JANUARY 2001 NUMBER 22

Porcupine!

Newsletter of the Department of Ecology & Biodiversity, The University of Hong Kong

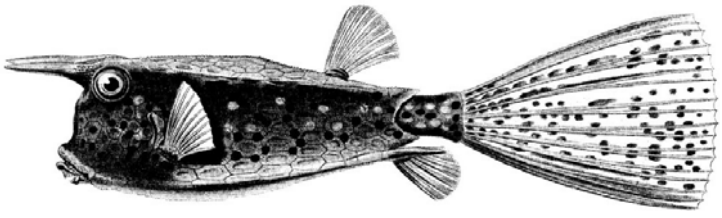
Reef fish diversity in Hong Kong

The rocky reefs and coral communities of Hong Kong hug the coast and islands of eastern and southeastern waters and shelter a surprising diversity of fish species. A recent four-year survey produced over 320 species, a third of which were new records for Hong Kong and one was new to science (see also Cornish, this issue). Moreover, the literature suggests that a further 200 species have been recorded from these habitats. Such diversity exceeds that of the fish fauna of the tropical Caribbean, yet, sadly, just as we come realize what we have, so does it become clear what we are losing.

From interviews with fishers and divers and accounts in the literature, it is evident that many fishes, once common enough to be commercially important in local waters, are now uncommon, even rare. Several larger species of wrasse such as the Black-spot tuskfish (青衣), *Choerodon schoenleinii*, which can reach 1 m in length, was common in the 1960s but is rarely taken locally today. The famous Humphead wrasse (蘇眉), *Cheilinus undulatus*, although probably never common here, has now all but disappeared from our shores. Three decades ago, of 8 species of grouper considered to be locally abundant, most are rare today. Even the Hong Kong, or Red, grouper (紅斑), *Epinephelus akaara*, once caught in 'considerable quantity…from Port Shelter and the Ninepins…' (Chan, 1968) in the 1960s, is no longer common, while the Mud grouper (油斑), *E. bruneus*, formerly abundant on trawl grounds, is now one of the rarest. (read also about the disappearance of the Giant yellow croaker, P.27 inside) These losses and declines reflect their vulnerable nature; they are long-lived, slow-growing and little capable of withstanding the various pressures exerted by a burgeoning coastal community (Sadovy and Cornish, 2000). Indeed, given that such species are often the first to respond to over-fishing, they may represent good indicators of the fishery condition of local reefs.

This diverse fish fauna may now be facing threats of yet another kind; those posed by introductions. As marine resources in SE Asia become scarcer, efforts to 'improve' them follow apace. One approach being applied in Taiwan and also proposed for Hong Kong, is known as 'restocking' whereby young fish are purchased and released in the hope that they will replenish the fishery. Not only is there little evidence that such releases make any difference to an unmanaged recipient fishery, they often involve imported fishes, thereby introducing species, genotypes or diseases not natural to the release area. Just as excessive extractions or habitat losses can negatively impact fish communities, so can 'additions' prove not only economically, but also ecologically, costly.

Approaches to maintaining our rich and beautiful reef fish fauna would be to protect small areas of coastal waters and to prohibit imported marine introductions. Expansion of our marine reserve or park systems and prohibitions of fishing in marine parks would contribute to conserving a small percentage of Hong Kong's coastal areas. Surely it is inconsistent that, while hunting is not permitted in country parks, fishing is permitted in marine parks? Such protected areas can also improve surrounding fished areas by emigration of fish and movements of eggs and larvae out of the reserve area. Good news from Cape d'Aguilar Marine Reserve is that within a few years of protection, smaller fishes appear to have increased in abundance, while larger, commercial, species show signs of greater numbers and larger sizes; a great attraction for divers! (Porcupine! Cornish N. 21:15). By appreciating and understanding the richness of the fish fauna along local shores, the better we are placed to recognize depletions and prevent losses.



The rare Longhorn cowfish, *Lactoria cornuta*, is found in shallow water coral communities in Hong Kong.

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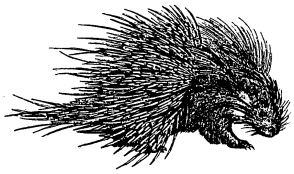
Porcupine!



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Newsletter of the Department of Ecology & Biodiversity, The University of Hong Kong

INSIDE THIS ISSUE:

Editorial

Another Porcupine!, only four months after the previous issue. What is going on here? We admit to some surprise ourselves. It has become a time-honored tradition that Porcupine! is late, but improved technology has made it easier to put together an issue and the exponential increase in local environmental information has made it worthwhile. Perhaps the best indicator of this growth in our understanding of the Hong Kong environment is the length of the list of new publications. A pity this understanding is not, in most cases, being translated into action!

David Dudgeon's account in this issue of a visit to Japan's largest lake, Lake Biwa (p.15), modestly omits to mention why he was there. David was in Japan to receive the 10th *Biwako Prize for Ecology*, named after the lake and awarded by the Shiga Prefectural Government in recognition of his contributions to freshwater ecology. Congratulations, David!!

Richard T. Corlett

DEB News

by David Dudgeon

We live in interesting times. The big news recently has been EPD's rejection – on ecological grounds - of the EIA for the KCRC rail line through Long Valley. Predictably, KCRC have appealed. This one will certainly run and run. Almost as significant, EPD has also nixed the EIA for the north-south road crossing Lantau from Tai Ho to Mui Wo – again, on ecological grounds. This is significant, since it effectively pits one Government (EPD) against another (Highways Department). The solution is obvious however: either abandon the link (a highly unlikely outcome) or build a tunnel.

The implications of the first case (EPD versus a big, bad developer – albeit one that has very close links to Government) should post a warning to private companies that EPD cannot be relied upon to be compliant supporters of the desecration of the Hong Kong countryside. A subsidiary point is that, in rejecting the EIA, EPD seemed unconvinced that impacts of railway construction would be contained within the footprint of the work site. This recognition is overdue, as anyone who has observed the collateral damage associated with civil engineering in the countryside will be able to confirm. Lisa Hopkinson (Green Lantau Association) recently emailed me about the consequences of construction of a road running from the end of Sham Wat Road across the stream to Sham Wat village on North Lantau. Contractors working for Highways Department (again!) have caused enormous damage to the foreshore, including dumping of construction waste on mangroves, diversion of the stream, and dumping of rocks and rubble on the beach (see p.16-17). In this case, the environmental effects are felt well beyond the site boundaries. Such damage is just the sort of thing that worried the Director of EPD during his deliberations over the KCRC rail line EIA. There were other issues too (the likely effectiveness of mitigation, the lack of due consideration being given to alternative routing of the rail line). Nevertheless, Green Groups (if not work-site supervisors) will welcome the attention given to what is actually happening on the ground during the construction phase.

What else is new? The release of the Biodiversity Survey results, much trumpeted in the previous issue of *Porcupine!*, has led to …… well, nothing much. After months of being hassled by AFCD to 'get the results out', the official response to our report has been muted. We are told that they have been visiting the sites recommended for protection and that they are reviewing conservation policy in Hong Kong. One intention of this is to address issues relating to the protection of ecologically important sites currently under private ownership. Consultation of relevant government departments will be needed, and public consultation is (according to C.C. Lay of AFCD) scheduled for the middle of next year. So we won't be holding our breath. The delay gives rise to concern that many sites could be trashed in the interim – perhaps by a sudden resumption in interest in agriculture accompanied by tree-feeling, marsh draining and so on (the case of Sham Chung comes to mind) - let's hope not.

INVERTEBRATES

New moth species for Hong Kong , part 5 : update and further 1999 records

by Roger C. Kendrick

Field recording of moths in Hong Kong has been very much reduced during 2000, but the processing of the data obtained from 1999 has yielded further additions to the Hong Kong list. Two visits to Tai Lung Farm, to view the Agriculture, Fisheries & Conservation Department's moth collection and visits by specialists from overseas have also enabled a clearer picture of the status of some of the rarer species to be obtained. Updated information has clarified the identification of some of the species previously reported in this series (Kendrick, 1998a, 1998d, 1999a, 1999b).

During 2000, several moth taxonomists visited Hong Kong – in February, a leading specialist on Notodontidae from the Oriental Region, Dr. Alexander Schintlmeister (Dresden, Germany), visited The University of Hong Kong (HKU) and deposited material of that family, including paratype specimens, with the HKU collection. These species were collected recently in Vietnam (Schintlmeister, 1997); some of them also occur in Hong Kong and most of the rest could conceivably also occur if looked for at the right time of year in the appropriate habitat. Also visiting HKU in 2000 was Yen Shen-horn (studying for his Ph.D. at Imperial College, The University of London), a specialist in Epipleminae (Uraniidae), Zygaenidae and Pyralidae. During his visits in April and October he viewed the material from those families in the HKU collection and has taken some material for further study. He will at some point be describing some new species as a result. This includes species of Nymphulinae, whose larvae are aquatic and some of which are associated with unpolluted streams (e.g. *Eristina* sp. nr. *bifurcalis*). The comments Yen made regarding the species of Zygaenindae have added a good five or six species, including at least two new to science, to the Hong Kong list of this relatively small family. Papers on these matters will be published by Yen in due course.

The visits to Tai Lung Farm have necessitated some corrections from previous notes in *Porcupine!* on new moth species to Hong Kong. A specimen of *Endoclita davidi* Poujade, 1886 (mis-identified as *E. chalybeatus* Moore) (Lep.: Hepialidae) was recorded by Clive Lau from KARC on 18 October 1993, making the record from 1997 (Kendrick, 1998b) the second from Hong Kong. A series of five specimens of *Macroglossum saga* (Lep.: Sphingidae, Macroglossinae) also predate the previously noted "first" record (Kendrick, 1998c) for Hong Kong. The first of these is dated 21 October 1992 and was recorded at Tai Lung Farm; the others are from Tai Lung Farm (7 & 10 i 1993, 10 iii 1995) and from Ho Pui (23 ii 1994). Also noteworthy in the collection at Tai Lung Farm are specimens of a clearwing moth (*Toleria sinensis* Walker [Sesiidae]) only known from Hong Kong and not seen since the 1860's, recorded by Mr. Chan Ping-wing of the Agriculture, Fisheries & Conservation Dept. (AFCD) (H.K. Govt.) from Ma On Shan Country Park. The following information was provided by Stephen Lai (AFCD, Tai Lung Experimental Research Station) by way of Gaden Robinson at the Natural History Museum, London.: "Notes - moth larvae and pupae were collected from the tree trunk of *Ormosia pachycarpa* at Ma On Shan (Shatin), New Territories, Hong Kong on 24 May 1999. Over 20 trees (*Ormosia*) were badly affected. One of the most severely affected trees was cut down and part of the tree trunk was brought back to Tai Lung Farm for further observation. Adult moths subsequently emerged over the period of 2-6 June 1999. Entomopathogenic nematodes (*Steinernema carpocapsae*) were sprayed on the tree trunk as a control measure but no information is available on its efficacy." Let's hope (for the sake of maintaining Hong Kong's endemic wildlife) the nematodes are not too successful!

A check on the older material in the HKU moth collection revealed the presence of an unlabelled specimen of *Endoclita sinensis* (Moore, 1877) (Lep.: Hepialidae), another species recently reported as new to Hong Kong (Kendrick, 1998b). This is likely to represent the first record for Hong Kong as most of the unlabelled specimens in the HKU collection are thought to have been taken by D.S. Hill in the 1970's from the Pok Fu Lam area, but due to the total lack of a data label to confirm this it cannot be accepted as such. Since the first record from KARC, there have been several other records from the New Territories.

Fig.1 *Endoclita sinensis*

As with previous parts of this series, identifications have been verified by comparison with published sources or with material from The Natural History Museum, London (visited again in July 2000) and records are (unless stated) from mercury-vapour light traps operated overnight at the localities stated. Sites are abbreviated as follows: KARC – Kadoorie Agricultural Research Centre ; KFBG – Kadoorie Farm & Botanic Garden. All records and deteminations (det.) are by R.C.K unless stated. I would like to thank Martin Honey (MRH) of the Natural History Museum and Tony Galsworthy (ACG) for their determinations of several of the species listed and the Trustees of the Natural History Museum for granting access to the moth collections there.

Pyralidae: Nymphlinae

Thysanoima stellata (Warren, 1896) (Yen, pers. com.); previously noted as *Parthenodes stellata* and misplaced in Pyraustinae (sensu Kendrick, 1999a).

Geometridae: Larentiinae

Pasiphila viridata Warren (det. ACG – "I have checked out the *Pasiphila viridata* (?) with Malcolm Scoble [the Natural History Museum]. He says it doesn't match 100%, though is close. The species is based on a single male. Yours, naturally is a female, so there is no way at present of marrying them. My guess is that this is the female, and that there is a slight sexual difference (or it could be geographical), so the best determination for the moment has to be *viridata*."); previously noted as *Pasiphila* sp ? *palpata* (Walker) (sensu Kendrick, 1999b).

Fig.2 *Eupithecia sekkongensis*

Eupithecia sekkongensis Galsworthy, 1999; previously noted as *Eupithecia* sp. nov. (sensu Kendrick, 1998d) and *Eupithecia* sp. near *ustata* (sensu Kendrick, 1998a). This species is still only known from KARC, where it flies between late December and February.

male *female*

Fig. 3 *Sigilliclystis kendricki*

Sigilliclystis kendricki Galsworthy, 1999; previously noted as '*Chloroclystis'* sp. nov. (sensu Kendrick, 1998d) and *Eupithecia* sp. near *costalis* (sensu Kendrick, 1998a). This species is also a Hong Kong endemic, although Galsworthy (1999) notes that its range is "doubtless also extending onto the Chinese mainland".

Geometridae: Ennominae

Coremecis sp. indet. or *Dasyboarmia subpilosa* abberation; previously noted as *Coremecis maculata* (Warren, 1894) (sensu Kendrick, 1999b), the actual identity of this specimen remains unresolved. Should it be an aberration of *D. subpilosa* then it would not be a new record for Hong Kong.

Fig. 4 *Hypomecis cineracea*

Hypomecis cineracea Moore (det. ACG – " Genitalia are almost identical to Holloway's (1993 [1994]) illustration of *Hypomecis cineracea* Moore. Uncus is possibly a slightly different shape, but this could well just be geographical variation. Definitely not *lunifera*"); previously noted as *Hypomecis* sp ? *lunifera* or *cineracea* (Hampson, 1891) (sensu Kendrick, 1999b).

Arctiidae: Lithosiinae

Neasura apicalis (Walker) 8 iii 1997; KARC.

Noctuidae: Ophiderinae

Bamra lepida (Moore, 1874) (det. MRH). 5 x 1999; Kwun Yam Shan, KFBG.

