	49
32	GRAMPIAN	INT	28	28	0	0	0	0	0	12	16	0
33	SE SCOTLAND	ALL	62	18426	0	34	163	85	1744	7738	8634	28
33	SE SCOTLAND	INT	62	62	0	0	1	0	6	26	29	0
34	HIGHLANDS	ALL	103	34044	0	0	0	0	763	15270	5464	12547
34	HIGHLANDS	INT	103	103	0	0	0	0	2	46	17	38

Table 6a Summary of sampling of land group for whole of Britain. Strategy 3 medium professional input. ALL = total number of squares, INT = actual squares chosen, SUM = sum count, and PCT = percentage of total. The total number of squares are presented in the right-hand column.

LABEL	LABEL2	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8	TOTAL
ALL	SUM	53079.00	21115.00	38112.00	15469.00	27660.00	36424.00	31769.00	16420.00	240048
ALL	PCT	22.11	8.80	15.88	6.44	11.52	15.17	13.23	6.84	240048
INT	SUM	400.00	95.00	269.00	159.00	130.00	117.00	105.00	49.00	1324
INT	PCT	30.21	7.18	20.32	12.01	9.82	8.84	7.93	3.70	1324

Table 6b Summary of sampling of land groups within five major regions of Britain. Strategy 3 medium professional input. ALL = total number of squares, INT = actual squares chosen, SUM = sum count, and PCT = percentage of total. The total number of squares are presented in the right-hand column.

-- REGION=CENG --

LABEL	LABEL2	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8	TOTAL
ALL	SUM	1788.00	336.000	23118.00	1384.00	2405.00	7.00000	6.00000	0	29044
ALL	PCT	6.16	1.157	79.60	4.77	8.28	0.02410	0.02066	0	29044
INT	SUM	11.00	2.000	156.00	7.00	23.00	0.00000	0.00000	0	199
INT	PCT	5.53	1.005	78.39	3.52	11.56	0.00000	0.00000	0	199

-- REGION=NENG --

LABEL	LABEL2	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8	TOTAL
ALL	SUM	29.0000	1116.00	8427.00	7709.00	6793.00	4350.00	5528.00	0	33952
ALL	PCT	0.0854	3.29	24.82	22.71	20.01	12.81	16.28	0	33952
INT	SUM	0.0000	13.00	59.00	131.00	46.00	17.00	22.00	0	288
INT	PCT	0.0000	4.51	20.49	45.49	15.97	5.90	7.64	0	288

-- REGION=SCOT --

LABEL	LABEL2	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8	TOTAL
ALL	SUM	0	541.000	182.000	2772.00	6852.00	32023.00	26234.00	16420.00	85024
ALL	PCT	0	0.636	0.214	3.26	8.06	37.66	30.85	19.31	85024
INT	SUM	0	2.000	1.000	8.00	21.00	100.00	83.00	49.00	264
INT	PCT	0	0.758	0.379	3.03	7.95	37.88	31.44	18.56	264

-- REGION=SENG --

LABEL	LABEL2	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8	TOTAL
ALL	SUM	50000.00	13343.00	5557.00	181.000	1290.00	0	0	0	70371
ALL	PCT	71.05	18.96	7.90	0.257	1.83	0	0	0	70371
INT	SUM	383.00	56.00	50.00	1.000	5.00	0	0	0	495
INT	PCT	77.37	11.31	10.10	0.202	1.01	0	0	0	495

-- REGION=WALS --

LABEL	LABEL2	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8	TOTAL
ALL	SUM	1262.00	5779.00	828.000	3423.00	10320.00	44.0000	1.00000	0	21657
ALL	PCT	5.83	26.68	3.823	15.81	47.65	0.2032	0.00462	0	21657
INT	SUM	6.00	22.00	3.000	12.00	35.00	0.0000	0.00000	0	78
INT	PCT	7.69	28.21	3.846	15.38	44.87	0.0000	0.00000	0	78

Table 7   Strategy 4. Sampling of approximately equal numbers of squares from each land group. Medium professional input. Numbers of squares selected from sampling by NUTS2 region and land group. ALL = total number of squares and INT = actual squares chosen.

NUTS2NUM	NUTS2NAM	LABEL	SQWANT	TOTAL	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8
1	EAST ANGLIA	ALL	82	13091	11224	386	1481	0	0	0	0	0
1	EAST ANGLIA	INT	82	81	27	27	27	0	0	0	0	0
2	ESSEX	ALL	41	3595	3453	142	0	0	0	0	0	0
2	ESSEX	INT	41	42	21	21	0	0	0	0	0	0
3	GREATER LONDON	ALL	30	1500	1405	95	0	0	0	0	0	0
3	GREATER LONDON	INT	30	30	15	15	0	0	0	0	0	0
4	KENT	ALL	14	4097	3639	458	0	0	0	0	0	0
4	KENT	INT	14	14	7	7	0	0	0	0	0	0
5	SURREY/SUSSEX	ALL	45	5411	5051	360	0	0	0	0	0	0
5	SURREY/SUSSEX	INT	45	46	23	23	0	0	0	0	0	0
6	HANTS & IOW	ALL	29	4314	3967	347	0	0	0	0	0	0
6	HANTS & IOW	INT	29	30	15	15	0	0	0	0	0	0
7	BEDS/HERTS	ALL	49	3100	2275	0	825	0	0	0	0	0
7	BEDS/HERTS	INT	49	50	25	0	25	0	0	0	0	0
8	BERKS/BUCKS/OXON	ALL	64	6300	4492	0	1808	0	0	0	0	0
8	BERKS/BUCKS/OXON	INT	64	64	32	0	32	0	0	0	0	0
9	AVON/GLOS/WILTS	ALL	59	7509	5463	1293	611	3	139	0	0	0
9	AVON/GLOS/WILTS	INT	59	59	18	13	13	3	12	0	0	0
10	DORSET/SOMERSET	ALL	20	6066	4706	1072	0	0	288	0	0	0
10	DORSET/SOMERSET	INT	20	21	7	7	0	0	7	0	0	0
11	DEVON/CORNWALL	ALL	33	10788	949	9103	0	0	736	0	0	0
11	DEVON/CORNWALL	INT	33	33	11	11	0	0	11	0	0	0
12	SHROPS/STAFFS	ALL	37	6699	21	6	5178	287	1207	0	0	0
12	SHROPS/STAFFS	INT	37	36	7	6	8	7	8	0	0	0
13	WEST MIDLANDS	ALL	30	1500	293	1	1196	8	2	0	0	0
13	WEST MIDLANDS	INT	30	30	8	1	13	6	2	0	0	0
14	HEREF/WORCS/WARKS	ALL	29	4600	3376	87	832	178	127	0	0	0
14	HEREF/WORCS/WARKS	INT	29	30	6	6	6	6	6	0	0	0
15	LEICS/NORTHANTS	ALL	30	5000	67	0	4933	0	0	0	0	0
15	LEICS/NORTHANTS	INT	30	30	15	0	15	0	0	0	0	0
16	DERBY/NOTTS	ALL	38	4301	1	0	3461	8	824	7	0	0
16	DERBY/NOTTS	INT	38	39	1	0	14	8	9	7	0	0
17	LINCS	ALL	23	6812	1283	202	5208	119	0	0	0	0
17	LINCS	INT	23	24	6	6	6	6	0	0	0	0
18	HUMBERSIDE	ALL	17	3832	123	127	2652	929	1	0	0	0
18	HUMBERSIDE	INT	17	16	3	3	5	4	1	0	0	0
19	SOUTH YORKS	ALL	22	900	0	0	490	33	371	0	6	0
19	SOUTH YORKS	INT	22	24	0	0	6	6	6	0	6	0
20	WEST YORKS	ALL	38	4500	0	0	2749	59	1476	108	108	0
20	WEST YORKS	INT	38	40	0	0	8	8	8	8	8	0
21	NORTH YORKS	ALL	20	5946	28	58	2811	267	1514	989	279	0
21	NORTH YORKS	INT	20	21	3	3	3	3	3	3	3	0
22	CLEVELAND/DURHAM	ALL	19	3184	0	4	1171	398	292	595	724	0
22	CLEVELAND/DURHAM	INT	19	18	0	3	3	3	3	3	3	0
23	NORTHUMB/TYNE & WEAR	ALL	16	5398	0	8	565	224	318	1462	2821	0
23	NORTHUMB/TYNE & WEAR	INT	16	18	0	3	3	3	3	3	3	0
24	CUMBRIA	ALL	28	7271	0	755	281	1669	1927	1186	1453	0
24	CUMBRIA	INT	28	30	0	5	5	5	5	5	5	0
25	LANCASHIRE	ALL	41	2982	0	151	103	1755	842	10	121	0
25	LANCASHIRE	INT	41	42	0	7	7	7	7	7	7	0
26	MERSEYSIDE	ALL	57	976	0	115	0	860	1	0	0	0
26	MERSEYSIDE	INT	57	57	0	21	0	35	1	0	0	0
27	CHESHIRE	ALL	52	2395	1	25	709	1559	99	0	2	0
27	CHESHIRE	INT	52	53	1	9	13	19	9	0	2	0

NUTS2NUM	NUTS2NAM	LABEL	SQWANT	TOTAL	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8
28	GT MANCHESTER	ALL	19	1300	0	0	38	918	324	0	20	0
28	GT MANCHESTER	INT	19	20	0	0	5	5	5	0	5	0
29	N & C WALES	ALL	58	17870	272	4117	778	3309	9349	44	1	0
29	N & C WALES	INT	58	58	8	10	9	10	12	8	1	0
30	SOUTH WALES	ALL	21	3787	990	1662	50	114	971	0	0	0
30	SOUTH WALES	INT	21	20	4	4	4	4	4	0	0	0
31	SW SCOTLAND	ALL	70	23329	0	507	19	2687	4252	5166	6902	3796
31	SW SCOTLAND	INT	70	70	0	10	10	10	10	10	10	10
32	GRAMPIAN	ALL	28	9225	0	0	0	0	93	3849	5234	49
32	GRAMPIAN	INT	28	28	0	0	0	0	7	7	7	7
33	SE SCOTLAND	ALL	62	18426	0	34	163	85	1744	7738	8634	28
33	SE SCOTLAND	INT	62	63	0	9	9	9	9	9	9	9
34	HIGHLANDS	ALL	103	34044	0	0	0	0	763	15270	5464	12547
34	HIGHLANDS	INT	103	104	0	0	0	0	26	26	26	26

Table 8a   Summary of sampling of land groups for whole of Britain. Strategy 4. Medium professional input. ALL = total number of squares, INT = actual squares chosen, SUM = sum count, and PCT = percentage of total. The total number of squares are presented in the right-hand column.

LABEL	LABEL2	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8	TOTAL
ALL	SUM	53079.00	21115.00	38112.00	15469.00	27660.00	36424.00	31769.00	16420.00	240048
ALL	PCT	22.11	8.80	15.88	6.44	11.52	15.17	13.23	6.84	240048
INT	SUM	263.00	245.00	249.00	167.00	174.00	96.00	95.00	52.00	1341
INT	PCT	19.61	18.27	18.57	12.45	12.98	7.16	7.08	3.88	1341

Table 8b Summary of sampling of land groups within five major regions of Britain. Strategy 4. Medium professional input. ALL = total number of squares, INT = actual squares chosen, SUM = sum count, and PCT = percentage of total. The total number of squares are presented in the right-hand column.

-- REGION=CENG --

LABEL	LABEL2	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8	TOTAL
ALL	SUM	1788.00	336.000	23118.00	1384.00	2405.00	7.00000	6.00000	0	29044
ALL	PCT	6.16	1.157	79.60	4.77	8.28	0.02410	0.02066	0	29044
INT	SUM	40.00	16.000	67.00	37.00	26.00	7.00000	6.00000	0	199
INT	PCT	20.10	8.040	33.67	18.59	13.07	3.51759	3.01508	0	199

-- REGION=NENG --

LABEL	LABEL2	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8	TOTAL
ALL	SUM	29.0000	1116.00	8427.00	7709.00	6793.00	4350.00	5528.00	0	33952
ALL	PCT	0.0854	3.29	24.82	22.71	20.01	12.81	16.28	0	33952
INT	SUM	4.0000	51.00	47.00	88.00	44.00	29.00	36.00	0	299
INT	PCT	1.3378	17.06	15.72	29.43	14.72	9.70	12.04	0	299

-- REGION=SCOT --

LABEL	LABEL2	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8	TOTAL
ALL	SUM	0	541.000	182.000	2772.00	6852.00	32023.00	26234.00	16420.00	85024
ALL	PCT	0	0.636	0.214	3.26	8.06	37.66	30.85	19.31	85024
INT	SUM	0	19.000	19.000	19.00	52.00	52.00	52.00	52.00	265
INT	PCT	0	7.170	7.170	7.17	19.62	19.62	19.62	19.62	265

-- REGION=SENG --

LABEL	LABEL2	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8	TOTAL
ALL	SUM	50000.00	13343.00	5557.00	181.000	1290.00	0	0	0	70371
ALL	PCT	71.05	18.96	7.90	0.257	1.83	0	0	0	70371
INT	SUM	207.00	145.00	103.00	9.000	36.00	0	0	0	500
INT	PCT	41.40	29.00	20.60	1.800	7.20	0	0	0	500

-- REGION=WALS --

LABEL	LABEL2	LGRP1	LGRP2	LGRP3	LGRP4	LGRP5	LGRP6	LGRP7	LGRP8	TOTAL
ALL	SUM	1262.00	5779.00	828.000	3423.00	10320.00	44.0000	1.00000	0	21657
ALL	PCT	5.83	26.68	3.823	15.81	47.65	0.2032	0.00462	0	21657
INT	SUM	12.00	14.00	13.000	14.00	16.00	8.0000	1.00000	0	78
INT	PCT	15.38	17.95	16.667	17.95	20.51	10.2564	1.28205	0	78

Table 9   The number of 1-km squares selected within strategies 1-4 and at three levels of professional input.

