sources, indicating their tolerance to salinity changes and desiccation stress. Observations have shown that they are also good climbers as they move up and cling on mangrove stems tightly during high tides, possibly as a means to avoid prolonged immersion as well as predation from aquatic predators. Spotting of *P. bidens* on open sand-/mudflats (that are immediately next to the mangroves) is extremely unusual. They seem to have a strong association with mangroves and their activity is, therefore, mostly restricted within the mangrove stand. Field observations suggest that they are aggressive and agonistic encounters are rather common. When kept in captivity, they tend to cannibalize.

Perisesarma bidens are swift and alert, and therefore difficult to catch. They can retreat very quickly into narrow refuges and also give a painful bite! As in many other sesarmine crabs, *P. bidens* play a key role in the mangrove food web as leaf litter processors. Interestingly, they also spend most of their time cropping on surface sediments, a behaviour that has been recognized, yet generally ignored by crab ecologists. The reason(s) for crabs feeding on such an apparently nutritionally inferior food item could be simple or complex, which is a good lesson to me that there is still much to be learnt about mangrove crabs' feeding ecology.

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Fig. 1. *Perisesarma bidens*

'Hong Kong Newt (*Paramesotriton hongkongensis*)' by Dr Leung Sze Lun, Alan

Of the 23 species of amphibians in Hong Kong, there is only a single species of salamander, also known as "tailed amphibians", naturally occurring in Hong Kong and this is the Hong Kong newt, *Paramesotriton hongkongensis*. The species is endemic to Guangdong, including Hong Kong, and protected by law under the Wild Animals Protection Ordinance Cp. 170 Schedule 2. The adult length, from snout to the end of the tail, is about 11 to 14 cm, with four legs similar in size. The body colour ranges from light brown to dark brown with some patches of orange markings scattered on the ventral side of the body. The patterns of the patches are unique for each individual, just like the fingerprints of humans. The tadpoles have some finger-like gills around their necks which are usually absent in frog and toad tadpoles, and the gills disappear after metamorphosis to adult.

The Hong Kong newts undergo seasonal breeding migrations. Each year after the end of the wet season around October, the newts move into the stream pools. After breeding, they will eventually leave the pools around December, but the information on where they go is still poor. From a Hong Kong newt migration study I carried out during 1996 to 1997 "The seasonal migration and diet of Hong Kong Newts, *Paramesotriton hongkongensis* in KFBG and Tai Tam", it was found that at the beginning of the breeding season, the newt population in pools was male-biased. Towards the end of the breeding season, the newt population tended to become female-biased. The males that breed quicker than others may have an advantage since their offspring can hatch earlier. As cannibalism is common in this species, being "bigger" can reduce the risk of being eaten.

Fig. 2. 'Hong Kong Newt' *Paramesotriton hongkongensis*

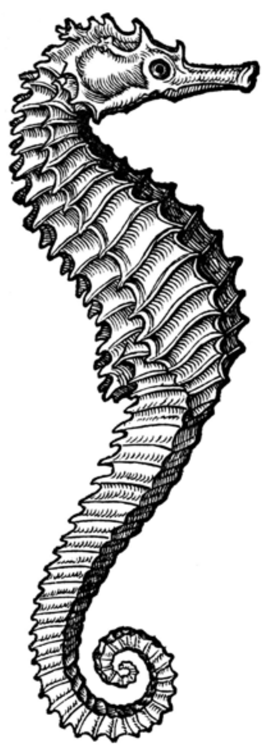
MISCELLANY

CITES in Santiago

by Yvonne Sadovy

The recent CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) meeting, held in Chile, Santiago, ended on some high notes in mid-November after two exhausting weeks of debate, politics and a lot of sitting around. This was the 12th Conference of the Parties (CoP): the term Parties refers to the countries that are signatories to the Convention, each of which can send delegations to the Conference and vote on the various proposals discussed for species listing on CITES Appendices. There are currently 159 Parties (Kuwait was welcomed for the first time at this CoP), including China. I was very fortunate to have been part of the IUCN (World Conservation Union) delegation as Chair of the Grouper/Wrasse Specialist Group. I was invited because of the United States proposal to list the humphead wrasse, *Cheilinus undulatus*, on Appendix II. IUCN had a special role as an intergovernmental organization (IGO) at the Conference and is considered to be the primary scientific authority on species conservation status. The IGO status enabled IUCN to comment frequently on the various proposals up for consideration by the Conference.

So why is CITES important for conservation and what is the significance of the different CITES Appendices? CITES is the only widely recognized, respected and implemented international instrument that deals with sustainable international trade in wild species. It involves 3 appendices. The best known is Appendix I that prohibits any commercial trade in species that are already endangered, such as tigers, gorillas or the coelacanth. In practice, the most important Appendix is II. This includes species that are not endangered but may become so if trade is not regulated. An inclusion on Appendix II requires that listed species are properly monitored and regulated to ensure that any trade (all of which requires a licence or permit) is sustainable and comes from a legal source. Appendix II includes about 95% of the 30,000 species listed CITES. Appendix III includes species at the request of a particular Party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation. More details can be found on http://www.cites.org/index.html.



