

# Appendix 13.5 Marine Ecology Field Survey Result Excluding CWD

# 1. Baseline Conditions of Subtidal Shore and Coral Communities

The marine waters in the North Western Water Control Zone support both subtidal hard and soft bottom assemblages. The locations with coral communities of conservation importance recorded are shown in the habitat maps **Drawing No. MCL/P132/EIA/13-014** to **Drawing No. MCL/P132/EIA/13-020**.

## 1.1 Subtidal Hard Bottom Assemblages

Spot dive surveys and rapid ecological assessments (REAs) at 16 coral survey points for hard bottom coral were undertaken between August 2012 and September 2013. Dates for the hard-bottom and soft-bottom coral spot-check dive surveys and REAs are given in Table 1.1.

Table 1-1: Dates for coral-check dive surveys and REAs (hard-bottom and soft-bottom)

Hard-bottom		Soft-bottom	
Location	Date	Location	Date
D1	9 Aug 2012	C1	10 May 2013
D2	9 Aug 2012	C2	14 May 2013
D3	9 Aug 2012	C3	14 May 2013
D4	9 Aug 2012	C4	9 May 2013
D5	9 Aug 2012	C5	9 May 2013
D6	9 Aug 2012	C6	24 May 2013
D7	9 Aug 2012	C7	24 May 2013
D8	9 Aug 2012	C8	10 May 2013
D9	2 Sept 2013	C9	10 May 2013
D10	31 Jul 2013	C10	10 May 2013
D11	31 Jul 2013	C11	24 May 2013
D12	4 Aug 2013	C12	10 May 2013
D13	4 Aug 2013	C13	14 May 2013
D14	31 Jul 2013	C14	14 May 2013
D15	11 Sept 2013	C15	21 May 2013
D16	2 Sept 2013	C16	21 May 2013
-		C17	9 May 2013
-		C18	9 May 2013
-		C19	21 May 2013
-		SC2	21 May 2013
-		SC10	15 May 2013
-		SC12	10 May 2013

Detailed findings of the hard bottom coral dive surveys are provided in **Annex A1**.

Survey results indicated that only isolated colonies of ahermatypic cup coral *Balanophyllia* sp. and gorgonian *Guaiaogorgia* sp. were recorded. These species were also recorded in the east and west of the Chek Lap Kok Channel under the HKZMB – HKLR project. *Guaiaogorgia* sp. recorded in the western Hong Kong waters are less common in the eastern and southern waters of Hong Kong, and this species appears to be accustomed to the turbid and hyposaline conditions in western waters (ERM, 2012).

## Project Footprint

Within the proposed land formation footprint (D2 to D7), no hermatypic hard corals were found (**Drawing No. MCL/P132/EIA/13-014**). *Guaiaigorgia* sp. was recorded at all survey sites along the airport island but at a low coverage (less than 1%). This gorgonian is very common in Hong Kong western waters and not considered of conservation importance. Furthermore, partial mortality was observed on many colonies of the gorgonian, demonstrating the poor conditions of the gorgonians.

Other epifauna found on the boulders were mainly sessile bivalves including green mussel *Perna viridis*, rock oyster *Saccostrea* sp., and predatory snail *Thais* sp. These fauna are not of conservation importance.

## Adjacent Area along the Airport Island

Around the airport island outside the project footprint, there was no hermatypic hard coral, whilst *Guaiaigorgia* sp. was recorded at the western side (D1) and both *Guaiaigorgia* sp. and *Balanophyllia* sp. were recorded at the northeast corner (D8) (**Drawing No. MCL/P132/EIA/13-014**). Like the gorgonians, the ahermatypic cup coral *Balanophyllia* sp. was also common in the western Hong Kong waters. At all sites the coral percentage cover was low where it occurred (less than 1%).

## Proposed Pipeline Landing Point at Sha Chau and Lung Kwu Chau Marine Park (SCLKCMP)

At the proposed pipeline landing point at Sha Chau (D9), both *Guaiaigorgia* sp. and *Balanophyllia* sp. were recorded with the highest percentage cover (5 – 10%) within the Study Area (**Drawing No. MCL/P132/EIA/13-015**). REA was performed at this site, where it was observed that the seabed consisted mostly of boulder blocks with diameter of more than 50 cm (51 – 75%). Other bed types and materials were bedrock or continuous pavement, boulder blocks of diameter less than 50 cm and sand. Sponges and bryozoans were most common taxa at the site.

## Reference Sites

Both *Guaiaigorgia* sp. and *Balanophyllia* sp. were recorded at all reference sites from Tai O to Yan O and the Brothers (D10, D12 to D15), except for Hau Hok Wan (D11) where no coral was observed (**Drawing No. MCL/P132/EIA/13-016 to Drawing No. MCL/P132/EIA/13-020**). The coral cover was generally low (less than 1%) and was the highest at Yan O (1 - 5%). REA was performed at Yan O (D14), where it was observed that the bottom substrate was mostly bedrock or continuous pavement (51 -75%). Other bottom substrates included boulder blocks (11 – 30 %) and sand (6 – 10%). The most common taxa were sponges and bryozoan, followed by *Guaiaigorgia* sp., the rock oyster *Saccostrea cucullata* and mussel *Perna viridis*. In contrast, *Balanophyllia* sp. was relatively rare at this site.

## 1.2 Subtidal Soft Bottom Assemblages

Spot dive surveys were conducted in May 2013 at 22 coral survey points for soft bottom coral.

The depths of all the surveyed sites ranged between 3.7 m and 13.9 m. Visibility was low, ranging between 0.3 m to 1 m as the bottom substrates are mainly soft mud with occasion small area of rocks.

Occurrence of benthos on the muddy seabed surface is very low. These include crabs and sea urchins. Occurrence of marine benthos attached on rock surface include green mussel, the gorgonian *Echinomuricea* sp. and *Guaiaigorgia* sp. and two ahermatypic cup corals *Balanophyllia* sp. and *Paracyathus rotundatus*.

Since the seabed of the study sites are composed of loose substrate and have low visibility, such sites are not habitat suitable for reef-building corals. Only low abundance of gorgonians occurs.

No coral communities were recorded within the proposed project footprints. Details of the soft bottom coral survey findings are provided in **Annex A2**.

### **Project Footprint (within the HKIAAA)**

Survey stations C3 to C6 are within the proposed land formation footprint (C4 to C6) and proposed submarine cable diversion alignment (C3) where these stations are within the existing Hong Kong International Airport Approach Area 3 (HKIAAA) (Drawing No. MCL/P132/EIA/13-008). The seabed substratum composition is mainly fine silt, mud, gravel and with some broken shells (Plate 3 of **Annex A2**). Only a few numbers of unidentified crabs was recorded at survey station C5.

### **Project Footprint (outside the HKIAAA)**

Survey stations C7 to C13 are within the proposed land formation footprint (C7 to C12) and proposed submarine cable diversion alignment (C13) but outside the HKIAAA (**Drawing No. MCL/P132/EIA/13-008**). The seabed substratum composition is mainly fine silt, mud, gravel and with some broken shells. No obvious surface benthos occurred on the seabed, with only a low percentage coverage of green mussel *Perna viridis* occurred on rock surface at survey station C7, a few number of unidentified crabs at survey station C9 and three sea anemones recorded at survey station C12 (**Plate 5 of Annex A2**).

### **Northern Lantau outside Project Footprint**

Survey stations C14 and C15 are adjacent to the proposed land formation footprint (**Drawing No. MCL/P132/EIA/13-008**). The seabed substratum composition is mainly soft mud. It shares similar characteristics with survey station C13, with no obvious surface benthos occurred on the seabed.

Survey station SC12 is located on the northeastern side of the airport island. The seabed substratum is composed of quarry rock. Few crabs, gastropods and hydroids were recorded (**Plates 18 of Annex A2**).

### **Sha Chau and Lung Kwu Chau Marine Park**

Survey stations C16 and C17 are further north from the proposed land formation footprint and are within the SCLKCMP (**Drawing No. MCL/P132/EIA/13-008**). The seabed substratum composition is mainly soft mud with occasional broken shells. One colony of *Echinomuricea* sp. and several sea urchins (**Plates 6 to 7 of Annex A2**) were recorded at survey station C16 (**Drawing No. MCL/P132/EIA/13-015**). A few unidentified crabs and gastropods were recorded in survey station C17 (**Plate 8 of Annex A2**).

Rock outcrops were found on the seabed at survey stations SC2 and SC10 by geophysical survey conducted in December 2012. The survey stations are located on the southern shore of the island of Sha Chau within the SCLKCMP. Gorgonian *Guaigorgia* sp., ahermatypic cup corals *Paracyathus rotundatus* and *Balanophyllia* sp. of <5% were recorded on the rock outcrops at both stations (**Plates 10 to 17 of Annex A2**) (**Drawing No. MCL/P132/EIA/13-015**). The gorgonian and ahermatypic hard cup corals recorded are common in western waters in Hong Kong, with *Guaigorgia* sp. being localised in North Lantau area. The estimated coral mortality is around 15% - 20%. Green mussel *Perna viridis*, sea urchins and oysters were also recorded in survey station SC2.

### Reference Sites – Tai O and Yan O

Survey stations C1 and C2 at Tai O and C18 and C19 at Yan O, where the stations are further away from the proposed land formation footprint, were selected as reference sites for reviewing the habitat quality for the project footprint (**Drawing No. MCL/P132/EIA/13-008**). The seabed substratum composition at Tai O near-shore soft bottom areas is mainly fine silt and mud with some broken shells. No benthos were recorded on the seabed.

The seabed substratum composition at Yan O near-shore soft bottom areas is mainly soft mud with some broken shells. No benthos were recorded on the seabed except for survey station C19 where low abundance of sea anemone and sea urchins were recorded.

Of the corals recorded in the survey, ahermatypic cup coral *Balanophyllia* sp. and ahermatypic cup coral *Paracyathus rotundatus* are considered as species of conservation importance as they are protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). Octocorals are not included in the impact assessment as they are not protected locally, regionally or internationally, and they are usually common and widespread in Hogn Kong waters.






## 2. Baseline Conditions of Artificial Reefs

A preliminary dive survey was conducted on 11 July 2013 at the artificial reefs (ARs) of the SCLKMP. Initial findings indicated that the waters around the artificial reefs are similar to other areas in the western Hong Kong waters, i.e. being turbid with low visibility of less than 1 m on the day of the site visit. Due to the high turbidity and low visibility, only qualitative records were obtained. Gorgonians were observed at low density on the ARs, with macroinvertebrates (e.g., unidentified crabs) and sessile fauna recorded as attached to the ARs.

The first survey was conducted on 11 July 2013 for the wet season. The underwater visibility was about 0.5 m. The water depth at the AR was approximately 15 m, and the light condition was very low. The lower parts of the AR structures were found partially buried by very fine and soft sediments similar to the surface of surrounding seabed, but the upper parts could still be recognised in particular the vertical walls of the container units, though also covered by a layer of fine sediments. Epifauna of low diversity and typical of the western Hong Kong waters were found on the surface of the upper parts of the AR, including gorgonian *Guaiaorgia* sp., ahermatypic cup coral *Balanophyllia* sp., green mussel *Perna viridis*, and bryozoans. The percentage cover of both gorgonians and ahermatypic cup corals were low (less than 5%), with the gorgonians distributed more evenly while the ahermatypic cup corals more patchy. Sea urchin *Temnopleurus* sp. was also found. Mobile fauna encountered included small-sized shrimps and small-sized fish in large groups, but the species could not be identified due to their swift movement and the low light conditions.

Further to the first survey in the wet season, in which it was found that the physical environment was not suitable for underwater visual count (UVC) survey, a second survey was conducted in the dry season (8 November 2013) to check if there were seasonal changes of the environment. However, the conditions of the AR, the associated fauna found on the AR, as well as the physical environment including the underwater visibility and light conditions, were similar between the wet season and the dry season, which are not suitable for UVC survey. Representative photos taken during the dive survey were shown in **Plate 2-1 to Plate 2-6**.

**Representative Photos taken at the Sha Chau and Lung Kwu Chau Marine Park Artificial Reefs**

	
<p>Plate 2-1 gorgonians <i>Guaiagorgia</i> sp.</p>	<p>Plate 2-2 Ahermatypic cup corals <i>Balanophyllia</i> sp.</p>
	
<p>Plate 2-3 gorgonians <i>Guaiagorgia</i> sp.</p>	<p>Plate 2-4 Sea urchin <i>Temnopleurus</i> sp.</p>
	
<p>Plate 2-5 bryozoans</p>	<p>Plate 2-6 green mussels <i>Perna viridis</i></p>

### 3. Baseline Conditions of Marine Benthic Communities

Benthic grab surveys were conducted between July 2012 and April 2013 during the wet season and November 2013 for the dry season (**Drawing No. MCL/P132/EIA/13-009**). Survey dates are shown in **Table 3-1**. The results were summarised in **Table 3-2**. Raw data of benthic grab surveys and ABC plots are provided in **Annex B**.

Table 3-1: Dates for benthic grab sampling surveys

Location	Dry Season	Wet Season
B1	6 Nov 2013	28 Jul 2012
B2	6 Nov 2013	28 Jul 2012
B3	6 Nov 2013	28 Jul 2012
B4	6 Nov 2013	27 Jul 2012
B5	5 Nov 2013	27 Jul 2012
B6	6 Nov 2013	27 Jul 2012
B7	6 Nov 2013	27 Jul 2012
B8	5 Nov 2013	27 Jul 2012
B9	5 Nov 2013	27 Jul 2012
B10	5 Nov 2013	27 Jul 2012
B11	5 Nov 2013	27 Jul 2012
B12	5 Nov 2013	27 Jul 2012
B13	5 Nov 2013	27 Jul 2012
B14	5 Nov 2013	1 Apr 2013
B15	5 Nov 2013	1 Apr 2013
B16	6 Nov 2013	29 Oct 2012
B17	6 Nov 2013	29 Oct 2012
B18	6 Nov 2013	1 Apr 2013
B19	5 Nov 2013	29 Oct 2012
B20	5 Nov 2013	29 Oct 2012
B21	6 Nov 2013	29 Oct 2012
B22	6 Nov 2013	29 Oct 2012

In the wet season survey, a total of 2,848 benthic organisms, comprising 155 species from 101 families in 10 phyla (Annelida, Arthropoda, Chordata, Cnidaria, Echinodermata, Echiura, Mollusca, Nemertinea, Platyhelminthes and Sipuncula) were recorded (**Annex B**). Polychaetes (Annelida) were collected at all locations and represented the highest species richness and abundance in the samples in the season. Other common species included the amphipod *Byblis* sp.