	LOW	MEDIUM	HIGH
Strategy 1	1194	1324	1475
Strategy 2	1185	1312	1462
Strategy 3	1192	1324	1477
Strategy 4	1217	1341	1485

Table 10

Distribution of 1-km squares among regions at three levels of professional help. The table presents the total number of squares at each level of help and the modelled contribution of professional fieldworkers; 'V' volunteer fieldwork, 'P' professional fieldwork. This example is based on Strategy One (see Table 9).

NUTS2NUM	NUTS2NAM	VLOW	PLOW	LOW	VMED	PMED	MEDIUM	VHIGH	PHIGH	HIGH
1	EAST ANGLIA	82	0	82	82	0	82	82	3	85
2	ESSEX	41	0	41	41	0	41	41	0	41
3	GREATER LONDON	30	0	30	30	0	30	30	0	30
4	KENT	14	0	14	14	0	14	14	2	16
5	SURREY/SUSSEX	45	0	45	45	0	45	45	0	45
6	HANTS & IOW	29	0	29	29	0	29	29	0	29
7	BEDS/HERTS	49	0	49	49	0	49	49	0	49
8	BERKS/BUCKS/OXON	64	0	64	64	0	64	64	0	64
9	AVON/GLOS/WILTS	59	0	59	59	0	59	59	0	59
10	DORSET/SOMERSET	16	1	17	16	4	20	16	9	25
11	DEVON/CORNWALL	10	12	22	10	23	33	10	33	43
12	SHROPS/STAFFS	33	1	34	33	4	37	33	8	41
13	WEST MIDLANDS	30	0	30	30	0	30	30	0	30
14	HEREF/WORCS/WARKS	27	0	27	27	2	29	27	4	31
15	LEICS/NORTHANTS	30	0	30	30	0	30	30	1	31
16	DERBY/NOTTS	38	0	38	38	0	38	38	0	38
17	LINCS	22	0	22	22	1	23	22	5	27
18	HUMBERSIDE	13	1	14	13	4	17	13	7	20
19	SOUTH YORKS	22	0	22	22	0	22	22	0	22
20	WEST YORKS	38	0	38	38	0	38	38	1	39
21	NORTH YORKS	17	1	18	17	3	20	17	7	24
22	CLEVELAND/DURHAM	18	0	18	18	1	19	18	3	21
23	NORTHUMB/TYNE & WEAR	7	4	11	7	9	16	7	15	22
24	CUMBRIA	18	4	22	18	10	28	18	16	34
25	LANCASHIRE	41	0	41	41	0	41	41	0	41
26	MERSEYSIDE	57	0	57	57	0	57	57	0	57
27	CHESHIRE	52	0	52	52	0	52	52	0	52
28	GT MANCHESTER	19	0	19	19	0	19	19	0	19
29	N & C WALES	34	13	47	34	24	58	34	39	73
30	SOUTH WALES	21	0	21	21	0	21	21	0	21
31	SW SCOTLAND	16	30	46	16	54	70	16	78	94
32	GRAMPIAN	7	12	19	7	21	28	7	31	38
33	SE SCOTLAND	29	19	48	29	33	62	29	49	78
34	HIGHLANDS	11	57	68	11	92	103	11	125	136
		====	====	====	====	====	======	=====	=====	====
		1039	155	1194	1039	285	1324	1039	436	1475

Table 11 Within-species calibrations between Atlas frequency index and bird counts within 1-km squares. The table presents r² and p values from linear regression (see text for details). '*' indicates that the within-species calibrations were not used in subsequent analyses.

SPECIES CALIBRATIONS - SAMPLING STRATEGIES

SPECIES	PCP92 Slope	r²	p	PCP93 Slope	r²	p	RSPB Slope	r²	p	NCC Slope	r²	p
Blackbird	0.58	0.66	0.0001	0.60	0.84	0.0001	-	-	-	-	-	-
Blackcap	0.33	0.42	0.0001	0.30	0.48	0.0001	-	-	-	-	-	-
Bullfinch	0.13	0.13	0.0001	0.15	0.23	0.0001	-	-	-	-	-	-
Black-headed Gull	0.49	0.22	0.0001	0.37	0.17	0.0001	-	-	-	-	-	-
Barn Owl*	0.00	0.00	-	0.03	0.02	0.4021	-	-	-	-	-	-
Blue Tit	0.53	0.61	0.0001	0.54	0.79	0.0001	-	-	-	-	-	-
Black Redstart*	0.00	0.00	-	0.00	0.00	-	-	-	-	-	-	-
Buzzard	0.32	0.37	0.0001	0.29	0.46	0.0001	-	-	-	-	-	-
Carrion Crow	0.60	0.67	0.0001	0.61	0.80	0.0001	-	-	-	0.23	0.27	0.0001
Cormorant	-	-	-	0.16	0.50	0.0650	-	-	-	-	-	-
Corn Bunting	0.19	0.17	0.0001	0.22	0.19	0.0001	-	-	-	-	-	-
Chiffchaff	0.26	0.30	0.0001	0.27	0.43	0.0001	-	-	-	-	-	-
Collared Dove	0.42	0.39	0.0001	0.40	0.47	0.0001	-	-	-	-	-	-
Canada Goose	0.25	0.10	0.0001	0.31	0.19	0.0001	-	-	-	0.77	0.41	0.0001
Chaffinch	0.64	0.69	0.0001	0.64	0.84	0.0001	-	-	-	-	-	-
Cuckoo	0.32	0.39	0.0001	0.25	0.41	0.1229	-	-	-	0.26	0.30	0.0001
Cirl Bunting	0.00	0.00	-	0.46	0.41	0.1229	-	-	-	-	-	-
Common Gull	-	-	-	0.36	0.18	0.0002	-	-	-	-	-	-
Coot	0.11	0.60	0.0010	0.14	0.15	0.0001	-	-	-	-	-	-
Common Crossbill	0.10	0.04	0.3768	0.07	0.03	0.3712	-	-	-	-	-	-
Common Sandpiper	0.10	0.15	0.0017	0.05	0.08	0.0100	0.09	0.31	0.0001	0.15	0.13	0.0015
Coal Tit	0.25	0.22	0.0001	0.28	0.30	0.0001	-	-	-	-	-	-
Curlew	0.55	0.62	0.0001	0.47	0.53	0.0001	0.41	0.51	0.0001	0.57	0.70	0.0001
Dunnock	0.39	0.55	0.0001	0.49	0.68	0.0001	-	-	-	-	-	-
Dipper	0.08	0.08	0.0301	0.05	0.04	0.0943	-	-	-	0.12	0.14	0.0009
Dunlin	-	-	-	-	-	-	0.59	0.53	0.0001	1.12	0.34	0.0003
Fulmar	-	-	-	0.60	0.18	0.0482	-	-	-	-	-	-
Feral Pigeon	0.26	0.09	0.0001	0.39	0.19	0.0001	-	-	-	-	-	-
Green Woodpecker	0.21	0.24	0.0001	0.24	0.38	0.0001	-	-	-	-	-	-
Great Black-backed Gull	0.15	0.08	0.1182	0.51	0.39	0.0001	-	-	-	-	-	-
Goldcrest	0.12	0.11	0.0001	0.16	0.19	0.0001	-	-	-	-	-	-
Goosander	0.00	0.00	-	0.11	0.02	0.4597	-	-	-	-	-	-
Great Crested Grebe	0.08	0.02	0.1302	0.06	0.03	0.0381	-	-	-	-	-	-
Grasshopper Warbler	0.09	0.08	0.0234	0.03	0.01	0.5055	-	-	-	-	-	-
Greenshank	-	-	-	-	-	-	0.15	0.58	0.0001	-	-	-
Grey Wagtail	0.02	0.01	0.2567	0.08	0.11	0.0001	-	-	-	0.16	0.22	0.0001
Goldfinch	0.37	0.36	0.0001	0.40	0.45	0.0001	-	-	-	-	-	-
Golden Plover	-	-	-	0.22	0.07	0.1560	0.76	0.60	0.0001	0.89	0.44	0.0001
Greenfinch	0.47	0.47	0.0001	0.49	0.62	0.0001	-	-	-	-	-	-
Great Spotted Woodpecker	0.15	0.15	0.0001	0.22	0.38	0.0001	-	-	-	-	-	-
Great Tit	0.41	0.53	0.0001	0.45	0.68	0.0001	-	-	-	-	-	-
Garden Warbler	0.16	0.18	0.0001	0.14	0.18	0.0001	-	-	-	-	-	-
Grey Heron	0.15	0.12	0.0001	0.18	0.17	0.0001	-	-	-	-	-	-
Hooded Crow	-	-	-	0.29	0.65	0.0003	-	-	-	-	-	-
Hawfinch	0.18	0.15	0.1032	0.02	0.00	0.7618	-	-	-	-	-	-
Herring Gull	0.69	0.35	0.0001	0.65	0.30	0.0001	-	-	-	-	-	-
House Martin	0.35	0.27	0.0001	0.33	0.35	0.0001	-	-	-	-	-	-
House Sparrow	0.62	0.49	0.0001	0.61	0.62	0.0001	-	-	-	-	-	-
Hobby*	0.00	0.00	-	0.02	0.01	0.5804	-	-	-	-	-	-
Jay	0.20	0.23	0.0001	0.20	0.28	0.0001	-	-	-	-	-	-
Jackdaw	0.52	0.37	0.0001	0.59	0.54	0.0001	-	-	-	-	-	-
Kestrel	0.16	0.28	0.0001	0.14	0.29	0.0001	-	-	-	-	-	-
Kingfisher	0.00	0.00	-	0.04	0.05	0.0088	-	-	-	-	-	-
Lapwing	0.38	0.25	0.0001	0.38	0.37	0.0001	0.31	0.48	0.0001	0.28	0.36	0.0001
Lesser Black-backed Gull	0.31	0.14	0.0003	0.45	0.19	0.0001	-	-	-	-	-	-
Little Grebe	0.01	0.00	0.7093	0.06	0.06	0.0025	-	-	-	-	-	-
Linnet	0.51	0.45	0.0001	0.55	0.56	0.0001	-	-	-	-	-	-
Little Owl	0.04	0.04	0.0349	0.05	0.04	0.0105	-	-	-	-	-	-

