

Agreement CE63/2008 (CE) Dredging Works in
Kwai Tsing Container Basin and its Approach
Channel – Investigation, Design and Construction

Appendix 5.3 Marine Benthic Grab Survey Report

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Civil Engineering and Development Department

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Executive Summary

- Carrying out a marine benthic survey is part of the environmental requirements of Governmental approval for any works involving the Hong Kong sea shore. This survey should identify any sensitive communities within the area likely to be impacted by the works.
- On the 9th January 2010, the Oceanway Corporation Limited carried out Marine Benthic Surveys at nine locations within the study area (See Appendix A for location details).
- All locations recorded benthic animals. A total of 108 different species were recorded in total, with an average of 108 animals of 61 species being retained at each site. The total mass was 11.585g.
- None of the animals recorded were protected species.
- There is no suggested mitigation works based upon the results of the Benthic Survey results alone.
- Selected photographs are in Appendix D.

1. Introduction

In many of the marine areas over 10m deep in Hong Kong, the seabed is either soft mud or a mixture of mud and sand. The actual detailed composition of this soft bottom seabed varies depending upon location and can experience frequent disturbance from anthropogenic activities like in-shore trawling. These two factors are possibly the main criteria that influence the type of bottom dwelling organisms that inhabit areas of sediment.

In Hong Kong the soft sediments do support a very diverse benthic community. These are important since they provide a basic food source for the territories demersal fishery. Also it has long been established that healthy benthic communities maintain a stable diversity of other marine fauna.

There are also indicators in this community. The burrowing infauna are localized and sessile and therefore can be used to indicate the changing stress levels in areas. This makes such communities important ecologically.

Finally, present surveys of the benthic community in Hong Kong have identified the scattered occurrence of a resident population of the amphioxus *Branchiostoma belcheri*. This is a species of high conservation value. Whilst the resident populations seem to be restricted to areas around the eastern and north-eastern waters, there are many areas in Hong Kong that have not been investigated thoroughly. The presence of this species in local waters is important.

2. Methodology

2.1 Introduction

Benthic survey was carried out in the area expected to be impacted by the works. There have been several comprehensive benthic surveys carried out in the past with the most recent being the survey carried out by the City University of Hong Kong (CPSL, 2002). Several of the stations of this 2002 survey are either inside or nearby to the study area for this survey, in particular stations 42, 43, 46, 49 and 51. The conclusion compares the results of this survey with the results of the 2002 survey.

2.2 Sub-tidal Benthic Surveys

Benthic sediment samples were collected in 9 predetermined stations to quantitatively assesses the benthic communities at each location. See the map in Appendix A. At each site three van Veen grab samples (0.1m²) were taken. The sediment of each grab was assessed for degree of disturbance, penetration depth and amount of leakage. If each of these parameters was acceptable the characteristics of the samples were recorded (colour, odour, type and consistency), The sediment sorted and fauna identified using methods described below. Note that in sandy substrates, where insufficient material was collected from one grab, another was taken to provide the same volume of sediment.

2.2.1 Sorting and Identification

Sediment samples were carefully washed through a 0.5mm sieve using seawater. Material retained on the sieve was transferred into pre-labelled triple bagged zip-lock plastic bags and preserved using a 20% buffered formalin solution and additionally a Rose Bengal stain. Samples were then preserved and shipped to the Oceanway laboratory for taxonomic identification.

At the laboratory, samples were rinsed with freshwater over a 0.5mm mesh. Sieve residues were initially elutriated with fresh water to extract the majority of “light” organisms, notably crustaceans and small worms. Subsequent sample examination of the residue was under 10x or higher binocular microscope where necessary. Routine procedures require the resorting of at least 10% of samples, with the extraction of ≥95% of individuals and 100% of species in each sample. Where sieves were not readily cleaned by rinsing between samples, the mesh was rinsed with methylene blue (or similar) to minimize cross-sample contamination.

All animal specimens were identified to species where possible. Specimens were counted as “heads” or as oral disks for the ophiuroids / asteroids. Voucher material was retained; voucher specimens were routinely checked by a second identifier where any doubt might exist. Sample animal specimens and sample residues (as required) were retained in alcohol for duration for two months.

2.2.2 Data Analysis and Reporting

All data were entered into Excel format (See Appendix B). A detailed account of each site was prepared including description of the following parameters:

Environmental conditions:

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- GPS location of each site; and
- Physical characteristics of sediment (colour odour, type, consistency).

Taxonomic identification:

- Number of species;
- Number of individuals; and
- Biomass (net weight).
- The biomass of the animals recovered was determined after placing them onto blotting paper for about 3 minutes then determined using a suitable scale.