One of the biggest successes was the inclusion in Appendix II, for the very first time, of fishes of significant commercial importance. Two species of shark, the basking shark *Cetorhinus maximus* and the whale shark, *Rhincodon typus* and 32 species of seahorses (genus *Hippocampus*) were listed. These listings represent landmark decisions because, until now, the Convention has not played an important role in global fisheries. Why is this? There are several reasons but probably three that are most important. The first is that it is only relatively recently that we are coming to realize, and accept, that commercially exploited fishes could possibly be threatened with extinction (or rather, that there is no reason to believe that they are any different from other plants and animals in this respect). The second reason is that, for many commercially important species, there are regional fishery management authorities or the Food and Agriculture Organization (FAO) of the United Nations that can, or at least should, deal with threats to the species. In such cases, it is argued, CITES is not needed. However, FAO does not manage fish and many areas have no regional authority (think of the South China Sea for example). The third reason is that there is insufficient information on most fishes to be able to properly assess their conservation status. While it is certainly true that population status of aquatic marine species are difficult to evaluate fishery management is often based on similarly inadequate data. Unfortunately, it may be the best information available and the sole to act upon. Clearly such arguments are no longer excuses to exclude fishes from CITES Appendices. In case you were wondering, the humphead wrasse was not listed but fell just 7 votes short of the two-thirds majority needed. Given declining numbers in this species I hope that the next CoP will afford it the attention it needs, especially given the successes with commercial fishes.

Among the other important outcomes from the CoP were listings for mahogany, 26 species of Asian turtles, several parrots, protection for several threatened species in Madagascar, and strict controls for trade in African elephant ivory stockpiles. Mahogany *Swietenia macrophylla* (neotropical populations including logs, veneer sheets, plywood and sawn wood) was listed on Appendix II after 10 years of discussion while the turtles were included because of declining numbers, habitat loss and illegal trade. The yellow-headed parrot *Amazona oratrix,* yellow-naped parrot *A. auropalliata*., and blue-headed macaw *Ara couloni* were transferred from Appendix II to Appendix I because population numbers have continued to decline due to trade and habitat loss.

The Santiago meeting is considered to have been one of the most politicized of all CoPs but it also made ground-breaking progress with listings such as mahogany and fishes. One thing is clear; for species that are heavily traded, vulnerable and not effectively managed, CITES is a critically important management and conservation tool….for many species, it is the only one.

Explorations of two underground water channels in Hong Kong!

by Rita Yam, Sze-man Cheung and Benny Chan

The environment and life inside underground water channels often gives people a mysterious impression due to the darkness, reduced temperature, difficulties of access and the stories of monsters inside. Ecological studies concerning underground water channels have tended to focus on the diversity of bats which are the major occupants on the ceiling of these channels (Ades, 1994, 1999). A bat surveying team encountered a water monitor (*Varanus* spp.: Class Reptilia, Oder Squamata) during their investigation of an underground water pipe (L.K. Lin *pers. comm*.). Inside the channels, however, there is a lotic environment and there are, so far, no formal records of what species are living inside. One month ago, a piece of news (Oriental Daily 20 November, 2002) reported that a man got lost in an underground water channel in his great journey of fishing in the darkness. This led us to wonder whether there are assemblages of aquatic organisms living in these water draining channels.

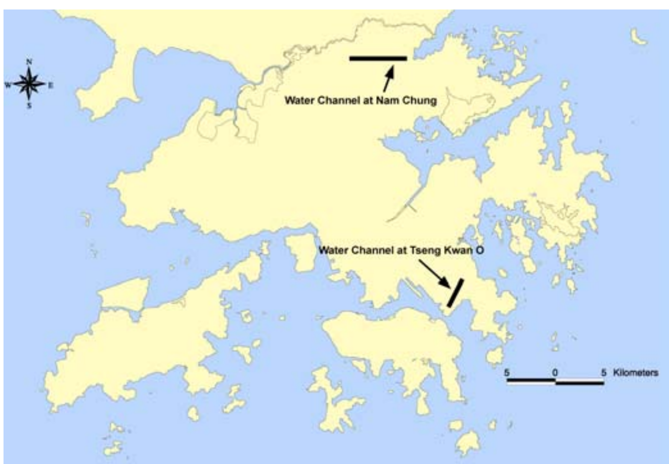


Fig. 1. A map of Hong Kong showing the locations of the two underground water pipes visited.

