Program DOBSERV : User Instructions

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Introduction

Although point counts are frequently used in ornithological studies, basic assumptions about consistency in detection probabilities often remain untested. We apply a double-observer approach developed to estimate detection probabilities for aerial surveys (Cook and Jacobson 1979) to avian point counts. At each point count, one observer is designated "primary", and indicates to the other ("secondary") observer all birds detected. The secondary observer records all detections of the primary observer, as well as any birds not detected by the primary observer. Observers alternate primary and secondary roles during the course of a survey. The approach permits estimation of observer-specific detection probabilities and bird abundance. We developed a set of models incorporating different assumptions about sources of variation (e.g., observer, bird species) in detection probability. Single observer point counts generally miss varying proportions of the birds actually present, as observer and bird species were both found to be relevant sources of variation in detection probabilities. However, using the double observer approach, overall detection probabilities (probability of being detected by at least 1 of the 2 observers) were very high (>0.95) yielding precise estimates of avian abundance. We believe that most questions meriting the effort required to carry out point counts also merit serious attempts to estimate detection probabilities associated with the counts. The double-observer approach is a method which can be used for this purpose.

Data input (Dependent observers)

The input file for program DOBSERV consists of counts, by species, of individuals observed by both observers, and counts of individuals observed by the secondary observer which were not observed by the primary observer. The input file should be in ASCII text format in the following form:

$O1, SPEC_{1a}, N1_{1a}, N2_{1a}$
$O1, SPEC_{1b}, N1_{1b}, N2_{1b}$
$O1, SPEC_{1c}, N1_{1c}, N2_{1c}$
:
$O2, SPEC_{2a}, N1_{2a}, N2_{2a}$
$O3, SPEC_{2b}, N1_{2b}, N2_{2b}$
$O3, SPEC_{2c}, N1_{2c}, N2_{2c}$
:

where

- Oi = code signifying which observer is primary for observation stop i,
- $SPEC_{ix}$ = 4-character code for species x for observation stop i,
- $N1_{ix}$ = Number of birds of species x observed by the primary observer at stop i
- $N2_{ix}$ = Number of birds of species x observed by the secondary observer at stop i which were not observed by the primary observer.

Data input (Independent observers)

The input file for independent observers consists of counts, by species, of individuals observed by observer 1 which were not observed by observer 2, counts of individuals observed by observer 2, but not observed by observer 2, and counts of individuals observed by both observes. The input file should be in ASCII text format in the following form:

$O1, SPEC_{1a}, N1_{1a}, N2_{1a}, N3_{1a}$
$O1, SPEC_{1b}, N1_{1b}, N2_{1b}, N3_{1b}$
:

where

- Oi = dummy code (ignored by program),
- $SPEC_{ix}$ = 4-character code for species x for observation stop i,
- $N1_{ix}$ = Number of birds of species x observed by observer 1, not observed by observer 2
- $N2_{ix}$ = Number of birds of species x observed by observer 2, not observed by observer 1
- $N3_{ix}$ = Number of birds of species x observed by both observers

Models

Estimates for detection probability are generated under several models. The models are defined as follows:

- P(.,.) - detection probability (p) is the same for all species and both observers.
- P(s,.) - detection probability (p) is different for each species, but equal among observers.
- P(.,i) - detection probability (p) is equal among species but different between observers.
- P(g,.) - detection probability (p) is equal within groups of species and equal among observers.
- P(g,i) - detection probability (p) is equal within groups of species, but different between observers.
- P(s,i) - detection probability (p) is different for each species and different between observers.

Program Operation:

- The first step is to create an input file. The program expects the data to be in the format specified above. A word processing program may be used as long as the file is saved as 'ASCII' text. A spreadsheet may be used to create the data, but the file must be saved as 'comma-separated-values (csv) and quotation marks removed.
- The next step is to run DOBSERV. On startup, the program will display a 'splash screen' which can be removed by clicking on it. Help is available via the 'Help' menu. Output can be viewed via the 'View' menu.
- The program is designed to run in a fashion like many Windows 'wizard' programs. A button appears on the screen which tells you what needs to be done next. The first step is to get the program to read the input data. Clicking on step 1 will cause the program to ask for the name and location of the input file. Use the

standard windows procedure to navigate to and select the desired input file. Before reading the input file, the program must know which type of data are being used. Click 'Yes' if the observers collected data independently, or 'No' if the 'dependent-observer' scheme was used.