Species												
Little Ringed Plover	0.09	0.08	0.1008	0.04	0.00	0.6354	-	-	-	-	-	-
Lesser Redpoll	0.12	0.08	0.0020	0.13	0.07	0.0009	-	-	-	-	-	-
Lesser Spotted Woodpecker	0.02	0.01	0.4840	0.04	0.02	0.2582	-	-	-	-	-	-
Long-tailed Tit	0.21	0.18	0.0001	0.32	0.29	0.0001	-	-	-	-	-	-
Lesser Whitethroat	0.13	0.18	0.0001	0.13	0.16	0.0001	-	-	-	-	-	-
Mistle Thrush	0.31	0.38	0.0001	0.27	0.41	0.0001	-	-	-	-	-	-
Mallard	0.27	0.23	0.0001	0.40	0.41	0.0001	0.04	0.12	0.0043	0.15	0.25	0.0001
Magpie	0.42	0.55	0.0001	0.41	0.70	0.0001	-	-	-	-	-	-
Moorhen	0.11	0.11	0.0001	0.17	0.29	0.0001	-	-	-	-	-	-
Mandarin	0.44	0.14	0.2039	0.14	0.07	0.1964	-	-	-	-	-	-
Meadow Pipit	0.50	0.46	0.0001	0.53	0.50	0.0001	0.49	0.51	0.0001	1.43	0.84	0.0001
Mute Swan	0.18	0.06	0.0029	0.17	0.11	0.0001	-	-	-	-	-	-
Marsh Tit	0.13	0.10	0.0004	0.09	0.09	0.0001	-	-	-	-	-	-
Nightingale	0.04	0.03	0.3554	0.03	0.03	0.1803	-	-	-	-	-	-
Nuthatch	0.18	0.15	0.0001	0.20	0.26	0.0001	-	-	-	-	-	-
Nightjar*	0.00	0.00	-	0.05	0.08	0.3381	-	-	-	-	-	-
Oystercatcher	0.30	0.36	0.0001	0.45	0.48	0.0001	0.11	0.39	0.0001	-	-	-
Grey Partridge	0.25	0.23	0.0001	0.18	0.16	0.0001	-	-	-	-	-	-
Pied Flycatcher	0.04	0.02	0.4857	0.09	0.12	0.0189	-	-	-	-	-	-
Pheasant	0.45	0.45	0.0001	0.48	0.62	0.0001	-	-	-	-	-	-
Pochard*	0.00	0.00	-	0.00	0.00	-	-	-	-	-	-	-
Pied Wagtail	0.22	0.31	0.0001	0.29	0.48	0.0001	-	-	-	0.09	0.18	0.0001
Quail*	0.00	0.00	-	0.00	0.00	-	-	-	-	-	-	-
Robin	0.47	0.60	0.0001	0.51	0.76	0.0001	-	-	-	-	-	-
Reed Bunting	0.14	0.14	0.0001	0.19	0.22	0.0001	-	-	-	0.28	0.22	0.0005
Rock Pipit	0.11	0.20	0.1448	0.00	0.00	-	-	-	-	-	-	-
Red Grouse	-	-	-	0.33	0.29	0.0002	-	-	-	1.44	0.70	0.0001
Red-throated Diver	-	-	-	-	-	-	0.13	0.42	0.0001	-	-	-
Redshank	0.12	0.07	0.0121	0.24	0.24	0.001	0.13	0.20	0.0002	0.19	0.08	0.0555
Red-Legged Partridge	0.33	0.33	0.0001	0.30	0.43	0.0001	-	-	-	-	-	-
Raven	0.24	0.20	0.0019	0.31	0.25	0.0001	-	-	-	-	-	-
Rook	0.66	0.33	0.0001	0.80	0.55	0.0001	-	-	-	-	-	-
Ringed Plover	0.12	0.05	0.1510	0.10	0.06	0.576	0.02	0.20	0.0002	-	-	-
Redstart	0.16	0.27	0.0001	0.21	0.29	0.0001	-	-	-	-	-	-
Reed Warbler	0.06	0.02	0.2072	0.13	0.13	0.0001	-	-	-	-	-	-
Ring Ouzel	0.15	0.14	0.0959	0.15	0.13	0.0816	-	-	-	0.45	0.30	0.0001
Skylark	0.65	0.60	0.0001	0.61	0.68	0.0001	0.36	0.50	0.0001	1.09	0.78	0.0001
Stonechat	0.26	0.09	0.1068	0.19	0.20	0.0014	-	-	-	-	-	-
Stock Dove	0.25	0.21	0.0001	0.24	0.22	0.0001	-	-	-	-	-	-
Spotted Flycatcher	0.08	0.08	0.0001	0.07	0.10	0.0001	-	-	-	-	-	-
Starling	0.81	0.59	0.0001	0.80	0.73	0.0001	-	-	-	-	-	-
Sparrowhawk	0.06	0.04	0.0078	0.09	0.07	0.0001	-	-	-	-	-	-
Swift	0.39	0.34	0.0001	0.40	0.39	0.0001	-	-	-	-	-	-
Siskin	0.20	0.06	0.0886	0.18	0.07	0.0465	-	-	-	-	-	-
Swallow	0.47	0.53	0.0001	0.40	0.62	0.0001	-	-	-	-	-	-
Sand Martin	0.11	0.04	0.0447	0.14	0.06	0.0035	-	-	-	-	-	-
Snipe	0.11	0.16	0.0002	0.22	0.24	0.0001	0.79	0.36	0.0001	0.51	0.28	0.0001
Song Thrush	0.37	0.48	0.0001	0.36	0.60	0.0001	-	-	-	-	-	-
Shelduck	0.35	0.23	0.0001	0.32	0.20	0.0001	-	-	-	-	-	-
Sedge Warbler	0.14	0.08	0.0002	0.14	0.17	0.0001	-	-	-	-	-	-
Teal	0.03	0.02	0.3669	0.05	0.02	0.2628	0.04	0.14	0.0026	0.26	0.11	0.0331
Treecreeper	0.09	0.10	0.0001	0.08	0.11	0.0001	-	-	-	-	-	-
Turtle Dove	0.24	0.25	0.0001	0.16	0.24	0.0001	-	-	-	-	-	-
Tawny Owl	0.01	0.00	0.5480	0.04	0.04	0.0080	-	-	-	-	-	-
Tree Pipit	0.12	0.12	0.0004	0.13	0.14	0.0001	-	-	-	-	-	-
Tree Sparrow	0.13	0.12	0.0001	0.14	0.13	0.0001	-	-	-	-	-	-
Tufted Duck	0.06	0.02	0.1002	0.16	0.10	0.0001	-	-	-	-	-	-
Twite	0.08	0.04	0.4059	0.24	0.31	0.0073	-	-	-	0.55	0.32	0.0001
Wheatear	0.32	0.25	0.0001	0.30	0.22	0.0001	0.12	0.29	0.0001	0.55	0.52	0.0001
Whinchat	0.11	0.13	0.0025	0.12	0.10	0.0032	-	-	-	0.49	0.25	0.0001
Whitethroat	0.34	0.45	0.0001	0.37	0.52	0.0001	-	-	-	-	-	-
Woodcock*	0.00	0.00	-	0.03	0.01	0.4302	-	-	-	-	-	-
Woodlark*	-	-	-	0.32	0.12	0.2745	-	-	-	-	-	-
Whimbrel*	-	-	-	0.38	0.17	0.7369	-	-	-	-	-	-
Wigeon	-	-	-	-	-	-	0.04	0.12	0.0044	-	-	-
Wood Warbler	0.10	0.11	0.0036	0.03	0.04	0.0495	-	-	-	-	-	-
Woodpigeon	0.75	0.66	0.0001	0.77	0.86	0.0001	-	-	-	-	-	-
Wren	0.54	0.62	0.0001	0.58	0.80	0.0001	-	-	-	-	-	-
Willow Tit	0.03	0.01	0.2202	0.08	0.06	0.0036	-	-	-	-	-	-
Willow Warbler	0.36	0.53	0.0001	0.33	0.55	0.0001	-	-	-	-	-	-

Yellowhammer	0.45	0.61	0.0001	0.43	0.65	0.0001	-	-	-	-	-	-
Yellow Wagtail	0.14	0.11	0.0003	0.17	0.20	0.0001	-	-	-	-	-	-

Table 12   A summary of species monitored under sampling strategies 1-4 at three levels of professional help. Threshold precision was set at an ability to detect a 50% between-year change. WA = Wales, SC = Scotland, EN = England, BR = Britain.

	LOW				MEDIUM				HIGH			
	WA	SC	EN	BR	WA	SC	EN	BR	WA	SC	EN	BR
Strategy 1	43	61	98	111	45	72	100	115	48	83	102	120
Strategy 2	41	62	95	108	46	72	97	113	48	81	101	116
Strategy 3	39	58	98	110	47	75	99	113	48	84	101	118
Strategy 4	41	65	100	112	48	71	103	116	50	82	103	117

Table 13a   Lists species (in taxonomic order) monitored by all four strategies within Britain at three levels of professional input (a), and lists marginal species at a British level (b). '*' indicates that precision was estimated from a cross-species calibration and results for these species must be treated with caution. 'R' indicates a Red Data Bird (including those qualifying on the basis of breeding or wintering populations). Complete data are presented in Table 17.

SPECIES COVERED BY ALL STRATEGIES WITHIN BRITAIN

Great Crested Grebe
Grey Heron
Mute Swan
Greylag Goose R*
Canada Goose
Shelduck R
Mallard
Pochard R*
Tufted Duck
Ruddy Duck *
Sparrowhawk
Buzzard
Kestrel
Peregrine R*
Red Grouse R
Red-legged Partridge
Grey Partridge R
Pheasant
Moorhen
Coot
Oystercatcher R
Golden Plover R
Lapwing
Dunlin R
Snipe
Woodcock *
Curlew R
Redshank R
Common Sandpiper
Black-headed Gull
Common Gull
Lesser Black-backed Gull
Herring Gull
Great Black-backed Gull
Feral Pigeon/Rock Dove
Stock Dove
Woodpigeon
Collared Dove
Turtle Dove
Cuckoo
Barn Owl R*
Short-eared Owl *
Swift

Green Woodpecker
Great Spotted Woodpecker
Skylark
Sand Martin
Swallow
House Martin
Tree Pipit
Dunnock
Robin
Redstart
Whinchat
Stonechat
Wheatear
Ring Ouzel
Blackbird
Song Thrush
Mistle Thrush
Sedge Warbler
Reed Warbler
Lesser Whitethroat
Whitethroat
Garden Warbler
Blackcap
Wood Warbler
Chiffchaff
Willow Warbler
Goldcrest
Spotted Flycatcher
Long-tailed Tit
Marsh Tit
Willow Tit
Coal Tit
Blue Tit
Great Tit
Nuthatch
Treecreeper
Jay
Magpie
Jackdaw
Rook
Carrion Crow
Hooded Crow
Raven

Starling
House Sparrow
Tree Sparrow
Meadow Pipit
Yellow Wagtail
Grey Wagtail
Pied Wagtail
Dipper
Wren
Chaffinch
Greenfinch
Goldfinch
Siskin
Linnet
Twite R
Lesser Redpoll
Bullfinch
Yellowhammer
Reed Bunting
Corn Bunting

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Table 13b Lists species (in taxonomic order) monitored adequately within Britain by specific sampling strategies. '1' indicates a species achieves a threshold level of precision. Symbols follow those in Table 13a. 'BR1L' indicates Britain, strategy one, low professional input, etc. Complete data are presented in Table 17.

SPECIESN	BR1L	BR2L	BR3L	BR4L	BR1M	BR2M	BR3M	BR4M	BR1H	BR2H	BR3H	BR4H
Mandarin	.	.	.	.	.	.	.	.	.	.	1	.
Gadwall R*	1	.	1	1	1	1	1	1	1	1	1	1
Teal R	1	1	.	1	1	1	.	1	1	1	1	1
Shoveler R*	1	.	1	1	1	1	1	1	1	1	1	1
Eider*	.	.	.	1	1	1	1	1	1	1	1	1
Red-breasted Merganser*	1	1	.	1	1	1	1	1	1	1	1	1
Hen Harrier R*	.	.	.	.	1	.	.	.	1	1	1	.
Golden Eagle R*	.	.	.	.	.	1	.	1	1	1	1	1
Merlin R*	.	.	1	.	1	1	1	1	1	1	1	1
Hobby*	1	.	1	1	1	.	1	1	1	.	1	1
Black Grouse R*	.	.	.	.	.	.	.	.	1	.	1	.
Quail R*	.	.	.	.	.	.	1	.	1	1	.	.
Ringed Plover R	.	.	.	.	.	.	.	1	1	.	.	1
Little Owl	.	.	.	.	1	.	.	1	1	1	1	1
Rock Pipit	.	.	.	.	.	.	.	.	1	.	.	1
	====	====	====	====	====	====	====	====	====	====	====	====
	5	2	4	6	9	7	7	10	14	10	12	11

Table 14a Lists species (in taxonomic order) monitored by all four strategies within England at three levels of professional input (a), and lists marginal species at a British level (b). '*' indicates that precision was estimated from a cross-species calibration and results for these species must be treated with caution. 'R' indicates a Red Data Bird (including those qualifying on the basis of breeding or wintering populations). Complete data are presented in Table 18.

SPECIES COVERED BY ALL STRATEGIES WITHIN ENGLAND

Great Crested Grebe
Grey Heron
Mute Swan
Greylag Goose R*
Canada Goose
Shelduck R
Mallard
Pochard R*
Tufted Duck .
Ruddy Duck *
Sparrowhawk
Buzzard
Kestrel
Red Grouse R
Red-legged Partridge
Grey Partridge R
Pheasant
Moorhen
Coot
Oystercatcher R
Golden Plover R
Lapwing
Dunlin R
Snipe
Woodcock *
Curlew R
Redshank R
Black-headed Gull
Common Gull
Lesser Black-backed Gull
Herring Gull
Great Black-backed Gull
Feral Pigeon/Rock Dove
Stock Dove
Woodpigeon
Collared Dove
Turtle Dove
Cuckoo
Barn Owl R*
Swift
Green Woodpecker
Great Spotted Woodpecker
Skylark
Sand Martin

Swallow
House Martin
Tree Pipit
Meadow Pipit
Yellow Wagtail
Grey Wagtail
Pied Wagtail
Wren
Dunnock
Robin
Redstart
Whinchat
Wheatear
Blackbird
Song Thrush
Mistle Thrush
Sedge Warbler
Reed Warbler
Lesser Whitethroat
Whitethroat
Garden Warbler
Blackcap
Chiffchaff
Willow Warbler
Goldcrest
Spotted Flycatcher
Long-tailed Tit
Marsh Tit
Willow Tit
Coal Tit
Blue Tit
Great Tit
Nuthatch
Treecreeper
Jay
Magpie
Jackdaw
Rook
Carrion Crow
Starling
House Sparrow
Tree Sparrow
Chaffinch
Greenfinch

Goldfinch
Linnet
Lesser Redpoll
Bullfinch
Yellowhammer
Reed Bunting
Corn Bunting

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Table 14b   Lists species (in taxonomic order) monitored adequately within England by specific sampling strategies. '1' indicates a species achieves a threshold level of precision. Symbols follow those in Table 13a. 'EN1L' indicates England, strategy one, low professional input, etc. Complete data are presented in Table 17-20.

SPECIESN	EN1L	EN2L	EN3L	EN4L	EN1M	EN2M	EN3M	EN4M	EN1H	EN2H	EN3H	EN4H
Gadwall R*	1	.	1	1	1	1	1	1	1	1	1	1
Shoveler R*	1	.	1	1	1	1	1	1	1	1	1	1
Hobby*	1	.	1	1	1	.	1	1	1	.	1	1
Common Sandpiper	.	.	.	1	.	.	.	1	1	.	1	1
Little Owl	.	.	.	.	1	.	.	1	1	.	1	.
Dipper	.	.	.	.	.	.	.	.	.	.	.	1
Stonechat	.	.	.	.	.	.	.	1	.	1	.	1
Ring Ouzel	.	.	.	1	.	.	.	1	1	.	.	1
Wood Warbler	.	.	.	.	.	.	.	.	.	1	.	.
Raven	.	.	.	.	1	.	1	1	1	1	1	1
Siskin	.	.	.	.	.	.	.	.	.	1	.	.
	====	====	====	====	====	====	====	====	====	====	====	====
	3	0	3	5	5	2	4	8	7	6	6	8

Table 15a   Lists species (in taxonomic order) monitored by all four strategies within Scotland at three levels of professional input (a), and lists marginal species at a British level (b). '*' indicates that precision was estimated from a cross-species calibration and results for these species must be treated with caution. 'R' indicates a Red Data Bird (including those qualifying on the basis of breeding or wintering populations). Complete data are presented in Table 19.