Abundance, biomass, species diversity H' and evenness J was calculated for pooled data using the following formulae:

$$H' = -\sum(Ni/N)\ln(Ni/N); \text{ and } J = H' / \ln S$$

Where S is the total number of species in the sample, N is the total number of individuals and Ni is the number of individuals of the i th species.

2.3 References

CityU Professional Services Limited. (2002). *Consultancy Study on Marine Benthic Communities in Hong Kong*. Submitted to Agriculture, Fisheries and Conservation Department of the HKSAR Government.

3. Results

3.1 Introduction

The survey was carried out on 8th January 2010. The weather was overcast. The air temperature was 18°C. Water temperature at the surface was 17°C. The sea was mild with 0.5m waves recorded in most areas. These were natural in the open areas and created by boats in the Port area. Sea surface salinity was 32ppt.

Mud samples were taken from a total of nine predetermined stations using a van Veen grab with a grab volume of 0.1m². Three grabs were taken at each location. The samples were then sieved through a 0.5mm sieve and the residue retained was examined for animals.

The map in Appendix A shows the locations of these. A total of 106 species were recorded with an average of 108 animals from 61 different species (0.3 m⁻²) at each station. Table 3.1 below shows the summary results for the survey.

Table 3.1: The summary results of the Benthic Survey carried out at Kwai Tsing

Station	Depth (m)	No. Animals	No. Species	Mass (g)	H'	J	Remarks
A	18.0	107	72	0.954	4.16	0.97	Mud - light grey
B	16.2	115	64	2.352	3.97	0.96	Mud / shells - dark grey
C	8.5	94	53	0.963	3.77	0.96	Mud - light grey
D	14.1	141	59	1.640	3.78	0.93	Mud / sand / shells
E	17.8	158	62	1.842	3.98	0.96	Mud / sand / shells
F	15.3	110	70	0.768	4.16	0.98	Mud / shells - light grey
G	10.2	69	50	0.785	3.82	0.98	Mud / hypoxic
H	15.3	85	61	1.379	4.03	0.98	Mud - like clay - light grey
I	15.8	91	60	0.902	3.95	0.97	Mud - dark grey - slightly hypoxic

There was an extra effort made to search through all of the material collected for any lancelets especially *Branchiostoma belcheri*. Past surveys have recorded this species of high ecological value in Hong Kong waters.

3.2 Benthic Survey Results

Location A

The location of this station is shown on the map in Appendix A. The Map reference location information is in Appendix B, Table B1. The species abundance data is in Appendix B, Table B2. The biomass of the animals retained by a 0.5mm sieve is contained in Appendix B, Table B3.

This location was close to Hong Kong Island, close to the Cyber Port Facility at Pok Fu Lam. The sediment was light grey in colour and there was no sulphurous odour associated with it. A photograph of the sediment is in Appendix C. The station depth was 18.0m.

The seabed was light grey mud with very few shells. All of the bivalves recorded in this sample were

very small. This location recorded the highest total number of species (72) with 107 animals retained in the three grab samples taken. The mass of animals recorded was 0.954g. Of this, 0.619g was measured for the phylum Annelide. See Table 3.1 and Appendix B, Table B3 for further details.

Location B

The location of this station is shown on the map in Appendix A. The Map reference location information is in Appendix B, Table B1. The species abundance data is in Appendix B, Table B2. The biomass of the animals retained by a 0.5mm sieve is contained in Appendix B, Table B3.

This location was in the centre of the East Lamma Channel out from the Cyber Port Facility at Pok Fu Lam. The sediment was dark grey in colour with shells and there was no sulphurous odour associated with it. A photograph of the sediment is in Appendix C. The station depth was 16.2m.

Four specimens of the green decorator urchin *Salmacis sphaeroides* were collected at this location. There was only one other area that this animal was collected (Station E). All were very small juveniles.

This location recorded a total number of 115 animals from 64 species. The biomass was 2.352g of this the Echinodermata recorded 1.462g. This station recorded the highest biomass of all stations investigated in this survey. See Table 3.1 and Appendix B, Table B3 for further details.

Location C

The location of this station is shown on the map in Appendix A. The Map reference location information is in Appendix B, Table B1. The species abundance data is in Appendix B, Table B2. The biomass of the animals retained by a 0.5mm sieve is contained in Appendix B, Table B3.

This location was in the East Lamma Channel about 2.5km out from the Cyber Port Facility at Pok Fu Lam. The sediment was light grey in colour and there was no sulphurous odour associated with it. A photograph of the sediment is in Appendix C. The station depth was 8.5m.

This location recorded a total number of 94 animals from 53 species. The biomass was 0.963g of this the Annelide recorded 0.606 g. See Table 3.1 and Appendix B, Table B3 for further details.

