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for information

The Ecological Study of Seagrass

Progress Report

August 1995

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Progress Report of Seagrass Project

1. Population and Community Studies at Lai Chi Wo

In order to understand the dynamics of the seagrass population, percent coverage and biomass (above-and below-ground) of Zostera japonica have been monitored monthly at Lai Chi Wo since December 1994. Percent coverage ranged from 18 to 91% in the nautral habitat.

The relationship between the abundance of associated fauna and biomass of seagrass is determined by monthly collection of seagrass bed fauna. This information will help to identlfy the key species that controls the structure of the local seagrass community. More than 30 species of bivalves, gastropods, polychactes, amphipods, nematods and crabs have been found in the seagrass bed. The total number of associated fauna can be > 10000 individuals m^2. Among which, the gastropod Clithon spp. is most abundant (> 1000 individuals m^2).

The environmental conditions at the seagrass habitat (salinity, dissolved oxygen grain size of sediment, suspended solids and nutrients) have been monitored monthly.

2. Reproduction

The reproductive biology (i.e. the morphology of different flowering stages, pollination and seed production) of Zostera japonica was studied.

Flowering began in March and finished in June, (same as the flowering period of the population at Pak Kok Wan and Tung Chung). The structure of inflorescence and development stages were described and recorded.

3. Development of Stress Indicators

A series of experiment has been carried out in order to identify suitable "stress indicators" for the assessment of the "health conditions" of seagrass. Results showed that % CHN, C:N ratio, Adenylate energy charges, Photosynthetic/Respiration ratio and Chl. a may serve as suitable stress indicators for Zostera japonica.

4. Mesocosm Studies

Mesocosms were set up to study the effects of environmental perturbation on seagrass communities and eco-physiology.

Mesocosms were established at the Swire Marine Laboratory, using sediment collected from Tung Chung and seagrass from Lai Chi Wo. Preliminary experiments have been carried out to determine the effects of nutrient (N and P) enrichment on seagrass. Results showed that seagrass grown better in a nutrient enriched environment, as indicated by significant in % coverage, Chl. a, % CHN and a lower C:N ratio.

SURVEY OF UNMANAGED FRESHWATER WETLANDS

IN HONG KONG

Progress Report
January to July 1995

G.T. REELS

1. Study sites

Locations of all study sites are indicated in Fig. 1. Exploratory field trips have yielded several new wetland sites since January 1995, of which 12 have been water-sampled and 7 sampled for invertebrates. The latter are briefly described below:

Cheung Sheung
A mid-altitude (~ 400m) permanent pond and marsh above Yung Shue O on Three Fathoms Cove. The pond reaches 0.25 ha in area during summer, but shrinks to half this size during the dry season. A good dragonfly site.

Sunset Peak Pond
A 0.25 ha permanent man-made pond located on the southern face of Sunset Peak at an elevation of ~ 750m. The pond is a breeding site for at least two spp. of aeshnid dragonflies, and contains a large population of the endemic newt *Paramesotriton hongkongensis*.

Sha Lo Tung
A mid-altitude basin north of Tai Po containing low-gradient streams and 2-3 ha of shallow marsh. The site is notable for its riverine dragonflies but the marsh itself is apparently unexceptional.

Kau Sai Chau Pond
A small (5 x 30 m) pond on the northeast of Kau Sai Chau. The only Hong Kong breeding site for the tiny dragonfly *Nannophya pygmaea* (Keith Wilson, pers. comm.).

Ma Tso Lung
A large marsh by the Shenzhen River in the Frontier Closed Area, to the northeast of Lok Ma Chau. Only visited once so far but looks promising.

Pak Long and Lung Tsai
Two ~ 1ha seasonal marshes to the west of Castle Peak.

Further exploratory visits to seasonal marshes on the west of Three Fathoms Cove and Liu Pok to the east of Ma Tso Lung are planned for September.

