Ant occupancy survey

In this exercise we will try to estimate the occupancy of large black ants on the lawns. You will need PRESENCE v.3 installed on your computer as well as a spreadsheet program such as MS Excel.

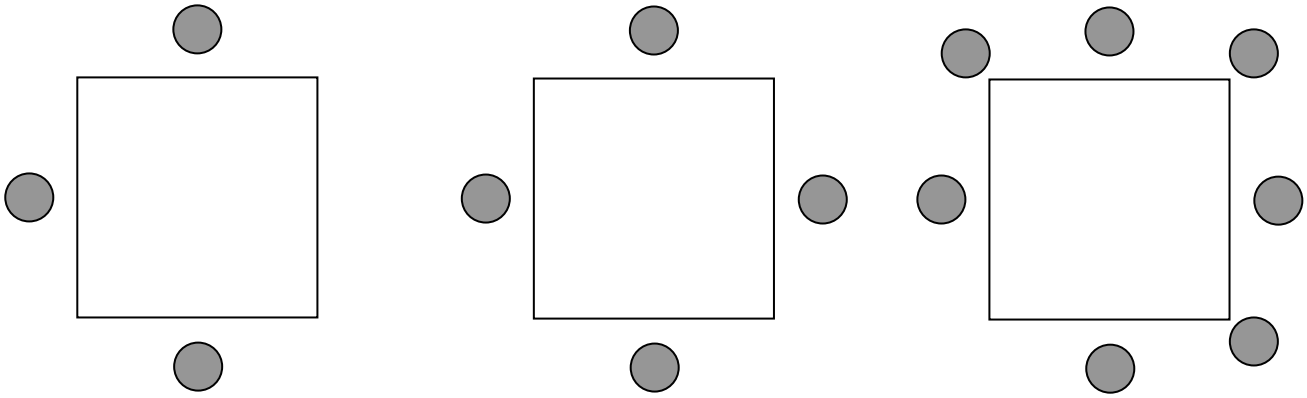
Quadrats (1.5m x 1.5m) are marked out on the lawn; these are the **sites** for the survey. Each quadrat has a number. *Please don't walk inside the quadrats*.

Several observers will visit each site, and the data for each observer will be treated as a separate survey **occasion**.

The survey in the field

Work in teams of 4 to 8 observers (one team can have just 3 observers as long as the other teams have at least 4). Teams don't need to be equal in size.

At each quadrat, the members of the team position themselves around the quadrat: up to 4 people one on each side; if more than 4 people, use the corners as well. See the examples in the diagrams below.



3 observers 4 observers 7 observers

For exactly 1 minute (someone keep time with a watch), each member of the team looks for ants inside the quadrat without moving from their position. Please don't indicate to other members of the team if you spot an ant. At the end of 1 min, note on your data sheet whether you detected ants or not.

Data analysis

a) Each observer can calculate the proportion of sites where they detected ants.

b) Put the data into an Excel spreadsheet, with a row for each site and a column for each observer; enter '1' for detection and '0' for non-detection. (If teams are different sizes, use enough columns for the biggest team, and put '-' in the extra columns for smaller teams.)

The screen shot below shows the data where one team had 4 observers and the others had 5.

Microsoft Excel - SJ_ants2.xls

File Edit View Insert Format Tools Data

A1 site

	A	B	C	D	E	F	G
1	**site**	**1**	**2**	**3**	**4**	**5**	
2	**1**	0	1	1	0	-	
3	**2**	1	1	1	1	1	
4	**3**	1	1	1	1	1	
5	**4**	1	1	1	1	-	
6	**5**	1	1	1	1	1	

Count the sites where at least one observer detected ants, and calculate the proportion of sites occupied: this is the **naïve** estimate of occupancy. This will be higher than the results for (a).

Importing the data into PRESENCE

Open PRESENCE.

⚠ When you open PRESENCE, a black window with the C:\ icon appears on the Windows task bar. Don't close this window unless PRESENCE has frozen and you want to terminate it.

Select 'File > New project' from the pull-down menus, the type "Ants" (or something similar) in the "Title for this set of data" box.

Click on the 'Input Data Form' button.

The data input form looks like a spreadsheet with 20 rows and 4 columns. The number of columns and rows will be adjusted when we copy and paste the data from Excel into the data input form.

Copy and paste the data from the Ants spreadsheet into the 'Presence/Absence Data' form:

- In Excel, select all the data including the first column of site numbers, but not the column headings. Press Ctrl-C to copy to the clipboard.
- Back in PRESENCE, paste in the site names as well as the data: use Edit > Paste > Paste w/sitenames (you can't use Ctrl-V to paste in PRESENCE).

Data Input Form

File Edit Simulate Help

rows 36 cols 5 No. Occ/season 1

Presence/Absence data

data	1-1	2-1	3-1	4-1	5-1
1	[illegible]	1	1	0	-
2	1	1	1	1	1
3	1	1	1	1	1
4	1	1	1	1	-
5	1	1	1	1	1
6	0	0	0	0	0

You'll see that the number of rows and columns at the top has changed: check that the number of rows equals the number of sites and the number of columns matches the number of columns in the spreadsheet.