- Once the input file has been read, the program will display a summary of observations for each species observed. Each species name is followed by a number in parentheses representing the total observation count for the species, and a group-number in brackets[].. The group-number box allows you to assign species to different groups based on a priori hypotheses. Detection probabilities are constrained to be equal among species with the same group number for models P(g,.), and P(g,i). For example, you might classify some species as 'easy' to detect, and others 'difficult' to detect. You could assign the 'easy' species to group-number 2, and the 'difficult' species to group-number 1.
- Any species with fewer than 10 observations will automatically be pooled into the group which it has been assigned for all models. For some species it may be desirable to force them into a group for all models even if there are 10 or more observations. This can be accomplished by clicking on the species name and clicking on the 'Force into group' button. This will cause the species name to appear with a 'x' at the right.
- The limit of 10 observations can be changed by selecting the 'Options' menu, and clicking on 'Change data pooling cutoff'.
- Once the groups have been assigned, click on 'Step 2 - Run SURVIV with input file'. This will cause the DOBSERV program to summarize the data according to the specified grouping and call another program (SURVIV) to compute estimates of detectability (p) for the models listed above. Program SURVIV will run in a separate window and should take only a few seconds.
- After SURVIV finishes, click 'Step 4 - Pick Best Model'. The program will then display a list of models with the 'option buttons' on the left. Models are sorted by AIC value with the 'best' model pre-selected on top. If you would like to choose one of the other models, click on the associated button at the left of the model.
- The last step in the process is to compute estimates of Population size (N) from the estimates of detectability. Although this computation is trivial (N = x/p where x=number of individual birds observed by either of the observers), the computation of the standard error is not. To get this estimate, program DOBSERV recreates the SURVIV input file with redefined parameters. Instead of p1 (detection probability of observer 1) and p2 (detection probability of observer 2), the parameters are defined as p' (overall detection probability by either/both observers), and p1' (where p'=1-(1-p1)*(1-p2) and p1'=p1/p'). In cases where p1=1, the program switches p2 for p1.
- Click on 'Step 4 - Compute estimates of N' and the program will call SURVIV again. When SURVIV finishes, a text box will appear with the estimates of N, standard error and confidence intervals for each species. A message above the box informs you that these results have been saved in a file named 'dobserv.out'. The SURVIV output can be viewed or printed in the Windows notepad by clicking on the 'View' menu, then clicking 'View SURVIV output (estimates of N)'. Output from the previous steps may also be viewed or printed by selecting the desired choice from the 'View' menu.
- To quit the program, click on the 'File' menu, then 'Quit'.

Variance-Covariance Problems:

When estimates of p1 or p2 for a species are zero or one, it is not possible to obtain a variance for that species. This will be indicated by a message in the SURVIV output, and in the final output list if the chosen model has this problem. If you are only interested in the estimates of p or N, then this is not a problem. If you need the variances, you have two choices:

1. Choose another model,
2. Pool the offending species with another species or group of species.

To choose another model, simply rerun the program and select another model in step 3. To pool observations of the species, assign the species to the same group number as another species just after step 1. Then, force the observations to be pooled into the group for all models by clicking on the species name and hitting the spacebar. After pooling the problem species, proceed with the other steps.

REFERENCES

Nichols, J. D., J. E. Hines, J. R. Sauer, F. W. Fallon, J. E. Fallon, and P. J. Geglund
A Double-observer Approach for Estimating Detection Probability and Abundance from Point
Counts. The Auk 2000; 117(2): 393-408.

If you have questions, problems or comments with this program please contact:

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