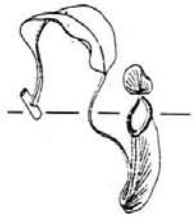
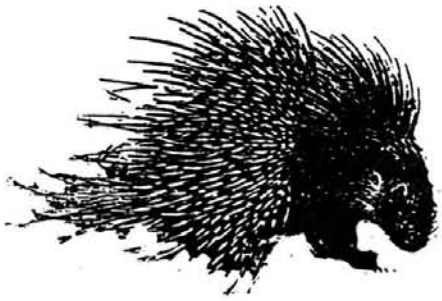
DECEMBER 1998 NUMBER 18



Porcupine!

Newsletter of the Department of Ecology & Biodiversity, The University of Hong Kong, in collaboration with Kadoorie Farm & Botanic Garden Fauna Conservation Department



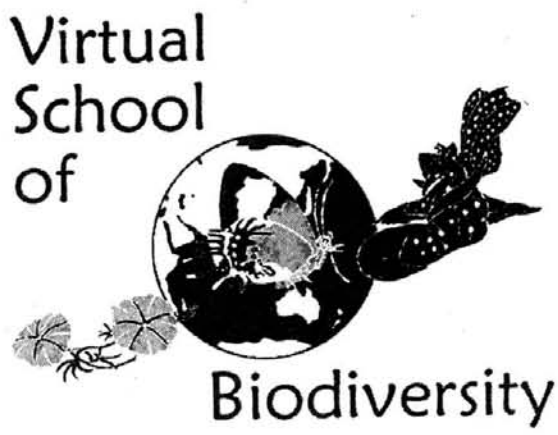
ALMOST PUNCTUALLY, we present *Porcupine!* No. 18 for your edification. Please read and respond. Although there is no *Feedback* in this issue, there were some "verbal responses" to the format introduced in No. 17. Amongst the wild praise received from our overjoyed readers, some valid criticism was levelled at the *Wildlife Windows* section, which is now returned to something approaching its original format. Otherwise, we forge boldly ahead...

The ecological value of Hong Kong's "agricultural" land comes under the spotlight in our eight-page special feature *Focus on Farmlands* (p. 19). Other major articles concern Seagrasses (p.10), Horseshoe Crabs (p. 9) and Artificial Reefs (p. 12). Xuhua Xia gets somewhat distracted with *Six papers that shook...* and Edward Liew mounts a bar stool to talk about fungi and stuff.

There is no *Porc* cartoon in this issue. Some readers may find further cause for joy in this discovery. Should *Porc* return? Should he, in fact, be shot and stuffed? *You* decide. Write and tell us.

Virtual School of Biodiversity launched!

The Virtual School of Biodiversity (VSB) was formally launched by Professor Sir Colin Campbell, Vice-Chancellor of The University of Nottingham, and Professor YC Cheng, Vice-Chancellor of The University of Hong Kong, at a ceremony in The University of Hong Kong on 2 November 1998.

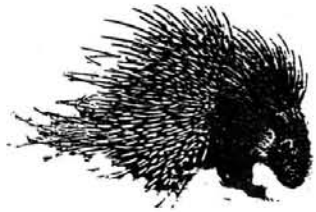


The VSB was founded in June 1998 at a meeting in Hong Kong between the Department of Ecology and Biodiversity, South East Asia's leading centre of biodiversity research and education, and the School of Biological Sciences of The University of Nottingham. At this meeting Dr Peter Davies, who heads the Nottingham team, and Prof John Hodgkiss resolved to establish the Virtual School and last month this was achieved. As well as Nottingham's IBiS Learning Technology Group, who represent the UK's Teaching and Learning Technology Programme Biodiversity Consortium (an association of ~40 universities) and have an international reputation in technology-based teaching and learning, the VSB also includes the internationally renowned Natural History Museum in London.

The primary aim of the VSB is to catalyse international co-operation between universities in the field of biodiversity research and education, with a view to promoting both the understanding and the conservation of the natural world. The principal objectives are to construct an innovative and resourceful learning environment on the World Wide Web, and to use it to deliver co-operative teaching and high quality distributed learning – at both undergraduate and postgraduate levels – to institutions, organisations and individuals all over the world.

(continued on page 2)

Porcupine!



NUMBER 18
DECEMBER 1998

Newsletter of the Department of Ecology & Biodiversity, the University of Hong Kong, in collaboration with Kadoorie Farm & Botanic Garden Fauna Conservation Department

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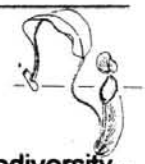
DEB NEWS



Virtual School of Biodiversity -

cont/d from front page

With HKU's new lap-top initiative, most 1st Year undergraduates will have access to multimedia teaching materials. At present this will take the form of course modules or units on Nottingham's Biodiversity CD ROM, some of which are being authored or customized for Hong Kong use by DEB staff in collaboration with the IBiS team. So far collaboration has involved Gray Williams working at Nottingham on an Algal Diversity module, Dr Peter Davies coaching DEB staff in the use and potential mis-use of multimedia education and Drs Will Trewhella and Kevin Caley from Nottingham spending ~3 weeks in Hong Kong working with DEB staff on a variety of teaching modules which will be initially launched in CD format for the 1st Year BSc courses at HKU in January 1999.

The Virtual School has been established under the auspices of *Universitas 21*, an international association of research intensive universities committed to co-operation and mutual accreditation in teaching and learning. As such it is hoped that material prepared from DEB can be distributed within the *U21* framework, including a number of Chinese institutions. It is also hoped that institutions outside *U21* will make use of these accredited materials, and in this connection the Nottingham team also met with members of the KFBG staff to discuss possible future collaborations.

Gray Williams

Recent developments

I promised to provide more information concerning the proposed development at SWIMS but, at present, there is no progress to report!

However, talking of SWIMS, there is spare accommodation there at present and so, any postgraduates who fancy the splendid view, the healthy air and the relaxation of a "place by the sea", now's your chance! Contact SWIMS directly for terms.

I'm glad to report a speeding up in thesis completion rates over the past few months, and offer my appreciation to those who managed to submit <u>within</u> their minimum period (wipe the smug look off your face Graham, there were others!). It was rewarding to see so many Ph.D and M.Phil graduates from DEB on the Congregation list this year! Congratulations to you all.

Dr Stephen Pointing has joined the Department since *Porcupine!* last appeared. He is on a three year appointment as Research Assistant Professor but he will also be doing some teaching. Some of you will have already met him (on the field course in many cases) but for those of you who haven't, he is working in Eliot Hall.

A new staff member Dr Ji-dong Gu will be joining us as an Assistant Professor in mid-December (hopefully). He has worked on biofilms, ecotoxicology and microbial degradation, and joins us from Harvard University. Perhaps we can get him to introduce himself in the next issue of *Porcupine!*

John Hodgkiss (HoD)

KFBG NEWS

Animal rehabilitation

Injured native **mammals** seem to be few and far between in Hong Kong; this may in part be as a result of some old-fashioned attitudes to wildlife (as in... "Oh look we could eat that."). This does not prevent us from doing some useful work. Since the last *Porcupine!* we have succesfully relocated a Female Dusky Langur *Trachypithecus obscurus* (that we were holding on AFD's behalf) to a breeding group in the UK. This relocation was our first after an agreement with AFD that KFBG can be authorised to assist AFD with responsible re-homing of confiscated animals. We have since taken on a Pygmy Loris *Nycticebus pygmaeus* from AFD and, once the animal is healthy, we will pursue its introduction into the world captive breeding program for this threatened species (as re-release is not a valid option).

As always many new **reptile** cases have been received, from Tokay Gecko's *Gekko gecko* to Three-lined and Yellow-margined Box Turtles *Cuora trifasciata* and *Cistoclemmys flavomarginata*. We also received a Cuban Anole *Anolis*

equestris from Penfold Park where it had apparently been seen living free for around 1 year (worrying as this is a known destructive invading alien species). On AFD's behalf we are currently holding a juvenile Siamese Crocodile *Crocodylus siamensis* (CITES I) which is yet another casualty of the illegal pet trade and we hope to place this animal within a responsible breeding centre.

The autumn passage of **birds** was marked by the admittance of a couple of rarities, namely a Black Bittern *Ixobrychus flavicollis* on 22 September 1998 and an Oriental Scops Owl *Otus sunia* on 24 November 1998. The Black Bittern was suffering from a broken pelvis. It was therefore euthanised. The Oriental Scops Owl was released the following day.

A Besra Sparrowhawk *Accipiter virgatus* - found injured at Mai Po and later released, after ringing, from our rescue centre on 8 July 1997 - was trapped at Mai Po on 10 December 1998 by members of the Hong Kong Bird Watching Society.

