



考察岩岸生態系統（馬灣） Study of Rocky Shore Ecosystem (Ma Wan)

姓名 Name _____ 組別 Group _____ 日期 Date _____

學習目標 Learning goals

完成課程後，學生應能：

After the course, students should be able to:

1. 辨認本港常見的岩岸生物，並將其分類 Classify and identify living organisms commonly found in a local rocky shore habitat;
2. 觀察生物如何適應環境 Observe how living organisms adapt to the environment;
3. 識別生態系統中生物與生物之間的關係 Identify interrelationships between living organisms in an ecosystem;
4. 在岩岸量度和記錄非生物因子 Record and measure abiotic factors in a rocky shore ecosystem;
5. 使用簡單取樣工具 Use simple sampling tools;
6. 在實驗室執行簡單水質測試 Do simple analysis of water sample in the laboratory;
7. 組織和分析數據作簡報之用 Analyze and organize data for presentation;
8. 與他人合作進行科學探究 Cooperate with others and work together in a scientific investigation;
9. 欣賞自然，尊重生物 Appreciate the wonder of nature and respect living things.

程序 Schedule

09:00 - 10:00	簡介 Briefing
10:00 - 13:00	考察 Field work
13:00 - 14:00	午膳 lunch
14:00 - 14:30	實驗工作 Laboratory work
14:30 - 15:15	資料整理 Data processing
15:15 - 16:15	分組匯報 Group presentation
16:15 - 16:30	討論及總結 Discussion & summary

儀器和工具 Equipment and tools

1	寫字夾板 (x1) Clipboard	9	50米樣條 (x1) 50m Transect
2	光強度計 (x1) Light meter	10	樣方0.5 x 0.5米 (x1) Quadrat 0.5m x 0.5m
3	風速計 (x1) Anemometer	11	膠整理盤 (x1) Plastic sorting tray
4	電子溫濕計 (x1) Digital thermohygrometer	12	取水樣瓶 (x4) Water sampling bottles
5	手套 (x2) Gloves	13	圖鑑 (x1) Wildlife Pictorial Guide
6	金屬篩 (x1) Metal sieve	14	平板電腦 (x1) Tablet computer
7	鑷子 (x1) Forceps	15	水桶 (x1) Bucket
8	小鏟 (x2) Trowel		

你知道嗎？ Do You Know?

中國海岸線長度約1.8萬公里，橫跨了溫帶、亞熱帶和熱帶地區，主要分成三個海岸類型：平原海岸、山地丘陵海岸和生物海岸。海洋生態系統複雜多樣，孕育了超過20,000多種海洋生物。

China has a coastline that stretches for approximately 18,000 kilometers spanning across temperate, subtropical, and tropical regions. The coastline can be categorized into three types: plain coasts, mountainous and hilly coasts, and biological coasts. The marine ecosystems along the Chinese coast are complex and diverse, nurturing over 20,000 species of marine organisms.

衣著 Clothing

1. 不應穿著短褲。穿著長袖上衣和長褲能更有效防止蚊蟲叮咬，亦可減低被太陽曬傷的機會。
Shorts are not recommended. Long-sleeved shirt and trousers for better protection against mosquito and insect bites, as well as preventing sunburn.
2. 不應穿著拖鞋或涼鞋，而應穿著運動布鞋，以減低腳部受傷的機會。
A pair of plimsolls for preventing injuries. Slippers and sandals are not recommended.

安全 Safety

1. 不要在斜度大、落差大和海浪衝擊大的岩岸進行考察。不准涉入水中進行戲水或暢泳等活動。Avoid the steep slopes, elevated rocks and wave impounding areas for field study. Never go into the water for swimming and other activities.
2. 小心石面濕滑，慢步踏穩基石行走。Beware of the slippery rock surface. Move slowly and try footing for each step.
3. 小心邊緣銳利的石蠔和藤壺，可致嚴重割傷。Beware of the sharp edges of rock oysters and barnacles which can cause serious wound.





1. 取水樣本 Water sampling

利用取水樣瓶分別在潮池及海邊取海水樣本，再帶返實驗室作分析。

Use water sampling bottles to collect water sample in the rock pool and sea at the shore respectively. Bring the water sample to the laboratory for further analysis.

2. 岩岸生境辨別 Identifying rocky habitat

考察地點的岩石海岸有明顯分別，請仔細觀察並找出外露岩岸和碎石灘的不同。

The field site has two obvious different rocky habitats. Identify the differences between the exposed rocky shore and the pebbles shore.

	外露岩岸 Exposed rocky shore	碎石灘 Pebbles shore
基質組成 Substratum composition		
受海浪衝擊情況 Wave action effect		
微生境類型 Types of microhabitat		

3. 主動搜尋動物 Active searching for animals

a. 記錄依附在岩石表面或一些凹陷面生長的動物。

b. 查看藏於石塊底下、潛於潮池水中和石縫之間的動物。可以利用小鏟協助，但記緊把翻起的石塊回復原狀。

c. 將動物暫時置於膠整理盤，辨認、觀察和拍照記錄，隨後全部放歸原處。

a. Record the small animals attached on the rock surface or some cavities.

b. Check for the animals beneath the rocks, submerged in rock pools or hidden in the gaps. A trowel may be helpful but remember to restore the overturned stones to their original states.

c. Animals can be placed temporarily on the sorting tray for identification, observation and photographing. Once the work is finished, put them back to their original places.