Fig. 5 *Bamra lepida*

Fig. 6 *Targalla transversa*

Scedopla sp. near *regalis* Butler, 1878. 11 ii 1999; KARC

Noctuidae: Euteliinae

Eutelia flavillatrixoides Poole, 1989; previously noted as *E. flavillatrix* Walker (sensu Kendrick, 1998a).

Targalla sp. near *duplicilinea* Walker, 1862 (det. ACG). 1 x 1999; KARC

Targalla transversa (Candèze, 1927) (det. ACG),. 18 viii 1999; Kwun Yam Shan, KFBG.

Noctuidae: Hadeninae

Mythimna argentea Yoshimatsu, 1994 (det. ACG); this is the replacement name for the previously noted *Polia fasciata* (Leech, 1889) (sensu Kendrick, 1999a), a species originally placed in the genus *Hecatera*, a synonym of *Mythimna*, and which is a junior homonym of a different species, *Borolia* (=*Mythimna*) *fasciata* Moore 1881.

Nolidae: Nolinae (transferred from Noctuidae by Holloway, 1998)

Nola lucidalis Walker. 20 ii 1997; KARC.

Nola izuensis Inoue; previously noted as *Ididclytta* sp. nr. *tornotis* Meyrick, 1907 (sensu Kendrick, 1998d).There are at least five more species of Nolinae awaiting identification, several are likely to be undescribed.

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Orthetrum poecilops Ris - A marine dragonfly of conservation priority

by Keith D.P. Wilson

Introduction

Odonate larvae are generally intolerant of highly saline water. There are two notable exceptions, which are *Orthetrum poecilops* Ris, from the Old World and *Erythrodiplax berenice* (Drury), from the New World, both of which can tolerate fully saline seawater. *O. poecilops* can be found in inter-tidal mudflats amongst *Kandelia* mangroves in northeast Hong Kong. Three subpopulations have been located at Starling Inlet, two at Nam Chung and one at Hoi Pui Leng. A single specimen has also been recorded from Shuen Wan.

Dragonflies and salinity

Corbet (1999) reviewed dragonflies tolerance of high conductivity environments and considered only *Erythrodiplax berenice* could be considered a truly marine dragonfly. This sympetrine dragonfly , which inhabits the coastal marshes between Ecuador and Canada, commonly occurs at salinities of 36-48 $^{0}/_{00}$ seawater; seawater being typically $35^{0}/_{00}$. *E. berenice* is one of the few insects known to tolerate high salinity and has been documented to survive in salinities as high as 70 $^{0}/_{00}$. Dunkle (2000) describes this species as being the only dragonfly in the western hemisphere that can breed in undiluted seawater.

Orthetrum poecilops must also be considered a marine dragonfly. It is only found in Hong Kong at sites below the high water mark. Although parts of these sites are influenced by small freshwater trickles and seepages at low tide, at high tide, all the Hong Kong sites are fully covered by seawater. During the wet season salinities of surface seawater at Starling Inlet drop to as low as 18 $^{0}/_{00,}$ or less, but during the winter dry season, surface water salinities are typically fully saline at 33 $^{0}/_{00.}$

There are a number of dragonflies, both Anisoptera and Zygoptera, which can also tolerate brackish waters, but at Salinity levels much lower than fully saline conditions. In Japan *Mortonagrion hirosei* is considered to prefer brackish water habitats. This species also occurs in the vicinity of Starling Inlet, at Luk Keng marsh, where conditions are brackish. In Moore (1997) *Mortonagrion hirosei* is the only dragonfly recommended, by the IUCN Species Survival Commission Odonata Specialist Group, as a priority species for protection, because of its preference for brackish water conditions. If the rarity and habitat preference of *O. poecilops* had been fully appreciated by the Odonata Specialist Group it is likely this species would also have been recommended as a priority species for protection for its biology. In Japan *Orthetrum poecilops miyajimaensis* is already classified as endangered on the IUCN red list, principally due to habitat loss.

Biology

Very little is known of the biology of *O. poecilops* apart from its preference for intertidal mudflats amongst *Kandelia* mangroves. In Japan the only known sites are coastal marshes. In Hong Kong males can be found holding territories throughout the day; typically perching on *Kandelia* mangroves or *Phragmites australis* reed stems. Females appear at the breeding sites during the early morning and late afternoon. Coupling takes place in a settled, stationary position with the 'wheel' stage lasting about 10 minutes, which is quite a long time for a libellulid.

Distribution

The type locality for *O. poecilops* is Guangdong. It is also known from Foochow, Fujian and from a small island, Miyajima, located off the coast of Hiroshima, Japan.

In 1998 I met Mr. Sawano, who rediscovered *Orthetrum poecilops* at Miyajima, in 1955, after a gap of some 17 years. Mr. Sawano had come to Hong Kong to help the Chugoku Broadcasting Company, from Hiroshima, to make a television documentary of *Orthetrum poecilops.* As part of the documentary they filmed breeding sites in both Hong Kong and Japan.

Identification

One of several blue-bodied 'darter' dragonflies in Hong Kong. The sides of the body are yellow and black striped, becoming darker with age. It is the only Hong Kong blue libellulid species with a whitish face. It is about 4.5 cm long with a 7 cm wingspan. The females, which are seldom seen, are dull brownish with yellow and black markings. Some of Asahina's (1970) figures are reproduced here in figs 1-7.

Synonymic notes

Orthetrum poecilops miyajimaensis Yûki & Doi (1938) was originally described as a separate species, from the Japanese island of Miyajima. Asahina and Sawano (1957) synonymised *miyajimaensis* with *poecilops.* However, Asahina (1970) reestablished the separate taxonomic status of *miyajimaensis,* at subspecies level, by creating *O. miyajimaensis poecilops.* Asahina's judgement was based principally on the smaller size of *miyajimaensis,* which has now been shown to be inconsistent and may be related to the timing of emergence within the season (pers. com. Sadayuki Ugai). No structural differences

have been identified. *O. miyajimaensis poecilops* should be treated as a synonym of *O. p. poecilops.*

***Orthetrum poecilops* Ris, 1919**

Orthetrum poecilops: Ris, 1919: 1091, fig. 627, "Holotype male, IV-1911, Guangdong"; Asahina & Sawano, 1957: 8-12, "2 males, 5 females, 20-III-1955, 18 males, 2 females, 29-VII-1956, Yamashiro-ura, Miyajima, Japan, leg. Sawano".
Orthetrum poecilops poecilops: Asahina, 1970: 200, figs 1-4, 10 males, 11 females, Foochow, Fujian, circa, 1928, leg. Kellogg; Wilson, 1995: 158-159, 165, "Hong Kong"; Wilson, 1997: 41, 68, 1 fig., "Nam Chung, Hong Kong".
Orthetrum poecilops ssp.: Saito & Ogata, 1995: 43, figs 105-106, "Shuen Wan, Nam Chung, Hong Kong".
Orthetrum miyajimaensis: Yûki & Doi, 1938: 153-155, "1 female, Itsukushima (=Miyajima), prov. Hiroshima, Japan, 21-VI-1936"; Sawano, 1966: 9: 4, "larvae, Miyajima , Japan".
Orthetrum poecilops miyajimaensis: Asahina, 1970: 202-203, figs 5-7 (larvae), "Miyajima , Japan".
New material: 3 males, 1 female, Hoi Pui Leng, Starling Inlet, Hong Kong, 3.IX.2000, coll. K.D.P. Wilson.

Discussion

There are few Hong Kong examples of internationally rare odonate species occurring in lowland, lentic, freshwater habitats. Rare odonates tend to be found in flowing waters and numbers of rare species typically increase with altitude. With a distribution of Hong Kong to Japan *Orthetrum poecilops* was probably once a relatively wide-spread species. However, due to habitat destruction, suitable sites are now rare along southern Chinese and Japanese coastlines. Loss of mangrove habitat in southern China has been well documented.

None of the sites in Hong Kong, where *O. poecilops* has been recorded, are classified as Sites of Special Scientific Interest and none are located within Country Parks. As is often the case in Hong Kong, Country Park boundaries are tantalizingly close but typically lowlands and village environs are excluded. The Country Park boundaries in the case of the *O. poecilops* sites are less than 0.25 km away.

Recommendations

In view of its global rarity and its unusual biology the conservation of *O. poecilops* in Hong Kong should be considered a high priority. It is certainly worth further study to determine its life cycle, quantify its salinity tolerance and determine its habitat requirements.

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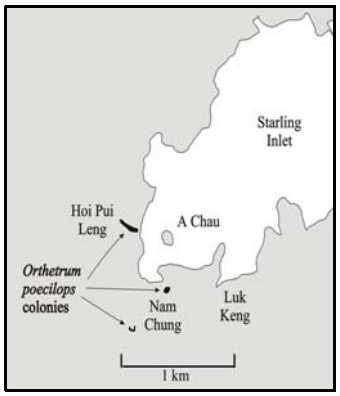

Distribution of *Orthetrum poecilops* at Starling Inlet

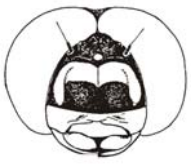

Fig.1

Fig. 3

Fig. 5

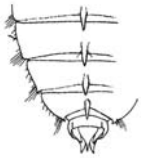

Fig. 6

Fig. 2

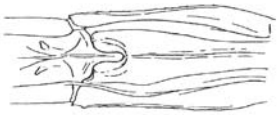

Fig. 4

Fig. 7

Figures 1-7, *Orthetrum poecilops* Ris (from Asahina, 1970). Figs 1-3, male, Foochow, Fujian: (1) head, frontal, (2) caudal append-age, lateral, (3) secondary genital appendages. Fig. 4, female, Foochow, Fujian: (4) valvula vulvae. Figs 5-7, larvae, Miyajima, Japan: (5) labium, (6) caudal abdomen, dorsal, (7) abdomen, lateral.

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Soil Towers

by R.D. Hill

Rather more than 40 years ago I first read Charles Darwin's classic monograph on *The formation of vegetable mould, through the action of worms: with observations on their habits*, published first just a year before he died in 1882. Right through subsequent years of research on agriculture and soils his ideas were tucked away in my memory with the realization that in Hong Kong - so far as I was able to discover - nothing had been done on soil turnover by animals. It took a hill fire at the site of Mervyn Peart's and my soil erosion study in the New Territories to make me realize just how important this may be. Within a couple of days hitherto blackened slopes began to be sprinkled with yellowish - brown patches of soil ranging in size from a few square centimetres to half a square metre, from a few tens of grams to several tens of kilograms, in all likelihood.

Some unsystematic observations and discussion established that the larger heaps of material were probably the work of porcupines - only one actually seen - and/or ferret badgers - none seen. As these animals are nocturnal or partly so, some fairly sophisticated methods would be needed to study them. Smaller heaps were clearly the work of wasps, ants and termites. The material is fine-grained and formed into weakly aggregated balls about 0.5 to 1.0 mm in diameter. Wasps form a low conical mound, roughly circular in slope, centred upon a hole about 10 cm in diameter. This is of some depth for the colour of the aggregates is the yellowish-brown of the B horizon of our hill soils and this generally extends downwards from around 20 to 50 cm in the profile, not the darker brown of the A horizon. Ants or termites - which ones is under study - form extensive clay-roofed galleries as well as producing conical mounds like wasps. One well-known gallery-builder is the termite *Coptotermes.* (In H.K. does this seem have something of an affinity for Acacias?). Ants also build towers. These may be quite slender - 5 am in diameter and up to about 5 cm in height. Others are broader - 2 or 3 cm in diameter and up to 10 cm tall. Which insects build which kinds of towers remains to be established. These towers are quite fragile and are destroyed by heavy rain.

Not so the towers now known to be built by an earthworm. These were first noticed by following a hill fire in 1999 on the ridge leading up to Tai Mo Shan from Kun Yam Shan, though Richard Corlett's indefatigably keen eye on various H. K. mountain slopes had earlier noticed them. Towers are, for H.K., fairly substantial, long-lasting structures, hard to very hard as soil aggregates, verging on indurated. They are formed as irregularly globular masses of clayey material, some clearly drawn from the A horizon - as evidenced by their colour - some from the B, like that of wasp mounds, more yellow in colour. The towers are about 3 - 4 cm in diameter rising to about 10 cm, exceptionally a little more. Each has a hole about 3 mm in diameter right through the tower.

Such was the state of my knowledge until this October, when, after having listed "The role of animals in soil turnover" as a final-year undergraduate project for some years, Katie Chick began investigations, focussing on the invertebrates. A first field trip to the Tai Mo Shan ridge above KFBG found plenty of towers, a few inhabited by ants and spiders who clearly appeared to be opportunistic visitors or inhabitants. Out of 20 towers opened up, only one was inhabited by a possible builder, a worm, probably a juvenile, some 3 cm long. A second visit on a wet morning established the presence in abundance of large earthworms, up to 30 cm long and 5-6 mm in diameter. There, at last, was a candidate for tower-building. The visits also established two other things. The tower did not lead into an underground chamber. Some were actually built on a concrete path. The second fact was that these worm-casts - for that is what they are - do not necessarily form towers. The material may be deposited on the ground though still in globular masses. What appears to happen, though this is yet to be directly observed, is that the animal in the central hole in the cast, vents the cast material onto earlier vented material with which it binds. Where active venting occurs, recently deposited material at the top (or side) is soft and somewhat viscous, rather darker and much moister than the earlier deposited material. The material contains a good deal of clay and probably also mucus to act as a binding agent. This, after drying in the atmosphere, leads to remarkable aggregate stability. An attempt to measure stability by placing bits of cast in a mixture of alcohol and water has shown no dissolution after nearly two months.

Not all H.K. worm casts are as spectacular as these. On hill slopes at lower elevations the casts are much smaller and certainly do not form towers, each probably representing material from a single evacuation. But they too are quite stable having turned up in our erosion traps. Whether such aggregate stability is enhanced by the baking effects of hill fire remains to be established. Casts probably contain significant quantities of soil nutrients though this too is still to be measured. Certainly an anonymous H.K. civil servant was, nearly 50 years ago, convinced that they were important. In his view, one reason why H.K.'s rice-fields gave heavy yields year upon year, without fertilizer, was that large quantities of worm-casts were washed onto them, the hillsides being deliberately fired to aid the process of nutrient transfer.

Worm cast

VERTEBRATES

The fish assemblages inhabiting shallow coral communities in Hong Kong's eastern waters

by Andy Cornish

Hong Kong has some of the northernmost coral communities along the coast of mainland China. These coral communities, which do not have a limestone base of accumulated hard coral as do true coral reefs, are most abundant as shallow, fringing communities in eastern waters. Surprisingly, given the economic importance of reef fishes in Hong Kong, little was known about the fishes inhabiting these coral communities, leaving me to start my Ph.D research virtually from scratch.