Other recent birds of interest include two Woodcocks *Scolopax rusticola* admitted in October (one of which was released and the other euthanised) and a wing-damaged Peregrine Falcon *Falco peregrinus*, admitted on 31 October, which will be trained and then assessed for release.

Holding

For the duration of December, we are providing temporary accommodation for 82 native ducks and geese which have been captive bred in the UK. This is a collaborative project between Mai Po Marshes Nature Reserve and KFBG. The 82 birds comprise Swan Goose, Bean Goose, Common Shelduck, Ruddy Shelduck, Pochard, Wigeon, Pintails, Green-winged Teal and Gargany.

All of the birds have to undergo thorough examination, weighing, deworming and random blood sampling as part of the mandatory 30 day quarantine procedure, after which they will be relocated to their permanent home at the Captive Waterfowl Collection, Mai Po.

Paul Crow, Rupert Griffiths and Amanda Haig

Compost man

Mr David Sanders joined the staff of the Horticulture Department in November 1998. He will be establishing an in-house treatment facility for the Farm's livestock waste. In future, such waste will be deposited into septic tanks for pre-treatment. The overflow will then be channeled via Virbela flow-forms (which aerate the wastewater) into a series of treatment ponds. The emerging water will subsequently be diverted into a marshland cultivation area, and thence into a constructed "natural" wetland.

It is believed that this will be the first wastewater treatment system of its kind in Hong Kong. The idea is to demonstrate that waste can be treated through a living filter system, and most of the harmful substances can be converted into useful nutrients for plant growth. The system is expected to be completed by April 1999.

Lam Kong Hing

South China Biodiversity Team activities

Following the China Team's visit to Hua Ping National Nature Reserve, northeast Guangxi, in August, during which several reports of recent presumed tiger activity were received, two sets of infra-red-triggered cameras were borrowed from the Department of Ecology & Biodiversity, HKU. The cameras were set up at Hua Ping on 14 September 1998, by officials of the Guangxi Forestry Department (with help from KFBG), close to where the most recent reports were made. The South China Tiger has been regarded as extinct in Guangxi.

September 1998: Field surveys of Da Yao Shan and Da Ping Shan Nature Reserves, East Guangxi. Conducted with the Guangxi Forestry Dept., Guangxi Institute of Botany, Guangxi Normal University, South China Normal University, Xinyang University and Mr Bosco Chan of The University of Hong Kong (formerly of KFBG).

Several different parts of the huge (2,000 sq. km) Da Yao Shan reserve were investigated. As known from reports by Hong Kong birdwatchers visiting the range in recent years, deforestation and hunting have had a heavy impact. Local farmers reported that some streams (and their own livelihoods) are being badly impacted by the practice of liming, by groups from neighbouring towns. Recent growth of cash crops, such as aniseed trees, has also contributed to the demise of natural forests. Some good forest remains, however, particularly at higher elevations. A site occupied by the nationally-protected Crocodile Lizard, the sole member of a family endemic to Da Yao Shan, showed drastic habitat disturbance despite an enforced ban on hunting these animals. Improved habitat conservation measures are being discussed with Forestry officials.

Da Ping Shan was a lower-altitude site with some patches of forest. However, wardens reported difficulties in preventing hunting.

October 1998: Field surveys of Xi Da Ming Shan and Long Hu Shan Nature Reserves, Southwest Guangxi. Conducted with the Guangxi Forestry Department, South China Institute of Botany and Xinyang University. This was the last field survey by the KFBG Team in 1998. A short visit to Xi Da Ming Shan revealed a very degraded forest, managed principally for timber extraction. Long Hu Shan, where an area of forest supporting macaques is managed for tourism, still supports some rare species, but is subject to considerable human disturbance.

John Fellowes and Graham Reels

Chebaling National Nature Reserve under threat

Chebaling National Nature Reserve in north Guangdong Province was profiled in Porcupine! 15: 25-32. It was then noted that ecotourism was being promoted by the reserve management. Sadly, a visit during November 1998 suggested that the Chinese face of ecotourism is not the environmentally friendly approach to sustainable management that might be hoped for.

Around the reserve headquarters an area of farmland with trees along the riverside had been cleared for horse riding and horse stables and a house or perhaps restaurant were under construction. A weir was being placed across the river in order to produce an area for canoeing and a concrete "pagoda" was under construction on the river bank. A further promised attraction was "camping", though it was not clear what form this was to take. All these developments appeared to be down to the initiative of a new reserve management team which is primarily interested in bringing more money into the reserve.

Whilst all these changes were rather distasteful to one who remembered when the horse riding area had wild Common Pheasants *Phasianus colchicus* feeding in the early morning, they might be seen as a necessary trade-off in ensuring adequate resources for the rest of the Reserve. Sadly, however, it is apparent that nature conservation is very low on the list of management priorities.

Most damaging is the construction of a hydro-electric scheme in the heart of the reserve which will result in the permanent diversion of around 3km of the tributary river to the south of Sin Yau Tung Village. This has led to the construction of a new access road and the destruction of forest along one side of the valley, as well as the partial blocking of the tributary by debris (though this will disappear in the longer term in any case). The destroyed section of forest was one of the areas in the reserves where woodpeckers (Picidae) were most frequently seen suggesting that it contained some of the older trees in the Reserve. Whilst this forest might partially recover, the diversion of the river will result in the permanent loss of one or two Blyth's Kingfisher *Alcedo hercules* territories. Together with the likely loss of a further territory around the headquarters; approximately 25-40% of the river area formerly used by Blyth's Kingfishers (Leven 1996) will now be unsuitable.

Evidence of lack of interest in nature conservation was abundantly evident elsewhere: the human pressure on the reserve had increased considerably compared to that reported by Ades *et al.* (1996) and there was much evidence of the collection of forest products, with at least 50 people collecting in the supposedly restricted-access "kernel" area alone. A White's Thrush *Zoothera dauma* was found in a snare; this had probably been set for pheasants (Phasianidae).

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Ades, G., Fellowes, J. and Lau, M. 1996. Chebaling Mammals. Porcupine! 15:29.
Leven, M.R. 1996. Blyth's Kingfisher at Chebaling. Porcupine! 15: 27.

Michael R. Leven

Hong Kong Conservation Strategy?

In a meeting of the Environmental Panel, Legislative Council on 11 December 1998, the Chair, Christine Loh, said that she was working with the Advisory Council on the Environment to set up a meeting some time in April 1999 to discuss Hong Kong conservation. At the meeting, both parties will request the Government to inform them of its existing conservation strategy and to introduce any future plans on Hong Kong conservation. Ms Loh will invite local green groups and other relevant NGOs and individuals to participate in the meeting.

We will keep readers informed of the progress of this meeting.

Billy Hau

Here to help

In response to an article under the heading "Illegal trapping" by Kwok Hon-Kai in *Porcupine!* 17, I would like to make an appeal to all readers of this newsletter. Should you come across any native wildlife in distress please don't hesitate to contact the Kadoorie Farm animal rehabilitation centre. We will respond to cases as soon as possible with advice on how to proceed (in some circumstances we will also respond to cases involving threatened exotic species). In Kwok Hon-Kai's case of the soaked and flight-deprived egret we would give the bird a full survival assessment and treat it accordingly. Besides drying the bird we would ensure that its feather condition was adequate for release and also assess its general state of health. Dehydration or emaciation could easily be treated, giving the bird a better chance of survival. Most wild animals which are in severe enough distress to allow their capture have more serious problems than those immediately obvious to the untrained eye.

For your interest some of the species we have had at the rescue centre in the past are listed: Styan Squirrel, Noctule Bat, Dusky Langur, Chinese Porcupine, Pygmy Loris, Koel, Night Heron, Great Egret, Magpie, Pheasant-tailed Jacana, Lesser and Greater Coucals, Woodcock, Yellow Bittern, Banded Rail, Little Green Heron, White-breasted Kingfisher, Common Kingfisher, Chestnut Bittern, Collared Scops Owl, Besra, Black-eared Kite, Eagle Owl, Crested Goshawk, Brown Hawk

Owl, Hobby, Saker Falcon, Barred Owlet, Japanese Sparrowhawk, Burmese Python, Water Monitor, Malaysian Giant Turtle, Temple Terrapin, Three-banded Box Turtle, Reeve's Turtle, Bengal Monitor, Black Pond Turtle, Annam Leaf Turtle.

The list continues but I guess you get the idea by now, so please give us a call at KFBG if you come across injured wildlife. CALL 2488 6192.

