

高中生物科野外考察課程

Senior Secondary Biology Field Study Course



考察淡水溪流生態系統 Study of Freshwater Stream Ecosystem

姓名Name	
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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 實驗工作 13:15 - 14:15 Laboratory work 資料整理 14:15 - 15:15 Data processing 分組匯報 15:15 - 16:15 Group presentation 討論及總結 16:15 - 16:30 Discussion & summary

儀器和工具 Equipment and tools

1	寫字夾板 (xl) 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 (xl) Digital thermometer	11	膠整理盤 (xl) Plastic sorting tray	
5	毛筆 (x2) Writing brush	12	取水樣瓶 (xl) Water sampling bottles	
6	金屬篩(xl) Metal sieve	13	《生物圖錄》(xl) Wildlife Pictorial Guide	
7	鑷子 (x2) Forceps	14	平板電腦 (xl) 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.





考察工作 Field work



1. 取水樣 Water sampling

在將會進行動物調查的位置 , 小心地將溪水完全注滿水樣瓶。

At the location for animal sampling, carefully fill up the water sample bottle with stream water.

2. 目測調查動物 Sighting survey of animals

透過仔細觀察,搜尋生活在不同微生境的動物 — 水面上、水中和水底石塊的表面。試用攝影或攝錄,記錄各種動物的外貌和行為特徵。By careful observation, search for animals living in different micro-habitats - on the water surface, in the water or on the submerged rock surfaces. Try to use photography or videography to record the external features and behaviour of the animals species.

水面動物 Animals on water surface	
水中動物 Animals in the water	
水底動物 Animals at the bottom	

3. 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 $0.5 \text{ m} \times 0.5 \text{ m}$ 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鯖 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

	l	充速度 ter flow	` '	強度(l ht inte		氣溫度 Air tem	` '	温度(ater te	' '	酉	養鹼値	рН		(mg/l) Oxygen
樣方一 Quadrat 1														
樣方二 Quadrat 2														



考察工作 Field work



4. 主動搜尋動物 Active searching for animals

- a. 在有相當數量的根或莖伸入水中的位置,利用一金屬篩去收集生活在水底根莖之間或依附在根莖表面的動物
- b. 用金屬篩撈起水底的枯枝落葉,細心找尋匿藏當中的動物。
- c. 輕柔地拿起水底石塊,找出棲於石塊底下和石塊縫隙的動物。
- d. 將所有動物置於整理盤辨認、觀察和拍照 , 隨後全部放歸原處。
- a. In the regions with considerable amount of submerged plant roots or stems. Use a metal sieve to collect animals attaching on or hiding amongst the submerged plant roots or stems.
- b. Use a metal sieve to scoop up the litter from the bottom. Search carefully for animals hiding amongst the litter.
- c. Gently pick up small rocks from the bottom, look at animals living under the rocks and animals living in rock crevices.
- d. Put all the animals onto the sorting tray, identify, observe and take photos. Then release all of them to their original micro-habitats.

動物名稱和分類 Animal name and classification	微生境 Micro-habitat 1. 水底根莖 Submerged plant roots or stems 2. 水底枯枝落葉 Submerged litter 3. 水底石塊 Submerged rocks	抵抗捕食者方式 Anti-predation methods 1. 具硬殼 Bearing hard shell 2. 建造保護罩 Constructing protective case 3. 偽裝 Camouflage 4. 警戒色 Warning colour 5. 製造毒素 Producing toxin 6. 反應迅速 Quick reaction 7. 匿藏於遮蔽物 Hiding under shelters

5. 記錄環境因素 Recording environmental factors

í	a. 記卜近日的降雨丶雲量丶氣溫等大氣貸料。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. 記錄考察地區的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 Stablizing water channel

實驗室工作 Laboratory work

7. 水質測試 Water test

用溶解氣計、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)		水温度(°C) Water temp.		рН		總溶 Total Dissolve		總懸 Total Suspende	
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	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 Miara arganiam nama	分類 Classification	食性層次 Trophic level
Micro-organism name	Classification	Trophic level