APPENDIX 10D

Results of HKBCF Ecological Survey Programme

1 Introduction

Highways Department (hereafter the Client) is planning a project namely **"Agreement No. CE 14/2008 (CE) Hong Kong-Zhuhai-Macao Bridge - Hong Kong Boundary Crossing Facilities - Investigation"** (hereafter the Project).

An EIA Study Brief (ref: ESB-183/2008) was issued by EPD to Highways Department on 11 April 2008, to carry out an EIA study for the Project.

The Project involves reclamation at the western Hong Kong waters. In Accordance with the EIA Study Brief, marine ecological assessment is a component of the EIA study, and an ecological field survey programme covering intertidal survey, coral dive survey and marine benthic survey, is required.

This paper presents the results of the ecological survey programme for the HKBCF EIA study.

2 Staff

Ecosystems Limited was commissioned as the consultant for the Study. Two marine ecologists were responsible for the present marine ecological study.

Vincent Lai Chi-sing: Marine Ecologist. Mr. Lai joined Ecosystems Ltd. in January 1999. He is experienced in designing and conducting ecological field surveys and reporting for EIA and ecological studies. He has broad academic and practical experience with coastal and marine ecology. He has also conducted dive and benthic surveys and impact assessments for various EIA and ecological studies in Hong Kong.

Keith Kei: Dive Specialist. Mr. Kei is a dive specialist affiliated with Ecosystems Ltd. He has extensive experience in marine ecology, particularly in assessment and management of corals in Hong Kong. Mr. Kei has conducted coral surveys for a number of projects and studies in Hong Kong, including Impact Assessment of Sand Dredging at the West Po Toi Marine Borrow Area, and Proposed Extension of Public Golf Course at Kau Sai Chau Island, Sai Kung. Mr. Kei is leading the Reef Check Foundation and organised the activities of "Reef Check" in Hong Kong since 1998.

3 Objectives and Scopes of the Study

In accordance with the requirements of Section 5(1) of the EIAO, a project profile (No PP-346/2008) was submitted to Environmental Protection Department (EPD) for the application of an EIA Study Brief on 12 March 2008. Pursuant to Section 5(7)(a) of the EIAO, EPD issued to the Project Proponent, namely Highways Department, a study brief (ref: EIA Study Brief No: ESB-183/2008 dated 11 April 2008) to carry out an EIA study.

As stipulated in Section 3.4.5.4 (i) and (iii), the Ecological Impact Assessment will review the findings of relevant studies/surveys, including EIA studies for Tuen Mun Chek Lap Kok Link (TMCLKL) and the HZMB Hong Kong Link Road (HKLR), to collate ecological information of the assessment area. Necessary ecological field surveys will be carried out if information gap is identified.

The key issues of the present EIA study stipulated in the EIA Study Brief include:

- Coral communities
- Horseshoe Crabs
- Seagrass bed
- Chinese White Dolphin

In addition, the following two issues are also considered of concern given the nature of the Project:

- Marine benthic communities
- Intertidal habitat

In accordance with the EIA Study Brief for TMCLKL, the ecological field surveys for that EIA shall include coral communities, marine benthic communities, Horseshoe Crabs and avifauna and the duration shall be at least 9 months covering wet and dry seasons. Therefore it is anticipated that the TMCLKL ecological surveys could provide sufficient data for the North Lantau waters where its alignment goes through.

It is also anticipated that the coming ecological survey programme for Hong Kong Link Road would cover embayment along and close to Airport Channel where its alignment goes through or is in close distance, including Tung Chung Bay and San Tau. Information on horseshoe crabs and seagrass beds in those habitats would be available from HKLR.

Furthermore, AFCD annual dolphin monitoring programme provide the long-term and updated data sufficient for baseline establishment and impact assessment purposes.

Therefore the ecological field surveys for the present Ecological survey programme were conducted to fill in information gap, in particular the direct impact areas, i.e. the reclamation area and the landing points of connecting roads on Airport Island.

4 Methodology

a) Survey methodology

(1) Intertidal Survey

Intertidal survey is to investigate the intertidal habitats and communities. Intertidal surveys for epifauna communities were conducted on both natural and artificial coastlines at the northeast of Airport Island, during both wet season and dry season (August and November 2008).

The survey includes an active search survey within the Project Area, as well as quantitative survey on rocky shores, artificial seawall and sandy shores within the Project Area, to record the species and abundance of intertidal fauna, to evaluate and rank the ecological values at different locations.

Before the quantitative surveys, a walk-through survey was conducted within the Survey Area to collect information to facilitate the determination of representative sites for conducting the quantitative surveys. Walk-through surveys were also conducted at each quantitative site during the quantitative sampling (two surveyors for 30 minutes).

Horizontal transects of 50m in length were established at three tidal levels (High, Middle and Low) on each of the two locations where direct impacts from the Project are anticipated (the landing points of the connecting roads on Airport Island).

The locations of the intertidal transects are shown in **Figure 1**. There were ten 0.5m x 0.5m quadrats on each transect. The epifauna within each quadrat were identified and their numbers/coverage percentages were recorded. Species diversity and abundance were reported for evaluating and ranking the ecological values.

(2) Marine Grab Survey

Marine grab samplings for benthic communities were conducted at 9 stations within the BCF reclamation area (see Figure 1) during both wet season and dry season (September and December 2008). Five grab sample replicates of 0.1m2 were collected in each of the sampling stations by van Veen Grab. Collected samples were sieved by 0.5mm mesh sieve and then preserved in 5% buffered seawater formalin. Organisms inside the samples were sorted from the sediments by staining with Rose Bengal and then identified to the lowest practicable taxonomic level. Species diversity, abundance and biomass were reported for evaluating and ranking the ecological values.

(3) Dive Survey

Dive surveys for corals and other hard substrate marine organisms were conducted in September 2008. The dive surveys concentrated on shallow coastal waters that would be subject to direct loss of marine habitats or indirect water quality impacts, including both natural and artificial coastlines at the northeast of Airport Island.

The methodology used in the present survey followed those adopted in the AFCD territorial wide dive survey conducted in 2001-2002 (AFCD 2004). It consisted of a suite of three standardized "nested" survey methods including spot-check dive reconnaissance dives, Rapid Ecological Assessment (REA) and video transects. In the present study, due to the highly turbid water and the low diversity and coverage of marine fauna, video transect was not performed. The spot-check and REA methods were used and were found sufficient for establishing the ecological profile of the study area.

Spot Reconnaissance survey

Spot reconnaissance dives were conducted 17 spot-check dives were conducted and covered: 1) along the coastlines of Northeast Airport Island (8 spots), with focus concentrated on the section opposite to the future BCF reclamation area, ; 2) as well as within the future BCF reclamation area covering the entire proposed reclamation site (9 spots). The locations for spot reconnaissance dives are shown in Figure 1. Visual reconnaissance was made of the area of each bounce dive point, by adopting a circular path.

The purposes of the spot reconnaissance dives are to verify whether corals (including all hard corals, octocorals and black corals) and other marine organisms with conservation importance are present within the areas potentially subject to direct impacts (e.g. the reclamation area) and indirect impacts (e.g. the Airport Island coastlines). As the underwater visibility is low in North Lantau waters, during the reconnaissance dives circular paths at each dive spots were adopted (continuous routes are not suitable under the very low visibility). Besides the biota, the habitat types present within the areas and their approximate proportions/distributions were also recorded. Underwater photographs were taken.

REA survey

Semi-quantitative Rapid Ecological Assessment (REA) survey were conducted at the two major locations where the connecting roads with BCF will land on Airport Island, as well as with hard substrates identified during the spot reconnaissance dives. The REA transect locations are shown in **Figure 1**. The starting points of the REA transects were determined on site in accordance with the site conditions and underwater visibility.

The REA survey at the landing point areas were performed along 100m underwater transects horizontal to the coastlines. Transects perpendicular to the coastline of 50m (limited by the underwater visibility) were also performed. The depth and substrate along the perpendicular transects for REA were recorded at 3m intervals. The benthic cover, taxon abundance, and

ecological attributes of the transects were recorded in a swathe of 2m wide, 1m either side of the transects, following the Rapid Ecological Assessment (REA) technique. Video footages and photos were taken during the dive surveys.

The purposes of the REA survey are to quantitatively record the habitat types and ecological values of the area by SCUBA diving and the application of Rapid Ecological Assessment (REA) approach. The REA approach (see Annex A for details) aims at collecting data on the type of substrate and the abundance of marine organisms in particular the occurrence of corals and the extent of the coral distribution from the coastline, for ranking the ecological values. Other parameters to be recorded during the surveys include site condition (e.g. observations regarding the degree of exposure of the sites to wave action), species list of corals and other marine organisms, coral sizes, coral health status, and translocation feasibility of corals.

Table 1 Time schedule of the ecological survey programme

Items	2008					2009	
	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Approval of survey plan	■						
Marine grab		■			■		
Dive survey			■				
Intertidal survey	■			■			
Draft Results						■	
Final Results							■

5 Results

The proposed Project comprises two major elements, reclamation next to the Airport Island and connecting road/access from the HKBCF to Airport Island.

5.1 Intertidal survey

Intertidal survey is to investigate the intertidal habitats and communities. Two types of intertidal habitats were present and surveyed i.e. artificial seawalls immediately landward to the reclamation area, and rocky shore to the north and to the south of the artificial seawalls, which included a small section of sandy shore further southward to the southern rocky shore.

