

Study of Lichen Distribution

INTRODUCTION

Lichen, one of the best examples of mutualism. Like other green plants, it relies on photosynthesis to produce food. On the one hand, it is so tough that it can survive on very desiccated and hard substrata such as exposed bare rock surfaces. On the other hand, it is very vulnerable to modern elements introduced to our natural environment, especially the industrial pollutant - sulphur dioxide. Both are attributed to its strong ability to take up and accumulate gaseous material in solution. It is a classical winner but a modern loser.

It is reasonable to expect lichen, like other plants, would distribute according to physical factors like light availability, humidity, substratum nature and substratum chemistry. Today, however, we have introduced a new factor affecting its distribution - sulphur dioxide level in air. You may now find different lichens growing in areas with different sulphur dioxide levels because they have different resistance towards the pollutant.

We are going to conduct a qualitative investigation about the factors affecting the distribution of lichens in Tai Mo Shan area. We will go to 3 lichen inhabiting sites with different environmental factors. In those sites, approximate densities of six indicator lichens would be assessed and various factors measured. Base on the survey results, we try to assess the significance of different factors in affecting the distribution of lichens. In order to minimize complexity of the investigation, we only focus on tree trunk lichens.

Collection of any lichen is absolutely restricted as some species are threatened by extinction, and it would also make future study impossible. Always identify in the field.

FIELD WORK

A. SITES AND SAMPLES

Records recent weather conditions and time of the day, they affect reliability of your measurements of the physical factors.

Three sites are to be investigated (see the map).

Only lichens on tree trunks will be studied. In each site, you have to study at least **10** different samples (trunks). The samples should include **4** different species and **2** trees having no lichen. Select trees with different physical factors - different light intensity, different bark nature, different distance from suspected pollution source etc.. If most of the trees do not have lichens, increase the number of samples having no lichens. That means, in the 10 samples, you may get 9 samples having no lichen.

B. PHYSICAL FACTORS

1. Site physical factors:

- a. Find out approximate altitudes of the sites from the map and describe its surrounding environment.
- b. Try to find out possible sources of pollution, their locations and their nature from the map and by your own observation.
- c. Use the digital thermohygrometer to measure temperature and humidity of the sites. Make several measurements and take the average.
- d. Measure wind speed and wind direction by a wind meter, a compass and a piece of light thread.
- e. Measure air sulphur dioxide level at the sites.

2. Tree physical factors

For each individual tree, measure :

- a. Average light intensity directing on the tree trunk by a light meter.
- b. Humidity and temperature on trunk surface by the digital thermohygrometer.
- c. Approximate distance between the tree and the nearest suspected pollution source.

C. BIOTIC FACTORS

For each individual tree, record:

- a. Name of the tree.
- b. Bark nature (hard, soft, thick, thin, smooth, rough, shallow cracked, deeply cracked, fibrous peeling, scaly peeling, paper like...)
- c. Lichens other than the indicator species inhabiting on it.
- d. Other inhabitants including climbing plants, algae, mosses, fungi and small animals which may affect lichens' growth on the tree.

D. INDICATOR LICHENS

There are six genera of indicator lichens which you have to investigate in detail, they are:

- a. *Protococcus* (green algal film, actually not lichen but looks like)
- b. *Lecanora*
- c. *Lecidia*
- d. *Pyxine*
- e. *Dirinaria*
- f. *Parmotrema*

Use the following indexes to represent the abundance of the indicator species:

Abundant - **15** or more patches / thalli

Few - **5 to 9** patches / thalli

Many - **10 to 14** patches / thalli

Rare - **1 to 4** patches / thalli

field work equipment

1	Counter	1 pc
2	Digital thermohygrometer	1 pc
3	Magnifying glass	2 pc
4	Light meter	1 pc
5	Anemometer	share
6	Compass	1 pc
7	Light thread	1 pc
8	Instrument for measuring sulphur dioxide level in air	share
9	Map	1 pc

References

1	Hong Kong Lichens
2	Hong Kong Trees
3	Lichens of Tai Mo Shan
4	Trees of Tai Mo Shan (Lichen study)
5	Bark nature

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School / group : _____

Members : _____

Date of study : _____ Time of study : _____

Recent weather conditions : _____

Site Physical Factors

	Site 1	Site 2	Site 3
Altitude			
Surrounding environment			
Possible pollution Source			
Humidity and temperature			
Wind speed and direction			
Sulphur dioxide level			
Other description			

Tree physical factors

Tree no.	Light intensity	Humidity	Temp.	Dist.*	Abundance					
					Proto.	Lecan.	Lecid.	Pyxine.	Dirin.	Parm.
Site 1										
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
Site 2										
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
Site 3										
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

* Distance from nearest suspected pollution source

Biotic factors

Description of other lichens	Description of other inhabitant	Bark nature	Tree name	Tree no.
Site 1				
				1
				2
				3
				4
				5
				6
				7
				8
				9
				10
				11
				12
Site 2				
				1
				2
				3
				4
				5
				6
				7
				8
				9
				10
				11
				12
Site 3				
				1
				2
				3
				4
				5
				6
				7
				8
				9
				10
				11
				12

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Organize the data

1. Compare abundance of each lichen species especially indicator lichens in the three sites.
2. Compare lichens (species and abundance) on same species of tree but in different sites.
3. Compare Lichens receiving similar intensity of light in different sites.
4. Compare lichens receiving different intensity of light in the same site.
5. Compare lichens on different species of trees in the same site.
6. Compare lichens on different trees with similar bark nature.
7. Sort out the common factors when there is no lichen on the trees.
8. Sort out the common factors when there are same lichens living on different trees.

Humidity factor, temperature factors, wind factor, etc. have not been included in the above examples, try to organize the data by your own ways.

Questions for discussion

1. In your investigation, do physical factors affect lichen distribution? Which physical factors are more important to lichens' distribution?
2. Is there any sign of host specification (certain lichen species only grow on certain tree species)? Quote examples from your investigation to illustrate.
3. Did you find any association between bark nature and lichen distribution? If yes, can you suggest possible explanations?
4. Do you think different species of lichens are competing?
5. Did you find any association (positive or negative) between the lichens and other inhabitants? Quote examples from your investigation to illustrate.
6. Is it true to say that lichens in Tai Mo Shan area are strongly affected by sulphur dioxide level in the air?
7. State the limitations of this study and suggest what would you propose to further investigate lichen distribution.