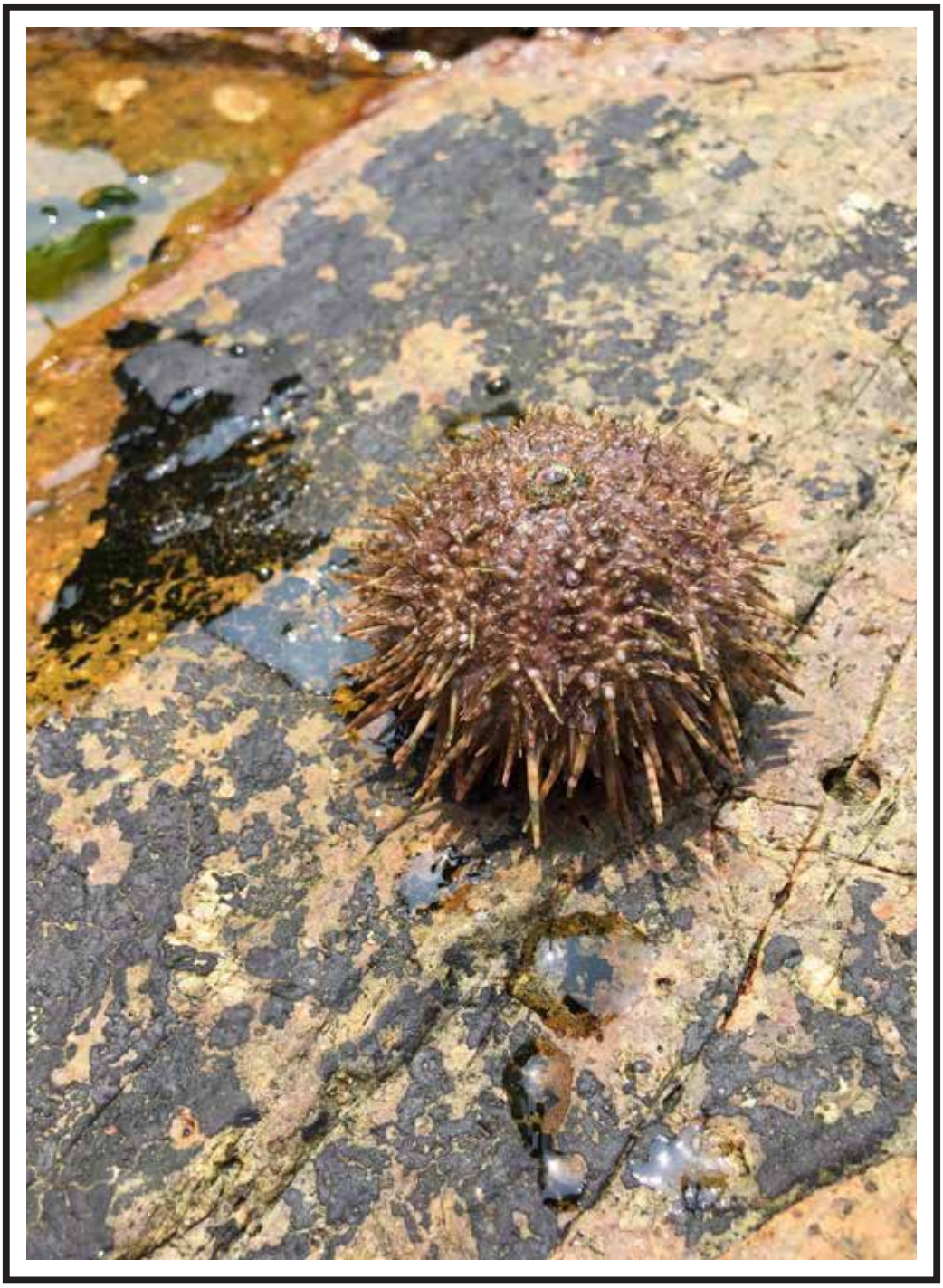
明愛陳震夏郊野學園
Caritas Chan Chun Ha
Field Studies Centre

BIOLOGY

Rocky Shore



/ /

School Name | Student Name | Group

/ DD-MM-YYYY / / / m at / m at

Site | Date | Time | Recent Weather Conditions | High Tide (level & time) | Low Tide (level & time)

INTRODUCTION

Background

Though Hong Kong is just a tiny little place in the world, we have a relatively long coastline, along which, we can find different seashore habitats such as mudflats, sandy shores, boulder shores and rocky shores.

With respect to local environmental factors such as tides, waves and types of substratum, the seashore communities have developed a special zonation pattern.