A total of 21 taxa were recorded during the surveys. All were common intertidal organisms in Hong Kong. The survey data were shown in **Annex 2**.

Table 2 List of Intertidal Fauna Recorded during the survey

Common name	Scientific name	Commonness in Hong Kong
Rock oyster	*Saccostrea cucullata*	Common
Green mussel	*Perna viridis*	Common
Bivalve	*Barbatium* sp.	Common
Limpet	*Cellana grata*	Common
False Limpet	*Siphonaria* sp.	Common
Littorid snail	*Echinolittorina trochoides*	Common
Littorid snail	*Echinolittorina radiata*	Common

Common name	Scientific name	Commonness in Hong Kong
Littorid snail	*Littoraia articulata*	Common
Snail	*Nerita yoldii*	Common
Snail	*Chlorostoma argyrostomum*	Common
Dog whelk	*Thais clavigera*	Common
Dog whelk	*Thais* sp.	Common
Stalked barnacle	*Capitulum mitella*	Common
Barnacle	*Tetraclita squamosa*	Common
Barnacle	*Balanus amphitrite*	Common
Isopod	*Ligia exotica*	Common
Hermit crab	*Clibanarius infraspinatus*	Common
Crab	*Hemigrapsus sanguineus*	Common
Crab	*Gaetice depressus*	Common
Crab	*Ocypode* sp.	Common
Crab	*Parasesarma pictum*	Common

All the intertidal fauna recorded during the survey were very common to intertidal habitats in Hong Kong. The abundance and diversity of intertidal fauna were low on both the artificial seawalls and the rocky shore. The Diversity Index (H') and Evenness Index (J) were shown in the table below. Both the diversity index and evenness index in both wet (August 2008) and dry (November 2008) seasons were low for the northern and southern transect sites.

Table 3 Diversity index and Evenness index at the 2 transect sampling sites

	August 2008	
	North Site	South Site
Diversity index (*H'*)	1.37	1.19
Evenness index (*J*)	0.60	0.52
	November 2008	
	North Site	South Site
Diversity index (*H'*)	1.23	1.14
Evenness index (*J*)	0.59	0.52

5.2 Benthic survey results

A total of 210 benthic organisms were recorded in the wet season survey, while 348 benthic organism were recorded in dry season survey. 80 taxa were recorded, including 8 phyla (Annelida, Arthropoda, Chordata, Coelentarate, Echinodermata, Mollusca, Nemertea and Phoronida), (Table 4). Detailed results of the benthic survey are presented in Annex 3. In both wet and dry seasons, no species of conservation importance was found and none of the species are listed in the IUCN Red List (IUCN 2008).

Table 4. Summary of the macrofauna collected in wet season (September) and dry season (December) 2008.

Phylum	Wet Season (September 2008)			Dry Season (December 2008)		
	Number of species/ families	Total number of individuals	Total biomass (g)	Number of species/ families	Total number of individuals	Total biomass (g)
Annelida	21	70	3.21	30	129	7.45
Arthropoda	10	41	45.228	16	114	25.196
Chordata	3	8	12.53	3	9	14.4
Coelenterata	1	1	0.08	2	2	0.04
Echinodermata	3	11	2.334	2	15	6.67
Mollusca	9	68	200.09	13	69	125.75
Nemertea	1	8	0.58	1	3	0.05
Phoronida	1	3	0.22	1	7	0.13
Total	**49**	**210**	**264.272**	**68**	**348**	**179.686**

Table 5 Species diversity index and species evenness index of the 9 stations

Station	G1	G2	G3	G4	G5	G6	G7	G8	G9
Wet season									
Individual number	30	30	23	27	16	28	29	14	13
Species diversity H’	2.35	2.83	2.69	1.74	2.51	2.53	2.46	2.07	2.35
Species evenness J	0.69	0.83	0.86	0.53	0.91	0.76	0.73	0.78	0.92
Dry season									
Individual number	60	49	30	34	23	39	29	59	26
Species diversity H’	2.90	2.60	2.75	2.57	2.54	2.70	2.76	3.14	2.74
Species evenness J	0.71	0.67	0.81	0.73	0.81	0.74	0.82	0.78	0.84

Error! Not a valid link. ranged from 1.74 to 3.14, while Pielou’s Evenness index ranged from 0.53 to 0.92

Infauna diversity in the Study Are is relatively low when compared to other areas in Hong Kong. All the species recorded occur frequently in Hong Kong and no rare species were observed (Shin 2002)

5.3 Dive survey

Spot dive survey

Spot dive surveys were conducted at 17 locations, including 8 stations along the coastlines of Airport Island and 9 stations within the HKBCF reclamation site. All surveyed areas/sites were of turbid waters and thus low visibility. The coordinates of these spot dive sites are shown in the table below.

Table 6 Coordinates of spot dive sites

Point	Latitude(N)	Longitude(E)
S1	22.192	113.563
S2	22.193	113.564
S3	22.192	113.565
S4	22.191	113.565
S5	22.185	113.564
S6	22.184	113.563
S7	22.184	113.562
S8	22.183	113.562
G1	22.191	113.570
G2	22.190	113.571
G3	22.190	113.572
G4	22.190	113.570
G5	22.190	113.571
G6	22.185	113.572
G7	22.185	113.565
G8	22.185	113.570
G9	22.184	113.572

Spot dive Site S1 to S8 were located on the coastline of Airport Island, from the northeast corner of Airport Island (S1), to the eastern shore of Airport Island southward to the airport runway signal light (S8).

Spot Dive Site S1, S3, S4, S5, and S6 were artificial seawalls, either vertical seawall (S3 and S5) or sloping seawalls (S1, S4, S6).

Sloping seawalls are composed of irregular boulders and maintained the same gradient till they reached the seabed. Gorgonian coral Echinomuricea sp. was found on the surface of the boulders, though the coverage percentage was low (<5%). One species of ahermatypic coral Balanophyllia sp. was also found on boulders at S4, but at a even lower coverage (<1%). Other epifauna on the boulders included Perna viridis and Thais sp.. Beyond the seawalls, the seabed turned into muddy substrates, and no epifauna was found.

The epifauna on vertical seawalls were of a even lower percentages/abundance than that on sloping seawalls. Very limited gorgonian coral Echinomuricea sp. colonized on the crevices of the seawall blocks.

S2 and S7, and S8 were natural coastlines. Boulders (of much smaller sizes than those of sloping seawalls) covered the seabed in the nearshore, and scattered on sandy substrate further offshore. No hard or soft coral was found on these boulders.

G1 to G9 were inside the HKBCF reclamation site. The seabed within the reclamation site was generally in very low gradient. The water depth of these sites was similar, about 5-6m. All these 9 sites were of sandy/muddy substrate. The water was turbid and the visibility in these 9 sites (offshore to the coastline) was lower than the sites near the coastline. No epifauna or any coral was found on these locations with sandy substrate.

Dive REA survey

REA dive survey was conducted at S4 and S6, both are sloping seawalls and are potentially subject to direct impacts from the HKBCF project.

Table 7 The profile of REA Transects

	S4		S6	
Distance (m)	**Depth (m C.D.)**	**Substratum**	**Depth (m C.D.)**	**Substratum**
0	-0.5	Boulders	-0.5	Boulders
3	-1.2	Boulders	-1.2	Boulders
6	-2.5	Boulders	-2.5	Boulders
9	-3	Boulders	-3	Boulders
12	-4	Boulders	-4	Boulders
15	-5	Boulders	-5	Sandy/muddy
18	-5	Boulders	-5	Sandy/muddy
21	-5	Boulders	-5	Sandy/muddy
24	-5	Sandy/muddy	-5	Sandy/muddy
27	-5	Sandy/muddy	-5	Sandy/muddy
30	-5	Sandy/muddy	-5	Sandy/muddy
33	-5.5	Sandy/muddy	-5	Sandy/muddy
36	-5.5	Sandy/muddy	-5	Sandy/muddy
39	-5	Sandy/muddy	-5.5	Sandy/muddy
42	-5	Sandy/muddy	-5.5	Sandy/muddy
45	-5.5	Sandy/muddy	-5.5	Sandy/muddy
48	-5	Sandy/muddy	-5.5	Sandy/muddy

The results of the REA survey were shown in the table below:

Table 8 List of Marine Species Recorded by the REA survey within the Project Area

REA criteria	S4	S6
Substratum		
Bedrock/Continuous pavement	0	0
boulders	6	6
Rubble	0	0
Cobbles	0	0
Sand with gravel	0	0
Mud	0	0
Ecological attributes		
Hard coral	1	0
Dead standing corals	0	0
Soft corals	1	1
Sea anemone beds	0	0
Macroalgae	0	0

A total of 8 species of marine organisms were recorded in the area, while only one species of ahermatypic coral of very low coverage was found. Selected photos of the coral species were shown in **Photo Plate**. All the species recorded are common to dominant in Hong Kong, of no special conservation importance.