2. Sampling schedule to July 1995

With one exception, all of the sites sampled between August and December 1994 have been revisited at least once since January 1995. However, it has proven impossible to adhere rigidly to the sampling schedule proposed in the January 1995 Progress Report. Table 1 gives a breakdown of the sampling schedule achieved to date.

3. Further work

Invertebrate sorting from site collections is ongoing; however the following 13 have been (provisionally) identified as "core sites": Luk Keng, Kuk Po, Sheung Miu Tin, Sam A Tsuen, Shuen Wan, Sha Lo Tung, Sham Chung, Cheung Sheung, Kau Sai Chau pond, Ma Tso Lung, Sunset Peak pond, Pui O and Yi O. Plant identification and vegetation mapping is now a priority for these sites.

Ma Tso Lung and Kau Sai Chau pond have so far been visited only once, and further water and invertebrate collections should be taken from these sites as soon as possible - certainly no later than September. Invertebrate sampling at all core sites may be necessary in October.

Fig. 1. Wetland sites visited August 1994 - July 1995

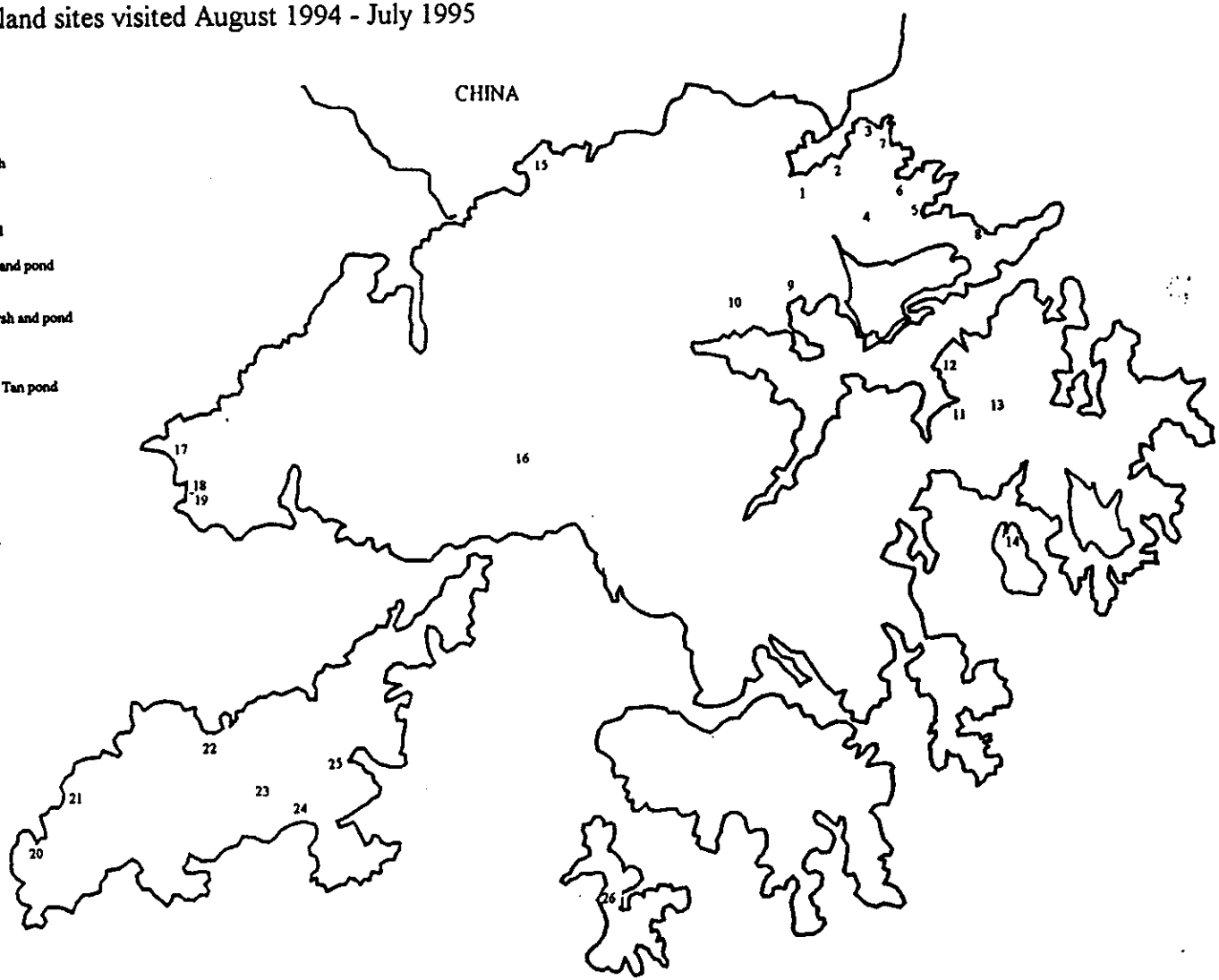

Table 1	Wetland Survey - Field sampling schedule August 1994 to July 1995								
Site			Invertebrate collecting			Water sampling			
Luk Keng marsh			Aug,Nov'94;Jun,Jul'95			Aug,Nov'94;Feb,Mar,Jun,Jul'95			
	sedgebed		Jun'95			Feb,Mar,Jun,Jul'95			
	reedbed		Jun'95			Feb,Mar,Jun,Jul'95			