Paul Crow
(Conservation Officer, KFBG)

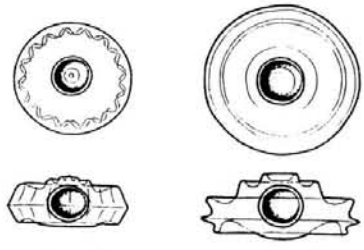
GASTROPODS

New species of Littorinidae recorded in Hong Kong

Mak Yiu Ming has recently described (with Dr David Reid of the Natural History Museum, London) two new species of Littorinidae in the genus *Peasiella*. The two species are *Peasiella fasciata*, which is 1.3-2.5mm in diameter, cream to opaque greyish white with brown-dark red or black lines/bands. This species is found on moderately-exposed to sheltered shores amongst the rock oyster *Saccostrea* and has been found at Wu Kwai Sha, Peng Chau, Hoi Ha and Cape d'Aguilar. The second species is *Peasiella habei*, which is 1.6-3.8mm in diameter, fawn cream to ochre in colour with faint brown stripes. This species is also found amongst barnacles and rock oysters in the upper eulittoral on sheltered shores and has been recorded from Tolo Harbour and Lok Wo Sha Bay in the Tolo Channel.

Hong Kong has the greatest number of sympatrically occurring species of these very small littorinids – and their discovery takes the number of species in this family in Hong Kong to 16 species.

Peasiella roepstorffiana



P. fasciata *P. habei*

Illustrated are the shell of the common *Peasiella roepstorffiana* and the egg capsules of the new species *Peasiella fasciata* and *Peasiella habei*, all drawn by Mak.

Gray Williams

BUTTERFLIES

Zographetus satwa (Lepidoptera: Hesperiidae): a first record from Hong Kong

On the 28th of October 1998, a field meeting held by the Hong Kong Lepidoptera Group visited Cheung Sheung in order to monitor the population of *Aeromachus pygmaea* (Fabricius) (Lep.: Hesperiidae; Hesperiinae). The group started out at Yueng Shue O at around 10 a.m. and were walking out of the village towards Jacob's Ladder, when, just 50 or so metres from the start of the path, a small skipper butterfly was noticed flying around a small clearing the path passed through. Out of curiosity, it was netted and put into a container for closer inspection. This revealed the skipper resting in the typical Hesperiinae "V" wing posture, making it difficult to see the dorsal wing surface. The ventral surface of the hindwing had a bold ventral colour pattern that I did not recognise; namely a milk-chocolate brown with the costal third of the wing straw coloured. The specimen was passed to James Young for his opinion as to its identity; he said only that it was new to Hong Kong as he did not recognise it either. The butterfly was thus retained for further investigation and now resides in the Kadoorie Farm & Botanic Garden's butterfly collection. The following day James Young (pers. comm.) forwarded a message to say that he had identified the butterfly from Chou (1994) as a male *Zographetus satwa* (de Nicéville, 1884) (Hesperiidae; Hesperiinae) and that it was indeed the first time this species had been recorded in Hong Kong. Bascombe (1995) gives the distribution as "Nepal, NE India, Burma, Thailand and Hainan, south through Malay peninsula to Sumatra and Java". This record thus extends the known range of *Zographetus satwa* some 500km eastwards.

My thanks to James Young for agreeing to identify and set the specimen.

Roger Kendrick

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Bascombe, M.J., 1995. Check list of the butterflies of South China. *Memoirs of the Hong Kong Natural History Society* **20**: 1-205.

Chou, I. (Chief Ed.), 1994. *Monographia Rhopalocerorum Sinensium*. Henan Science and Technology Press, Zhengzhou, Henan

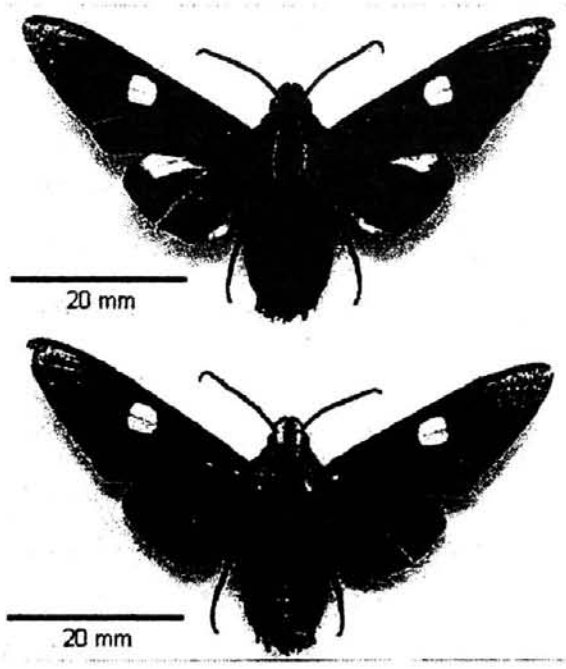
MOTHS

Hayesiana triopus (Westwood, 1848) (Lep.: Sphingidae, Macroglossinae) recorded from Hong Kong

This rather attractive species of hawkmoth has recently been added to the list of Sphingidae recorded from Hong Kong, bringing the total number of sphingids found in Hong Kong to 70 species. There are two records so far; the first being from Tai Mo Shan on 2 June 1997, a forewing found by Dr. A. Ballantyne and passed to A.C.Galsworthy for identification

(A.C.Galsworthy, pers. comm.), with the comments "sent me a forewing of this species picked up on Taimoshan . . . . , and presumably left by some passing bat. It is unmistakable. I still have it.". The second record is of an adult moth taken half an hour before dusk on 8 September 1998, at Kadoorie Agricultural Research Centre, Shek Kong, whilst feeding at *Duranta repens*. The flight pattern was surprisingly slow and seemingly clumsy for an hawkmoth, being more reminiscent of a large, ponderous beetle. Identification was made from Inoue et al (1997), a straightforward process due to the distinctive white semi-hyaline cell on the forewing, the unusually stubby appearance of the body and the crimson on the abdomen (see below). It would seem this species is genuinely uncommon throughout its distribution, but it is known to have been bred in Guangdong Province, China, by Mell (1922) (I.J.Kitching, pers. comm.). Inoue et al (loc. cit.) give the distribution as from north-east India, Nepal, Thailand and south China and the larval hostplant as *Adina* (Rubiaceae). Zhu & Wang (1997) give the distribution of the species (mentioned under the genus *Rhodosoma*) as from Guangxi Province, China. They make no reference to the information of Mell, nor, despite referencing Mell, of the global distribution; a poor illustration is provided. The Kadoorie specimen is illustrated in Figure one, below.

In the systematic list of moths for Hong Kong, *Hayesiana* is placed between *Sphingonaepiopsis* and *Macroglossum*.



Dorsal (above) and ventral surfaces of *Hayesiana triopus*.

Roger Kendrick

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Mell, R., 1922. *Beiträge zur Fauna Sinica (II). Biologie und Systematik der Süd-chinesischen Sphingiden. Zugleich ein Versuch einer Biologie tropischer Lepidopteren überhaupt*. Berlin.

Zhu, H-F. & Wang, L-Y., 1997. *Fauna Sinica Insecta Vol. 11: Lepidoptera; Sphingidae*. Science Press, Beijing. 410 pp., 325 figs., 8 plates.

Further records of the Oleander Hawkmoth in Hong Kong

Since the article on the Oleander Hawkmoth (*Daphnis nerii* (Linnaeus, 1758) Lep.; Sphingidae) in the last *Porcupine!* (Aston & Kendrick, 1998), I have received information from David Mohn (pers. comm.) in North Point, Hong Kong Island, that he found three larvae of this species (in the penultimate instar) on either 31 December 1997 or 1 January 1998, which changed to the final instar a week later and pupated in the middle of January. A fourth larva was found at the same time with two moults remaining; this pupated in the last week of January. All four pupae took about 14 days to hatch. Identification of the adults was made using the illustrations in Aston & Kendrick (loc. cit.). The foodplant was given as *Vinca* sp. (Periwinkle). So far as is known, this is the first time that *D. nerii* has been recorded as breeding in Hong Kong.

I have also received several other records of *D. nerii* occurring in Hong Kong at the end of 1997. This species is a well known migrant and it is quite possible that a migration of the Oleander Hawkmoth took place late in 1997. So little is known about the movements of this species that it is very difficult to know whether it should be regarded as a resident species in Hong Kong or as a migrant to or through Hong Kong. Such a spate of records at the end of 1997 with none before, despite regular recording during the previous decade (e.g. Li, 1992; Tennent, 1992; Waring, Thomas & Li, 1994; the observations of M. Bascombe and of A.C. Galsworthy), would indicate the latter.

Roger Kendrick

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Li, K.H.K., 1992. Notes on a collection of *Macroglossum* and other species (Lepidoptera, Sphingidae) in Hong Kong. *Memoirs of the Hong Kong Natural History Society* **19**: 1-3.

Tennent, W.J., 1992. The hawk moths (Lepidoptera, Sphingidae) of Hong Kong and South-east China. *Entomologist's Record & Journal of Variation* **104**: 88-112.

