



牛糞小生境大揭秘 (下花山)

Big Secret of the Cow Dung Micro-habitat (Ha Fa Shan)

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:

- 鞏固對營養循環的認知 Consolidate the knowledge of nutrient cycle;
- 明白牛糞乃快速演替的小生境 Understand the rapid succession in cow dung microhabitat;
- 探索牛糞小生境的技巧 Acquire the skill in exploration of cow dung microhabitat;
- 辨別棲息於牛糞中的動物及認識其適應特徵 Identify the animals found in cow dung micro-habitat and understand their adaptation features;
- 與他人合作進行考察和資料整理工作 Cooperate with others to do field investigation and data processing;
- 製作簡單科學報告 Make simple scientific report;
- 欣賞大自然之美和尊重生物 Appreciate the wonder of nature and respect living things.

程序 Schedule

09:00 - 10:00	簡介 Briefing
10:00 - 12:00	考察 Field work
12:00 - 13:00	午膳 lunch
13:00 - 14:00	實驗室工作 Laboratory work
14:00 - 14:30	顯微鏡觀察 Microscopic observation
14:30 - 15:30	數據分析 Data analysis
15:30 - 16:30	匯報及總結 Presentation & summary

你知道嗎？ Do You Know?

2018年漁農自然護理署聯同中國科學院動物研究所的專家對糞金龜亞科進行調查，共記錄了13個屬和51個糞金龜亞科甲蟲在香港出現，其中更有14個物種是香港的新紀錄！

In 2018, the Agriculture, Fisheries and Conservation Department collaborated with experts from the Institute of Zoology, Chinese Academy of Sciences to conduct a survey on the subfamily Scarabaeinae in Hong Kong. A total of 13 genera and 51 species of scarab beetles were recorded, including 14 species that were newly recorded in Hong Kong!



儀器和工具 Equipment and tools

1 寫字夾板 (x1) Clipboard		6 立體顯微鏡 (x1) Stereomicroscope	
2 平板電腦 (x1) Tablet computer		7 培養皿 (x5) petri dishes	
3 圖鑑 (x1) Wildlife Pictorial Guide		8 土壤溫度計 (x1) soil thermometer	
4 小鏟 (x1) Trowel		9 鐵尺 (x1) Steel ruler	
5 鑷子 (x2) Forceps		10 膠袋 (x2) Plastic bag	

衣著 Clothing

- 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.
- 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

- 避免踏足陡斜和濕滑的岩石表面。
Avoid stepping on steep and wet rock surfaces.
- 切勿闖入植物生長茂密的地方，以免觸及蜂巢或被植物割傷。
To prevent being attacked by wasps from disturbed wasp nests or being injured by plant leaves and thorns, do not get into places with dense vegetation.



A. 檢視牛糞 Check the cow dung

在考察地點檢視不同狀況的牛糞。記錄以下數據，並拍照作紀錄。

At the field study site, check the status of cow dung. Record the following data and take photos for reference.

情況 Status	樣本一 Sample 1	樣本二 Sample 2	樣本三 Sample 3	樣本四 Sample 4	樣本五 Sample 5	樣本六 Sample 6
完整性 Completeness						
最大直徑 Largest diameter						
牛糞溫度 Temperature of the cow dung						
表面顏色和堅硬度 Surface colour and hardness						
內部顏色和堅硬度 Inner colour and hardness						
新鮮程度 Freshness (1最新New -5 最舊Old)						
在牛糞表面的動物 Animals found on the surface of the cow dung						

B. 收集牛糞 Collect the cow dung

在考察現場收集一個完好的牛糞樣本，新鮮程度要在2-4之間。收集時，將牛糞放進一個膠袋，並將該牛糞下的落葉或泥土用小鏟挖出，放進另一個膠袋。把兩個膠袋封好，拿回實驗室進行詳細記錄和分析。

Collect a complete cow dung sample with the freshness between 2-4. During the collection, also dig out the wilted leaves and soil beneath the cow dung with a trowel, and place into a different bag. Bring the two bags to laboratory for further record and analysis.

1. 量度牛糞水份含量 Measure the water content in the cow dung

抽取小部份牛糞，先量度重量，再放入焗爐30分鐘，再次度量，便可得出牛糞的水份含量。

Extract a small portion of cow dung and measure its weight, put into the oven for 30mins, weigh again to calculate the water content in the cow dung.

錶面玻璃重量(克) The weight of watch glass (g)	濕牛糞重量(克) The weight of wet cow dung (g)	乾牛糞重量(克) The weight of dry cow dung (g)	(濕牛糞 - 乾牛糞) / 濕牛糞 x 100% = (Wet cow dung - dry cow dung) / wet cow dung x 100% =



2. 檢視牛糞和泥土中的生物 Check for the organisms in the cow dung and soil

把牛糞和泥土分別放在白色膠盤中，利用工具仔細分散。尋找並收集當中的生物，放於立體顯微鏡中觀察。嘗試分類及點算各種生物的數量。

Place the cow dung and soil in sorting trays separately. Search and collect the organisms carefully with appropriate tools. If the organisms are too small, put it under the stereomicroscope for observation. Try to identify and count their numbers of different species.

牛糞 / 泥土中的生物名稱 Name of the organisms in the cow dung / soil	生命史階段 (幼蟲、蛹(糞室)等) Life history stages (larvae, pupae (dung case) etc.)	個體數量 No. of individuals (如超過20, 估算最接近的十位數 If over 20, estimate its number to the nearest tens digit)	營養模式 Mode of nutrition 1. 自養 Autotroph 2. 植食 Herbivore 3. 肉食 Carnivore 4. 雜食 Omnivore 5. 食腐植 Detritivore 6. 食腐肉 Scavenger

分析及討論 Analysis and Discussion

1. 試描述在樣本中的生物多樣性。

Describe the biodiversity of your sample.

2. 利用考察所得資料，就著牛糞不同的新鮮程度，以及生物物種和階段的變化，製作一幅牛糞演替圖。

Based on the data collected from the field survey, including the freshness of cow dung and the change of animals with different stages, construct an annotated diagram of cow dung succession.

3. 牛糞中的生物和土壤中的生物有甚麼相同與不同呢？當中有任何關連嗎？

Is there any similarities and differences in the species found between the cow dung and the soil beneath?
Any relationships between them?

4. 糞金龜有甚麼形態特徵有利於適應牛糞小生境中的獨特挑戰？

What special features do the dung beetles have to adapt the challenges in the cow dung microhabitat?

5. 根據動物調查的數據（個體數量和進食模式），繪製出相關小生境的食物網。

According to the animal survey data (their number of individuals and nutrition modes,) construct a food web in the microhabitats.