Investigation 1: Invertebrate Biodiversity & Populations

Syllabus Topics 2.3.1, 2.3.2, 2.3.5, and 2.6.3

Research Question: You need to decide what you want to find out about the insects in the hotel compound, and then you will need to phrase a question which clearly states what you are investigating. In order to do this you will have to consider what sort of variables will affect insect distribution. Come back at the end and check that your research question matches your experiment! The question should include the dependent variable, independent variable and 'where?'

Variables: Identify what things affect where insects will be found. Decide which one you will be able to study effectively in the four days and nights we have at the hotel. Identify what you will measure to test your ideas. Identify which variables you will have to keep the same to make a fair test.

Hypothesis: Having decided what you will be investigating, you will now need to make a "guess" of what you think will happen, and then justify why you think it will happen so as to make a Hypothesis. The hypothesis needs to be related to your research question.

Apparatus: You have a selection of materials available including sweep nets, pooters, small animal traps, insecticide sprays, and pitfall traps you may design with your teammates. You will need to decide how you will test your hypothesis. Consider the environmental impact of you tests when selecting materials.

Method: Consider how you will alter your independent variable, measure your dependent variable and control all the others. Remember to think about how much data and what data is sufficient to justify your hypothesis. Record how you are being environmentally aware.

Results: Design a way of recording your data before you start the experiment- it helps you to record only relevant data and makes the experiment easier. Remember that you might want to process the data using some statistical techniques or using one of the biological test or indexes we have looked at in class.

Conclude and evaluate: While doing the experiment think about where you were limited in your accuracy, how might your results be affected by things beyond your control or even what mistakes you might make. Write them down in your field book as you think of them so you don't forget! Think about how these problems could be fixed. When you are finished you will need to be able to answer whether your hypothesis was right or wrong and explain why!

Capturing Mobile Organisms

It is often very difficult to count directly the number of moving organisms within an area; they may not all be easily visible, and they may move during the sampling process. Instead, an indirect method –the **Lincoln Index** (the mark-release-recapture method) – is used. The procedure is as follows:

- capture a sample of the population
- mark each individual in a non-harmful way
- recapture organisms after an appropriate length of time
- Note the number of marked organisms recaptured

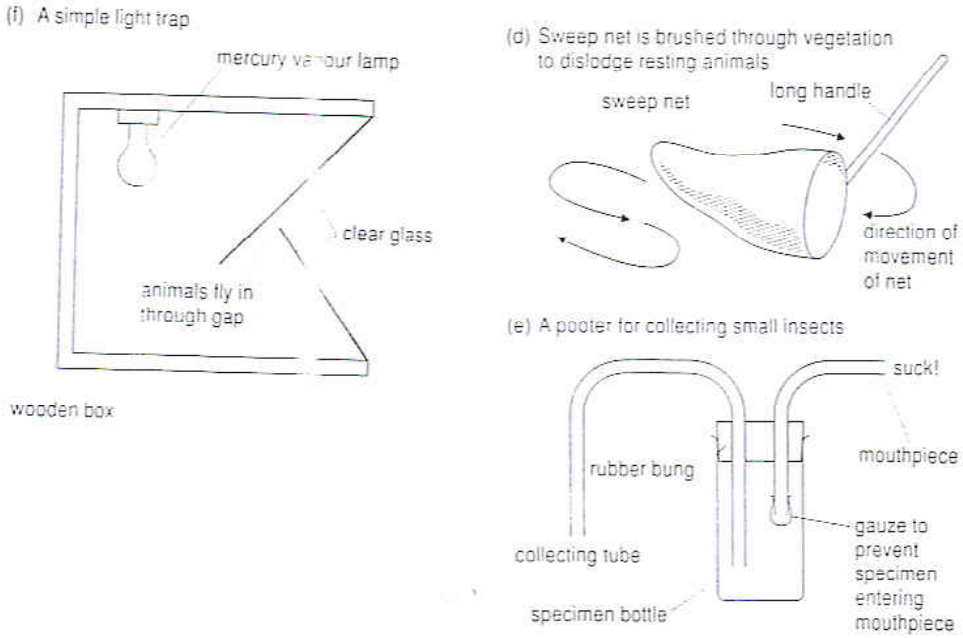
The aim is to give an indication of the total number of individuals in the population. To understand how this works, consider the following case: there are 100 organisms in a population. Ten of them are captured and marked, and then released. These mix back in with the rest of the population, so that 10% of the total population is marked. We would therefore expect 10% of the next sample to be already marked.

