



Lichen Ecology



School Name / Student Name / Group

Site / DD-MM-YYYY / Time / Recent Weather Conditions

INTRODUCTION

Background

Lichens are one of the epiphytes growing on other plants or rocks. They consist of fungi and algae, living with a mutual beneficial relationship in a single body, called thallus. Lichen thalli may be divided into four main forms; crustose, scaly, leafy and bushy. Under natural conditions, they are slow-growing and long-lived. Studies on air pollution and lichen growth consistently show that there is a relationship between the growth form and the degree of pollution. Therefore, they have come into prominence as biological indicators, giving an inexpensive means of monitoring atmospheric pollution. Though we can easily find lichens on tree barks and rock surfaces, most of them are so dependent on their particular habitat that when that is destroyed, they will be also destroyed.

In the present study, we will investigate the lichen ecology on different tree barks and on the rock surfaces. Pay special attention to any sign of air pollution from the lichen forms that we meet.

Aims and Objectives

- To appreciate the wonders of the living world.
- To familiarize different techniques to carry out ecological studies of lichens.
- To observe, compare and contrast the lichen distribution on different tree barks and rock surfaces.
- To monitor the air quality of the campus by studying the lichens growing there.

Equipment

For Biotic factors sampling

<input type="checkbox"/>	Aquarium net	x1
<input type="checkbox"/>	Clip board	x1
<input type="checkbox"/>	Blunt forceps	x1
<input type="checkbox"/>	Fine forceps	x1
<input type="checkbox"/>	Hand lens	x2
<input type="checkbox"/>	Plastic basket	x1
<input type="checkbox"/>	Plastic mini-quadrat	x4
<input type="checkbox"/>	Plastic vial	x5
<input type="checkbox"/>	Razor blade	x1
<input type="checkbox"/>	Lichen identification kit	x2

For measurement of abiotic factors

<input type="checkbox"/>	Abney level	x1
<input type="checkbox"/>	Compass	x1
<input type="checkbox"/>	Light meter	x1
<input type="checkbox"/>	Thermohygrometer	x1
<input type="checkbox"/>	Measuring tape	x2
<input type="checkbox"/>	Velcro (Nylon Fastening Tape)	x1 Set
<input type="checkbox"/>	Gas Detector (SO ₂)	(Share)

Remarks

- No smoking is allowed at the site.
- Put on long-sleeved shirts, jeans and hats with wide brim.
- Do not reach into holes.
- Be careful upon handling those animals which may bite.
- Never pollute/damage the environment in all sense. Minimize trampling.
- Behave yourselves, and avoid disturbance to the people.
- Team leader should organize members to work in a serious and efficient way. Members should co-operate with the leader.

Since time is limited, you should work efficiently. If you do have extra time, you are highly recommended to carry out your own investigations, provided that it is safe to do so.

1

Site Profile

1.1. Tree habitat

Select 2 host trees among all the assigned trees. Identify the species and mark their positions on Figure 1. Record their bark nature, girth and other particulars of interest.

1.2. Rock habitat

Select 1 rock among the assigned rocks. Sketch the shape and make brief description on Figure 2. Mark down any vegetation clinging on, lying above or standing near them.

2

Study of
Abiotic Factors

2.1. Tree habitat (Record data on Table 1.)

- Place two pieces of Velcro (Nylon Fastening Tape) on the tree trunk at heights about 1m and 1.5m above ground level respectively.
- By using a compass, with reference to the part of the trunk between 1m and 1.5m, divide the circular belt transect into 4 equal sectors, North, East, South and West. Fix the limits of each quarter by attaching a piece of Velcro on the tree trunk.
- By using a measuring tape, measure the distance to the object possibly shading the host tree subtended by each quarter.
- At each quarter, measure the:
 - A. Temperature and relative humidity with a digital thermo- hygrometer;
 - B. Light intensity with a light meter;
 - C. Sulphur dioxide with a gas detector
 in the layer of air immediately above each quarter of the tree trunk.

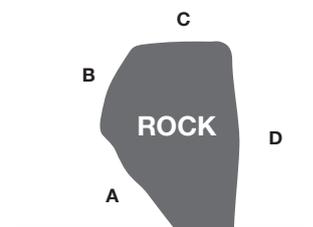
2.2. Rock habitat (Record the data on Table 2.)

