



考察沙坪生態系統 Study of Sand Flat Ecosystem

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. 辨認在沙坪常見的生物，並將其分類 Classify and identify organisms commonly found in a sand flat habitat,
2. 觀察生物如何適應環境 Observe how organisms adapt to the physical environment,
3. 識別生態系統中生物與環境之間的關係 Distinguish interrelationships between living organisms and the environment in an ecosystem,
4. 在沙坪量度和記錄非生物因素 Record and measure physical factors in a sand flat ecosystem,
5. 使用樣帶法取樣和其他簡單工具 Use belt transect method and simple sampling tools,
6. 在實驗室執行簡單水質測試 Do simple chemical 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 for conducting a scientific investigation,
9. 欣賞自然，尊重生物 Appreciate nature and respect living things.

程序 Schedule

| | |
|---------------|-----------------------------------|
| 9:00 - 10:00 | 簡介 Briefing |
| 10:30 - 12:30 | 野外考察 Field work |
| 13:00 - 14:00 | 午膳 Lunch |
| 14:00 - 14:50 | 實驗與數據分析 Lab. work & Data analysis |
| 14:50 - 15:30 | 準備匯報 Prepare presentation |
| 15:30 - 16:30 | 匯報與總結 Presentation & summary |

儀器和工具 Equipment and tools

| | | | |
|---|--|----|--|
| 1 | 寫字夾板 Clipboard (x1) | 10 | 膠整理盤 (x1) Plastic sorting tray |
| 2 | 光照度計 Light meter (x1) | 11 | 取水樣瓶 (x1) Water sampling bottle |
| 3 | 電子溫濕計 (x1) Digital thermohygrometer | 12 | 《河口生物》(x1) Estuarine Organisms |
| 4 | 電子風速計 (x1) Digital anemometer | 13 | 生物圖錄 (x1) Wildlife Pictorial Guide |
| 5 | 50米樣條線 (x1) 50M Transect Line | 14 | 《香港海岸植物》(x1) Hong Kong Coastal Plants |
| 6 | 樣方 Quadrat 0.5x0.5M (x1) | 15 | 《沙灘》Sandy Shore (x1) |
| 7 | 指南針 Compass (x1) | 16 | 手套 Cotton gloves (x2) |
| 8 | 鑷子 Forceps (x2) | 17 | 尼龍線 Nylon thread (x1) |
| 9 | 小鏟 Trowel (x2) | | |

衣著 Clothing:

1. 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，不應穿著短褲。 Long-sleeved shirt and trousers for better protection against mosquito and insect bites, as well as preventing sunburn. Shorts are not recommended.
2. 不應穿著拖鞋或涼鞋，而應穿著運動布鞋。 A pair of shoes for preventing injuries. Slippers and sandals are not recommended.

安全 Safety:

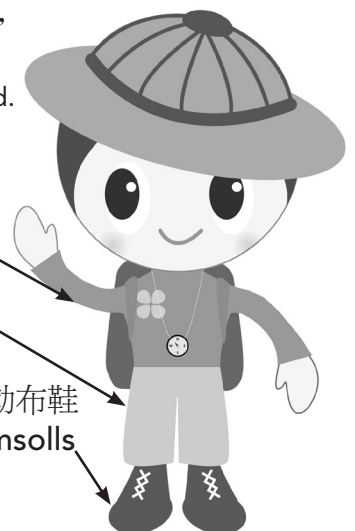
1. 不准涉入水中進行戲水或暢泳等活動。 Never go into the water for swimming and other activities.
2. 小心邊緣銳利的石蠔和籐壺，可致嚴重割傷。 Beware of the sharp edges of rock oyster and barnacles which can cause serious wound.

長袖上衣
Long-sleeved shirt

長褲 Trousers

運動布鞋

Plimsolls



1. 海岸生境辨別 Identifying sea shore habitats

考察地點的海岸有著微妙的變化，請仔細觀察並記錄當中的不同。

The field site has some variations along the coast. Please record the differences by careful observation.

| | 石灘 Stony shore | 沙灘 Sandy shore | 河口 Estuary |
|--|----------------|----------------|------------|
| 基質組成 Substratum composition | | | |
| 乾濕程度 (含水量) Wetness (water content) | | | |
| 微生境類型 例如：沙面、石底、石縫、水體等 Types of microhabitats Example: sand surface, beneath rock, rock gap, water body etc. | | | |