Table 9 List of marine coral species recorded within the Project area

Scientific name	Commonness in Hong Kong
Perna viridis	Very common
Balanophyllia sp.	Common
Echinomuricea sp.	Very common
Balanus amphitrite	Very common
Chlorostoma sp.	Very common
Thais sp.	Very common
Hermit crab	Very common
Crassostrea cucullata	Very common

END

Annex 1

Rapid Ecological Assessment

Rapid Ecological Assessment involves 'semi-quantitative' swim-surveys allowing for assessment and classification of survey areas. The field data are collected by divers experienced in the underwater identification of sessile benthic taxa, swimming along coral communities or identified sections of coastline on SCUBA.

REA surveys provide information on the assessment of relative cover of coral and other major benthic groups, as well as an inventory of sessile benthic taxa used to define community types.

Five ecological and six substratum attributes shall be assessed on site and/or by reviewing video footages. Each of the attributes (**Table A1-1**) should be assigned to one of the seven standard ranked categories (from zero to six, representing percentage cover from none to over 76%)(**Table A1-2**).

An inventory of benthic taxa shall be complied for transect. Taxa shall be identified in situ to the following levels:

1) Hard corals to species level where possible;
2) Soft corals, anemones and macroalgae to genus level where possible; and
3) Other benthos to genus level where possible or phylum with growth form.

Each taxon in the inventory shall also be ranked to one of the six categories (**Table A1-3**) in terms of abundance (from 0 to 5, representing from absent to dominant) in the community.

Table A1-1 Ecological and Substratum attributes used in REA

Ecological attributes
Hard coral
Dead standing corals
Soft corals
Sea anemone beds
Macroalgae
Substratum
Bedrock/Continuous pavement
boulders
Rubble
Cobbles
Sand with gravel
Mud

Table A1-2 Ranking of Ecological and substratum attributes

Rank	**Percentage cover (%)**
0	None recorded
1	1-5
2	6-10
3	11-30
4	31-50
5	51-75
6	76-100

Table A1-3 Ranking of Benthos abundance

Rank	Abundance
0	Absent
1	Sparse
2	Uncommon
3	Common
4	Abundant
5	Dominant

End of Annex 1

Annex 2
Intertidal survey results

S4 (North Site) – August 2008

High level										
Quadrat	**H1**	**H2**	**H3**	**H4**	**H5**	**H6**	**H7**	**H8**	**H9**	**H10**
Echinolittorina radiata	2	6		6	11		3			11
Echinolittorina trochoides	11		9	4	3			2		
Littoraria articulata										
Capitulum mitella		35					36			
Middle Level										
Quadrat	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**
Saccostrea cucullata	23	6	13	9	35	16	36	12		21
Perna viridis										
Cellana grata		3			1		1	1		1
Siphonaria sp.						2				1
Echinolittorina radiata										
Echinolittorina trochoides										
Littoraria articulate										
Nerita yoldii										
Thais clavigera		1		3	2			1		
Thais sp.										
Capitulum mitella				15		3			2	
Teraclita squamosa	6	14	11	2	2		31	2		4
Balanus amphitrite										
Low Level										
Quadrat	**L1**	**L2**	**L3**	**L4**	**L5**	**L6**	**L7**	**L8**	**L9**	**L10**
Saccostrea cucullata	9	31	51	34	16	14	5	31	45	35
Perna viridis				1				2		2
Cellana grata		5		3				3		
Siphonaria sp.										
Echinolittorina radiata										
Echinolittorina trochoides										
Littoraria articulata										
Nerita yoldii				2						
Thais clavigera		2	2		1	3		5	1	11
Thais sp.										
Capitulum mitella							37			
Teraclita squamosa	80	18		25	66	12	41	74	39	90
Balanus amphitrite										

S6 (South Site) – August 2008

High level										
Quadrat	**H1**	**H2**	**H3**	**H4**	**H5**	**H6**	**H7**	**H8**	**H9**	**H10**
	-	-	-	-	-	-	-	-	-	-
Middle Level										
Quadrat	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**
Saccostrea cucullata	5	7	10	80	90	5	15	90	60	80
Perna viridis								6		
Cellana grata							8	30	25	60
Echinolittorina radiata										
Echinolittorina trochoides										
Littoraria articulata							22			
Nerita								1		
Thais clavigera								11		
Thais sp.										
Capitulum mitella										
Teraclita squamosa	4						2			
Balanus amphitrite										
Low Level										
Quadrat	**L1**	**L2**	**L3**	**L4**	**L5**	**L6**	**L7**	**L8**	**L9**	**L10**
Saccostrea cucullata	9	26	11					1	1	3
Perna viridis									6	
Cellana grata									5	
Siphonaria sp.			1							
Echinolittorina radiata										
Echinolittorina trochoides										
Littoraria articulata										
Nerita yoldii										
Thais clavigera	8			5			2	15		2
Thais sp.									2	
Capitulum mitella										
Teraclita squamosa										
Balanus amphitrite	70	40	40	70	90	95	70	70	60	80

S4 (North Site) – November 2008

High level										
Quadrat	**H1**	**H2**	**H3**	**H4**	**H5**	**H6**	**H7**	**H8**	**H9**	**H10**
Echinolittorina radiata		4		14	7				1	10
Echinolittorina trochoides				9	3			1		
Littoraria articulata										
Capitulum mitella					41					
Middle Level										
Quadrat	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**
Saccostrea cucullata	13	8	15	20	29	1	36		2	18
Perna viridis										
Cellana grata				2				1		1
Siphonaria sp.										1
Echinolittorina radiata										
Echinolittorina trochoides										
Littoraria articulata										
Nerita yoldii										
Thais clavigera			2		1			1		
Thais sp.										
Capitulum mitella		11				1				
Teraclita squamosa	18	4		4		1	26	1	3	1
Balanus amphitrite										
Low Level										
Quadrat	**L1**	**L2**	**L3**	**L4**	**L5**	**L6**	**L7**	**L8**	**L9**	**L10**
Saccostrea cucullata	12	27	80	33	13	18	21	23	30	40
Perna viridis										
Cellana grata			7							
Siphonaria sp.										
Echinolittorina radiata										
Echinolittorina trochoides										
Littoraria articulata										
Nerita yoldii										
Thais clavigera			3	2			2	1	3	10
Thais sp.										
Capitulum mitella		22								
Teraclita squamosa	60	23		13	53	28	35	70	42	80
Balanus amphitrite										

S6 (South Site) – November 2008

High level										
Quadrat	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
	-	-	-	-	-	-	-	-	-	-
Middle Level										
Quadrat	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
Saccostrea cucullata	3	8	60	6	9	61	28	67	71	74
Perna viridis								2	2	
Cellana grata					3		4	14	26	31
Siphonaria sp.										
Echinolittorina radiata										
Echinolittorina trochoides										
Littoraria articulata									3	6
Nerita yoldii									2	
Thais clavigera								5	5	
Thais sp.										
Capitulum mitella										
Teraclita squamosa	6			2			3			
Balanus amphitrite										
Low Level										
Quadrat	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
Saccostrea cucullata		11	23	9			5		6	
Perna viridis									6	
Cellana grata			2				3			
Siphonaria sp.										
Echinolittorina radiata										
Echinolittorina trochoides										
Littoraria articulata										
Nerita yoldii										
Thais clavigera		5	5	6					8	4
Thais sp.				1		2				
Capitulum mitella										
Teraclita squamosa										
Balanus amphitrite	70	51	20	85	55	85	65	80	50	70

End of Annex 2

Annex 3

Results of Benthic Garb Survey

Results of Dry Season Benthic Grab Survey

		1A		1B		1C		1D		1E		2A		2B		2C		2D		2E		3A		3B		3C		3D		3E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
	COELENTERATA																														
	Actiniaria																														
1	Actinian																														
2	*Virgularia* sp.																														
	NEMERTEA																														
3	Nemertean																	1	0.01												
	ANNELIDA																														
	Polychaeta																														
4	*Aglaophamus dibranchis*																														
5	*Asychis* sp.																														
6	*Australaugeneria* sp.																														
7	*Bhawania goodei*																														
8	*Chloeia parva*	1	0.13	1	0.17																									1	0.1
9	*Ceratonereis* sp.																														
10	*Cossurella dimorpha*																														
11	*Diopatra variabilis*					1	0.09																								
12	*Eteone longa*									1	0.01																				
13	*Eunice indica*			1	0.02	4	0.13	3	0.1	6	0.16																				
14	*Glycera convoluta*																														
15	*Glycera rouxi*							1	0.01					1	0.03	1	0.04											1	0.03		
16	*Harmothoe imbricata*							1	0.01	1	0.01																				
17	*Heteromastus filiformis*																														
18	*Laonice cirrata*							1	0.01							1	0.02														
19	*Leocrates chinensis*																														
20	*Lepidasthenia microlepis*																														