Waring, P., Thomas, R.C. & Li, K.H.K., 1994. Hawk-moths in Hong Kong, April 1993, with ecological notes. *British Journal of Entomology and Natural History* **7**: 181-191.

New moth species for Hong Kong, Part 2: 1997-1998 records

This paper continues the process of recording moth species knowingly seen for the first time in Hong Kong during research undertaken in 1997 and 1998 for my Ph.D. Unless stated, records are of species seen at mercury vapour light trap and the locality is Kadoorie Agricultural Research Centre, Shek Kong, N.T.

Several of the Geometridae species listed in part one (Kendrick, 1998) have turned out to be undescribed species. These are now in the process of being described by Tony Galsworthy (Galsworthy, in press, in prep) and are to be published during 1999; they are marked on this list again along with the original entry from part one.

I again express my gratitude to Tony Galsworthy, who determined the identifications (undertaking dissection of the genitalia where necessary) for many of the species listed by comparison with material at the Natural History Museum, London and previewed this paper. I should also like to thank Mike Shaffer of the Natural History Museum, London, for identifying some of the Pyraustinae.

Oecophoridae: Xyloryctinae
Synchalara rhombota Meyrick 12 Apr. 1997
Thymiatria arista Diakonoff 21 June 1997

Gelechiidae:
Anarsia phortica Meyrick 25 June 1997
Hypatima deviella (Walker, 1864) 9 Oct. 1997
Hypatima spathota (Meyrick, 1913) 5 Feb. 1997

Pyralidae: Phycitinae
Aurana vinaceella (Inoue, 1963) 25 Mar. 1998
Calguia hapalanthes (Meyrick, 1932) 9 Oct. 1997
Coleothrix sp. near to *swinhoeella* (Raganot, 1893) 30 July 1998
Metallostichodes sp. near to *hemicautella* (Hampson, 1899) 30 July 1998
Spatulipalpia effosella Raganot, 1893 10 May 1997
Volobilis sp. ? *biplaga* Walker, 1863 30 Jan. 1997
Pyralidae: Nymphulinae
Strepsinoma croesusalis Walker 9 Aug. 1997
Pyralidae: Cybalomiinae
Trichopysetis problematica (Fabricius, 1794) 15 Sep. 1997
Pyralidae: Pyraustinae
Botyodes caldusalis (Walker) 14 Aug. 1997
Botyodes sp. near *patulalis* (Walker) 26 Mar. 1997; Tai Po Kau Special Area
Bradina admixtalis (Walker, 1859) 21 June 1997
Cangetta hartoghialis (Snellen, 1872) 27 Sep. 1997
Ceratarcha umbrosa Swinhoe 1 Feb. 1998
Gyptitia sp. near *ochracealis* (Walker) 27 Sep. 1997
Ischnurges gratiosalis Walker 18 June 1997
Lygropia quaternalis Zeller 29 Mar. 1997
Metasia coniotalis Hampson 7 Apr. 1998
Pachynoa sabelialis (Guenée) 24 Mar. 1998; Hok Tau BBQ site, Pat Sin Leng Country Park.
Pyralidae: Odontiinae
Hemiscops sanguinea Banzinger 11 Jul. 1997

Geometridae: Sterrhinae
Antitrygodes vicina Thierry-Mieg. 16 Jan. 1997
Geometridae: Larentiinae
Axinoptera orphnobathra (Prout, 1940) 7 June 1997
Carige lunulineata Moore 6 May 1998
'Chloroclystis' **sp. nov** (Galsworthy, in prep) 5 Apr. 1997 [listed in Kendrick (1998) as *Eupithecia* species near *costalis* Walker]
Eupithecia **sp. nov** (Galsworthy, in prep) 12 Jan. 1997 [listed in Kendrick (1998) as *Eupithecia* species near *ustata* Moore, possibly undescribed]
Glaucoclystis immixtaria (Walker) 2 Oct. 1997
Loxofidonia buda Swinhoe 9 May 1998
Sauris **sp. nov.** (Galsworthy, in press) 28 Apr. 1997 [listed in Kendrick (1998) as *Sauris* species, probably undescribed]
Geometridae: Ennominae
Godonela monticolaria Leech 8 Mar. 1997
Godonela **sp. ? nov.** near to *myandaria* Walker 30 May 1997
Lomographa claripennis Inoue 28 Aug. 1997

Drepanidae: Drepaninae
Nordstreomia duplicata (Warren, 1922) 8 Aug. 1998

Epiplemidae
Dysaethria erasaria Christoph 3 Nov. 1997
Dysaethria fulvihamata Hampson 25 July 1997
Monobolodes prunaria Moore 15 Sep. 1997
Phazaca theclata (Guenée, 1852) 10 Sep. 1997

Notodontidae
Besaia albifusa (Wileman, 1910) 15 Sep. 1997; first record outside Taiwan, (Schintlmeister, 1991 [1992]; Galsworthy, pers. comm.)

Lymantriidae
Laelia lilacina Moore 14 Nov. 1997
Lymantria mathura ? Moore (= *umbrina* Moore) 25 Oct. 1997

Arctiidae: Lithosiinae
Garudinia **sp. ? nov.** near to *latana* Walker 26 Mar. 1997
Miltochrista sp. ? *limbata* 5 Aug. 1997
Pseudoblabes oophora Zeller 24 Mar. 1998

Noctuidae: Aganainae
Asota plana Walker, 1854 5 Aug. 1998
Noctuidae: Herminiinae
Bertula abjucidalis Walker, [1859] 24 Mar. 1998
Nodaria sp. near to *simplex* Hampson 10 May 1997; Tai Po Kau Special Area
Noctuidae: Rivulinae
Rivula niveipuncta Swinhoe 21 July 1997
Rivula sp. indeterminate 26 Nov. 1997
Noctuidae: Hypeninae
Anoratha paritalis Walker 25 Oct. 1997
Noctuidae: Catocalinae (*sensu lato*)
Pangrapta parvula Leech 19 Mar. 1998
Pseudogyrtona perversa Walker 6 May 1998
Noctuidae: Plusiinae
Chrysodeixis acuta (Walker, [1858]) 9 Oct. 97 [The Tunbridge Wells Gem]
Noctuidae: Stictopterinae
Lophoptera squammigera Guenée, 1852 8 Nov. 1997
Sigmuncus arcuata (Hampson, 1897) 19 Feb. 98

New moth species (continued)

Noctuidae: Chleophorinae

Gelastocera rubicundula Wileman 25 July 1997

Noctuidae: Acontiinae

Amyna natalis (Walker, [1859]) 17 Sep. 98

Eublemma parva (Hübner, [1803]) 5 Aug. 1997 [The Small Marbled]

Eublemma rivula Moore 15 Sep. 1997

Lophomilia takao Sugi 11 Apr. 1998

Maliattha quadripartita Walker 5 Aug. 1997

Ozana chinensis (Leech, 1900) 20 Sep. 1997

Zurobata vacillans (Walker, 1864) 22 May 1998

Noctuidae: Pantheninae

Antitrisuloides catocalina (Moore, 1883) 25 July 1997

Noctuidae: Ipimorphinae

Bagada malayica (Snellen, 1880) 28 Aug. 1997

Other species of note:

Geometridae: Ennominae

Plutodes transmutata Walker was recorded at KARC on October 22nd 1997 and at Tai Po Kau in May 1998. These were the first records of this species since it was first seen in Hong Kong (Hong Kong Island) some 90 years ago.

Drepanidae: Thyatirinae

A fresh specimen of *Thyatirta batis* (Linnaeus) was recorded in September 1998 at KARC. This makes *T. batis* a trivoltine species in Hong Kong, unlike conspecific populations in the Palaearctic where it is either bivoltine or univoltine (Goater, 1992).

Roger Kendrick

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Erratum: ***Porcupine!*** **17**, p. 16. The date for ***Endoclita sinensis*** being recorded at KARC is **10 April 1998**, and not 10 April 1997 as stated.

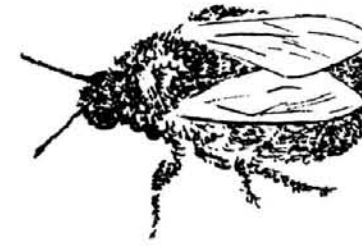
RK

BEES

Bombus eximius Smith (Hym.: Apidae, Bombinae): a queen recorded from Hong Kong

The presence of worker bees of *Bombus eximius* has recently been observed at various locations in the New Territories and has been reported by Corlett (1997) and Ng & Corlett (1997). These sightings were made during March, April and May of 1996, 1997 and 1998. On 20th September 1998, a field meeting held by the Hong Kong Lepidoptera Group was arranged to visit Ma On Shan for the purpose of recording hill-topping butterflies. Whilst on this trip, at some 500m altitude on the ridge leading upto the top of the Tiu Shau Ngam (UTM 50Q KK 161 812), J.J.Young, V.Yiu and R.C.Kendrick encountered a very large bee. It was brought to our attention by the very low frequency drone as it flew past. Fortunately, it settled on a nearby rock, where a closer look was taken. The bee was somewhat larger than the *Xylocopa* carpenter bees, at about 30-35mm in length. It was much more reminiscent of a *Bombus* in shape, although the size seemed excessive. Colour photographs were taken, (see Figure 1) but the specimen flew off before it could be caught and no more attention was paid during the field trip. The bright light levels encountered resulted in very dark shadows, making for poor black and white digital reproduction of the original slide.

