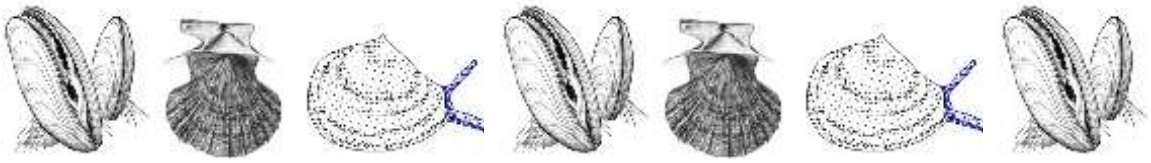
17th INTERNATIONAL BIOLOGY OLYMPIAD
9 - 16 JULY 2006
Río Cuarto – República Argentina
第 17 屆國際生物奧林匹亞

PRACTICAL TEST 實作
2

Animal Anatomy, Systematics and Ecology
動物解剖學，生態學和分類學

Student Code: 學生代碼	



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General remarks about the practical tests
關於實際的試驗的一般說明

DEAR PARTICIPANTS 參賽者

The practical tests are organized in four different laboratories.
實作試驗被在 4 間不同的實驗室進行

Nº 1- Plant Anatomy, Systematics and Physiology 植物解剖學，分類學和生理學

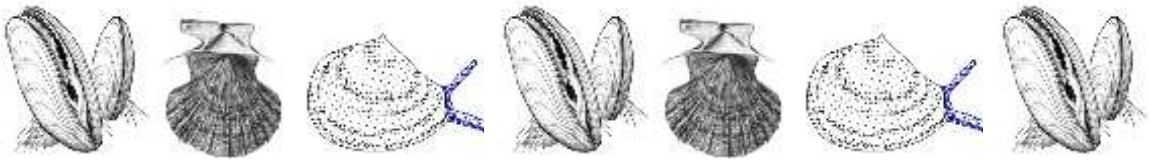
Nº 2- Animal Anatomy, Systematics and Ecology 動物解剖學，生態學和分類學

Nº 3- Biocheminstry 生物化學

Nº 4- Microbiology 微生物學

- You have **1 hour** to perform laboratories Nº 1 and Nº 2. 實驗室 1 及 2，1 小時
- You have **1 hour 30 minutes** to perform laboratories Nº 3 and Nº 4. 實驗室 3 及 4，1.5 個小時。
- You can score maximum of **40 points** in each laboratory, which means a total of **160 points** for the whole practical test. 每間實驗室最多可得 40 分，實作試驗共 160 分

Good luck !!!!!!!



Practical Test Nº 2: Animal Anatomy, Systematics and Ecology

動物解剖、分類及生態

Introduction 引言

Bivalves are an important group of molluscs, the second in number of species after gastropoda. Other names for the class include Pelecypoda, and Lamellibranchia.

雙殼貝綱(Bivalve)是軟體動物門(molluscs)中非常重要的一群, 它的數量僅次為腹足綱(gastropoda), 此綱也可稱為斧足綱(pelecypoda)或瓣鰓綱(lamellibranchia).

Bivalves include all dorsoventrally compressed mollusc species; they typically have two-part shells dorsally hinged by strong muscles and ligaments.

雙殼貝包含所有背腹扁平的軟體動物, 其特徵包括：具有雙殼, 在背部有強韌的肌肉和韌帶連接雙殼.

The mantle, which secretes the shell, is the dorsal body wall covering the visceral mass. The mantle cavity is lateral and in most bivalves, the gills have a respiratory and digestive function.

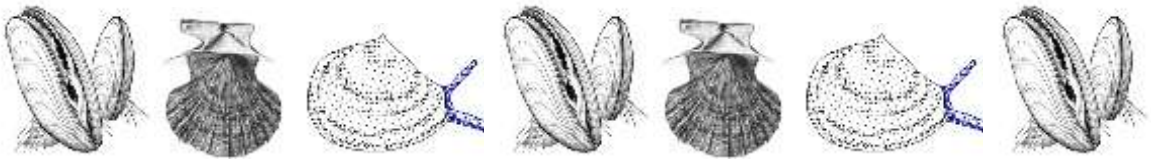
雙殼貝的外殼是由外套膜分泌而來, 套膜包覆著內臟, 在多數雙殼貝中, 外套腔多位於兩側, 鰓具有呼吸和消化的功能.