In the proposed land formation footprint (B1, B2, B3, B4, B5, B7, B8, B9 and B10), 13 to 62 species were recorded from different stations with the highest at station B8 and the lowest at stations B2 and B3 (both within the existing Hong Kong International Airport Approach Area (HKIAAA)). The highest abundance and biomass were recorded in stations B7 and B8 (see **Table 3-2**). The proposed land formation footprint had moderate to high species diversity and moderate to high evenness. No species of conservation importance was recorded.



In north Chek Lap Kok waters (B6, B11, B12, B13 and B19), 36 to 56 species were recorded, which was the highest in north airport waters. The highest number of species and abundance were recorded in location B11 (within the existing capped contaminated mud pit) (see **Table 3-2**). The north Chek Lap Kok waters had high species diversity and moderate to high evenness. One single individual of the amphioxus *Branchiostoma belcheri*, which is listed as “Endangered” in the China Species Red List, was found in sampling location B19.

In west Chek Lap Kok waters (B18, B21 and B22), 27 to 35 species were recorded (see **Table 3-2**). The highest number of species and abundance were recorded in location B18 (along the proposed submarine cable diversion alignment). The west Chek Lap Kok waters had high species diversity and high evenness. No species of conservation importance was recorded.

In the waters around the Brothers (B16 and B17), 14 to 20 species were recorded in two survey locations (see **Table 3-2**). The Brothers had moderate species diversity and high evenness. No species of conservation importance was recorded.

In SCLKCMP and adjacent waters (B14, B15 and B20), 16 to 23 species were recorded. SCLKCMP had moderate species richness and high evenness. No species of conservation importance was recorded.

Table 3-2 also shows the *W* statistic obtained from the ABC plot at each sampling location in the wet season. Details of the plots can be referred in **Annex B**. Of all the sampling locations, no one location had negative *W* value in the wet season, indicating that these locations were not environmentally disturbed. In general, sampling locations B7, B8, B11 and B12 had low *W* values, suggesting that these locations were “moderately disturbed” to some extent. While the other locations indicated “undisturbed” condition. In the wet season survey, only one individual of amphioxus was recorded at one of the replicates in B19 sampling location among all the 66 samples collected in the wet season. Also as observed on site, the sediment in B19 sampling location, together with all other sampling locations in the North Lantau waters covered by the present survey, was mainly muddy sediment different from the sandy substrate preferred by amphioxus as reported by a previous study (Chan, 2007). The single species was considered possibly being washed from elsewhere as a transient species and the existing habitat is not considered as major habitat.

Table 3-2: Summary of grab sampling result in the wet season

Sampling location	Number of species	Density m <sup>2</sup>	Biomass	Shannon diversity ( <i>H'</i> )	Evenness ( <i>J'</i> )	<i>W</i>
B1	20	450	1.522	2.81	0.94	0.305
B2	13	380	1.348	2.23	0.87	0.284
B3	13	210	0.196	2.44	0.95	0.409
B4	55	1720	7.531	3.54	0.88	0.375
B5	38	820	2.476	3.43	0.94	0.438
B6	42	1580	9.141	3.08	0.82	0.324
B7	52	4430	25.678	2.99	0.76	0.166
B8	62	4980	31.836	3.19	0.77	0.182
B9	23	430	0.746	2.89	0.92	0.319
B10	24	780	1.887	2.60	0.82	0.298
B11	56	4030	8.690	2.91	0.72	0.101
B12	36	1140	1.504	3.08	0.86	0.142
B13	37	950	10.930	3.36	0.93	0.533
B14	17	310	1.096	2.72	0.96	0.533
B15	16	430	2.825	2.23	0.80	0.248
B16	14	340	1.027	2.44	0.92	0.348
B17	20	450	1.957	2.72	0.91	0.347

Sampling location	Number of species	Density m <sup>2</sup>	Biomass	Shannon diversity ( <i>H'</i> )	Evenness ( <i>J'</i> )	<i>W</i>
B18	35	1150	2.514	3.23	0.91	0.347
B19	51	1700	30.854	3.45	0.88	0.453
B20	23	470	0.881	2.69	0.86	0.387
B21	27	820	13.927	2.96	0.90	0.498
B22	29	910	7.625	3.00	0.89	0.368

In the dry season survey, a total of 1,030 benthic organisms, comprising 112 species from 78 families in 10 phyla (Annelida, Arthropoda, Chordata, Cnidaria, Echinodermata, Echiura, Mollusca, Nemertinea, Platyhelminthes and Sipuncula) were found in the marine benthic grab survey (**Annex B**). Polychaetes (Annelida) were collected at all locations and represented the highest species richness and abundance in the samples. The amphipod *Byblis* sp. was the most common species, which was mostly found in sampling locations B12, B16, B21 and B22. *Aglaphamus dibranchis* was the dominant polychaete which formed the second most abundant species recorded in the survey of the dry season.

In the proposed land formation footprint (B1, B2, B3, B4, B5, B7, B8, B9 and B10), 6 to 39 species were recorded, with the highest at station B1 and lowest at station B10 (within the contaminated mud pit area). The highest abundance and biomass were recorded in locations B1 and B8 (see Table 3-3). The proposed land formation footprint had low to high species diversity and high evenness. No species of conservation importance was recorded.

In north Chek Lap Kok waters (B6, B11, B12, B13 and B19), 15 to 17 species were recorded. The highest number of species and abundance was recorded in location B19 (see Table 3-3). The north Chek Lap kok waters had moderate species diversity and high evenness.

In west Chek Lap Kok waters (B18, B21 and B22), 22 to 32 species were recorded (see Table 3-3) with the highest species richness recorded at station B21. West Chek Lap Kok waters had moderate species diversity and moderate to high evenness.

In waters around the Brothers (B16 and B17), 26 to 28 species were recorded in two survey locations (see Table 3-3). The Brothers had moderate species diversity and high evenness.

In SCLKCMP (B14, B15 and B20), 8 to 18 species were recorded. SCLKCMP had low to moderate species diversity and high evenness.

**Table 3-3** also shows the *W* statistic obtained from the ABC plot at each sampling location in the dry season. Details of the plots can be referred in **Annex B**. Of all the sampling locations, no one location had negative *W* value in the dry season, indicating that these locations were not environmentally disturbed. In general, sampling location B9 (over the capped contaminated mud pit) had low *W* values, suggesting that the location was “moderately disturbed” to some extent. While the other locations indicated “undisturbed” condition.

Table 3-3: Summary of grab sampling result in the dry season

Sampling location	Number of species	Density m <sup>2</sup>	Biomass	Shannon diversity ( <i>H'</i> )	Evenness ( <i>J'</i> )	<i>W</i>
B1	39	263	11.923	3.30	0.90	0.502
B2	28	180	32.204	3.04	0.91	0.578
B3	9	53	0.077	2.08	0.95	0.398
B4	12	53	1.281	2.34	0.94	0.741
B5	14	87	0.115	2.31	0.88	0.372

Sampling location	Number of species	Density m <sup>2</sup>	Biomass	Shannon diversity (H')	Evenness (J')	W
B6	17	63	0.846	2.80	0.99	0.738
B7	21	193	2.622	2.78	0.91	0.421
B8	32	353	4.010	2.96	0.85	0.260
B9	11	80	0.076	2.14	0.89	0.009
B10	6	50	0.057	1.53	0.85	0.251
B11	17	93	0.431	2.63	0.93	0.489
B12	15	130	13.473	2.29	0.84	0.498
B13	16	83	5.566	2.60	0.94	0.678
B14	18	143	5.709	2.54	0.88	0.487
B15	16	113	5.025	2.52	0.91	0.560
B16	28	203	11.990	2.63	0.79	0.459
B17	26	180	13.713	2.84	0.87	0.497
B18	22	163	0.682	2.83	0.92	0.345
B19	17	147	53.967	2.56	0.90	0.575
B20	8	40	5.181	1.91	0.92	0.686
B21	32	406	3.326	2.66	0.77	0.241
B22	30	353	1.291	2.77	0.81	0.182

Overall, one single individual of the amphioxus *Branchiostoma belcheri*, which is a species of conservation importance, was found in sampling location B19. The sea cucumber *Acaudina molpadioides*, which is listed as “Endangered” in the China Species Red List, was recorded in B8 and B18. It is excluded from the ecological impact assessment in the current EIA study as it is commonly recorded in SCLKCMP, northern and western Chek Lap Kok waters by the Contaminated Mud Pits Environmental Monitoring and Audit trawl surveys (see **Appendix 13.1**). The greasyback shrimp *Metapenaeus ensis*, which is listed as “Vulnerable”, was recorded in B2. The greasyback shrimp is listed as under the China Species Red List due to over-exploitation. However, it is actually common in mangroves and estuarine areas in Hong Kong (Leung, 1999 and Vance, 1999). Therefore, it is also excluded from the ecological impact assessment in the current EIA study.

## 4. Baseline Conditions of Intertidal Habitats

Schedule of intertidal surveys conducted at different types of intertidal habitats and assemblages is present as follows:

Intertidal survey	2012									2013									
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Artificial Shore			✓			✓	✓	✓	✓	✓	✓				✓	✓	✓		
Rocky Shore			✓	✓		✓	✓			✓	✓	✓	✓	✓		✓			✓
Sandy Shore		✓	✓	✓		✓	✓	✓						✓					
Mangrove and Mudflat	✓	✓	✓	✓			✓			✓	✓	✓		✓		✓	✓	✓	
Seagrass Bed	✓	✓					✓				✓					✓		✓	
Horseshoe Crab		✓	✓	✓			✓				✓					✓			

### 4.1 Artificial Shores

Surveys at artificial shore habitats were conducted at the following locations:

- North Chek Lap Kok
- West Chek Lap Kok
- North Tung Chung
- North of Tai Ho Wan

For every survey location, qualitative survey results were listed with literature review, where appropriate, to obtain a more complete list of species for habitat evaluation and assessment. Quantitative survey results in dry and wet seasons at each location (except North Chek Lap Kok where only qualitative survey could be conducted) were also presented.

#### Chek Lap Kok

The shores of Chek Lap Kok are largely artificial shores formed in 1990s when the platform for the current Hong Kong International Airport was constructed. The artificial shores are mostly sloping seawalls composed of armour rocks while those at the piers are vertical seawalls.

Field surveys at the sloping seawalls were conducted at East of Chek Lap Kok for the HZMB-HKBCF EIA, at North and West Chek Lap Kok for this Project. Species found at these sloping seawalls are presented in **Table 4-1** to establish a list of species at artificial shores of Chek Lap Kok.

Table 4-1: List of intertidal species recorded at artificial shores of Chek Lap Kok

Category	Scientific Name	East Chek Lap Kok HZMB-HKBCF EIA (ES 2008)	North Chek Lap Kok Field Survey	West Chek Lap Kok Field Survey
Bivalve	<i>Barbatia virescens</i>		Y	Y
	<i>Donax</i> spp.			Y
	<i>Perna viridis</i>	Y	Y	Y
	<i>Saccostrea cucullata</i>	Y	Y	Y
	<i>Septifer virgatus</i>		Y	Y
	<i>Trapezium sublaevigatum</i>			Y
Cnidarian	<i>Diadumene lineata</i>		Y	Y
Crustacean	<i>Balanus amphitrite</i>	Y	Y	Y
	<i>Capitulum mitella</i>	Y	Y	Y
	<i>Chthamalus malayensis</i>		Y	
	<i>Clibanarius virescens</i>			Y
	<i>Gaetice depressus</i>			Y
	<i>Hemigrapsus sanguineus</i>		Y	
	<i>Ligia exotica</i>		Y	Y
	<i>Megabalanus volcano</i>		Y	
	<i>Metopograpsus quadridentatus</i>		Y	
	<i>Tetraclita squamosa</i>	Y	Y	Y
Fish	<i>Omobranchus punctatus</i>			Y
Gastropod	<i>Cellana grata</i>	Y	Y	Y
	<i>Cellana toreuma</i>		Y	Y
	<i>Collisella dorsuosa</i>			Y
	<i>Echinolittorina radiata</i>	Y	Y	Y
	<i>Echinolittorina pascua</i>	Y	Y	Y
	<i>Echinolittorina vidua</i>			Y
	<i>Littoraria articulata</i>	Y	Y	Y
	<i>Monodonta labio</i>		Y	Y
	<i>Morula musiva</i>		Y	
	<i>Nerita albicilla</i>		Y	Y
	<i>Nerita chamaeleon</i>			Y
	<i>Nerita squamulata</i>		Y	Y
	<i>Nerita yoldii</i>	Y		
	<i>Nerita</i> sp.	Y		
	<i>Nipponacmea concinna</i>		Y	Y
	<i>Patelloida pygmaea</i>		Y	Y
	<i>Patelloida saccharina</i>			Y
	<i>Siphonaria japonica</i>	Y	Y	Y
	<i>Siphonaria laciniosa</i>			Y
	<i>Siphonaria</i> sp.	Y		
	<i>Thais clavigera</i>	Y	Y	Y
	<i>Thais luteostoma</i>		Y	Y
<i>Thais</i> sp.	Y			
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.		Y	
	<i>Corallina</i> spp.		Y	Y
	<i>Endarachne binghamiae</i>			Y

Category	Scientific Name	East Chek Lap Kok	North Chek Lap	West Chek Lap
		HZMB-HKBCF EIA (ES 2008)	Kok Field Survey	Kok Field Survey
	<i>Hapalospongidion gelatinosum</i>			Y
	<i>Hildenbrandia rubra</i>		Y	Y
	<i>Kyrtuthrix maculans</i>			Y
	<i>Ralfsia expansa</i>		Y	Y
	<i>Ulva</i> spp.		Y	
Polyplacophora	<i>Acanthopleura japonica</i>			Y
Worm	<i>Harmothoe imbricata</i>			Y
	<i>Phascolosoma scolops</i>			Y
	Ribbon worms (Nemertea)			Y
<b>Number of species:</b>		<b>15</b>	<b>32</b>	<b>42</b>

### North Chek Lap Kok

The qualitative survey results of intertidal species recorded at the artificial sloping seawall of North Chek Lap Kok are presented in **Table 4-2**. A total of 32 intertidal species were recorded at the area.

During the dry season, a total of 28 intertidal species were observed at the artificial sloping seawall habitat. Abundant species included *Echinolittorina radiata* at high tidal zone; *Siphonaria japonica* and *Tetraclita squamosa* at mid tidal zone; *Saccostrea cucullata*, *Corallina* spp., *Nipponacmea concinna* and *Thais luteostoma* at low tidal zone.