Kuk Po marsh			Aug,Nov'94;May,Jul'95			Aug,Nov'94;Feb,Mar,May,Jul'95			
Yung Shue Au marsh						Feb'95			
Sheung Miu Tin marsh			Dec'94;May,Jul'95			Dec'94;Feb,Mar,May,Jul'95			
Sam A Tsuen marsh			Dec'94;May,Jul'95			Dec'94;Feb,Mar,May,Jul'95			
Siu Tan marsh			Dec'94			Dec'94;Feb,May,Jul'95			
So Lo Pun pond						Feb'95			
Hung Shek Mun pond			Dec'94;May'95			Dec'94;May'95			
Shuen Wan marsh			Aug,Nov'94;May,Jul'95			Aug'94;Feb,Apr,May,Jul'95			
Sha Lo Tung marsh			Feb,May,Jul'95			Feb,Apr,May,Jul'95			
Yung Shue O marsh						Feb,Mar,Jul'95			
Sham Chung marsh			Oct'94;Mar,May,Jul'95			Oct'94;Feb,Mar,May,Jul'95			
Cheung Sheung marsh			Feb,May,Jul'95			Feb,Mar,May,Jul'95			
and pond									
Kau Sai Chau pond			Mar'95			Mar'95			
Ma Tso Lung marsh			May'95			May'95			
[Old paddy] Tai Lam CP			Nov'94			Nov'95			
Leung Kwu Sheung Tan pond						Mar'95			
Pak Long marsh			Jul'95			Jul'95			
Lung Tsai marsh			Jul'95			Jul'95			
Yi O marsh			Aug,Nov'94;Jun,Jul'95			Aug'94;Feb,Apr,May,Jun,Jul'95			
Tai O reedbed						Feb'95			
Tung Chung marsh			Sep'94			Feb'95			
Sunset Peak pond			Feb,Jun,Jul'95			Feb,Jun,Jul'95			
Pui O marsh			Aug,Dec'94;Jun'95			Aug,Dec'94;Feb,Apr,Jun'95			
Luk Tei Tong pond						Feb,Jun'95			
Lamma Island pond			Sep'94;Jun'95			Mar,Apr,Jun'95			

The Distribution and Ecology of *Nepenthes mirabilis* in Hong Kong.
Report for the months of January to June 1995.
Dr M A Weatherhead.