Unlike other molluscs, bivalves lack a radula and feature labial palps, which carry food from the gills to the mouth.

與其他軟體動物不同的是, 雙殼貝缺乏齒舌, 具有唇瓣, 可將食物由鰓送到口部.

The head is small and it does not feature specific sensorial organs.

雙殼貝的頭很小, 沒有特化的感覺器官.



Task Nº 1: Bivalve dissection 雙殼貝解剖 （共 13 分）

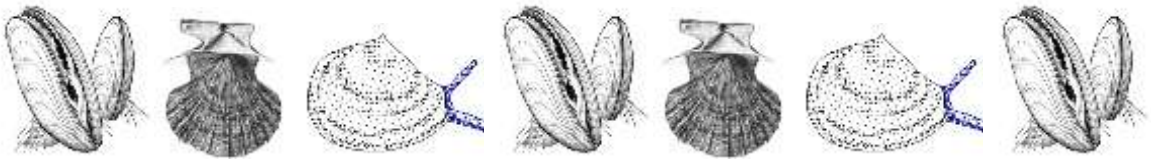
Task Nº 1 includes part A and part B 包括 A、B 兩部分（A 佔 10 分、B 佔 3 分）

The aim is to compare anatomical structures in three marine bivalves.
這個解剖題的主要目標, 是比較三種海棲雙殼貝的構造

Materials:

- ✓ Tray containing three samples of marine bivalves numbered 1, 2 and 3 (stored in 70% alcohol).
  標本盤: 內含編號 1~3 的三個海洋雙殼貝標本 (保存在 70%酒精中)
- ✓ 1 dissection table.一個 解剖台
- ✓ 1 lancet. 一支解剖刀
- ✓ 1 pair of tweezers. 一支鑷子
- ✓ 10 color pins (3 green, 3 red, 3 blue and 1 yellow).
  十支大頭針(三綠, 三紅, 三藍, 一黃)
- ✓ 1 pair of disposable gloves. 一雙拋棄式手套
- ✓ 1 respirator mask. 一個口罩
- ✓ 1 magnifying glass. 一支放大鏡

REMARK: BEFORE STARTING THE PRACTICAL TASK, BE SURE TO HAVE ALL THE LISTED MATERIALS, OTHERWISE RAISE YOUR HAND TO CALL THE ASSISTANT.
實驗開始前, 檢查所有的材料, 如有不足, 請舉手要求工作人員的協助



PART A

Procedure

1- Put on the gloves and respiratory mask.
戴上手套和口罩

2- Before starting the dissection, locate the external parts of the bivalve (Figure 1).
在開始解剖前, 先辨識雙殼貝的外形 (圖一)

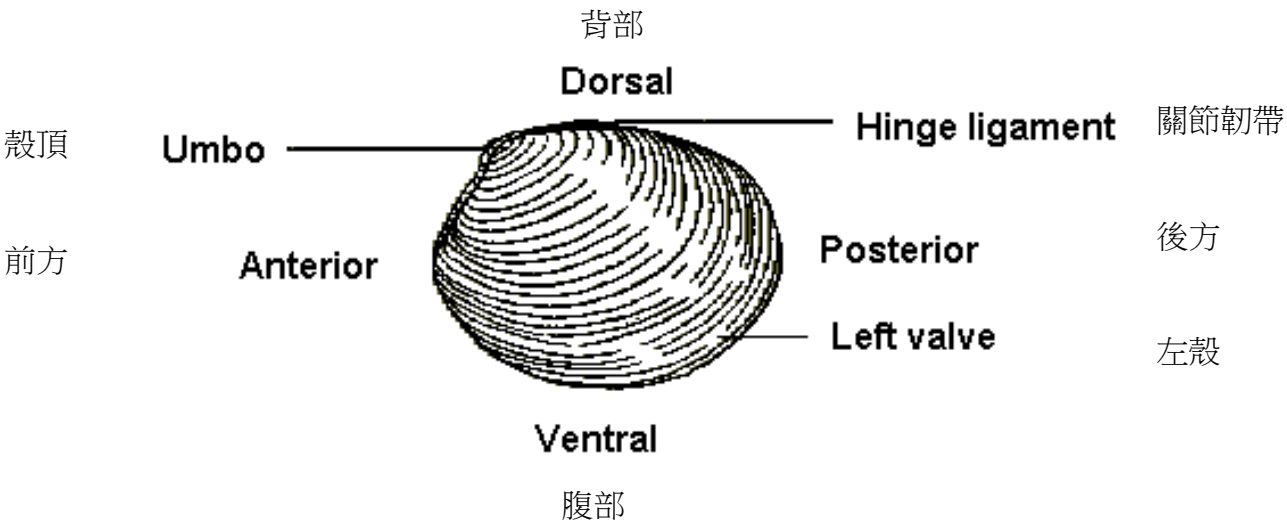
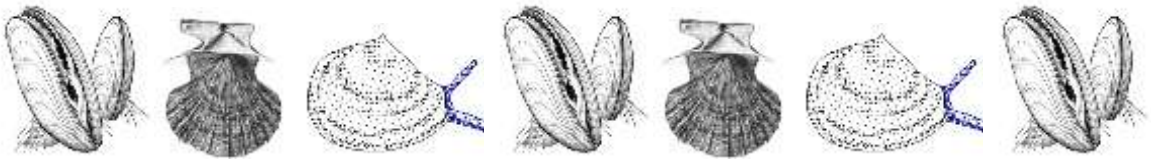