SPECIES COVERED BY ALL STRATEGIES WITHIN SCOTLAND

Grey Heron	Rook
Mallard	Carrion Crow
Buzzard	Hooded Crow
Kestrel	Raven
Red Grouse R	Starling
Pheasant	House Sparrow
Oystercatcher R	Chaffinch
Golden Plover R	Greenfinch
Lapwing	Goldfinch
Dunlin R	Siskin
Snipe	Linnet
Curlew R	Yellowhammer
Redshank R	Reed Bunting
Black-headed Gull	
Common Gull	
Lesser Black-backed Gull	57
Herring Gull	
Great Black-backed Gull	
Feral Pigeon/Rock Dove	
Woodpigeon	
Collared Dove	
Cuckoo	
Swift	
Skylark	
Swallow	
House Martin	
Meadow Pipit	
Pied Wagtail	
Wren	
Dunnock	
Robin	
Whinchat	
Wheatear	
Blackbird	
Song Thrush	
Mistle Thrush	
Whitethroat	
Willow Warbler	
Goldcrest	
Coal Tit	
Blue Tit	
Great Tit	
Magpie	
Jackdaw	

Table 15b   Lists species (in taxonomic order) monitored adequately within Scotland by specific sampling strategies. '1' indicates a species achieves a threshold level of precision. Symbols follow those in Table 13a. 'SC1L' indicates Scotland, strategy one, low professional input, etc. Complete data are presented in Tables 17-20.

SPECIESN	SC1L	SC2L	SC3L	SC4L	SC1M	SC2M	SC3M	SC4M	SC1H	SC2H	SC3H	SC4H
Mute Swan	.	.	.	.	.	.	.	.	.	.	.	1
Shelduck R	.	.	.	1	1	.	1	1	1	1	1	1
Eider*	.	.	.	1	1	1	1	1	1	1	1	1
Red-breasted Merganser*	.	.	.	.	1	1	1	1	1	1	1	1
Hen Harrier R*	.	.	.	.	.	.	.	.	1	.	1	.
Golden Eagle R*	.	.	.	.	.	1	.	1	1	1	1	1
Peregrine R*	.	.	.	.	1	.	.	.	1	.	1	1
Grey Partridge R	.	.	.	1	1	.	1	1	1	1	1	1
Moorhen	.	.	.	.	.	.	.	.	1	1	1	1
Woodcock*	.	.	.	.	.	.	.	.	.	1	.	.
Common Sandpiper	1	1	.	.	1	1	1	1	1	1	1	1
Stock Dove	.	.	.	.	.	.	.	1	1	1	1	1
Short-eared Owl*	.	.	.	.	.	1	1	.	1	1	1	1
Great Spotted Woodpecker	.	.	.	.	.	.	.	.	1	.	1	.
Sand Martin	.	.	.	.	.	.	.	.	1	1	1	1
Tree Pipit	.	.	.	.	.	1	1	.	1	1	1	.
Rock Pipit	.	.	.	.	.	.	.	.	.	.	.	1
Grey Wagtail	.	.	.	.	.	1	1	.	1	1	1	1
Dipper	.	.	.	.	.	.	.	.	.	1	1	.
Redstart	.	.	.	.	1	1	1	.	1	1	1	1
Stonechat	1	.	.	.	1	1	1	1	1	1	1	1
Ring Ouzel	.	.	.	.	.	.	1	.	1	.	1	1
Sedge Warbler	.	.	.	1	1	.	1	1	1	1	1	1
Blackcap	1	1	.	1	1	1	1	1	1	1	1	1
Chiffchaff	.	1	.	1	1	1	1	1	1	1	1	1
Spotted Flycatcher	.	.	.	.	.	.	.	.	1	1	1	1
Long-tailed Tit	1	1	.	1	1	1	1	1	1	1	1	1
Twite R	.	1	1	1	1	1	1	1	1	1	1	1
Lesser Redpoll	.	.	.	.	1	1	1	.	1	1	1	1
Bullfinch	.	.	.	.	1	1	1	1	1	1	1	1
====	====	====	====	====	====	====	====	====	====	====	====	====
	4	5	1	8	15	15	18	14	26	24	27	25

Table 16a Lists species (in taxonomic order) monitored by all four strategies within Wales at three levels of professional input (a), and lists marginal species at a British level (b). '*' indicates that precision was estimated from a cross-species calibration and results for these species must be treated with caution. 'R' indicates a Red Data Bird (including those qualifying on the basis of breeding or wintering populations). Complete data are presented in Tables 17-20.

SPECIES COVERED BY ALL STRATEGIES WITHIN WALES

Buzzard	Robin	Rook
Pheasant	Blackbird	Carrion Crow
Curlew R	Song Thrush	Raven
Woodpigeon	Mistle Thrush	Starling
Collared Dove	Whitethroat	House Sparrow
Cuckoo	Blackcap	Chaffinch
Swift	Chiffchaff	Greenfinch
Skylark	Willow Warbler	Goldfinch
Swallow	Long-tailed Tit	Linnet
House Martin	Coal Tit	Yellowhammer
Meadow Pipit	Blue Tit	
Pied Wagtail	Great Tit	
Wren	Magpie	__
Dunnock	Jackdaw	**38**

Table 16b Lists species (in taxonomic order) monitored adequately within Wales by specific sampling strategies. '1' indicates a species achieves a threshold level of precision. Symbols follow those in Table 13a. 'WA1L' indicates Wales, strategy one, low professional input, etc. Complete data are presented in Tables 17-20.

SPECIESN	WA1L	WA2L	WA3L	WA4L	WA1M	WA2M	WA3M	WA4M	WA1H	WA2H	WA3H	WA4H
Mallard	1	1	.	.	1	1	1	1	1	1	1	1
Lapwing	1	1	.	1	1	1	1	1	1	1	1	1
Black-headed Gull	.	.	.	.	1	1	1	1	1	1	1	1
Lesser Black-backed Gull	.	.	.	.	.	.	.	.	.	1	.	1
Herring Gull	1	1	.	1	1	1	1	1	1	1	1	1
Stock Dove	.	.	.	.	.	.	.	.	.	.	.	1
Green Woodpecker	.	.	.	.	1	.	.	1	1	1	1	1
Redstart	1	.	.	.	1	1	1	1	1	1	1	1
Wheatear	1	.	1	1	1	1	1	1	1	1	1	1
Goldcrest	.	.	.	.	.	.	1	1	1	.	1	1
Nuthatch	.	.	.	.	.	1	1	1	1	1	1	1
Jay	.	.	.	.	.	1	1	1	1	1	1	1
	====	====	====	====	====	====	====	====	====	====	====	====
	5	3	1	3	7	8	9	10	10	10	10	12

Table 17   Species monitoring within strategy one, by country and at three levels of professional help. 168 species are listed. Symbols are as described above.

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
Red-throated Diver R	.	.	.	.	.	.	.	.	.	.	.	.
Little Grebe	.	.	.	.	.	.	.	.	.	.	.	.
Great Crested Grebe	.	.	1	1	.	.	1	1	.	.	1	1
Slavonian Grebe R*	.	.	.	.	.	.	.	.	.	.	.	.
Black-necked Grebe R*	.	.	.	.	.	.	.	.	.	.	.	.
Bittern R*	.	.	.	.	.	.	.	.	.	.	.	.
Grey Heron	.	1	1	1	.	1	1	1	.	1	1	1
Mute Swan	.	.	1	1	.	.	1	1	.	.	1	1
Greylag Goose R*	.	.	1	1	.	.	1	1	.	.	1	1
Canada Goose	.	.	1	1	.	.	1	1	.	.	1	1
Egyptian Goose*	.	.	.	.	.	.	.	.	.	.	.	.
Shelduck R	.	.	1	1	.	1	1	1	.	1	1	1
Mandarin	.	.	.	.	.	.	.	.	.	.	.	.
Wigeon	.	.	.	.	.	.	.	.	.	.	.	.
Gadwall R*	.	.	1	1	.	.	1	1	.	.	1	1
Teal R	.	.	.	1	.	.	.	1	.	.	.	1
Mallard	1	1	1	1	1	1	1	1	1	1	1	1
Pintail R*	.	.	.	.	.	.	.	.	.	.	.	.
Shoveler R*	.	.	1	1	.	.	1	1	.	.	1	1
Pochard R*	.	.	1	1	.	.	1	1	.	.	1	1
Tufted Duck	.	.	1	1	.	.	1	1	.	.	1	1
Eider*	.	.	.	.	.	1	.	1	.	1	.	1
Goldeneye R*	.	.	.	.	.	.	.	.	.	.	.	.
Red-breasted Merganser*	.	.	.	1	.	1	.	1	.	1	.	1
Goosander	.	.	.	.	.	.	.	.	.	.	.	.
Ruddy Duck*	.	.	1	1	.	.	1	1	.	.	1	1
Red Kite R*	.	.	.	.	.	.	.	.	.	.	.	.
Marsh Harrier R*	.	.	.	.	.	.	.	.	.	.	.	.
Hen Harrier R*	.	.	.	.	.	.	.	1	.	1	.	1
Goshawk R*	.	.	.	.	.	.	.	.	.	.	.	.
Sparrowhawk	.	.	1	1	.	.	1	1	.	.	1	1
Buzzard	1	1	1	1	1	1	1	1	1	1	1	1
Golden Eagle R*	.	.	.	.	.	.	.	.	.	1	.	1
Osprey R*	.	.	.	.	.	.	.	.	.	1	.	1
Kestrel	.	1	1	1	.	1	1	1	.	1	1	1
Merlin R*	.	.	.	.	.	.	.	1	.	.	.	1
Hobby*	.	.	1	1	.	.	1	1	.	.	1	1
Peregrine R*	.	.	.	1	.	1	.	1	.	1	.	1
Red Grouse R	.	1	1	1	.	1	1	1	.	1	1	1
Ptarmigan*	.	.	.	.	.	.	.	.	.	.	.	.
Black Grouse R*	.	.	.	.	.	.	.	.	.	.	.	.
Capercaillie R*	.	.	.	.	.	.	.	.	.	.	.	1
Red-legged Partridge	.	.	1	1	.	.	1	1	.	.	1	1
Grey Partridge R	.	.	1	1	.	1	1	1	.	1	1	1
Quail R*	.	.	.	.	.	.	.	.	.	.	.	1
Pheasant	1	1	1	1	1	1	1	1	1	1	1	1
Golden Pheasant*	.	.	.	.	.	.	.	.	.	.	.	.
Lady Amherst's Pheasant*	.	.	.	.	.	.	.	.	.	.	.	.
Water Rail*	.	.	.	.	.	.	.	.	.	.	.	.
Moorhen	.	.	1	1	.	.	1	1	.	1	1	1
Coot	.	.	1	1	.	.	1	1	.	.	1	1
Oystercatcher R	.	1	1	1	.	1	1	1	.	1	1	1
Avocet R*	.	.	.	.	.	.	.	.	.	.	.	.
Stone Curlew R*	.	.	.	.	.	.	.	.	.	.	.	.
Little Ringed Plover	.	.	.	.	.	.	.	.	.	.	.	.
Ringed Plover R	.	.	.	.	.	.	.	.	.	.	.	1

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
Dotterel R*	.	.	.	.	.	.	.	.	.	.	.	.
Golden Plover R	.	1	1	1	.	1	1	1	.	1	1	1
Lapwing	1	1	1	1	1	1	1	1	1	1	1	1
Dunlin R	.	1	1	1	.	1	1	1	.	1	1	1
Snipe	.	1	1	1	.	1	1	1	.	1	1	1
Woodcock*	.	.	1	1	.	.	1	1	.	.	1	1
Whimbrel R*	.	.	.	.	.	.	.	.	.	.	.	.
Curlew R	1	1	1	1	1	1	1	1	1	1	1	1
Redshank R	.	1	1	1	.	1	1	1	.	1	1	1
Greenshank R	.	.	.	.	.	.	.	.	.	.	.	.
Common Sandpiper	.	1	.	1	.	1	.	1	.	1	1	1
Black-headed Gull	.	1	1	1	1	1	1	1	1	1	1	1
Common Gull	.	1	1	1	.	1	1	1	.	1	1	1
Lesser Black-backed Gull	.	1	1	1	.	1	1	1	.	1	1	1
Herring Gull	1	1	1	1	1	1	1	1	1	1	1	1
Great Black-backed Gull	.	1	1	1	.	1	1	1	.	1	1	1
Feral Pigeon/Rock Dove	.	1	1	1	.	1	1	1	.	1	1	1
Stock Dove	.	.	1	1	.	.	1	1	.	1	1	1
Woodpigeon	1	1	1	1	1	1	1	1	1	1	1	1
Collared Dove	1	1	1	1	1	1	1	1	1	1	1	1
Turtle Dove	.	.	1	1	.	.	1	1	.	.	1	1
Ring-necked Parakeet*	.	.	.	.	.	.	.	.	.	.	.	.
Cuckoo	1	1	1	1	1	1	1	1	1	1	1	1
Barn Owl R*	.	.	1	1	.	.	1	1	.	.	1	1
Little Owl	.	.	.	.	.	.	1	1	.	.	1	1
Tawny Owl	.	.	.	.	.	.	.	.	.	.	.	.
Long-eared Owl*	.	.	.	.	.	.	.	.	.	.	.	.
Short-eared Owl*	.	.	.	1	.	.	.	1	.	1	.	1
Nightjar R*	.	.	.	.	.	.	.	.	.	.	.	.
Swift	1	1	1	1	1	1	1	1	1	1	1	1
Kingfisher	.	.	.	.	.	.	.	.	.	.	.	.
Green Woodpecker	.	.	1	1	1	.	1	1	1	.	1	1
Great Spotted Woodpecker	.	.	1	1	.	.	1	1	.	1	1	1
Lesser Spotted Woodpecker	.	.	.	.	.	.	.	.	.	.	.	.
Woodlark R*	.	.	.	.	.	.	.	.	.	.	.	.
Skylark	1	1	1	1	1	1	1	1	1	1	1	1
Sand Martin	.	.	1	1	.	.	1	1	.	1	1	1
Swallow	1	1	1	1	1	1	1	1	1	1	1	1
House Martin	1	1	1	1	1	1	1	1	1	1	1	1
Tree Pipit	.	.	1	1	.	.	1	1	.	1	1	1
Meadow Pipit	1	1	1	1	1	1	1	1	1	1	1	1
Rock Pipit	.	.	.	.	.	.	.	.	.	.	.	1
Yellow Wagtail	.	.	1	1	.	.	1	1	.	.	1	1
Grey Wagtail	.	.	1	1	.	.	1	1	.	1	1	1
Pied Wagtail	1	1	1	1	1	1	1	1	1	1	1	1
Dipper	.	.	.	1	.	.	.	1	.	.	.	1
Wren	1	1	1	1	1	1	1	1	1	1	1	1
Dunnock	1	1	1	1	1	1	1	1	1	1	1	1
Robin	1	1	1	1	1	1	1	1	1	1	1	1
Nightingale	.	.	.	.	.	.	.	.	.	.	.	.
Black Redstart R*	.	.	.	.	.	.	.	.	.	.	.	.
Redstart	1	.	1	1	1	1	1	1	1	1	1	1
Whinchat	.	1	1	1	.	1	1	1	.	1	1	1
Stonechat	.	1	.	1	.	1	.	1	.	1	.	1
Wheatear	1	1	1	1	1	1	1	1	1	1	1	1
Ring Ouzel	.	.	.	1	.	.	.	1	.	1	1	1