During the wet season, a total of 24 intertidal species were observed at the artificial sloping seawall habitat. Abundant species included *Saccostrea cucullata*, *Ligia exotica* and *Tetraclita squamosa* at mid tidal zone; *Corallina* spp. and *Thais luteostoma* at low tidal zone.

Table 4-2: List of intertidal species recorded at artificial shore of North Chek Lap Kok during field survey

Location: North Chek Lap Kok		Season & Tidal Level					
Category	Scientific Name	Dry			Wet		
		High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>					+	
	<i>Perna viridis</i>			+++		+	+
	<i>Saccostrea cucullata</i>		+++	++++		++++	
	<i>Septifer virgatus</i>		+	+			
Cnidarian	<i>Diadumene lineata</i>		+++	+++		+	+
Crustacean	<i>Balanus amphitrite</i>		++	++			+++
	<i>Capitulum mitella</i>	+	++		+	+	
	<i>Chthamalus malayensis</i>						+
	<i>Hemigrapsus sanguineus</i>						+
	<i>Ligia exotica</i>	+	+++			++++	+++
	<i>Megabalanus volcano</i>			+			
	<i>Metopograpsus quadridentatus</i>						+
	<i>Tetraclita squamosa</i>		++++	+++		++++	
Gastropod	<i>Cellana grata</i>		++			+	
	<i>Cellana toreuma</i>		+++	++		+	
	<i>Echinolittorina radiata</i>	++++			+		
	<i>Echinolittorina pascua</i>	++			+		

Location: North Chek Lap Kok		Season & Tidal Level					
		Dry			Wet		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Littoraria articulata</i>	+++			+	+	
	<i>Monodonta labio</i>		+				
	<i>Morula musiva</i>			+			
	<i>Nerita albicilla</i>		++				
	<i>Nerita squamulata</i>		+				
	<i>Nipponacmea concinna</i>		+++	++++		+	
	<i>Patelloida pygmaea</i>		+				
	<i>Siphonaria japonica</i>		++++	++		+	
	<i>Thais clavigera</i>		+++	++		+	
	<i>Thais luteostoma</i>				++++		++++
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.	+					
	<i>Corallina</i> spp.		+++	++++			++++
	<i>Hildenbrandia rubra</i>	++	++	+		++	
	<i>Ralfsia expansa</i>		+			++	
	<i>Ulva</i> spp.		+	++		+++	
<b>Total number of species = 32</b>		(28 in dry season)			(24 in wet season)		

Key:

+ : Present

++ : Occasional

+++ : Frequent

++++ : Abundant

### West Chek Lap Kok

In the qualitative surveys as shown in **Table 4-1**, a total of 42 intertidal species were recorded at the area. Quantitative survey results of intertidal species recorded at the artificial sloping seawall of West Chek Lap Kok are presented in **Table 4-3 to Table 4-4**.

During the dry season, a total of 34 intertidal species were recorded at the artificial sloping seawall habitat. Abundant species included *Littoraria articulata* at high tidal zone; *Saccostrea cucullata* and *Siphonaria japonica* at mid tidal zone; and *Cellana toreuma*, *Saccostrea cucullata* and unidentified juvenile crab at low tidal zone. Species diversity index (*H*) and species evenness index (*J*) were 1.53 and 0.49 respectively.

During the wet season, a total of 38 intertidal species were recorded at the artificial sloping seawall habitat. Abundant species included *Littoraria articulata* and *Echinolittorina radiata* at high tidal zone; *Saccostrea cucullata* at both mid and low tidal zones; unidentified juvenile crab and *Corallina* spp. at low tidal zone. Species diversity index (*H*) and species evenness index (*J*) were 1.73 and 0.53 respectively.

Table 4-3: Intertidal species recorded at artificial shore of West Chek Lap Kok in the dry season

Location: West Chek Lap Kok	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		1%	2%		1%	1%
	<i>Perna viridis</i>			1%			
	<i>Saccostrea cucullata</i>		42%	87%		34%	64%
	<i>Septifer virgatus</i>		1%	1%			1%
Cnidarian	<i>Diadumene lineata</i>		1	2		1	1

Location: West Chek Lap Kok	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Crustacean	<i>Balanus amphitrite</i>						1%
	<i>Capitulum mitella</i>	1%			1%	1%	
	<i>Clibanarius virescens</i>			6			
	<i>Ligia exotica</i>		1			1	
	<i>Tetraclita squamosa</i>		2%	1%		2%	1%
	Unidentified juvenile crab		16	16		4	13
Gastropod	<i>Cellana grata</i>		4			4	
	<i>Cellana toreuma</i>		9	16		3	16
	<i>Collisella dorsuosa</i>	3	8				1
	<i>Echinolittorina radiata</i>	7			21		
	<i>Echinolittorina pascua</i>				20		
	<i>Littoraria articulata</i>	17	18		10	24	
	<i>Monodonta labio</i>		3			2	
	<i>Nerita albicilla</i>	1	2	2	4		
	<i>Nerita chamaeleon</i>			2			
	<i>Nerita squamulata</i>			1		1	2
	<i>Nipponacmea concinna</i>		2	2		1	2
	<i>Patelloida pygmaea</i>		9	6		8	12
	<i>Patelloida saccharina</i>			2			2
	<i>Siphonaria japonica</i>	2	13	8	2	11	14
	<i>Thais clavigera</i>		4	5		2	5
<i>Thais luteostoma</i>			3		1	2	
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.		11%	25%		49%	7%
	<i>Endarachne binghamiae</i>					28%	1%
	<i>Hapalospongidion gelatinosum</i>			4%			71%
	<i>Hildenbrandia rubra</i>	18%	27%	41%	10%	21%	
	<i>Ralfsia expansa</i>	21%	60%	31%	32%		20%
Polyplacophora	<i>Acanthopleura japonica</i>					6	
Worm	<i>Phascolosoma scolops</i>		1				
<b>Total number of species = 34</b>							
<b>Species Diversity Index (<i>H'</i>) = 1.53</b>							
<b>Species Evenness Index (<i>J</i>) = 0.49</b>							

Table 4-4: Intertidal species recorded at artificial shore of West Chek Lap Kok in the wet season

Location: West Chek Lap Kok	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		1%	2%		1%	2%
	<i>Perna viridis</i>						1%
	<i>Saccostrea cucullata</i>		48%	87%		34%	86%
	<i>Septifer virgatus</i>		1%	3%		1%	7%
	<i>Trapezium sublaevigatum</i>						1%
	<i>Donax</i> spp.						1
Cnidarian	<i>Diadumene lineata</i>		2	1		2	2



Location: West Chek Lap Kok	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Crustacean	<i>Balanus amphitrite</i>						11%
	<i>Capitulum mitella</i>	3%			1%	1%	
	<i>Ligia exotica</i>	2	3	4	2	3	
	<i>Tetraclita squamosa</i>		6%	1%		5%	1%
	Unidentified juvenile crab		5	18		7	40
	<i>Gaetice depressus</i>			2			
Gastropod	<i>Cellana grata</i>		1			3	
	<i>Cellana toreuma</i>		8	15		8	11
	<i>Collisella dorsuosa</i>	2	3		1	7	
	<i>Echinolittorina radiata</i>	15			13		
	<i>Echinolittorina pascua</i>	3			2		
	<i>Echinolittorina vidua</i>	3					
	<i>Littoraria articulata</i>	16	13	4	3	10	4
	<i>Nerita albicilla</i>				1		
	<i>Nerita chamaeleon</i>		5	2		1	5
	<i>Nerita squamulata</i>			1			
	<i>Nipponacmea concinna</i>			4		3	3
	<i>Patelloida pygmaea</i>		4	9		9	5
	<i>Patelloida saccharina</i>					2	1
	<i>Siphonaria japonica</i>	3	6	3	17	7	2
	<i>Thais clavigera</i>		1	2		4	2
	<i>Thais luteostoma</i>		1	4		1	5
<i>Siphonaria laciniosa</i>					1		
<i>Thais sp.</i>			9				
Lichen, Cyanobacteria and Algae	<i>Corallina spp.</i>			46%			53%
	<i>Hildenbrandia rubra</i>	10%	23%		1%	11%	
	<i>Kyrtuthrix maculans</i>		20%			5%	
	<i>Ralfsia expansa</i>		30%	10%			1%
Polyplacophora	<i>Acanthopleura japonica</i>						2
Worm	<i>Harmothoe imbricata</i>			1			1
Fish	<i>Omobranchus punctatus</i>						1
<b>Total number of species = 38</b>							
<b>Species Diversity Index (<math>H'</math>) = 1.73</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.53</b>							

## North Tung Chung

Qualitative and quantitative survey results of intertidal species recorded at the artificial sloping seawall of North Tung Chung are presented in **Table 4-5 to Table 4-7**. In the qualitative surveys, a total of 30 intertidal species were recorded at the area (see **Table 4-5**).

During the dry season, a total of 22 intertidal species were recorded at the artificial sloping seawall habitat. Abundant species included *Kyrtuthrix maculans* and *Ulva* spp. at high tidal zone; *Hildenbrandia rubra* and *Nerita albicilla* at mid tidal zone; *Cellana toreuma* and *Saccostrea cucullata* at low tidal zone. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 1.38 and 0.48 respectively.

During the wet season, a total of 28 intertidal species were recorded at the artificial sloping seawall habitat. Abundant species included *Echinolittorina radiata* at high tidal zone; *Saccostrea cucullata* and *Chroococcus* sp. at mid tidal zone; *Cellana toreuma*, *Saccostrea cucullata* and *Ulva* spp. at low tidal zone. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 1.70 and 0.53 respectively.

Table 4-5: List of intertidal species recorded at artificial shore of North Tung Chung during field survey

Location: North Tung Chung	Number of species: 30
Category	Scientific Name
Bivalve	<i>Barbatia virescens</i>
	<i>Perna viridis</i>
	<i>Saccostrea cucullata</i>
	<i>Septifer virgatus</i>
Cnidarian	<i>Diadumene lineata</i>
Crustacean	<i>Balanus amphitrite</i>
	<i>Ligia exotica</i>
	<i>Metopograpsus quandridentatus</i>
	<i>Tetraclita squamosa</i>
Gastropod	<i>Cellana grata</i>
	<i>Cellana toreuma</i>
	<i>Echinolittorina radiata</i>
	<i>Echinolittorina pascua</i>
	<i>Littoraria articulata</i>
	<i>Lunella coronata</i>
	<i>Monodonta labio</i>
	<i>Nerita albicilla</i>
	<i>Nerita chamaeleon</i>
	<i>Nipponacmea concinna</i>
	<i>Patelloida pygmaea</i>
	<i>Patelloida saccharina</i>
	<i>Siphonaria japonica</i>
	<i>Thais clavigera</i>
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.
	<i>Corallina</i> spp.
	<i>Hildenbrandia rubra</i>
	<i>Kyrtuthrix maculans</i>
	<i>Ulva</i> spp.
Polyplacophora	<i>Acanthopleura japonica</i>
Worm	<i>Hydroides</i> spp.

Table 4-6: Intertidal species recorded at artificial shore of North Tung Chung in the dry season

Location: North Tung Chung	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
		High	Mid	Low	High	Mid	Low
Category	Scientific Name						
Bivalve	<i>Barbatia virescens</i>		1%	1%		2%	2%
	<i>Saccostrea cucullata</i>		28%	64%		72%	74%
	<i>Septifer virgatus</i>		1%	1%		1%	1%
Cnidarian	<i>Diadumene lineata</i>					1	1
Crustacea	<i>Balanus amphitrite</i>			1%		1%	1%

Location: North Tung Chung	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Tetraclita squamosa</i>					4%	1%
Gastropod	<i>Cellana grata</i>		1				
	<i>Cellana toreuma</i>		3	18		23	31
	<i>Echinolittorina radiata</i>	3			27		
	<i>Echinolittorina pascua</i>	2					
	<i>Littoraria articulata</i>	4	3		6		
	<i>Lunella coronata</i>			1			
	<i>Monodonta labio</i>		5	3		2	
	<i>Nerita albicilla</i>	3	11	3		2	
	<i>Nipponacmea concinna</i>		3	3		5	1
	<i>Patelloida pygmaea</i>					2	5
	<i>Siphonaria japonica</i>			4		9	6
	<i>Thais clavigera</i>			2		4	2
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.			1%			
	<i>Hildenbrandia rubra</i>	17%	47%	30%		54%	30%
	<i>Kyrtuthrix maculans</i>	47%	31%		44%		
	<i>Ulva</i> spp.	35%	21%	70%		40%	30%
<b>Total number of species = 22</b>							
<b>Species Diversity Index (<math>H'</math>) = 1.38</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.48</b>							

Table 4-7: Intertidal species recorded at artificial shore of North Tung Chung in the wet season

Location: North Tung Chung	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		2%	1%		5%	3%
	<i>Perna viridis</i>			2%		1%	4%
	<i>Saccostrea cucullata</i>		60%	82%		60%	63%
	<i>Septifer virgatus</i>		2%	7%		2%	4%
Cnidarian	<i>Diadumene lineata</i>		1				
Crustacean	<i>Balanus amphitrite</i>		1%	10%		2%	7%
	<i>Ligia exotica</i>		4	1		3	4
	<i>Metopograpsus quadridentatus</i>						2
	<i>Tetraclita squamosa</i>		3%	1%		1%	
	Unidentified juvenile crab		4	17		2	7
Gastropod	<i>Cellana grata</i>		2	3		9	5
	<i>Cellana toreuma</i>		11	14		19	23
	<i>Echinolittorina radiata</i>	10			12	3	
	<i>Echinolittorina pascua</i>	2			4		
	<i>Littoraria articulata</i>	2	6		7	4	
	<i>Monodonta labio</i>		2			1	
	<i>Nerita albicilla</i>					1	
	<i>Nerita chamaeleon</i>		2			1	1
	<i>Nipponacmea concinna</i>		3	9		6	8

Location: North Tung Chung	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Patelloida pygmaea</i>		7	8		15	14
	<i>Patelloida saccharina</i>			4			
	<i>Siphonaria japonica</i>			1			
	<i>Thais clavigera</i>			3			2
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.		50%			38%	
	<i>Hildenbrandia rubra</i>		20%			20%	
	<i>Ulva</i> spp.			90%			87%
Polyplacophora	<i>Acanthopleura japonica</i>						1
Worm	<i>Hydroides</i> spp.						10
<b>Total number of species = 28</b>							
<b>Species Diversity Index (<math>H'</math>) = 1.70</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.53</b>							

### North of Tai Ho Wan

The qualitative and quantitative survey results of intertidal species recorded at the artificial sloping seawall of north of Tai Ho Wan are presented in **Table 4-8 to Table 4-10**. In the qualitative surveys, a total of 41 intertidal species were recorded at the area (see **Table 4-8**).