Consequent on my previous report much field work (approx 2 - 3 trips per week) has been carried out in many areas of the Territory, in particular the North West New Territories and the Outlying Islands. Many new sites of *N. mirabilis* have been identified and mapped. In conjunction with mapping we are trying to utilise satellite based Global Position Instrumentation which gives precise details of locations. When these data are transferred onto a suitable computer programme a digital map can be produced. Other relevant data can also be included in the programme such as numbers of plants, associated vegetation etc..

It still seems that *N. mirabilis* grows virtually exclusively on granitic soils but further soil analyses are being carried out to try to discover why this should be so. Also included is transfer of plants from granitic to volcanic soils and monitoring of their progress.

In terms of propagation it is now certain that seasonal factors are involved. Previously vegetative propagation using nodal cultures was unsuccessful but with the onset of the growing season in approximately March all nodal cultures have been 100% successful. Cultures are initiated each month to establish the optimum time of year for this method of propagation. Some plants arising from this method have been transferred to Tai Tam Country Park and their progress is being monitored. While wishing to retain a number of plants for observation there is a surplus which could be made available to AFD if they so wish.

Seed germination appears to be possible throughout the year but as new seed has just been formed (during June/July) there may, again, be an optimum period for germination. This is being observed monthly. While seed can be germinated in water there is an indication that it may be more successful in tissue culture as a result of the removal of a possible seed coat inhibitor by the sterilisation process.

Contents of pitchers have not yet been analysed but samples are collected monthly and stored in order to eventually determine whether there is an annual fluctuation in prey.

I last reported that I did not consider *N. mirabilis* to be an endangered species in Hong Kong but I am becoming more and more concerned about the destruction of actual and potential sites by industrial processes which are presumably sanctioned by the Hong Kong Government. The WENT Landfill Site is a case in point being in the North West New Territories which is a major location of *N. mirabilis*. In this context I would urge the relevant authorities to seriously consider designating certain sites as SSSIs. For example Butterfly and Lichi Valleys at Tai Tong.

In conclusion it is proposed to continue the survey and the propagation research as described above.

The Ecological Study of Mangrove Stands in Hong Kong

Brief Progress Report

August 17, 1995

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Introduction

Mangroves are unique intertidal ecosystems that support genetically diverse communities of terrestrial and aquatic organisms. They are adapted to areas characterized by high temperatures, fluctuating salinities and shifting anaerobic substrates. These characteristics allow mangrove systems to play important roles such as coastal stabilization and protection against typhoons, producers of nutrients etc.

In Hong Kong, mangrove swamps have been destroyed due to reclamation and infrastructure development over the past decades. The over exploitation of mangroves in Hong Kong has seriously threatened the sustainability of the coastal shrubs and created an irreversible destruction to the diversity of coastal organisms. The aim of this study is to locate and perform ecological surveys on Hong Kong's remaining mangrove stands. The survey results may then be used to help assessing the conservation value of each site and allow the formulation of an overall mangrove conservation plan. The study will also provide baseline data for previously unstudied mangrove stands in Hong Kong.

The Sites

A total of 45 mangrove stands have been located (see Appendix map 1), of which 60% (27 sites) have been chosen for further study. A total of 75% of the fieldwork has now been completed. A breakdown of sites by geographical location shows that, 17%(8 sites) are in the North West New Territories, 57% (26 sites) are in the North East New Territories, 22% (10 sites) are on Lantau Island, and the remaining 2% (1 site) is on Hong Kong Island. Mai Po Marshes have been left out of this study because they are already well protected and studied.

Size

The 31 sites for which area has been ascertained have a total area of 81.4 hectares (81,3711 m^2). The largest of these sites in Tsim Bei Tsui 1 which is 19 hectares in extent, whereas the smallest is Pak Sha Wan which is only 0.15 hectare. The average size of the mangroves in the study is 2.63 hectares. The final total area for this study will probably top 100 hectares. According to the Hong Kong Flora and Fauna: Computing Conservation booklet the total area of mangrove in Hong Kong is 276 hectares or 0.3% of Hong Kong's land area. (For a more detailed breakdown of site sizes see Appendix Table 1.)