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
Blackbird	1	1	1	1	1	1	1	1	1	1	1	1
Song Thrush	1	1	1	1	1	1	1	1	1	1	1	1
Redwing R*	.	.	.	.	.	.	.	.	.	.	.	.
Mistle Thrush	1	1	1	1	1	1	1	1	1	1	1	1
Cetti's Warbler R*	.	.	.	.	.	.	.	.	.	.	.	.
Grasshopper Warbler	.	.	.	.	.	.	.	.	.	.	.	.
Sedge Warbler	.	.	1	1	.	1	1	1	.	1	1	1
Reed Warbler	.	.	1	1	.	.	1	1	.	.	1	1
Dartford Warbler R*	.	.	.	.	.	.	.	.	.	.	.	.
Lesser Whitethroat	.	.	1	1	.	.	1	1	.	.	1	1
Whitethroat	1	1	1	1	1	1	1	1	1	1	1	1
Garden Warbler	.	.	1	1	.	.	1	1	.	.	1	1
Blackcap	1	1	1	1	1	1	1	1	1	1	1	1
Wood Warbler	.	.	.	1	.	.	.	1	.	.	.	1
Chiffchaff	1	.	1	1	1	1	1	1	1	1	1	1
Willow Warbler	1	1	1	1	1	1	1	1	1	1	1	1
Goldcrest	.	1	1	1	.	1	1	1	1	1	1	1
Firecrest R*	.	.	.	.	.	.	.	.	.	.	.	.
Spotted Flycatcher	.	.	1	1	.	.	1	1	.	1	1	1
Pied Flycatcher	.	.	.	.	.	.	.	.	.	.	.	.
Bearded Tit R*	.	.	.	.	.	.	.	.	.	.	.	.
Long-tailed Tit	1	1	1	1	1	1	1	1	1	1	1	1
Marsh Tit	.	.	1	1	.	.	1	1	.	.	1	1
Willow Tit	.	.	1	1	.	.	1	1	.	.	1	1
Crested Tit R*	.	.	.	.	.	.	.	.	.	.	.	.
Coal Tit	1	1	1	1	1	1	1	1	1	1	1	1
Blue Tit	1	1	1	1	1	1	1	1	1	1	1	1
Great Tit	1	1	1	1	1	1	1	1	1	1	1	1
Nuthatch	.	.	1	1	.	.	1	1	1	.	1	1
Treecreeper	.	.	1	1	.	.	1	1	.	.	1	1
Jay	.	.	1	1	.	.	1	1	1	.	1	1
Magpie	1	1	1	1	1	1	1	1	1	1	1	1
Chough R*	.	.	.	.	.	.	.	.	.	.	.	.
Jackdaw	1	1	1	1	1	1	1	1	1	1	1	1
Rook	1	1	1	1	1	1	1	1	1	1	1	1
Carrion Crow	1	1	1	1	1	1	1	1	1	1	1	1
Hooded Crow	.	1	.	1	.	1	.	1	.	1	.	1
Raven	1	1	.	1	1	1	1	1	1	1	1	1
Starling	1	1	1	1	1	1	1	1	1	1	1	1
House Sparrow	1	1	1	1	1	1	1	1	1	1	1	1
Tree Sparrow	.	.	1	1	.	.	1	1	.	.	1	1
Chaffinch	1	1	1	1	1	1	1	1	1	1	1	1
Greenfinch	1	1	1	1	1	1	1	1	1	1	1	1
Goldfinch	1	1	1	1	1	1	1	1	1	1	1	1
Siskin	.	1	.	1	.	1	.	1	.	1	.	1
Linnet	1	1	1	1	1	1	1	1	1	1	1	1
Twite R	.	.	.	1	.	1	.	1	.	1	.	1
Lesser Redpoll	.	.	1	1	.	1	1	1	.	1	1	1
Crossbill	.	.	.	.	.	.	.	.	.	.	.	.
Scottish Crossbill R*	.	.	.	.	.	.	.	.	.	.	.	.
Bullfinch	.	.	1	1	.	1	1	1	.	1	1	1
Hawfinch	.	.	.	.	.	.	.	.	.	.	.	.
Yellowhammer	1	1	1	1	1	1	1	1	1	1	1	1
Cirl Bunting R	.	.	.	.	.	.	.	.	.	.	.	.
Reed Bunting	.	1	1	1	.	1	1	1	.	1	1	1
Corn Bunting	.	.	1	1	.	.	1	1	.	.	1	1

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
	===	===	===	===	===	===	===	===	===	===	===	===
	43	61	98	111	45	72	100	115	48	83	102	120

Table 18 Species monitoring within strategy two, by country and at three levels of professional help. 168 species are listed. Symbols are as described above.

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
Red-throated Diver R	.	.	.	.	.	.	.	.	.	.	.	.
Little Grebe	.	.	.	.	.	.	.	.	.	.	.	.
Great Crested Grebe	.	.	1	1	.	.	1	1	.	.	1	1
Slavonian Grebe R*	.	.	.	.	.	.	.	.	.	.	.	.
Black-necked Grebe R*	.	.	.	.	.	.	.	.	.	.	.	.
Bittern R*	.	.	.	.	.	.	.	.	.	.	.	.
Grey Heron	.	1	1	1	.	1	1	1	.	1	1	1
Mute Swan	.	.	1	1	.	.	1	1	.	.	1	1
Greylag Goose R*	.	.	1	1	.	.	1	1	.	.	1	1
Canada Goose	.	.	1	1	.	.	1	1	.	.	1	1
Egyptian Goose*	.	.	.	.	.	.	.	.	.	.	.	.
Shelduck R	.	.	1	1	.	.	1	1	.	1	1	1
Mandarin	.	.	.	.	.	.	.	.	.	.	.	.
Wigeon	.	.	.	.	.	.	.	.	.	.	.	.
Gadwall R*	.	.	.	.	.	.	1	1	.	.	1	1
Teal R	.	.	.	1	.	.	.	1	.	.	.	1
Mallard	1	1	1	1	1	1	1	1	1	1	1	1
Pintail R*	.	.	.	.	.	.	.	.	.	.	.	.
Shoveler R*	.	.	.	.	.	.	1	1	.	.	1	1
Pochard R*	.	.	1	1	.	.	1	1	.	.	1	1
Tufted Duck	.	.	1	1	.	.	1	1	.	.	1	1
Eider*	.	.	.	.	.	1	.	1	.	1	.	1
Goldeneye R*	.	.	.	.	.	.	.	.	.	.	.	.
Red-breasted Merganser*	.	.	.	1	.	1	.	1	.	1	.	1
Goosander	.	.	.	.	.	.	.	.	.	.	.	.
Ruddy Duck*	.	.	1	1	.	.	1	1	.	.	1	1
Red Kite R*	.	.	.	.	.	.	.	.	.	.	.	.
Marsh Harrier R*	.	.	.	.	.	.	.	.	.	.	.	.
Hen Harrier R*	.	.	.	.	.	.	.	.	.	.	.	1
Goshawk R*	.	.	.	.	.	.	.	.	.	.	.	.
Sparrowhawk	.	.	1	1	.	.	1	1	.	.	1	1
Buzzard	1	1	1	1	1	1	1	1	1	1	1	1
Golden Eagle R*	.	.	.	.	.	1	.	1	.	1	.	1
Osprey R*	.	.	.	.	.	.	.	.	.	.	.	.
Kestrel	.	1	1	1	.	1	1	1	.	1	1	1
Merlin R*	.	.	.	.	.	.	.	1	.	.	.	1
Hobby*	.	.	.	.	.	.	.	.	.	.	.	.
Peregrine R*	.	.	.	1	.	.	.	1	.	.	.	1
Red Grouse R	.	1	1	1	.	1	1	1	.	1	1	1
Ptarmigan*	.	.	.	.	.	.	.	.	.	.	.	.
Black Grouse R*	.	.	.	.	.	.	.	.	.	.	.	.
Capercaillie R*	.	.	.	.	.	.	.	.	.	.	.	.
Red-legged Partridge	.	.	1	1	.	.	1	1	.	.	1	1
Grey Partridge R	.	.	1	1	.	.	1	1	.	1	1	1
Quail R*	.	.	.	.	.	.	.	.	.	.	.	1
Pheasant	1	1	1	1	1	1	1	1	1	1	1	1
Golden Pheasant*	.	.	.	.	.	.	.	.	.	.	.	.
Lady Amherst's Pheasant*	.	.	.	.	.	.	.	.	.	.	.	.
Water Rail*	.	.	.	.	.	.	.	.	.	.	.	.
Moorhen	.	.	1	1	.	.	1	1	.	1	1	1
Coot	.	.	1	1	.	.	1	1	.	.	1	1
Oystercatcher R	.	1	1	1	.	1	1	1	.	1	1	1
Avocet R*	.	.	.	.	.	.	.	.	.	.	.	.
Stone Curlew R*	.	.	.	.	.	.	.	.	.	.	.	.
Little Ringed Plover	.	.	.	.	.	.	.	.	.	.	.	.
Ringed Plover R	.	.	.	.	.	.	.	.	.	.	.	.

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
Dotterel R*	.	.	.	.	.	.	.	.	.	.	.	.
Golden Plover R	.	1	1	1	.	1	1	1	.	1	1	1
Lapwing	1	1	1	1	1	1	1	1	1	1	1	1
Dunlin R	.	1	1	1	.	1	1	1	.	1	1	1
Snipe	.	1	1	1	.	1	1	1	.	1	1	1
Woodcock*	.	.	1	1	.	.	1	1	.	1	1	1
Whimbrel R*	.	.	.	.	.	.	.	.	.	.	.	.
Curlew R	1	1	1	1	1	1	1	1	1	1	1	1
Redshank R	.	1	1	1	.	1	1	1	.	1	1	1
Greenshank R	.	.	.	.	.	.	.	.	.	.	.	.
Common Sandpiper	.	1	.	1	.	1	.	1	.	1	.	1
Black-headed Gull	.	1	1	1	1	1	1	1	1	1	1	1
Common Gull	.	1	1	1	.	1	1	1	.	1	1	1
Lesser Black-backed Gull	.	1	1	1	.	1	1	1	1	1	1	1
Herring Gull	1	1	1	1	1	1	1	1	1	1	1	1
Great Black-backed Gull	.	1	1	1	.	1	1	1	.	1	1	1
Feral Pigeon/Rock Dove	.	1	1	1	.	1	1	1	.	1	1	1
Stock Dove	.	.	1	1	.	.	1	1	.	1	1	1
Woodpigeon	1	1	1	1	1	1	1	1	1	1	1	1
Collared Dove	1	1	1	1	1	1	1	1	1	1	1	1
Turtle Dove	.	.	1	1	.	.	1	1	.	.	1	1
Ring-necked Parakeet*	.	.	.	.	.	.	.	.	.	.	.	.
Cuckoo	1	1	1	1	1	1	1	1	1	1	1	1
Barn Owl R*	.	.	1	1	.	.	1	1	.	.	1	1
Little Owl	.	.	.	.	.	.	.	.	.	.	.	1
Tawny Owl	.	.	.	.	.	.	.	.	.	.	.	.
Long-eared Owl*	.	.	.	.	.	.	.	.	.	.	.	.
Short-eared Owl*	.	.	.	1	.	1	.	1	.	1	.	1
Nightjar R*	.	.	.	.	.	.	.	.	.	.	.	.
Swift	1	1	1	1	1	1	1	1	1	1	1	1
Kingfisher	.	.	.	.	.	.	.	.	.	.	.	.
Green Woodpecker	.	.	1	1	.	.	1	1	1	.	1	1
Great Spotted Woodpecker	.	.	1	1	.	.	1	1	.	.	1	1
Lesser Spotted Woodpecker	.	.	.	.	.	.	.	.	.	.	.	.
Woodlark R*	.	.	.	.	.	.	.	.	.	.	.	.
Skylark	1	1	1	1	1	1	1	1	1	1	1	1
Sand Martin	.	.	1	1	.	.	1	1	.	1	1	1
Swallow	1	1	1	1	1	1	1	1	1	1	1	1
House Martin	1	1	1	1	1	1	1	1	1	1	1	1
Tree Pipit	.	.	1	1	.	1	1	1	.	1	1	1
Meadow Pipit	1	1	1	1	1	1	1	1	1	1	1	1
Rock Pipit	.	.	.	.	.	.	.	.	.	.	.	.
Yellow Wagtail	.	.	1	1	.	.	1	1	.	.	1	1
Grey Wagtail	.	.	1	1	.	1	1	1	.	1	1	1
Pied Wagtail	1	1	1	1	1	1	1	1	1	1	1	1
Dipper	.	.	.	1	.	.	.	1	.	1	.	1
Wren	1	1	1	1	1	1	1	1	1	1	1	1
Dunnock	1	1	1	1	1	1	1	1	1	1	1	1
Robin	1	1	1	1	1	1	1	1	1	1	1	1
Nightingale	.	.	.	.	.	.	.	.	.	.	.	.
Black Redstart R*	.	.	.	.	.	.	.	.	.	.	.	.
Redstart	.	.	1	1	1	1	1	1	1	1	1	1
Whinchat	.	1	1	1	.	1	1	1	.	1	1	1
Stonechat	.	.	.	1	.	1	.	1	.	1	1	1
Wheatear	.	1	1	1	1	1	1	1	1	1	1	1
Ring Ouzel	.	.	.	1	.	.	.	1	.	.	.	1