During the dry season, a total of 26 intertidal species were recorded at the artificial sloping seawall habitat. Abundant species included *Echinolittorina radiata* at high tidal zone; *Hildenbrandia rubra* at mid tidal zone; *Ralfsia expansa*, *Cellana toreuma*, *Saccostrea cucullata* and *Siphonaria japonica* at low tidal zone. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 1.22 and 0.40 respectively.

During the wet season, a total of 31 intertidal species were recorded at the artificial sloping seawall habitat. Abundant species included *Chroococcus* sp., *Kyrtuthrix maculans* and *Echinolittorina radiata* at high tidal zone; *Cellana toreuma* at mid tidal zone; *Patelloida pygmaea*, *Cellana toreuma*, *Saccostrea cucullata* and *Ulva* spp. at low tidal zone. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 1.98 and 0.60 respectively.

Table 4-8: List of intertidal species recorded at artificial shore of North of Tai Ho Wan during field survey

Location: North of Tai Ho Wan	Number of species: 41
Category	Scientific Name
Bivalve	<i>Barbatia virescens</i>
	<i>Perna viridis</i>
	<i>Saccostrea cucullata</i>
	<i>Septifer virgatus</i>
Cnidarian	<i>Diadumene lineata</i>
Crustacean	<i>Balanus amphitrite</i>
	<i>Capitulum mitella</i>
	<i>Clibanarius virescens</i>
	<i>Ligia exotica</i>
	<i>Tetraclita squamosa</i>
	<i>Hemigrapsus penicillatus</i>
	<i>Hemigrapsus sanguineus</i>

Location: North of Tai Ho Wan	Number of species: 41
Category	Scientific Name
	<i>Gaetice depressus</i>
Gastropod	<i>Cellana grata</i>
	<i>Cellana toreuma</i>
	<i>Collisella dorsuosa</i>
	<i>Echinolittorina radiata</i>
	<i>Echinolittorina pascua</i>
	<i>Echinolittorina vidua</i>
	<i>Littoraria articulata</i>
	<i>Monodonta labio</i>
	<i>Nerita albicilla</i>
	<i>Nerita chamaeleon</i>
	<i>Nerita squamulata</i>
	<i>Nipponacmea concinna</i>
	<i>Patelloida pygmaea</i>
	<i>Patelloida saccharina</i>
	<i>Siphonaria japonica</i>
	<i>Siphonaria laciniosa</i>
	<i>Thais clavigera</i>
	<i>Thais luteostoma</i>
	<i>Siphonaria laciniosa</i>
<i>Planaxis sulcatus</i>	
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.
	<i>Corallina</i> spp.
	<i>Endarachne binghamiae</i>
	<i>Hildenbrandia rubra</i>
	<i>Kyrtuthrix maculans</i>
	<i>Ralfsia expansa</i>
	<i>Ulva</i> spp.
Polyplacophora	<i>Acanthopleura japonica</i>

Table 4-9: Intertidal species recorded at artificial shore of North of Tai Ho Wan in the dry season

Location: North of Tai Ho Wan	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>			2%		1%	1%
	<i>Saccostrea cucullata</i>		29%	66%		22%	64%
Cnidarian	<i>Diadumene lineata</i>		1	1			
Crustacean	<i>Capitulum mitella</i>		2%				
	<i>Tetraclita squamosa</i>		5%	17%		2%	16%
	Unidentified juvenile crab			1			
Gastropod	<i>Cellana grata</i>					2	
	<i>Cellana toreuma</i>		2	9		2	5
	<i>Echinolittorina radiata</i>	6			10		
	<i>Echinolittorina pascua</i>	4			1		
	<i>Littoraria articulata</i>	5	1		3		
	<i>Monodonta labio</i>		1			2	

Location: North of Tai Ho Wan	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Nerita albicilla</i>		5		1	2	
	<i>Nerita chamaeleon</i>		1				
	<i>Nerita squamulata</i>		3	1		2	1
	<i>Nipponacmea concinna</i>		1	4		1	1
	<i>Patelloida pygmaea</i>		1	2		2	2
	<i>Patelloida saccharina</i>						2
	<i>Siphonaria japonica</i>		3	5		4	8
	<i>Thais clavigera</i>					2	2
	<i>Thais luteostoma</i>				1		4
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.			28%		36%	17%
	<i>Endarachne binghamiae</i>						31%
	<i>Hildenbrandia rubra</i>		48%	28%		63%	12%
	<i>Kyrtuthrix maculans</i>		51%				
	<i>Ralfsia expansa</i>			42%			37%
<b>Total number of species = 26</b>							
<b>Species Diversity Index (<math>H'</math>) = 1.22</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.40</b>							

Table 4-10: Intertidal species recorded at artificial shore of North of Tai Ho Wan in the wet season

Location: North of Tai Ho Wan	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		2%	1%			1%
	<i>Saccostrea cucullata</i>		34%	44%		31%	56%
	<i>Septifer virgatus</i>		1%	1%		3%	
Cnidarian	<i>Diadumene lineata</i>			2		2	1
Crustacean	<i>Balanus amphitrite</i>		1%				
	<i>Ligia exotica</i>		5			7	
	<i>Tetraclita squamosa</i>		4%			2%	1%
	Unidentified juvenile crab		3	5		2	2
	<i>Hemigrapsus sanguineus</i>		4				
	<i>Gaetice depressus</i>				1		1
Gastropod	<i>Cellana toreuma</i>		27	38		21	14
	<i>Collisella dorsuosa</i>		2			3	
	<i>Echinolittorina radiata</i>	24			5		
	<i>Echinolittorina vidua</i>				2		
	<i>Littoraria articulata</i>	4	4		2	1	
	<i>Nerita albicilla</i>		2			4	
	<i>Nerita chamaeleon</i>						2
	<i>Nerita squamulata</i>			2		3	
	<i>Nipponacmea concinna</i>		7	15		2	
<i>Patelloida pygmaea</i>		10	1		13	35	

Location: North of Tai Ho Wan	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Patelloida saccharina</i>			8			1
	<i>Siphonaria japonica</i>		1	3		1	1
	<i>Thais luteostoma</i>						2
	<i>Siphonaria laciniosa</i>		1				3
	<i>Planaxis sulcatus</i>						1
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.	55%			43%		
	<i>Corallina</i> spp.			10%		10%	3%
	<i>Hildenbrandia rubra</i>		30%				
	<i>Kyrtuthrix maculans</i>	44%			56%		
	<i>Ulva</i> spp.					40%	86%
Polyplacophora	<i>Acanthopleura japonica</i>			2			1
<b>Total number of species = 31</b>							
<b>Species Diversity Index (<math>H'</math>) = 1.98</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.60</b>							

### Summary of Ecological Baseline Condition of Artificial Shores

Findings of desktop review and qualitative surveys are summarised in **Table 4-11** below.

Table 4-11: Species number at each artificial shore obtained from literature review and qualitative surveys

Location	North Chek Lap Kok (within project footprint)	Chek Lap Kok <sup>(1)</sup>	North Tung Chung	North of Tai Ho Wan
Number of intertidal species	32	53	30	41

Source of Literature Review: (1) ES, HZMB HKBCF & HKLR EIA (2008)

Findings of quantitative surveys for this Project at different survey locations are summarised in **Table 4-12** below.

Table 4-12: Species number, diversity index ( $H'$ ) and evenness index ( $J'$ ) recorded at each artificial shore

Survey Location	West Chek Lap Kok		North Tung Chung		North of Tai Ho Wan	
	D	W	D	W	D	W
Number of species	34	38	22	28	26	31
$H'$	1.53	1.73	1.38	1.70	1.22	1.98
$J'$	0.49	0.53	0.48	0.53	0.40	0.60

(1) D = dry season; W = wet season

From desktop review and field survey results, overall the species diversity and evenness at the artificial shores of Chek Lap Kok and north Lantau are low compared to other natural shores. Abundant species found at artificial shores were *Echinolittorina radiata*, *Cellana toreuma*, *Patelloida pygmaea*, *Siphonaria japonica*, *Saccostrea cucullata* and unidentified juvenile crabs. All species recorded were common in artificial/rocky shores of Hong Kong. No species of conservation importance was recorded at this habitat.

## 4.2 Rocky Shores

Surveys at rocky shore habitats were conducted at the following locations:

- Sheung Sha Chau
- Sha Chau
- Tai Mo To
- South Chek Lap Kok
- San Tau
- Hau Hok Wan
- Sham Wat Wan
- Tai O

For each survey location, qualitative survey results were listed with literature review, where appropriate, to obtain a more complete list of species for habitat evaluation and assessment. Quantitative survey results in dry and wet seasons at each location were also presented. Representative photo of the rocky shore habitat is presented in **Plate 4-1**.



Plate 4-1 Representative Photo of Rocky Shore Habitat at Sha Chau

### Sheung Sha Chau

At Sheung Sha Chau where the proposed new aviation fuel pipeline would surface, the habitat was exposed bedrock shore and steep in nature. Qualitative and quantitative survey results of intertidal species recorded at the rocky shore of Sheung Sha Chau are presented in **Table 4-13 to Table 4-15**. In the qualitative surveys, a total of 29 intertidal species were recorded at the area (see **Table 4-13**).

A total of 19 intertidal species were recorded at Sheung Sha Chau rocky shore habitat during the dry season. The survey results revealed that gastropods and rock oyster were abundant on the rocky shore of Sheung Sha Chau. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 1.46 and 0.52 respectively.

During the wet season, a total of 26 intertidal species were recorded at the rocky shore habitat. Gastropod *Echinolittorina radiata* and algae were abundant. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 2.06 and 0.67 respectively.

Table 4-13: List of intertidal species recorded at rocky shore of Sheung Sha Chau during field survey

Location: Sheung Sha Chau	Number of species: 29
Category	Species Name



Location: Sheung Sha Chau	Number of species: 29
Category	Species Name
Bivalve	<i>Barbatia virescens</i>
	<i>Saccostrea cucullata</i>
	<i>Septifer virgatus</i>
	<i>Trapezium sublaevigatum</i>
Cnidarian	<i>Diadumene lineata</i>
Crustacean	<i>Balanus amphitrite</i>
	<i>Capitulum mitella</i>
	<i>Chthamalus malayensis</i>
	<i>Clibanarius virescens</i>
	<i>Microeuraphia withersi</i>
	<i>Ligia exotica</i>
	<i>Tetraclita squamosa</i>
	Unidentified crab
Gastropod	<i>Cellana toreuma</i>
	<i>Echinolittorina radiata</i>
	<i>Echinolittorina pascua</i>
	<i>Littoraria articulata</i>
	<i>Monodonta labio</i>
	<i>Nerita albicilla</i>
	<i>Nerita squamulata</i>
	<i>Nipponacmea concinna</i>
	<i>Patelloida pygmaea</i>
	<i>Siphonaria japonica</i>
	<i>Thais clavigera</i>
Lichen, Cyanobacteria and Algae	<i>Enteromorpha</i> spp.
	<i>Hildenbrandia rubra</i>
	<i>Kyrtuthrix maculans</i>
	<i>Ulva</i> spp.
Worm	<i>Turbellaria</i>

Table 4-14: Intertidal species recorded at rocky shore of Sheung Sha Chau in the dry season

Location: Sheung Sha Chau	Season: Dry	Average Abundance/ Percentage Cover		
		Transect 1		
Category	Scientific Name	High	Mid	Low
Bivalve	<i>Saccostrea cucullata</i>		45%	54%
	<i>Septifer virgatus</i>		1%	1%
Crustacean	<i>Capitulum mitella</i>		1%	
	<i>Microeuraphia withersi</i>			1%
	<i>Tetraclita squamosa</i>		8%	4%
	Unidentified juvenile crab		1	
Gastropod	<i>Cellana toreuma</i>		3	2
	<i>Echinolittorina radiata</i>	18		
	<i>Echinolittorina pascua</i>	3		
	<i>Littoraria articulata</i>	19	10	
	<i>Monodonta labio</i>		15	13
	<i>Nerita albicilla</i>		4	5

Location: Sheung Sha Chau	Season: Dry	Average Abundance/ Percentage Cover		
		Transect 1		
Category	Scientific Name	High	Mid	Low
	<i>Nerita squamulata</i>		1	2
	<i>Nipponacmea concinna</i>		2	1
	<i>Patelloida pygmaea</i>		1	2
	<i>Siphonaria japonica</i>			3
	<i>Thais clavigera</i>		3	3
Lichen, Cyanobacteria and Algae	<i>Hildenbrandia rubra</i>		40%	
	<i>Ulva</i> spp.			33%
<b>Total number of species = 19</b>				
<b>Species Diversity Index (H) = 1.46</b>				
<b>Species Evenness Index (J) = 0.52</b>				

Table 4-15: Intertidal species recorded at rocky shore of Sheung Sha Chau in the wet season

Location: Sheung Sha Chau	Season: Wet	Average Abundance/ Percentage Cover		
		Transect 1		
Category	Scientific Name	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>			1%
	<i>Saccostrea cucullata</i>		40%	31%
	<i>Septifer virgatus</i>		1%	1%
	<i>Trapezium sublaevigatum</i>			2%
Cnidarian	<i>Diadumene lineata</i>		7	6
Crustacean	<i>Balanus amphitrite</i>		1%	7%
	<i>Capitulum mitella</i>	2%	1%	
	<i>Chthamalus malayensis</i>	10%		
	<i>Clibanarius virescens</i>			5
	<i>Ligia exotica</i>	4		
	<i>Tetraclita squamosa</i>		1%	5%
	Unidentified crab		2	2
Gastropod	<i>Cellana toreuma</i>	1	11	7
	<i>Echinolittorina radiata</i>	108		
	<i>Echinolittorina pascua</i>	17		
	<i>Littoraria articulata</i>	48	3	14
	<i>Monodonta labio</i>		6	11
	<i>Nerita albicilla</i>	5	7	3
	<i>Nipponacmea concinna</i>			5
	<i>Siphonaria japonica</i>		1	1
	<i>Thais clavigera</i>		1	3
Lichen, Cyanobacteria and Algae	<i>Enteromorpha</i> spp.		2%	
	<i>Hildenbrandia rubra</i>	20%	66%	
	<i>Kyrtuthrix maculans</i>		31%	
	<i>Ulva</i> spp.			70%
Worm	<i>Turbellaria</i>			6
<b>Total number of species = 26</b>				

<b>Location: Sheung Sha Chau</b>	<b>Season: Wet</b>	<b>Average Abundance/ Percentage Cover</b>		
		<b>Transect 1</b>		
<b>Category</b>	<b>Scientific Name</b>	<b>High</b>	<b>Mid</b>	<b>Low</b>
<b>Species Diversity Index (<i>H'</i>) = 2.06</b>				
<b>Species Evenness Index (<i>J'</i>) = 0.67</b>				

## Sha Chau

On Sha Chau, two types of rocky shores – flat boulder beach with some cobbles (Transect 1) and steep exposed bedrock (Transect 2) – were observed. Qualitative and quantitative survey results of intertidal species recorded at the rocky shore of Sha Chau are presented in **Table 4-16 to Table 4-18**. In the qualitative surveys, a total of 50 intertidal species were recorded at the area (see **Table 4-16**).