Aims and Objectives

- To appreciate the wonders of the living world.
- To familiarize the structure, flora and fauna in a rocky shore community.
- To familiarize some common ecological sampling techniques in studying rocky shore habitats.
- To observe, compare and contrast the ecology of rocky shore habitats with different degrees of exposure.

Equipment

For Biotic factors sampling

☐	Aquarium net	×2
☐	Clip board	×1
☐	Quadrat	×2
☐	Grid quadrat	×1
☐	Plastic basket	×2
☐	Plastic box	×1
☐	Plastic tray	×1
☐	Plastic vial	×6
☐	Rocky shore identification kit	×2
☐	Spoons	×2
☐	30m measuring tape	×1
☐	Trowel	×2
☐	Plankton net	(Share)

For measurement of abiotic factors

☐	Rope	×1
☐	Anemometer	×1
☐	Compass	×1
☐	Thermohygrometer	×1
☐	Ranging poles	×2
☐	pH meter cum thermometer	×1
☐	Light meter	×1
☐	Metre rule	×1
☐	Plastic bucket with a rope	×1
☐	Water sample bottles	×3
☐	Spirit level	×1
☐	Towel	×1
☐	Transect line	×1
☐	Dissolved oxygen meter	(Share)

Others

☐	Life buoy with a rope	(Share)

Remarks

- Dress in shorts and canvas shoes with adequate tread. Sandals are not recommended. Be careful of broken glass and abandoned construction material etc.
- Walk slowly and try footing for the stability of substratum. Be careful of loose gravel and slippery rock surface.
- Never step beyond the tide but prepare for getting wet during fieldwork.
- Retreat before high tide.
- Do not remove mollusc rudely.
- Do not pollute/damage the environment in all senses.
- Behave yourselves, and avoid disturbance to the local 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.

Exclusive for residential courses

FIELD WORK

1 Geographical Environment

Draw a sketch map (top view) of the surrounding area on **Figure 1**, indicating

•Your position in the study site (with a compass).

•Any rock pools, crevices, outcrops of rocks and other microhabitats.

•Any backshore plant community.

•Other particulars of interest.

Look for a region of shore with apparent zonation patterns perpendicular to the sea line, lay a transect line through the shore (with the zero mark, 0m, pointing towards back of the shore/the location specified). By using a compass, ensure the transect line is straight. Make record on your sketch map.

★Never attempt to step into areas with dense barnacle or oyster community.

★Never take any readings beyond waterfront unless specified.

★If the wind is strong, put some stones over the transect line to keep it in place.

★In order to proceed the sampling and measurement works at the same time, divide your group into two teams. One is responsible for biotic investigation while the other is to take abiotic measurement. However it is more important to understand the whole picture, so try to get involved in the work of your partners.

★Never consume too much time in setting up the transect line.

2 Study of Abiotic Factors

2.1. Water sampling **(Record data on Table 2.)**

A. Sea water sampling

Collect sea water sample by a bucket tied with a rope. Fill up the large vial carefully and close the lid tightly. Mark the sampling site on the sketch map.

B. Rock pool

Collect water samples with large vials inside 2 rock pools near your transect line. Make collection with different environmental variations (large vs. small or high vs. low). Mark on the sketch map and fill in Table 5 the distances offshore of the rock pools with reference to the transect line, their approximate areas with grid quadrat, and their maximum depths with metre rule.

C. pH and Dissolved Oxygen measurement

Use pH meter and DO meter to measure respective data by putting the probe into water samples.

★Do it prior to other studies.

★Clean the probe before each use.

2.2. Topography **(Record data on Figure 2.)**

A. Place 2 ranging poles at 1m intervals beside the transect line.

B. Tie a rope to each ranging pole at about 1m above the ground. Raise/lower the string at one pole to ensure the string is horizontal by using spirit level.

C. Record any drop or rise of the rope. Mark the height difference as "+" or "-" when the topography rises or declines respectively.

★Place the poles gently on the ground.

2.3.Wind speed **(Record data on Table 1.)**

Measure the average wind speed and respective direction (on shore/off shore) with an anemometer and a compass.

2.4. At 1 m intervals, measure the: **(Record data on Table 1.)**

A. Water temperature with a digital thermometer (i.e. the pH meter).

B. Relative humidity and temperature with a thermo-hygrometer.

C. Light intensity with a light meter.

★Wait for about 1 minute to take temperature readings.

★Never put the digital thermo-hygrometer into water.

★Prevent blocking sunlight with your body.

★You can take several readings and average your results.

Let's think...

How do you measure the RH when the interval mark is at a rock pool?

Exclusive for residential courses

Rocky Shore

FIELD WORK

3 Study of Biotic Factors (Belt-transect method)

Record data on Table 4.