⚠ **Save the data to a file before you close the Input Data Form, or you may have to start over!**

Select 'File > Save as' from the pull-down menus. A dialogue box pops up asking if you want to 'Use last col of data as frequency?' : click on 'No'. Save the data as a .pao file (eg. 'Ants.pao').

Now close the form (select 'File > Close' or click on the ☒ button in the top right corner.)

Back at the Specification window, you will see that the values for "No. Sites" and "No. Occasions" have been updated to match the data we have just entered.

Click on 'OK'.

PRESENCE will read your data file and a Results Browser window will appear – with no results in it until we run some analyses.

⚠ Do not close the Results Browser until you have finished the session, as the main PRESENCE window will also close without warning. If you do close down by mistake, don't panic: your work will be saved automatically and you can restart PRESENCE and reload the project.

C. A simple analysis

Select 'Run > Analysis:single-season' from the pull-down menu to open the 'Setup Numerical Estimation Run' window.

We'll use a custom model with all the default settings:

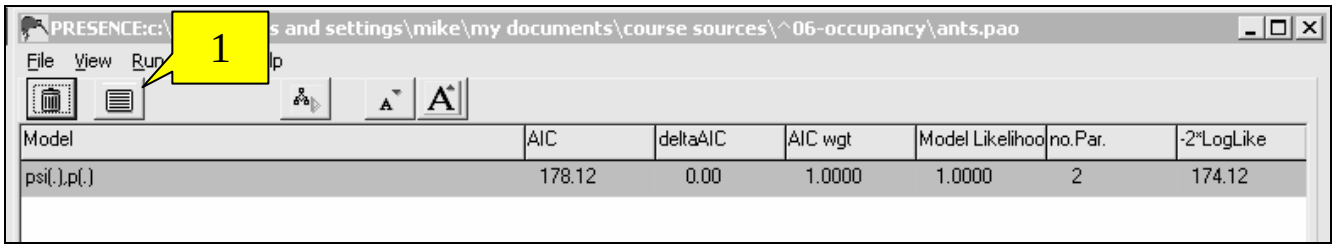
Click on Custom in the Models section. The Design Matrix will appear, but we will ignore that for the moment and just use the defaults.

Notice that "psi(.),p(.)" appears in the Model Name field; the dot in the brackets indicates that single values for probability of occupancy (psi) and probability of detection (p) will be used for all the sites and all the occasions.

Leave all the tick-boxes blank and click 'OK to run'.

PRESENCE now juggles around with possible values for psi and p, finding the likelihood of getting this particular set of presence / absence data for each combination, and selecting the combination which gives the maximum likelihood.

When a small box appears asking if you want to add the results to the Results Browser, click 'Yes'.



The psi(.),p(.) model results appear in the Browser (the values will depend on the data you collect, so will not be the same as in the screenshot above). On the right is the Likelihood of the values of psi and p selected based on this set of presence / absence data, expressed as -2*log(Likelihood).

If you're not familiar with the concepts of "likelihood" and "maximum likelihood estimation", take a look at "Frogs 2 – maximum likelihood estimators" on the www.wcsmalaysia.org/analysis web site.

Next to the log(Likelihood) is the Number of Parameters used: it's 2 (psi and p). On the left is the AIC or Akaike Information Criterion, which is

$$-2 * \log(\text{Likelihood}) + 2 * \text{No. of Parameters}$$

The AIC and the other numbers in the table are useful when we want to compare models.

And you thought PRESENCE was going to tell you how many of the quadrats were occupied by ants? Well it does, but almost as an after-thought!

Click on the model name in the Results Browser to highlight it, then click on the 'View model output' button (**1** in the screen-shot above).

A Notepad window opens with all the gory details. The first part summarizes what you put in. Scroll down to the section headed 'Custom model', where you'll find:

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Naive estimate                    = …
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The naïve estimate is what you get if you assume that all the sites where you did not detect ants are in fact unoccupied. It should be the same value that you calculated in the Excel spreadsheet in (b) on page 2.

A bit further down, you will find:

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Individual Site estimates of Psi:
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followed by:

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Individual Site estimates of p:
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These give the estimates for occupancy and probability of detection with 95% confidence intervals.

At the bottom of the page are values for "Psi-conditional". This is the probability that an individual site is occupied given your observations. For the sites where ants were detected, psi-conditional = 1, ie. we are certain they are occupied. If no ants were detected, the probability that the site is occupied is quite small, the actual size depending on the number of observers who looked.

You can add comments to the text in the Notepad window and save it when you close. These comments will be there when you re-open the project.

Getting finished

PRESENCE automatically saves all the results of analyses when you run them. You do not need to save results manually.

To exit PRESENCE, select 'File > Exit' or press Alt-F4 or click on the ☒ button at the top right of the window.

The results are stored in a folder with the name "Ants_project" (assuming you named the data file "Ants.pao" when you saved it). Don't change the contents of the project folder unless you've read the relevant Help pages and know what you're doing! If you want to copy or move the results to a new location, you must move the whole "Ants_project" folder.

You can re-open the project by starting PRESENCE again and selecting File > Open Project. Then navigate to the "Ants_project" folder and click on the file "Ants.pa3".

⚠ If you open a second project with 'File > Open project' when one is already open, the first project will be closed without warning. If you want to have two projects open at the same time, start a second instance of PRESENCE from the Start > Programs menu.

Acknowledgement

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