- Determine the number of surfaces on the rock and number them on the sketch map.
- On each main surface, record the:
 - A. Facing direction with a compass.
 - B. Slope with an abney level.
 - C. Roughness by hands.
 - D. Temperature and relative humidity with a digital thermo-hygrometer.
 - E. Light intensity with a light meter.
 - F. Sulphur dioxide with a gas detector.

- ★ Wait for about 1 minute to take readings.
- ★ Prevent blocking sunlight with your body.
- ★ You can take several readings and average your results.

- ★ Take estimation by feeling the texture.

Let's think...
How do you measure the slope of surface A?



FIELD WORK

3

Study of
Biotic Factors

3.1. Lichen distribution (Record the data on Table 3 and 4.)

Place the plastic mini-quadrat on each tree quarter/main rock surface. Record the total grid count occupied by each tree quarter/main rock surface. Identify the lichens, record their morphologies, count the number of grids and calculate the percentage covered by each species.

3.2. Animal sampling (Record the data on Table 5.)

With nets catch animals at different microhabitats on the trees and rocks studied and identify them with the keys provided.

3.3. Bark sampling

Each group is responsible for one tree. With scraper take a small piece of bark and put it in a plastic vial.

★ To protect our wildlife and environment, do not collect unnecessary specimen, put minimal disturbance and keep on your path.

★ Never collect lichen samples.

LABORATORY WORK

Equipment

<input type="checkbox"/> Filter	x1	<input type="checkbox"/> Syringe	x1	<input type="checkbox"/> Mortar and pestle	x1
<input type="checkbox"/> Blunt forceps	x1	<input type="checkbox"/> Test tube	x1	<input type="checkbox"/> Stereomicroscope	x1
<input type="checkbox"/> Fine forceps	x1	<input type="checkbox"/> Petri dishes	x5	<input type="checkbox"/> pH indicator	x1

Use the reference books, photographs and stereomicroscope provided to identify specimens collected from the site.

4.1. Lichen distribution analysis

Draw cyclical polygons (Figure 3) showing the lichen distribution of the two host trees.

4.2. Animal analysis (Record the data on Table 5.)

Observe and record any adaptive features of the animals you have collected.

4.3. Bark analysis (Record the data on Table 6.)

Transfer the small piece of bark and add about 10ml deionized water into a mortar. Pestle the bark and mix the content. Use syringe to filter the content into a test tube. Measure the pH of the bark filtrate by adding 5 drops of pH indicator.

★ Transfer the animals in the glass chamber specified after identification and clean up the vials.

★ Record the data form other groups for comparison.

4

Biological
Investigation

Discussions and Conclusions

- ★ After pooling all information with other groups, can you draw any conclusions on our study?
- ★ With reference to the cyclical polygons and constructed charts, comment on the distribution and the morphology of each lichen species in each quarter / on each rock surface. How do the physical factors affect their distribution?
- ★ Comment on any correlation / similarities / differences between the two host trees and the rock to the lichen distribution. What kinds of symbiotic relations do different species of lichen enjoy or suffer?
- ★ Comment on the air quality of your study area with regard to the species / forms of lichens found.
- ★ How do the animals affect lichens?
- ★ State the limitations and drawbacks of the investigation. Suggest any improvements for further study.

