



考察淡水溪流生態系統 Study of Freshwater Stream 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. 辨認本港常見的淡水溪流生物，並將其分類
Classify and identify living organisms commonly found in a local freshwater stream 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. 在淡水溪流量度和記錄非生物因素 Record and measure abiotic factors in a freshwater stream 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 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 and work together in a scientific investigation;
9. 欣賞自然，尊重生物 Appreciate nature and respect living things.

程序 Schedule

9:00 - 09:50	簡介 Briefing
10:00 - 12:15	考察 Field work
12:15 - 13:15	午膳 Lunch
13:15 - 14:15	實驗工作 Laboratory work
14:15 - 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

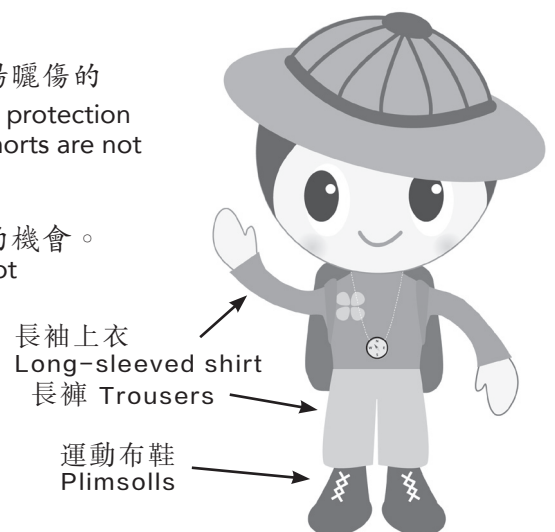
1	寫字夾板 (x1) Clipboard	8	小膠瓶 (x3) Vials
2	光強度計 (x1) Light meter	9	樣方 0.5 x 0.5米 (x1) Quadrat
3	流速計 (x1) Water flow meter	10	橡膠手套(x2 對) Rubber Gloves
4	電子溫度計 (x1) Digital thermometer	11	膠整理盤 (x1) Plastic sorting tray
5	毛筆 (x2) Writing brush	12	取水樣瓶 (x1) Water sampling bottles
6	金屬篩(x1) Metal sieve	13	《生物圖錄》(x1) Wildlife Pictorial Guide
7	鑷子 (x2) Forceps	14	平板電腦 (x1) Tablet computer

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，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. 避免踏足陡斜和濕滑的岩石表面。小心河底的玻璃碎和其他尖銳物件。 Avoid stepping on steep and wet rock surfaces. Beware of broken glasses and other sharp objects at the bottom.
2. 勿涉入深水區，避免直接觸及污水。 Never getting into deep water. Avoid direct contact with polluted water.





4. 樣方動物調查 Quadrat survey of animals

- a. 選擇一處安全的位置，放下一個 0.5 x 0.5 米的樣方，先仔細查看生活在水面和水底石塊表面的動物；輕柔地拿起水底石塊，找出棲於石塊底下和縫隙的動物。辨認和點算樣方內找到的全部動物。拍攝每種動物的外貌特徵。
- b. 記錄樣方放置位置的非生物因子，每項參數，量度三次，取其平均值。
- c. 找另一處環境特性相同的位置，重覆上述工作。
- a. Choose a safe area, place a 0.5 m x 0.5 m quadrat. Carefully look for animals living on the water surface and the underwater rock surfaces. Then, gently pick up small rocks from the bottom, look for animals living under the rocks and animals living in rock crevices. Identify and count all animals found within the quadrat. Take photos of external features of each animals species.
- b. Record the abiotic factors of the area sampled. For each parameter, take 3 measurements and take the average.
- c. Find another place with same abiotic features, repeat the above works.

動物名稱和分類 Animal name and classification	樣方一個體數目 No. of individuals in quadrat 1 (樣方內 Inside Quadrat)	樣方二個體數目 No. of individuals in quadrat 2 (樣方內 Inside Quadrat)	適應水流方式 Adaptation to fast running water 1. 流線形或扁平身軀 Streamlined or flattened body 2. 身體表面平滑 Smooth body surface 3. 肌肉發達的身軀或魚鰭 Muscular body or fins 4. 具吸盤狀結構 With sucker-like structure 5. 具鉤狀結構 Equipped with hooks 6. 用絲線固定 Fixed by fibres 7. 匿藏於遮蔽物 Hiding under shelters

	水流速度(m/s) Water flow rate			光強度(Lux) Light intensity			空氣溫度(°C) Air temperature			水溫度(°C) Water temperature		
樣方一 Quadrat 1												
樣方二 Quadrat 2												

5. 記錄環境因素 Recording environmental factors

- a. 記下近日的降雨、雲量、氣溫等天氣資料。Note down recent weather conditions such as rainfall, cloudiness and air temperature.

- b. 描述河溪周邊的環境，包括附近生境類型、土地用途、村落位置和各種可能的人為干擾等，並繪製一幅簡圖，以顯示相關資料。Describe the physical environment near the stream habitat, such as nearby habitat types, land use, location of village and possible human impacts. Draw a sketch map to show relevant information.

6. 記錄植物 Recording plants

a. 記錄考察地區各種植物及其生長位置和生態功能。Record the plants in the study area. Note their growing position in the water body and their ecological functions.

植物名稱和分類 Plant name and classification	生長位置 Growing position 1. 挺水性 Emergent 2. 沉水性 Submerged 3. 浮葉性 Floating leaf 4. 漂浮性 Free floating	生態功能 Ecological functions 1. 提供食物 Providing food 2. 提供庇護 Providing shelters 3. 減慢水流 Reducing water current 4. 減低光照度 Reducing light intensity 5. 固定河道 Stabilizing water channel

實驗室工作 Laboratory work

7. 水質測試 Water test

用溶解氧計、酸鹼度計、總溶解物計分別量度水樣的溶解氧、酸鹼度和總溶解物，用過濾法找出懸浮物質的量。重複以上四項測試，用自來水作為測試對象，比較兩組數據。

Use a dissolved oxygen meter, a pH meter, and a total dissolved solids meter to measure dissolved oxygen, pH and total dissolved solids of the water sample respectively. Use filtration method to find out the amount of suspended solids. Repeat the above work for tap water. Compare the results.

溶解氧 Dissolved oxygen (mg/l)		pH		總溶解物 Total Dissolved Solids (ppm)		總懸浮物 Total Suspended Solids (mg/l)	
溪水 Stream water	自來水 Tap water	溪水 Stream water	自來水 Tap water	溪水 Stream water	自來水 Tap water	溪水 Stream water	自來水 Tap water

8. 觀察微生物 (延伸活動) Observation on Micro-organisms (Extended activity)

收集少量絲狀水藻，將絲狀水藻樣本置於玻片上，用複式顯微鏡觀察，辨認及記錄各種微生物。

Collect few samples of filamentous algae. Place the samples of filamentous algae on glass slides and observe under a compound microscope. Identify and take records of the micro-organisms observed.

微生物名稱 Micro-organism name	分類 Classification	食性層次 Trophic level