Out of our own interest, we visited two underground water channels to conduct a preliminary survey on the fauna living inside. On 25 November, we visited an underground water channel located in Tseung Kwan O, where the man got lost when catching shrimps and crabs. This channel drains stream water from Tseng Lan Shue and diverts the water out to the harbour in Junk Bay (Fig. 1; total length 5 km). A gradient of salinity along the pipe is therefore established. Try to guess what we first saw when reaching the pipe entrance…a dead dog! (which was possibly disposed by the villagers). The channel is rectangular in shape and about 3 meters high with smooth walls. There are lots of turnings and junctions making people get lost easily, thus we needed to attach light sticks on the wall to mark our tracks. After a 20-minute walk, nothing was observed except annoying tiny flies. At the moment we decided to leave, there was something suddenly moving in the water under the light of our torches. Oh! It was a big mitten crab swimming slowly. We picked it up immediately and confirmed it to be an *Eriocheir japonica* (carapace width = 9.8cm). Having this as a 'hint' that we might encounter more organisms when going further, we carried on. Unlike the previous section of the channel, we found patches of boulders and sand accumulated on the bottom. We thought that there should be more organisms associated with such substrates. Searching the boulder patches intensively, we discovered a number of unidentified *Macrobrachium* spp. (Fig. 2) which will be sent to the Raffles Museum of the National University of Singapore for confirmation of species identity, mitten crab *Eriocheir* and estuarine crab *Varuna* sp. The crab *Varuna* is reported to have a distinctive seaward migration in water channels for breeding (Lee and Leung, 1999). In general, there were high abundances of crabs and shrimps in this completely dark environment. The salinity of the water where we got the crustaceans was 1 $^{o}/_{oo}$ suggesting that the aquatic lives were experiencing a gradual increase of salinity from the entrance of the channel, at which the salinity was 0.02 $^{o}/_{oo}$. Going further into the channel, we also collected two more mangrove crabs *Scylla paramamosain*. We continued to walk about 3 km down into the channel. Since only several cockroaches and moths greeted us, we decided to go back.

Two weeks later (6 December 2002), we visited another underground water channel at Nam Chung. The channel collects waters from hill streams going into Plover Clove Reservoir. It is a straight circular pipe about 6 km long. Having walked down into the first 100 meters, we found a group of bats and a long-legged centipede (Order Chilopoda, Family Scutigeridae) on the wall. The bottom of the channel was quite smooth, neither boulder patches nor leaf packs were present. As we had expected, there were not many aquatic organisms observed in this area. Passing that "desert", we encountered a number of *Eriocheir japonica* and the unidentified *Macrobrachium* spp. Besides shrimps and crabs, we also found gobies (Oder Perciformes, Family Gobiidae). Strange enough, some dead "headless" fishes were lying on the stream bottom. Since fish may probably be one of the major food sources for the bats living there, we guessed those fishes might have fallen onto the ground when they were being eaten by the bats hanging on the top of the water channel. According to Ades (1999), fish eating bats, *Myotis ricketti*, are found in Hong Kong and 59% of their gut contents by volume consist of fish (Cyprinidae) scales. After confirmation of the bat species, we were able to make the preliminary conclusions about our fish observation. On going further down into the channel, the wall became very rough with stalactites growing down from the ceiling, suggesting that this section might be constructed from a natural cave. Here, another group of bats was found and the water had become much deeper (0.5m) than that at the beginning area (0.3m). Also, we found two more species of fish *(Parazacco spilurus* and *Osteochilus vittatus*, fork length = 21.6 cm). We continued to explore this water channel for about 1.5 hours more and then returned.

Fig. 2. Unidentified *Macrobrachium* spp. collected at the underground water pipe at Tseng Kwan O.

We believe that most of the animals found in the water channels originate from feeder streams, interconnected reservoirs and, in the case of Tseung Kwan O site, from coastal shore near the seaward channel mouth. Compared to the feeder stream, at least for some taxa such as fish, the abundance was much reduced in the channel. For example, a school of *Parazacco spilurus* was observed in a pool directly outside the entrance of Nam Chung channel, but only a single individual of this species was recorded inside. The food chains in the channel also appeared to be incomplete. Although no systematic observation data were obtained, the channel served as a bat roosting rather than feeding site. We suspected that the bats have to disperse to nearby sites for feeding. In addition, water marks up to about two metres were seen in both channels and this suggested that water may rise to that level during the wet season. This means most aquatic life might be washed away during peak flow and animals from outside have to "colonize" the channels after the peak wet season. As a result, we believe underground water channels cannot be considered as a self-contained ecosystem, but rather as a special semi-natural microhabitat interconnected to other water bodies, depending on the imports of both faunal colonizers and nutrients.

One thing worth pointing out is the nature of these water channels in conducting water between different aquatic habitats. Gene flow of aquatic species such as *Macrobranchium* spp. among freshwater habitats may be promoted by the linkage of these pipes. Channels connecting hill streams to the sea may provide pathways for mass migration of anadromous species such as *Eriocheir japonica* and *Macrobranchium nipponensis*. However the spread of introduced species, especially large mobile species such as predatory exotic fish to nearby natural water bodies may threaten the survival of native resident species.

For faunal inventory purposes, future studies should cover water channels with different engineering designs as we feel that preference for "natural cave like" channels by different taxa of animals may exist. As both water channels were investigated during the daytime, further explorations should be extended to include night visits to recover nocturnal species.

Whether the gene flow of aquatic species among fragmented freshwater habitats and mass spawning migration of anadromous species through these underground water channels really exist is a potential research area for further studies.

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Ting Kok: a conservation issue

by David Poon

When there is sudden rustling of grasses and the weather is calm, you may guess that there must be something moving in the grass patch but …What is it? A bird? A dog? An I I (**I**llegal **I**mmigrant)? Or a porcupine?

My answer is: "It's a lizard!"

