

Study of Scrubland Ecosystem

INTRODUCTION

In Hong Kong, scrubland is defined as land with fairly continuous cover of shrubs and bushes of 0.3 m to 2.9 m in height. Scrubland is a transitional stage between grassland and forest. Locally, it is usually a belt of vegetation on high hillsides separating an area of hilltop grassland with mid-level forest.

Scrubland is a comparatively simple ecosystem, where you can easily find some common ecological processes existing on the scrubland - energy flow, nutrient cycles, successions, effects of human impacts, symbiotic associations, competition, adaptation and so on.

In this study, you shall look at the animals and plants living in the scrubland which is always dry and windy. Always ask yourself: "How do they adapt to the dry and windy environment?"

Besides looking at the relations between living organisms and the environment, also pay attention to the relations between different living organisms, that is predation, competition, commensalism, mutualism and parasitism.

Make sure that you understand every piece of work suggested in this manual, that means you know what to do, how to do, where to do, when to do and why to do. You must be well prepared before the field trip because you would not have extra time to consider the above questions in the field.

Impose minimum disturbance to the scrublands. We are collecting data, not collecting lives; we are observing, not killing. Collect samples only when necessary. For the purpose of detailed identification, one from each species is enough. Whenever possible, identify in the field.

Field Work

A. Transect line

Select an area on the scrubland which is representative. Run a 30 m long transect line which is a nylon string with measurement scales on it. Following field work shall be done near or along this transect line.

B. General observation

Record:

- a. Recent weather conditions.
- b. Aspect along the transect line.
- c. Approximate altitude of the scrubland (see the map).
- d. Approximate size of the scrubland. (see the map)
- e. Surrounding environment: woodland, farmland, road, trail, village etc..
- f. Possible human impacts on the scrubland.

C. Animal sampling

1. Use a air net to collect flying animals near the transect.
2. Use a sweep net to collect animals among grasses and shrubs.
3. Search for small animals in different micro-habitats such as under stones and rocks, on leaf surfaces, under leaf sheaths, in flowers, in fruits, in dead woods, in cow dung, in the soil etc..
4. For larger animals, use hand or forcep to collect. For smaller animals, use the pooter to collect. As far as possible, different animals should be put in different vials for identification. Otherwise, competitors may fight with each other; and predators may eat the preys.
5. All collected animals should be identified immediately and release back to their habitats before leaving the field site. Also look for any adaptive features equipped by the animals. Unless with special purposes, none of the animals should be brought back to the laboratory. For the same species, one individual is enough for investigatory purpose.

D. Plant sampling by belt transect

Belt transect consists of the transect line and a quadrat which will be put regularly along the transect line. In this investigation, quadrat will be put every two meters. Select one plant species for counting its density. The selected plant need not to be abundant, but should be commonly found on the scrubland. Within each quadrat, do the followings:

1. Identify the plants species with the help of the identification guide. If a plant cannot be identified, use its taxon name followed by a number. For example, grass 1, grass 2, fern 1, fern 2, moss 3 etc.. Record number of new species in each quadrat. New species are those have not been found in any previous quadrats.
2. With the help of a point quadrat, count the cover in percentage of the selected plant species.
3. Find out and record adaptive features of the plants.
4. If necessary, collect portions of a few representative plant species.

E. Physical factors

1. Use the light meter to measure the average light intensity in the field site.
2. Use the digital thermohygrometer to measure humidity and temperature.
 - (a) in open space well above the shrubs and grasses,
 - (b) just above the soil surface.
3. Use anemometer to measure average wind speed in the field site.
4. Use a light nylon thread together with a compass to measure the wind direction.
5. By means of an abney level and a supporting frame, measure gradient of the slope along the transect line at 2 m intervals.

F. Soil sampling

Use a trowel to collect about 1 kg soil sample at 15 m position of the transect. The sample will be brought back to the laboratory for further investigation.

Laboratory Work

A. Soil analysis

1. Examine colour, smell and nature (soft, hard, loose, sticky...) of the soil.
2. Place some soil into a tullgren funnel. Turn on the light for the tullgren funnel. Look for animals collected in the container below after an overnight.
2. Place few grams of soil in a petri dish, add some water and test for pH by the special pH paper.
3. Put soil into a weighed crucible, weigh. Put the crucible with soil into an oven operating at 105 °C. Until it is dry (about few hours later), cool it and then weigh. Calculate water content of the soil in percentage.
4. Burn the dry soil by the gas burner for about 20 minutes. Until it is cool, weigh . Calculate organic matter content of the soil in percentage.