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
Blackbird	1	1	1	1	1	1	1	1	1	1	1	1
Song Thrush	1	1	1	1	1	1	1	1	1	1	1	1
Redwing R*	.	.	.	.	.	.	.	.	.	.	.	.
Mistle Thrush	1	1	1	1	1	1	1	1	1	1	1	1
Cetti's Warbler R*	.	.	.	.	.	.	.	.	.	.	.	.
Grasshopper Warbler	.	.	.	.	.	.	.	.	.	.	.	.
Sedge Warbler	.	.	1	1	.	.	1	1	.	1	1	1
Reed Warbler	.	.	1	1	.	.	1	1	.	.	1	1
Dartford Warbler R*	.	.	.	.	.	.	.	.	.	.	.	.
Lesser Whitethroat	.	.	1	1	.	.	1	1	.	.	1	1
Whitethroat	1	1	1	1	1	1	1	1	1	1	1	1
Garden Warbler	.	.	1	1	.	.	1	1	.	.	1	1
Blackcap	1	1	1	1	1	1	1	1	1	1	1	1
Wood Warbler	.	.	.	1	.	.	.	1	.	.	1	1
Chiffchaff	1	1	1	1	1	1	1	1	1	1	1	1
Willow Warbler	1	1	1	1	1	1	1	1	1	1	1	1
Goldcrest	.	1	1	1	.	1	1	1	.	1	1	1
Firecrest R*	.	.	.	.	.	.	.	.	.	.	.	.
Spotted Flycatcher	.	.	1	1	.	.	1	1	.	1	1	1
Pied Flycatcher	.	.	.	.	.	.	.	.	.	.	.	.
Bearded Tit R*	.	.	.	.	.	.	.	.	.	.	.	.
Long-tailed Tit	1	1	1	1	1	1	1	1	1	1	1	1
Marsh Tit	.	.	1	1	.	.	1	1	.	.	1	1
Willow Tit	.	.	1	1	.	.	1	1	.	.	1	1
Crested Tit R*	.	.	.	.	.	.	.	.	.	.	.	.
Coal Tit	1	1	1	1	1	1	1	1	1	1	1	1
Blue Tit	1	1	1	1	1	1	1	1	1	1	1	1
Great Tit	1	1	1	1	1	1	1	1	1	1	1	1
Nuthatch	.	.	1	1	1	.	1	1	1	.	1	1
Treecreeper	.	.	1	1	.	.	1	1	.	.	1	1
Jay	.	.	1	1	1	.	1	1	1	.	1	1
Magpie	1	1	1	1	1	1	1	1	1	1	1	1
Chough R*	.	.	.	.	.	.	.	.	.	.	.	.
Jackdaw	1	1	1	1	1	1	1	1	1	1	1	1
Rook	1	1	1	1	1	1	1	1	1	1	1	1
Carrion Crow	1	1	1	1	1	1	1	1.	1	1	1	1
Hooded Crow	.	1	.	1	.	1	.	1	.	1	.	1
Raven	1	1	.	1	1	1	.	1	1	1	1	1
Starling	1	1	1	1	1	1	1	1	1	1	1	1
House Sparrow	1	1	1	1	1	1	1	1	1	1	1	1
Tree Sparrow	.	.	1	1	.	.	1	1	.	.	1	1
Chaffinch	1	1	1	1	1	1	1	1	1	1	1	1
Greenfinch	1	1	1	1	1	1	1	1	1	1	1	1
Goldfinch	1	1	1	1	1	1	1	1	1	1	1	1
Siskin	.	1	.	1	.	1	.	1	.	1	1	1
Linnet	1	1	1	1	1	1	1	1	1	1	1	1
Twite R	.	1	.	1	.	1	.	1	.	1	.	1
Lesser Redpoll	.	.	1	1	.	1	1	1	.	1	1	1
Crossbill	.	.	.	.	.	.	.	.	.	.	.	.
Scottish Crossbill R*	.	.	.	.	.	.	.	.	.	.	.	.
Bullfinch	.	.	1	1	.	1	1	1	.	1	1	1
Hawfinch	.	.	.	.	.	.	.	.	.	.	.	.
Yellowhammer	1	1	1	1	1	1	1	1	1	1	1	1
Cirl Bunting R	.	.	.	.	.	.	.	.	.	.	.	.
Reed Bunting	.	1	1	1	.	1	1	1	.	1	1	1
Corn Bunting	.	.	1	1	.	.	1	1	.	.	1	1

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
	===	===	===	===	===	===	===	===	===	===	===	===
	41	62	95	108	46	72	97	113	48	81	101	116

Table 19 Species monitoring within strategy three, by country and at three levels of professional help. 168 species are listed. Symbols are as described above.

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
Red-throated Diver R	.	.	.	.	.	.	.	.	.	.	.	.
Little Grebe	.	.	.	.	.	.	.	.	.	.	.	.
Great Crested Grebe	.	.	1	1	.	.	1	1	.	.	1	1
Slavonian Grebe R*	.	.	.	.	.	.	.	.	.	.	.	.
Black-necked Grebe R*	.	.	.	.	.	.	.	.	.	.	.	.
Bittern R*	.	.	.	.	.	.	.	.	.	.	.	.
Grey Heron	.	1	1	1	.	1	1	1	.	1	1	1
Mute Swan	.	.	1	1	.	.	1	1	.	.	1	1
Greylag Goose R*	.	.	1	1	.	.	1	1	.	.	1	1
Canada Goose	.	.	1	1	.	.	1	1	.	.	1	1
Egyptian Goose*	.	.	.	.	.	.	.	.	.	.	.	.
Shelduck R	.	.	1	1	.	1	1	1	.	1	1	1
Mandarin	.	.	.	.	.	.	.	.	.	.	.	1
Wigeon	.	.	.	.	.	.	.	.	.	.	.	.
Gadwall R*	.	.	1	1	.	.	1	1	.	.	1	1
Teal R	.	.	.	.	.	.	.	.	.	.	.	1
Mallard	.	1	1	1	1	1	1	1	1	1	1	1
Pintail R*	.	.	.	.	.	.	.	.	.	.	.	.
Shoveler R*	.	.	1	1	.	.	1	1	.	.	1	1
Pochard R*	.	.	1	1	.	.	1	1	.	.	1	1
Tufted Duck	.	.	1	1	.	.	1	1	.	.	1	1
Eider*	.	.	.	.	.	1	.	1	.	1	.	1
Goldeneye R*	.	.	.	.	.	.	.	.	.	.	.	.
Red-breasted Merganser*	.	.	.	.	.	1	.	1	.	1	.	1
Goosander	.	.	.	.	.	.	.	.	.	.	.	.
Ruddy Duck*	.	.	1	1	.	.	1	1	.	.	1	1
Red Kite R*	.	.	.	.	.	.	.	.	.	.	.	.
Marsh Harrier R*	.	.	.	.	.	.	.	.	.	.	.	.
Hen Harrier R*	.	.	.	.	.	.	.	.	.	1	.	1
Goshawk R*	.	.	.	.	.	.	.	.	.	.	.	.
Sparrowhawk	.	.	1	1	.	.	1	1	.	.	1	1
Buzzard	1	1	1	1	1	1	1	1	1	1	1	1
Golden Eagle R*	.	.	.	.	.	.	.	.	.	1	.	1
Osprey R*	.	.	.	.	.	.	.	.	.	.	.	.
Kestrel	.	1	1	1	.	1	1	1	.	1	1	1
Merlin R*	.	.	.	1	.	.	.	1	.	.	.	1
Hobby*	.	.	1	1	.	.	1	1	.	.	1	1
Peregrine R*	.	.	.	1	.	.	.	1	.	1	.	1
Red Grouse R	.	1	1	1	.	1	1	1	.	1	1	1
Ptarmigan*	.	.	.	.	.	.	.	.	.	.	.	.
Black Grouse R*	.	.	.	.	.	.	.	.	.	.	.	1
Capercaillie R*	.	.	.	.	.	.	.	.	.	.	.	.
Red-legged Partridge	.	.	1	1	.	.	1	1	.	.	1	1
Grey Partridge R	.	.	1	1	.	1	1	1	.	1	1	1
Quail R*	.	.	.	.	.	.	.	1	.	.	.	.
Pheasant	1	1	1	1	1	1	1	1	1	1	1	1
Golden Pheasant*	.	.	.	.	.	.	.	.	.	.	.	.
Lady Amherst's Pheasant*	.	.	.	.	.	.	.	.	.	.	.	.
Water Rail*	.	.	.	.	.	.	.	.	.	.	.	.
Moorhen	.	.	1	1	.	.	1	1	.	1	1	1
Coot	.	.	1	1	.	.	1	1	.	.	1	1
Oystercatcher R	.	1	1	1	.	1	1	1	.	1	1	1
Avocet R*	.	.	.	.	.	.	.	.	.	.	.	.
Stone Curlew R*	.	.	.	.	.	.	.	.	.	.	.	.
Little Ringed Plover	.	.	.	.	.	.	.	.	.	.	.	.
Ringed Plover R	.	.	.	.	.	.	.	.	.	.	.	.

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
Dotterel R*	·	·	·	·	·	·	·	·	·	·	·	·
Golden Plover R	·	1	1	1	·	1	1	1	·	1	1	1
Lapwing	·	1	1	1	1	1	1	1	1	1	1	1
Dunlin R	·	1	1	1	·	1	1	1	·	1	1	1
Snipe	·	1	1	1	·	1	1	1	·	1	1	1
Woodcock*	·	·	1	1	·	·	1	1	·	·	1	1
Whimbrel R*	·	·	·	·	·	·	·	·	·	·	·	·
Curlew R	1	1	1	1	1	1	1	1	1	1	1	1
Redshank R	·	1	1	1	·	1	1	1	·	1	1	1
Greenshank R	·	·	·	·	·	·	·	·	·	·	·	·
Common Sandpiper	·	·	·	1	·	1	·	1	·	1	1	1
Black-headed Gull	·	1	1	1	1	1	1	1	1	1	1	1
Common Gull	·	1	1	1	·	1	1	1	·	1	1	1
Lesser Black-backed Gull	·	1	1	1	·	1	1	1	·	1	1	1
Herring Gull	·	1	1	1	1	1	1	1	1	1	1	1
Great Black-backed Gull	·	1	1	1	·	1	1	1	·	1	1	1
Feral Pigeon/Rock Dove	·	1	1	1	·	1	1	1	·	1	1	1
Stock Dove	·	·	1	1	·	·	1	1	·	1	1	1
Woodpigeon	1	1	1	1	1	1	1	1	1	1	1	1
Collared Dove	1	1	1	1	1	1	1	1	1	1	1	1
Turtle Dove	·	·	1	1	·	·	1	1	·	·	1	1
Ring-necked Parakeet*	·	·	·	·	·	·	·	·	·	·	·	·
Cuckoo	1	1	1	1	1	1	1	1	1	1	1	1
Barn Owl R*	·	·	1	1	·	·	1	1	·	·	1	1
Little Owl	·	·	·	·	·	·	·	·	·	·	1	1
Tawny Owl	·	·	·	·	·	·	·	·	·	·	·	·
Long-eared Owl*	·	·	·	·	·	·	·	·	·	·	·	·
Short-eared Owl*	·	·	·	1	·	1	·	1	·	1	·	1
Nightjar R*	·	·	·	·	·	·	·	·	·	·	·	·
Swift	1	1	1	1	1	1	1	1	1	1	1	1
Kingfisher	·	·	·	·	·	·	·	·	·	·	·	·
Green Woodpecker	·	·	1	1	·	·	1	1	1	·	1	1
Great Spotted Woodpecker	·	·	1	1	·	·	1	1	·	1	1	1
Lesser Spotted Woodpecker	·	·	·	·	·	·	·	·	·	·	·	·
Woodlark R*	·	·	·	·	·	·	·	·	·	·	·	·
Skylark	1	1	1	1	1	1	1	1	1	1	1	1
Sand Martin	·	·	1	1	·	·	1	1	·	1	1	1
Swallow	1	1	1	1	1	1	1	1	1	1	1	1
House Martin	1	1	1	1	1	1	1	1	1	1	1	1
Tree Pipit	·	·	1	1	·	1	1	1	·	1	1	1
Meadow Pipit	1	1	1	1	1	1	1	1	1	1	1	1
Rock Pipit	·	·	·	·	·	·	·	·	·	·	·	·
Yellow Wagtail	·	·	1	1	·	·	1	1	·	·	1	1
Grey Wagtail	·	·	1	1	·	1	1	1	·	1	1	1
Pied Wagtail	1	1	1	1	1	1	1	1	1	1	1	1
Dipper	·	·	·	1	·	·	·	1	·	1	·	1
Wren	1	1	1	1	1	1	1	1	1	1	1	1
Dunnock	1	1	1	1	1	1	1	1	1	1	1	1
Robin	1	1	1	1	1	1	1	1	1	1	1	1
Nightingale	·	·	·	·	·	·	·	·	·	·	·	·
Black Redstart R*	·	·	·	·	·	·	·	·	·	·	·	·
Redstart	·	·	1	1	1	1	1	1	1	1	1	1
Whinchat	·	1	1	1	·	1	1	1	·	1	1	1
Stonechat	·	·	·	1	·	1	·	1	·	1	·	1
Wheatear	1	1	1	1	1	1	1	1	1	1	1	1
Ring Ouzel	·	·	·	1	·	1	·	1	·	1	·	1

