New progress on horseshoe crab rearing

馬蹄蟹保育迎來新進展

By Ellen Chan
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It was a sunny morning when the Form 5 students from St Paul's Secondary School started their journey to San Tau Village on Lantau Island. They were on a field trip during the summer vacation to study the ecological environment and characteristics of juvenile horseshoe crabs living in the wild.

At the start of the programme Dr Cheung Siu-gin, Associate Professor from the Department of Biology and Chemistry at CityU, and a team of CityU researchers explained the differences between wild and captive-bred horseshoe crabs, focusing on habitat and food. Most of the information was new to the participating students.

"I didn't know horseshoe crabs lived so close to people," said Catherine Wong Kit-ying, one of the students on the programme. "It makes me appreciate that environmental protection is very important. Anything we do can affect the ecological environment of creatures living in the wild."

Dr Cheung said the aim of the trip was to enhance the students' awareness about environmental protection. "Through the programme, the students can witness the difficulties facing the horseshoe crabs and other marine creatures. They learn that some of the environmental problems are caused by nature, but some are man-made," Dr Cheung said.

Horseshoe crabs are protected animals on the mainland, which means it is illegal to kill or eat them. However, they are not protected in Hong Kong, and they often get served as local fare in restaurants.

CityU has been engaged in the conservation of horseshoe crabs for many years, promoting the idea to secondary school students and the general public. In addition, Dr Cheung and Dr Paul Shin Kam-shing, also of the Department of Biology and Chemistry, have worked together on artificial methods of raising horseshoe crabs in order to increase their numbers and improve their survival rate.

One method is to insert computer chips into the captive-bred horseshoe crabs and then release them into the wild. The researchers then track the released crabs and compare them with those raised

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in a laboratory. They found that crabs reared in a laboratory for two years were a similar size to those living in the wild for four years. As this showed the crabs in a laboratory grew to a bigger size faster, the researchers said they hope raising the crabs artificially can help improve stocks.

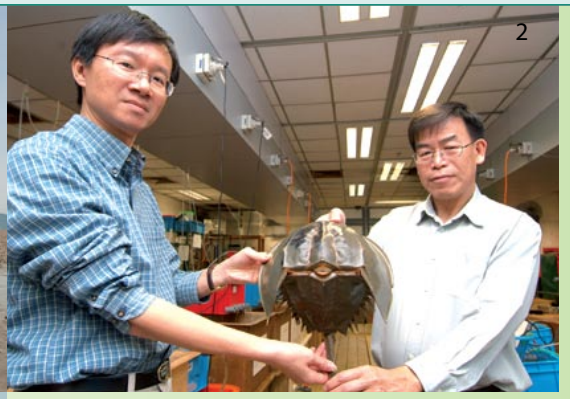
Dr Shin said the team has also tried to feed the crabs different foods such as brine shrimp and clams, matching the ratio of nutrients with the crabs' growth. "The ultimate objective is to speed up growth in order to release the crabs earlier and improve their survival rate," Dr Shin said.

They have also experimented with different reproductive techniques. In the past, Dr Shin said they had to kill the crabs to get to the sperm and eggs but the research team recently found that the temperature and salinity of water can play an important role in the fertilization process. The researchers are now trying to control these two variables to enable reproduction naturally in a laboratory, eliminating the need to kill.

The Department of Biology and Chemistry, which is strongly committed to the protection of marine life and the ecological environment, will hold an "International Workshop on the Science and Conservation of Horseshoe Crabs" at Hong Kong Wetland Park on 13–16 June 2011. The workshop will be supported by the Agriculture, Fisheries and Conservation Department of the Hong Kong SAR Government and the Ocean Park Conservation Foundation. Prominent scholars from different countries will be invited to discuss in detail horseshoe crab numbers and their ecological environment plus related educational issues.

400m years old, and endangered

The scientific name of the horseshoe crab is Tachypleus tridentatus. Its head and abdomen look like a horse shoe, hence the name. Actually, it is not a crab but a close relative of the spider and scorpion. It has evolved over 400 million years and now ranks locally among the top 10 most endangered marine species, according to the World Wild Fund for Nature (Hong Kong). Interestingly, its blood turns blue when exposed to air, a process used to test for endotoxins and bacterial contamination, a quality duly noted by the pharmaceutical industry.