My first task was to compile a comprehensive list of all reef fishes known from Hong Kong, as those inhabiting coral communities would be a sub-set of these. A literature review of 34 publications dating back to 1846 produced 448 valid species from 63 reef fish families (those with some reef-associated species), I added a further 137 new species and 6 new families for Hong Kong from market and field collections over a 4 year period. Of the total 576 species (69 families), 75% are widely distributed in the tropical Indo-Pacific, 15% are temperate or sub-tropical Asian-Pacific species and 10% had other distributions. Hong Kong is, therefore, a region of overlap for tropical and temperate species along the coast of mainland China. This is to be expected as local sea-surface temperatures vary from 27 to 16 ^{o}C annually.

Fish assemblages were studied in detail on 3 coral communities at Sharp Island, Hoi Ha Wan Marine Park and Ping Chau (Mirs Bay). Diversity (per unit area), abundance and biomass were recorded using Underwater Visual Census (UVC) of permanent 2 0 x 3 m transects. Biomass can be calculated by estimating the lengths of each fish and inputting these values into species-specific length-weight relationships derived from caught fishes.

As fish assemblages differed little between sites or between the two years of the survey, 1997 and 1998, I will just deal with the overall results here. Some 195 species, or 34 % of the local reef fish fauna, were recorded from the 3 sites. These shallow, fringing coral communities, are clearly hotspots for reef fish diversity, despite their small size. The fish assemblages were dominated by very few species , with just 9 species, contributing > 90% to abundance and > 75% to biomass. Surprisingly, the species with the greatest mean biomass was the nocturnal Silver sweeper (*Pempheris oualensis*), a fish that had not even been recorded previously from Hong Kong. Large reef fishes were scarce at all 3 sites and the largest fish recorded in over 500 censuses was a 40 cm Great barracuda (*Sphyraena barracuda*), estimated to weigh 530 g. Overall, mean biomass in the shallows, where the corals are most developed, was estimated at 20-29 g.m^{-2}. This figure comprises 2 components, the "visually obvious" fauna which was sampled using UVC, and the cryptic fauna which was sampled on 2 random transects by surrounding the transects with fine nets and collecting all the fishes within.

The biomass estimate of between 20 and 30 g.m^{-2} was highly revealing as it is amongst the lowest ever recorded from coral habitats in the Indo-Pacific, where biomass varies from 9.2 g. m^{-2} for just 8 families on a heavily dynamited reef in Kenya (McClanahan & Kaunda-Arara 1996) to 237 g.m^{-2} on the midshelf Great Barrier Reef (Williams & Hatcher 1983). The lack of larger reef fishes seems the fundamental reason for low biomass here, indeed most individuals of larger species recorded at the study sites had not reached size of sexual maturity. Biomass almost certainly used to be higher as more than 75% of long-time local divers responding to a questionnaire noted that parrotfishes (Scaridae) and groupers (Serranidae) had declined on coral communities in recent decades. Overfishing is the most likely cause of this decline, as these large reef fishes are slow to reach size of sexual maturation and respond poorly to being intensively fished, as they are in Hong Kong.

Fish assemblages varied seasonally, with diversity, abundance (excluding two common species, Chinese demoiselle [*Neopomacentrus bankieri*] and Broadbanded cardinalfish [*Apogon fasciatus*]), and biomass being greater in summer (July-September), than in winter (January-March). It appears that mobile fishes leave the coral communities and site-attached species spend more time within the coral framework in winter, apparently in response to cold water temperatures at this time. Wrasses, such as the common Bubblefin wrasse [*Halichoeres nigrescens*], may bury themselves under sand as is the case for some other wrasses, although this could not be proved. Similar seasonality in reef fish assemblages has also been reported from other high-latitude reefs in the Red Sea, Florida and Japan but is not a well-known phenomenon.

Chaetodon speculum "Mirror butterflyfish feed almost entirely on live coral polyps and are moderately abundant in Hong Kong"

At the moment, no coral communities in Hong Kong are protected from fishing although two coral areas, totalling 7.4 hectares, have been proposed as no-take areas in the proposed marine park at Tung Ping Chau. This is clearly an oversight if reef fish biodiversity is to be preserved in local waters. The scleractian corals themselves receive more protection than reef fishes, even though it is the latter that is seriously threatened by overexploitation. Even within the 2 marine parks, unlimited fishing with certain gears is still permitted by commercial license holders. Clearly, the duties of AFCD such as "protecting, restoring and, where necessary, enhancing marine life" are not being met, at least not with regard to reef fishes. Although no-take Artificial Reefs may protect some species, others only inhabit areas of hard coral, the coral-eating species of butterflyfish (Chaetodontidae) being a good example, or are quite mobile. The high proportion of sub-adult fish on coral communities also shows them to be nursery grounds for fish such as Blue-barred parrotfish (*Scarus ghobban*) and the most abundant local grouper, Chocolate hind (*Cephalopholis boenak*). This role as nursery grounds is surely enough reason to offer greater protection to coral communities in itself, given that very few local nursery areas have been identified to date (ERM HK Ltd. 1998). Conversely, the present low abundance of larger reef fishes means that fishers have little to lose financially by creating no-take zones of these nursery grounds. This is an important consideration as compensating fishers is currently a major obstacle to creating no-take reserves. Indeed, the issue of ex-gratia payments to fishers in compensation for creating the first no-take reserve at Cape d'Aguilar in 1996 has still not been resolved.

In the larger picture, coral communities are just one of the many habitat types that will need to be protected from exploitation if Hong Kong is serious about maintaining its substantial marine biodiversity. For example, The Great Barrier Reef Marine Park Authority has recently identified more than 70 marine "bioregions" in the Great Barrier Reef and is currently working to create no-take zones around representative areas of each (see www.gbrmpa.gov.au/). A comprehensive review of all habitat types is some way off in Hong Kong, but until then government could do much to protect the biodiversity and sustainability of reef fish stocks (and the corals themselves), by creating no-take areas encompassing our better coral communities.

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Amazing snake

by Jonathan Kolby & James Lazell

The Conservation Agency

Herpetologists continue to discover species of reptiles that are new to Hong Kong despite decades of collecting effort going back to the great naturalists Dr. Geoffrey Herklotts and John Romer. Far more rarely, a species new to science appears, as in 1987 when Fr. Anthony Bogadek discovered the borrowing lizard that bears his name: *Dibamus bogadeki*. The notion that a new reptilian genus might be discovered in Hong Kong seems scarcely credible.

On 4 July 1999 one of us (JK) caught a small, yellowish to olive-drab snake swimming in the central gutter of the Keung Shan catchwater on Lantau, where the catchwater crosses the main Tai O road above Lower Keung Shan village. In colour, virtual lack of pattern, and head shape, this snake is quite unlike any species known from Hong Kong. Most amazing, however, is the presence of three prefrontals, a condition not seen in any genus known from Guangdong or adjacent Provinces: Figure 1.

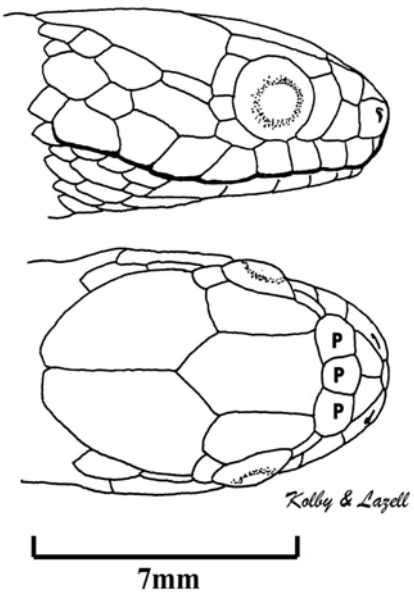

Fig 1. The Amazing snake (P indicates prefrontals)

The specimen keys out to *Opisthotrophis andersonii* if one chooses the character one prefrontal, or to "*Rhabdophis*" if one chooses two. With three, and its other peculiarities, it looks like none of these. The snake is a hatchling or newborn with a yolk sac scar. It is 150 mm snout-to-vent, with a tail length 61 mm. There are 19 dorsal rows at the neck, 19 at midbody, and 17 at the vent. There are 124 ventral plates and 82 paired subcaudals. The anal plate is divided in line and the dorsal scales are heavily keeled with the exception of rows 1-2.

Internally, the specimen has prominent vertebral hypapophyses with two tendinous muscle attachments on all body vertebrae, the defining feature of the subfamily Natricinae of family Colubridae, to which *Opisthotrophis* and *Natrix sensu lato* ("Rhabdophis," "Amphiesma," etc.) belong.

We are indebted to Drs. Michael Lau (Kadoorie Farm & Botanic Garden), Jacques Gauthier and Theodora Pinou (Yale

Peabody Museum) and Van Wallach (Museum of Comparative Zoology) for the examination of the specimen. Karsten Hartel (Harvard) prepared x-rays and William Sacco (Yale) made the photographs from which Figure 1 was traced.

So far, the view that this snake represents a new, unnamed, and undescribed genus seems inescapable. We will invest considerable effort in searching for more specimens.

"*Our over-riding goal is to preserve the diversity of life. Our guiding principle is that conservation is the application of the science of ecology, a complex and often arcane composite of the biological and physical sciences*." James D. Lazell, Ph.D., President (from the Conservation Agency website)

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Turtles in Temples

by Cheung Sze Man

Temple ponds or 'fang sheng chi' (ponds for keeping animals alive) have more than 15 years of history in Hong Kong. Turtles are frequently released into temple ponds for religious and cultural purposes. Similar practices have also been recorded in Taiwan (Chen et al., 2000) and Nepal (Shrestha, 1997). Ironically, these ponds, that are intended to keep turtles alive, have put chelonian conservationists in a dilemma.

The turtle pond in Wong Tai Sin Temple (Wong Tai Sin) was visited at least once every three months from 1995 onwards. Temple ponds in Yuen Yuen Hok Yuen (Tsuen Wan) and Wan Tsuen Sin Koon (Fanling) were also checked at least once a year during the same period and the species observed were recorded (Table 1). At least 10 species have been recorded so far and all except *Trachemys scripta elegans* were Asian species. The most frequent and abundant species was *T. s. elegans* while *Chinemys reevesii* followed. In recent years, more and more *Cuora amboinensis* and *Cuora galbinifrons* were observed in temple ponds, probably due to their ready availability from the local food market. Except for *T. s. elegans*, all species are of important conservation value. All *Cuora* species and *Indotestudo elongata* are listed on CITES Appendix II. Moreover both *Cuora galbinifrons* and *Cuora trifasciata* are critically endangered and most other recorded turtles are endangered (IUCN, 2000).

In fact, for many Asian turtle species temple ponds can be short-term sanctuaries from the regional food market. Also, releasing turtles into temple ponds by religious organizations causes less catastrophic ecological impact when compared to exotic turtles being released to the wild. However, as noted by Chen et al. (2000), 'temple ponds are unsuitable for turtles'. In Hong Kong, terrestrial *I. Elongata* individuals were once observed submerged in water (water level was half the shell depth) with *T. s. elegans*. A temple worker told the author that the diet of those omnivorous/carnivorous turtles consisted of leftover vegetables and rice only. The hygiene in turtle ponds is also worrying. As conservation organizations are usually short of funds, 'buying' turtles from temples for conservation management is impractical. Instead, temples should be invited to donate the endangered species for a captive breeding programme. However, as the turtles are the property of the temples , the willingness to co-operate still depends on the religious organizations. In Taiwan, a temple is planning an ecological garden for displaying native turtles to help in conservation education (Chen et al. 2000). Communication with the local religious organizations would be an appropriate measure to urge the temples to improve the husbandry of the turtles in those ponds. Education of the Buddhists and Taoists could also make them understand the right way to conserve turtles and to change their perception of turtles from blessing tools to lives that they should respect. In the current Asian turtle survival crisis, the status and role of temple turtle ponds are worth considering.

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Table 1. Chelonian species recorded from temple ponds in Hong Kong since the mid-1990s. WTS=Wong Tai Sin Temple (Wong Tai Sin), WTSK=Wan Tsuen Sin Koon (Fanling), YYHY=Yuen Yuen Hok Yuen (Tsuen Wan).

Species	Place
Chinemys reevesii	WTS, WTSK, YYHY
Cuora amboinensis	WTS, WTSK, YYHY
Cuora flavomarginata	WTS, YYHY
Cuora galbinifrons	WTS
Cuora trifasciata	WTS
Mauremys mutica	WTS, WTSK, YYHY
Ocadia sinensis	WTSK
Pyxidea mouhotii	WTS
Trachemys scripta elegans	WTS, WTSK, YYHY
Indotestudo elongata	WTS

Nocturnal news - Latest on the hillside sightings at KFBG

by Gary W J Ades
Executive Director (Acting)

In previous issues of Porcupine! I, and other members of staff have provided anecdotal animal sightings made within the 148 hectare protected area on the hillside at KFBG. Sightings of some mammals are becoming more frequent and in particular our security guards, having been equipped with a camera for their night time patrols, are taking amazing pictures of the nocturnal wildlife on our hillside. These photos, combined with occasional placement of infra-red cameras in 'mammal-active' areas, have provided the fauna conservation department with probably the best available information on nocturnal wild animal activity for any single site in Hong Kong. The information for the mammals is not very scientific in as much as we have not undertaken any systematic marking/tagging research, however, the sightings captured on film alone are quite incredible.

The guards have, on several occasions, caught on film a snake which had not until recently been photographed in the wild in Hong Kong, and have clear evidence to suggest, at least on our hill-side, that all deer records are *Muntia-cus muntjak* (not *reevesi*). Barking Deer, Wild Boar and Porcupines literally pose for their pictures. Apparently these creatures, which have highly acute olfactory senses, see the guards as little threat and, having got used to the characteristic sound of the patrol vehicle, they get on with their nocturnal habits as normal and in many cases seem not too perturbed by the odd camera flash.

We have a set of monthly photo records of hillside fauna going back 2 years. This information will be valuable in helping us determine 'hot spots' for mammal activity. It is already clear that mammals such as the Barking Deer have favoured areas. Also, Wild Boar activity, although random at times, will no doubt be shown to correlate with the presence of certain seasonal crops and tubers on and around our organic terraces.

Clearly, the two civet species, Pangolin and Ferret Badgers, all recorded on our hillside on several occasions, are less willing to hang around long enough to be photographed by the guards. Both civet species have been recorded by our infra-red cameras and in August 2000, I was able to approach a juvenile Masked Palm Civet, apparently playing on a road side vine. With the animal outlined by the light beam of the jeep I was driving, I was able to leave the vehicle and approach to within 1 metre before it ran up the vine with great agility and disappeared into the canopy of an adjacent tree. Pangolins are rarely seen. Both sightings in the last 5 years have occurred on the upper hill roadside; one was due to disturbance by feral dogs. Pangolins are obviously not so willing to use man-made roads to transit to different areas. Ferret Badgers are extremely shy and are able to detect human approach with their extremely good sense of smell. Anybody who has seen a Ferret Badger or Pangolin foraging will have immediately noted their poor visual acuity. Both species plod along like 'vacuum cleaners' with long snouts to the ground apparently moving randomly until a scent is picked up, both appear to have fairly good hearing which may also contribute to guide them through the clutter of the night. 'Guide' might not be the best word since both animals will often collide with fairly large objects as they snuffle along!