		1A		1B		1C		1D		1E		2A		2B		2C		2D		2E		3A		3B		3C		3D		3E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
21	*Linopherus hirsuta*											1	0.02			1	0.03														
22	*Loimia medusa*																														
23	*Lumbrineris latreilli*																							1	0.01						
24	*Lumbrineris meteorana*																														
25	*Lumbrineris nagae*	1	0.06									1	0.06									1	0.09								
26	*Malacoceros indicus*																							1	0.01						
27	Maldanidae																					1	0.01								
28	*Mediomastus californiensis*									1	0.01									2	0.03										
29	*Nectoneanthes multignatha*																														
30	*Nephtys polybranchia*			1	0.01									1	0.01			1	0.01	1	0.01	1	0.01			1	0.01				
31	*Notomastus latericeus*																					1	0.01			2	0.04				
32	*Ophelina grandis*																									1	0.17				
33	*Paraprionospio pinnata*											1	0.02					1	0.01												
34	*Pilargis* sp.															1	0.07														
35	*Poecilochaetus serpens*																			1	0.03							1	0.02		
36	*Prionospio malmgreni*									1	0.01																				
37	*Sigambra hanaokai*																														
38	*Sthenolepis japonica*							2	0.02																						
39	*Terebellides stroemi*																					1	0.01					1	0.12		
40	*Tharyx marioni*																														
	MOLLUSCA																														
	Bivalvia																														
41	*Anadara granosa*																														
42	*Corbula* sp.																														
43	*Donax* sp.							1	6					2	2.32	1	2.83							1	2.06						
44	*Dosinia* sp.																														
45	*Gafrarium* sp.																	1	1												
46	*Gari hosoyai*																														
47	*Nuculana* sp.																	1	0.11												

		1A		1B		1C		1D		1E		2A		2B		2C		2D		2E		3A		3B		3C		3D		3E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
48	*Paphia undulata*					2	0.44					2	2.77	2	11.6	5	11	6	10	1	0.31			3	6					1	2.26
49	*Placamen* sp.																														
50	*Sinonovacula constricta*																														
51	*Solen* sp.									1	0.12																			1	0.3
52	*Yoldia* sp.																														
	Gastropoda																														
	Columbellidae																														
53	*Alia* sp.																														
54	*Nassarius* sp.1							1	0.2																						
55	*Nassarius* sp.2																														
	Terridae																														
56	*Territella bacillum*					1	0.07	2	12					1	0.08																
	ARTHROPODA																														
	Crustacea																														
	Amphipoda																														
57	*Ampelisca* sp.									1	0.01																				
58	*Gammarus* sp.																														
59	Photidae	1	0.01	1	0.01			1	0.02													1	0.01								
60	Pleustidae																														
	Decapoda																														
61	*Alpheus* sp.							3	0.28	1	0.1																				
62	*Callianassa* sp.																														
63	*Charybdis affinis*									2	0.2	1	1.4																		
64	Hippolytidae																														
65	*Macrophthalmus latreillei?*																									1	0.62				
66	Mantis shrimp																														
67	*Metapenaeus* sp.																	1	1.7												
68	*Neoxenophthalmus obscurus*	1	0.2							1	0.12	2	0.9	1	0.08											2	0.19	2	0.2	1	0.25
69	*Polyonyx* sp.																														

		1A		1B		1C		1D		1E		2A		2B		2C		2D		2E		3A		3B		3C		3D		3E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
70	*Portunus* sp.																														
71	*Upogebia* sp.							1	0.03	3	0.22																				
72	*Typhlocarcinus nudus*					1	1.3			2	0.19																				
73	*Philyra olivacea*													1	0.31																
	PHORONIDA																														
74	*Phoronis australis*													1	0.02																
	ECHINODERMATA																														
	Holothuroidea																														
75	*Acaudina molpadioides*																														
76	*Protankyra bidentata*																														
	Ophiuroidea																														
77	Amphiuridae	2	0.26					1	0.07	1	0.03					1	0.01			2	0.16	1	0.04								
	Vertebrata																														
	Osteichthyes																														
78	*Odontamblyopus rubicundus*															1	3.1											1	0.07		
79	Gobiidae fish																														
80	Osteichthian (Fish)							1	0.15																						
	Replicates	6	0.66	4	0.21	9	2.03	19	18.9	22	1.2	8	5.17	10	14.5	12	17.1	12	12.8	7	0.54	7	0.18	6	8.08	7	1.03	6	0.44	4	2.91
	Stations									60	23									49	50.1									30	12.6
		348	180																												

		4A		4B		4C		4D		4E		5A		5B		5C		5D		5E		6A		6B		6C		6D		6E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
	COELENTERATA																														
	Actiniaria																														
1	Actinian																							1	0.02						
2	*Virgularia* sp.																														
	NEMERTEA																														
3	Nemertean																														

		4A		4B		4C		4D		4E		5A		5B		5C		5D		5E		6A		6B		6C		6D		6E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
	ANNELIDA																														
	Polychaeta																														
4	*Aglaophamus dibranchis*																									1	0.02				
5	*Asychis* sp.																														
6	*Australaugeneria* sp.																														
7	*Bhawania goodei*																														
8	*Chloeia parva*																														
9	*Ceratonereis* sp.																														
10	*Cossurella dimorpha*																														
11	*Diopatra variabilis*	1	1.99	1	0.59																										
12	*Eteone longa*																														
13	*Eunice indica*																														
14	*Glycera convoluta*																														
15	*Glycera rouxi*																														
16	*Harmothoe imbricata*																														
17	*Heteromastus filiformis*																														
18	*Laonice cirrata*															1	0.01													1	0.01
19	*Leocrates chinensis*																														
20	*Lepidasthenia microlepis*																														
21	*Linopherus hirsuta*															1	0.01									1	0.03				
22	*Loimia medusa*							2	0.11															1	0.78						
23	*Lumbrineris latreilli*																									1	0.02	1	0.01		
24	*Lumbrineris meteorana*																														
25	*Lumbrineris nagae*																							1	0.06	2	0.28	1	0.08		
26	*Malacoceros indicus*																														
27	Maldanidae																														
28	*Mediomastus californiensis*							1	0.01			2	0.01																		
29	*Nectoneanthes multignatha*																														
30	*Nephtys polybranchia*					1	0.02	1	0.01					1	0.01							1	0.01	1	0.04	1	0.01			1	0.01

		4A		4B		4C		4D		4E		5A		5B		5C		5D		5E		6A		6B		6C		6D		6E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
31	*Notomastus latericeus*											1	0.01																		
32	*Ophelina grandis*			1	0.12																	1	0.01								
33	*Paraprionospio pinnata*																					2	0.02			1	0.01				
34	*Pilargis* sp.																														
35	*Poecilochaetus serpens*													1	0.01																
36	*Prionospio malmgreni*																														
37	*Sigambra hanaokai*																														
38	*Sthenolepis japonica*																														
39	*Terebellides stroemi*																														
40	*Tharyx marioni*																														
	MOLLUSCA																														
	Bivalvia																														
41	*Anadara granosa*																									1	0.17				
42	*Corbula* sp.																														
43	*Donax* sp.			1	3.62									2	4.29																
44	*Dosinia* sp.																														
45	*Gafrarium* sp.																														
46	*Gari hosoyai*																														
47	*Nuculana* sp.																														
48	*Paphia undulata*	1	0.03					1	0.54					2	4.48	2	0.96			1	3.09										
49	*Placamen* sp.																														
50	*Sinonovacula constricta*																														
51	*Solen* sp.											1	0.37	1	0.41									1	0.21						
52	*Yoldia* sp.																									1	0.11				
	Gastropoda																														
	Columbellidae																														
53	*Alia* sp.																														
54	*Nassarius* sp.1																														
55	*Nassarius* sp.2																														
	Terridae																														

		4A		4B		4C		4D		4E		5A		5B		5C		5D		5E		6A		6B		6C		6D		6E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
56	*Territella bacillum*			1	0.13	2	0.58	1	0.12							1	0.5			1	0.05										
	ARTHROPODA																														
	Crustacea																														
	Amphipoda																														
57	*Ampelisca* sp.																														
58	*Gammarus* sp.																														
59	Photidae																									1	0.01	1	0.01		
60	Pleustidae											1	0.01											6	0.02	1	0.01				
	Decapoda																														
61	*Alpheus* sp.																													1	0.01
62	*Callianassa* sp.																														
63	*Charybdis affinis*																														
64	Hippolytidae					1	0.12																								
65	*Macrophthalmus latreillei?*																														
66	Mantis shrimp																														
67	*Metapenaeus* sp.					1	0.26	1	0.13																						
68	*Neoxenophthalmus obscurus*			2	0.17					1	0.17							1	0.15					1	0.06						
69	*Polyonyx* sp.													1	0.7																
70	*Portunus* sp.																														
71	*Upogebia* sp.			1	0.03																										
72	*Typhlocarcinus nudus*			5	1.83	2	0.43	1	0.6									1	0.26			1	0.23					2	1.23	1	0.7
73	*Philyra olivacea*																														
	PHORONIDA																														
74	*Phoronis australis*			1	0.03																										
	ECHINODERMATA																														
	Holothuroidea																														
75	*Acaudina molpadioides*																														
76	*Protankyra bidentata*			1	5.45																										
	Ophiuroidea																														

		4A		4B		4C		4D		4E		5A		5B		5C		5D		5E		6A		6B		6C		6D		6E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
77	Amphiuridae											1	0.03																		
	Vertebrata																														
	Osteichthyes																														
78	*Odontamblyopus rubicundus*	1	4																											2	0.22
79	Gobiidae fish			1	2.6																										
80	Osteichthian (Fish)																														
	Replicates	3	6.02	15	14.6	7	1.41	8	1.52	1	0.17	6	0.43	8	9.9	5	1.48	2	0.41	2	3.14	5	0.27	12	1.19	11	0.67	5	1.33	6	0.95
	Stations									34	23.7									23	15.4									39	4.41