Location D

The location of this station is shown on the map in Appendix A. The Map reference location information is in Appendix B, Table B1. The species abundance data is in Appendix B, Table B2. The biomass of the animals retained by a 0.5mm sieve is contained in Appendix B Table B3.

This location was to the immediate north of the East Lamma Channel and north-west of Green Island. The sediment was light grey in colour and consisted of mud, sand and shells. There was no sulphurous odour associated with it. A photograph of the sediment is in Appendix C. The station depth was 14.1m.

This location recorded a total number of 141 animals from 59 species. The biomass was 1.640g of this the Annelide recorded 0.754g. See Table 3.1 and Appendix B, Table B3 for details.

Location E

The location of this station is shown on the map in Appendix A. The Map reference location information is in Appendix B, Table B1. The species abundance data is in Appendix B, Table B2. The biomass of

the animals retained by a 0.5mm sieve is contained in Appendix B, Table B3.

This location was to the south west of Tsing Yi Island. The sediment was light grey in colour and consisted of mud, sand and shells. There was no sulphurous odour associated with it. A photograph of the sediment is in Appendix C. The station depth was 17.8m.

This location recorded a total number of 158 animals from 62 species. This station recorded the highest number of animals of any station in this survey. The biomass was 1.842g of this the Annelide recorded 0.847g. See Table 3.1 and Appendix B, Table B3 for details.

Location F

The location of this station is shown on the map in Appendix A. The Map reference location information is in Appendix B, Table B1. The species abundance data is in Appendix B, Table B2. The biomass of the animals retained by a 0.5mm sieve is contained in Appendix B, Table B3.

This location was to the immediate south of Tsing Yi Island. The sediment was light grey in colour and consisted of mud, sand and shells. There was no sulphurous odour associated with it. A photograph of the sediment is in Appendix C. The station depth was 15.3m.

This location recorded a total number of 110 animals from 70 species. The biomass was 0.768g of this the Annelide recorded 0.389g. See Table 3.1 and Appendix B, Table B3 for details.

Location G

The location of this station is shown on the map in Appendix A. The Map reference location information is in Appendix B, Table B1. The species abundance data is in Appendix B, Table B2. The biomass of the animals retained by a 0.5mm sieve is contained in Appendix B, Table B3.

This location was to the immediate south east of Tsing Yi Island. The sediment was light grey in colour and consisted of mud and some sand. There was a sulphurous odour associated with it indicating that it was hypoxic. A photograph of the sediment is in Appendix C. The station depth was 10.2m.

This location recorded a total number of 69 animals from 50 species. The biomass was 0.785g of this the Annelide recorded 0.466g. See Table 3.1 and Appendix B, Table B3 for details.

Location H

The location of this station is shown on the map in Appendix A. The Map reference location information is in Appendix B, Table B1. The species abundance data is in Appendix B, Table B2. The biomass of the animals retained by a 0.5mm sieve is contained in Appendix B, Table B3.

This location was inside the Kwai Tsing Container Port. The sediment was light grey in colour and consisted of mud and clay. There was no sulphurous odour associated with it. A photograph of the sediment is in Appendix C. The station depth was 15.3m.

This location recorded a total number of 85 animals from 61 species. The biomass was 1.379g of this the Annelide recorded 0.588g. See Table 3.1 and Appendix B, Table B3 for details.

Location I

The location of this station is shown on the map in Appendix A. The Map reference location information is in Appendix B, Table B1. The species abundance data is in Appendix B, Table B2. The biomass of the animals retained by a 0.5mm sieve is contained in Appendix B, Table B3.

This location was also inside the Kwai Tsing Container Port. The sediment was light grey in colour and consisted of mud and clay. There was a slight sulphurous odour associated with it, indicating that it may be slightly hypoxic. A photograph of the sediment is in Appendix C. The station depth was 15.8m.

This location recorded a total number of 91 animals from 60 species. The biomass was 0.902g of this the Annelide recorded 0.475g. See Table 3.1 and Appendix B, Table B3 for details.

4. Recommendation

Benthic Survey did not reveal any protected species or critical communities that deserve special protection. A Hong Kong wide benthic survey in this area was carried out in 2002 by the CPSL. There were four stations that were within or very close to the survey stations of this survey. These were #43, #46, #49 and #51. Note that the number of animals has been scaled up to match the CPSL figure of 1m² area. The number of species value for the CPSL figure is based upon five grabs and not the three as used in this survey. The value of 1m² is a standard used in the results of many surveys. By scaling the number of animals to this value these results may be compared to the results of other benthic surveys carried out in Hong Kong and overseas.