Subsequent reference to the articles above, combined with the photographs obtained, show this specimen to match the description of *Bombus eximius* given in Corlett (1997), with a shiny black hairy body, bright orange-brown legs and abdomen tip (last two or three segments). The wings appeared to have a shiny orange tinge. As the size of the worker bees of this species is given as 10 to 15 mm in length, it is assumed this sighting was of a queen bee, which is more in agreement with the 30 mm quoted in Frison (1934). This remains the only sighting of a *Bombus eximius* queen in Hong Kong (R. Corlett, pers. comm.) and is somewhat earlier in the dry season than the January prediction by Ng & Corlett (loc. cit.). For the record, the weather was sunny, very warm (30°C; 65% r.h.) and with just a gentle breeze. The bee was seen at about 11:30 a.m. Quite what it was doing on the rock is still a mystery.



Bombus eximius, (queen caste) dorsal view

Roger Kendrick

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FISH

Sightings of three freshwater fish

Three species of freshwater fish that are considered as being restricted in distribution or locally threatened by Chong & Dudgeon (1992) were found in our recent field surveys. Details as follows:

Rhodeus ocellatus (Kner)
25 May 1998
This species was first recorded for Hong Kong at Fanling by Chong & Dudgeon *loc. cit.* Abundant populations of this small fish were found in various sections of the upper course of Kam Tin River near Tai Lam Country Park and adjacent irrigation ditches of the surrounding agricultural fields. However, no sign of unionid bivalves (as egg repositories of the fish) was observed. Despite the fact that this fish is considered sensitive to water quality, it was found in quite large numbers at a section of the Kam Tin River which has been polluted to some extent by livestock wastes.

Acrossocheilus wenchowensis beijiangensis Wu & Lin
29 September 1998
This species was previously only found in Tung Chung Stream (Dudgeon & Corlett, 1994). Three juvenile specimens (1cm to 4cm in length) were found in the middle section of Wong Lung Hang Stream. Since the two streams are close together and drain into Tung Chung Bay, it is not surprising that this fish can be found in both streams.

Oryzias curvinotus (Uwa, Tanaka & Formacion)
30 September 1998
This species was reported by Chong & Dudgeon *loc. cit.* to be restricted to a few isolated sites which have yet to be invaded by *Gambusia affinis*. Large numbers of this fish were found together with *G. affinis* and *Xiphophporus* spp. in a sand pit and its culverts in Tung Chung. An unidentified water snake was also hiding in the sand pit which is located within some abandoned agricultural fields adjacent to construction sites of the new town. Perhaps the sand pit was used as a temporary refuge by aquatic organisms affected by construction works and thus a large number of fish occurred in this artificial structure.

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REPTILES

Two new reptiles for Hong Kong?

Two possible new lizards for Hong Kong have been found in the past year. Further details in next issue.

Nursery beaches for Horseshoe Crabs in Hong Kong

by Huang Qin, Helen Chiu and Brian Morton

Horseshoe crabs once thrived on many beaches in Hong Kong, but have largely disappeared since the late 1980s. In a recent study, many local fishermen expressed the belief that Hong Kong is no longer a habitat for horseshoe crabs. Apart from fishing, one of the most obvious reasons accounting for such a change is the environmental impacts, including urban development and marine pollution, upon beaches where adult horseshoe crabs breed and juveniles grow.

All three extant Asian horseshoe crab species have been reported from Hong Kong, i.e. *Tachypleus tridentatus* (Leach, 1819), *T. gigas* (Müller, 1785) and *Carcinoscorpius rotundicauda* (Latreille, 1802). *T. gigas* has not been identified definitively from here, however, and its local occurrence is anecdotal.

Tachypleus tridentatus is the only horseshoe crab species in Japan and is protected as a national treasure, but its regional extinction along the coast of the Seto Inland Sea, Habu Bay and Hakata Bay has been predicted as a consequence of habitat destruction and marine pollution. Similar environmental problems also exist in Hong Kong but their effect on horseshoe crab populations was not fully appreciated until recently as the species is not considered to be 'endangered' according to the 'Red List' of the International Union for the Conservation of Nature (IUCN), 1996.

In North America, a census of horseshoe crabs, *Limulus polyphemus* (Linnaeus, 1758), is carried out yearly, by monitoring the numbers of breeding individuals. The census showed there to be 1,200,000 horseshoe crabs in Delaware Bay, New Jersey, in 1991. The number dropped to ~ 400,000 in 1992 and dipped to < 200,000 in 1994 and 1995. The situation was controlled in 1996 and regulations have been set up in those states possessing horseshoe crab populations, governing their harvesting and protecting beach environments.

Although no horseshoe crabs have been seen spawning in Hong Kong for many years (the last time was at Lung Kwu Sheung Tan, west of Castle Peak, by BM), a few beaches are still inhabited by a small number of juveniles, for example, at Tung Chung on Lantau Island, and the Pak Nai mudflat in Deep Bay. In the summer of 1998, two newly-born horseshoe crabs, with a carapace diameter of ~ 5mm, were seen, respectively, on the mudflat at Pak Nai and the mangrove beach at Tai Ho Wan, Lantau Island (Shea and Frew, pers. comms.).

Juveniles of only one species, i.e. *Tachypleus tridentatus*, have been identified from Shui Hau Wan and San Tau, on Lantau Island. They were estimated to

be between 2 and 9 years old. Further investigations are required to locate the nursery beaches of *Carcinoscorpius rotundicauda* on Lantau, as adults of this species are frequently fished from the subtidal mud along the northwest coast of the island, including the sandy-mud beaches at Tai O, Yi O, Sham Wat Wan, Sha Lo Wan and Tung Chung Bay.

Compared with Lantau beaches, the intertidal mudflat at Pak Nai, in Deep Bay, has a higher density of juvenile horseshoe crabs. Juveniles of two species, i.e., *Tachypleus tridentatus* and *Carcinoscorpius rotundicauda*, here occur sympatrically, with the former being more numerous than the latter. Analysis of juveniles from this beach has shown that the smallest specimen of *T. tridentatus*, with a prosoma width of 20.5mm, could have been 2 years old (a 6th instar). The largest measured 86.0mm and was possibly ~ 10 years old (a 12th instar). Specimens of *C. rotundicauda* were estimated to be 6th to 10th instars. Using a mark-release-recapture method, the number of juvenile *T. tridentatus* on the Pak Nai mudflat was estimated to be < 200 in 1998, with an age range of between 3 and 9 years.

Researches in different countries suggest that *Tachypleus tridentatus* and *Carcinoscorpius rotundicauda* breed in different habitats: sand patches at high tide are essential for the former, while freshwater streams are required by the latter. The extensive Pak Nai intertidal mudflat provides ideal spawning and nursery habitats for both species. The mud stretches for ~ 4,000m along the shore and is lined by sand at the highest tidal levels. Five streams run across the mudflat. The three freshwater streams have broad sandy beds that extend into the subtidal. The other two streams are formed by water passing through respective mangrove areas. Between the two Ha Pak Nai freshwater streams, the mud is covered with a seagrass *Halophila beccarii*, that extends for more than 20m down the beach. Among the seagrass bed are small pools of water where juvenile horseshoe crabs feed when the tide goes out *[see also next article]*. According to local fishermen, the Pak Nai mudflat used to attract large numbers of spawning horseshoe crabs in summer, but few in the last decade. This too is largely unsurprising in view of the fact that they are, locally and elsewhere in China, fished, sold in markets and eaten as a specialist sea food.

The rate of regional species extinction is related to the rate of habitat loss which depends largely on the scale of human enterprises. Although far from the city, the extensive, multi-scaped intertidal mudflat at Pak Nai has not escaped local disturbance. At the southern end of HA Pak Nai sits a small pier where ship fuel is released and spreads out to form an oily film floating over the nearby mud. A few metres to the north of the southern Ha Pak Nai freshwater stream, an outlet discharges a noxious black effluent onto the beach. Experiments elsewhere have demonstrated that horseshoe crabs are unable to maintain normal embryonic and juvenile developments when exposed to oil and chlorinated hydrocarbons. It is clear, therefore, that both local horseshoe crab species are endangered by the fishing of adults, the similar collection of beached reproductively mature individuals and habitat destruction of the juveniles.