Figure 1

3- The valves are hinged by ligments. In order to identify the internal structure, you have to dissect the bivalve. You must be **very careful** when separating the valves, so as not to hurt your hands.
兩外殼以韌帶連接, 為了辨識內部構造必須解剖標本, 解剖時要非常小心, 以免傷到手.

Insert the lancet (Figure 2) and cut ✂, the adductor muscle/s, according to the bivalve.
插入解剖刀(圖二), 沿著外殼切斷閉殼肌.



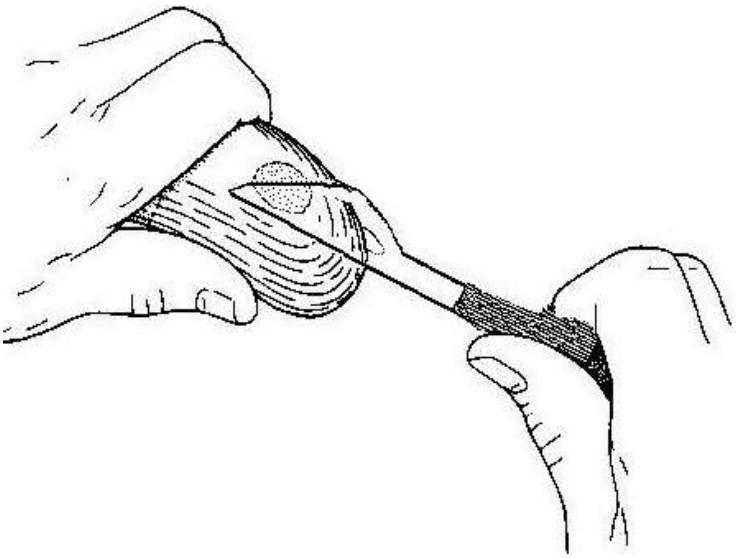


Figure 2

4- In order to separate the valves completely, once the muscle/s is/are cut, you must cut carefully the ligament in the umbo area.
為了完全分離雙殼, 請在切斷肌肉後, 請小心地切開殼頂的韌帶

5- Once the three samples are dissected, identify the structures with different color pins.
當三個樣本都解剖完後, 以不同顏色的大頭針標示以下構造

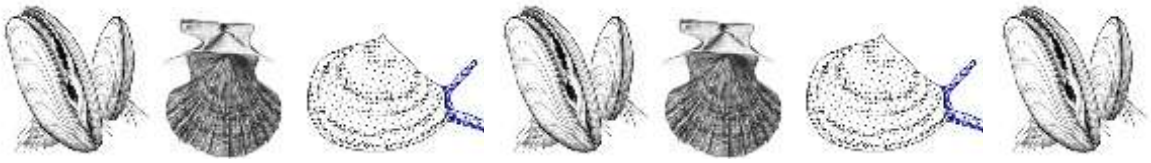
Use 3 pins for each bivalve sample (green, red, and blue), and a yellow pin only for bivalve 2, in the following way:
每種雙殼貝樣本用三支相同顏色的大頭針標示(分別為綠、紅、藍), 黃色的大頭針僅用於標示樣本 2, 方式如下:

- **green** pin for the **foot**. 以綠色大頭針標示足部
- **red** pin for **labial palps**. 以紅色大頭針標示唇鬚
- **blue** pin for the **gills**. 以藍色大頭針標示鰓
- **yellow** pin for the **inhaling siphon**. (Only for bivalve 2)
- 以黃色大頭針標示入水管 (僅需標示於樣本 2 上)

6- **After finishing the task you must raise your hand. An assistant will check the task. The Practical Test Sheet should be signed by both, you and the assistant**.
完成操作後請舉手, 由監試人員檢查, 試卷紙需要有你本人及監試人員的簽名

Signatures:

Student.:.....**Assistant**:.....