Table 4.1: Comparison of the results of this survey and the results of nearby survey stations of the CPSL 2002 Survey

Station	CityU 2002				Oceanway 2010								
	#43	#46	#49	#51	A	B	C	D	E	F	G	H	I
Number of Animals	128	86	134	1658	357	383	313	470	527	367	230	283	303
Number of Species	24	26	28	62	72	64	53	59	62	70	50	61	60
Species Diversity (<i>H'</i>)	2.47	3.14	2.92	2.82	4.16	3.97	3.77	3.78	3.98	4.16	3.82	4.03	3.95
Evenness Index (<i>J</i>)	0.78	0.97	0.88	0.68	0.97	0.96	0.96	0.93	0.96	0.98	0.98	0.98	0.97

Since this survey was carried out at the very end of one survey season and almost at the start of another. In such a case, it is prudent to consider a comparison of the number of animals by considering the range of values in this and the 2002 CityU surveys. This survey showed less variation in the values for animals obtained (300–527). The corresponding CPSL survey range for number of animals was from 86 to 1658. The value for number of species also showed less variation when compared to the values obtained in the CPSL survey. Both of these differences can probably be attributed to the impacts that the current government policy of cleaning up the Hong Kong Harbour via projects like HATS since large variations in the population of animals indicates variations in the conditions of the seabed. Some of this can be attributed to the amount of material, other than mud, in the sediment. Much of the variation can be attributed to the condition of the sediment. For example if it is hypoxic.

In 2008, the Western Buffer WCZ compliance was 92% with the Water Quality Objectives (WQOs) set for this area. This was up from a figure of 83% set for the year before. The Dissolved Oxygen (DO) values were also up to 75% in 2008. Considering the fact that only two of the nine sites sampled in this survey indicated that they were hypoxic, this may have improved further since then.

The comparison of the values of Species Diversity (*H'*) between the 2002 survey and the 2010 survey indicate the area recorded an increase in diversity. This means that there were more animals from more species recorded in the area in 2010. With regard to the Evenness Index (*J*), the result is similar to the Species Diversity. It appears that the area now has a more evenly distributed population of animals amongst the species.

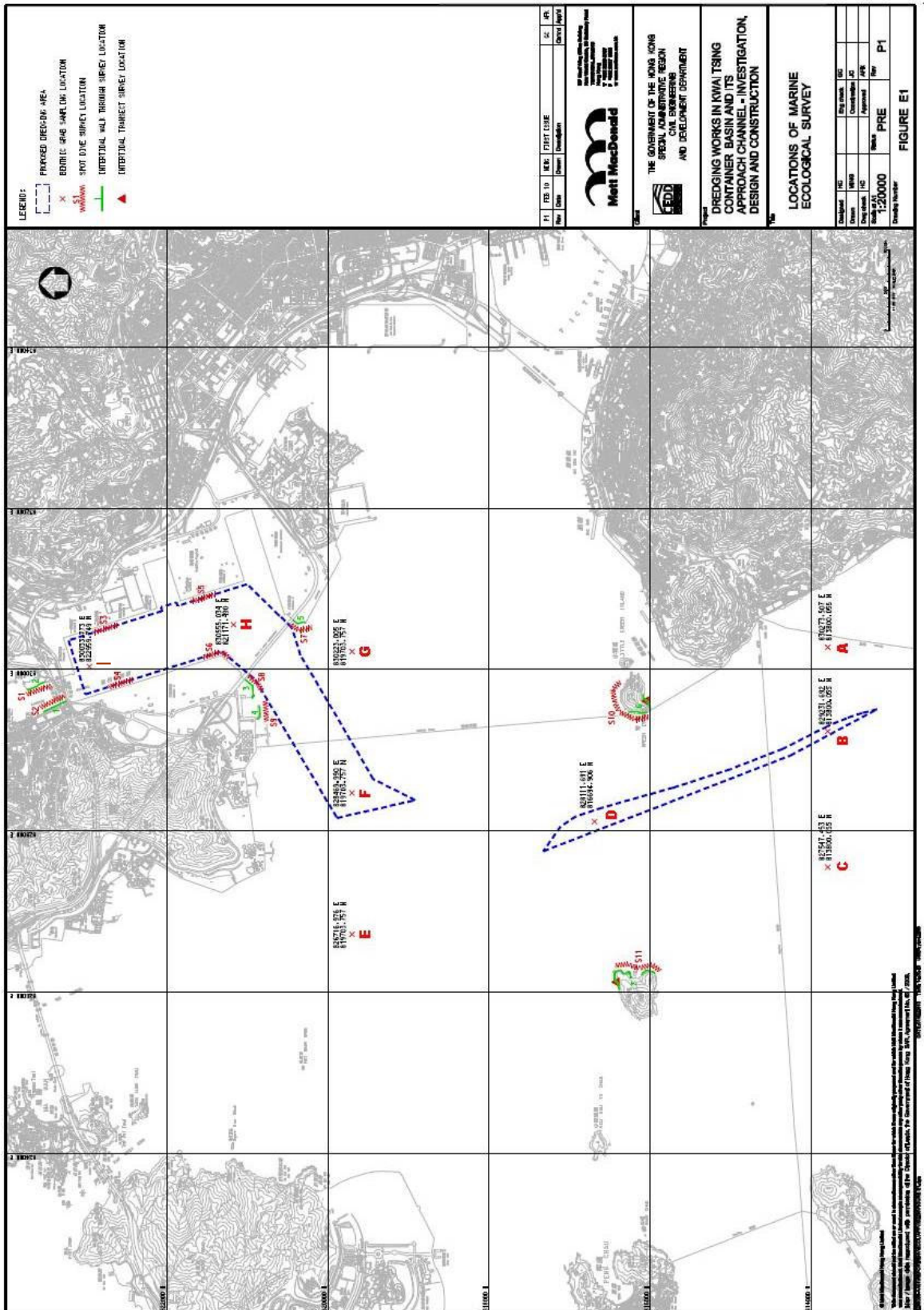
It has been noted that sandy benthos yields more animals and more species. This was the case in this survey, with the sandy samples at D and E yielding high results for number of animals and number of species. Station G recorded the fewest animals and number of species. The reason for this is probably the suspected hypoxic conditions at this station.