One interesting fact gained from infra red photography is that the home ranges of both Civet species overlap on our hillside, and that Barking Deer and Masked Palm Civets will tolerate each other at the same foraging site. Also, considering their abundance, Wild Boar are extremely difficult to capture using the infra-red set up, possibly due to their acute sense of smell, picking up human scent on the equipment.

Wild Boar and Porcupine are major wanderers with identified family groups (identified by age and number of young) being seen on the upper and lower hillside within the same period.

A kitten Leopard Cat was discovered dead behind our admini-stration building in September this year, indicating the presence of a breeding population nearby. These animals may account for the many reflected eyes we see on night time mammal treks but which do not stay around to be identified! My previous encounters with Leopard Cats in HK have been the result of catching their 'cats eyes' in torchlight, often quite

close to man-made paths and buildings. We even have one feral cat on our hillside that has suspiciously leopard cat-like markings, a very attractive animal, also caught on film by our guards.

We are able to incorporate these wild sightings in our educational information, so that visitors can be kept up to date on the latest nocturnal sightings and to raise awareness of the existence of these animals in protected areas in Hong Kong. Under our hillside ecological management programme we will be paying close attention to the seasonal records of mammal sightings, which will help us to determine any management measures that would help to protect and perhaps enhance conditions for some species and also consider arrangements to minimise damage to crops and flowers on our hillside terraces. This information will be an important part of our integrated management plans, since there will always be conflict between human needs and those of wild animals. With the known diversity of wildlife within our protected area, and the existence of our agricultural activities on the fringes of natural woodland, we have a great and important opportunity to monitor animal activities and needs and relate these to the human activities.

A list of the nocturnal life which has been seen between 1998 and 2000, follows. All except the Ferret Badger, Scops Owl and Nightjar have been photographed in the wild. Also, the approximate frequency of sightings is indicated. Please note that many sightings may be the same animals, we would have to mark the animals in some way if we wished to be more certain about the identity of individuals. In future and with AFCD sanction, we could perhaps consider colour-marking Barking Deer, Porcupines and Wild Boar so that they could be identified for a few weeks (perhaps a blowpipe loaded with a non-toxic paint ball could be employed to do this?).

C - Common (recorded nearly every month)
O - Occasional (< 5 sightings/year)
R - Rare (rarely seen)
(this reference does not necessarily represent status - Ferret Badgers although rarely seen are thought to be fairly abundant on our hillside)

* infra-red camera success

Mammals	**Frequency**
Chinese Porcupine	C
Barking Deer	C
Chinese Pangolin	R
Masked Palm Civet*	O
Small Indian Civet*	O
Wild Boar	C
Musk Shrew	O
Chinese Ferret-badger	R

Reptiles (Spring & Summer)

Burmese Python	O
White-lipped Pit Viper	C
Spotted Cat Snake	O
Mountain Pit Viper	R
Chinese Slug Snake	R
Common Rat Snake(D)	O
King Cobra	O
Chinese Cobra	C
Many banded Krait	C
Copper headed Racer(D)	O
Common Wolf Snake	O
Taiwan Kukhri	O
Red Mountain Racer	R
Big-headed Terrapin	O
Three Lined Box terrapin	R

Birds

Nightjar
Scops Owl
Woodcock

NB this is not a checklist of the fauna records for our hillside, merely those animals recorded during night time patrols and captured on film.

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More on typhoons and birds

Richard T. Corlett

In *Porcupine!* 20, Michael Leven and Amanda Haig describe the effects of Typhoon York (September 16th, 1999) on Hong Kong's birds. Although this was the biggest typhoon for 16 years, the impact on birds was apparently minor, in part because September is well past the main breeding season. In 1971, in contrast, Typhoon Freda struck on June 18th, right in the middle of the breeding season. An article by Elizabeth Hechtel in the AFD's newsletter *Wildlife Conservation* (No.13), describes the damage to the Sha Tau Kok egretry (presumably at Yim Tso Ha):

Innumerable nests were destroyed and the game wardens there reported picking up as many as 300 young dead birds for burial. Adult birds also suffered, especially the Chinese Pond Herons…. Bodies were still to be found lying on the ground, but two birds not yet dead we removed with a faint hope of restoring them to health.

The Hong Kong Bird Report for the year mentions that the egretry in Yuen Long suffered similar damage.

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FLORA

Ficus concinna (Miq.) Miq., a new *Ficus* found in Hong Kong

by Patrick Lai
Hong Kong Herbarium, AFCD

If you come across a giant *Ficus* in our countryside or villages in the New Territories, the leaves being small and elliptical with a tapering base, you would normally expect that it is *Ficus microcarpa*. During a field expedition at the woodland behind Ma On Shan Tsuen (altitude approximately 300 m), we found a giant *Ficus*, with the DBH estimated to be over 2.5m. As opposed to the *F. microcarpa*, it does not possess any aerial root at all. We climbed up the tree and managed to collect a twig with leaves and figs. At a closer look, although the leaves are very similar in shape and size as those of the *F. microcarpa*, they have more conspicuous veins at the surface. The leaves are lighter in colour and are not as dark green as *F. microcarpa*. We examined the specimen and dissected a few figs at the Herbarium. We identified the species as *Ficus concinna* (Miq.) Miq. In fact, the species has also been recorded in Guangdong and Guangxi and it is logical to find it here in Hong Kong. The elevation range of this species recorded in China is from 900 to 1600 m. This generally agrees with our record at Ma On Shan which is situated at a relatively higher altitude. We would be pleased to know if you are aware of any other locality of this species.

The silence of the Acacias

Richard T. Corlett

While walking in Country Parks over the last couple of months, I have several times been struck by a total absence of bird song when going past or through stands of *Acacia confusa*. The only exceptions have been when flocks of Japanese White-eyes pass through. Indeed, these flocks sometimes appear to follow rows of *Acacia* across otherwise treeless landscapes. Other bird-watchers have confirmed my impression that *Acacia* stands are particularly poor bird habitat. But, why? Kwok Hon Kai has shown that plantations of *Lophostemon confertus* have a much lower bird density than native secondary forests of similar stature (Kwok & Corlett, 2000), but bird diversity in these plantations is similar and, to the human observer, the lower bird density is compensated by greater visibility. Like most of our common plantation trees, *Acacia confusa* is not native in Hong Kong, but it grows naturally in Taiwan, so it might reasonably be argued that it is "less unnatural" here than *Lophostemon*, *Eucalyptus* or the American pines. *Acacia* fruits are dry but the “leaves” do show signs of herbivore damage, so it must provide at least some food for insectivores. The most likely explanations I can think of for the relative unattractiveness of *Acacia* stands, are the absence of the native understorey which provides fruits and insects in plantations of other exotic species, and the unique (for Hong Kong trees) substitution of leaves by "phyllodes" (flattened petioles), which may not provide a suitable foraging surface for birds larger than white-eyes.

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Acronychia pedunculata : the solution to a sweet mystery

by Richard T. Corlett

The only detectable sugars in the pulp of most fruits eaten by birds in Hong Kong are glucose and fructose, usually in approximately equal amounts (Ko *et al.* 1998). There are small amounts of sucrose in a few species, but only one fruit known to be eaten by birds has sucrose as the predominant sugar, making up almost a third of the dry weight. This is the fruit of *Acronychia pedunculata*, a small forest tree in the family Rutaceae. One major lineage of birds, which includes the thrushes, robins, starlings and mynahs, has no sucrase (the enzyme which digests sucrose) at all, and even birds which have a sucrase seem to prefer the more-easily assimilated hexose sugars. Why then does *Acronychia* ignore the best scientific evidence and sweeten its fruits with sucrose?

Acronychia fruits are pale-coloured and the flesh has a crisp texture. As with the dominance of sucrose, neither of these characteristics is common in bird fruits, which tend to be black

or red, with a soft pulp that is easily ingested by toothless birds. All our bird feeding records for *Acronychia* are of bulbuls (which have a sucrase) and all come from late in the winter when few alternative fruits are available. Most of the time, even bulbuls ignore them. This suggests that *Acronychia* fruits may be targeted at mammals rather than birds. A few seeds have been found in the scats of civets, which eat several other sucrose-dominated fruits, but not enough to suggest they are the major dispersal agents. The only other possibility in Hong Kong is fruit bats. Captive *Cynopterus brachyotis* – closely related to the commonest of Hong Kong's two fruit bats, *C. sphinx* – prefer sucrose to glucose and fructose in choice tests, and can also detect sucrose at lower concentrations than the other sugars (Herrera et al. 2000). The pale colour of *Acronychia* fruits, their texture, and their display on the outside of the tree crown are also consistent with dispersal by bats.

Although I have still not actually seen a bat taking a fruit, careful searches in the area around fruiting trees over the last 6 weeks have almost always revealed many roughly cleaned seeds concentrated under one or more trees within 20 metres of the *Acronychia* tree. These trees always have branches at approximately the same height as the *Acronychia* fruits and there is a clear flight path between the two trees. This matches the typical feeding behaviour of fruit bats, which select one or more ripe fruits and fly with them to a nearby 'feeding roost', where they are processed while the bat hangs upside down (Corlett 1998). Only the smallest seeds are swallowed, while those larger than 2-4 mm are dropped. *Acronychia* seeds are around 7 mm in diameter so they are always dropped. The bat then shuttles between the fruiting tree and the feeding roost with additional fruits while the seeds pile up on the ground below.

These observations do not just clear up a natural history mystery. This is also the first evidence that fruit bats are involved in the dispersal of a common forest tree in Hong Kong. Previous records of seed dispersal by bats in Hong Kong mostly involve figs (notably *Ficis fistulosa*, *F. hispida* and *F. variegata*, which seem to be dispersed entirely by fruit bats), and which are not important components of local forests.

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The Flora of Tung Lung Chau

by Richard T. Corlett and Ng Sai-chit

The 2.5 square kilometer island of Tung Lung Chau lies just off the southern tip of the Clearwater Bay peninsula and due east of Hong Kong Island. It is one of several islands currently being considered as a possible future Country Park. At present, the Qing Dynasty fort in the north-east of the island is a Special Area but the rest of the island is unprotected. It is easily accessible at weekends by *kaito* from Lei Yue Mun and is popular with campers, as well as rock climbers, who make use of the spectacular cliffs along the east coast of the island. The view from these cliffs towards the Ninepin Islands is among the most wild and beautiful in Hong Kong.

Country Park status for Tung Lung Chau can easily be justified on recreational grounds, but there is very little biodiversity information available. To remedy this deficit for vascular plants, Ng Sai-chit, Wong Yim Wah, Laura Wong and Richard Corlett visited Tung Lung Chau on May 20th, 2000, and again, with the addition of Alvin Tang, on November 11th. On both trips, we listed everything we knew and collected everything we did not know, trying to visit all major habitat types on the islands. In total we recorded 348 species – an amazing number for such a tiny, rocky island! This is 16% of Hong Kong's total recorded flora of 2135 vascular plant species in only 0.2% of the total land area. This list is certainly incomplete and we intend to make further visits in the future.

The most interesting species so far is *Marsdenia lachnostoma*, for which this is the only recent Hong Kong locality. Other rare species included *Cleyera japonica*, *Elaeagnus tutcheri*, *Litsea greenmaniana*, *Tutcheria microcarpa*, *Vitis bryonifolia* and the fern, *Notholaena hirsuta*. Equally interesting was the list of species we did not find, which included *Acronychia pedunculata*, *Cinnamomum parthenoxylon*, *Diospyros morrisiana*, *Elaeocarpus chinensis*, *Prunus phaeosticta* and *Tridax procumbens*. All these species are - we thought - ubiquitous in Hong Kong, and they can all be found on the east coast of Hong Kong Island, less than three kilometres away.

MISCELLANY

The Bass that ate Biwa (or Protecting Japan's Largest Lake)

by David Dudgeon

In the spirit of Richard Corlett's travelogue in the last issue of *Porcupine!*, I would like to share some observations made during a recent trip to Japan. I was a guest of the Shiga Prefectural Government (a part of Japan near Kyoto, Nara and Osaka). Although the Prefecture is landlocked, there is plenty of aquatic habitat in the form of Lake Biwa – Japan's largest lake. It has a maximum depth of over 100 m and an area of 674 km^2; in other words, it covers more than half the total extent of Hong Kong SAR. The catchment is around 3,200 km^2, and occupies over 90% of Shiga Prefecture. The boundaries match the Prefectural borders almost exactly. This feature has important implications that I will come back to later. Lake Biwa was designated a Ramsar site in 1993. It is an important sanctuary for migratory birds and supports Japan's largest freshwater fishery. Of greater significance is its age: 4 million years. This puts it in the same category as other ancient lakes such as Lake Tanganyika, Lake Baikal, and the Caspian Sea. Like those lakes, Biwa hosts an array of endemic species. Although it lacks something as emblematic as the freshwater seals of Lake Baikal, Lake Biwa supports 57 species and subspecies (the taxonomic rank of some of them is difficult to determine) found nowhere else. They include 12 species of fish, 38 benthic invertebrates (mainly molluscs), and two aquatic macrophytes.

Approximately 1.3 million people live along the shores of Lake Biwa, and over 20% of them are clustered around the shallow southern basin (which averages only 4 m in depth). Inevitably, then, there are problems with contamination (!jargon alert!), and the primaeval oligotrophic lake is now distinctly mesotrophic tending to eutrophic in the southern basin. Pollution from domestic, industrial and agricultural sources have caused problems such as red tides (*Uroglena americana* seems to have been the culprit), blooms of blue-green algae (*Anabena* and *Microcystis*), and choking growths of exotic waterweeds (*Elodea* and *Egeria*). These problems first appeared in the late 1970s. The Shiga Prefectural Government was aware of the likely environmental consequences of a large, rapidly growing population situated within an enclosed lake basin. In 1973, they introduced pollution control ordinances that were more stringent than those applied nationally and, in 1979, strengthened these by introducing specific new clauses directed towards reductions in nitrogen and phosphate in effluents. The laws were beefed up again in 1996. Infrastructural investment in sewage treatment has been impressive, and the few houses that are not connected to a treatment plant are visited periodically whereupon the accumulated human excrement is vacuumed out and taken to a municipal treatment works. (I didn't actually see this myself, but this is the kind of thing that I'm willing to take on trust!) Other initiatives included low-interest loans with long repayment periods that could allow small-scale industries to upgrade waste-treatment facilities and, in 1985, a ban on the sale of detergents containing phosphorus. Agricultural pollution sources have been tackled by legislation that restricts the use of certain fertilizers.

