

Study of Seashore Ecosystem

Introduction

The sheltered shore at Hoi Sing Wan (Starfish Bay) is composed of a sandy beach which is crossed by a stream. The nature of substrate varies along the main beach. It is a mixture of sand, gravel and stones in the south east part. Substrate in north west part tends to be more muddy. Middle part is basically sandy.

The main purpose is to study the physical factors, the plants and animals, their zonation, adaptations, competition, modes of nutrition, and inter-relationships between the living organisms. In addition, by comparing the biotic and abiotic factors in different locations, we try to find out how do the communities vary according to the change of physical environment.

Animals are mainly burrowing type, it is difficult to find them once they retreat into their deep burrows. Therefore, field work should be done in care so as to avoid disturbance especially along the transect line.

Precautions

- 1. Sandals and slippers are not recommended, which cannot protected the feet well. Canvas shoes with adequate tread should be worn.*
- 2. Beware of broken glasses, oyster shells, and other sharp objects.*
- 3. No specimen should be brought away from the field site.*
- 4. Be attentive to tide level. It can change quickly.*
- 5. Minimize disturbance to the environment.*

FIELD WORK

A. Running the transect

Run a 50 m long transect line across the beach (perpendicular to the coast line). Avoid stepping on the area where the transect line will be situated on.

B. General description

Draw a sketch map of the bay indicating its landscape, aspect, approximate positions of high tide mark and low tide mark and position of the transect line. Also make notes of general features of the habitat.

C. Animal survey

Start from 0 m, place a 50 x 50 cm quadrat at intervals of 10 m along the transect line. Within each quadrat frame, do the followings:

1. Collect animals situated on the surface of the sediment / rock. Put them in the tray, identify and count them.
2. For stony area, gently lift the stones and find the animals hiding below.
3. For soft substratum, dig out top layer (5 - 10 cm thick), sort out the animals, identify and count. It is important that collection of sediment should be done quickly and quietly because animals may retreat into their deep burrows even under slight disturbance.
4. Pay attention to any special behaviour of the animals such as feeding behaviour, defence mechanism, respiration, locomotion, etc.. Besides, try to observe any inter-relationship between the living organisms, for instance, competition, mutualism and parasitism.

D. Plant survey

1. Record plants growing inside the quadrat - their identities, approximate densities and adaptive features.
2. Observe the plants growing on back shore. Record their identities, approximate densities and adaptive features shown.

E. Physical factors

1. Note wave actions in different areas of the bay.
2. Measure average wind speed by anemometer, find out wind direction by a piece of nylon thread and a compass.
3. Measure average light intensity by the light meter.
4. Measure temperature at intervals of 2 m. If substratum is soft, insert the soil thermometer into the sediment. If it is rock use the digital thermometer with the sensor placed on rock surface. Measure also the water temperature.
5. For rocky habitat, measure humidity at intervals of 2 m by the digital thermohygrometer with sensor facing the rock surface.

F. Measuring gradient

Measure gradient at 5 m intervals by using the abney level and the supporting frame
For uneven slopes, measure at 1 m intervals.

G. Water sampling

Collect water sample from the site where transect line runs into the sea. Also collect water sample from rock pool (if present). If the transect cuts a stream, collect also stream water.

H. Sediment sampling

In soft substratum habitat, collect about 1kg of sediment sample from an area which is representative and then put it into a plastic bag. If transect cuts the stream, also collect sediment near the stream.

LABORATORY WORK

A. Sediment analysis

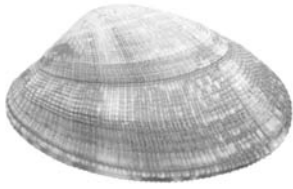
1. Examine colour, smell and nature (sticky, hard, soft, loose...) of the sediment.
2. Add about 500 ml sediment to a 1000 ml measuring cylinder, fill in water until it reaches 1000 ml mark. Cover the mouth and shake vigorously, then let the mixture settle for few hours. Estimate the proportion of each component - gravel (diameter > 2 mm), coarse sand (diameter 0.2 - 2 mm), fine sand (diameter 0.02 - 0.2 mm), silt (diameter 0.002 - 0.02 mm), clay (diameter < 0.002 mm) and humus (on water surface).
3. Add collected sediment to a weighed crucible (about 3/4 full), then put it in an oven operating at 105 °C. When it is dried, weigh. Then burn it by the gas burner for about 20 minutes, after it is cooled, weigh again. Calculate the amount of organic matter present in the sediment.