In the morning of 18 September, while I was passing through Ting Kok village, there were sudden vigorous movements from a grass patch (near a pink house) away to my left. I thought it was a stray dog ready for an attack (!) but it turned out to be a surprise - its dark body, the typical lizard appearance, and the characteristic reptilian movement as it rushed away, made me certain that it was a *Varanus* lizard!

At first I believed that it was *Varanus salvator* – the water monitor believed to be extinct from Hong Kong's wild places (Dudgeon and Corlett, 1994). Personal communication with Richard Corlett, Gary Ades, and Michael Lau later led me to suspect, however, that it was more likely to be an escapee of the illegally imported Bengal monitors, *Varanus bengalensis* (Apple Daily, 29.6.02; Ming Pao, 29.6.02).

Another "surprise" came to me two months later: on 13 October, I discovered a massive cutting of *Kandelia candel* at the Ting Kok mangrove. A large number of mangrove trees had been cut down and only the basal parts (roots) remained.

So what are the lessons here? First, although Bengal monitors have being designated as endangered species in their native range since 1976 (U.S. Fish and Wildlife Service), if the escapees survive and breed successfully at Ting Kok, this will be an addition to Hong Kong's exotic species list. Second, given the apparent strong association between mangrove tree diversity and crab species richness, in particular the grapsid crabs (see Lee 1998 for review), the massive tree cutting not only resulted in a reduction of floral cover, but may also lead to a decline in crab (notably *Perisesarma bidens*) abundance through the loss of refuges and food sources. Also, it is uncertain whether the tree destroyers will return and convert the entire habitat into an ecological desert, like the Yi O mangrove reported by Olive Lee (2001). Ting Kok mangrove has been designated as a Site of Special Scientific Interest since 1985 (WWFHK) so, unless officially approved, any destruction or removal of fauna and flora from Ting Kok is prohibited. All in all, both the tree cutting and the importation (and the subsequent accidental release) of an endangered species (*Varanus bengalensis*) are equally illegal and ecologically destructive!

What happened to Ting Kok is just one of the many reported issues that demonstrate how Hong Kong's natural environment is being frequently damaged by local citizens. Perhaps a majority of our locals do not realize that the effects of anthropogenic disturbance to our ecosystem are often, like cancers, only apparent when it is too late to recover! Finally, to reiterate, in order to protect Hong Kong's natural environment, we need to equip ourselves with a sense of awareness as well as appreciation of nature – this is going to be an obligate matter, not a facultative one. It's our responsibility to preserve the dwindling, yet still rich, local biodiversity for future generations, who have the right to be able appreciate it.

Acknowledgements

Thanks Dr. Richard Corlett for forwarding my Bengal monitor sighting to Drs. Gary Ades and Michael Lau. Also thanks to Gary Ades for the newspaper cuttings.

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The Virtual School of Biodiversity: an update

by Kevin J. Caley and Will Trewhella
Virtual School of Biodiversity, Department of Ecology & Biodiversity, The University of Hong Kong

Back in December 1998, Gray Williams introduced Porcupine readers (see: *Porcupine!* 18) to a new collaborative teaching initiative, called the "Virtual School of Biodiversity" (VSB) (Fig. 1) that was going on in the Department of Ecology & Biodiversity (DEB). That was four years ago, so it is about time you had an update on some of the things the VSB has been up to since then.

Fig. 1. The VSB logo

Firstly though, a quick reminder of what the VSB is all about. The VSB has it roots in a university-level teaching collaboration in the United Kingdom, known as the "Biodiversity Consortium" that was developed by the Biology department in the University of Nottingham. During the 1990s, this project carried out research and development in the field of 'technology-mediated, student-centred teaching' in biology. So what exactly is 'technology-mediated, student-centred' teaching? It is basically a fancy way of describing using computers to deliver teaching resources, though there is much more to it than that. Information Technology of various types (CD-Roms, multimedia, email and the World Wide Web) can be used to create and deliver teaching resources, to help foster an 'on-line' teaching and learning community, and to share these resources amongst a wide audience. The student-centred side of this project focuses on providing opportunities for students to investigate a topic at their own pace and depth, rather than by simple 'rote learning'; this is regarded as a better way to get students to understand what they are being taught.

The opportunity arose in 1998 to turn this project into an international collaboration, and the VSB was set up between the University of Nottingham, The University of Hong Kong (HKU) and the Natural History Museum, London. The main objective of the VSB is developing and delivering good, technology-mediated teaching resources in the field of biodiversity. The VSB was a timely project, since its launch coincided with HKU's student laptop initiative, and a growing awareness of the role the World Wide Web (WWW) has to play in education.

With support from the VSB's core partners, and funding from a range of sources (DEB, HKU, the University Grants Council, the HKU Foundation, and *Universitas 21*, amongst others) the VSB has tried to develop a model for cross-institutional, collaborative teaching. Here we describe some of these initiatives in detail, and outline where the VSB may go from here.