PART B

As you have seen during the dissection, the three bivalves show differences in their muscles.
在解剖過程中可以觀察到, 這三種雙殼貝的閉殼肌存在著差異

There exists a muscle classification according to their number and size:
根據閉殼肌的數量和大小, 可將閉殼肌分類如下:

- ✓ Dimyarian isomyarian condition: in which both muscles have similar size.
  等閉殼肌: 兩個閉殼肌的大小相同
- ✓ Dimyarian heteromyarian condition: in which both muscles are different in size.
  不等閉殼肌: 兩個閉殼肌的大小不同
- ✓ Monomyarian condition: Having only one, large adductor muscle to close the valves.
  單一閉殼肌: 只具有一個大型閉殼肌, 用以關閉雙殼

Complete the table by using the codes below. 利用代號完成以下表格

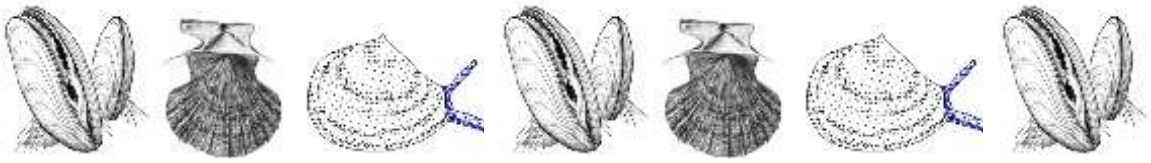
	Bivalve 1	Bivalve 2	Bivalve 3
Condition 狀態			

Codes: **代號**

01- Dimyarian isomyarian. **等閉殼肌**

02- Dimyarian heteromyarian. **不等閉殼肌**

03- Monomyarian. **單一閉殼肌**



Task Nº 2: Bivalve adaptive radiation

Task Nº 2 includes parts A, B and C. （共 27 分）

Most bivalves are filter feeding molluscs, that is to say, they filter marine water to obtain their food consisting mainly of plankton and suspended organic matter. The evolutionary acquisition of feeding by filtering allowed them to colonize many habitats, thereby giving rise to an important adaptative radiation.

所有雙殼貝皆為濾食性的軟體動物, 即經由過濾海水來獲得食物, 其食物主要包括浮游生物及懸浮的有機物質. 演化出此種濾食方式, 使它們得以在不同的環境中生存, 因而產生輻射適應.

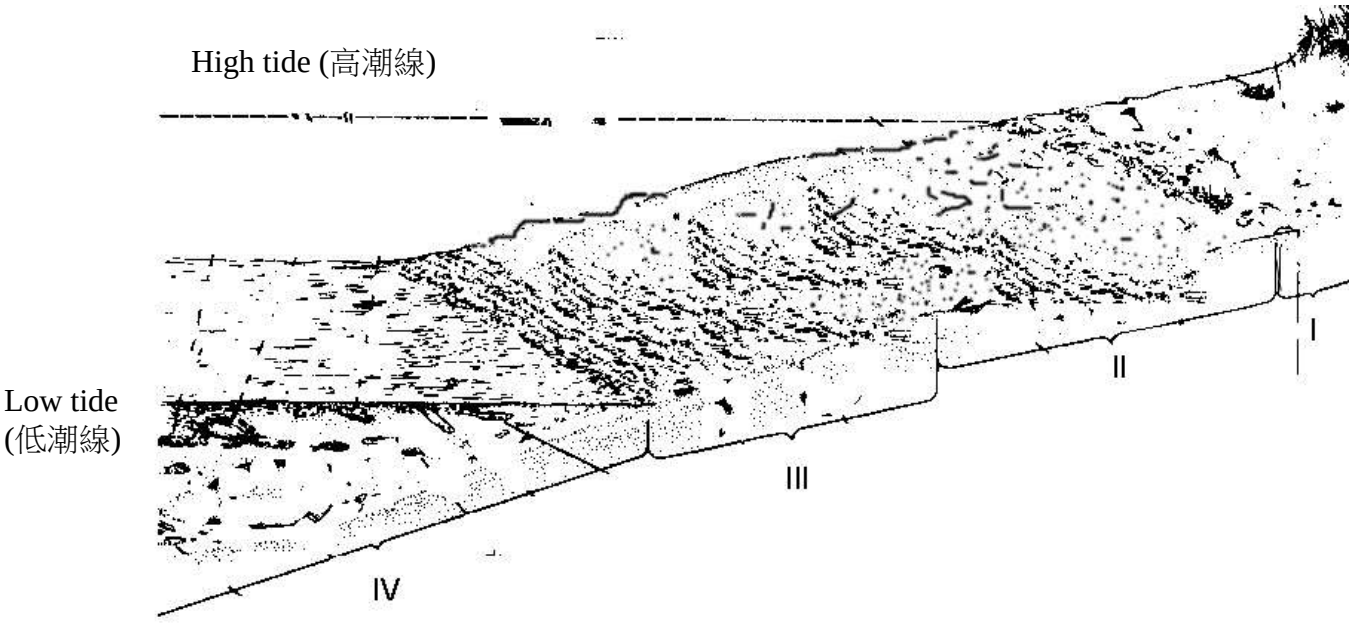
The aims of this part of the test are to determine the habitat of the marine bivalve samples and to identify the exomorphological and anatomophysiological characteristics associated to these habitats.