B. Water analysis

1. Measure pH of by a pH meter.
2. Measure salinity by a refractometer.
3. Filter 100 ml water sample by a dry filter paper, then dry the filter paper and weigh it. Calculate the amount of total suspended solids.

C. Detailed study of specimen

1. Observe micro-organism in the water and in the sediment by a microscope.
2. Identify the collected animals and plants.
3. By studying body morphology of the living organisms, try to find out their adaptive features - nutrition, respiration, locomotion, attachment and defence against predators.



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Record Sheets



可觀自然教育中心暨天文館
Ho Koon Nature Education cum Astronomical Centre

School / group: _____

Members:

_____	_____	_____
_____	_____	_____
_____	_____	_____

Date of study : _____ Time of study : _____

Profile data

Position	0 m										
Gradient											
Substrate temp.											
Humidity (boulder shore only)											
Remarks											

Position											
Gradient											
Substrate temp.											
Humidity (boulder shore only)											
Remarks											

Position											
Gradient											
Substrate temp.											
Humidity (boulder shore only)											
Remarks											

Sketch map



Brief description and physical factors

Brief description : _____

Recent weather conditions : _____

Description of wave action: _____

Wind direction & average wind speed: _____ Average light intensity: _____

Today's tides:

Water temperature : _____

Distribution of seashore animals

Number Animal name	Position															
	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																

Distribution of seashore plants

Approx. density Plant name	Position															Back shore
	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

Sea water

1. pH :

2. Salinity (g / 100 g) :

3. Total suspended solids (mg / l) :

Sediment

1. Colour :

2. Smell :

3. Nature :

4. Amount of organic matter (g / 100g) :

5. Composition :

Component	Gravel	Coarse sand	Fine sand	Silt	Clay	Humus
%						

Ecological information of seashore living organisms

	Name	Micro-habitat	Ecological roles	Behavioural adaptation	Morphological adaptation	Physiological adptation
1						
2						
3						
4						
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6						
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12						
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24						
25						



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Animal and Plant distribution

1. Use the gradient data and plant data to draw a sectional profile diagram. The diagram should show the gradient change and distribution of plants.
2. Select several representative animal species, draw diagrams or charts to show their distribution along the transect.

Questions for discussion

1. Are the plants evenly distributed along the transect ? If not, what are the pattern of distribution ? Can you explain the pattern?
2. Are the animals evenly distributed along the transect ? If not, what are the pattern of distribution ? Do you think distribution of the animals is related to the physical factors ? Can you explain the pattern ?
3. What unfavourable factors are the plants facing ? What adaptive features have you observed ? Describe how do these adaptive features work.
4. What unfavourable factors are the animals facing ? What adaptive features have you observed ? Describe how do these adaptive features work.
5. Construct a food web to show the feeding relations between the living organisms.
6. Describe other relations between the living organisms found, such as commensalism, mutualism and competition. Choose some representative organisms to illustrate.
7. Have you observe any human impact to the ecosystem ? How important are they ? Would you suggest any solution to minimize these impacts ?
8. If your group has studied two different habitats, describe the main differences in physical factors and explain how are they related to the variations of the two communities ?
9. how would you conclude this study ?



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Field work equipment and reference material

1	Transect line - 30 m measuring tape	1 pc
2	Quadrat - 50 x 50 cm	2 pcs
3	Light meter	1 pc
4	Digital thermohygrometer	1 pc
5	Abney level and supporting frame	1 set
6	Trowel	2 pcs
7	Plastic bag	2 pcs
8a	Forcep - blunt	2 pcs
8b	Forcep - fine	2 pcs
9	Magnifying glass	2 pcs
10	Compass	1 pc
11	White plastic tray	2 pc
12	Blue plastic tray	1 pc
13	Metal sieve	2 pcs
14	Counter	1 pc
15	Map	1 pc
16	Ruler - 30 cm	1 pc
17	Water sampling bottle	2 pcs
18	Digital anemometer	1 pc
19	Soil thermometer	1 pc
20	Digital thermometer with probe	1 pc
21	Nylon thread	1 pc

1	A Colour Guide to Hong Kong Animals
2	Hong Kong Seaweeds
3	Field Study Handbook - Wildlife Pictorial Guide
4	Estuarine Organisms
5	Hong Kong Coastal Plants
6	Sandy Shore