The stream at Sheung Pak Nai once served as an important freshwater resource for the village's pond fishery. In recent years, however, the formerly clear stream has been injected with pig sewage near Sheung Pak Nai. From the pig farm down to the shore the river bed has turned black, carrying black water, a foul smell, and polluting the horseshoe crab beach.

The Pak Nai mudflat is also threatened by planned constructions, including the building of the Lingding Yang Bridge that will link Hong Kong and Zhu Hai across the mouth of the Pearl River on its western estuary. If at all possible, and if it is not destroyed by such developments, habitat restoration is needed at Pak Nai to restore the various components of this complex intertidal ecosystem. Protection of this mudflat is concerned with not only the horseshoe crabs (which are, for it, but a symbol of its health), but with the numerous other floristic and faunistic elements of the shore, including the resident sea grass, and the Deep Bay coastal environment as a whole. It is also time that the two horseshoe crabs be declared locally endangered species and removed from the markets.

Distribution of Hong Kong seagrasses
by Terence Ching-wai Fong

Seagrasses are the only angiosperms surviving wholly submerged in shallow marine waters. Seagrasses possess erect leaves and shoots and creeping stems or rhizomes. Their flowers are pollinated underwater and develop into fruits and seeds. Seagrass meadows occur in most shallow, sheltered, soft-bottomed marine coastlines and estuaries of the world (Den Hartog, 1970; Phillips and Meñez, 1988). These meadows may be either monospecific or multispecific, in that up to 12 species may co-exist in the communities (Kirkman, 1985). Globally, about 58 seagrass species belonging to two orders (Hydrocharitales and Najadales), four families (Hydrocharitaceae, Posidoniaceae, Cymodoceaceae and Zosteraceae), and 12 genera (*Enhalus*, *Thalassia*, *Halophila*, *Posidonia*, *Syringodium*, *Halodule*, *Cymodocea*, *Amphibolis*, *Thalassodendron*, *Zostera*, *Heterozostera* and *Phyllospadix*) are recognized (Kuo and McComb, 1989).

Three species of seagrass namely, *Zostera japonica* Aschers. & Graebn. (=*Z. nana* Roth.), *Halophila ovata* Gaud. and *Halophila beccarii* Aschers. have been recorded from Hong Kong (Fong, 1998). A fourth species of marine monocotyledonous angiosperm,

Ruppia maritima L. S. L., has also been recorded (Hodgkiss and Morton, 1978a, b; Melville and Chan, 1992). All the Hong Kong seagrasses share the same characteristic of co-occurring with mangroves in the low to mid-intertidal region of sand and mud flat areas.

Ruppia maritima, the Widgeon grass, was once recorded from Shek O Lagoon (Dunn and Tutcher, 1912) and has been recently reported from shallow brackish water '*gei wai*' (shrimp ponds) at the Mai Po Marshes Nature Reserve (Melville and Chan, 1992). *R. maritima* usually grows in *gei wai* channels at between 0.6 to 1.2m depth.

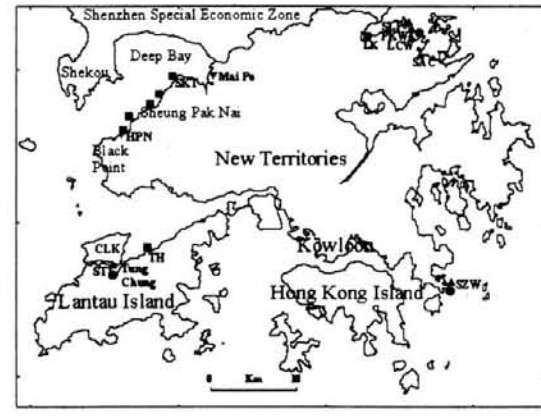
Halophila beccarii, the Spoon grass, is widely distributed in the South China Sea and the Bay of Bengal (Den Hartog, 1970; Phillips and Meñez, 1988). In Hong Kong, the plant was first recorded from Tsim Bei Tsui as dense mats amongst pioneer mangroves (Hodgkiss and Morton, 1978b). The recent distribution of *H. beccarii* suggests that the plant is extending its range on the intertidal mud flat along the southern fringe of Deep Bay, from Sha Kiu Tsuen to Ha Pak Nai (Fong, 1998; Fig. 1). The largest bed of *H. beccarii*, also the largest seagrass bed in Hong Kong, occurs at Ha Pak Nai and occupies a total area of ~ 4 hectares. Juvenile horseshoe crabs are commonly found feeding inside *H. beccarii* beds in Deep Bay. *H. beccarii* seems to be an important nursery and feeding ground of horseshoe crabs. Besides Deep Bay, *H. beccarii* can also be found in Tai Ho in Lantau (Frew, pers. comm.) and occasionally in Starling Inlet, especially Luk Keng (Wong, 1998).

Halophila ovata has a wide distribution. The centre of its geographical range is the South China Sea and the seas of the Sunda shelf, near Indonesia (Den Hartog, 1970). Its northernmost occurrence is in Hong Kong. It used to be widely distributed on the sheltered flats at Tai Tam, Three Fathoms Cove and Hoi Sing Wan in Tolo Harbour and in Deep Bay (Morton and Morton, 1983). *H. ovata* is now recorded from four locations in Hong Kong, namely, San Tau in Lantau, Sheung Sze Wan in Sai Kung and Lai Chi Wo in Crooked Harbour (Fong, 1998; Fig. 1). *H. ovata* is a short-lived annual plant with *r*-strategy. The extent of the intertidal *H. ovata* population at San Tau, close to the new international airport at Chek Lap Kok, was reduced significantly during the commencement of the construction and reclamation works in 1992. The plant almost disappeared in 1995 but recovered gradually after the completion of the reclamation work for the new airport. At Lai Chi Wo, *H. ovata* previously occurred in low intertidal and extended to shallow sub-tidal areas and seemed to be the second largest seagrass bed in Hong Kong (~ 2 ha), however, this population disappeared completely in 1998. These two examples suggest that *H. ovata* is a pioneer *r*-strategy plant that can colonize some areas in a short time but disappears quickly under unfavourable conditions, e.g., typhoon or strong water current.

Zostera japonica, the Eelgrass, occurs from Sakhalin and Kamchatka (north of Japan) to Vietnam in East Asia, and along the Pacific coasts of North America (Den Hartog, 1970; Phillips and Meñez, 1988). Unlike *Halophila ovata*, *Z. japonica* is perennial in Hong Kong (Fong, 1998). *Z. japonica* Aschers. & Graebn. was first recorded from North America in 1957 but was named *Z. nana* Roth (Hitchcock *et al.*, 1969). The plant was later renamed *Z. americana* Den Hartog (Den Hartog, 1970). Harrison (1976) suggested that *Z. japonica* and *Z. americana* were probably synonymous after comparing specimens of *Z. americana* with Den Hartog's drawings of *Z. japonica*. Bigley (1981) further used principal components analysis to confirm Harrison's suggestion.

Zostera japonica Aschers. & Graebn. was first reported as *Z. nana* Roth. from Lai Chi Wo, Hong Kong, by Hodgkiss and Morton (1978a). *Z. nana* Roth. is a junior synonym of *Z. japonica* Aschers. & Graebn. (Phillips and Meñez 1988) and the identity of the local *Z. japonica* was confirmed by Lee (1994).

Fig. 1. A map showing the distribution of the Hong Kong seagrasses. ▲ = locations for *Zostera japonica*: LCW-Lai Chi Wo, SLP-So Lo Pun, PKW-Pak Kok Wan, SAC-Sam A Chung, SZW-Sheung Sze Wan and ST-San Tau; ● = locations for *Halophila ovata*: LCW, ST, SZW and TH-Tai Ho; ■ = locations for *Halophila beccarii*: along the shore of Deep Bay from Sha Kiu Tsuen (SKT) to Ha Pak Nai (HPN) and LK-Luk Keng; ▼ = locations for *Ruppia maritima*: a gei wai at Mai Po. CLK indicates the new international airport at Chep Lap Kok.



Zostera japonica has been recorded from several locations in Hong Kong, namely, Sheung Sze Wan in Sai Kung, San Tau in Lantau Island, Lai Chi Wo, So Lo Pun and Pak Kok Wan in Crooked Harbour and Sam A Chung in Double Haven, north-east N.T. (Fong, 1998; Fig. 1). The first record as well as the largest *Zostera* bed was from Lai Chi Wo (Hodgkiss and Morton, 1978a). The populations of *Z. japonica* at So Lo Pun (~ $10m^2$), Pak Kok Wan (~ $25m^2$) and Sam A Chung (~ $40m^2$) are small and are probably pioneer populations. *Z. japonica* at So Lo Pun, Pak Kok Wan and Sam A Chung may have originated from the population at Lai Chi Wo in view of the proximity of the three locations. The small population of *Z. japonica* at Sheung Sze Wan, bed area less than $10m^2$, may also be originated from the population at Lai Chi Wo, even though it is

quite far away. Due to the development of the Chek Lap Kok airport, *Z. japonica* at San Tau, as with *Halophila ovata*, is threatened by development. The major threat influencing the growth and survival of *Z. japonica* at San Tau is increased sedimentation from the construction and reclamation works of the new airport development (Lee, 1994; 1997). Following the completion of the airport and, therefore, the disappearance of anthropogenic stressors, the population of *Z. japonica* at San Tau seems to have stopped declining and is now recovering.