此部分的目的, 是要判斷不同樣本在海中生存的環境為何? 並指出外部形態及生理解剖特徵, 與它們棲息環境的關係.

PART A (9 points) – Below there are two marine zones, one corresponding to a sandy beach (Figure 1), and the other to a rocky beach (Figure 2).

part A 以下二圖表示兩種海洋環境(每種環境又有不同的分區), 圖一表示沙岸, 圖二表示岩岸.(9 分)

Figure 1



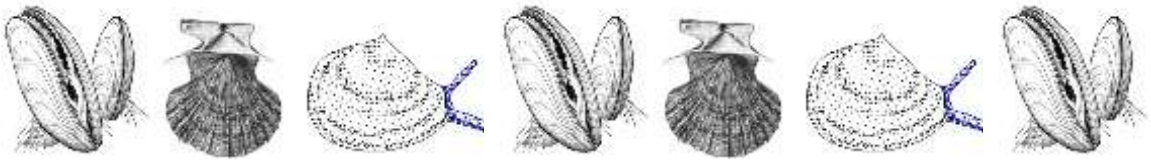
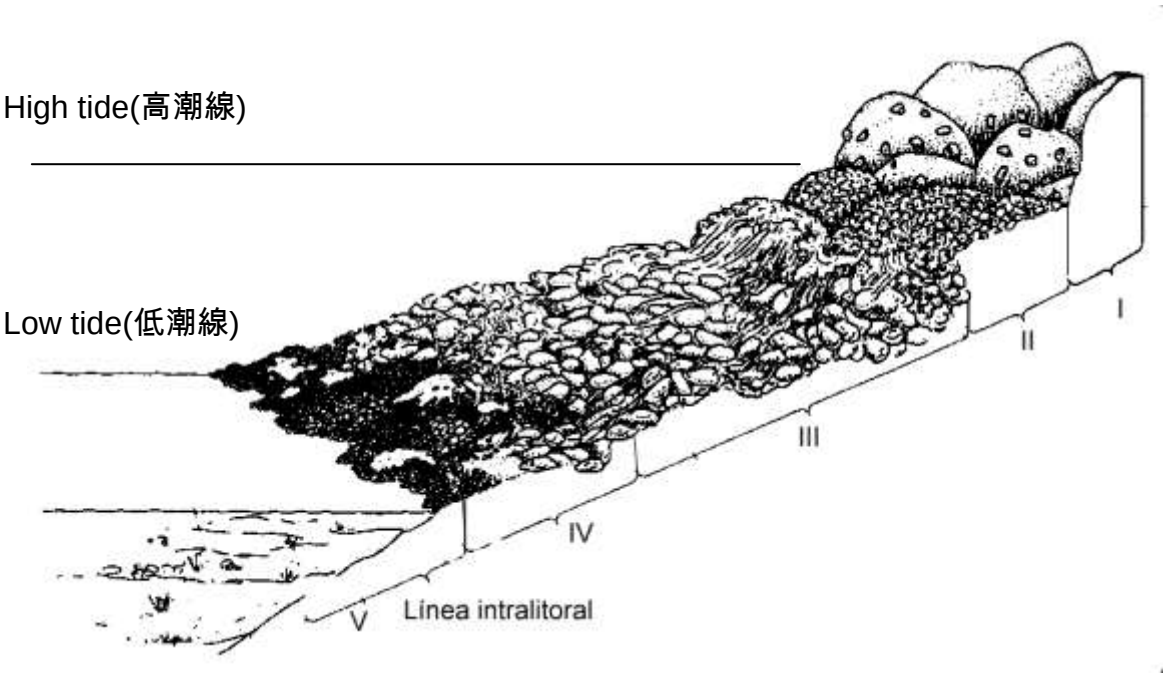