None of these measures would have been successful without the support of the local people. Fortunately, the inhabitants of Shiga Prefecture are proud of Lake Biwa, and are committed to protecting it. The many local citizens' groups organize neighbourhood and shoreline clean ups, environmental fairs and other community activities. In addition, environmental education is a mandatory and important part of school curricula, there are numerous local education centres, and all 5^{th} grade primary school students are taken on an overnight field-trip *cum* cruise on Lake Biwa in the Prefectural school boat (really!). The Lake Biwa Museum, opened in 1996, played host to its three millionth visitor around the time that I was there. This figure indicates the extent of local interest and pride in the Lake. It is certainly an excellent museum, focussing on the Lake and its biota (there is an excellent aquarium), the human uses of the Lake and its cultural significance, as well as the conservation significance of ancient lakes in a global context.

I got the strong impression from the people I met that they took great pride in the efforts made to protect Lake Biwa and its biota. Nevertheless, it must be said that there is some enlightened self-interest at work here. Lake Biwa provides drinking water for 14 million people (including cities such as Kyoto). So it is not too surprising that the Prefectural Government has set stringent water-quality standards for the Lake. Yet despite strenuous efforts, the water quality in the Lake does not yet meet the targets set. However, those targets are stringent, and the current condition of the Lake is not far off the desired standard. Plus the Prefectural Government has a well-staffed and committed Department of Environmental Policy (something that Hong Kong lacks), and all of the major stakeholders seem dedicated to the goal of protecting Lake Biwa. That objective seems realisable because the Prefectural boundaries match the limits of the drainage basin almost precisely – this allows the possibility of local government control of all activities with the potential to damage the Lake environment. To put things in the context prevailing in most Asian countries where the policy on the environment (such as it is) is usually something along the lines of 'develop now – clean up later', Shiga Prefecture definitely seems to be at the 'later' stage.

So, is this one of those near mythic beasts - an environmental success story? I thought so at first. A closer look uncovers a rather different story – for example, the loss of almost the entire reed-bed habitat along the shoreline to rice farming, and the introduction of large amounts of fine sediments from waters draining agricultural land. That said, it might be that the

main threat faced by the biota of Lake Biwa is invasion by exotic species. The plants and animals in this ancient Lake have evolved in isolation, and the community is vulnerable to invasion by species from elsewhere. I have already mentioned exotic aquatic plants, but the main category of invaders is freshwater fish. Predators from North America such as Black (= Large-mouth) bass (*Micropterus salmoides*) and Bluegill sunfish (*Lepomis macrochirus*) have been introduced (perhaps by anglers) and are busy eating their way through the native fish fauna. At least one Asian species of Snakehead (*Channa argus*), a highly efficient predator upon frogs and fishes, is present also, as is an exotic goby that appears to occupy the same niche as the endemic Lake Biwa goby. It seems likely that the European bitterling (*Rhodeus sericeus*) will soon become established – who knows what effect this will have on the five species of indigenous bitterlings in Lake Biwa.

I do not mean to give the impression that no one is aware of the threats posed by exotic species. Scientists are concerned and, behind the scenes in the Lake Biwa Museum, captive breeding of endemic fishes is being undertaken. *Ex situ* conservation seems a viable - albeit depressing – option for some species. Many other individuals, although lacking paper credentials, are worried about the fate of Lake Biwa also. I met a couple of elderly gentlemen belonging to a citizens' environmental group who were trying to teach farmers about the difference between exotic Mosquitofish (*Gambusia affinis*) and the native Ricefish (*Oryzias latipes*) upon which it preys. (There is an eerie parallel here with the interaction between Mosquitofish and *Oryzias curvinotus* in Hong Kong.) One of their aims was to persuade farmers to engineer the environment of paddy fields along the Lake shores so as to maintain favourable conditions for Ricefish. But how to engineer the entire Lake in order to safeguard indigenous and endemic fishes from an array of predators against which they have evolved no defenses ? That is one question that Japanese ingenuity and commitment to environmental protection has yet to answer. Unfortunately, time is running out.

* * *

A Road To Nowhere

by Lisa Hopkinson

the Green Lantau Association

In 1995, the-then Director of Audit criticised a $25 million highway from Sham Wat, a picturesque little bay south of the airport (between Tai O and Tung Chung), to Sha Lo Wan. The Highways Department had already completed Stage 1, involving a $11 million 2.2 km road to Sham Wat, from the road leading to Ngong Ping, in 1990. Stage 2 involved extending the road further up the coast to Sha Lo Wan.

The District Office had somehow estimated that the road would serve 600 villagers but the census actually showed only 73 people living there. The Director of Audit rightly decided that it would be a gross waste of public money to spend a further $25 million on 73 people, and blamed poor planning of the Highways Department and the Home Affairs Department. One of the original reasons for the road, was that it was thought that the public pier at Sha Lo Wan may be removed due to the airport works, but in the end it was retained. The government suspended Stage 2. Or did it?

Five years later Highways Department are back, and guess what, they've started building a road from Sham Wat to Sha Lo Wan. What was once a beautiful little beach is now a construction site. The Sham Wat stream, which is estimated to be one of the most ecologically diverse in Lantau, has been crudely diverted. Construction waste has been dumped on mangroves and mudflats and the contractor has extended his works area well beyond what is legally and contractually permitted.

The road, with armour rock wall and crash barriers, stops after about 50 metres, and thus gives vehicular access to a handful of villagers that previously had to walk across a footbridge to get to their cars. The new construction is grossly and irrevocably inappropriate and intrusive and a gross overdesign for a one-in-a-hundred years typhoon. The armour rock wall 'protects' a 4 metre reinforced concrete wall, the whole replacing a gently shelving beach of seagrass.

The once peaceful village of Sham Wat was featured in a coastal walk between Tung Chung and Tai O in Friends of the Earth's Lantau Coastal Guide:

"*It would be worth planning your walk to arrive here for a picnic lunch as it is a beautiful location. A refreshing dip in the beautiful stream is also highly recommended*."

Now the village is full of construction vehicles, noise and dust.

Highways Department stated in a letter to the Green Lantau Association (GLA) in July 2000 that the contractor would be excluded from areas outside the site boundary, that Highways Department's site staff would monitor the contractor and that the contractor would be instructed to erect a fence around the site boundary to limit disturbances to ecological resources in the area.

The GLA has held two site visits with the Highways Department's consultant Resident Engineer, Mouchel Asia Ltd, and contractor, Hang Kee Construction Ltd in September and November 2000. Agreements reached at these site meetings have largely not been honoured. The GLA thus decided that under the present circumstances further site visits would not be fruitful. GLA has since asked the Lands Department to consider prosecuting the consultants and contractor for trespass onto government land. GLA is also preparing a submission to the Director of Audit and the Ombudsman.

The so-called Resident Engineer is actually resident engineer for two other projects in Sai Kung, severely limiting the amount of time he can spend at Sham Wat. Highways Department failed to turn up at both site meetings and even while

fully aware of the various breaches of contract have continued to reassure GLA in writing that "precautionary and mitigation measures required as a result of the ecological review will be implemented".

Many of these problems could have been avoided had there been an environmental assessment conducted for this project. However, since this is considered a 'minor' rural project, it is excluded from the EIA process, and therefore lacks an effective enforcement mechanism. Instead, government officials witnessing illegal occupation and destruction of government land do nothing but write warning letters which they know will be ignored.

If this was an isolated case it wouldn't be so bad, but similar 'minor' acts of destruction are going on all the time, promoted by villagers, aided and abetted by government works departments and funded by tax-payers. Completely unnecessary concreting of streams, footpaths and slopes - some of them so over the top as to become absurd. One footpath on Lamma has so much concrete that even the rocks adjacent to the path have their own concrete 'plinths'.

The Home Affairs Department which administers the Rural Public Works (RPW) Programme (formerly known as the Rural Planning & Improvement Strategy Minor Works Programme (RPIS), guaranteed to strike dread into the heart of environmentalists) has a budget of $100 million for the financial year 2000/01. While this is small beer in government terms, it translates into a lot of damage to the SAR's streams, beaches and woodlands. The HAD circulates details of the projects to the Environmental Protection Department and Agriculture, Fisheries & Conservation Department, who generally have no objection. The projects are approved by District Councillors and District Officers, who generally have an interest in encouraging employment for local contractors.

What is needed is for EPD to bring these projects within the EIA purview . While small projects, due to the ecological sensitivity of the project locations, they can actually do a lot of damage, both individually and cumulatively. A full EIA would not be necessary in most cases, but could focus on ecological and visual impacts only in many cases. Perhaps a panel comprising representatives from EPD and AFCD could be formed to deal with works under a certain cost ceiling.

The Director of Audit should also take a close look at the need for many of these projects – with the current system of term contractors there appears to be an awful lot of work being generated for works sake. Last, but not least, government engineers within Home Affairs Department, and government works departments need a crash course in ecology.

Photos by Lisa Hopkinson

* * *

Notes on the ecological value of Sham Wat Stream and its valley

by Bosco Chan and Michael Lau

Sham Wat, or Sai Tso Wan in North Lantau retains its rural characteristics due to its inaccessibility; visitors have to walk either from Tai O or Tung Chung along the coast, or take the steep walk starting around Ngong Ping. Despite having most of the stream flow intercepted by a catchwater at about 100 m asl, Sham Wat Stream has copious year-round flow and a diverse and natural physical environment. Fish life was both diverse and abundant prior to recent channelization and construction work; a total of 15 fish species were recorded by BC in his PhD study, one of the highest fish species richnesses for local streams , and, in particular, it has many migratory species. A goby species previously unrecorded in Hong Kong freshwaters, *Redigobius* cf. *bikolanus* was found, and other interesting records included the carp *Nicholsicypris normalis* and two rarely seen sleepers, *Eleotris acanthopoma* and *E. melanosoma*. *Nicholsicypris normalis* was thought to be restricted to the eastern side of the mainland New Territories, but it occurred in good numbers in Sham Wat Stream. In Hong Kong, both *E. acanthopoma* and *E. melanosoma* have only been recorded in streams on Lantau. Sham Wat was also the only stream during BC's study where three species of sleepers co-existed in pure freshwater. The high abundance of these predatory species also suggests that a very productive ecosystem existed in Sham Wat Stream. In addition, the locally rare dragonfly *Diplacodes nebulosa* and locally uncommon Three-striped Grass Frog *Rana macrodactyla* were found along the grassy banks during the Biodiversity Survey.

Prior to the present destruction, the strip of mangrove which lined the estuary and the gentle gradient/flow of the lowland section provided ample food sources and allowed penetration of migratory fishes, respectively. Sadly, the river mouth was recently destroyed to accommodate the new road, and the lower section of the stream, which had the most interesting fish fauna, was dredged and all pools and riparian vegetation were destroyed. Nutrient input is likely to be lower after destruction of the mangrove and the riparian vegetation, and the dredged channel has noticeably faster water flow. These alterations are likely to affect the structure of the fish community, since species preferring pool or slow current habitats are unlikely to cope with the changes.

Although this short note discusses some of the ecological value of the valley and highlights the need to conduct baseline ecological assessment for "minor" government works, the information provided here is by no means comprehensive and more species of conservation value could surely be found with more intensive field work. The lack of a comprehensive ecological survey is a common phenomenon for many remote inlets (e.g. those facing Crooked Harbour and Double Haven), basins (e.g. those excised within Country Parks), and foothills (e.g. those scattered in the Kam Tin/Yuen Long and Sha Tau Kok areas), where vehicular access is impossible and "outsiders" are not always welcomed by the villagers.
Naturally, scientists tend to concentrate their efforts in sites with either easy access (e.g. Tai Po Kau) or with known interest (e.g. Tai Ho). Hence many hidden ecological hotspots face the danger of quietly disappearing as a result of the Government's well-intentioned but often environmentally-destructive "improvement" projects.

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More on Grid References

by Jackie Yip Yin

In an earlier issue of *Porcupine!* George Walthew warned us of the use of grid references from old (pre-1994) topographic maps, because the geodetic datum has been changed from the Hong Kong 1980 Geodetic Datum (HK80 Datum) to the World Geodetic System (WGS84 Datum). The problem does not end there. The topographic maps offer three different methods to mark the location of a site, so which method should we use? A couple of puzzled fellow postgrads have asked me this question.

The 1:20000 topographic maps (HM20C Series) published by the Survey and Mapping Office present three types of coordinate systems:

1. latitude and longitude
2. Universal Transverse Mercator Grid (UTM Grid)
3. Hong Kong 1980 Grid (HK1980 Grid)

To put it simply, if you are planning to publish in international journals, use either 1 or 2, because these are global systems. These can also be read directly in the field by Global Positioning System (GPS) receivers. HK1980 Grid is only used locally, but it has the benefit of being equally sized. The HK1980 Grid is used by the Biodiversity Survey.

The coordinate systems should not be confused with the geodetic datum. HK80 and WGS84 are both geodetic datums, which are ellipsoids defined with orientation, position, size and shape, as references for positions. UTM and HK1980 Grids are coordinate systems. Coordinate systems are based on map projections, which are the representation of the latitude and longitude of the ellipsoidal Earth surface on a flat surface. Imagine the UTM projection as a cylinder wrapping the Earth, the UTM grid system is obtained by slitting the cylinder and flattening it on a map. Because the HK80 and the WGS84 Datums give different reference positions, a change of geodetic datum yields different latitudes and longitude as well as UTM coordinates, as discussed in Walthew's article. However, this is not completely hopeless because you can tell which geodetic datum is used by looking at the prefixes. The UTM zones in Hong Kong using HK80 Datum are Zones 49Q GQ, HQ and Zones 50Q JV, KV. These have been changed to Zones 49Q GE, HE and Zones 50Q JK and KK respectively under WGS84 Datum, with slight shifting of grid lines. Therefore, while you can leave out the Grid Zones 49Q and 50Q in the grid references, you should always state whether it is from GE, HE, JK or KK.

The above is relevant only if you are using the Topographic Maps (e.g. HM20C Series). Life is a lot easier if you use the Countryside Series Maps, because they have only UTM Grid coordinates. The UTM coordinates can be written in either way, with alphabetical prefixes (GE, HE, JK and KK), or numeral prefixes (7, 8, 1, 2 respectively), but the Survey and Mapping Office has created an extra source of confusion by leaving out the alphabetical prefixes in the Countryside Series Maps. A location read as 50Q KK10 65 in the Topographic Maps can also be read as $^{2}10^{000}$ E, $^{24}65^{000}$ N if you are using the Countryside Series, but the former is the global reference. If you have not bought any maps, my advice is to get the Topographic Maps. They show topographic features more clearly, they offer more choices of grid references, and they cost just about the same.