2. 樣方動物調查 Quadrat survey for animals

- i. 選擇一個海岸生境，由高潮線開始拉出一條五十米長的樣線，並與海岸線成直角，直出海邊。
 - ii. 在每隔十米的距離，擺放一個 0.5 x 0.5 米的樣方，記緊要放在樣線的同一邊。
 - iii. 把樣方內，在基質表面生活的動物，撿起並放在膠盤內整理，然後辨認品種和點算數量，只記錄活著的動物，死掉的螺和貝類不要計算（沒有螺蓋 / 壓的螺和輕易打開的貝蛤便是死的）。
 - iv. 若樣方內有石塊，可以翻開檢查石底，辨認和點算這些動物。
 - v. 當完成基面的動物點算，可以利用小鏟挖沙泥，盡量快速地把沙泥挖出，然後可用手把泥中的動物輕輕摸出。挖泥的深度約十厘米。
 - vi. 記錄樣方放置位置的非生物因子。
 - vii. 重覆以上的步驟，完成一共六個樣方的動物調查。
- i. Select a sea shore habitat, starting from the high tide mark to run a 50 metre transect towards the sea, perpendicular to the shoreline.
 - ii. Place a 0.5 m X 0.5 m quadrat at every 10 meter intervals along the transect, make sure the quadrats are on the same side.
 - iii. Pick up the animals found on substratum surface within the quadrat, identify and count them in the sorting tray. Only record the living animals, don't count the dead gastropods and bivalves (shells without operculum or can be opened easily).
 - iv. If there is stone inside the quadrat, lift up the stone to check the animals underneath, identify and count them too.
 - v. After counting the animals on the surface, use the trowel to dig out the soil quickly for about 10cm depth. Sort out the animals by hand, identify and count them too.
 - vi. Record the abiotic factors of the area sampled.
 - vii. Repeat the above procedure for all the six quadrats.

| | 土壤溫度 (°C) Soil temperature | 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 | | | | | |
| 樣方五 Quadrat 5 | | | | | |
| 樣方六 Quadrat 6 | | | | | |



| 動物名稱 Animal name | 抵抗捕食者方式 #Anti-predation methods | 個體數目 No. of individuals | | | | | |
|---------------------|------------------------------------|----------------------------|------------------|------------------|------------------|------------------|------------------|
| | | 樣方一 Quadrat 1 | 樣方二 Quadrat 2 | 樣方三 Quadrat 3 | 樣方四 Quadrat 4 | 樣方五 Quadrat 5 | 樣方六 Quadrat 6 |
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#1. 具硬殼 Bearing hard shell; 2. 偽裝 Camouflage; 3. 警戒色 Warning colour; 4. 反應迅速如逃跑 Quick reaction e.g. fast run; 5. 沒有反應如裝死 No reaction e.g. playing dead; 6. 聚集行為 Congregation behaviour; 7. 鑽挖基質 Drill and bore into the substratum.

3. 海岸植物調查 Coastal plant survey

i. 在考察地點的後灘位置，分辨出草本、灌木及喬木，利用圖鑑嘗試辨認至品種。同時，留意這些植物有甚麼適應特徵，克服強烈的海風、猛烈的陽光、不穩定的地基等。

i. At the backshore, look for the grasses, shrubs, and trees and try to identify them into species with the guide. At the same time, record any adaptation features for them to cope with the strong wind and sunlight, unstable substratum etc.

| 植物名稱 Plant names | 草本 / 灌木 / 喬木 Grass/ Shrub/ Tree | *適應海岸的特徵 Adaptation features for coastal environment |
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* 1. 匍匐生長 Creeping growth form; 2. 節節生根 Roots grow from stem nodes; 3. 肥厚的葉片及莖幹 Thick leaves and stems;
4. 表面長有絨毛 Hairs on leaf surface; 5. 革質葉片 Cuticle leaves; 6. 針形葉 Needle-shaped leaves

4. 取水樣本 Water sampling

利用取水樣瓶在河口和海邊的位置取水樣本，再帶返實驗室作化學分析。

Use water sampling bottles to collect water samples in the estuary and sea water at the shore. Bring the water samples to the laboratory for further chemical analysis.

實驗室工作 Laboratory work

- i. 把水樣瓶樽蓋打開，直接把溶氧量計的探針放進樽內，等讀數穩定後(約30秒)，便可記錄溶氧量，請留意單位。
- ii. 將水樣本倒進量杯內，用酸鹼度計量度酸鹼值。
- iii. 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。
- iv. 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大約100-200毫升的水樣本，再放進焗爐內30分鐘，待濾紙焗乾後，用同一電子秤再量度，得出的相差數值以及過濾水樣本的份量，便可以計算出總懸浮粒子量。
 - a. Open the sampling bottle's cap and put the D.O. meter probe into the bottle directly. Wait for the readings become steady (about 30 sec.) and record the Dissolved Oxygen level with correct unit.
 - b. Pour the water sample into a beaker, use the pH meter to measure the pH value.
 - c. Add 2-3 drops of water sample on the glass surface of the refractometer to measure the salinity.
 - d. Weigh a filter paper taken out from the oven by an electronic balance. Filter 100-200ml water sample using Buncher Funnel and suction pump, then 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 by the weight difference of the filter paper and the amount of water filtered.

| 溶解氧 Dissolved oxygen (mg/l) | | pH | | 鹽分含量 Salinity (ppt) | | 總懸浮物 Total Suspended Solids (mg/l) | |
|--------------------------------|------------------------|-----------------|------------------------|------------------------|------------------------|---------------------------------------|------------------------|
| 海水 Sea water | 河口水 Estuarine water | 海水 Sea water | 河口水 Estuarine water | 海水 Sea water | 河口水 Estuarine water | 海水 Sea water | 河口水 Estuarine water |
| | | | | | | | |