The formula used is:

$$\frac{\text{No. in population}}{\text{No. in first sample}} = \frac{\text{No. in recaptured sample}}{\text{No. already marked in recaptured sample}}$$

Collecting organisms in air or vegetation

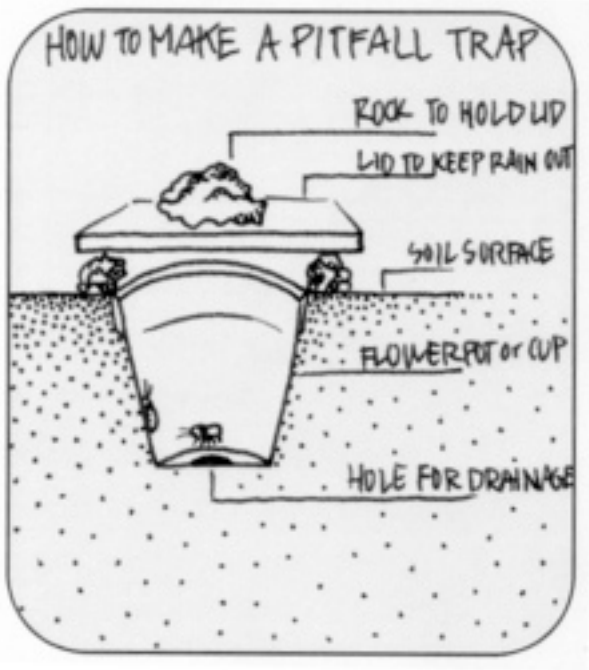
Various types of nets may be used to collect flies or animals resting on vegetation. A **pooter** (Figure 9.12 e) may be used to suck small animals into the collecting chamber. Various types of **trap** (figures 9.12 f and 9.12 h) may be used to attract insects.



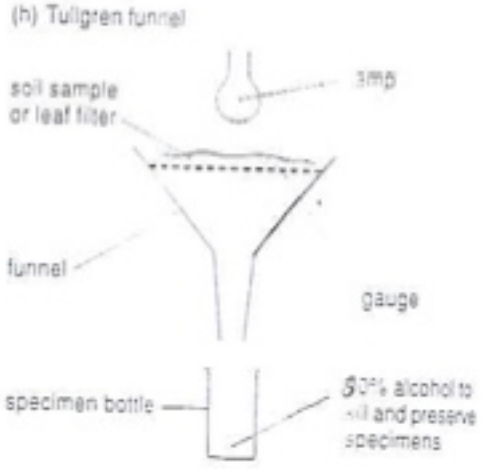
Collecting invertebrates in soil or leaf litter

Invertebrates that move across the surface of the ground may be trapped by a **pitfall trap**. A **tullgren funnel** is used to extract small invertebrates from lead litter of soil. The invertebrates in the soil sample move away from the drying effect of the bulb and fall through into the specimen bottle below. Another method for animals such as earthworms is to draw them to the surface by an irritant such as dilute potassium manganate (VII). They may then readily be sampled.

Using much of the equipment is self explanatory. If you wish to use a “pitfall trap” there is a picture below to show you how to make one. If you have problems using the more technical stuff ask a teacher for help rather than potentially breaking the equipment!



Source: http://wwwentomology.wisc.edu/mbcn/pitfall.jp



Assessment Criteria

This is a *full lab*, meaning your work will be assessed under the PL, DCP, and DEC criteria described in the student handbook and listed below.

PLANNING (PL): Total Marks _____ out of maximum 6			
Levels/marks	Aspect 1	Aspect 2	Aspect 3
	Defining the problem and selecting variables	**Controlling variables**	**Developing a method for collection of data**
Complete/2	States a focused problem/ research question and identifies the relevant variables.	Designs a method for the effective control of variables.	Describes a method that allows for the collection of sufficient relevant data.
Partial/1	States a problem/research question that is incomplete or identifies only some relevant variables.	Designs a method that makes some attempt to control the variables.	Describes a method that does not allow for the collection of sufficient relevant data.
Not at all/0	Does not state a problem/ research question and does not identify any relevant variables.	Designs a method that does not allow for the control of the variables.	Describes a method that does not allow for the collection of any relevant data.
DATA COLLECTION AND PROCESSING (DCP): Total Marks _____ out of maximum 6			
Levels/marks	Aspect 1	Aspect 2	Aspect 3
	Recording data	**Processing data**	**Presenting processed data**
Complete/2	Systematically records appropriate quantitative and/or qualitative data*, including units.	Processes primary and/or secondary data correctly.	Presents processed data appropriately and effectively to assist analysis.
Partial/1	Records appropriate quantitative and/or qualitative data but with some mistakes and/or omissions.	Processes primary and/or secondary data but with some mistakes and/or omissions.	Presents processed data appropriately but lacks clarity or with some mistakes and/or omissions.
Not at all/0	Data is not recorded or is recorded incomprehensibly.	No processing of data is carried out or major mistakes are made in processing.	Presents processed data inappropriately or incomprehensibly.
DISCUSSION, EVALUATION AND CONCLUSION (DEC): Total Marks _____ out of maximum 6			
Levels/marks	Aspect 1	Aspect 2	Aspect 3
	Discussing and reviewing	**Evaluating procedure(s) and suggesting improvements**	**Concluding**
Complete/2	Discussion is clear and well reasoned, showing a broad understanding of context and the implications of results.	Identifies weaknesses and limitations and suggests realistic improvements.	States a reasonable conclusion, with a correct explanation, based on the data.
Partial/1	Discussion is adequate, showing some understanding of context and implications of results.	Identifies weaknesses and limitations but misses some obvious faults. Suggests only superficial improvements.	States a reasonable conclusion or gives a correct explanation, based on the data.
Not at all/0	Discussion is inadequate, showing little understanding of context and implications of results.	The weaknesses and limitations are irrelevant or missing. Suggests unrealistic improvements.	States an unreasonable conclusion or no conclusion at all.