References

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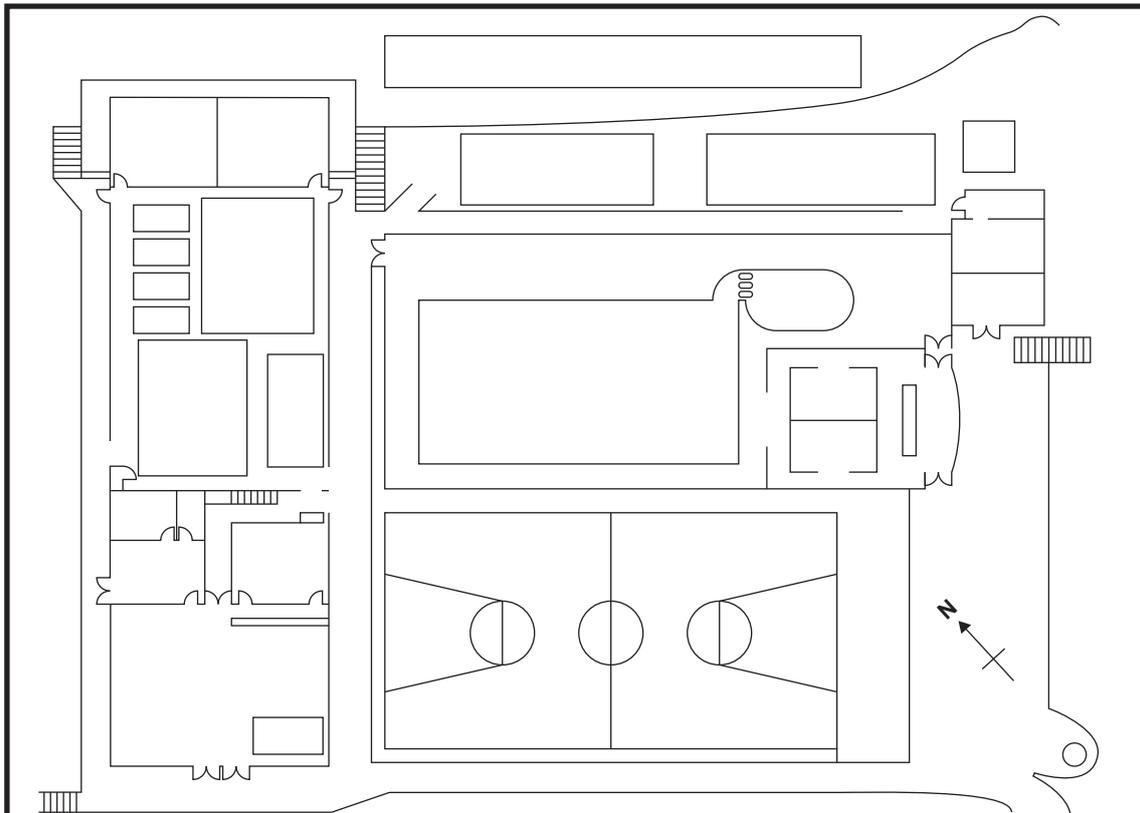
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DATA SHEET

_____/_____/_____
 School Name Student Name Group

_____/____/_____
 Site Date Time Recent Weather Conditions

Figure 1. Site Profile: Top view of the site



Host tree species 1:		Girth (cm):	
Bark nature:			
Host tree species 2:		Girth (cm):	
Bark nature:			

Figure 2. Rock sketches

<p>Descriptions:</p>

Table 1. Study of Abiotic Factors: Tree habitat

Sector \ Abiotic factors	Tree 1				Tree 2			
	East	South	West	North	East	South	West	North
Distance to the nearest object (m)								
Temperature (°C)								
Relative humidity (%)								
Light intensity (lux)								
Sulphur dioxide (ppm)								

Table 2. Study of Abiotic Factors: Rock habitat

Abiotic factors \ Surface(s)	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th
Direction								
Slope								
Roughness (Rough - R, Fine - F, Smooth - S)								
Temperature (°C)								
Relative humidity (%)								
Light intensity (lux)								
Sulphur dioxide (ppm)								

Table 3. Lichen distribution: Tree habitat

Lichen	Morphology (Morphology of lichens may include encrusting, scaly, leafy or bushy.)	Grid count / Percentage cover							
		Tree 1				Tree 2			
		East	South	West	North	East	South	West	North
Protococcus 原球藻									
Dirinaria 背衣									
Graphis 文字衣									
Sarcographa 大星衣									
Buellia 黑瘤衣									
Lecanora 茶漬									
Chrysothrix 燭金絮衣									
Lepraria 癩屑衣									
★ Total area of the quarter		100%	100%	100%	100%	100%	100%	100%	100%