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Shui Hau – Past and Present

By David Y. N. Poon and
Benny K. K. Chan

Prologue

Shui Hau, one of the few sheltered sand flats in Hong Kong, is located on the south coast of Lantau Island. Morton and Morton (1983) have given a detailed description of the fauna and flora there, and refer to it as an undisturbed soft shore having a rich faunal diversity, with the bivalve *Meretrix* (Fig. 1) and the tiny gastropod *Umbonium* (Fig. 1) being the dominant species (a *Meretrix – Umbonium* sand flat).

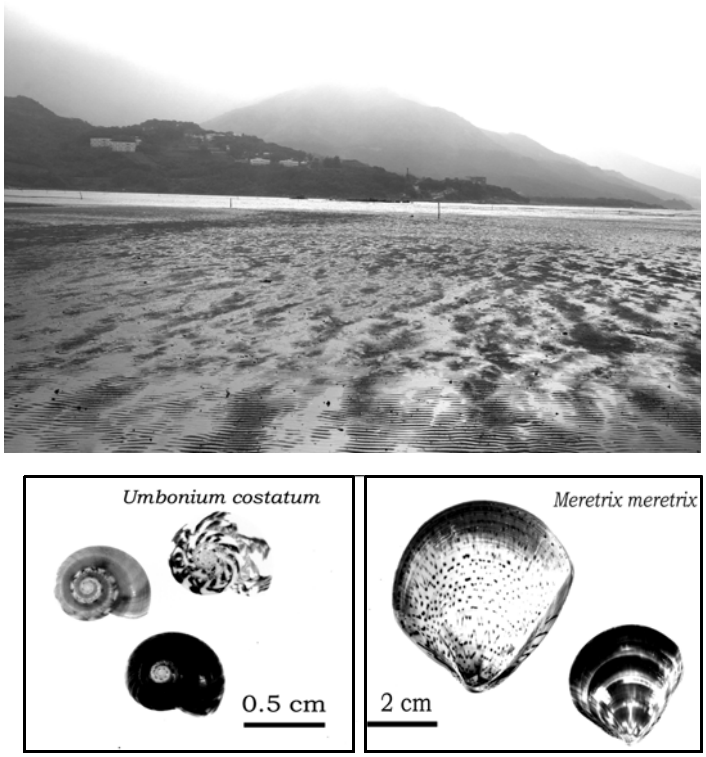

Fig. 1. A sand flat at Shui Hau showing the abundant species recorded in the past. Both *Umbonium* and *Meretrix* are polymorphic and their shell colour are variable.

Ecological studies conducted in Shui Hau, however, have received relatively scant attention. This is possibly due to its remoteness in comparison to other soft shores (e.g. Starfish Bay, where a number of surveys have been done during the local marine workshops ; also see Lee, 1996). Also, with increasing pollution and human disturbance, much of our local marine fauna and fauna is now in peril (Morton *et al.*, 1996). In early November, we visited Shui Hau twice during spring low tides and there seem to have been changes in faunal composition in comparison with that described by Morton and Morton (1983), almost two decades ago. This article therefore aims at providing a qualitative ecological description of Shui Hau, based on what we observed during these trips. We also hope, through addressing the possible faunal changes and some special observations, that this article can provide some baseline information for future potential ecological studies on Shui Hau and the sand flats elsewhere in Hong Kong.

The Sand Flat Fauna

The upper shore of the sand flat consisted of a large number of burrows, which were most probably dug by the ghost crabs (*Ocypode* sp.). As we moved down the upper shore, smaller burrows, with sand balls radiating from the entrance (a characteristic feature of sand bubbler crabs, *Scopimera* spp.), were more common,. Further down the shore the epifauna was dominated by hermit crabs (*Clibanarius*, *Diogenes*, and *Pagurus*) and potamidid snails (*Batillaria* spp.) , with *Nassarius festivus* also seen crawling around on the low shore. There was a considerable number of *Batillaria* with shells heavily fouled by sessile epibionts (e.g. the barnacles *Balanus reticulatus*, and the oysters *Saccostrea cucullata*, which are roughly double the weight of the snail's shell (Fig. 2)). The same phenomenon was also observed on *Batillaria* shells occupied by hermit crabs. On soft shores, hard substratum is a limiting resource for many sessile/sedentary marine invertebrates (Olabarria, 2000). Fouled snails can suffer from increased drag that may in turn retard growth (Wahl, 1996; 1997) and fouled mussels are more susceptible to predation (Wahl *et al.* 1997). Also, provided that there is a cost, in terms

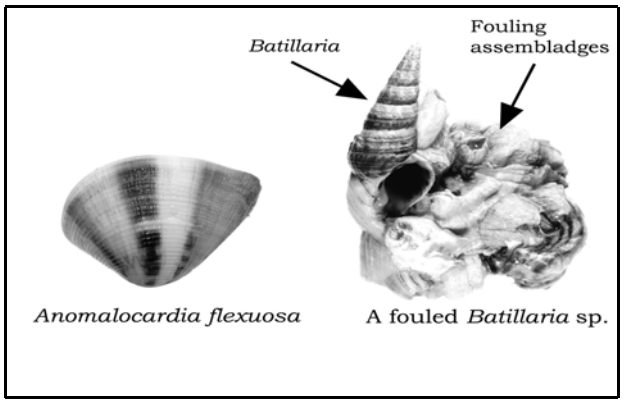

Fig. 2. The abundant organisms (the bivalve *Anomalocardia flexuosa* and the fouled *Batillaria* sp.) at Shui Hau during the visits in November 2000.

of energy expenditure, involved in carrying a shell (Herreid and Full, 1986), hermit crabs should prefer non-fouled shells to the fouled ones, as reported by Conover (1978) and McClintock (1985). Shell availability can limit the population of hermit crabs (Kellogg, 1976; Vance, 1972). At Shui Hau, does the observed high number of hermit crabs hosting fouled *Batillaria* shells, support the shell-limitation hypothesis; or do they have a preference for fouled shells because of some intrinsic benefits (Olabarria, 2000; Wahl, 1989)? Also, given the detrimental effects that fouling could have on marine gastropods, does fouling of *Batillaria* (probably decreasing the life span) indirectly help provide a new supply of empty shells to the hermit crabs?

We also searched for the infauna along the tidal gradient.

What we found, however, was not a handful of *Meretrix* and *Umbonium*, but a considerable number of *Anomalocardia flexuosa* (Fig. 2), with live *Meretrix* occasionally recovered from the substratum. *Umbonium* were present, but were not as abundant as described in Morton and Morton (1983). In addition, all the *Umbonium* found were empty shells, suggesting that the molluscan diversity of Shui Hau may have declined. There were also a lot of tubes (built by polychaetes) protruding from the sandy substratum (Fig. 3).

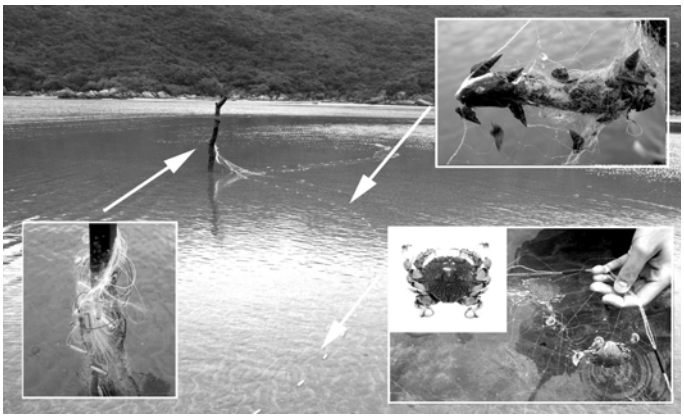

Fig. 3. A line of Fishing net found across the sand flat at Shui Hau which resulted in a crab disaster 'for details, refer to text'.

Fishes, Crabs, and … Disaster!

There were a number of wooden piles erected at regular intervals on the intertidal region of the sand flats, and the presence of a trammel-net gave a clue to their function. With curiosity we examined the nets. During our first visit to Shui Hau, along the net we saw dozens of fish carrion, including the marine catfish *Plotosus lineatus* (see inset of Fig. 4), and these

Fig. 4. The U-shaped burrow of a polychaete dung out from the sand flat.

carrion attracted clusters of *Batillaria* snails … Wait! Potamidids are not carnivores! They were in fact hermit crabs, comprising at least three different species (*Clibanarius infraspinatus*, *C. longitarsus* and *Diogenes spinifrons*). In only a few clusters could we find the small scavenging gastropod *Nassarius festivus*, but they were not abundant, which is contrary to the observations made at Starfish Bay during the Environmental Biology Field Course, and those reported in the literature (e.g. Britton and Morton, 1992; Morton and Yuen, 2000).

As well as fish carrion, common sand crabs *Matuta lunaris* were also seen "resting" in the proximity of the net (Fig. 4), which is very unusual as they are often wary of the presence of humans. On closer examination the mystery was solved – they were entangled by the trammel-nets. Here, what shocked us most was that, on lifting up the net a "chain" of *Matuta* was found entangled near the base (Fig. 4)! We managed to save some by cutting the net but finally gave up, as the number of trapped crabs was enormous (And sad to say, on our second visit a week later, most of the crabs were found dead in the net, and this time many *Nassarius festivus* were found under the net and nearby). Although the artisanal fishery created a food source for the hermit crabs and the nassariid snails, it caused a catastrophe to the population of *M. lunaris*. A similar 'crab disaster' was also observed in Three Fathoms Cove during the 1999 Environmental Biology Field Course.

The Boulder Fringe

After examining the trammel-net we accessed the high shore again and reached a small boulder field lining the border of the shore. Here, many boulders were heavily colonized by the rock oyster *Saccostrea cucullata* and the barnacles *Balanus reticulatus* and *B. albicostatus*. Upon approaching the boulders the grapsid *Metopograpsus messor* were seen running about swiftly. The area was scattered with litter, which further indicates that Shui Hau is no more an unspoiled sand flat.

Mangrove Stand and Grass Field

Not far from the boulder fringe there was a small stream, with gobiid fishes (most probably mud skippers) jumping around as we were wading through the water. After crossing the stream, there was a small mangrove stand with *Avicennia marina* and *Aegiceras corniculatum* being the common species (see species list below), some of them entangled by plastic litter. Unlike other local mangrove stands, sesarmine crabs were scarce. As we moved further there was a small grass field. At first glance there was nothing special but again, on closer examination, the ground was full of burrows and the sesarmine *Parasesarma erythrodactylum* was abundant and juveniles were seen running about quickly.

Epilogue

Based on what we could see throughout the trip, it is obvious that the once unspoiled sand flat has received considerable human disturbance. Although our survey was largely qualitative in nature, environmental degradation could well be the cause for the observed decline in abundance of *Meretrix* and *Umbonium*, as well as many other molluscan species recorded in Morton and Morton (1983). In addition, human exploita-

tion may also lead to the decline in abundance of *Meretrix* (collection of *Meretrix* by local fishermen in Shui Hau was also reported by Morton and Morton (1983) and the price of *Meretrix* sold in a Japanese supermarket at Causeway Bay nowadays is roughly $78 for 15 individuals). In Hong Kong studies of intertidal ecology have largely been focused on the hard shores and mangroves. Most of the studies concerning the sandy shore organisms were focused on molluscs, in particular the nassariid snails (Britton and Morton, 1992; Chan, 1998; Cheung, 1997; Cheung and Lam, 1999; Morton and Yuen, 2000). Very little is known about the ecology of many other local soft shore communities. Apart from the effects of pollution and human disturbance, there still exists a high diversity of crustacean and molluscan fauna (especially Starfish Bay, pers. obs.), of which the ecology is still little understood. It is, therefore, a time to initiate more research in soft shores.

Acknowledgements

We would like to thank Dr. His-Te Shih (National Sun Yat-sen University, Kaohsiung, Taiwan) and Timothy Lam for their help on identification of hermit crabs and fishes respectively.

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List of organisms found during the Shui Hau visits (* = abundant)

BIVALVIA
*Anomalocardia flexuosa**
Anomalocardia squamosa
Dosinia sinensis
Meretrix meretrix
*Saccostrea cucullata**

CIRRIPEDIA
*Balanus reticulatus**
*Balanus albicostatus**
Balanus amphitrite

DECAPODA
Anomura
Clibanarius infraspinatus
*Clibanarius longitarsus**
*Diogenes spinifrons**
Pagurus dubius

BRACHYURA
Gaetice depressus
Matuta lunaris
Metopograpsus messor
Ocypode sp.
*Parasesarma erythrodactylum**

GASTROPODA
Batillaria multiformis.*
Clithon spp.*
Nassarius festivus
Polinices ???

MANGROVE PLANTS
*Avicennia marina**
*Aegiceras corniculatum**
Kandelia candel
Acanthus ilicifolius
Lumnitzera racemosa

What is a 'Conservation Area' and what does it conserve ?

by Richard T. Corlett

Hong Kong's protected area legislation is far more complex than one would expect for such a small place. Taking the broadest possible definition of 'protected area' – an area where biodiversity receives some form of protection - Hong Kong has: Country Parks, Special Areas, Marine Parks, Marine Reserves, Restricted Areas (sometimes called Wild Animal Protection Areas), Sites of Special Scientific Interest (SSSIs), Conservation Areas, Coastal Protection Areas and Green Belts – all of which have some degree of legal backing – plus a number of non-statutory designations, including Landscape Protection Area (in Metroplan), Wetland Conservation Area and Wetland Buffer Area. Furthermore, the government has a variety of powers to protect wildlife outside these areas, some of which apply to the whole of Hong Kong (such as the Wild Animals Protection Ordinance), some of which apply only to Government Land (the Forest and Countryside Ordinance), and some of which apply only to specific types of leased land (such as those with lease clauses which prohibit tree felling without permission).

The most confusing of these categories is **Conservation Area (CA)**, because of inconsistencies between the name, the way in which the government sometimes uses this category, and the legal protection it confers. Conservation Areas derive their legal authority from the Town Planning Ordinance, under which the planning intentions of the government are translated into statutory Outline Zoning Plans (OZPs). Areas covered by these plans are assigned various land-use zonings, such as Agriculture, Recreation, Village Type Development, SSSI, Conservation Area, Coastal Protection Area, and Green Belt. The non-statutory Hong Kong Planning Standards and Guidelines refers to the last four of these land-use zonings as "conservation zones" (note the small "c"!), but gives "to conserve and protect flora and fauna" as the planning intention only for SSSIs. Conservation Areas are intended "to retain existing natural features and rural use", Coastal Protection Areas "to retain natural coastline" and Green Belts "to define the limits of urban development areas by conserving landscape features".