B. Analysis of collected plants and animals

1. Identify the plants and animals you brought back from the field. By studying body morphology of the living organisms, try to find out their adaptive features. Adaptive features can be found in respiratory organs, feeding organs, organs for attachment and locomotion, organs for defending against enemies and organs for preventing desiccation. Use the stereo-microscope to study structure of the small animals and plants whenever necessary.

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Record sheets

School / Group : _____

Members : _____

Date of investigation : _____ Time of investigation : _____

General observation

Recent weather conditions	
Aspect along transect	
Approx. altitude	
Approx. size	
Surrounding environment	
Possible human impacts	

Profile diagram data

Position along transect	0 m	2 m	4 m	6 m	8 m	10 m
Gradient						

Position along transect	12 m	14 m	16 m	18 m	20 m	22 m
Gradient						

Position along transect	24 m	26 m	28 m	30 m
Gradient				

Animal data

	Animal name	No. found	Micro-habitat	Adaptive features
e.g.	Green Shield Bug <i>(Nezara viridula)</i>	2	Among grasses	Camouflage (Green Shield), ejects obnoxious to repel predators, strong external shell
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22				

Physical factors

Average light intensity(Lux)	
Above shrub temperature	
humidity	
Above soil temperature	
humidity	
Average wind speed (m/s)	

Soil properties

Soil colour, smell and nature	
Soil pH	
Water content (%)	
Organic matter (%)	

Plant distribution data

Position along transect	0 m	2 m	4 m	6 m	8 m	10 m
Cover of selected plant (%)						

Position along transect	12 m	14 m	16 m	18 m	20 m	22 m
Cover of selected plant (%)						

Position along transect	24 m	26 m	28 m	30 m
Cover of selected plant (%)				

Name of selected plant : _____

Plant data Summary

Number of tree species	
Number of shrub species	
Number of herb species	
Number of grasses and sedges species	
Number of fern species	
Number of moss & liverwort species	
Number of fungus species	
Number of alga species	

Plant data

	Plant name	Plant type	Relative abundance	Adaptive features
e.g.	<i>Rhus hypoleuca</i>	Small tree	few	Leaves covered by hairs to prevent water lose, plant sap causes allergies to potential herbivores.
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22				

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Questions for discussion

1. Use the gradient data and plant data to draw a profile diagram. The diagram should be able to show the positions and relative sizes of the plants.
2. Plot a graph showing the changes of cover of the selected plant along the transect line. Is there any reason for the changes?
3. Which plant(s) is/are most successful in this scrubland. Explain?
4. Which animal(s) is/are most successful in this scrubland. Explain?
5. List and describe different kinds of animal and plant relations you found in the scrubland.
6. Propose a food web for the scrubland.
7. Describe how the plants face the unfavourable conditions in the scrubland.
8. Describe how the animals face the unfavourable conditions in the scrubland.
9. In what ways are human impacts important to the scrubland in respect of their vegetative compositions and patterns, and their future development?
10. State the limitations of this field study and suggest how to improve it providing that there is no time constraint.
11. What further investigation(s) would you propose concerning scrubland in Hong Kong ?

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Field work equipment

1	Transect line	1 pc
2	Light meter	1 pc
3	Digital thermohygrometer	1 pc
4	Abney level and supporting frame	1 set
4	Trowel	1 pc
6	Plastic bag	2 pcs
7a	Forcep - blunt	2 pcs
7b	Forcep- fine	2 pcs
8a	Vial - large	4 pcs
8b	Vial - medium	5 pcs
8c	Vial - small	5 pcs
9	Magnifying glass	2 pcs
10	Air net	1 pc
11	Sweep net	1 pc
12	Compass	1 pc
13	Sorting tray (white)	1 pc
14	Pooter	1 pc
15	Cotton gloves	2 pairs
16	Counter	1 pc
17	Quadrat - 50 x 50 cm	1 pc
18	Point quadrat	1 pc
19	Map	1 pc
20	Anemometer	1 pc
21	Light nylon thread	1 pc

References

1	Hong Kong Animals
2	Hong Kong Insects
3	Hong Kong Insects Vol. 2
4	Hong Kong Trees
5	Hong Kong Shrubs vol. 2
6	Hong Kong Herbs vol. 2
7	Grasses & Sedges of Hong Kong
8	Hong Kong Ferns
9	Hong Kong Climbing Plants
10	Scrubland plants of Tai Mo Shan