3.1. Animal sampling

A. Place a 0.5m × 0.5m quadrat along the transect line at 2m intervals. Search, identify, count animals and note down their microhabitats within the quadrat.

B. Identify and count animals within the selected 2 rock pools.

C. Observe any special interaction and adaptive behaviour such as feeding behaviour, defence mechanism, respiratory mechanism, locomotion, competition, mutualism and parasitism etc.

3.2. Algae / Cyanobacteria sampling

A. Identify and estimate the % cover of algae/cyanobacteria within the grid quadrat.

B. Identify and estimate the % cover of algae/cyanobacteria within the 2 selected rock pools.

★Place quadrat on the same side with further placements.

★Place quadrat at the beginning of each successive interval.

4 Plankton Sampling

Tow the plankton net in the sea for 10 times to collect planktons in the sample bottles.

★Pull the net quickly to avoid the nets sinks to the seabed.

Rocky Shore

LABORATORY WORK

Equipment

☐	Slides	×3	☐	Dropper	×1	☐	Compound microscope	×1
☐	Cover slips	×3	☐	Refractometer	×1	☐	Stereomicroscope	×2
☐	Blunt forcep	×1	☐	Lens cleaning cloth	×1	☐	Wash bottle with deionized water	×1
☐	Fine forcep	×1	☐	Petri dish	×3			

5 Salinity of Water Samples

Record data on Table 2.

Place 2-3 drops of sample onto the refractometer.

★Remember to rinse the glass chamber before taking readings.

★Fill the sample full on the glass surface.

★Prevent making air bubbles on the surface.

★Calibration can be made with deionized water.

6 Biological Investigation

6.1. Identification **(Record data on Table 4.)**

For any other unknown species, use reference books, photographs and stereomicroscope provided to identify them.

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

6.2. Microscopic study **(Record data on Table 3.)**

Put 1-2 drops of water sample from sea and rock pool(s) onto a slide. Observe and record any planktonic and other microscopic organisms present under a compound microscope.

★Put the used slides and cover slips at respective beaker/vial specified.

Exclusive for residential courses

SUMMARY

Discussions and Conclusions

★After pooling all information along the transect with other groups, can you draw any conclusions on our study?

★Compare and contrast the abiotic and biotic factors of the exposed and sheltered rocky shores. Which factor(s) do you think is/are limiting to the community? Why?

★Construct a cross sectional profile of your study area with high and low tide level. Draw graphs on **Figure 2** to show changes in abiotic factors.

★Draw kite diagrams on **Figure 3** to represent the abundance and distribution of organisms. Account for any zonation patterns found.

★Describe a rock pool community against its physical environment and describe the differences between communities on rock surface and rock crevices.

★How do the intertidal organisms adapt to the environment with respect to

- microhabitats (in rock crevices/ in rock pool /on rock surface etc.),
- feeding habits (omnivorous/carnivorous/herbivorous etc.)
- relationships between organism (competition / predation / commensalism / mutualism / parasitism etc.)

★Based on the organisms collected and observed, try to construct food chains/web to show the trophic levels in the communities.

★State the limitations and uncertainties of the investigation. Suggest any improvements for further studies.

References

1. 許狄思、費嘉倫編著，何迪媛譯（1989）香港動物原色圖鑑，香港：香港政府印務局

2. Orr, J., (1985) Hong Kong Seashells. Hong Kong: The Urban Council Hong Kong

3. 約翰．柯爾著，何孟恆譯（1985）香港裸鰓類動物，香港：香港市政局

4. 韓國章，李國仁（1984）香港海藻，香港：香港市政局

5. 韋念時（2003）岩岸（香港野外圖鑑１），香港：香港大學生態學及生物多樣性學系．萬里機構出版有限公司

6. Morton, B. & J. Morton. 1983. The Seashore Ecology of Hong Kong. Hong Kong University Press, Hong Kong. 350 pp.

Rocky Shore

DATA SHEET

School Name	Student Name	Group
	/	/

Site	Date	Time	Recent Weather Conditions	High Tide (Level & Time)	Low Tide (Level & Time)
/	/ DD-MM-YYYY	/	/	/ m at	/ m at

Figure 1. Site profile – Top view of the study area

Location of Field Site

Exposed Shore

Sheltered Shore

Past Weather Information

Tide level

Figure 2. Topography of shore

Transect Reading		0m/sea	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m	16m	17m	18m	19m	20m
sea level (cm)																						