Table 4. Lichen distribution: Rock habitat

Lichen	Morphology (Morphology of lichens may include encrusting, scaly, leafy or bushy.)	Grid count / Percentage cover							
		Rock surface(s)							
		1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th
Ramalina 樹花									
Parmotrema 裸緣梅衣									
Xanthoparmelia 黃梅衣									
Diploschistes 雙緣衣									
Squamaria 鱗茶漬									
Lecanora 茶漬									
Pertusaria 雞皮衣									
Buellia 黑瘤衣									
Caloplaca 橙衣									
Chrysothrix 燭金絮衣									
★ Total area of the quarter		100%	100%	100%	100%	100%	100%	100%	100%

Table 5. Animal sampling

Animals species	Respective microhabitat(s)			Adaptive features
	Tree 1	Tree 2	Rock	

Tree microhabitats may include: bark surfaces, bark cracks etc.
 Rock microhabitats may include: upper rock surfaces, rock crevices etc.

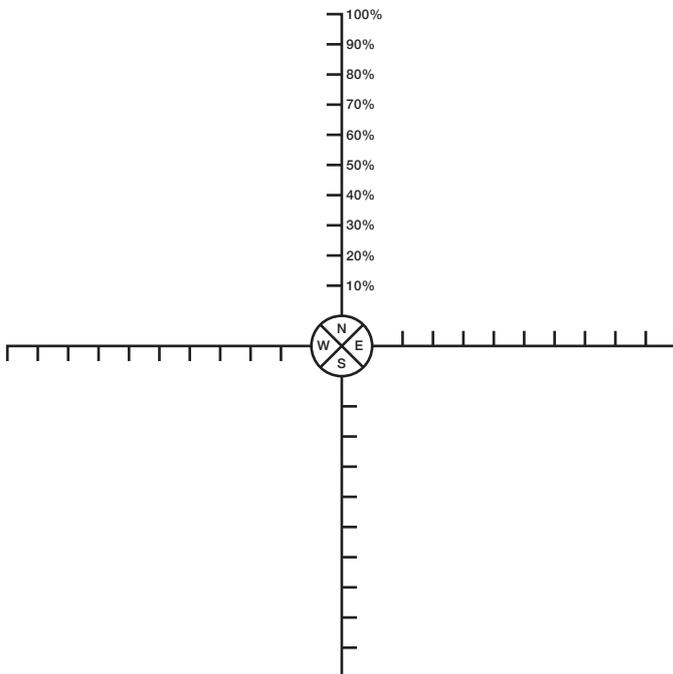
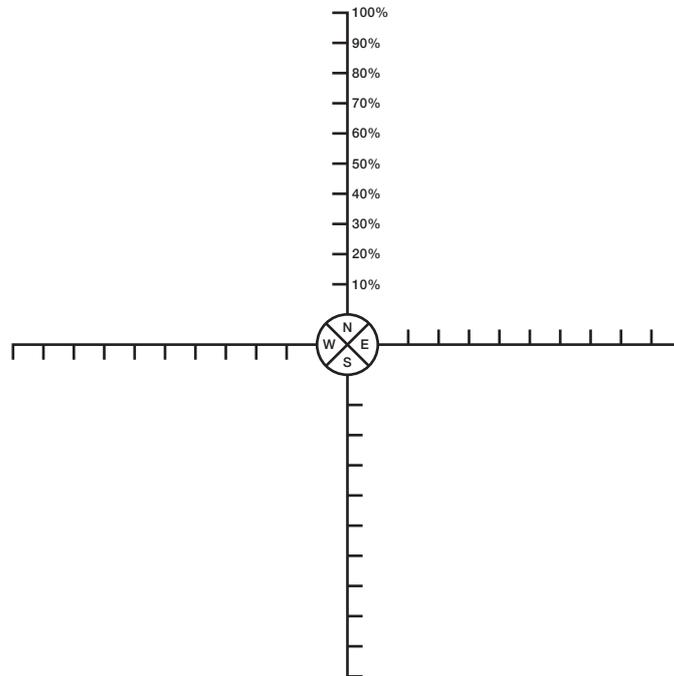
Table 6. Bark analysis

Tree species	pH		
	Sample 1	Sample 2	Sample 3

Figure 3. Cyclical polygons

Tree 1

Name of tree



Tree 2

Name of tree