		7A		7B		7C		7D		7E		8A		8B		8C		8D		8E		9A		9B		9C		9D		9E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
	COELENTERATA																														
	Actiniaria																														
1	Actinian																														
2	*Virgularia* sp.																									1	0.02				
	NEMERTEA																														
3	Nemertean	1	0.02											1	0.02																
	ANNELIDA																														
	Polychaeta																														
4	*Aglaophamus dibranchis*																														
5	*Asychis* sp.																														
6	*Australaugeneria* sp.																														
7	*Bhawania goodei*			1	0.01																										
8	*Chloeia parva*																														
9	*Ceratonereis* sp.																											1	0.01		
10	*Cossurella dimorpha*																														
11	*Diopatra variabilis*											1	0.02																	1	0.09
12	*Eteone longa*																														

		7A		7B		7C		7D		7E		8A		8B		8C		8D		8E		9A		9B		9C		9D		9E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
13	*Eunice indica*											1	0.01															2	0.03		
14	*Glycera convoluta*											1	0.01																	1	0.08
15	*Glycera rouxi*													1	0.02																
16	*Harmothoe imbricata*																														
17	*Heteromastus filiformis*											2	0.01																		
18	*Laonice cirrata*									1	0.16			1	0.01																
19	*Leocrates chinensis*											1	0.01							1	0.04										
20	*Lepidasthenia microlepis*																														
21	*Linopherus hirsuta*																														
22	*Loimia medusa*			1	0.17							4	0.04													1	0.19				
23	*Lumbrineris latreilli*					1	0.01																								
24	*Lumbrineris meteorana*																														
25	*Lumbrineris nagae*					1	0.05			1	0.03																				
26	*Malacoceros indicus*																														
27	Maldanidae																														
28	*Mediomastus californiensis*																														
29	*Nectoneanthes multignatha*																														
30	*Nephtys polybranchia*					1	0.02	1	0.01			1	0.01	1	0.01	1	0.01			1	0.01									1	0.01
31	*Notomastus latericeus*																														
32	*Ophelina grandis*											1	0.02																		
33	*Paraprionospio pinnata*																			1	0.01										
34	*Pilargis* sp.																														
35	*Poecilochaetus serpens*													1	0.01																
36	*Prionospio malmgreni*																	1	0.01							1	0.01				
37	*Sigambra hanaokai*																														
38	*Sthenolepis japonica*																														
39	*Terebellides stroemi*																														
40	*Tharyx marioni*																	1	0.01												
	MOLLUSCA																														

		7A		7B		7C		7D		7E		8A		8B		8C		8D		8E		9A		9B		9C		9D		9E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
	Bivalvia																														
41	*Anadara granosa*							1	0.35																						
42	*Corbula* sp.																							1	0.04						
43	*Donax* sp.									1	1.47																				
44	*Dosinia* sp.																														
45	*Gafrarium* sp.																														
46	*Gari hosoyai*											1	0.11																		
47	*Nuculana* sp.																														
48	*Paphia undulata*																														
49	*Placamen* sp.											1	0.02																		
50	*Sinonovacula constricta*																														
51	*Solen* sp.	1	0.07							1	0.14																				
52	*Yoldia* sp.																														
	Gastropoda																														
	Columbellidae																														
53	*Alia* sp.					1	0.05																								
54	*Nassarius* sp.1																														
55	*Nassarius* sp.2																														
	Terridae																														
56	*Territella bacillum*			1	1.16									1	0.07	1	0.13					1	31								
	ARTHROPODA																														
	Crustacea																														
	Amphipoda																														
57	*Ampelisca* sp.			1	0.01									1	0.01			3	0.01							1	0.01				
58	*Gammarus* sp.											1	0.01																		
59	Photidae									1	0.01							1	0.01												
60	Pleustidae					6	0.01					2	0.02	1	0.01			2	0.01												
	Decapoda																														
61	*Alpheus* sp.											9	0.24													4	0.27	1	0.01	1	0.02
62	*Callianassa* sp.																							1	0.01						

		7A		7B		7C		7D		7E		8A		8B		8C		8D		8E		9A		9B		9C		9D		9E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
63	*Charybdis affinis*			1	0.47																										
64	Hippolytidae																														
65	*Macrophthalmus latreillei?*											1	6.5	1	0.06																
66	Mantis shrimp																														
67	*Metapenaeus* sp.																														
68	*Neoxenophthalmus obscurus*													1	0.07							1	0.11								
69	*Polyonyx* sp.																														
70	*Portunus* sp.																									1	0.44				
71	*Upogebia* sp.													1	0.03																
72	*Typhlocarcinus nudus*	2	0.62											1	0.06											1	0.5				
73	*Philyra olivacea*																					1	0.18								
	PHORONIDA																														
74	*Phoronis australis*													1	0.01	1	0.03			2	0.02			1	0.02						
	ECHINODERMATA																														
	Holothuroidea																														
75	*Acaudina molpadioides*																														
76	*Protankyra bidentata*			1	0.48																										
	Ophiuroidea																														
77	Amphiuridae			1	0.05					1	0.05											1	0.02					1	0.02		
	Vertebrata																														
	Osteichthyes																														
78	*Odontamblyopus rubicundus*																	1	4.2												
79	Gobiidae fish																														
80	Osteichthian (Fish)											1	0.06																		
	Replicates	4	0.71	7	2.35	10	0.14	2	0.36	6	1.86	28	7.09	13	0.39	3	0.17	9	4.25	5	0.08	4	31.3	3	0.07	10	1.43	5	0.07	4	0.2
	Stations									29	5.42									58	12									26	33.1

Results of Wet Season Benthic Grab Survey

		W1A		W1B		W1C		W1D		W1E		W2A		W2B		W2C		W2D		W2E		W3A		W3B		W3C		W3D		W3E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
	COELENTERATA																														
	Actiniaria																														
1	Actinian																														
2	*Virgularia* sp.																													1	0.08
	NEMERTEA																														
3	Nemertean	1	0.01									1	0.02													1	0.01	1	0.02		
	ANNELIDA																														
	Polychaeta																														
4	*Aglaophamus dibranchis*	2	0.03							1	0.01											1	0.02								
5	*Asychis* sp.																									1	0.01	1	0.01		
6	*Australaugeneria* sp.																														
7	*Bhawania goodei*																														
8	*Chloeia parva*																			1	0.14										
9	*Ceratonereis* sp.																														
10	*Cossurella dimorpha*	1	0.01																												
11	*Diopatra variabilis*																			1	0.05										
12	*Eteone longa*																														
13	*Eunice indica*																														
14	*Glycera convoluta*																														
15	*Glycera rouxi*																					1	0.03								
16	*Harmothoe imbricata*																														
17	*Heteromastus filiformis*			1	0.01							1	0.01			1	0.01														
18	*Laonice cirrata*																														
19	*Leocrates chinensis*													1	0.02																
20	*Lepidasthenia microlepis*																														
21	*Linopherus hirsuta*							1	0.01	1	0.02																				
22	*Loimia medusa*					1	0.05																			1	0.4				

		W1A		W1B		W1C		W1D		W1E		W2A		W2B		W2C		W2D		W2E		W3A		W3B		W3C		W3D		W3E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
23	*Lumbrineris latreilli*																														
24	*Lumbrineris meteorana*	1	0.01																												
25	*Lumbrineris nagae*															1	0.13														
26	*Malacoceros indicus*																														
27	Maldanidae																														
28	*Mediomastus californiensis*	1	0.01			1	0.01							1	0.01			3	0.02			1	0.01								
29	*Nectoneanthes multignatha*																														
30	*Nephtys polybranchia*																														
31	*Notomastus latericeus*	1	0.01																												
32	*Ophelina grandis*																														
33	*Paraprionospio pinnata*																														
34	*Pilargis* sp.																														
35	*Poecilochaetus serpens*							1	0.01																	1	0.01	1	0.01		
36	*Prionospio malmgreni*																														
37	*Sigambra hanaokai*															1	0.01														
38	*Sthenolepis japonica*																														
39	*Terebellides stroemi*																														
40	*Tharyx marioni*																														
	MOLLUSCA																														
	Bivalvia																														
41	*Anadara granosa*																														
42	*Corbula* sp.																														
43	*Donax* sp.	1	4	2	18	1	0.02											2	0.52	1	0.53							1	0.38		
44	*Dosinia* sp.																														
45	*Gafrarium* sp.																														
46	*Gari hosoyai*																														
47	*Nuculana* sp.																														
48	*Paphia undulata*	4	9	1	6	1	6.81			3	19									1	0.72	2	2.21								
49	*Placamen* sp.																														

		W1A		W1B		W1C		W1D		W1E		W2A		W2B		W2C		W2D		W2E		W3A		W3B		W3C		W3D		W3E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
50	*Sinonovacula constricta*																														
51	*Solen* sp.			1	0.05									1	0.04							1	0.08					2	0.1		
52	*Yoldia* sp.																														
	Gastropoda																														
	Columbellidae																														
53	*Alia* sp.																														
54	*Nassarius* sp.1																														
55	*Nassarius* sp.2																							1	0.1						
	Terridae																														
56	*Territella bacillum*																														
	ARTHROPODA																														
	Crustacea																														
	Amphipoda																														
57	*Ampelisca* sp.																														
58	*Gammarus* sp.																														
59	Photidae																														
60	Pleustidae											2	0.02					2	0.01												
	Decapoda																														
61	*Alpheus* sp.																					2	0.14								
62	*Callianassa* sp.															1	0.02														
63	*Charybdis affinis*																														
64	Hippolytidae																														
65	*Macrophthalmus latreillei?*											1	0.03																		
66	Mantis shrimp																														
67	*Metapenaeus* sp.																														
68	*Neoxenophthalmus obscurus*							1	0.08					2	0.12											1	0.17				
69	*Polyonyx* sp.													1	0.03																
70	*Portunus* sp.																														
71	*Upogebia* sp.																														