Planning notes attached to every OZP list, in a "Schedule of Uses" for each land-use zoning, the "uses always permitted" (also known as "Column 1" uses) and the "uses that may be permitted with or without conditions on application to the Town Planning Board" ("Column 2" uses). There is also usually an "Explanatory Statement", which goes into more details on the planning intention of each area but is not, legally, part of the plan. Although, in theory, the schedule of uses for each zoning category can vary between different plans, in practice, they are more or less standardized. For SSSIs, there are usually no uses which are always permitted, so such a designation gives strong protection against adverse land-use changes. For Conservation Areas, in contrast, the "always permitted" uses usually include at least "agricultural use" and "tree plantation". No doubt these are seen as fully compatible with the intention "to retain existing natural features and rural use".

Unfortunately, however, Conservation Area has also become an alternative zoning for areas of high conservation value for which SSSI status, although appropriate, was opposed by villagers or other local interests. Thus in the Luk Keng and Wo Hang OZP, both the abandoned Yim Tso Ha Egretry and the current egretry on A Chau are given SSSI status, but the diverse and important freshwater marsh at Luk Keng, and the large, old and diverse *fung shui* wood at Sheung Wo Hang, are designated as Conservation Areas. Clearly, neither agriculture nor tree planting are compatible land uses in these cases. Although they are still listed in Column 1 of the Schedule. The planning intentions of the Luk Keng and Sheung Wo Hang Conservation Areas are made very clear in the explanatory statement, which refers to them both as "sites of ecological importance" which should "be protected and preserved". However, no permission is needed for land-use changes which are in the "always permitted" column, so the planning intention in such cases is never consulted and becomes, in effect, irrelevant.

Does this mean that that any ecologically valuable site which is designated as a Conservation Area can be destroyed by conversion to agriculture or a plantation? The answer to this question will depend on whether the site is on Government or leased land and, if leased, the type of lease conditions, if any. Most village-associated habitats, like *fung shui* woods and freshwater wetlands, are likely to be on old leases without any conditions that restrict cultivation. In such cases, genuine protection – rather than simply "flagging" the site as important – requires that all incompatible land-use changes need permission. Although this could easily be achieved in a Conservation Area by simply removing incompatible uses from the "always permitted" column, it would make a lot more sense to designate all such sites as SSSIs.

Unfortunately, there are also problems with SSSI status. It is only a land-use zoning and provides no protection from adverse impacts (such as collecting plants or trapping animals) which do not involve a change in land use. In the long term, it would make even more sense to include these areas within the adjacent Pat Sin Leng Country Park. Indeed, the same applies to many other small areas of high conservation value that have been designated as Conservation Areas or SSSIs, and are immediately adjacent to the boundaries of Country Parks.

Outline Zoning Plans can be obtained from the Lands Department map sales counters on the 23rd floor of the North Point Government Offices in Java Road or the ground floor at 382 Nathan Road. Information on the availability and status of OZPs and other statutory plans is available on the Planning Department's excellent web site (www.info.gov.hk/planning). This site also has the full text of the Hong Kong Planning Standards and Guidelines, as well as both the Town Planning Ordinance and the draft Town Planning Bill which is intended to replace it.

Greedy Hong Kong Shock!

by David Dudgeon

The UNEP World Conservation Monitoring Centre, World Wide Fund for Nature and their collaborators have just published the *Living Planet Report 2000*. Much of that report deals with 'ecological footprints'. These measure a population's consumption of food, materials and energy in terms of the area of biologically-productive land or sea required to produce those resources and absorb the corresponding waste. The ecological footprint method therefore allows us to estimate the human pressures on the earth, and compare humanity's demands on nature with the Earth's capacity to supply resources and assimilate wastes. The basic message of this report is that the ecological footprint of the global population is over 30% larger than the Earth's biological productive capacity. That is bad news. What is worse, is the way that Hong Kong features in global rankings of countries according to their ecological footprint. We rank 13th overall out of a total of 150 nations, but this is in terms of our total ecological footprint. If we look at individual components of the footprint, we rank 8th in terms of the cropland footprint (i.e. the area required to produce all the crops that an individual consumes); 6th in terms of forest footprint (the area needed to produce the fuelwood, paper and timber that we use); 11th in terms of fishing ground footprint (the area required to produce the fish and seafood products we eat); and, 8th in terms of our carbon dioxide footprint (the area required to absorb emissions resulting from our energy consumption).

A sobering perspective on these data can be obtained by comparing the ecological footprint of Hong Kong with our own domestic biological capacity. The difference between the footprint and this capacity represents our 'ecological deficit'. That value for Hong Kong is –67.07 – the highest of any population on Earth. For comparison, UAR – which is ranked second – scores –15.3, USA scores –6.66, Taiwan –4.14, mainland China –0.96, and New Zealand 6.26. While these data do not necessarily indicate which nations are on the path to sustainability, and which are not, they do indicate the challenges ahead if we are to preserve global ecosystems through this century and beyond.

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Please also look at the **Electronic Porcupine**! Just go to www.hku.hk/ecology and click on the porcupine. This is no longer just a scanned–in version of the print issue but has been enhanced by the additional of colour pictures and relevant hyperlinks.

WILD CORNER

Any sightings of civets, mongooses, ferret badgers, leopard cats, barking deer, pangolins and porcupines – live or dead - should be reported. Rare birds, reptiles, amphibians and fish, or unusual behaviour by common species, are also of interest, as are rare or interesting invertebrates and plants. If you think it is interesting, our readers probably will! Please give dates, times and localities as accurately as possible.

MAMMALS

On 6 April at approximately 3 p.m. David Gallacher and Maria Salas (HKU) saw a **Mongoose** (*Herpestes* sp.) crossing the road located behind Mai Po Nature Reserve.

In June of this year, Ben Ridley found a dead (very dead, judging from the photograph!) **Ferret Badger** on the footpath down from Lantau Peak near the Tung Chung Road. On 7 September, he found fresh droppings of a **Barking Deer** and a **Civet** along a small trail through tall shrubland north of Sunset Peak.

On 14 June, a **Javan Mongoose** (*Herpestes javanicus*) was seen by Yu Yat Tung in the Lok Ma Chau fishpond area near the cross border bridge.

On August 18th, Paul Leader found a dead **Javan Mongoose** (*Herpestes javanicus*) at Mai Po.

Ed Glenwright sighted a "fully grown" **Wild Boar** (sex indeterminable) crossing Sha Tin Heights Road (off Tai Po Road) near Tai Wai at 8:30 p.m. on 22 August.

At approximately 11 a.m. on 6 September, Maria Salas (HKU) saw a **Mongoose** (*Herpestes* sp) crossing the road inside the close boundary area of Mai Po.

On 8 October, Richard Corlett (HKU) found a dead **Ferret Badger** near the summit of Violet Hill on Hong Kong Island.

At 12:15 p.m. on 17 October, Captain Wong (KFBG) and Wong Lun Fai saw a **Javan Mongoose** (*Herpestes javanicus*) at Long Valley (very close the main entrance that birdwatchers usually start their birding). At 4:15 p.m. of the same day, another one was seen at the rocky outcrop at the Mai Po Nature Reserve.

In the late afternoon of November 11, Richard Corlett (HKU) saw a large **Barking Deer** in an old *Lophostemon* plantation near the Kap Lung forest trail in Tai Lam Country

Park. It hid in a clump of shrubs and made loud alarm calls for several minutes.

Paul Leader and Mike Leven reported a recent population of at least 200 feral **Water Buffaloes** at Kam Tin, including 31 calves.

Cheung Sze Man (HKU) had three sightings of **Mongoose** (*Herpestes* sp.) on 25th November at about 10:00 a.m., 3:00 p.m. and 5:00 p.m. at three different locations on the road to the Education Centre in Mai Po. Since the three locations are quite near each another, it is not certain whether these were the same individual.

Nic Gilbert saw a dead **Mongoose** (*Herpestes* sp.) smaller but similar to *Herpestes urva* besides Pat Sin Leng Nature Trail above Plover Cove Reservoir.

Richard Corlett (HKU) reported seeing **Porcupine** droppings (containing only wood and bark fragments) on a path north of Ngau Liu in Tai Lam Country Park on 26th November.

Bosco Chan saw a relatively young **Rhesus macaque** at the well-wooded entrance of Wong Chuk Yeung village above Fo Tan on 30 December 2000. A villager said a troop of over 10 macaques regularly visit this village.

BIRDS

Tom Dahmer and Kwok Hon Kai saw a male **Black Bittern** (*Ixobrychus flavicollis*) in Ta Sha Lok on 5 September. They also reported seeing a **Peregrine Falcon** (*Falco peregrinus*) at the same location on the same date.

Richard Corlett (HKU) has noticed a large increase in the abundance of the introduced **Greater Necklaced Laughingthrush** (*Garrulax pectoralis*) over the last 5 years, both on Hong Kong Island and in the central New Territories.

Captain Wong (KFBG) saw a **Grey-streaked Flycatcher** (*Muscicapa griseisticta*) eating a *Ficus* fruit at Tai Ho, Lantau Island, at about 11a.m. on 15 October. The tree was a *Ficus* sp. with fruits and leaves resembling those of *Ficus microcarpa*, but without the air roots.

Captain Wong (KFBG) saw an **Asian Brown Flycatcher** (*Muscicapa dauurica*) holding a black fruit on a *Ficus microcarpa* in Kowloon Park on 16 September. The tree was fruiting then and was also visited by **Bulbuls** and **White-eyes**.

Kwok Hon Kai saw a juvenile and 2 adult **White-bellied Sea Eagles** (*Haliaeetus leucogaster*) in Kau Sai Chau, Port Shelter, on 18 October. They hawked at a flock of approximately 40 Night Herons.

Kwok Hon Kai reported seeing an adult **Crested Serpent Eagle** (*Spilornis cheela*) in Kau Sai Chau on 10 November.

Kwok Hon Kai saw a **Chestnut Bittern** (*Ixobrychus cinnamomeus*) in Pui O taro marsh (which was quite wet then), Lantau Island, on 1 November.

Kwok Hon Kai saw an **Imperial Eagle** (*Aquila heliaca*) and a **Peregrine Falcon** (*Falco peregrinus*) in Lok Ma Chau on 12 November.

On 21 and 22 September, Lee Kwok Shing and Michael Lau saw five species of flycatchers: **Asian Brown** (*Muscicapa dauurica*), **Grey-streaked** (*Muscicapa Griseisticta*), **Sooty** (*Muscicapa sibirica*), **Verditer** (*Eumyias thalassina*) and **Yellow-rumped** (*Ficedula zanthopygia*), feeding on the fruits of a large *Trema cannabina* shrub behind a village in the Da Ming Shan Nature Reserve area in Guangxi. **Japanese White-eyes** (*Zosterops japonica*) also joined the feast.

FISH

New record for Hong Kong. The Indo - Pacific tarpon, *Megalops cyprinoides* (Broussonet, 1782). Specimen taken by Mark Sigson, Sept 8, 2000, in Nim Shue Wan Bay (Discovery Bay Marina Area). Mark notified Yvonne Sadovy he had seen schools of this species of about 10-20 fish individuals, each about 1-2 ft long.

AMPHIBIANS/REPTILES

Yu Yat Tung sighted a **Reeves' Terrapin** (*Chinemys reevesii*) in Long Valley near Tsung Pak Long Village on 15 August.

On 6 September David Gallacher and Maria Salas (HKU) found a run-over snake (possibly a **Checkered Keelback** *Xenochrophis piscator*) on the road inside the close boundary area of Mai Po.

A freshly dead **Mock Viper** (*Psammodynastes pulverulentus*) was seen by Cheung Sze Man (HKU) on 14 September in a stream leading to Shing Mun Reservoir. Its total length was over 30 cm and it was lying on a boulder on

the stream bank.


Photo by Michael Lau

On the night of 11 October, Cheung Sze Man (HKU) saw two light phase juveniles of **Hong Kong Newt** (*Paramesotriton hongkongensis*) walking under the water on the edge of a deep pool in Tai Po Kau. These newts are seldom recorded in Tai Po Kau.


Photo by Michael Lau

At 11 a.m. on September 11th, Cheung Sze Man (HKU) saw a **Green Cascade Frog** (*Rana livida*) in the catchwater leading to Tai Tam Reservoir. They are normally nocturnal but appeared in daytime in this case.

Cheung Sze Man (HKU) saw a juvenile **Common Rat Snake** (*Ptyas mucosus*) in the catchwater leading to the Tai Tam Reservoir at 11 a.m. on 11 September.


Photo by Cheung Sze Man

Cheung Sze Man (HKU) sighted a **Chinese Bullfrog** (*Rana rugulosa*) on 17 September in the lotus pond of a temple in Fanling. Wild populations of this bullfrog are uncommon in Hong Kong nowadays , although there is suitable habitat available nearby. Possibly people released this one for religious purposes.

A juvenile **Chinese Cobra** (*Naja atra*) was spotted in the catchwater area in Shek Kong by Cheung Sze Man (HKU) on 28 September.

Nick Gilbert found a dead **Large - spotted Cat Snake** (*Boiga multomaculata*) on the road near Discovery Bay Reservoir, Lantau Island, on 1 October. The creature was approximately 70cm in length. It was a recent kill and still beautiful.

A juvenile, purplish phase **Mock Viper** (*Psammodynastes pulverulentus*) was reported by Cheung Sze Man (HKU) on 4 October in Tai Po Kau. Cheung Sze Man (HKU) saw a juvenile **Chinese Mountain Snake** (*Sibynophis chinensis*) on October 4 in Tai Po Kau.


Photo by Cheung Sze Man

A juvenile, mustard phase **Mock Viper** (*Psammodynastes pulverulentus*) was seen by Cheung Sze Man (HKU) on 6 October in Tai Po Kau.

Cheung Ming saw a turtle surface next to the SWIMS Boston Whaler off Wong Chuk Kok, east Lamma on 24 October. It is suspected to be a **Green Turtle** (*Chelonia mydas*), the most common marine turtle in Hong Kong waters.

Bosco Chan (HKU) saw a **Hong Kong Cascade Frog** (*Amolops hongkongensis*) in Hau Tong Kai, Hoi Ha Road at approx. 10:30 p.m. on 25 October. It is apparently the first sighting of this locally protected species from the Sai Kung Peninsula.