Seagrass dispersal depends on two ways, vegetative and reproductive. Vegetative propagation can only allow the plants to colonize adjacent unvegetated area but not far away. Seed reproduction can help seagrass to disperse farther. The seeds of seagrasses, however, are too heavy to travel a long distance by water current alone (Orth *et al.*, 1994). The most probable means of seagrass colonizing nearby shores is through the transportation of seeds with floating flowering shoots (Fong, 1998). The flowering shoots may have been dislodged by disturbances, such as storms or the burrowing activities of crustaceans, and may stay afloat for a long distance. New colonies may be formed if the seeds released from the detached flowering shoots encounter a suitable environment during drift. Dispersal agents such as birds are required for long distance (> 40 km) dispersal, e.g., *Zostera japonica* from Lai Chi Wo to San Tau or Sheung Sze Wan. Egrets usually feed on coastal sand/mud shore and may become the seagrass dispersal means. The seagrass seeds, accidentally eaten by egrets, can travel a long distance when the birds fly away and colonize a new area, and then defecate. An analysis of gene flow among the seagrass populations in different areas can help to explain the dispersal ability of this species and the connectivity between the locally fragmented seagrass habitats.

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Hong Kong Artificial Reefs Programme: Is the aggregation versus production issue relevant?

by Keith Wilson

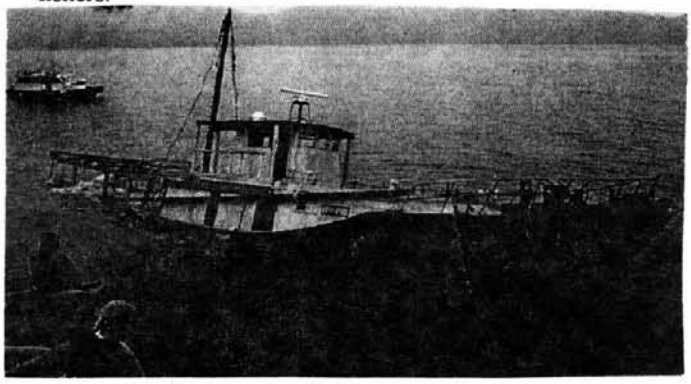
Artificial Reefs (ARs) are popular tools to improve marine resources. High catch rates and huge numbers of fish associated with ARs give the impression that fish stocks have been greatly improved. Many fishery scientists however challenge this view and consider ARs to be a waste of money, which do little if anything to enhance fishery resources. Some go further and theorise that ARs actually do more damage than good by aggregating fish, which makes them easier to catch, thus exacerbating over-fishing. These arguments are here examined and applied to the Hong Kong fishery and considered alongside the artificial reef programme and the Consultants' recommendations for further deployment.

Background

Hong Kong's fisheries are heavily exploited. The Fisheries Resources and Fishing Operations Study recently completed by ERM-HK Ltd. has confirmed that Hong Kong's fisheries are over-fished. As one of the measures to restore local fisheries the Hong Kong Government of the SAR has provided HK$100 million to finance a five-year artificial reef (AR) programme which will enhance fisheries resources and promote bio-diversity in Hong Kong's marine environment.

As part of the first phase, ARs are being deployed in the existing marine parks. Twenty vessels have been prepared and sunk in Hoi Ha Wan and Yan Chau Tong Marine Parks during 1998. Between July and September 1998 some 200 tyre-AR units were deployed at eight sites in Hoi Ha Wan and Yan Chau Tong Marine Parks. Each tyre unit consists of 42 tyres

strapped together to form a pyramidal-shaped structure, nearly 3 metres high and 20 m^3 in volume. Plans are also in hand to deploy concrete and quarry rock AR units at Yan Chau Tong and Sha Chau and Lung Kwu Chau Marine Parks and the Chek Lap Kok Marine Exclusion Zone Airport during 1999. AFD has brokered a no fishing agreement with the permitted fishers on the ARs currently deployed in the marine parks. This agreement was made possible by deploying the ARs in habitat limited areas of open mud, away from the traditional fishing grounds of the small-scale fishers.



AR 06 being sunk in Hoi Ha Wan Marine Park

Tyre AR Units being deployed in Yan Chau Tong Marine Park

The second phase of AR deployment will take place outside the existing marine parks. A one-year AR consultancy study, conducted by ERM-HK Ltd., is nearing completion. As part of this study extensive liaison has taken place with the community in two stages to identify, by consensus, sites for future deployment.

Attraction-Production Issue

Over a decade ago fishery scientists challenged the notion that ARs benefit fish stocks. They questioned whether ARs actually produced more fish or merely aggregated them. This has become known as the aggregation-production question. Fishery scientists Bohnsack and Sutherland (1985) reasoned that if fishing mortality has reduced stocks to levels below the optimum that natural reef habitat would support, then, with stocks below the carrying capacity, the amount of hard-bottom habitat could not be limiting. If reef fish and invertebrate populations are recruitment-limited then ARs are unlikely to enhance productivity. The theory of the 'recruitment limiting' argument, applied to Hong Kong, is that since fishing pressure has decreased reef fish populations there is plenty of habitat for the reduced number of recruits to colonise. Consequently there is no point in constructing ARs as the habitat is not in short supply.

The 'aggregation-production' and 'recruitment limiting' arguments in heavily fished areas are only of concern if ARs are also over-exploited. If there is no fishing on ARs then any aggregated fish would be protected resulting in stock enhancement. In my opinion ARs initially aggregate fish but in time, they support a large biomass of invertebrates and associated 'bait' fish, which in turn support a large numbers of commercial predatory fish. Determining just how many fish are 'aggregated' and how many fish are 'produced' is extremely difficult and quite frankly a waste of time and resources. Provided ARs are protected from over-fishing it doesn't matter whether fish are 'aggregated' or 'produced'. Managed ARs will serve as fish sanctuaries supporting balanced fish populations.

Marine Protected Areas

Many fishery scientists will argue that improvement in fish stocks should be achieved by establishment of marine protected areas (MPAs) on natural rocky shore areas rather than through AR programmes. Is this a practical solution? In Hong Kong MPA programmes are already in progress with the establishment of three marine parks and one marine reserve. I hasten to add that fishing is still permitted in these marine parks for dependent fishers. There are 20,000 fishermen based in Hong Kong and more than 700 permits have been issued to dependent fishers for Yan Chau Tong and Hoi Ha Wan Marine Parks. The fishermen's ex-gratia payment issues for the extremely small Cape d'Aguilar Marine Reserve, where fishing is prohibited, are still unresolved. The area occupied by Cape d'Aguilar is a small fraction of 1% of Hong Kong waters. To have measurable impacts on Hong Kong fisheries it is obvious that significant areas of Hong Kong waters need to be protected.

A carefully planned AR programme has the potential to overcome many of the problems, which beset the establishment of no fishing areas, or 'no-take' areas in traditional small-scale fishing grounds. The advantages of linking an AR programme with MPAs and managing them as fish sanctuaries were detailed in Wilson and Cook (1998). ARs can be deployed in areas of open water away from the heavily fished natural rocky shores. These ARs will form substitute rocky shore fisheries in areas with limited hard-bottom habitat. The physical presence of ARs will also prevent bottom trawling which is a non-selective method of fishing. In the long run trawlers will also benefit from AR deployment since catches in waters adjacent to AR areas will be enhanced.

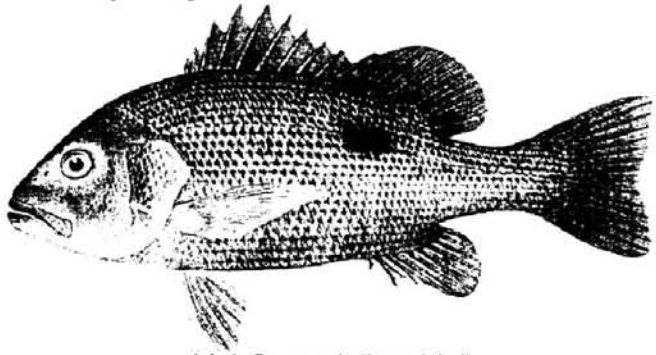
AR Recommendations

The AR consultancy study has proposed five potential areas, totalling some 10% of Hong Kong waters, for second phase deployment. It is recommended that these areas should be designated as 'Marine Special Areas' and managed under the Fisheries Protection Ordinance, (Chapter 171). The study has also recommended that most of the ARs deployed in Hong Kong should be protected from high fishing pressure and located in 'no-take' zones where fishing will not be permitted. The key factor is effective management of ARs deployed.