Brief Methodology

A brief methodology is given below. Field visits were made to each of the mangrove sites identified. The extent (or area) and special features of interests including the topography, human disturbances, pollution sources, historical interests in each site were recorded. The distribution and quantities of the flora and fauna in each site were measured by transect and quadrat analyses. Two to five transects per site were used, depended on

the area and heterogeneity of the site. In each transect, 3 to 5 quadrat were used for flora study (quadrat size of either 3m x 3m or 5m x 5m, depending on how dense the mangrove was), and 5 to 10 quadrat for surface dwelling animals (quadrat size of 0.5m x 0.5m). The diversity of plant and animal species, their density, frequency and percentage cover were recorded. Seasonal variations (winter and summer) of mangrove fauna were also examined. Specimen of plants and animals were preserved and photographs were taken for each species identified. The pH and salinity of pore water collected from mangrove floor were determined. The substrate of the mangrove floor and the percentage cover of stones were also recorded.

Sketch diagrams and photographs of each mangrove site were taken. Each site was visually mapped on 1:5000 scale maps and the area was then determined by both weighing method and image analyzing technique. The area of sites which are difficult to access will be estimated by aerial photographs.

Based on the information collected, the conservation values of each mangrove site will be evaluated with minimum bias. Over 8 criteria will be used to indicate the overall conservation value of each mangrove site. After obtaining the overall conservation value of each mangrove site, priorities of managing and conserving these mangrove sits will be recommended. Conservation measures and management strategy for the very important sites will be recommended.

Fauna

So far 97 species of surface dwelling fauna have been collected, of which 75% (71 spp.) are molluscs, 23% (24 spp.) are crustaceans and 2% (2 spp.) are annelids. Of the total 9% (9 spp.) have not yet been identified. Fauna diversity has been worked out for 6 sites will the highest being Sai Keng (38 spp.) and lowest being Nam Chung (7 spp.). Average diversity so far is 19 species. The mangroves harbour 8 species of fish (though the actual number of species may be higher) of which only 2 species are resident in the mangrove at all tidal states, the other 6 species are itinerant. Only 6 species of birds are commonly seen in the mangroves: this includes egrets, herons and kingfishers (2 spp.). Other species such as coucals, white eyes, crested mynahs and black kites are occasionally seen in the swamps. The bird life of the mangroves is however much more diverse than this and is only included in this study if very obvious.

Flora

So far 16 species of plants have been seen growing in the mangroves. These come from 11 families, including locally rare species such as *Bruguiera gymnorhyza, Lumnizera racemosa* and *Heritiera littoralis*.

The mangroves so far studied can be broken down into 3 types depending on substrate, stony, sandy and muddy. The stony sites

such as Chek Ken tend to have dwarf trees(<1m tall); the muddy sites such as Tsim Bei Tsui have the tallest trees (>4m tall), the sandy sites such as Shui Hau are variable. The health of the trees is variable throughout all sites.

Problems Encountered

There are some problems encountered in completing the field work although most of them had been overcome. One of the biggest problems so far has been the weather. Both last summer and this summer numerous field trips have had to be cancelled due to heavy rain, which made working in the mangrove very difficult because the water remains on the trees and soaks data sheets making them illegible. It also makes working in the mangrove extremely uncomfortable. In Hong Kong, the winter low tides needed for the work are mostly at night which leaves very few suitable for fieldwork, thus some sites may not have fauna data for both winter and summer. Access to some sites such as Tsim Bei Tsui is restricted because it is located inside the frontier closed area. The police have been very helpful in arranging access there. Other sites such as Sam A Tseun, Lai Chi Wo and Tai Ho Wan are not accessible by road and require either a boat or a long walk to get to the sites. This cuts down the time available by road and require either a boat or a long walk to get to the sites. This cuts down the time available for working at the sites. Deep mud is another problem especially at Sheung Pak Nai and Tsim Bei Tsui, both these sites have waist deep mud which is both hazardous and impossible to work in. Gross pollution by sewage is a problem at Ho Chung and Yuen Long Industrial Estate. Great care must be taken not to get scratched or grazed at both sites; scratches and grazes are very common when working in the mangroves. Finally some sites such as Kei Ling ha Lo Wai and To Kwa Peng have resident populations of wild or semi-wild dogs roaming around, these dogs can on occasion become quite aggressive.