Photo by Michael Lau

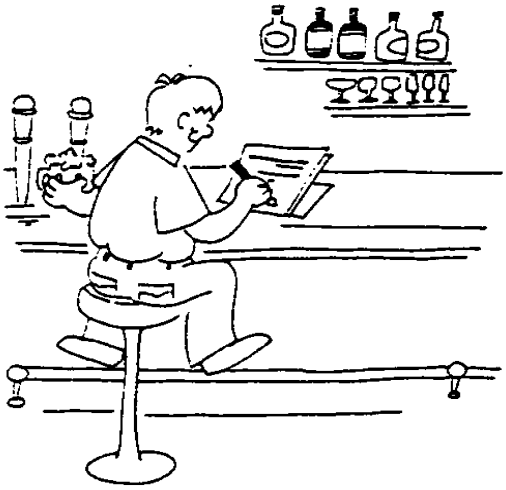
A **Common Wolf Snake** (*Lycodon aulicus*) measuring 12cm total length was collected in a storeroom on the first floor of Queen Mary Hospital, HK Island on 17 November. The dead snake was subsequently handed over to Bosco Chan (HKU).

On 25th November, Cheung Sze Man (HKU) saw a 5-feet long **Chinese Cobra** (*Naja atra*) on the Mai Po Rotary Nature Trail. Its body was body covered by soil and litter and it escaped into a ground burrow. Possibly it woke up during the warm spell of weather.

PLANTS

Ng Sai Chit reports that the horribly spiny **Hateful Mimosa** (*Mimosa diplotricha*) is growing scattered in abandoned fields and pathsides at Lok Ma Chau. AFCD have attempted to eliminate the large population at Ting Kok by spraying with herbicide.

From the (tea) bar…..



The Carrying Capacity Myth

by William Cheung

In a public forum "The Marine Environment of Hong Kong: Now and Beyond 2010" organized by the Hong Kong Marine Biological Association on 2 December 2000, one statement that was brought up in the discussion session was "…allowing disposal of waste into the sea, that is, within the carrying capacity of the ocean." The thing that stimulated my thinking was not on the issue of using the sea as our garbage bin, but more on the "carrying capacity" aspect. In fact, usage and exploitation of the sea within its carrying capacity has been a primary goal of marine conservation in the last century. However, I argue that "carrying capacity" is an unattainable and inappropriate goal of marine conservation. Alternatively, I propose that rebuilding or restoring our natural resources and environment to its past under-exploited state should be our new goal. In this article, I will focus the discussion on marine conservation issues, but I do not see any limit to expanding the same argument to the terrestrial side.

Carrying capacity is defined here as the level of use, at a given level of management, which a natural or man-made resource can sustain over long period of time (Scialabba, 1998). It seems that this is an attractive and plausible term. With the advocacy of "within the carrying capacity", people can unwarily exploit natural resources or dispose waste into the sea. However, before that, one must determine what is the carrying capacity of our environment. This will inevitably rely on the search for reference points which provide people with an indication of the limit of our natural environment. For instance, fishery scientists or managers put tremendous effort in determining reference points such as the Maximum Sustainable Yield (MSY) over the last century. In the past (and some still do believe that nowadays), they claimed that fishery exploitation within MSY can be sustained forever! Another example is the use of various Water Quality Objectives such as level of Biochemical Oxygen Demand, *E. coli* amount etc. in water to determine how much sewage we can dispose into the sea. These indicators are used to determine the "carrying capacity" of the sea.

I called "Carrying capacity" a myth because it can never be truly determined. The first reason is the inability of these reference points in indicating the actual carrying capacity of the ocean. In general, determination of reference points Requires baseline information of the environment, so that usage of natural resources within the specific reference point does not have a significant impact on the environment as *per* the baseline. However, if someone is able to compare the environmental "baseline" from previous generations to the present day one, it may be obvious that the "baseline" is shifting (and sadly most shifts are unidirectional to a lower standard baseline). For example, in the 70s, people swam every morning in the Victoria Harbour just outside North Point. Nowadays, the baseline of our Harbour is that it is only good for providing toilet flushing water. In my father's generation, Tolo Harbour was a pristine coast with fringing corals, and I would say that my personal impression of Tolo Harbour is its polluted water. Similar shifts in baseline have also been widely documented in fisheries, in which each generation of fisheries scientists accepts as a baseline the stock size and species composition that occurred at the beginning of their careers, and uses this to evaluate changes. Pauly (1995) termed the phenomenon "Shifting Baseline Syndrome". With this shifting baseline, do you think that the carrying capacity of the ocean is also shifting? The answer is no. It merely reflects our inability in determining the true carrying capacity of our ocean.

The second reason for the "Carrying capacity" myth is the difficulty in the estimation of the specific reference point, even if no shift in baseline is assumed. Both the biotic and physical aspects of the marine environment are highly uncertain. For example, water current, upwelling, water temperature etc. can vary greatly in an event of *El Niño*. Recruitment in fish stocks is largely unpredictable. Since the true carrying capacity of the ocean is associated with highly varying environmental conditions, there is a large uncertainty in estimation of the specific reference point used to determine the carrying capacity. Even if the precautionary approach is applied, it is often difficult to arrive at a consensus between various stakeholders (i. e. the government, conservationists, scientists and resource-users) for adopting a conservative reference point. Moreover, to determine the carrying capacity, one must over-load the system first so to identify the threshold. However, irreversible damage may have already been imposed on the environment before the realization that the carrying capacity has been over-reached. Again, these problems suggest that the determination of carrying capacity is both difficult and dangerous.

Owing to the inappropriateness of the "Carrying capacity" myth, it is suggested that rebuilding and restoring should be a new goal of marine conservation. This idea was initiated

from Pitcher and Pauly (1998) who suggested the novel idea of rebuilding the past under-exploited ecosystem, rather than sustaining at the present level of misery, should be the ultimate goal for fishery management. This idea should also be suitable in marine conservation in general. It should be noted that there is no intention to bring our environment back to prehistory. Instead, we should target for a state where every users of the ocean, including organisms in the marine ecosystem, enjoy a justified share of the resources (Brunk and Dunham, 2000).

Sceptics say that costs (in terms of pure market value) will be too high to make the restoration/rebuilding goal realistic. Such conclusion was drawn because non-market values, which include social and ecological values, were not taken into account. The social and ecological values can be understood as the benefits obtained from people having a good environment, and the intrinsic value of the ecosystem respectively. Moreover, intergenerational equality must be considered, which means that our children and grandchildren should be able to see the sea and marine resources as valuable as we see nowadays. With cost-benefit evaluations including all of the above factors, it should be obvious that more benefits could be obtained from restoration/rebuilding. This has been shown quantitatively in fishery resources studies (Buchary *et al*., in prep; Sumaila *et al*, in press).

The restoration/rebuilding goal sounds theoretical, but it should not be viewed as a "Hanging Garden". To implement restoration/rebuilding of the marine environment, consensus must first be made between different stakeholders on what state of the marine environment should we target for. Then cost-benefit analyses of restoration should be carried out. After that, suitable measures or policies should be developed to facilitate restoration.

In conclusion, it has been argued that the target on the Carrying Capacity Myth is inappropriate for marine conservation. Effort should be redirected to restore/rebuild a healthy, under-exploited, marine environment. Standing on the shoulder of a giant, I just want to arouse more discussion to search for directions for marine conservation in the new millenium. The hope of swimming in Victoria Harbour without worrying about going to hospital because of intestinal infection, or fishing sizeable sea perch in Castle Peak Bay, as one of Mr. Peter Wong's wishes in a recent public forum, is always here.

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BOOK REVIEW

Wild Plants of Shenzhen, China

By Xing Fuwu and Yu Ming'en (2000, China Forestry Publishing House).

Although this book is focused on the flora of Shenzhen, it is also very useful for studying wild plants in Hong Kong, because all but 15 of the 724 plant species illustrated have been recorded here. In addition to including most of our locally common woody plants, it also covers many locally rare and very rare species (e.g. *Oleandra cumingii*, *Amentotaxus argotaenia*, *Machilus leptophyllus*, *Stemona tuberosa*), thus making it more useful for local field botanists. Among the species illustrated, there are also a number of the plants which were first found in Hong Kong only recently (e.g. *Popowia pisocarpa*, *Macaranga auriculata*, *Combretum alferdii*, *Cyclobalanopsis hui*, *Meliosma thorelii*, and *Dictyospermum scaberrimum*). Compared to its rich collection of dicot flowering plants and orchids, the book is, however, relatively weak for other monocots, especially for the highly species rich but boring-looking Cyperaceae and Poaceae.

Although (or, perhaps, because) William Xing is not a professional photographer, his photographs are good enough for field identification. The descriptions are, unfortunately, all in Chinese, and too brief and simplified for detailed study, but this is inevitable given the large number of species included. Differences in the scientific names used between this book and earlier publications are unavoidable and I suggest the reader refers to the Flora of China Website (http://mobot.mobot.org/W3T/Search/foc.html) for conversion of names.

A little surprising, although not totally unexpected, was the discovery of a few of Hong Kong's globally very rare species in Shenzhen, including *Rhododendron hongkongense*, *Camellia granthamiana*, and *Boeica guileana*. In fact, given the proximity of Shenzhen to Hong Kong, it is likely the 15 species that have been found in Shenzhen but not in Hong Kong will one day be discovered here, among them perhaps the globally rare *Cycas fairylakea*.

Ng Sai Chit

BOOK REVIEW

Watching, from the edge of extinction by B.P. Stearns and S.C. Stearns (1999, Yale University Press).

Books on conservation are a dime a dozen. Some are dry as dust; others are just so whacked out and third-way 'deep' ecology that they seem more like spiritual tracts than descriptions of the real world. The last book about conservation that I read that seemed to have much relationship to the nature as it surrounds me was John Terborgh's (1999) *Requiem for nature*. Terborgh is a tropical ecologist, and something of a pessimist; his book was quite well judged and written with feeling, but it made me feel that conservation action was little more than delaying the inevitable. And Terborgh may be right. I picked up *Watching, from the edge of extinction* because I knew Stephen Stearns' work on life-history strategies. As a Ph.D. student, I was impressed by an article he wrote in *Quarterly Review of Biology* (published in 1976 it is now a 'citation classic') that neatly synthesized thinking about the timing and frequency of breeding by animals. There was an apocryphal story that the article was really the introduction to Stearns' Ph. D. thesis. In 1984, I had the chance to check this when I came upon his Ph.D. thesis in a library at the University of British Columbia. Sure enough, the texts matched almost word-for-word.

All this to say that any book with 'S.C. Stearns' on the spine is worthy of your attention. This volume is co-written with Bev Stearns, a professional journalist, and she lends the book a pacey, easy - to - read style. " Extinction is real – and it lasts forever." This, the first sentence, gives a hint of what to expect and, in places, it is quite page-turning in an airport thrillerish kind of way. (Sort of Hannibal Lecter meets Gerald Durrell if you know what I mean.) *Watching…* tells a number of stories of people who have seen species slip towards, or over the edge of, extinction. The authors show how humans who work with endangered species deal with what sometimes appears to be the inevitability of extinction, often resulting in the need for action which, in many cases, consumes their lives. There is more in this book than the recital of scientific facts, as these "… are stories of love and passion, dedication and wisdom, life and death …" (pg. xii). But also they are also stories of principled people encountering politics, greed, corruption, folly and hypocrisy - features that are manifest in some of the scientists and conservation organisations portrayed in this book. There is much about professional skull - duggery, jealousy and academic vanity – conservationists are not saints.

The book consists of a series of stories (OK, case studies if you must) of conservation successes or failures. Each reveals something profound about biodiversity and the action we should or (more surprisingly) should not take in order to preserve it. The authors use many direct quotes from conservationists allowing them to tell the stories in their own words. This gives each chapter a distinct flavour, because the passion and speech idiosyncrasies of workers for whom English is a second language is allowed to shine through. There are two chapters on Hawaiian birds, and others on land snails, Chimpanzees, butterflies, Monk seals, Lake Victoria's endemic cichlid fishes, Wild dogs, Salamanders, the fauna and flora of Mauritius and Rodrigues, and the history (and elimination) of Gibbons (*Hylobates agilis*) in China. (Incidentally, this species would once have called from the Hong Kong treetops.) A concluding section ('lessons learned'), a useful bibliography and an excellent index complete the book. The scope is wide, and the people that are interviewed are varied in background, training and affiliation. Other examples could have been chosen (there isn't much about plants, and South America does not get a look in), but completeness is not essential and these stories reveal a great deal. For example, the fact that conservation action may actually contribute to the decline of a species (as in stories about Wild dogs, the Monk seal, and the Hawaiian crow) because human motivations are often mixed or muddled. There are particularly striking accounts of what happens when there is a conflict between the need to collect publishable data and the damaging consequences for endangered animals during the collection of such data. (The scientists come out of this rather badly in a two such instances.) Some of the case studies also show that competent people are in short supply, so many endangered species do not meet with the best that humanity has to offer. Some scientists or conservationists are well meaning but foolish; others are lazy or even corrupt. However, there are plenty of the usual suspects here too: devious politicians, scheming greedy developers, and incompetent government officials. In that context, the tale of the Barton Springs salamander of Austin, Texas, has all of the characters well known to us from conservation battles in Hong Kong. (At first glance I thought this chapter was allegorical.)

Other important messages in *Watching…*are the fact that most scientists do not make good lobbyists: we are not effective advocates and tend to equivocate or qualify our remarks; developers and industrialists are trained to exaggerate their position and speak with certainly. Another is the point that some endangered species will never be able to persist without constant management; in IUCN terminology, they are conservation-dependent. The endemic birds of Mauritius are a case in point, which has important implications for changes in government priorities, soft money, and sustainability. Clearly, it will be extremely important for us (and governments) to determine our priorities and hold them in the long (really long) term. But what are our priorities? Can we get along with fewer species? Is it enough to see tigers in zoos, museums, or on videotape (or digital- whatsits) rather than in the wild? If you reckon the answer is 'yes', then you must carry the responsibility for that conscious decision not to do anything. Fair enough (and may you roast for eternity). But if wild plants and animals do matter to you, yet you remain apathetic and fail to do anything to preserve them, you allow developers and others who exploit nature become rich and steal irreplaceable species and habitats from you, your children, and future generations. Ignorance may be no excuse but, as the authors stress, informed apathy is worse.

The final messages of this book are, I am afraid, rather famil-

iar – " …the long term solution is to have fewer people, and for those people to consume less ..." (pg. 243) – combined with a plea to think about the consequences of development. Erm, yes, but how can that be translated into action now? OK, there are no miracle cures, and it is perhaps unfair of me to expect this book to provide them. However, because *Watching…* is so good and, it seems to me, so true to life, my immediate reaction is 'What the hell can we do about this?' It is sobering to reflect on the last pages that describe a hike by senior citizens through forests and alpine meadows in Switzerland. The good burghers enjoy the outdoors, and enthuse over the many varieties of wildflowers they encounter. These people have all the benefits of development, and the high income and leisure time to appreciate the countryside. But what is left in this country that gives its people such economic security? The bears, wolves, and otters that once roamed the land are gone. Nature reserves in Switzerland are now defined on the basis of beetles and flowers. Does any of this sound familiar?

David Dudgeon

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