1. 研究員使用探測器追蹤裝上晶片的馬蹄蟹蹤跡。

2. 張肇堅博士（左）及單錦城博士。

「城大參與馬蹄蟹保育工作已多年，近年更致力向中學生及社會大眾推廣保育，喚醒各界對大自然保育的關注。」

暑假期間一個天朗氣清的早上，一群來自聖保祿中學參加馬蹄蟹校園保姆計劃的中五學生與城大生物及化學系副教授張肇堅博士及研究員，浩浩蕩蕩朝着大嶼山磡頭村出發了。他們將實地考察野生馬蹄蟹的自然生態環境和習性。

張博士和研究員向中學生悉心講解了野生與人工飼養馬蹄蟹的區別，例如棲息環境、食物等。

這些中學生是首次親身在自然環境裏接觸野生馬蹄蟹，感到新鮮有趣，興奮不已。「我一點也不知道，原來馬蹄蟹自然棲息的地方與民居距離不足百米，突然覺得保護環境很重要，因為人類的一舉一動都可能影響自然生物的生態環境，」名叫王潔迎的學生說。

張博士表示，安排參加馬蹄蟹校園保姆計劃的中學生到野外實地考察，目的是希望提升學生對保護自然環境的關注與認識。「學生可以直接了解馬蹄蟹及其他海洋生物所面對的挑戰，既有自然的，也有人為造成的，」張博士說。

在內地，馬蹄蟹已被列為國家二級保護動物，嚴禁捕殺及食用；可是在香港，馬蹄蟹仍未被列入此類別，因此仍有人食用馬蹄蟹，加強相關的保育推廣工作，實在是刻不容緩。

城大參與馬蹄蟹保育工作已多年，近年更致力向中學生及社會大眾推廣保育，喚醒各界對大自然保育的關注。張博士與同系副教授單錦城博士攜手合作，研究人工飼養馬蹄蟹的方法，藉此增加這種瀕臨絕種生物的數量及存活率。

他們曾經將晶片植入放生的人工馬蹄蟹，並成功找回其中一隻，繼而將牠與同期未放生到野外的馬蹄蟹比較，發現在實驗室內飼養兩年的馬蹄蟹體形已與野外生長了四年的馬蹄蟹相等，證明實驗室養殖的馬蹄蟹生長速度理想，因此希望藉此方法使馬蹄蟹的數量回復較高水平。

單博士表示，曾經嘗試用不同食糧，如豐年蝦、蜆肉等，飼養馬蹄蟹。目前，研究小組根據馬蹄蟹的生長狀況，自行調配含不同養料比例的人工飼料養育馬蹄蟹。「我們開始利用自行調配的飼料餵飼馬蹄蟹，並準備研究這些飼料對馬蹄蟹生理有甚麼影響，最終是為了加快牠們的生長速度，縮短日後放生的時間和有效改善存活率，」單博士說。

單博士指出，過往利用人工繁殖馬蹄蟹時，需要先殺掉一對雌雄馬蹄蟹，再從牠們身上取出卵子與精子交配。近日研究小組發現，水的溫度及鹽度會直接影響馬蹄蟹的產卵情況，於是嘗試在實驗室內透過控制水溫和鹽度讓人工飼養的馬蹄蟹自然繁殖，可以免卻殺掉馬蹄蟹進行交配的程序。

城大一向關注保護海洋生物及生態環境。生物及化學系得到漁農自然護理署及海洋公園保育基金的支持，定於明年6月13至16日，在香港濕地公園舉行全球性國際研討會及工作坊，探討馬蹄蟹在亞洲區的狀況。屆時將邀請世界各地的著名學者參加，深入討論馬蹄蟹的數量、棲息的生態環境、應用及教育等範疇的問題。

四億年的活化石

馬蹄蟹是鱟的俗稱，頭及胸部看上去像隻馬蹄，故名馬蹄蟹。其實並不是蟹，而是蜘蛛和蠍子的近親，在地球上已生活了約4億年，現被世界自然基金會（香港）列入海洋十種瀕危動物之一。馬蹄蟹的血液暴露在空氣中會變為藍色，具有醫學價值，在美國有藥廠用其血液製造檢測癌症及病菌感染試劑。