A total of 38 intertidal species were recorded at Sha Chau rocky shore habitat during the dry season. The survey results revealed that gastropods and algae (*Hildenbrandia rubra*, *Littoraria articulata*, *Nerita squamulata* and *Corallina* spp.) were abundant on the rocky shore of Sha Chau. Species diversity index (*H'*) and species evenness index (*J'*) were 2.02 and 0.56 respectively.

During the wet season, a total of 35 intertidal species were recorded at the rocky shore habitat. Abundant species included *Balanus amphitrite*, *Saccostrea cucullata* and *Septifer virgatus* at high tidal zone; *Saccostrea cucullata*, *Hildenbrandia rubra* and Unidentified crab juvenile at mid tidal zones; *Barbatia virescens* and *Saccostrea cucullata* low tidal zones. Species diversity index (*H'*) and species evenness index (*J'*) were 1.43 and 0.41 respectively.

Table 4-16: List of intertidal species recorded at rocky shore of Sha Chau during field survey

<b>Location: Sha Chau</b>	<b>Number of species: 50</b>
<b>Categories</b>	<b>Scientific Name</b>
Bivalve	<i>Anomalocardia squamosa</i>
	<i>Barbatia virescens</i>
	<i>Cardita leana</i>
	<i>Perna viridis</i>
	<i>Isognomon isognomum</i>
	<i>Saccostrea cucullata</i>
	<i>Septifer virgatus</i>
	<i>Striarca symmetrica</i>
	<i>Trapezium sublaevigatum</i>
Cnidarian	<i>Diadumene lineata</i>
Crustacean	<i>Balanus amphitrite</i>
	<i>Capitulum mitella</i>
	<i>Clibanarius virescens</i>
	<i>Epixanthus frontalis</i>
	<i>Gaetice depressus</i>
	<i>Hemigrapsus penicillatus</i>
	<i>Hemigrapsus sanguineus</i>
	<i>Ligia exotica</i>
	<i>Megabalanus volcano</i>
	<i>Metopograpsus quandridentatus</i>
	<i>Nanosesarma minutum</i>

<b>Location: Sha Chau</b>	<b>Number of species: 50</b>
<b>Categories</b>	<b>Scientific Name</b>
	<i>Pagurus dubius</i>
	<i>Tetraclita squamosa</i>
	<i>Unidentified juvenile crab</i>
Gastropod	<i>Cellana grata</i>
	<i>Cellana toreuma</i>
	<i>Cerithidea cingulata</i>
	<i>Collisella dorsuosa</i>
	<i>Echinolittorina radiata</i>
	<i>Echinolittorina vidua</i>
	<i>Littoraria articulata</i>
	<i>Monodonta labio</i>
	<i>Morula musiva</i>
	<i>Nerita albicilla</i>
	<i>Nerita lineata</i>
	<i>Nerita squamulata</i>
	<i>Nerita undata</i>
	<i>Nipponacmea concinna</i>
	<i>Patelloida pygmaea</i>
	<i>Siphonaria japonica</i>
	<i>Thais clavigera</i>
	<i>Thais luteostoma</i>
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.
	<i>Corallina</i> spp.
	<i>Hildenbrandia rubra</i>
	<i>Ralfsia expansa</i>
	<i>Ulva</i> spp.
Worm	<i>Oligochaeta</i>
	<i>Phascolosoma scolops</i>
	<i>Ribbon worms (Nemertea)</i>

Table 4-17: Intertidal species recorded at rocky shore of Sha Chau in the dry season

Location: Sha Chau	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Anomalocardia squamosa</i>			1			1
	<i>Barbatia virescens</i>		1%	3%		1%	3%
	<i>Isognomon isognomum</i>					5%	
	<i>Saccostrea cucullata</i>		20%	34%		44%	22%
	<i>Septifer virgatus</i>		1%	1%		1%	1%
	<i>Trapezium sublaevigatum</i>						1%
Cnidarian	<i>Diadumene lineata</i>		1	1		1	2
Crustacean	<i>Balanus amphitrite</i>	1%	1%	2%		1%	
	<i>Capitulum mitella</i>				5%		
	<i>Clibanarius virescens</i>			11			19
	<i>Epixanthus frontalis</i>			1			
	<i>Gaetice depressus</i>	1	2				

Location: Sha Chau	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Hemigrapsus sanguineus</i>	1	1				
	<i>Ligia exotica</i>	6			1		
	<i>Nanosesarma minutum</i>			1		3	
	<i>Pagurus dubius</i>			1			
	<i>Tetraclita squamosa</i>					1%	
	Unidentified juvenile crab	5					
Gastropod	<i>Cellana grata</i>			9			
	<i>Cellana toreuma</i>		1			2	
	<i>Cerithidea cingulata</i>			2			
	<i>Collisella dorsuosa</i>		2				
	<i>Echinolittorina radiata</i>				17		
	<i>Echinolittorina vidua</i>				8		
	<i>Littoraria articulata</i>	3	4		41	67	
	<i>Monodonta labio</i>		12				
	<i>Nerita albicilla</i>		7				
	<i>Nerita squamulata</i>	9	11	2		4	
	<i>Nipponacmea concinna</i>		1	1			
	<i>Patelloida pygmaea</i>			5		1	
	<i>Siphonaria japonica</i>		8			17	10
	<i>Thais clavigera</i>		5			4	1
<i>Thais luteostoma</i>			2				
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.						
	<i>Hildenbrandia rubra</i>	15%	5%		73%	40%	30%
	<i>Ralfsia expansa</i>	17%	8%	63%			33%
Worm	<i>Phascolosoma scolops</i>		3				1
	Ribbon worms (Nemertea)			1			
<b>Total number of species = 38</b>							
<b>Species Diversity Index (<math>H'</math>) = 2.02</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.56</b>							

Table 4-18: Intertidal species recorded at rocky shore of Sha Chau in the wet season

Location: Sha Chau	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>						6%
	<i>Cardita leana</i>			2			
	<i>Perna viridis</i>						2%
	<i>Saccostrea cucullata</i>		3%	58%		63%	15%
	<i>Septifer virgatus</i>		1%	17%		5%	1%
	<i>Striarca symmetrica</i>					1	2
	<i>Trapezium sublaevigatum</i>						1%
Cnidarian	<i>Diadumene lineata</i>		2	6		3	1
Crustacean	<i>Balanus amphitrite</i>					2%	
	<i>Clibanarius</i> spp.					8	2

Location: Sha Chau	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Epixanthus frontalis</i>	1	1	2			
	<i>Gaetice depressus</i>		1				
	<i>Hemigrapsus penicillatus</i>		2				
	<i>Hemigrapsus sanguineus</i>						1
	<i>Megabalanus volcano</i>					1%	
	<i>Metopograpsus quandridentatus</i>						1
	<i>Nanosesarma minutum</i>					6	2
	<i>Pagurus dubius</i>			1			2
	<i>Tetraclita squamosa</i>						
	Unidentified juvenile crab	2				11	22
Gastropod	<i>Cellana grata</i>				5		
	<i>Cellana toreuma</i>			3		5	
	<i>Littoraria articulata</i>	4			7		
	<i>Monodonta labio</i>		1				2
	<i>Morula musiva</i>						1
	<i>Nerita albicilla</i>	4	1	1		1	
	<i>Nerita squamulata</i>	1	1	2	2	1	
	<i>Nerita undata</i>	7		2			
	<i>Nipponacmea concinna</i>			2		2	
	<i>Siphonaria japonica</i>				1		
	<i>Thais clavigera</i>					2	1
	<i>Thais luteostoma</i>			2		6	2
Lichen, Cyanobacteria and Algae	<i>Hildenbrandia rubra</i>	25%	30%				
	<i>Ulva</i> spp.				80%	90%	87%
Worm	<i>Oligochaeta</i>		1				
<b>Total number of species = 35</b>							
<b>Species Diversity Index (<i>H'</i>) = 1.43</b>							
<b>Species Evenness Index (<i>J'</i>) = 0.41</b>							

### Tai Mo To

Boulder/cobble shore with a flat profile was the major habitat of Tai Mo To. Qualitative and quantitative survey results of intertidal species recorded at the boulder shore of Tai Mo To are presented in **Table 4-19 to Table 4-21**. In the qualitative surveys, a total of 39 intertidal species were recorded at the area (see **Table 4-19**).

During the dry season, a total of 31 intertidal species were recorded at the boulder shore. Abundant species included *Echinolittorina radiata* and *Littoraria articulata* at high tidal zone; *Saccostrea cucullata*, *Littoraria articulata* and *Monodonta labio* at mid tidal zone; *Monodonta labio*, *Cellana toreuma* and *Ulva* spp. at low tidal zone. Species diversity index (*H'*) and species evenness index (*J'*) were 2.37 and 0.73 respectively.

During the wet season, a total of 31 intertidal species were recorded at the rocky shore habitat. Abundant species included *Littoraria articulata*, *Nerita albicilla* and *Ligia exotica* at high tidal zone; *Monodonta labio*

and *Hildenbrandia rubra* at mid tidal zones; *Monodonta labio* and *Saccostrea cucullata* low tidal zones. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 2.35 and 0.70 respectively.

Table 4-19: List of intertidal species recorded at rocky shore of Tai Mo To during field survey

Location: Tai Mo To	Number of species: 39
Categories	Scientific Name
Bivalve	<i>Barbatia virescens</i>
	<i>Saccostrea cucullata</i>
	<i>Septifer virgatus</i>
Cnidarian	<i>Diadumene lineata</i>
Crustacean	<i>Balanus amphitrite</i>
	<i>Capitulum mitella</i>
	<i>Clibanarius</i> spp.
	<i>Clibanarius virescens</i>
	<i>Epixanthus frontalis</i>
	<i>Microeuraphia withersi</i>
	<i>Gaetice depressus</i>
	<i>Hemigrapsus penicillatus</i>
	<i>Hemigrapsus sanguineus</i>
	<i>Ligia exotica</i>
	<i>Nanosesarma minutum</i>
	<i>Pagurus dubius</i>
	Unidentified crab
	Unidentified juvenile crab
Gastropod	<i>Cellana grata</i>
	<i>Cellana toreuma</i>
	<i>Chlorostoma argyrostoma</i>
	<i>Echinolittorina radiata</i>
	<i>Echinolittorina pascua</i>
	<i>Littoraria articulata</i>
	<i>Monodonta labio</i>
	<i>Nerita albicilla</i>
	<i>Nerita chamaeleon</i>
	<i>Nipponacmea concinna</i>
	<i>Patelloida pygmaea</i>
	<i>Siphonaria japonica</i>
	<i>Thais clavigera</i>
	Lichen, Cyanobacteria and Algae
<i>Endarachne binghamiae</i>	
<i>Hildenbrandia rubra</i>	
<i>Kyrtuthrix maculans</i>	
<i>Ralfsia expansa</i>	
<i>Ulva</i> spp.	
Worm	<i>Hydroides</i> spp.
	<i>Turbellaria</i>

Table 4-20: Intertidal species recorded at rocky shore of Tai Mo To in the dry season

Location: Tai Mo To	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		1%				
	<i>Saccostrea cucullata</i>		15%	3%		5%	10%
	<i>Septifer virgatus</i>		1%				1%
Cnidarian	<i>Diadumene lineata</i>		2	2		1	3
Crustacean	<i>Balanus amphitrite</i>	1%	1%	1%		1%	1%
	<i>Capitulum mitella</i>	1%	1%				
	<i>Clibanarius spp.</i>			5			
	<i>Clibanarius virescens</i>			6			
	<i>Gaetice depressus</i>		2	3		2	4
	<i>Hemigrapsus penicillatus</i>			1			
	<i>Ligia exotica</i>		7	1	4	5	6
	<i>Pagurus dubius</i>			12			
	Unidentified crab					1	1
	Unidentified juvenile crab		4	3		7	2
Gastropod	<i>Cellana grata</i>		1	1		3	1
	<i>Cellana toreuma</i>		2	15		12	10
	<i>Echinolittorina radiata</i>	31	6		4	3	
	<i>Echinolittorina pascua</i>	10					
	<i>Littoraria articulata</i>	24	19	4	20	15	
	<i>Monodonta labio</i>		7	43		34	22
	<i>Nerita albicilla</i>		7	7		11	6
	<i>Nipponacmea concinna</i>		3	3		3	1
	<i>Siphonaria japonica</i>		3				
	<i>Thais clavigera</i>						2
Lichen, Cyanobacteria and Algae	<i>Corallina spp.</i>		18%	1%		1%	6%
	<i>Endarachne binghamiae</i>			7%			9%
	<i>Hildenbrandia rubra</i>		18%	1%	70%		
	<i>Kyrtuthrix maculans</i>	100%	47%				
	<i>Ulva spp.</i>		14%	74%		29%	76%
Worm	<i>Hydroides spp.</i>		1	2		1	3
	<i>Turbellaria</i>		1	2			
<b>Total number of species = 31</b>							
<b>Species Diversity Index (H') = 2.37</b>							
<b>Species Evenness Index (J) = 0.73</b>							

Table 4-21: Intertidal species recorded at rocky shore of Tai Mo To in the wet season

Location: Tai Mo To	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		2%	1%			
	<i>Saccostrea cucullata</i>			22%		8%	23%
	<i>Septifer virgatus</i>			2%	1%	1%	1%
Cnidarian	<i>Diadumene lineata</i>		1	1			



Location: Tai Mo To	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Crustacean	<i>Balanus amphitrite</i>		2%	1%		1%	1%
	<i>Capitulum mitella</i>				2%		
	<i>Clibanarius virescens</i>			1			
	<i>Epixanthus frontalis</i>		4	2			
	<i>Microeuraphia withersi</i>		2%				
	<i>Gaetice depressus</i>		2			4	2
	<i>Hemigrapsus sanguineus</i>		2	1			3
	<i>Ligia exotica</i>	9		12	5	6	
	<i>Nanosesarma minutum</i>		1				
	<i>Pagurus dubius</i>			1			2
	Unidentified juvenile crab	1					
Gastropod	<i>Cellana grata</i>		1				
	<i>Cellana toreuma</i>		1	2			3
	<i>Chlorostoma argyrostoma</i>						2
	<i>Echinolittorina radiata</i>	2			12		
	<i>Echinolittorina pascua</i>				1		
	<i>Littoraria articulata</i>	26	3		20	1	
	<i>Monodonta labio</i>		13	11	1	5	10
	<i>Nerita albicilla</i>		4	2	62		3
	<i>Nerita chamaeleon</i>			1		2	
	<i>Nipponacmea concinna</i>			3			
	<i>Patelloida pygmaea</i>			2			1
	<i>Siphonaria japonica</i>				12	18	
	<i>Thais clavigera</i>			2			2
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.			1%			
	<i>Hildenbrandia rubra</i>			40%	45%	70%	
	<i>Ralfsia expansa</i>			20%			
<b>Total number of species = 31</b>							
<b>Species Diversity Index (<math>H'</math>) = 2.35</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.70</b>							

### South Chek Lap Kok

The rocky shore at South Chek Lap Kok, which was kept natural during land formation works at Chek Lap Kok for constructing the current Hong Kong International Airport, was a steep bedrock shore. Qualitative and quantitative survey results of intertidal species recorded at the rocky shore of South Chek Lap Kok are presented in **Table 4-22 to Table 4-24**. From the review of survey data for HZMB HKLR and the qualitative survey results for this Project, an overall total of 54 intertidal species were recorded at the area (see **Table 4-22**).