The most abundant polychaetes recorded at different stations were *Nepthyidae* sp. (29 individuals) and *Terebellidae* sp. (20 individuals). These are not dominant species as suggested in the CPSL 2002 Report. Neither are they known to be very tolerant to organic pollution, as is the case with *Mediomastus* spp., *Prionospio* spp. and *Paraprionospio pinnata*. The latter species were recorded in this survey but not as the most abundant species.

Appendices

Appendix A. Benthic Station Location Map _____
Appendix B. Benthic Raw Data _____
Appendix C. Grab Sample Photographs _____
Appendix D. Photographs _____

Appendix A. Benthic Station Location Map



Appendix B. Benthic Raw Data

Table B1 – Notes taken for each grab station. For Locations see Appendix A.

Station	WGS84		Time	Depth	Samples	Bucket	Colour	Odour	Sediment		Consistency	Notes
	E	N							Type			
A	114 07.123	22 15.780	10:05	18.0	3	100%	Lt. grey	OK	Mud		Mixed	
B	114 06.517	22 15.780	10:50	16.2	3	100%	Dk. grey	OK	Mud / shells		Mixed	Some broken shells
C	114 05.536	22 15.779	11:30	8.5	3	100%	Lt. grey	OK	Mud		Mixed	
D	114 05.864	22 17.348	11:56	14.1	3	100%	Dk. grey	OK	Mud/sand/shells		Coarse	Some broken coral
E	114 05.051	22 18.978	12:30	17.8	3	100%	Dk. grey	OK	Mud/sand/shells		Coarse	Some stones
F	114 06.071	22 18.979	13:03	15.3	3	100%	Lt. grey	OK	Mud / shells		Mixed	
G	114 07.092	22 18.979	13:31	10.2	3	100%	Grey	Sulphur	Stones		Mixed	Hypoxic
H	114 07.285	22 19.774	15:05	15.3	3	100%	Lt. grey	OK	Mud / clay		Fine	
I	114 06.981	22 20.743	15:30	15.8	3	100%	Dk. grey	Sulphur	Dead coral		Mixed	Slightly hypoxic

Table B2 – Abundance of species collected from Stations A to I and retained in a 0.5mm sieve.

Species	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3	E1	E2	E3	F1	F2	F3	G1	G2	G3	H1	H2	H3	I1	I2	I3
Echiuran sp. 1	1				1			1		1	1		1			1		1		1						2	
Nemertean indet.	1										1														1		
Virgularia	1				1			1																			
Annelide																											
<i>Aglaophamus dibranchis</i>		1					1					1	1	1	1					1						1	1
<i>Aglaophamus lyrochaeta</i>					1				1													1		1			
<i>Ampharetidae</i> sp. 1			1								1			1				1	1				1	1			
<i>Ampharetidae</i> sp. 2	1		1			1				1								1							1	1	
<i>Ampharetidae</i> sp. 3			1	1			1				1		1		2	1		1		1	1	1					1
<i>Amphinomidae</i> sp. 1		1			1					1	1			1	1						1						
<i>Capitellidae</i> sp. 1	1														1									1		1	
<i>Chaetopteridae</i> sp. 1	1				1				1	1	1		1	1			1	1			1						
<i>Cirratulidae</i> sp. 1								2	1			1	1	2	1		1	1				1					
<i>Cirratulidae</i> sp. 2				1						1		3	2			2				1			1		1		
<i>Cirratulidae</i> sp. 3			1			1					1	1	1	2			1				1		1	1		1	
<i>Cirratulidae</i> sp. 4	1								1	1			1			1						1					
<i>Cossurella dimorpha</i>			1	1	1										1				1	1			1		1		1
<i>Cossuridae</i> sp. 1	1				1										1		1					1		1			
<i>Ctenodrilidae</i> sp. 1										1			1													1	
<i>Dorvilleidae</i> sp. 1				1					1								1		1		1			1			
<i>Glyceridae</i> sp. 1									1													1				1	
<i>Goniadidae</i> sp.				1		1						1		1	2												
<i>Hesionidae</i> sp. 1													1										1		1		1
<i>Lumbrineris nagae</i>			1			1				1						1					1						
<i>Mediomastus</i> sp.																		1			1		1	1			
<i>Nephtyidae</i> sp. 1	1	1		1	2	2	3	3	2	2		1	1	2	2		1		1	1					1	2	
<i>Nereididae</i> sp. 1									1								1	1					1			1	