Biodiversity and Biosystematics teaching resources

Whole organism biology teaching is experiencing increasing pressure in universities these days, as new lecturers are appointed in 'trendy' research areas, such as molecular biology. One of the ways the VSB is trying to address this issue is to commission and develop quality teaching resources on biodiversity and biosystematics. The key to getting quality is to approach leading experts in these fields around the world, to get their biological input into the teaching resources. The VSB has developed a system to tap into the biological knowledge of these experts, and develop this into a series of technology-mediated tutorials, without expecting too much IT and pedagogical know-how from them. Over the years, the VSB has built up a portfolio of biodiversity tutorials, which is ever-increasing (http://ecology.hku.hk/vsbhome/Virtschl7_2.htm), and these are being used in DEB's teaching programme, particularly in the VSB's flagship module on "Biodiversity".

"Biodiversity" – a flagship module for the VSB

Despite its name, prior to the academic year 2000 – 2001 the department did not offer a module in "Biodiversity". Fortunately, this was where the VSB could help. Since 1996, Nottingham had been using some of its technology-mediated biodiversity tutorials to teach a whole module on this subject. So we decided to run this module in DEB as a compulsory component of the Environmental Life Science Programme. Just to make things more complicated, we thought it would be a good idea to run the biodiversity module simultaneously in both Nottingham and Hong Kong, and have formal interactions between the students taking the module in each institution.

The "Biodiversity" module deals with concepts, principles and contemporary issues concerning the earth's biodiversity at all levels (genetic, species and ecological), as well as social and economic aspects of biodiversity. It also has the central aim of enhancing students' experience and competence in learning independently (i.e. it is 'student-centred'), and developing their ability to employ a range of research, IT and communications skills. The bulk of the module's content is delivered via interactive tutorials available on CD-Rom, rather than conventional lectures, but it is not a totally faceless module. There is a series of seminars on particular biodiversity topics, and group work is encouraged through group projects and use of on-line discussion fora.

This module has been taught by DEB for two years now to around 70 students a year, and is forming part of an increasing array of student-centred teaching initiatives in the department as we try to get students thinking more for themselves and away from conventional, passive learning. The exam marks and evaluations show that this module is a success, and is adding to the department's reputation in the area of whole organism biology teaching.

Learning Support Centres for supporting student teaching in DEB

On-line student support is an important component of the biodiversity module. With the WWW and e-mail, it is possible to make a move towards 'paperless' management for teaching modules such as "Biodiversity". The WWW is also packed with a vast number of useful resources for teaching biology, but this sheer volume of material can be daunting. The VSB has managed to address the issues of module management and provision of quality-assured WWW resources by developing a WWW-based system of teaching support, called "Learning Support Centres" (LSCs), which it has successfully piloted in the department (see http://147.8.128.254/vsb/lsc/). LSCs (Fig.

2) provide both a module-specific support framework for teaching and a generic framework, e.g via study skills, news services, careers advise, etc. LSCs are designed to be dedicated resource and communication centres offering direct access to a variety of quality-reviewed WWW-based resources related to the curriculum and to the needs of independent learners. All modules taught by the department have their own LSCs, and these are updated each year by the module convenor, in collaboration with VSB staff.

Fig. 2. The Learning Support Centre "homepage"

DEB / Schools links mediated via the VSB

Although the main focus of the VSB has been at university-level teaching, in the last year the VSB has concentrated on developing links with local secondary schools in Hong Kong.

The starting place for these links is an advisory group of teachers and DEB lecturers, set up to find out from the teachers what they would find useful to support their biodiversity and ecology teaching. Out of this came the idea of workshops run by DEB staff to demonstrate how teachers can best organize fieldwork for their students. Four sets of workshops ("Exploring Rocky Shores", "Exploring Mangroves", "Exploring Streams" and "Exploring Sandy Shores") have been held so far, supported by WWW-based resources (http://ecology.hku.hk/jupas) and laminated field ID sheets of the most common species in these habitats.

A series of bilingual field guides to the fauna and flora of Hong Kong is also being produced in collaboration with AFCD. Four titles - "Rocky Shores", "Hillstreams", "Hillsides" and "Sandy Shores" should be available very soon. Each guide will provide information on around 100 of the most abundant or most obvious species in their respective habitats, give ecological details on individual habitats and how and where to explore them, and on general Hong Kong natural history and ecology. These guides will fill a gap in Hong Kong's biodiversity education and are being developed in collaboration with local schools, focusing in part on some of the current A-level syllabus needs. They should also improve the general appreciation and understanding of the Hong Kong countryside and biodiversity issues among the next generation of Hong Kong residents, and will have a significant community-wide impact.

VSB and the future

This has been just a taster of some of the things the VSB has been involved in over the last few years, as it tries to explore how technology can be used to help deliver 'quality assured' biodiversity teaching resources to a wider audience.

The VSB aims to be an example of good practice for the use and development of IT in learning. If the number of demonstrations of the project to visiting academics that the VSB has been asked to give in both Nottingham and Hong Kong is anything to go by, then it is certainly succeeding in this aim. The VSB has helped the teaching review processes in both biology departments in Nottingham and Hong Kong, being commended in both DEB's Teaching and Learning Quality Process Review process in the summer of 2002, and in Nottingham's School of Life and Environmental Science's Teaching Quality Audit in 2000. The VSB has also entered HKU's ACITE Award for IT in Education in 2001 and 2002, and won 1st prize for "Best Web-based or IT enhanced learning initiative, including project activities, materials and tools" in both years.