Figure 3. Kite diagrams - Abundance and Distribution of Organisms

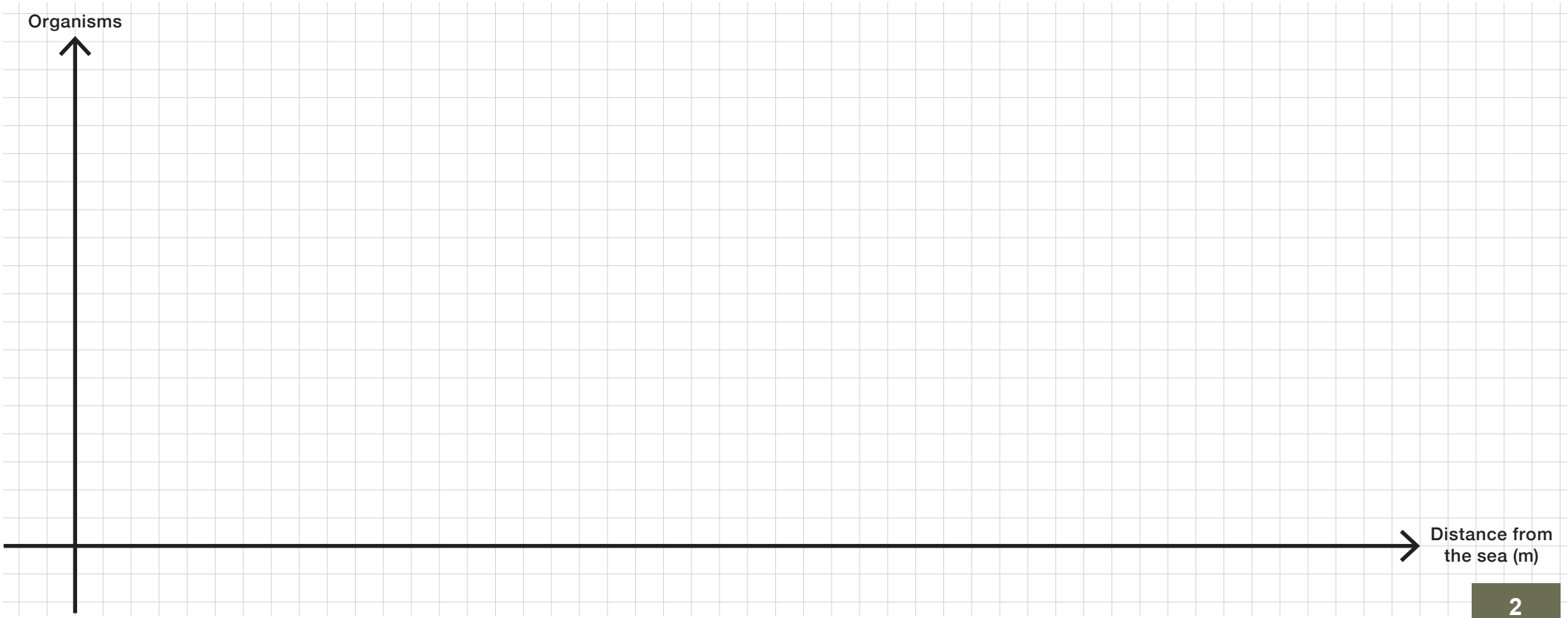


Table 1. Study of Abiotic Factors 1

Transect Reading	0m/sea	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m	16m	17m	18m	19m	20m
Change in height (cm)																					
Cumulative change in height (cm)																					
Temperature (°C)																					
Relative Humidity (%)																					
Light Intensity (lux)																					
Wind Speed (m/s)	1st Reading					2nd Reading						3rd Reading					Average				

Table 2. Study of Abiotic Factors 2

	Distance from the sea (m)	Temperature (°C)	Light Intensity (lux)	Approximate area (square grid)*	Maximum depth (cm)	pH	Salinity (ppm)	DO (ppm)
Sea	0							
Rock Pool 1								
Rock Pool 2								

*Use the quadrate to count the number of grip

Table 3. Study of Microscopic

	Species found	Relative Abundance
Planktonic		
Phytoplankton		

Exclusive for residential courses

Table 4. Study of Biotic Factors

	Organisms abundance																				
Transect Reading	0m	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m	16m	17m	18m	19m	20m	Rock Pool 1	Rock Pool 2
Microhabitat (RS / RP/ RC)																							
Periwinkles																							
Dog Whelk																							
Common Top Shells																							
Common Turban Shells																							
Planaxid Snail																							
Common Chitons																							
Limpets																							
Mussel																							
Rock Oyster																							
Stalked Barnacles																							
Acorn Barnacles																							
Anemones																							
Red Algae*																							
Green Algae*																							
Kyrtuthrix Maculans*																							
OTHER																							
OTHER																							

*by % coverage