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Species	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3	E1	E2	E3	F1	F2	F3	G1	G2	G3	H1	H2	H3	I1	I2	I3
<i>Onuphidae</i> sp. 1	1	1	1		1	1		1	1		1			2				1				1			1		
<i>Onuphidae</i> sp. 2							1											1		1							
<i>Opheliidae</i> sp. 1										2		2	1	1	1		1							1		1	
<i>Ophiodromus angustifrons</i>	1	2		1	2	1	1		1							1	1		1							1	
<i>Orbiniidae</i> sp. 1			1		1			1	1	1	1																
<i>Otopsis</i> sp.		1				1		1			1	1	1	2											1		
<i>Palmyridae</i> sp. 1	1		1				1		1	1					2	1	1	1			1			1		1	1
<i>Paraonidae</i> sp. 1								1			1	1	1		1			1				1		1	2		
<i>Paraonidae</i> sp. 2	1			1		1	1										1						1				1
<i>Paraprionospio pinnata</i>	1	1								2	2	1	1	1	1			1	1					1		1	
<i>Phyllodocidae</i> sp. 1		1						1																			
<i>Phyllodocidae</i> sp. 2	1				1													1					1			1	
<i>Phyllodocidae</i> sp. 3			2					1				1	1	1	2			1	1		1		1		1		
<i>Phyllodocidae</i> sp. 4				1				1					2													1	
<i>Pilargidae</i> sp. 1					1						1		1		1	1						1		1		1	
<i>Pilargidae</i> sp. 2		1	2	1			1		1	1		1	1	1					1				1				
<i>Pilargidae</i> sp. 3								1									1			1						1	
<i>Poecilochaetidae</i> sp. 1	1	1														1		1		1							1
<i>Polynoidae</i> sp. 1	1		2													1						1		1			
<i>Polynoidae</i> sp. 2		1															1						1		1	1	
<i>Polynoidae</i> sp. 3																		1						1			
<i>Polynoidae</i> sp. 4							1	1	1			1	1	2	1	1	1					1					
<i>Prionospio ehlersi</i>	1			1	1														1				1			1	
<i>Prionospio malmgreni</i>										1							1	1		1			1		1	1	
<i>Serpulidae</i> sp. 1		1						2					3	2	1			1			1	1					
<i>Sigalionidae</i> sp. 1	1		1		1		1	1			1								2			1	1	2			
<i>Sigalionidae</i> sp. 2													2	1	1	1				1							1
<i>Sigalionidae</i> sp. 3		1	1		1	1				2					1		1	1				1		1		1	
<i>Sigambra hanaokai</i>	1		1									1	1	1	2	1		1	1								
<i>Sigambra</i> sp.					1			2		1							1		1			1		1			1