動物名稱 Name of the animal	微生境 Micro-habitat 1. 岩石表面 Rock surface 2. 凹陷處 Cavity 3. 石塊底 Beneath rock 4. 潮池中 In rock pool 5. 石縫間 Between rock gaps 6. 沙泥中 In sandy substratum 7. 沙泥表面 On sandy surface	適應被海浪沖刷的方式 Adaptation to wave actions 1. 體型細小 Small body size 2. 扁平身軀 Flattened body 3. 發達的抓附能力 Well developed attachment ability 4. 分泌物能融合基質 Secretion merged to substratum 5. 絲狀物質相連 Silky filaments for connection 6. 聚集行為 Congregation behaviour 7. 鑽挖基質 Drill and bore into the substratum



4. 樣帶動物調查 Belt transect survey for animals

- 由上潮帶拉一條三十米樣線到海邊。每隔十米擺放一個 0.5x0.5 米的樣方，共擺放四個樣方。
 - 在第一個樣方中，盡量不干擾物理環境並辨認和點算移動能力高的生物，然後記錄樣方內的非生物因子。每項參數量度三次，取其平均值。
 - 在樣方內仔細尋找並撿起岩石表面上的動物，然後放在膠整理盤內；如樣方內有石塊，可揭起石塊，查看藏於石塊底下的動物；利用小鏟小心掘出沙泥裡的動物。辨認和點算樣方內活著的動物，隨後全部放歸原處。
 - 重覆上述工作，直至完成四個樣方。
- Lay a 30m transect line from upper shore to the seaside and place 0.5 m X 0.5 m quadrat at every 10m interval.
 - Identify and count the organisms with high mobility in the quadrat without interfering with the physical environment. Record the abiotic factors of the area sampled. For each parameter, take three measurements and calculate the mean.
 - Pick up the animals found on the rock surface within the quadrat and put them into the tray. If there are stones, lift the stones to look for animals hiding beneath. Use a trowel to dig out animals in the soil carefully. Identify and count every living animals. Once the work is finished, return them to their original places.
 - Repeat the above steps until all quadrats are finished.

動物名稱 Name of the animal	抵抗捕食者方式 Anti-predation methods 1.具硬殼 Bearing hard shell 2.偽裝 Camouflage 3.警戒色 Warning colour 4.反應迅速 Quick reaction 5.裝死 Playing dead 6.附著於硬基質上 Firmly attached to hard substratum	個體數目 No. of individuals			
		樣方一 Quadrat 1 (____m)	樣方二 Quadrat 2 (____m)	樣方三 Quadrat 3 (____m)	樣方四 Quadrat 4 (____m)



考察工作 Field work



	氣溫 (°C) Air temperature			相對濕度(%) Relative humidity			光強度(lux) Light intensity			風速(m/s) Wind speed		
樣方一 Quadrat 1												
樣方二 Quadrat 2												
樣方三 Quadrat 3												
樣方四 Quadrat 4												

實驗室工作 Laboratory work

- 把水樣瓶樽蓋打開，直接把溶氧量計的探針放進瓶內，等讀數穩定後記錄溶氧量。
 - 將水樣本倒進量杯內，用酸鹼值計量度酸鹼值。
 - 滴2-3滴水樣本於氯化鈉折光儀的玻璃面上，量度鹽分含量。
 - 用電子秤先量度從焗爐中取出的濾紙重量，然後利用布氏漏斗和抽氣泵過濾250毫升水樣本，再放進焗爐內30分鐘。待濾紙焗乾後，用同一電子秤再量度濾紙重量，最後計算出總懸浮物量。
- Open the sampling bottle's cap and put the D.O. meter probe into the bottle directly. After the reading becomes steady, record the dissolved oxygen level.
 - Pour the water sample into a beaker and use the pH meter to measure the pH value.
 - Add 2-3 drops of water sample on the glass surface of the refractometer to measure the salinity.
 - Weigh a filter paper taken out from the oven by an electronic balance. Filter 250ml water sample using Buncher Funnel and suction pump. Dry the filter paper in the oven for 30mins. Re-weigh the filter paper by the same balance. Calculate the amount of total suspended solids.

溶解氧 Dissolved oxygen (mg/L)		酸鹼值 pH		鹽分含量 Salinity (ppt)		總懸浮物 Total Suspended Solids (mg/L)	
海水 Sea water	潮池水 Rock pool water	海水 Sea water	潮池水 Rock pool water	海水 Sea water	潮池水 Rock pool water	海水 Sea water	潮池水 Rock pool water