		W1A		W1B		W1C		W1D		W1E		W2A		W2B		W2C		W2D		W2E		W3A		W3B		W3C		W3D		W3E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
72	*Typhlocarcinus nudus*																			1	0.17	1	0.39								
73	*Philyra olivacea*																														
	PHORONIDA																														
74	*Phoronis australis*													1	0.15									1	0.02						
	ECHINODERMATA																														
	Holothuroidea																														
75	*Acaudina molpadioides*															1	0.16														
76	*Protankyra bidentata*																														
	Ophiuroidea																														
77	Amphiuridae									1	0.01							1	0.05												
	Vertebrata																														
	Osteichthyes																														
78	*Odontamblyopus rubicundus*																														
79	Gobiidae fish																														
80	Osteichthian (Fish)																														
	Replicates	12	13.1	5	24.1	4	6.89	3	0.1	6	19	5	0.08	7	0.37	5	0.33	8	0.6	5	1.61	9	2.89	2	0.12	5	0.6	6	0.52	1	0.08
	Stations									30	63.2									30	2.99									23	4.2
		210	264																												

		W4A		W4B		W4C		W4D		W4E		W5A		W5B		W5C		W5D		W5E		W6A		W6B		W6C		W6D		W6E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
	COELENTERATA																														
	Actiniaria																														
1	Actinian																														
2	*Virgularia* sp.																														
	NEMERTEA																														
3	Nemertean			1	0.01	1	0.45																								
	ANNELIDA																														
	Polychaeta																														
4	*Aglaophamus dibranchis*	1	0.01	1	0.01	1	0.02	1	0.01	2	0.02	2	0.02											1	0.01						
5	*Asychis* sp.																														
6	*Australaugeneria* sp.																														
7	*Bhawania goodei*																														
8	*Chloeia parva*									1	0.9																				
9	*Ceratonereis* sp.																														
10	*Cossurella dimorpha*																														
11	*Diopatra variabilis*																														
12	*Eteone longa*																														
13	*Eunice indica*																														
14	*Glycera convoluta*																														
15	*Glycera rouxi*																														
16	*Harmothoe imbricata*																														
17	*Heteromastus filiformis*					1	0.01																								
18	*Laonice cirrata*																					1	0.01								
19	*Leocrates chinensis*																														
20	*Lepidasthenia microlepis*																									1	0.06				
21	*Linopherus hirsuta*																														
22	*Loimia medusa*											1	0.17																		
23	*Lumbrineris latreilli*											1	0.01																		

		W4A		W4B		W4C		W4D		W4E		W5A		W5B		W5C		W5D		W5E		W6A		W6B		W6C		W6D		W6E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
24	*Lumbrineris meteorana*													1	0.01																
25	*Lumbrineris nagae*																														
26	*Malacoceros indicus*																														
27	Maldanidae																														
28	*Mediomastus californiensis*							1	0.01																						
29	*Nectoneanthes multignatha*																														
30	*Nephtys polybranchia*																														
31	*Notomastus latericeus*																														
32	*Ophelina grandis*																			1	0.02										
33	*Paraprionospio pinnata*																														
34	*Pilargis* sp.																														
35	*Poecilochaetus serpens*																														
36	*Prionospio malmgreni*																														
37	*Sigambra hanaokai*																														
38	*Sthenolepis japonica*																														
39	*Terebellides stroemi*																														
40	*Tharyx marioni*																														
	MOLLUSCA																														
	Bivalvia																														
41	*Anadara granosa*																					1	0.11								
42	*Corbula* sp.																														
43	*Donax* sp.									1	0.4											2	0.35	1	0.25						
44	*Dosinia* sp.																														
45	*Gafrarium* sp.																														
46	*Gari hosoyai*																														
47	*Nuculana* sp.																														
48	*Paphia undulata*	3	21	1	5	5	31	2	11	1	5.5											1	0.38	2	0.52	1	0.22				
49	*Placamen* sp.																														
50	*Sinonovacula constricta*																														

		W4A		W4B		W4C		W4D		W4E		W5A		W5B		W5C		W5D		W5E		W6A		W6B		W6C		W6D		W6E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
51	*Solen* sp.													1	0.45							1	0.04	1	0.03						
52	*Yoldia* sp.																														
	Gastropoda																														
	Columbellidae																														
53	*Alia* sp.																														
54	*Nassarius* sp.1							1	0.2																						
55	*Nassarius* sp.2																														
	Terridae																														
56	*Territella bacillum*																														
	ARTHROPODA																														
	Crustacea																														
	Amphipoda																														
57	*Ampelisca* sp.																														
58	*Gammarus* sp.																														
59	Photidae																														
60	Pleustidae																														
	Decapoda																														
61	*Alpheus* sp.																					1	0.03								
62	*Callianassa* sp.																														
63	*Charybdis affinis*																											1	0.6		
64	Hippolytidae																														
65	*Macrophthalmus latreillei?*			1	10																										
66	Mantis shrimp											1	4.5																		
67	*Metapenaeus* sp.																														
68	*Neoxenophthalmus obscurus*																													2	0.33
69	*Polyonyx* sp.																														
70	*Portunus* sp.																														
71	*Upogebia* sp.																														
72	*Typhlocarcinus nudus*													1	0.27			1	0.4			1	0.03	1	0.09	2	0.28			1	0.09

		W4A		W4B		W4C		W4D		W4E		W5A		W5B		W5C		W5D		W5E		W6A		W6B		W6C		W6D		W6E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
73	*Philyra olivacea*																													1	0.29
	PHORONIDA																														
74	*Phoronis australis*													1	0.05																
	ECHINODERMATA																														
	Holothuroidea																														
75	*Acaudina molpadioides*																														
76	*Protankyra bidentata*																			1	0.54					2	0.21				
	Ophiuroidea																														
77	Amphiuridae																			1	0.05									2	0.12
	Vertebrata																														
	Osteichthyes																														
78	*Odontamblyopus rubicundus*					1	5							2	3.09							1	0.02								
79	Gobiidae fish																														
80	Osteichthian (Fish)													1	0.01																
	Replicates	4	21	4	15	9	36.5	5	11.2	5	6.82	5	4.7	7	3.88	0	0	1	0.4	3	0.61	9	0.97	6	0.9	6	0.77	1	0.6	6	0.84
	Stations									27	90.5									16	9.59									28	4.08

		W7A		W7B		W7C		W7D		W7E		W8A		W8B		W8C		W8D		W8E		W9A		W9B		W9C		W9D		W9E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
	COELENTERATA																														
	Actiniaria																														
1	Actinian																														
2	*Virgularia* sp.																														
	NEMERTEA																														
3	Nemertean									1	0.03																			1	0.03
	ANNELIDA																														
	Polychaeta																														
4	*Aglaophamus dibranchis*	2	0.02	1	0.03																										

		W7A		W7B		W7C		W7D		W7E		W8A		W8B		W8C		W8D		W8E		W9A		W9B		W9C		W9D		W9E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
5	*Asychis* sp.																														
6	*Australaugeneria* sp.	1	0.01																												
7	*Bhawania goodei*																														
8	*Chloeia parva*																														
9	*Ceratonereis* sp.																														
10	*Cossurella dimorpha*																														
11	*Diopatra variabilis*																														
12	*Eteone longa*																														
13	*Eunice indica*																														
14	*Glycera convoluta*																														
15	*Glycera rouxi*																														
16	*Harmothoe imbricata*																														
17	*Heteromastus filiformis*							1	0.01																						
18	*Laonice cirrata*																														
19	*Leocrates chinensis*																														
20	*Lepidasthenia microlepis*																														
21	*Linopherus hirsuta*																														
22	*Loimia medusa*					1	0.08																								
23	*Lumbrineris latreilli*																														
24	*Lumbrineris meteorana*							1	0.01			1	0.01											1	0.02						
25	*Lumbrineris nagae*							1	0.21			1	0.02																		
26	*Malacoceros indicus*																														
27	Maldanidae																														
28	*Mediomastus californiensis*	1	0.01			4	0.04	1	0.01							1	0.01														
29	*Nectoneanthes multignatha*																														
30	*Nephtys polybranchia*																														
31	*Notomastus latericeus*															1	0.03														
32	*Ophelina grandis*																													1	0.3
33	*Paraprionospio pinnata*																														