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<i>Spionidae</i> sp. 1			1												1			1					1				
<i>Spionidae</i> sp. 2	1		1			1											1	1								1	
<i>Spionidae</i> sp. 3		1	1	2	1			1		1		3								1		1			1	1	
<i>Spionidae</i> sp. 4						1							1	1	1					1	1	1					
<i>Spionidae</i> sp. 5	1														1	1	1	1						1		1	
<i>Spionidae</i> sp. 6				1												1			1					1	1	1	
<i>Syllidae</i> sp. 1	1		1		1					3	5	3	1	1	1	1	1	1		1							
<i>Syllidae</i> sp. 2								1													1			1		1	
<i>Syllidae</i> sp. 3								1				1					1			1							1
<i>Syllidae</i> sp. 4							1																			1	
<i>Terebellidae</i> sp. 1		1	1	2	1	1			1	1	3	2	1	2	1	1		1		1		1					
<i>Terebellidae</i> sp. 2	1		1						1								1	1									
<i>Terebellidae</i> sp. 3		1	1		1																			1	1		1
<i>Terebellidae</i> sp. 4	1	1	2	2				1		1	4	3	1			1	1						1	1			
<i>Tharyx</i> sp.		1																		1						1	
Oligochaete																											
<i>Tubificidae</i> sp. 1	1		2		2			1	1	1			1		1	1	1			1						1	
<i>Thalassodrilides gurwitschi</i>								1		1												1	1	1	2	3	2
Crustaceans																											
<i>Ampelisca</i> sp. A	1												1					1				1					1
<i>Callianassa Japonica</i>				1	1	4				2	2	2	1	1	1	1				1	2				1	1	2
<i>Clausidiidae</i> sp. A	1	1	1	3	1			1		1	2	3	2	2	1		1	1	2	1							
<i>Iphinoe</i> sp. A		1		1		2		1					1	3		1	1		1		1	1	1	1	1	1	
<i>Leptochela aculeocaudata</i>	1												1		1		1										
<i>Maera</i> sp. A										2												1			1		1
<i>Megaluropus</i> sp. A	1		1		2										2												
<i>Melita</i> sp.				1	1						1							1				1					
<i>Melitidae</i> sp. B					1		1	1	2	1	1	1			2	1		1					1		1	1	

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 Appendix 5.3 Marine Benthic Grab Survey Report



Species	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3	E1	E2	E3	F1	F2	F3	G1	G2	G3	H1	H2	H3	I1	I2	I3
<i>Microprotopus</i> sp. C	1			1													1	1		1	1						
<i>Neoxenophtalmus obscurus</i>	1	2	1							2	1	3										1	1				
<i>Oedicerotidae</i> cf. <i>sinoediceros</i>		1		1	1		4		1												1						
<i>Pakistanapseudes hodgsoni</i>		1				1						1						1							1	1	
cf <i>Photis</i> sp. A	1							2	1	1										1		1		1			
cf <i>Photis</i> sp. B		1		1		1	1	1										1			1						
cf <i>Phtisica</i> A	1				1		1		1	1			2	1	2	1			1				2		1	1	
<i>Processa</i> sp. A		1		1													1										
<i>Synchelidium</i> sp. A		1		2	1		2					1			1								1				1
<i>Synchelidium</i> sp. B	1					1			1			1						1	1	1						2	
<i>Typhlocaccinops denticapes</i>		1			1			1	1	1	2	2	1			1		1								1	
<i>Varuna</i> cf <i>littorata</i>	1			1										1	1	1	1				1						
Mollusca																											
<i>Abra</i> sp. juveniles		1		1		2																					
<i>Mabellarca consociata</i>					1		1					1	1	3	1	1				1			1	1		1	
<i>Paphia undulata</i>			1	3		2	1	1	2	1		1	3	1	1	1	1	1				1					1
<i>Philine</i> cf <i>orientalis</i>	1					3					4	2		2	3	2	1	1					1	1			
<i>Potamocorbula laevis</i>		1		1	1	1	2	1	1		1	1	1	1	2				1		1	1		1		1	
<i>Ruditapes philippinarum</i>					1					1		1		1	2	1		2	1	2					1		2
<i>Theora</i> A		1	1	1			2		1	1		1	2	1	1	1	2			1	2		1				
<i>Trisdos semitorata</i>	1					3																					
Sipunculans																											
<i>Apionsoma trichocephala</i>	1				1					2	1		1	1	1				1			1	1		1		
Echinodermata																											
<i>Amphiodia oblecta</i>			1			1				1	2	1		1													
<i>Amphioplus (Lymanella) laevis</i>		1						1							2			1							1		
<i>Salmacis sphaeroides</i>				3		1								1													

Table B3 – Biomass of the taxa collected from nine stations and retained in a 0.5mm sieve in grabs collected from the Kwai Chung Container Basin and its Approach Channel.

Station	A	B	C	D	E	F	G	H	I
Annelide	0.619	0.564	0.606	0.754	0.847	0.389	0.466	0.588	0.475
Crustacea	0.097	0.175	0.121	0.278	0.223	0.189	0.189	0.125	0.250
Mollusca	0.004	0.027	0.013	0.017	0.040	0.058	0.006	0.005	0.008
Echinodermata	0.020	1.462	0.009	0.035	0.269	0.008	0.000	0.000	0.011
Others	0.214	0.124	0.214	0.556	0.463	0.124	0.124	0.661	0.158
Total:	0.954	2.352	0.963	1.640	1.842	0.768	0.785	1.379	0.902