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
Blackbird	1	1	1	1	1	1	1	1	1	1	1	1
Song Thrush	1	1	1	1	1	1	1	1	1	1	1	1
Redwing R*	.	.	.	.	.	.	.	.	.	.	.	.
Mistle Thrush	1	1	1	1	1	1	1	1	1	1	1	1
Cetti's Warbler R*	.	.	.	.	.	.	.	.	.	.	.	.
Grasshopper Warbler	.	.	.	.	.	.	.	.	.	.	.	.
Sedge Warbler	.	.	1	1	.	1	1	1	.	1	1	1
Reed Warbler	.	.	1	1	.	.	1	1	.	.	1	1
Dartford Warbler R*	.	.	.	.	.	.	.	.	.	.	.	.
Lesser Whitethroat	.	.	1	1	.	.	1	1	.	.	1	1
Whitethroat	1	1	1	1	1	1	1	1	1	1	1	1
Garden Warbler	.	.	1	1	.	.	1	1	.	.	1	1
Blackcap	1	.	1	1	1	1	1	1	1	1	1	1
Wood Warbler	.	.	.	1	.	.	.	1	.	.	.	1
Chiffchaff	1	.	1	1	1	1	1	1	1	1	1	1
Willow Warbler	1	1	1	1	1	1	1	1	1	1	1	1
Goldcrest	.	1	1	1	1	1	1	1	1	1	1	1
Firecrest R*	.	.	.	.	.	.	.	.	.	.	.	.
Spotted Flycatcher	.	.	1	1	.	.	1	1	.	1	1	1
Pied Flycatcher	.	.	.	.	.	.	.	.	.	.	.	.
Bearded Tit R*	.	.	.	.	.	.	.	.	.	.	.	.
Long-tailed Tit	1	.	1	1	1	1	1	1	1	1	1	1
Marsh Tit	.	.	1	1	.	.	1	1	.	.	1	1
Willow Tit	.	.	1	1	.	.	1	1	.	.	1	1
Crested Tit R*	.	.	.	.	.	.	.	.	.	.	.	.
Coal Tit	1	1	1	1	1	1	1	1	1	1	1	1
Blue Tit	1	1	1	1	1	1	1	1	1	1	1	1
Great Tit	1	1	1	1	1	1	1	1	1	1	1	1
Nuthatch	.	.	1	1	1	.	1	1	1	.	1	1
Treecreeper	.	.	1	1	.	.	1	1	.	.	1	1
Jay	.	.	1	1	1	.	1	1	1	.	1	1
Magpie	1	1	1	1	1	1	1	1	1	1	1	1
Chough R*	.	.	.	.	.	.	.	.	.	.	.	.
Jackdaw	1	1	1	1	1	1	1	1	1	1	1	1
Rook	1	1	1	1	1	1	1	1	1	1	1	1
Carrion Crow	1	1	1	1	1	1	1	1	1	1	1	1
Hooded Crow	.	1	.	1	.	1	.	1	.	1	.	1
Raven	1	1	.	1	1	1	1	1	1	1	1	1
Starling	1	1	1	1	1	1	1	1	1	1	1	1
House Sparrow	1	1	1	1	1	1	1	1	1	1	1	1
Tree Sparrow	.	.	1	1	.	.	1	1	.	.	1	1
Chaffinch	1	1	1	1	1	1	1	1	1	1	1	1
Greenfinch	1	1	1	1	1	1	1	1	1	1	1	1
Goldfinch	1	1	1	1	1	1	1	1	1	1	1	1
Siskin	.	1	.	1	.	1	.	1	.	1	.	1
Linnet	1	1	1	1	1	1	1	1	1	1	1	1
Twite R	.	1	.	1	.	1	.	1	.	1	.	1
Lesser Redpoll	.	.	1	1	.	1	1	1	.	1	1	1
Crossbill	.	.	.	.	.	.	.	.	.	.	.	.
Scottish Crossbill R*	.	.	.	.	.	.	.	.	.	.	.	.
Bullfinch	.	.	1	1	.	1	1	1	.	1	1	1
Hawfinch	.	.	.	.	.	.	.	.	.	.	.	.
Yellowhammer	1	1	1	1	1	1	1	1	1	1	1	1
Cirl Bunting R	.	.	.	.	.	.	.	.	.	.	.	.
Reed Bunting	.	1	1	1	.	1	1	1	.	1	1	1
Corn Bunting	.	.	1	1	.	.	1	1	.	.	1	1

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
	===	===	===	===	===	===	===	===	===	===	===	===
	39	58	98	110	47	75	99	113	48	84	101	118

Table 20
Species monitoring within strategy four, by country and at three levels of professional help. 168 species are listed. Symbols are as described above.

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
Red-throated Diver R	.	.	.	.	.	.	.	.	.	.	.	.
Little Grebe	.	.	.	.	.	.	.	.	.	.	.	.
Great Crested Grebe	.	.	1	1	.	.	1	1	.	.	1	1
Slavonian Grebe R*	.	.	.	.	.	.	.	.	.	.	.	.
Black-necked Grebe R*	.	.	.	.	.	.	.	.	.	.	.	.
Bittern R*	.	.	.	.	.	.	.	.	.	.	.	.
Grey Heron	.	1	1	1	.	1	1	1	.	1	1	1
Mute Swan	.	.	1	1	.	.	1	1	.	1	1	1
Greylag Goose R*	.	.	1	1	.	.	1	1	.	.	1	1
Canada Goose	.	.	1	1	.	.	1	1	.	.	1	1
Egyptian Goose*	.	.	.	.	.	.	.	.	.	.	.	.
Shelduck R	.	1	1	1	.	1	1	1	.	1	1	1
Mandarin	.	.	.	.	.	.	.	.	.	.	.	.
Wigeon	.	.	.	.	.	.	.	.	.	.	.	.
Gadwall R*	.	.	1	1	.	.	1	1	.	.	1	1
Teal R	.	.	.	1	.	.	.	1	.	.	.	1
Mallard	.	1	1	1	1	1	1	1	1	1	1	1
Pintail R*	.	.	.	.	.	.	.	.	.	.	.	.
Shoveler R*	.	.	1	1	.	.	1	1	.	.	1	1
Pochard R*	.	.	1	1	.	.	1	1	.	.	1	1
Tufted Duck	.	.	1	1	.	.	1	1	.	.	1	1
Eider*	.	1	.	1	.	1	.	1	.	1	.	1
Goldeneye R*	.	.	.	.	.	.	.	.	.	.	.	.
Red-breasted Merganser*	.	.	.	1	.	1	.	1	.	1	.	1
Goosander	.	.	.	.	.	.	.	.	.	.	.	.
Ruddy Duck*	.	.	1	1	.	.	1	1	.	.	1	1
Red Kite R*	.	.	.	.	.	.	.	.	.	.	.	.
Marsh Harrier R*	.	.	.	.	.	.	.	.	.	.	.	.
Hen Harrier R*	.	.	.	.	.	.	.	.	.	.	.	.
Goshawk R*	.	.	.	.	.	.	.	.	.	.	.	.
Sparrowhawk	.	.	1	1	.	.	1	1	.	.	1	1
Buzzard	1	1	1	1	1	1	1	1	1	1	1	1
Golden Eagle R*	.	.	.	.	.	1	.	1	.	1	.	1
Osprey R*	.	.	.	.	.	.	.	.	.	.	.	.
Kestrel	.	1	1	1	.	1	1	1	.	1	1	1
Merlin R*	.	.	.	.	.	.	.	1	.	.	.	1
Hobby*	.	.	1	1	.	.	1	1	.	.	1	1
Peregrine R*	.	.	.	1	.	.	.	1	.	1	.	1
Red Grouse R	.	1	1	1	.	1	1	1	.	1	1	1
Ptarmigan*	.	.	.	.	.	.	.	.	.	.	.	.
Black Grouse R*	.	.	.	.	.	.	.	.	.	.	.	.
Capercaillie R*	.	.	.	.	.	.	.	.	.	.	.	.
Red-legged Partridge	.	.	1	1	.	.	1	1	.	.	1	1
Grey Partridge R	.	1	1	1	.	1	1	1	.	1	1	1
Quail R*	.	.	.	.	.	.	.	.	.	.	.	.
Pheasant	1	1	1	1	1	1	1	1	1	1	1	1
Golden Pheasant*	.	.	.	.	.	.	.	.	.	.	.	.
Lady Amherst's Pheasant*	.	.	.	.	.	.	.	.	.	.	.	.
Water Rail*	.	.	.	.	.	.	.	.	.	.	.	.
Moorhen	.	.	1	1	.	.	1	1	.	1	1	1
Coot	.	.	1	1	.	.	1	1	.	.	1	1
Oystercatcher R	.	1	1	1	.	1	1	1	.	1	1	1
Avocet R*	.	.	.	.	.	.	.	.	.	.	.	.
Stone Curlew R*	.	.	.	.	.	.	.	.	.	.	.	.
Little Ringed Plover	.	.	.	.	.	.	.	.	.	.	.	.
Ringed Plover R	.	.	.	.	.	.	.	1	.	.	.	1

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
Dotterel R*	.	.	.	.	.	.	.	.	.	.	.	.
Golden Plover R	.	1	1	1	.	1	1	1	.	1	1	1
Lapwing	1	1	1	1	1	1	1	1	1	1	1	1
Dunlin R	.	1	1	1	.	1	1	1	.	1	1	1
Snipe	.	1	1	1	.	1	1	1	.	1	1	1
Woodcock*	.	.	1	1	.	.	1	1	.	.	1	1
Whimbrel R*	.	.	.	.	.	.	.	.	.	.	.	.
Curlew R	1	1	1	1	1	1	1	1	1	1	1	1
Redshank R	.	1	1	1	.	1	1	1	.	1	1	1
Greenshank R	.	.	.	.	.	.	.	.	.	.	.	.
Common Sandpiper	.	.	1	1	.	1	1	1	.	1	1	1
Black-headed Gull	.	1	1	1	1	1	1	1	1	1	1	1
Common Gull	.	1	1	1	.	1	1	1	.	1	1	1
Lesser Black-backed Gull	.	1	1	1	.	1	1	1	1	1	1	1
Herring Gull	1	1	1	1	1	1	1	1	1	1	1	1
Great Black-backed Gull	.	1	1	1	.	1	1	1	.	1	1	1
Feral Pigeon/Rock Dove	.	1	1	1	.	1	1	1	.	1	1	1
Stock Dove	.	.	1	1	.	1	1	1	1	1	1	1
Woodpigeon	1	1	1	1	1	1	1	1	1	1	1	1
Collared Dove	1	1	1	1	1	1	1	1	1.	1	1	1
Turtle Dove	.	.	1	1	.	.	1	1	.	.	1	1
Ring-necked Parakeet*	.	.	.	.	.	.	.	.	.	.	.	.
Cuckoo	1	1	1	1	1	1	1	1	1	1	1	1
Barn Owl R*	.	.	1	1	.	.	1	1	.	.	1	1
Little Owl	.	.	.	.	.	.	1	1	.	.	.	1
Tawny Owl	.	.	.	.	.	.	.	.	.	.	.	.
Long-eared Owl*	.	.	.	.	.	.	.	.	.	.	.	.
Short-eared Owl*	.	.	.	1	.	.	.	1	.	1	.	1
Nightjar R*	.	.	.	.	.	.	.	.	.	.	.	.
Swift	1	1	1	1	1	1	1	1	1	1	1	1
Kingfisher	.	.	.	.	.	.	.	.	.	.	.	.
Green Woodpecker	.	.	1	1	1	.	1	1	1	.	1	1
Great Spotted Woodpecker	.	.	1	1	.	.	1	1	.	.	1	1
Lesser Spotted Woodpecker	.	.	.	.	.	.	.	.	.	.	.	.
Woodlark R*	.	.	.	.	.	.	.	.	.	.	.	.
Skylark	1	1	1	1	1	1	1	1	1	1	1	1
Sand Martin	.	.	1	1	.	.	1	1	.	1	1	1
Swallow	1	1	1	1	1	1	1	1	1	1	1	1
House Martin	1	1	1	1	1	1	1	1	1	1	1	1
Tree Pipit	.	.	1	1	.	.	1	1	.	.	1	1
Meadow Pipit	1	1	1	1	1	1	1	1	1	1	1	1
Rock Pipit	.	.	.	.	.	.	.	.	.	1	.	1
Yellow Wagtail	.	.	1	1	.	.	1	1	.	.	1	1
Grey Wagtail	.	.	1	1	.	.	1	1	.	1	1	1
Pied Wagtail	1	1	1	1	1	1	1	1	1	1	1	1
Dipper	.	.	.	1	.	.	.	1	.	.	1	1
Wren	1	1	1	1	1	1	1	1	1	1	1	1
Dunnock	1	1	1	1	1	1	1	1	1	1	1	1
Robin	1	1	1	1	1	1	1	1	1	1	1	1
Nightingale	.	.	.	.	.	.	.	.	.	.	.	.
Black Redstart R*	.	.	.	.	.	.	.	.	.	.	.	.
Redstart	.	.	1	1	1	.	1	1	1	1	1	1
Whinchat	.	1	1	1	.	1	1	1	.	1	1	1
Stonechat	.	.	.	1	.	1	1	1	.	1	1	1
Wheatear	1	1	1	1	1	1	1	1	1	1	1	1
Ring Ouzel	.	.	1	1	.	.	1	1	.	1	1	1

SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
Blackbird	1	1	1	1	1	1	1	1	1	1	1	1
Song Thrush	1	1	1	1	1	1	1	1	1	1	1	1
Redwing R*	.	.	.	.	.	.	.	.	.	.	.	.
Mistle Thrush	1	1	1	1	1	1	1	1	1	1	1	1
Cetti's Warbler R*	.	.	.	.	.	.	.	.	.	.	.	.
Grasshopper Warbler	.	.	.	.	.	.	.	.	.	1	1	1
Sedge Warbler	.	1	1	1	.	1	1	1	.	1	1	1
Reed Warbler	.	.	1	1	.	.	1	1	.	.	1	1
Dartford Warbler R*	.	.	.	.	.	.	.	.	.	.	.	.
Lesser Whitethroat	.	.	1	1	.	.	1	1	.	.	1	1
Whitethroat	1	1	1	1	1	1	1	1	1	1	1	1
Garden Warbler	.	.	1	1	.	.	1	1	.	.	1	1
Blackcap	1	1	1	1	1	1	1	1	1	1	1	1
Wood Warbler	.	.	.	1	.	.	.	1	.	.	.	1
Chiffchaff	1	1	1	1	1	1	1	1	1	1	1	1
Willow Warbler	1	1	1	1	1	1	1	1	1	1	1	1
Goldcrest	.	1	1	1	1	1	1	1	1	1	1	1
Firecrest R*	.	.	.	.	.	.	.	.	.	.	.	.
Spotted Flycatcher	.	.	1	1	.	.	1	1	.	1	1	1
Pied Flycatcher	.	.	.	.	.	.	.	.	.	.	.	.
Bearded Tit R*	.	.	.	.	.	.	.	.	.	.	.	.
Long-tailed Tit	1	1	1	1	1	1	1	1	1	1	1	1
Marsh Tit	.	.	1	1	.	.	1	1	.	.	1	1
Willow Tit	.	.	1	1	.	.	1	1	.	.	1	1
Crested Tit R*	.	.	.	.	.	.	.	.	.	.	.	.
Coal Tit	1	1	1	1	1	1	1	1	1	1	1	1
Blue Tit	1	1	1	1	1	1	1	1	1	1	1	1
Great Tit	1	1	1	1	1	1	1	1	1	1	1	1
Nuthatch	.	.	1	1	1	.	1	1	1	.	1	1
Treecreeper	.	.	1	1	.	.	1	1	.	.	1	1
Jay	.	.	1	1	1	.	1	1	1	.	1	1
Magpie	1	1	1	1	1	1	1	1	1	1	1	1
Chough R*	.	.	.	.	.	.	.	.	.	.	.	.
Jackdaw	1	1	1	1	1	1	1	1	1	1	1	1
Rook	1	1	1	1	1	1	1	1	1	1	1	1
Carrion Crow	1	1	1	1	1	1	1	1	1	1	1	1
Hooded Crow	.	1	.	1	.	1	.	1	.	1	.	1
Raven	1	1	.	1	1	1	1	1	1	1	1	1
Starling	1	1	1	1	1	1	1	1	1	1	1	1
House Sparrow	1	1	1	1	1	1	1	1	1	1	1	1
Tree Sparrow	.	.	1	1	.	.	1	1	.	.	1	1
Chaffinch	1	1	1	1	1	1	1	1	1	1	1	1
Greenfinch	1	1	1	1	1	1	1	1	1	1	1	1
Goldfinch	1	1	1	1	1	1	1	1	1	1	1	1
Siskin	.	1	.	1	.	1	.	1	.	1	.	1
Linnet	1	1	1	1	1	1	1	1	1	1	1	1
Twite R	.	1	.	1	.	1	.	1	.	1	.	1
Lesser Redpoll	.	.	1	1	.	.	1	1	.	1	1	1
Crossbill	.	.	.	.	.	.	.	.	.	.	.	.
Scottish Crossbill R*	.	.	.	.	.	.	.	.	.	.	.	.
Bullfinch	.	.	1	1	.	1	1	1	.	1	1	1
Hawfinch	.	.	.	.	.	.	.	1	.	.	.	1
Yellowhammer	1	1	1	1	1	1	1	1	1	1	1	1
Cirl Bunting R	.	.	.	.	.	.	.	.	.	.	.	.
Reed Bunting	.	1	1	1	.	1	1	1	.	1	1	1
Corn Bunting	.	.	1	1	.	.	1	1	.	.	1	1

| SPECIESN	WAL	SCL	ENL	BRL	WAM	SCM	ENM	BRM	WAH	SCH	ENH	BRH
===	===	===	===	===	===	===	===	===	===	===	===	===
	41	65	100	112	48	71	103	116	50	82	103	117

Table 21   A summary of species monitored under sampling strategies 1-4 at three levels of professional help. Threshold precision is set at an ability of detect a 25% between-year change. WA = Wales, SC = Scotland, EN = England, BR = Britain.

|	LOW				MEDIUM				HIGH			
	WA	SC	EN	BR	WA	SC	EN	BR	WA	SC	EN	BR
Strategy 1	15	22	60	70	15	24	60	71	15	25	62	77
Strategy 2	15	23	59	71	15	24	60	71	15	25	63	76
Strategy 3	15	22	60	71	15	24	61	71	15	24	64	77
Strategy 4	15	23	63	72	15	24	64	72	15	24	65	79

Figure 1   Map of EC NUTS2 regions.

Figure 2   Graphical model showing relationship between sampling intensity and volunteer observer density with different levels of professional input.
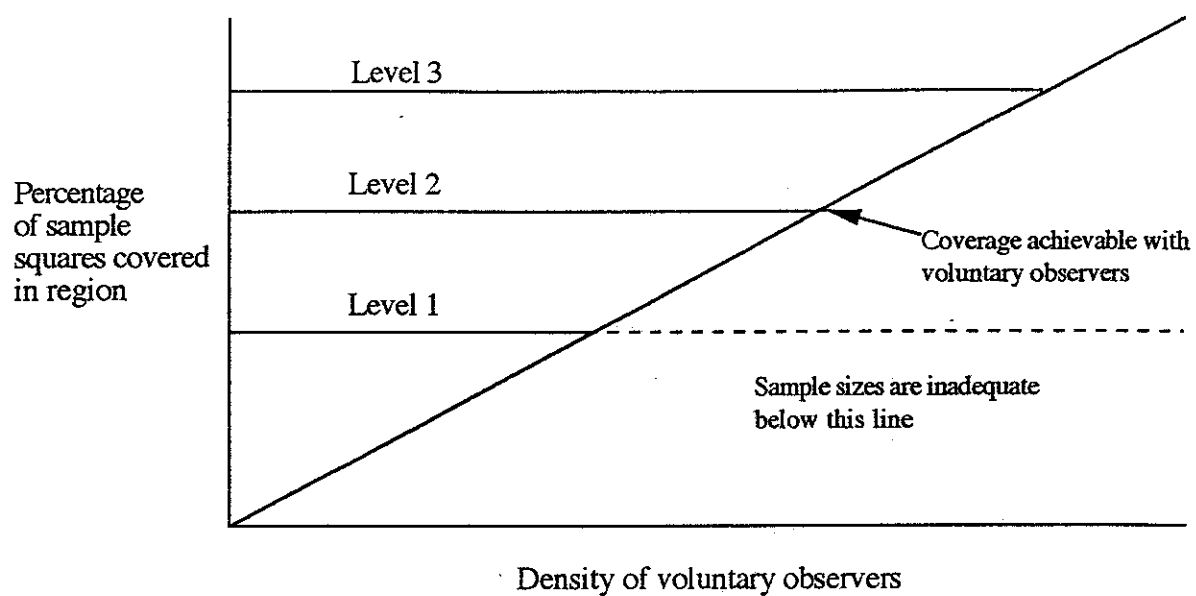
Figure 3
Plot of sampling intensity against density of voluntary observers at (a) low, (b) medium and (c) high levels of professional input. Each point represents a BTO region. The figure shows data from strategy one.
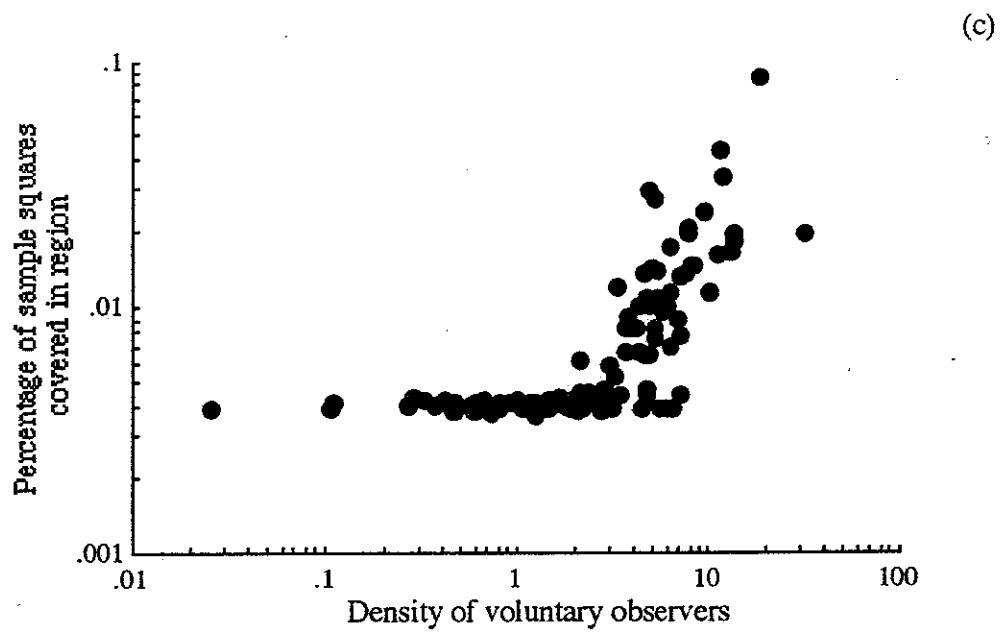
(a)

(b)

(c)
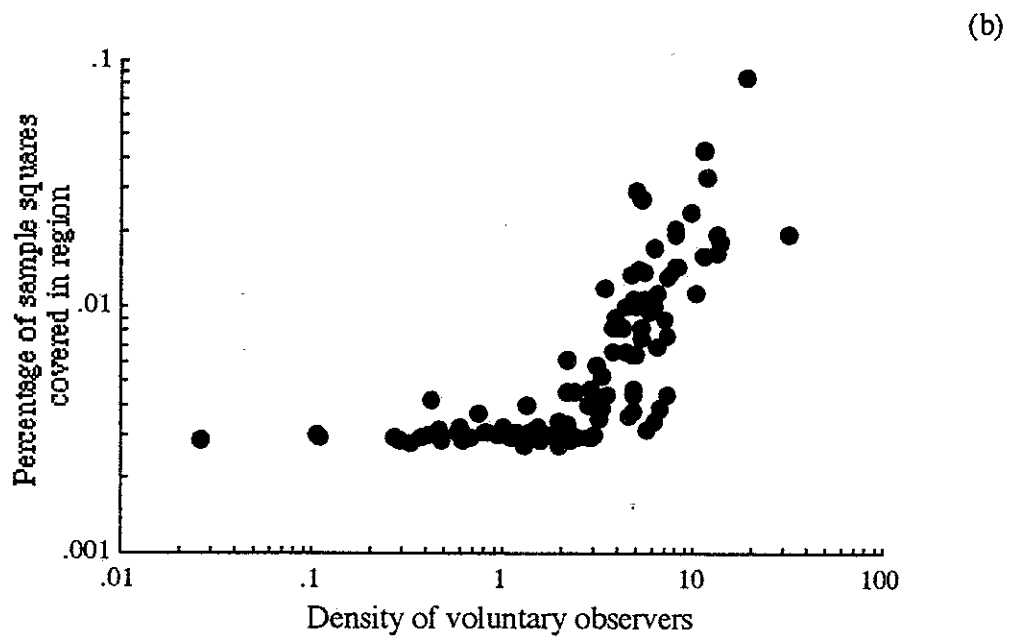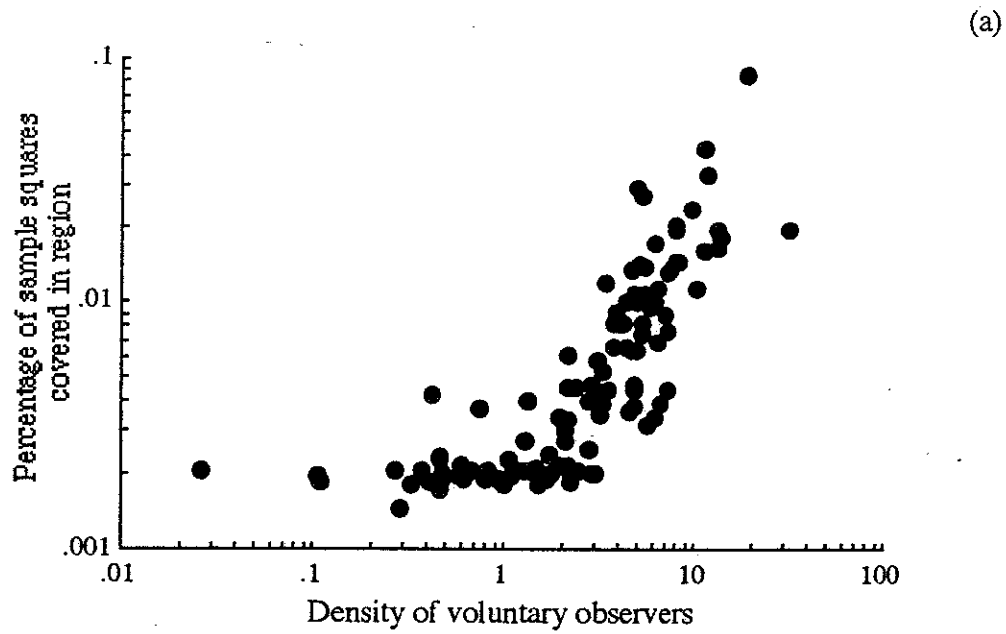
Figure 4 Cross-species relationship between log (standard error of between-year change) and log (mean number of bird registrations in paired year comparison) (d.f.= 88, r2= 0.45, F= 71.55 P<0.0001). 'A' actual values, 'P' predicted values from regression model: Log10 (standard error) = -0.34 + -.27 (log10 (number of registrations).