		W7A		W7B		W7C		W7D		W7E		W8A		W8B		W8C		W8D		W8E		W9A		W9B		W9C		W9D		W9E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
34	*Pilargis* sp.																														
35	*Poecilochaetus serpens*																														
36	*Prionospio malmgreni*																														
37	*Sigambra hanaokai*																														
38	*Sthenolepis japonica*																														
39	*Terebellides stroemi*																														
40	*Tharyx marioni*																														
	MOLLUSCA																														
	Bivalvia																														
41	*Anadara granosa*																					1	8								
42	*Corbula* sp.																														
43	*Donax* sp.																														
44	*Dosinia* sp.	1	1.07																												
45	*Gafrarium* sp.																														
46	*Gari hosoyai*																														
47	*Nuculana* sp.																														
48	*Paphia undulata*	2	15			4	11																								
49	*Placamen* sp.																														
50	*Sinonovacula constricta*																									1	0.36				
51	*Solen* sp.																									1	0.11	1	0.08		
52	*Yoldia* sp.																														
	Gastropoda																														
	Columbellidae																														
53	*Alia* sp.																														
54	*Nassarius* sp.1																														
55	*Nassarius* sp.2																														
	Terridae																														
56	*Territella bacillum*	1	6.5			1	4.46							1	1.77	1	1.7	1	2.94									1	3.1		
	ARTHROPODA																														
	Crustacea																														

		W7A		W7B		W7C		W7D		W7E		W8A		W8B		W8C		W8D		W8E		W9A		W9B		W9C		W9D		W9E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
	Amphipoda																														
57	*Ampelisca* sp.																														
58	*Gammarus* sp.																														
59	Photidae																														
60	Pleustidae									1	0.01																				
	Decapoda																														
61	*Alpheus* sp.																			3	1.6										
62	*Callianassa* sp.																														
63	*Charybdis affinis*																			1	22										
64	Hippolytidae																														
65	*Macrophthalmus latreillei?*																														
66	Mantis shrimp																														
67	*Metapenaeus* sp.																														
68	*Neoxenophthalmus obscurus*	1	0.03																							1	0.1				
69	*Polyonyx* sp.																														
70	*Portunus* sp.																														
71	*Upogebia* sp.																														
72	*Typhlocarcinus nudus*					1	1.5							1	0.46					1	0.7			1	0.4	1	0.32				
73	*Philyra olivacea*																														
	PHORONIDA																														
74	*Phoronis australis*																														
	ECHINODERMATA																														
	Holothuroidea																														
75	*Acaudina molpadioides*					1	0.6																								
76	*Protankyra bidentata*																													1	0.59
	Ophiuroidea																														
77	Amphiuridae																														
	Vertebrata																														
	Osteichthyes																														

		W7A		W7B		W7C		W7D		W7E		W8A		W8B		W8C		W8D		W8E		W9A		W9B		W9C		W9D		W9E	
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
78	*Odontamblyopus rubicundus*																	1	1.9												
79	Gobiidae fish	1	2.5																												
80	Osteichthian (Fish)																									1	0.01				
	Replicates	10	25.1	1	0.03	12	17.7	4	0.24	2	0.04	2	0.03	2	2.24	3	1.74	2	4.84	5	24.3	1	8	2	0.42	5	0.9	2	3.18	3	0.92
	Stations									29	43.1									14	33.1									13	13.4

Figure 1 Sampling locations at and near the HKBCF for the Marine Ecological Study