Appendix C. Grab Sample Photographs

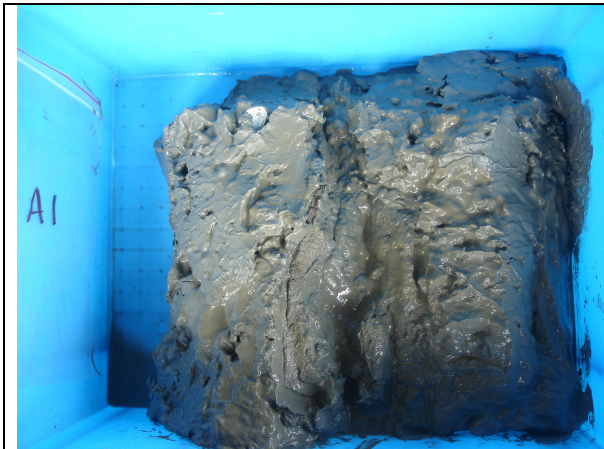


Plate 1. Grab Sample from Station A.



Plate 2. Grab Sample from Station B.



Plate 3. Grab Sample from Station C.



Plate 4. Grab Sample from Station D.



Plate 5. Grab Sample from Station E.

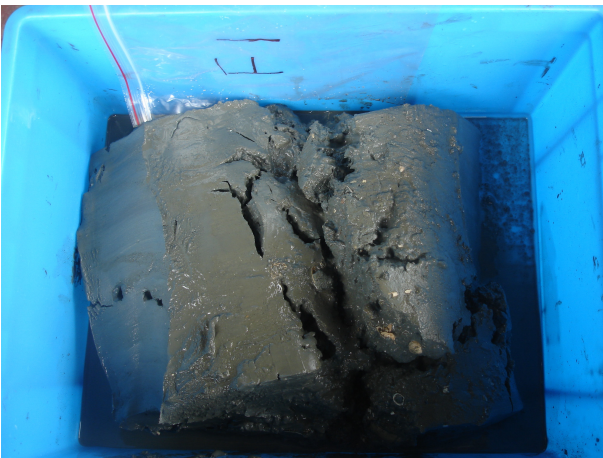


Plate 6. Grab Sample from Station F.

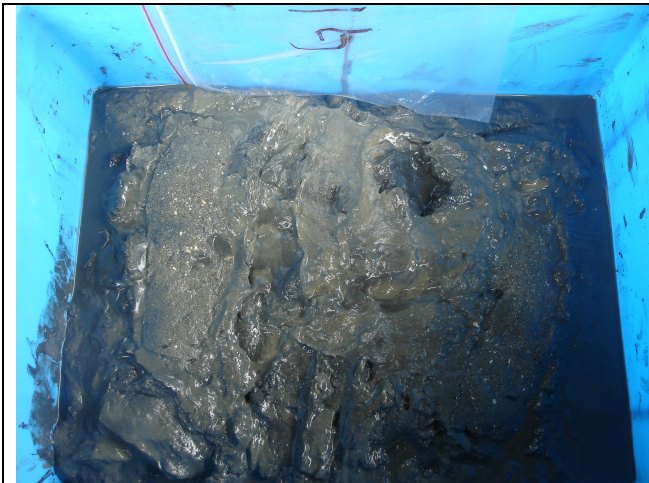


Plate 7. Grab Sample from Station G.

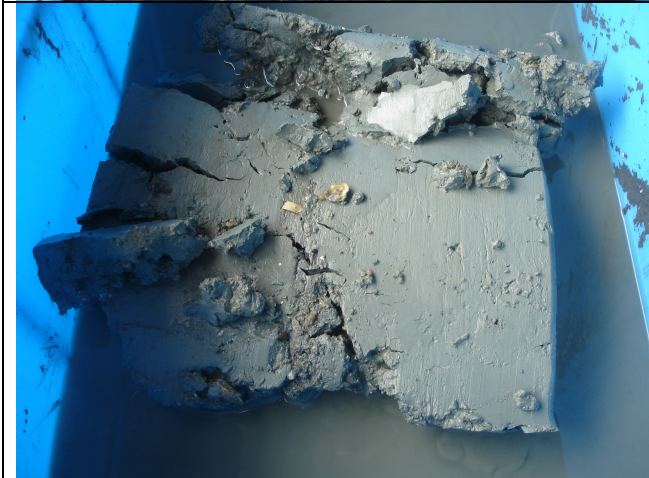


Plate 8. Grab Sample from Station H.



Plate 9. Grab Sample from Station I.

Appendix D. Photographs



Plate 10. The grab in action at Station A.



Plate 11. Pulling the grab onto the boat.



Plate 12. Washing the sediment for the residue.



Plate 13. The work area, ready for the next grab station.



Plate 14. Some of the stations were in the shipping lane.



Plate 15. Inside the container port area.