Future Work

Future work includes finishing off the field work, which has the highest priority at the moment, continuing with the identification of the animals collected so far, collating the data collected and writing up the final report. The fieldwork is estimated to be finished by the end of December, 1995.

[pa-0095]

Table 1. The area of each mangrove site studied in this project.

No.	Site	Size hectares	Size Sq.m
1	Chek Keng	0.69	6,900
2	Chi Ma Wan		
3	Discovery Bay	1.01	10,100
4	Ha Pak Nai	0.71	7,084
5	Ho Chung	2.37	23,738
6	Hoi Ha Wan	0.53	5,331
7	Kau Sai Chau		
8	Kei Ling Ha Hoi		
9	Kei Ling Ha Lo Wai	2.45	24,510
10	Lai Chi Cheong		
11	Lai Chi Wo	2.69	26,953
12	Luk Keng	3.84	38,375
13	Lut Chau		
14	Nai Chung	0.4	4,025
15	Nam Chung	8.72	87,150
16	Pak Sha Wan	0.15	1,469
17	Pak Tam Chung	0.47	4,650
18	Pui O Wan	1.33	13,300
19	Sai Keng	3.86	38,362
20	Sai Kung Hoi	2.07	20,706
21	Sam A Tseun		
22	Sam A Wan		
23	San Tau	2.14	21,410
24	Sha Tau Kok	2.51	25,100
25	Sham Chung		
26	Sham Wat	0.22	2,175
27	Sheung Pak Nai		
28	Shui Hau	0.7	6,950
29	Tai Ho Wan		
30	Tai O	0.61	6,100
31	Tai Tam	0	0
32	Tai Tan	1.19	11,925
33	Tai Wan	2.68	26,818
34	Tan Ka Wan		
35	TBT1	19.00	190,000
36	TBT2	5.00	5000
37	TBT3	1.75	17,500
38	Ting Kok	8.77	87,675
39	To Kwa Peng	2.09	20,925
40	Tolo Pond	1.41	14,105
41	Tung Chung		
42	Wong Chuk Wan	0.26	2,575
43	Wong Yi Chau	1.78	17,800
44	Yeun Long Ind. Est		
45	Yi O		
	SUM	81.40	768711
	AVGE.	2.625806	24797.13
	COUNT	31	31

The area of the mangrove stand at Mai Po is 85 hectares

No.	Site
1	Chek Keng
2	Discovery Bay
3	Ha Pak Nai
4	Ho Chung
5	Hoi Ha Wan
6	Kau Sai Chau
7	Kei Ling Ha Hoi
8	Kei Ling Ha Lo Wai
9	Lai Chi Cheong
10	Lai Chi Wo
11	Luk Keng
12	Nai Chung
13	Nam Chung
14	Pak Sha Wan
15	Pak Tam Chung
16	Pui O Wan
17	Sai Keng
18	Sai Kung Hoi
19	San Tau
20	Sha Tau Kok
21	Sham Chung
22	Sham Wat
23	Sheung Pak Nai
24	Shui Hau
25	Tai Ho Wan
26	Tai O
27	Tai Tam
28	Tai Tan
29	Tai Wan
30	Tan Ka Wan
31	TBT1
32	TBT2
33	TBT3
34	Ting Kok
35	To Kwa Peng
36	Tolo Pond
37	Wong Chuk Wan
38	Wong Yi Chau
39	Yeun Long Ind. Est
40	Yi O
41	Tung Chung
42	Sam A Wan
43	Sam A Tseun
44	Lut Chau
45	Chi Ma Wan