



考察沙坪生態系統 (汀角東) Study of Sand Flat Ecosystem (Ting Kok East)

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生物及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 abiotic 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

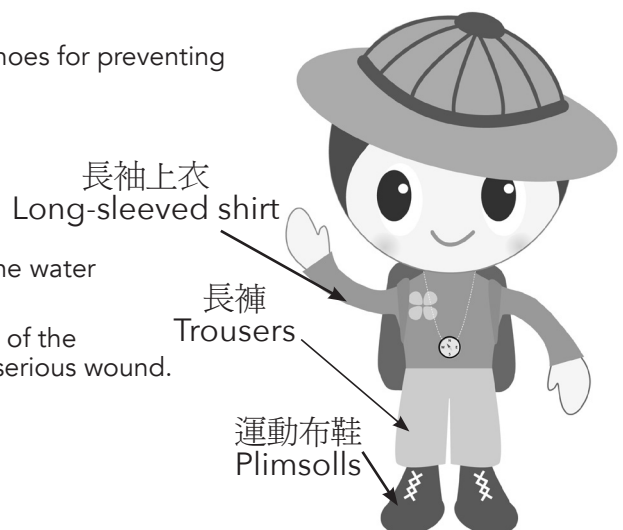
1	寫字夾板 Clipboard (x1)	10	光照度計 Light meter (x1)
2	膠整理盤 (x1) Plastic sorting tray	11	《香港海岸植物》(x1) Hong Kong Coastal Plants
3	電子溫濕計 (x1) Digital thermohygrometer	12	生物圖錄 (x1) Wildlife Pictorial Guide
4	電子風速計 (x1) Digital anemometer	13	《河口生物》(x1) Estuarine Organisms
5	小鏟 Trowel (x2)	14	《沙灘》 Sand Shore (x1)
6	鑷子 Forceps (x2)	15	手套 Cotton gloves (x2)
7	指南針 Compass (x1)	16	尼龍線 Nylon thread (x1)
8	取水樣瓶 (x1) Water sampling bottle	17	30米卷尺 30M Measuring tape (x1)
9	樣方 Quadrat 0.5x0.5M (x1)		

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. 要注意安全。Beware of your own safety.
2. 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.
3. 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 oysters and barnacles which can cause serious wound.



1. 海岸生境辨別 Identifying sea shore habitat

考察地點的海岸有著微妙的變化，請仔細觀察並找記錄當中的不同。

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 microhabitat Examples.: sand surface, beneath rock, rock gap, water body etc.			

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

- i. 由上潮帶拉一條30米卷尺到海邊，在每隔十米距離擺放一個 0.5x0.5 米的樣方。記緊要放在樣線同一邊。
 - ii. 把樣方內，在基質表面生活的動物撿起並放在膠盤內整理；如樣方內有石塊，可揭起石塊，查看藏於石塊底下的動物；然後利用小鏟，小心掘出沙泥裡的動物（挖泥的深度約10厘米），辨認和點算樣方內找到仍然活著的動物。
 - iii. 記錄樣方放置位置的非生物因子。
 - iv. 重覆上述工作直至完成四個樣方。所有生物請放回原處。
- i. Lay 30m measuring tape from upper shore to the seaside, place 0.5m x 0.5m quadrat at every 10m interval. Make sure the quadrats are on the same side.
 - ii. Pick up the animals found on the substratum surface within the quadrat, identify and count in the tray. If there are stones within the quadrat, lift the stones to look for animals hiding beneath. Use a trowel, carefully dig out animals in the soil (dig out soil for about 10cm depth), identify and count every living animals.
 - iii. Record the abiotic factors of the area sampled.
 - iv. Repeat the above procedure until 4 quadrats finished. Once the work is finished, put the living animals back to their original places.

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

- # 1. 具硬殼 Bearing hard shell 2. 偽裝 Camouflage 3. 警戒色 Warning colour 4. 沒有反應如裝死 No reaction e.g. playing dead 5. 反應迅速如逃跑 Quick reaction e.g. fast run 6. 聚集行為 Congregation behaviour 7. 鑽挖基質 Drill and bore into the substratum



	氣溫 (°C) Air temperature	土壤溫度(°C) Soil temperature	光強度(lux) Light intensity	相對濕度(%) Relative humidity	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					

3. 主動搜尋動物 Active searching for animals

- i. 搜尋生活在不同小生境的動物 – 沙泥表面、沙泥內、石塊表面、石塊底下和水邊的動物，可以利用小鏟協助，但記緊把翻起的石塊回復原狀。
 - ii. 可以將動物暫時置於膠整理盤，方便辨認、觀察和拍照記錄，隨後全部放歸原處。
- i. Search for animals living in different micro-habitats - on sand or mud surface, in sand or mud surface, on rock surface, under rock, waterfront. A trowel may be helpful but remember to restore the overturned sands or mud or stones to their original states.
 - ii. 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 Animal name	微生境 Micro-habitat	抗熱抗旱 Preventing desiccation and overheat
	1. 沙泥表面 On sandy surface 2. 沙泥裡 In sandy substratum 3. 石塊表面 On rock surface 4. 石塊底下 Under rock 5. 水邊 Waterfront	1. 厚殼和磨 Thick shell and operculum 2. 外殼中空 Hollow shell 3. 藏身於石塊下 Hide under rocks 4. 鑽挖基質 Drill and bore into the substratum 5. 聚集行為 Congregation behaviour

4. 海岸植物調整 Coastal plant survey

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、不穩定的基質等。

At the back-shore, 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

* 1. 匍匐生長 Creeping growth form 2. 節節生根 Roots grow from stem nodes 3. 葉表面長有絨毛 Hairs on leaf surface
4. 肥厚的葉片及莖幹 Thick leaves and stems 5. 革質葉片 Cuticle leaves 6. 針形葉 Needle-shaped leaves

5. 取水樣本 Water sampling

利用取水樣瓶在河口和海邊的位置取海水樣本，再帶返實驗室作化學分析。

Use a water sampling bottle to collect water sample in estuary and sea water at the shore. Bring the water sample 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。
- i. 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.
 - ii. Pour the water sample into a beaker, use the pH meter to measure the pH value.
 - iii. Add 2-3 drops of water sample on the glass surface of the refractometer to measure the salinity.
 - iv. 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