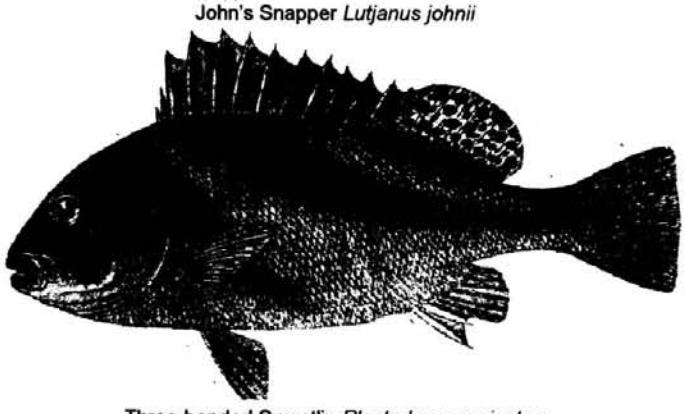
Colonisation: the results so far

Even during the short period ARs have been established in Hoi Ha Wan and Yan Chau Tong Marine Parks there is ample evidence that they are beginning to achieve their objectives. Juveniles of many high value reef fish have already begun to establish impressive populations. In addition a few sizeable grouper adults have also taken up residence on several of the ARs.

Between June and July large numbers of John's Snapper (*Lutjanus johnii*), colonised many of the vessel ARs. This is a highly commercial and valuable fish, which used to be common in local trawl catches. During the seventies juveniles were widely caught locally and reared in Hong Kong mariculture zones. Today adults are rare and fry so scarce that they are no longer collected for the mariculture. The ARs now support and protect these fish from over-exploitation. It will be interesting to obtain data from these fish at maturity, when spawning events occur.



John's Snapper *Lutjanus johnii*



Three-banded Sweetlip *Plectorhyncus cinctus*

The Red Snapper (*Lutjanus malabaricus*) is another high value fish, which is rarely encountered in local waters. In the late seventies trawl catches of this snapper used to outweigh the catches of all the other snappers added together. A small number of juveniles of this fish have colonised several of the boat ARs and they are growing rapidly. The ARs are also supporting thousands of bream. This year's fry have grown so rapidly that many now exceed 15 cm. SCUBA surveys, using underwater video and camera, have catalogued more high value juvenile fish such as Yellow Grouper (*Epinephelus awoara*), Brown-striped Red Snapper (*Lutjanus vitta*), Pinjalo Snapper (*Pinjalo pinjalo*), Three-banded Sweetlip (*Plectorhynchus cinctus*), Painted Sweetlip (*Diagramma pictum*), Red Pargo (*Pagrus major*), Gold-lined Seabream (*Rhabdosargus sarba*), Black Seabream (*Acanthopagrus schlegeli*) and Yellow-finned Seabream (*Acanthopagrus latus*). Also, adult Mangrove Snapper (*Lutjanus argentimaculatus*) and Chicken Grunt (*Parapristipoma trilineatus*).

The early indications are that the ARs deployed in Hong Kong are capable of supporting large numbers of high value fish. Two contracts have recently been awarded, which will monitor the progress and development of macroinvertebrates and fish populations. These monitoring programmes will catalogue the colonisation progress of ARs and quantitatively determine their ability to support a high biomass of reef fish.

It may be non-scientific, but it is my observation, after completing many hundreds of SCUBA dives in Hong Kong waters on ARs, rocky shores and wrecks, that ARs are much more attractive to commercial reef fish than natural reef areas.

Multi-species Ecosystem Modelling

Development of Hong Kong's AR proposals has involved the use of multi-species ecosystem models developed and applied by the Fisheries Unit of the University of British Colombia. These models have assessed the cost benefits of the proposed AR programme. The models indicate that the AR proposals will reverse the current trend of deterioration in the value of the Hong Kong fishery. Even after consideration of the capital cost of construction and deployment, and the full cost of management, there will be a predicted increase of about 28% in the value of the fishery after 15 years and 52% after 30 years. The models predict that as long as ARs are well managed they are an effective tool for rebuilding damaged fisheries.

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DEB RESEARCH

Measuring pollution in Hong Kong's rivers
by David Gallacher

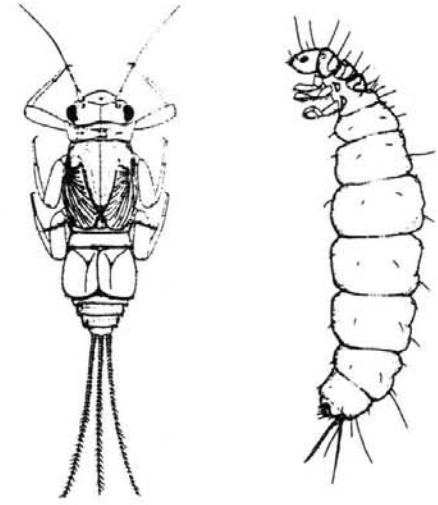
Anyone who has spent a little time in Hong Kong may have noticed it has a few pollution problems.... from air pollution that often reaches levels high enough to pose a health risk, to the tons of sewage dumped daily into Victoria Harbour. Water quality of Hong Kong's streams and rivers has improved since the 1980s, but many watercourses, particularly in the New Territories, remain heavily polluted.

Across much of East Asia, including Hong Kong, river water quality is usually monitored with abiotic measures of pollution (things like pH, nutrient levels and dissolved oxygen concentrations). Although essential in any monitoring scheme, using just these measures has limitations. For example, water chemistry samples can only indicate pollution levels at one point in time. The use of biological monitoring may help solve this problem. As organisms are present in rivers for extended periods of time, they can provide a good indication of long term pollution trends.

In flowing waters, macroinvertebrates are commonly used as biomonitors. The communities found in the river bed (the benthos) are made up of insects, snails, bivalves, crustaceans and annelids. They make good monitors as they are easy to sample, are found in virtually all types of rivers, and most importantly, the whole community responds to lots of different impacts. For example, in my final year undergraduate project in the UK, I investigated how benthic macroinvertebrate communities responded to both a saline mine discharge and an organic pollution source. Here in Hong Kong, I am looking at how best to use macroinvertebrates to detect impacts in local streams and rivers. My project is divided into 2 parts; how to sample the communities, and how to interpret the data collected.

Appropriate sampling programmes are essential in any study of natural communities. As many macro-invertebrate monitoring schemes involve sampling a large number of sites, the emphasis is usually placed on collecting a representative sample of taxa from a site for the least amount of effort. Many of the studies I have looked at from East Asia contain no explanation as to why a particular sampling programme has been chosen, or else the programme used had been based on European or N. American studies. I therefore thought it worthwhile to look at what sampling regime would be most efficient in Hong Kong streams. I chose 2 sites on different rivers in the New Territories for this part of my study, taking 10 replicate 1 min. kick-samples at each site on 3 occasions in both the wet and dry seasons. Once I have finished processing the samples, I'll be able to decide how many replicates one should take at a site to gain a representative taxa list, how many times you need to sample in a season, and whether it's necessary to sample in both the wet and dry seasons.

Even with an efficient sampling program, biomonitoring surveys can generate a lot of raw data, which can take eons to process, and is often difficult to interpret. This has led researchers in Europe and N. America to develop simple measures of community structure or function that are sensitive to pollution and other impacts. In Europe, biotic indices are amongst the most popular of these measures. These indices are based around tolerance values: scores given to each species or family in a community based on their tolerance to pollution. The index is calculated by summing the tolerance values of all the scoring taxa found at a site. Such measures are quick and easy to calculate, and produce results easily understood by non-specialists who may have to base important decisions on biomonitoring survey results.



Aquatic insects with potential use as biomonitors
(a) mayfly nymph (b) caddisfly larva

In the second part of my study, I am developing a biotic index specific to local benthic invertebrates. To do this, I'm using data collected from over 60 sites around Hong Kong. About half of these sites were sampled by Tony Chan for his M. Phil., and are mostly free from pollution. The rest of the data I collected myself from sites with various levels of pollution. Once I've processed all the samples, I'll rank the sites according to their pollution status using physical, chemical and biological data collected at each site. By looking at the distribution and abundance of invertebrate taxa through these rankings, I can allocate each taxon a score between 1 and 10, based on their tolerance to pollution. An index value can then be calculated by summing all the scores from a site. The effectiveness of this simple scoring system will then be tested on a different data set (which I'll collect in 1999).