A total of 32 intertidal species were recorded at South Chek Lap Kok rocky shore habitat in the dry season. The survey results revealed that only rock oyster was abundant whilst other intertidal species are of low abundance. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 1.39 and 0.42 respectively.

During the wet season, a total of 36 intertidal species were recorded at the rocky shore habitat. Gastropod *Monodonta labio* was abundant. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 1.90 and 0.55 respectively.

Table 4-22: List of intertidal species recorded at rocky shore of South Chek Lap Kok

Location: South Chek Lap Kok	Number of species: 54	HZMB-HKLR EIA VES (2009)	Field Survey
Category	Scientific Name		
Bivalve	<i>Barbatia virescens</i>		Y
	<i>Perna viridis</i>	Y	Y
	<i>Saccostrea cucullata</i>	Y	Y
	<i>Septifer virgatus</i>	Y	Y
	<i>Trapezium sublaevigatum</i>	Y	Y
Cnidarian	<i>Diadumene lineata</i>	Y	Y
Crustacean	<i>Balanus amphitrite</i>		Y
	<i>Balanus reticulatus</i>	Y	
	<i>Chthamalus malayensis</i>		Y
	<i>Clibanarius virescens</i>		Y
	<i>Clibanarius striolatus</i>	Y	
	<i>Epixanthus frontalis</i>		Y
	<i>Gaetice depressus</i>	Y	Y
	<i>Hemigrapsus sanguineus</i>	Y	Y
	<i>Ligia exotica</i>	Y	Y
	<i>Leptodius exaratus</i>	Y	
	<i>Metopograpsus quadridentatus</i>		Y
	<i>Nanosesarma minutum</i>	Y	
	<i>Pagurus dubius</i>	Y	Y
	<i>Parasesarma pictum</i>	Y	Y
	<i>Tetraclita squamosa</i>		Y
	Unidentified juvenile crab		
Gastropod	<i>Cellana grata</i>	Y	Y
	<i>Cellana toreuma</i>	Y	Y
	<i>Chlorostoma argyrostoma</i>		Y
	<i>Echinolittorina radiata</i>	Y	Y
	<i>Echinolittorina pascua</i>		Y
	<i>Littoraria articulata</i>		Y
	<i>Littoraria sinensis</i>	Y	
	<i>Lunella coronata</i>		Y
	<i>Monodonta labio</i>	Y	Y
	<i>Monodonta nertoides</i>	Y	
	<i>Nerita albicilla</i>		Y
	<i>Nerita chamaeleon</i>		Y
	<i>Nerita squamulata</i>		Y
	<i>Nerita yoldii</i>	Y	
	<i>Nipponacmea concinna</i>		Y
	<i>Omphalius nigerrimus</i>	Y	
	<i>Patelloida pygmaea</i>	Y	Y
	<i>Patelloida saccharina</i>		Y
<i>Planaxis sulcatus</i>	Y	Y	

Location: South Chek Lap Kok	Number of species: 54	HZMB-HKLR EIA VES (2009)	Field Survey
Category	Scientific Name		
	<i>Siphonaria japonica</i>		Y
	<i>Thais clavigera</i>	Y	Y
	<i>Thais luteostoma</i>		Y
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.		Y
	<i>Corallina</i> spp.		Y
	<i>Hildenbrandia occidentalis</i>		Y
	<i>Hildenbrandia rubra</i>		Y
	<i>Kyrtuthrix maculans</i>		Y
	<i>Porphyra suborbiculata</i>	Y	Y
	<i>Ulva</i> spp.		Y
Worm	<i>Hydroides</i> sp.	Y	
	<i>Oligochaeta</i>		Y
Polyplacophora	<i>Acanthopleura japonica</i>		Y

Table 4-23: Intertidal species recorded at rocky shore of South Chek Lap Kok in the dry season

Location: South Chek Lap Kok	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		1%	2%		2%	2%
	<i>Perna viridis</i>						1%
	<i>Saccostrea cucullata</i>		64%	55%		75%	70%
	<i>Septifer virgatus</i>		1%	1%		1%	2%
Crustacean	<i>Chthamalus malayensis</i>			1%			
	<i>Clibanarius virescens</i>			1			1
	<i>Epixanthus frontalis</i>		2	1			
	<i>Pagurus dubius</i>		5	4		11	37
	<i>Tetraclita squamosa</i>						1%
	Unidentified juvenile crab		6	5			3
	<i>Metopograpsus quadridentatus</i>		1	1			
Gastropod	<i>Cellana grata</i>		1			2	1
	<i>Cellana toreuma</i>		8	4		8	6
	<i>Echinolittorina radiata</i>	21			15		
	<i>Echinolittorina pascua</i>	17			21		
	<i>Littoraria articulata</i>	10	2	6	14	13	
	<i>Lunella coronata</i>		4	3		6	11
	<i>Monodonta labio</i>		11	3		10	11
	<i>Nerita albicilla</i>		5			5	3
	<i>Nerita squamulata</i>		5	1		3	10
	<i>Nipponacmea concinna</i>		5	3		4	4
	<i>Patelloida pygmaea</i>		2	1		4	4
	<i>Patelloida saccharina</i>						2
	<i>Planaxis sulcatus</i>						8

Location: South Chek Lap Kok	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Siphonaria japonica</i>		4			4	5
	<i>Thais clavigera</i>		3	1		6	5
	<i>Thais luteostoma</i>		12				
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.						20%
	<i>Hildenbrandia rubra</i>		45%			20%	
	<i>Kyrtuthrix maculans</i>		13%			12%	
	<i>Ulva</i> spp.		10%				21%
Polyplacophora	<i>Acanthopleura japonica</i>		2				2
<b>Total number of species = 32</b>							
<b>Species Diversity Index (<math>H'</math>) = 1.39</b>							
<b>Species Evenness Index (<math>J</math>) = 0.42</b>							

Table 4-24: Intertidal species recorded at rocky shore of South Chek Lap Kok in the wet season

Location: South Chek Lap Kok	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		1%	5%		1%	3%
	<i>Perna viridis</i>						2%
	<i>Saccostrea cucullata</i>		68%	60%		35%	66%
	<i>Septifer virgatus</i>		1%	1%	1%	1%	2%
	<i>Trapezium sublaevigatum</i>			1%			1%
Cnidarian	<i>Diadumene lineata</i>					1	1
Crustacean	<i>Balanus amphitrite</i>		1%	1%			6%
	<i>Clibanarius virescens</i>						1
	<i>Gaetice depressus</i>			1			
	<i>Hemigrapsus sanguineus</i>					1	
	<i>Ligia exotica</i>				1		
	<i>Metopograpsus quadridentatus</i>			2		1	1
	<i>Pagurus dubius</i>						1
	<i>Parasesarma pictum</i>				1		
Gastropod	Unidentified juvenile crab			1		2	2
	<i>Cellana grata</i>	1	2			2	
	<i>Cellana toreuma</i>		9	15		5	20
	<i>Chlorostoma argyrostoma</i>						1
	<i>Echinolittorina radiata</i>	25	1		5		
	<i>Echinolittorina pascua</i>	13			4		
	<i>Littoraria articulata</i>	19	19	18	28	15	4
	<i>Lunella coronata</i>			6			2
	<i>Monodonta labio</i>		48	33		41	20
	<i>Nerita albicilla</i>		2	1		6	2
	<i>Nerita chamaeleon</i>		2	1		4	2
<i>Nerita squamulata</i>		1					
<i>Nipponacmea concinna</i>		2	12		3	7	

Location: South Chek Lap Kok	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Patelloida pygmaea</i>	1	4	6		2	8
	<i>Planaxis sulcatus</i>		1				
	<i>Thais clavigera</i>						5
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.		15%				
	<i>Corallina</i> spp.		18%	22%		1%	15%
	<i>Hildenbrandia occidentalis</i>						20%
	<i>Porphyra suborbiculata</i>						5%
	<i>Ulva</i> spp.		1%				
Worm	<i>Oligochaeta</i>						1
<b>Total number of species = 36</b>							
<b>Species Diversity Index (<math>H'</math>) = 1.90</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.55</b>							

### San Tau

The southern part of San Tau was composed of a steep bedrock shore with some backshore vegetation. Qualitative and quantitative survey results of intertidal species recorded at the rocky shore of San Tau are presented in **Table 4-25 to Table 4-27**. In the qualitative surveys, a total of 51 intertidal species were recorded at the area (see **Table 4-25**).

During the dry season, a total of 37 intertidal species were recorded at the rocky shore habitat. Abundant species included *Monodonta labio* at mid tidal zone; *Saccostrea cucullata* at low tidal zone. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 1.84 and 0.52 respectively.

During the wet season, a total of 36 intertidal species were recorded at the rocky shore habitat. Abundant species included *Littoraria articulata* at high tidal zone; *Monodonta labio* at mid tidal zone; *Saccostrea cucullata* at low tidal zone. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 1.89 and 0.54 respectively.

Table 4-25: List of intertidal species recorded at rocky shore of San Tau during field survey

Location: San Tau	Number of species: 51
Category	Scientific Name
Bivalve	<i>Barbatia virescens</i>
	<i>Isognomon isognomum</i>
	<i>Saccostrea cucullata</i>
	<i>Septifer virgatus</i>
	<i>Trapezium sublaevigatum</i>
Cnidarian	<i>Diadumene lineata</i>
Crustacean	<i>Balanus amphitrite</i>
	<i>Chthamalus malayensis</i>
	<i>Clibanarius virescens</i>
	<i>Hemigrapsus penicillatus</i>
	<i>Ligia exotica</i>
	<i>Metopograpsus quadridentatus</i>
	<i>Pagurus dubius</i>
	<i>Perisesarma bidens</i>

<b>Location: San Tau</b>	<b>Number of species: 51</b>
<b>Category</b>	<b>Scientific Name</b>
	<i>Unidentified juvenile crab</i>
	<i>Omobranchus fasciolatoceps</i>
	<i>Periophthalmus cantonensis</i>
Gastropod	<i>Batillaria multiformis</i>
	<i>Cellana grata</i>
	<i>Cellana toreuma</i>
	<i>Cerithidea cingulata</i>
	<i>Cerithidea djadjariensis</i>
	<i>Clypeomorus coralia</i>
	<i>Echinolittorina radiata</i>
	<i>Echinolittorina pascua</i>
	<i>Echinolittorina vidua</i>
	<i>Littoraria ardouiniana</i>
	<i>Littoraria articulata</i>
	<i>Littoraria articulata</i>
	<i>Littoraria melanostoma</i>
	<i>Littoraria pallescens</i>
	<i>Lunella coronata</i>
	<i>Monodonta labio</i>
	<i>Nerita albicilla</i>
	<i>Nerita chamaeleon</i>
	<i>Nipponacmea concinna</i>
	<i>Patelloida pygmaea</i>
	<i>Thais luteostoma</i>
	<i>Patelloida saccharina</i>
	<i>Siphonaria japonica</i>
	<i>Siphonaria sp.</i>
Lichen, Cyanobacteria and Algae	<i>Chroococcus sp.</i>
	<i>Corallina spp.</i>
	<i>Hildenbrandia rubra</i>
	<i>Kyrtuthrix maculans</i>
	<i>Ralfsia expansa</i>
	<i>Ulva spp.</i>
Polyplacophora	<i>Acanthopleura japonica</i>
Worm	<i>Phascolosoma scolops</i>
	<i>Ribbon worms (Nemertea)</i>
	<i>Siphonosoma cumanense</i>

Table 4-26: Intertidal species recorded at rocky shore of San Tau in the dry season

Location: San Tau	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		2%	13%		7%	9%
	<i>Isognomon isognomum</i>						1%
	<i>Saccostrea cucullata</i>		39%	62%		25%	60%
	<i>Septifer virgatus</i>		1%	1%		1%	1%

Location: San Tau	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Cnidarian	<i>Diadumene lineata</i>	1	3	1		3	1
Crustacean	<i>Balanus amphitrite</i>		1%	1%		1%	
	<i>Clibanarius virescens</i>					1	4
	<i>Hemigrapsus penicillatus</i>						2
	<i>Ligia exotica</i>				2		
	<i>Pagurus dubius</i>			2			
	Unidentified juvenile crab			1	1		3
Fish	<i>Omobranchus fasciolatocephs</i>						1
	<i>Periophthalmus modestus</i>				1		
Gastropod	<i>Batillaria multiformis</i>	1		1		4	
	<i>Cellana grata</i>		4				
	<i>Cellana toreuma</i>			9		1	10
	<i>Cerithidea cingulata</i>			1			
	<i>Cerithidea djadjariensis</i>					4	
	<i>Clypeomorus coralia</i>			1			
	<i>Echinolittorina radiata</i>	3					
	<i>Echinolittorina pascua</i>				13		
	<i>Echinolittorina vidua</i>		2			1	
	<i>Littoraria articulata</i>	7	5	1	5	2	
	<i>Lunella coronata</i>		1	7		6	11
	<i>Monodonta labio</i>	5	9	8	7	13	1
	<i>Nerita albicilla</i>			2			4
	<i>Nerita chamaeleon</i>		9	2		1	2
	<i>Nipponacmea concinna</i>		4	2		5	3
	<i>Patelloida pygmaea</i>		3	2		3	2
	<i>Patelloida saccharina</i>		4			7	8
	<i>Siphonaria japonica</i>				3		4
<i>Siphonaria</i> sp.		3					
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.			15%			12%
	<i>Kyrtuthrix maculans</i>		22%			15%	
	<i>Ralfsia expansa</i>						1%
	<i>Ulva</i> spp.		10%	1%			1%
Worm	<i>Phascolosoma scolops</i>						3
<b>Total number of species = 37</b>							
<b>Species Diversity Index (<math>H'</math>) = 1.84</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.52</b>							