One of the ways forward is to spread the VSB's model of collaborative teaching to other universities, both in Hong Kong and internationally, and to other educational audiences. So far, this has proved remarkably hard to achieve at the university level, despite initial enthusiasm from several other institutions around the world interested in the biodiversity module and teaching resources; with the growing interest in teaching collaborations world-wide, we hope to break through this hurdle and expand the VSB network. Teaching partnerships – both internationally (through bodies like *Universitas 21*) and nationally (see this year's University Grants Committee's Sutherland report on teaching in Hong Kong, and HKU's Faculty of Science plans) – are politically flavour of the month. On a technological side, our colleagues in Nottingham are developing the 'next generation' in WWW-based learning environments (see: http://whurle.sourceforge.net/) that the VSB and others can use to deliver teaching resources. Growing links with secondary schools in Hong Kong are also showing how the interface between secondary and tertiary education can be bridged.

Biodiversity is facing a global challenge as habitats are lost and species go extinct. Promoting education, public awareness and training in biodiversity can help address these challenges, providing suitable educational resources exist. Developing and sharing these resources is ultimately what the VSB is all about!

Aeromonas and *Vibrio* spp. detected in Mai Po Nature Reserve and Inner Deep Bay

by Ji-Dong Gu and Yanling Wang

Mai Po and Inner Deep Bay Nature Reserve involve an area covering approximately 1,500 hectares, consisting of intertidal mudflats, mangroves, *gei wai's*, fishponds and drainage channels. Each winter, between 49,000 to 68,000 water birds regularly stay at the site. Undoubtedly, this is the largest remaining wetland in Hong Kong and plays a very important role in supporting a wide range of wildlife including migratory birds and local important species like the blackfaced spoonbill. Since part of the intertidal wetland is on Shenzhen's side of the Mainland China and the Shenzhen River also discharges a large quantity of wastewater into the Deep Bay Nature Reserve, protection of the ecological conditions of the area is an issue of regional importance for protection of wildlife and biodiversity. Microbial quality of the water and sediment in an area may also have a significant impact on wildlife. Recent findings suggest that fauna and migratory birds could be infected by microorganisms, particularly *Aeromonas* and *Vibrio* species occurring in polluted environments (Biscardi *et al*., 2002; Merrell *et al*., 2002).

An investigation was initiated to examine the current status of potentially harmful microorganisms in water and sediment samples of Mai Po and Inner Deep Bay. Both water and sediment were sampled, transported back to our laboratory immediately in a cooler, kept at 4°C and cultured for environmental *Aeromonas* and *Vibrio* spp. on selective culture media in February 2002. Among the water samples taken from four different locations of the Inner Deep Bay area, all were found positive for the presence of *Aeromonas* and *Vibrio* spp. Further detailed investigation indicated that between 25.9–100% of the samples collected tested positive for both microorganisms. Interestingly, water samples from two *gei wai*'s also showed positive results for the presence of *Aeromonas* and *Vibrio* spp. and 7.7–24.3% of the water samples were positive. In addition, sediment samples were also found positive for the two microorganisms and as high as 42.4-100% of the individual samples tested positive. It seems that the level of contamination is more serious in the Deep Bay area.

Isolation of these bacteria through enrichment culture on selective microbiological media could to be conducted in warmer months when the environmental temperatures are higher for positive recovery of these bacteria. Our detection of these bacteria as early as February strongly suggests that the Mai Po and Inner Deep Bay areas are seriously contaminated; detection of the opportunistic pathogen *Aeromonas* spp. and potentially pathogenic *Vibrio* spp. was unexpectedly high because the temperature at the sampling time in February is the lowest of the year and is not optimum for the growth of microorganisms. The positive results of water and sediment samples indicate that a large population of these microorganisms is residing in Mai Po Nature Reserve and Deep Bay, and represents a potential risk to migratory and local birds. As food source for water birds, both epifauna and infauna should be monitored for the extent of microbiological contamination.

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Trawling experience and treasures in Hong Kong waters

by Benny Chan and Kenny Leung

During the summer of 2002, we received HKD1.3 million from CityU Professional Services Limited to carry out a consultancy study entitled "*Provision of Services for Undertaking Laboratory and Field Programmes of Potential Biological Indicators for Monitoring Marine Pollution*". The key purpose of this study was to validate the potential biological indicators or biomarkers for monitoring marine pollution :

- Ethoxyresorufin-O-deethylase (EROD) in fish liver;
- General histopathology and conditions of fish;
- Lysosomal stability of the mussel *Perna viridis*;
- Gonadosomatic index of the limpet *Cellana grata* and *Patelloidea pygmea*; and
- Spatial distribution and abundance of barnacles (*Balanus amphitrite* and *Tetraclita squamosa* and *Tetraclita japonica*) and mussel (*P. viridis*) in Hong Kong.