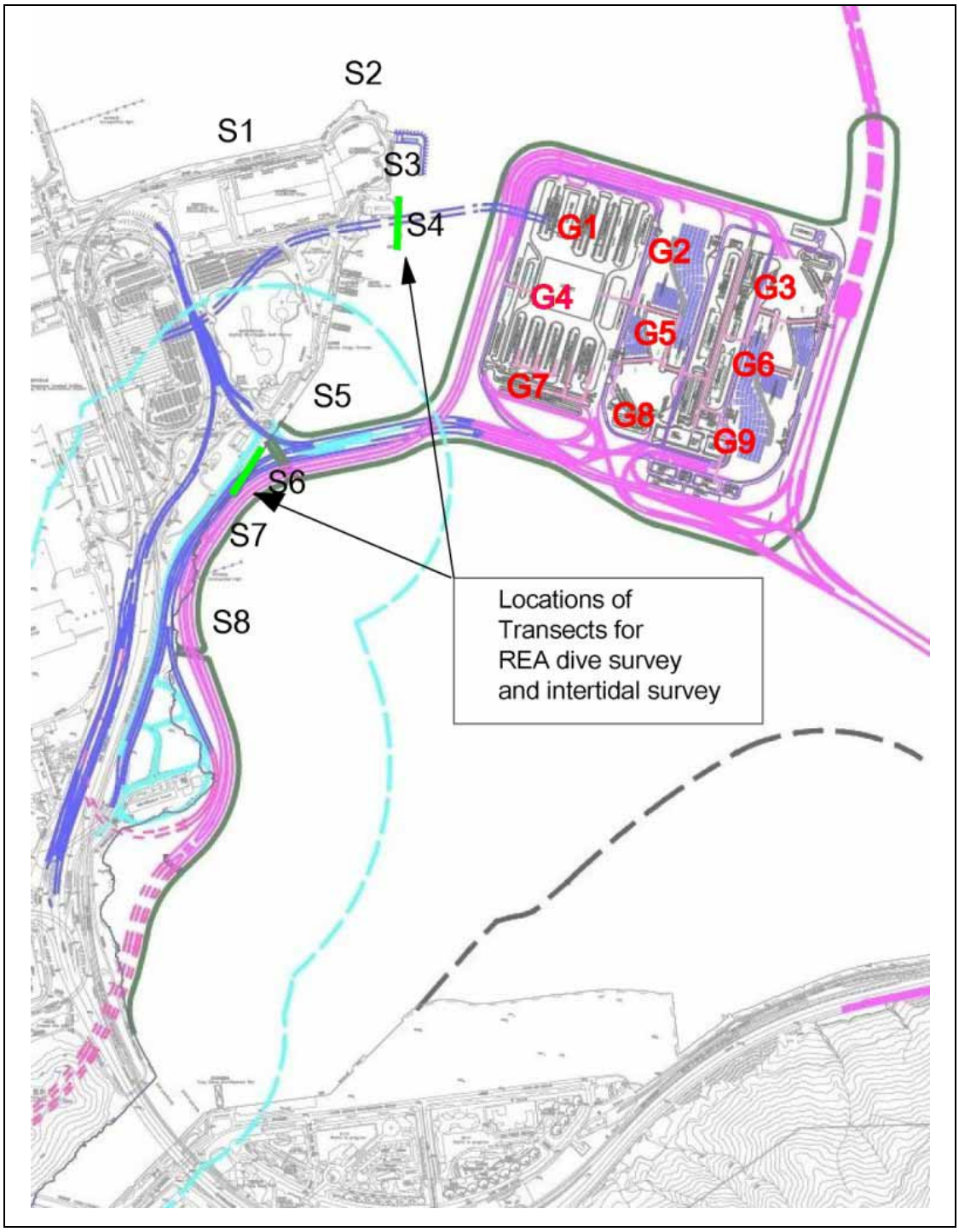

Figure 2 ABC plot for the wet season benthic survey in G1 to G9 stations

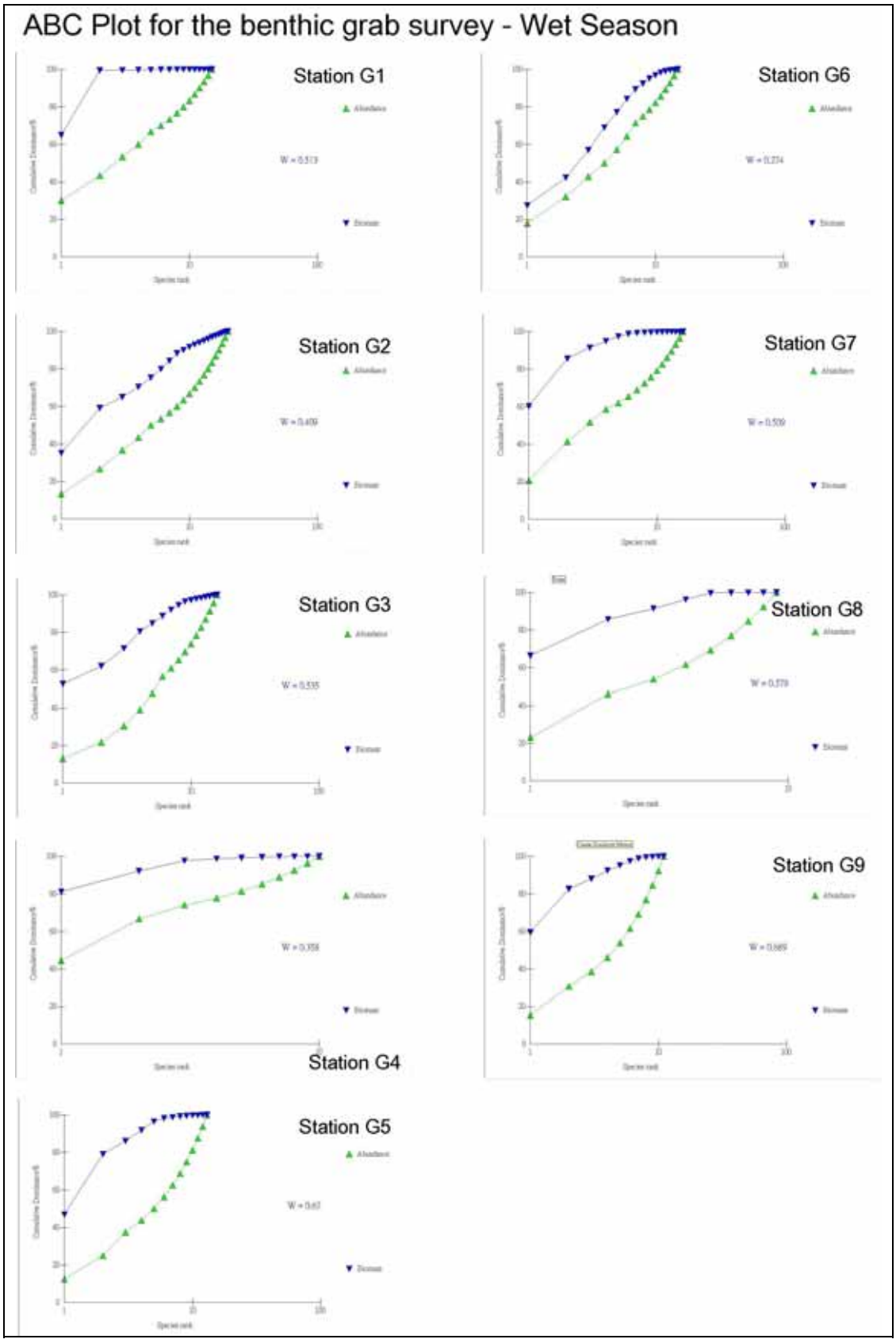

Figure 3 ABC plot for the dry season benthic survey in G1 to G9 stations

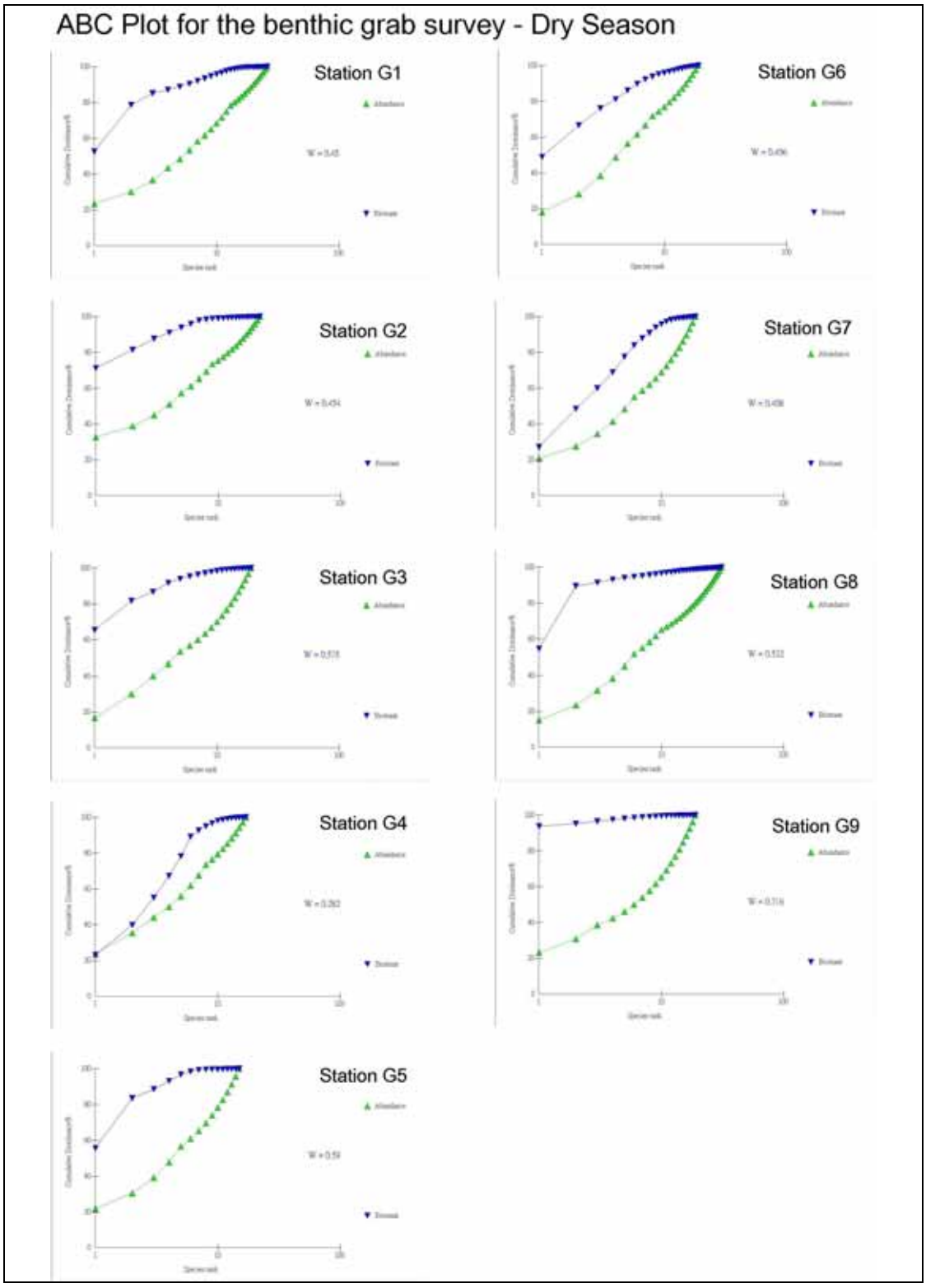

Figure 4 Seabed profile in G1 to G9 stations as shown on sonic device

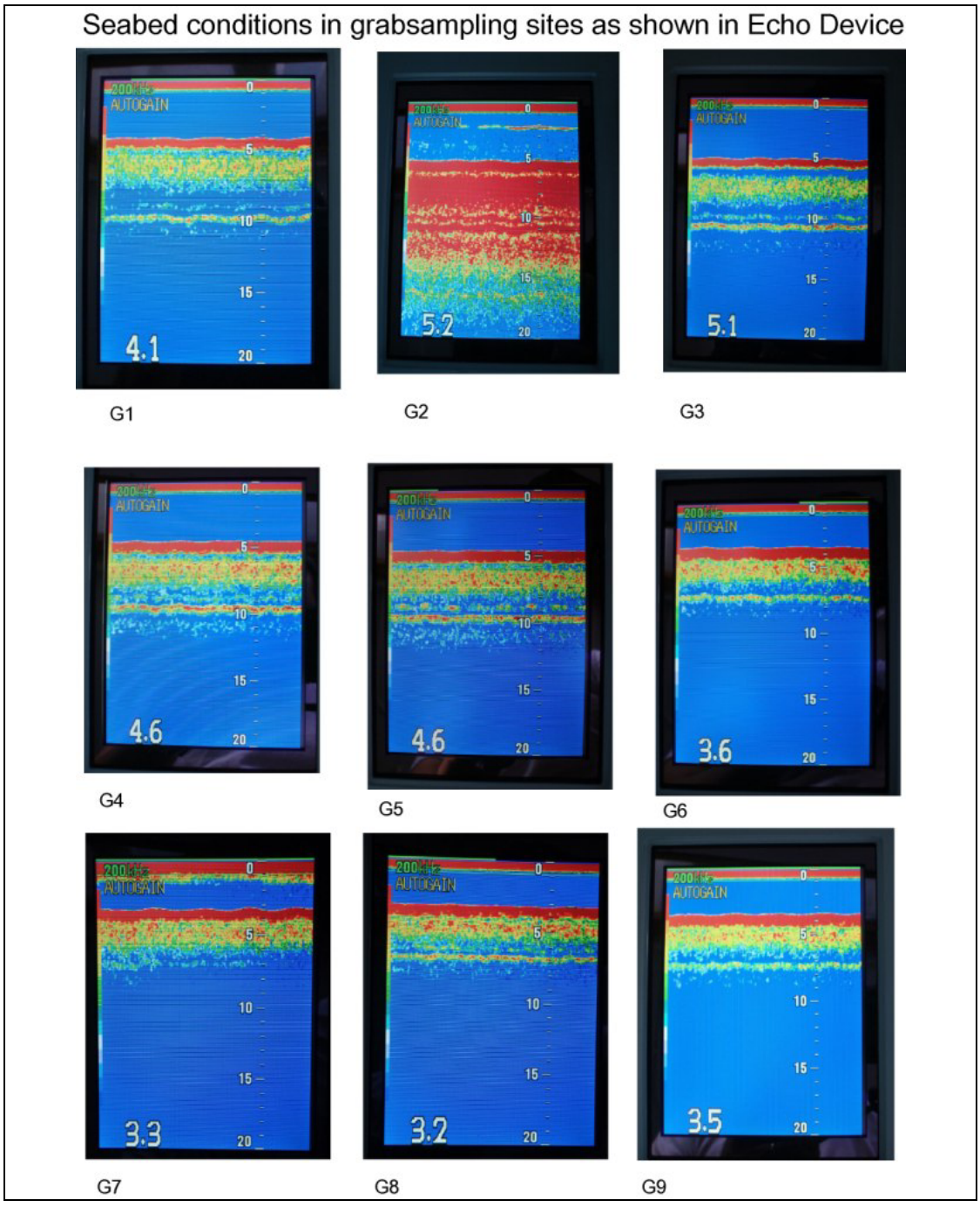

Figure 5 Photos of dive survey