Table 4-27: Intertidal species recorded at rocky shore of San Tau in the wet season

Location: San Tau	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		2%	9%		5%	11%
	<i>Saccostrea cucullata</i>		36%	54%		58%	78%
	<i>Septifer virgatus</i>	1%	14%	1%		1%	2%

Location: San Tau	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Trapezium sublaevigatum</i>			2%		2%	1%
Cnidarian	<i>Diadumene lineata</i>			2			1
Crustacean	<i>Balanus amphitrite</i>		1%	4%		1%	1%
	<i>Chthamalus malayensis</i>	1%			1%		
	<i>Ligia exotica</i>		1		2		
	<i>Metopograpsus quadridentatus</i>		1	1			1
	<i>Pagurus dubius</i>						4
	<i>Perisesarma bidens</i>			1			
	Unidentified crab		1				
	Unidentified juvenile crab	2		4	2	5	8
Gastropod	<i>Cellana grata</i>			2		2	
	<i>Cellana toreuma</i>		3	9		6	8
	<i>Echinolittorina radiata</i>	6	17		4		
	<i>Echinolittorina pascua</i>	10			6		
	<i>Littoraria arduiniana</i>	2					
	<i>Littoraria articulata</i>	16	10		9	8	4
	<i>Littoraria melanostoma</i>	4					
	<i>Littoraria pallescens</i>		1				
	<i>Lunella coronata</i>			5		1	
	<i>Monodonta labio</i>		36	10		17	15
	<i>Nerita albicilla</i>			4		1	
	<i>Nerita chamaeleon</i>			3			
	<i>Nipponacmea concinna</i>		3	14		5	
	<i>Patelloida pygmaea</i>		3	7		4	9
<i>Thais luteostoma</i>			1				
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.					10%	
	<i>Corallina</i> spp.			25%			13%
	<i>Hildenbrandia rubra</i>			30%			15%
	<i>Ulva</i> spp.					1%	
Polyplacophora	<i>Acanthopleura japonica</i>			1			
Worm	<i>Phascolosoma scolops</i>						1
	Ribbon worms (Nemertea)			1			
	<i>Siphonosoma cumanense</i>			2			
<b>Total number of species = 36</b>							
<b>Species Diversity Index (<math>H'</math>) = 1.89</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.54</b>							

### Hau Hok Wan

The western and eastern fringes of Hau Hok Wan were rocky shores composed of steep bedrock. Qualitative and quantitative survey results of intertidal species recorded at the rocky shore of Hau Hok Wan are presented in **Table 4-28 to Table 4-30**. From the review of survey data for HZMB HKLR and the qualitative survey results for this Project, an overall total of 44 intertidal species were recorded at the area (see **Table 4-28**).



During the dry season, a total of 33 intertidal species were recorded at the rocky shore habitat. Abundant species included *Echinolittorina radiata* and *Littoraria articulata* at high tidal zone; *Hildenbrandia rubra* at mid tidal zone; *Saccostrea cucullata* at low tidal zone. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 1.31 and 0.39 respectively.

During the wet season, a total of 30 intertidal species were recorded at the rocky shore habitat. Abundant species included *Echinolittorina radiata* and *Littoraria articulata* at high tidal zone; *Monodonta labio* at mid tidal zone; *Saccostrea cucullata* at low tidal zone. Species diversity index ( $H'$ ) and species evenness index ( $J'$ ) were 1.98 and 0.61 respectively.

Table 4-28: List of intertidal species recorded at rocky shore of Hau Hok Wan

Location: Hau Hok Wan	Number of species: 44	HZMB-HKLR EIA EBS (2004)	Field Survey
Category	Scientific Name		
Bivalve	<i>Barbatia virescens</i>		Y
	<i>Isognomon isognomonum</i>		Y
	<i>Saccostrea cucullata</i>	Y	Y
	<i>Septifer virgatus</i>		Y
	<i>Trapezium sublaevigatum</i>		Y
Cnidarian	<i>Diadumene lineata</i>		Y
Crustacean	<i>Balanus amphitrite</i>		Y
	<i>Chthamalus malayensis</i>		Y
	<i>Clibanarius virescens</i>	Y	Y
	<i>Epixanthus frontalis</i>		Y
	<i>Gaetice depressus</i>		Y
	<i>Metopograpsus quadridentatus</i>		Y
	<i>Pagurus dubius</i>	Y	Y
	Unidentified juvenile crab		Y
	<i>Hemigrapsus sanguineus</i>	Y	
Gastropod	<i>Cellana grata</i>		Y
	<i>Cellana toreuma</i>		Y
	<i>Cerithidea rhizophorarum</i>	Y	
	<i>Clithon</i> sp.	Y	
	<i>Echinolittorina radiata</i>		Y
	<i>Echinolittorina pascua</i>		Y
	<i>Echinolittorina vidua</i>		Y
	<i>Littoraria articulata</i>		Y
	<i>Lunella coronata</i>		Y
	<i>Monodonta labio</i>	Y	Y
	<i>Nassarius festivus</i>		Y
	<i>Nerita albicilla</i>		Y
	<i>Nerita squamulata</i>		Y
	<i>Nerita polita</i>	Y	
	<i>Nipponacmea concinna</i>		Y
	<i>Patelloida pygmaea</i>		Y
	<i>Pyramidella</i> sp.		Y
	<i>Siphonaria japonica</i>		Y
	<i>Thais clavigera</i>		Y
	<i>Thais luteostoma</i>		Y

Location: Hau Hok Wan	Number of species: 44	HZMB-HKLR EIA EBS (2004)	Field Survey
Category	Scientific Name		
	<i>Tectus pyramis</i>		Y
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.		Y
	<i>Corallina</i> spp.		Y
	<i>Hildenbrandia rubra</i>		Y
	<i>Kyrtuthrix maculans</i>		Y
	<i>Lyngbya</i> sp.		Y
	<i>Ulva</i> spp.		Y
Worm	<i>Turbellaria</i>		Y
Polyplacophora	<i>Acanthopleura japonica</i>		Y

Table 4-29: Intertidal species recorded at rocky shore of Hau Hok Wan in the dry season

Location : Hau Hok Wan	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		1%	3%		1%	2%
	<i>Saccostrea cucullata</i>		58%	40%		50%	56%
	<i>Septifer virgatus</i>		1%	1%		1%	1%
	<i>Trapezium sublaevigatum</i>			1%			1%
Cnidarian	<i>Diadumene lineata</i>		1	1			2
Crustacean	<i>Chthamalus malayensis</i>	1%					
	<i>Clibanarius virescens</i>		13				
	<i>Epixanthus frontalis</i>			1			
	<i>Gaetice depressus</i>			1			
	<i>Pagurus dubius</i>						6
	Unidentified juvenile crab					1	3
	<i>Metopograpsus quadridentatus</i>		2	2			
Gastropod	<i>Cellana grata</i>					4	
	<i>Cellana toreuma</i>		2	1		1	2
	<i>Echinolittorina radiata</i>	4			19	1	
	<i>Echinolittorina pascua</i>	1			9		
	<i>Echinolittorina vidua</i>	3					
	<i>Littoraria articulata</i>	36	5	5	15	2	
	<i>Lunella coronata</i>			5		3	7
	<i>Monodonta labio</i>		10	17	4	8	2
	<i>Nerita albicilla</i>		9	4		4	3
	<i>Nerita squamulata</i>		1	1		1	1
	<i>Nipponacmea concinna</i>		1	2		1	
	<i>Patelloida pygmaea</i>					2	1
	<i>Siphonaria japonica</i>		2			2	
	<i>Thais clavigera</i>		1	1		2	1
	<i>Thais luteostoma</i>						2
<i>Tectus pyramis</i>				1			
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.			5%			10%
	<i>Hildenbrandia rubra</i>		33%			43%	
	<i>Kyrtuthrix maculans</i>		5%			23%	
	<i>Ulva</i> spp.						10%
Polyplacophora	<i>Acanthopleura japonica</i>						1
<b>Total number of species = 33</b>							

Location : Hau Hok Wan	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Species Diversity Index ( $H'$ ) = 1.31							
Species Evenness Index ( $J'$ ) = 0.39							

Table 4-30: Intertidal species recorded at rocky shore of Hau Hok Wan in the wet season

Location: Hau Hok Wan	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		4%	7%			3%
	<i>Isognomon isognomum</i>			1%			4%
	<i>Saccostrea cucullata</i>		49%	72%		18%	72%
	<i>Septifer virgatus</i>		1%	1%		1%	1%
	<i>Trapezium sublaevigatum</i>		3%	1%			1%
Cnidarian	<i>Diadumene lineata</i>	1		3		2	3
Crustacean	<i>Balanus amphitrite</i>	1%		1%			1%
	<i>Chthamalus malayensis</i>	1%			5%		
	<i>Clibanarius virescens</i>						5
	<i>Metopograpsus quadridentatus</i>		2	2		1	
	<i>Pagurus dubius</i>						2
	Unidentified juvenile crab		3	3			8
Gastropod	<i>Cellana grata</i>		1			1	1
	<i>Cellana toreuma</i>	6	17	13		5	9
	<i>Echinolittorina radiata</i>	20	1		10		
	<i>Echinolittorina pascua</i>	24			2		
	<i>Littoraria articulata</i>	16	12		23	5	2
	<i>Lunella coronata</i>		2	4		6	20
	<i>Monodonta labio</i>	5	33	10	1	26	6
	<i>Nassarius festivus</i>						7
	<i>Nerita albicilla</i>	1	9	15		14	8
	<i>Nipponacmea concinna</i>		2	2		1	4
	<i>Patelloida pygmaea</i>			8			
	<i>Pyramidella</i> sp.		1				1
<i>Thais clavigera</i>						7	
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.		19%			37%	
	<i>Corallina</i> spp.		30%	20%			20%
	<i>Hildenbrandia rubra</i>	10%	30%	30%		34%	40%
	<i>Lyngbya</i> sp.	6%					
Worm	<i>Turbellaria</i>	4					
<b>Total number of species = 30</b>							
<b>Species Diversity Index (<math>H'</math>) = 1.98</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.61</b>							

## Sham Wat Wan

Similar to Hau Hok Wan, the western and eastern sides of Sham Wat Wan were steep bedrock shores. Qualitative and quantitative survey results of intertidal species recorded at the rocky shore of Sham Wat Wan are presented in **Table 4-31 to Table 4-33**. In the qualitative surveys, a total of 46 intertidal species were recorded at the area (see **Table 4-31**).

During the dry season, a total of 40 intertidal species were recorded at the rocky shore habitat. Abundant species included *Echinolittorina radiata* at high tidal zone; *Littoraria articulata* and *Monodonta labio* at mid tidal zone; *Saccostrea cucullata* at low tidal zone. Species diversity index (*H'*) and species evenness index (*J'*) were 2.20 and 0.61 respectively.

During the wet season, a total of 30 intertidal species were recorded at the rocky shore habitat. Abundant species included *Echinolittorina pascua* at high tidal zone; *Saccostrea cucullata* and *Littoraria articulata* at both mid and low tidal zones. Species diversity index (*H'*) and species evenness index (*J'*) were 2.04 and 0.62 respectively.

Table 4-31: List of intertidal species recorded at rocky shore of Sham Wat Wan during field survey

Location: Sham Wat Wan	Number of species: 46
Category	Scientific Name
Bivalve	<i>Barbatia virescens</i>
	<i>Perna viridis</i>
	<i>Saccostrea cucullata</i>
	<i>Septifer virgatus</i>
	<i>Trapezium sublaevigatum</i>
Cnidarian	<i>Diadumene lineata</i>
Crustacean	<i>Balanus albicostatus</i>
	<i>Balanus amphitrite</i>
	<i>Chthamalus malayensis</i>
	<i>Clibanarius</i> spp.
	<i>Clibanarius virescens</i>
	<i>Epixanthus frontalis</i>
	<i>Gaetice depressus</i>
	<i>Hemigrapsus sanguineus</i>
	<i>Ligia exotica</i>
	<i>Nanosesarma minutum</i>
	<i>Pagurus dubius</i>
	Unidentified crab
	Unidentified juvenile crab
	Gastropod
<i>Cellana toreuma</i>	
<i>Echinolittorina radiata</i>	
<i>Echinolittorina pascua</i>	
<i>Echinolittorina vidua</i>	
<i>Littoraria articulata</i>	
<i>Monodonta labio</i>	
<i>Nerita albicilla</i>	
<i>Nerita chamaeleon</i>	
<i>Nerita squamulata</i>	

<b>Location: Sham Wat Wan</b>	<b>Number of species: 46</b>
<b>Category</b>	<b>Scientific Name</b>
	<i>Nipponacmea concinna</i>
	<i>Patelloida pygmaea</i>
	<i>Patelloida saccharina</i>
	<i>Planaxis sulcatus</i>
	<i>Siphonaria japonica</i>
	<i>Siphonaria laciniosa</i>
	<i>Siphonaria</i> sp.
	<i>Thais clavigera</i>
	<i>Thais luteostoma</i>
	<i>Onchidium verrucosa</i>
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.
	<i>Corallina</i> spp.
	<i>Hildenbrandia rubra</i>
	<i>Kyrtuthrix maculans</i>
	<i>Ulva</i> spp.
Worm	<i>Hydroides</i> spp.
	Ribbon worms ( <i>Nemertea</i> )

Table 4-32: Intertidal species recorded at rocky shore of Sham Wat Wan in the dry season