We also quantified the levels of contaminants (PAHs and PCBs) in the tissues of fish and mussels. Owing to such a large-scale project, we were in collaboration with an overseas expert on EROD assay (Dr. Monique Gagnon, Curtin University of Technology, Australia) and other local companies. Additionally, there were two research assistants (RAs), Dr Alan Leung and Wolfy Lai, and eight student RAs involved in this project. One of the most exciting things was that we used shrimp-trawlers to sample fish (the flat head *Platycephalus indicus*, the sole *Cynoglossus spp*., the pony fish *Leiognathus brevirostris* and the rabbit fish *Siganus oramin*) from six locations (Deep Bay, Urmstron Road, Tolo harbor, Ninepin, Lamma and Tathong Channel) once in June and once in August 2002. At each location, we performed two 30 minutes tows. In this article, we would like to share some of our trawling experiences with *Porcupine*'s readers.

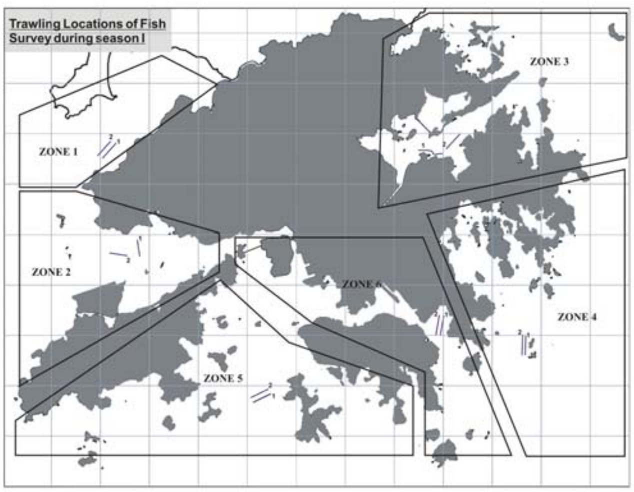

Fig. 1. Locations of the study: (1) Deep Bay, (2) Urmstron Road, (3) Tolo Harbour, (4) Ninepin, (5) Lamma and (6) Tathong Channel.

We spent three consecutive days carrying out the trawling survey at each of the six zones in June 2002 (Fig. 1). The first day of trawling began in Tolo Harbour. To all students, it was the first time that they had been onboard a shrimp-trawler. Most of us were unfamiliar with equipment and other things inside the trawler and the unpleasant smell of petrol. After we had arranged the equipment and ice-boxes in a systematic manner, the trawler arrived at the area outside Wu Kai Sha where the trawling commenced. After 30 minutes tow, we were very excited about the 'catches' from the trawl nets. After sorting the catch, we obtained the three target fish species except the *Cynoglossus spp*. The pony fish *L. brevirostris* was found to be the most abundant species at the location. The catch also consisted of a number of crab species, predominantly *Portunus pelagicus*, *P. sanguinolentus*, and *Charybdis feriatus* (Fig. 2). All these three crab species are commercially important. Furthermore, a large number of small crab species including *Charybdis truncata* and *Dorippe granulata* were also found (Fig. 2). The third and fourth legs of *Dorippe* are short and hooked; making the legs capable of placing a flat grey anemone (*Carcinactis ichikawai*) on the carapace for escape from predation (see illustration in Fig. 2; Morton and Morton, 1983). There were a large number of mantis shrimps, mainly *Harpiosquilla harpax* and *Dictosquilla foveolata*, found in the catch. Some of them were served as our lunch. Of course, they are very delicious! We also collected a considerable number of the bivalve *Bassina calophylla*. *Bassina* features with extensive lamellae on the shell surface to escape from predation by gastropod predators (Ansel and Morton, 1985). After collecting the target fish species, people started to get busy with dissecting the liver from fish and freezing it in liquid nitrogen. This was indeed one of the most difficult tasks because of the combined effects of both wave action and unpleasant petrol smell. The first day trip was finished in a half day.

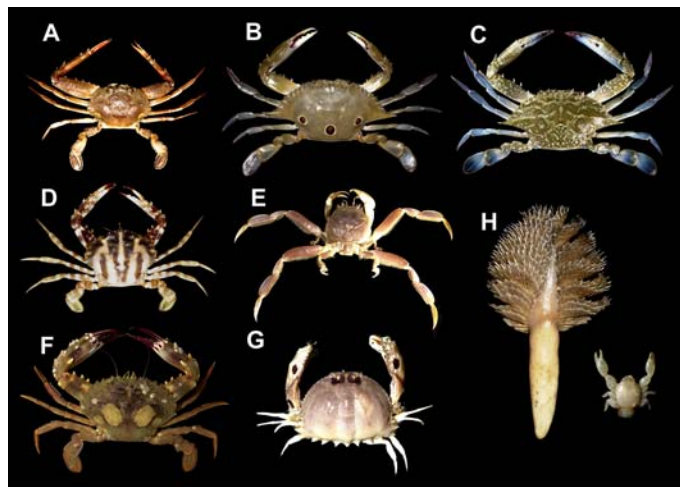

Fig. 2. Common crab assemblages collected from the trawling survey. A – *Portunus gracilimanus*, B – *Portunus sanguinolentus*, C – *Portunus pelagicus*, D – *Charybdis feriatus*, E – *Dorippe granulata*, F – *Charybdis lucifera*, G – *Calappa philargius*, H – the sea pen *Pteroeides sparmanni* and the commensal crab *Porcellana picta*. Photos taken by Miss Chan Hoi Lam.