Figure 2



Fill in the corresponding box in each table, indicating the site where the samples given in this practical task can be found.

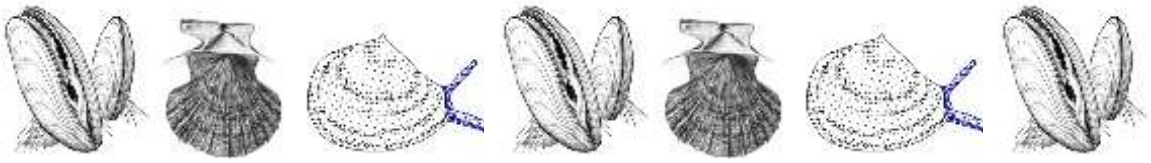
請將代碼 1~3 填入下表中, 指出不同樣本應出現在何種海洋環境中

Codes:代碼

01- Bivalve 1. 02- Bivalve 2. 03- Bivalve 3.

Sandy beach 沙岸	Zone I	Zone II	Zone III	Zone IV

Rocky beach 岩岸	Zone I	Zone II	Zone III	Zone IV	Zone V



PART B (6 points) - Keeping in mind the zones occupied by bivalves in rocky and sandy beaches, you must determine the category of the given samples by writing an **"X"** in the corresponding box.

Part B 根據這些雙殼貝在沙岸及岩岸各區的分布情形, 請以 "**X**" 表示這些雙殼貝樣本應生存於下列何種環境中(6 分)

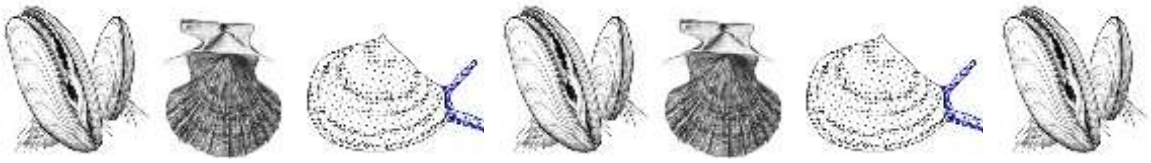
	Bivalve 1	Bivalve 2	Bivalve 3
Burrowers in soft substrate INFAUNA **穴居於軟的介質中**			
Surface dwellers attached to the substrate EPIFAUNA **附著於介質表面**			
Free swimming **自由游泳**			

PART C (12 points) - A series of characteristics related to the three given bivalves and their habitats is given below. Complete the table by examine your dissected specimens and summarize ALL their characteristics by writing the appropriate answer codes from the list into the table below.

Part C 以下為與三種樣本的特徵及其棲息環境相關的敘述, 檢查所解剖的樣本, 總結所有特徵, 將適當的代碼填入下表: (12 分)

Answer code: 答案代碼

01- large, burrowing foot **具有大型、穴居的足**



02- reduced, finger-like foot. 具有退化、指狀的足

03- highly reduced and barely visible foot. 具有高度退化、極不明顯的足

04- no anterior adductor muscle. 缺乏前閉殼肌

05- no siphons. 缺乏水管

06- two siphons: incurrent and excurrent (inhaling and exhaling).

具有兩套水管(出水管和入水管)

07- fringed incurrent siphon. 入水管位於殼的邊緣

08- highly developed sensory lobes in the mantle, with tentacles and small ocella.

外套膜上有高度發達的感覺葉, 其上有觸鬚及眼點

09- flat lower valve (right) 具有扁平的下殼(右側)

10- mantle edge with fusion points. 外套膜的邊緣融合

11- byssal threads. 具有分泌黏液附著於環境的足絲線

Bivalve 1	Bivalve 2	Bivalve 3