On Day two, we went to Deep Bay and Urmstron Road, respectively. This time, we were on a new trawler (larger and cleaner) without any unpleasant smell of petrol. Unexpectedly, there was a very cute and friendly dog, cheering up all of us during the boating time. The catch in Deep Bay and Urmstron Road primarily consisted of *P. indicus* and *L. brevirostris* with only a small amount of *Cynoglossus* spp. The crab assemblages were mainly composed of *Charybdis feriatus*, *C. anisodon*, *C. lucifera*, *Portunus gracilimanus*, *Dorippe granulata*, *Menippe* spp. and the mangrove crab *Scylla paramamosain* (Fig. 2). Additionally, there was a species of sea pen *Pteroeides sparmanni* in which we observed a number of beautiful small porcelain crabs *Porcellana picta* indicating a commensal association between these two species (Fig. 2; Morton and Morton, 1983). In these western Hong Kong waters, bivalves were made up of a high abundance of *Anadara* spp., which has a thick shell with brown hairs. Furthermore, there were at least six species of mantis shrimps found in these areas including *Clorida decorata*, *Dictyosquilla foveolata*, *Harpiosquilla harpax*, *Miyakea nepa*, *Oratosquilla oratoria, Oratosquillina. interrupta* and some of these species could not be observed in eastern Hong Kong Waters. Besides live organisms, the catch also consisted of a considerable number of large petrol drums and metal furniture frames, which were likely abandoned by fishermen. This waste material shows that the seabed in these areas has been heavily disturbed by human activities, apart from trawling. The mud in these areas was also black in colour with an unpleasant smell indicating high organic loads. This is likely attributable to pollution in the area.

The third day of the trawling trip was the hardest day, as we needed to survey three zones in one day. We started our trip at 7:30 a.m., travelling from Tuen Mun to the Ninepin. The waves around the Ninepin were so rough that the vessel rose and fell vigorously. Having sorted the target fish species, we needed to carry out the dissection of fish under extremely wavy conditions. During the dissection, many of us were seasick, feeling dizzy, with stomach upsets, vomiting and even losing the ability to carry on working. The remaining team members needed to work harder in this tough situation. Thank God! We finally finished the mission impossible – dissecting all the fish. Despite the seasickness, we saw a number of special and beautiful marine fauna. The 'by catch' in the Ninepin consisted of the box crab *Calappa philargius*, unidentified species of decorated crabs and some unidentified species of soft corals. After completion of the sampling at Ninepins, we headed towards Tathong Channel (i.e. Junk Bay) where the sea was far more 'calm'. Like Urmston Road, there was a lot of rubbish on the seabed in Junk Bay. As a result, a considerable number of nets were broken during the trawling there. It was amazing that we found used toilet bowls, vehicle tires and furniture etc. inside the trawl nets. Because of the rough seabed, this is an unfavourable fishing location for fishermen. Because of this "artificial reef", it was not surprising that we found three groupers *Epinephelus* spp. (15-20 cm flock length). They were released back to the sea immediately.

Finally, we headed to South Lamma Island and arrived there in the late afternoon. At this site, we were able to obtain all four target fish species and we also got several large sized rays (Elasmobranchs). The rays were given to our fish expert Dr Yvonne Sadovy for her ongoing research on this group of fish species in Hong Kong. Crabs collected in Lamma channel mainly consisted of *Charybdis feriatus* and *Dorippe granulata* as well as some *Eucrate* spp.

The trawling survey left all of us with some unforgettable memories. It was a wonderful experience for the students who could see, touch and learn about the diversity of benthic organisms in Hong Kong, as well as see the operation of shrimp-trawlers. All these experiences will be useful for their third year course on 'Fisheries and Mariculture'. In addition, the trawling survey has initiated some research interest for both of us. Although mantis shrimps are very common in Hong Kong waters, their ecology and population dynamics are largely unknown. If there is any funding available, Kenny would like to further study the species composition, spatial distribution, ecology and population dynamics of mantis shrimps in Hong Kong. During the trawling survey, Benny observed that the gills of the subtidal crabs, especially *Portunus pelagicus*, were colonized by a large number of stalked barnacles *Octolasmis* spp. which are considered to be parasites of crabs (woo.. Barnacles again!). Unlike other parasitic barnacles (e.g. *Sacculina* as reported *Porcupine! 23, p.6*) having a reduced larval stage and very patchy distribution, *Octolasmis* spp. shows a very wide distribution in Hong Kong and their larval stage is similar to that of other conventional barnacles. Therefore, Benny is currently working with Priscilla Leung to investigate the genetic differentiation of *Octolasmis* and *Sacculina* in Hong Kong to see whether or not the difference in larval dispersal will lead to different extents of gene flow in these parasitic barnacles.

Although Hong Kong waters are enriched with a huge variety of wonderful living organisms, such a great biodiversity is threatened by human activities such as sewage discharge, over fishing and illegal waste disposal. We therefore should work together in order to safeguard all these precious treasures. In the future, we will organise a few more trawling studies and you are welcome to join us to find out more about the treasures of Hong Kong Waters.

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