Location: Sham Wat Wan	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		1%	7%		1%	2%
	<i>Saccostrea cucullata</i>		52%	40%		60%	82%
	<i>Septifer virgatus</i>		1%	2%		2%	4%
	<i>Trapezium sublaevigatum</i>						2%
Cnidarian	<i>Diadumene lineata</i>		6	6		2	4
Crustacean	<i>Balanus albicostatus</i>			1%			
	<i>Balanus amphitrite</i>		1%	3%		2%	7%
	<i>Chthamalus malayensis</i>				1%	1%	
	<i>Clibanarius virescens</i>			1			1
	<i>Epixanthus frontalis</i>			1			
	<i>Gaetice depressus</i>			2	1		
	<i>Hemigrapsus sanguineus</i>		1				1
	<i>Ligia exotica</i>		4		1		
	<i>Nanosesarma minutum</i>			2			
	<i>Pagurus dubius</i>			3			1
	Unidentified crab	1					
Unidentified juvenile crab			4		3	16	
Gastropod	<i>Cellana grata</i>		2				
	<i>Cellana toreuma</i>		9	14		8	16
	<i>Echinolittorina radiata</i>	147			16		
	<i>Echinolittorina pascua</i>	55			19		
	<i>Echinolittorina vidua</i>					1	
	<i>Littoraria articulata</i>	1	33	1	20	42	33
	<i>Monodonta labio</i>		25	16		20	1

Location: Sham Wat Wan	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Nerita albicilla</i>		1	1		7	11
	<i>Nerita squamulata</i>			2		6	7
	<i>Nipponacmea concinna</i>		3	26		1	4
	<i>Patelloida pygmaea</i>		1	1		4	
	<i>Patelloida saccharina</i>		7				
	<i>Planaxis sulcatus</i>		3			2	
	<i>Siphonaria japonica</i>		1	1			
	<i>Siphonaria laciniosa</i>			1			
	<i>Siphonaria</i> sp.					1	
	<i>Thais clavigera</i>			2			23
	<i>Thais luteostoma</i>			2			10
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.			48%		5%	11%
	<i>Hildenbrandia rubra</i>		29%	10%		33%	10%
	<i>Kyrtuthrix maculans</i>		20%			5%	
	<i>Ulva</i> spp.		3%	11%			
Worm	<i>Hydroides</i> spp.						1
<b>Total number of species = 40</b>							
<b>Species Diversity Index (<math>H'</math>) = 2.20</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.61</b>							

Table 4-33: Intertidal species recorded at rocky shore of Sham Wat Wan in the wet season

Location: Sham Wat Wan	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>			1%		3%	21%
	<i>Perna viridis</i>						1%
	<i>Saccostrea cucullata</i>		59%	72%		70%	46%
	<i>Septifer virgatus</i>		3%	3%		2%	3%
Cnidarian	<i>Diadumene lineata</i>		1	1		2	1
Crustacean	<i>Balanus amphitrite</i>		1%	22%		1%	1%
	<i>Chthamalus malayensis</i>	1%					
	<i>Clibanarius</i> spp.					4	
	<i>Hemigrapsus sanguineus</i>			1		1	
	<i>Ligia exotica</i>		1	1		1	
	<i>Pagurus dubius</i>					3	
	Unidentified juvenile crab		2	3		17	12
Gastropod	<i>Cellana toreuma</i>		1			6	5
	<i>Echinolittorina radiata</i>	6	14		3		
	<i>Echinolittorina pascua</i>	29	3		45		
	<i>Littoraria articulata</i>	2	53	46	1	1	
	<i>Monodonta labio</i>		1			6	
	<i>Nerita albicilla</i>		1			4	
	<i>Nerita chamaeleon</i>		3	5		1	1
	<i>Nipponacmea concinna</i>					5	

Location: Sham Wat Wan	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Patelloida pygmaea</i>			2		5	1
	<i>Patelloida saccharina</i>					1	
	<i>Planaxis sulcatus</i>						1
	<i>Siphonaria japonica</i>						1
	<i>Thais clavigera</i>					1	5
	<i>Onchidium verrucosa</i>			1			
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.		2%	2%			
	<i>Hildenbrandia rubra</i>		26%	28%		16%	26%
	<i>Ulva</i> spp.						3%
Worm	Ribbon worms (Nemertea)					1	
<b>Total number of species = 30</b>							
<b>Species Diversity Index (<i>H'</i>) = 2.04</b>							
<b>Species Evenness Index (<i>J'</i>) = 0.62</b>							

## Tai O

At North Tai O, two types of rocky shores – flat boulder beach at mid-low tide (Transect 1) and steep exposed bedrock (Transect 2) – were observed. Qualitative and quantitative survey results of intertidal species recorded at the rocky shore of Tai O are presented in **Table 4-34 to Table 4-36**. In the qualitative surveys, a total of 44 intertidal species were recorded at the area (see **Table 4-34**).

During the dry season, a total of 36 intertidal species were recorded at the rocky shore habitat. Abundant species included *Echinolittorina radiata*, *Echinolittorina malaccana* and *Hildenbrandia rubra* at high tidal zone; *Saccostrea cucullata* at mid tidal zone; *Monodonta labio* and *Saccostrea cucullata* at low tidal zone. Species diversity index (*H'*) and species evenness index (*J'*) were 2.05 and 0.60 respectively.

During the wet season, a total of 38 intertidal species were recorded at the rocky shore habitat. Abundant species included *Echinolittorina radiata* at high tidal zone; *Saccostrea cucullata* at mid tidal zone; *Nipponacmea concinna* and *Saccostrea cucullata* at low tidal zone. Species diversity index (*H'*) and species evenness index (*J'*) were 2.11 and 0.59 respectively.

Table 4-34: List of intertidal species recorded at rocky shore of Tai O during field survey

Location: Tai O	Number of species: 44
Category	Species name
Bivalve	<i>Barbatia virescens</i>
	<i>Isognomon isognomum</i>
	<i>Saccostrea cucullata</i>
	<i>Septifer virgatus</i>
	<i>Trapezium sublaevigatum</i>
Cnidarian	<i>Diadumene lineata</i>
Crustacean	<i>Balanus amphitrite</i>
	<i>Capitulum mitella</i>
	<i>Chthamalus malayensis</i>
	<i>Clibanarius virescens</i>
	<i>Epixanthus frontalis</i>
	<i>Gaetice depressus</i>

<b>Location: Tai O</b>	<b>Number of species: 44</b>
<b>Category</b>	<b>Species name</b>
	<i>Hemigrapsus penicillatus</i>
	<i>Hemigrapsus sanguineus</i>
	<i>Ligia exotica</i>
	<i>Nanosesarma minutum</i>
	<i>Pagurus dubius</i>
	<i>Palaemon serrifer</i>
	<i>Petrolisthes japonica</i>
	<i>Tetraclita squamosa</i>
	<i>Unidentified juvenile crab</i>
Fish	<i>Omobranchus fasciolatoceps</i>
Gastropod	<i>Batillaria multiformis</i>
	<i>Cellana grata</i>
	<i>Cellana toreuma</i>
	<i>Echinolittorina radiata</i>
	<i>Echinolittorina pascua</i>
	<i>Echinolittorina vidua</i>
	<i>Littoraria articulata</i>
	<i>Lunella coronata</i>
	<i>Monodonta labio</i>
	<i>Nerita albicilla</i>
	<i>Nerita squamulata</i>
	<i>Nipponacmea concinna</i>
	<i>Patelloida pygmaea</i>
	<i>Siphonaria japonica</i>
	<i>Thais clavigera</i>
	<i>Thais luteostoma</i>
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.
	<i>Corallina</i> spp.
	<i>Hildenbrandia rubra</i>
	<i>Kyrtuthrix maculans</i>
	<i>Ralfsia expansa</i>
	<i>Ulva</i> spp.

Table 4-35: Intertidal species recorded at rocky shore of Tai O in the dry season

Location: Tai O	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
		High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		1%	1%		1%	2%
	<i>Saccostrea cucullata</i>		51%	44%		51%	58%
	<i>Septifer virgatus</i>		1%	1%		1%	1%
	<i>Trapezium sublaevigatum</i>						1%
Cnidarian	<i>Diadumene lineata</i>		2	3		2	4
Crustacean	<i>Balanus amphitrite</i>			1%		1%	1%
	<i>Clibanarius virescens</i>			1			
	<i>Epixanthus frontalis</i>			1			
	<i>Gaetice depressus</i>		1	1			



Location: Tai O	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Hemigrapsus penicillatus</i>		3	4			
	<i>Hemigrapsus sanguineus</i>		1	2			
	<i>Ligia exotica</i>		2		3		
	<i>Pagurus dubius</i>		1	5			
	<i>Tetraclita squamosa</i>						1%
	Unidentified juvenile crab				7		7
Gastropod	<i>Batillaria multiformis</i>		38	23		2	
	<i>Cellana grata</i>		2	2			
	<i>Cellana toreuma</i>		7	8		5	11
	<i>Echinolittorina radiata</i>	33	1		29	3	
	<i>Echinolittorina pascua</i>	50			23		
	<i>Echinolittorina vidua</i>	3				1	
	<i>Littoraria articulata</i>	12	6		9	7	
	<i>Lunella coronata</i>			1			
	<i>Monodonta labio</i>	1	17	40		6	1
	<i>Nerita albicilla</i>		6	4		6	2
	<i>Nerita squamulata</i>			3			2
	<i>Nipponacmea concinna</i>		4	11		1	11
	<i>Patelloida pygmaea</i>			3		1	3
	<i>Siphonaria japonica</i>		4	2		5	18
	<i>Thais clavigera</i>			1			2
<i>Thais luteostoma</i>						2	
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.		1%	5%		5%	48%
	<i>Hildenbrandia rubra</i>	90%	63%		76%		
	<i>Kyrtuthrix maculans</i>	10%			23%	70%	
	<i>Ralfsia expansa</i>						1%
	<i>Ulva</i> spp.		35%	80%		5%	9%
<b>Total number of species = 36</b>							
<b>Species Diversity Index (<math>H'</math>) = 2.05</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.60</b>							

Table 4-36: Intertidal species recorded at rocky shore of Tai O In the wet season

Location: Tai O	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		8%	1%		4%	4%
	<i>Isognomon isognomum</i>			1%			
	<i>Saccostrea cucullata</i>		45%	56%		56%	86%
	<i>Septifer virgatus</i>		1%	1%	1%	1%	7%
	<i>Trapezium sublaevigatum</i>			1%			
Cnidarian	<i>Diadumene lineata</i>		2	4		3	3
Crustacean	<i>Balanus amphitrite</i>		1%	4%		1%	2%
	<i>Capitulum mitella</i>		8%				
	<i>Chthamalus malayensis</i>				1%		

Location: Tai O	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Clibanarius virescens</i>			3			1
	<i>Epixanthus frontalis</i>			1			
	<i>Gaetice depressus</i>			1			
	<i>Ligia exotica</i>	1	1				
	<i>Nanosesarma minutum</i>			1			
	<i>Pagurus dubius</i>			1		1	2
	<i>Palaemon serrifer</i>			1			
	<i>Petrolisthes japonica</i>			1			
	<i>Tetraclita squamosa</i>		2%	1%			
	Unidentified juvenile crab	1		4			4
Fish	<i>Omobranchus fasciolatoceps</i>			1			
Gastropod	<i>Cellana grata</i>		2			1	
	<i>Cellana toreuma</i>		8	5		35	22
	<i>Echinolittorina radiata</i>	88	63		52		
	<i>Echinolittorina pascua</i>	65	43		14		
	<i>Littoraria articulata</i>	2	11		12	27	
	<i>Lunella coronata</i>			3			2
	<i>Monodonta labio</i>		9	34		12	
	<i>Nerita albicilla</i>		4	5		1	1
	<i>Nerita squamulata</i>						1
	<i>Nipponacmea concinna</i>		8	26		4	12
	<i>Patelloida pygmaea</i>						1
	<i>Siphonaria japonica</i>		1	2		1	
	<i>Thais clavigera</i>				3	5	1
	<i>Thais luteostoma</i>				1		1
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.	2%	25%			40%	
	<i>Corallina</i> spp.			38%		26%	73%
	<i>Hildenbrandia rubra</i>	80%	47%		23%	15%	
	<i>Ulva</i> spp.		27%	30%		17%	26%
<b>Total number of species = 38</b>							
<b>Species Diversity Index (<math>H'</math>) = 2.11</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.59</b>							

### Summary of Ecological Baseline Condition of Rocky Shores

Findings of desktop review and qualitative surveys are summarised in **Table 4-37** below.

Table 4-37: Species number at each rocky shore obtained from literature review and qualitative surveys

Location	Sheung Sha Chau	Sha Chau	Tai Mo To	South Chek Lap Kok <sup>(1)</sup>	San Tau	Hau Hok Wan <sup>(2)</sup>	Sham Wat Wan	Tai O
No. of intertidal species	29	50	39	54	51	44	46	44

Source of Literature Review: (1) VES, HZMB HKBCF & HKLR EIA (2009)

(2) EBS, HZMB HKBCF & HKLR EIA (2004)

Findings of quantitative surveys for this Project at different survey locations are summarised in **Table 4-38** below.

Table 4-38: Species number, diversity index ( $H'$ ) and evenness index ( $J'$ ) recorded at each rocky shore

Survey Location	Sheung Sha Chau		Sha Chau		Tai Mo To		South Chek Lap Kok		San Tau		Hau Hok Wan		Sham Wat Wan		Tai O	
	D	W	D	W	D	W	D	W	D	W	D	W	D	W	D	W
Number of species	19	26	38	35	31	31	32	36	37	36	33	30	40	30	36	38
$H'$	1.46	2.06	2.02	1.43	2.37	2.35	1.39	1.90	1.84	1.89	1.31	1.98	2.20	2.04	2.05	2.11
$J'$	0.52	0.67	0.56	0.41	0.73	0.70	0.42	0.55	0.52	0.54	0.39	0.61	0.61	0.62	0.60	0.59

(1) D = dry season; W = wet season

From desktop review and field survey results, overall the species diversity and evenness at the undisturbed rocky shores of north-western Lantau, Sha Chau area and Tai Mo To are moderate. Rocky shores at South Chek Lap Kok and San Tau, where more human disturbance is present, have relatively lower species diversity and evenness. Abundant species found at the rocky shores were *Echinolittorina radiata*, *Littoraria articulata*, *Monodonta labio* and *Saccostrea cucullata*. All species recorded were common in rocky shores of Hong Kong. No species of conservation importance was recorded at this habitat.

### 4.3 Sandy Shores

Surveys at sandy shore habitats were conducted at the following locations:

- Sha Chau
- Yan O
- Tai Ho Wan
- Tung Chung Bay
- San Tau
- Hau Hok Wan
- Sha Lo Wan
- Sham Wat Wan

For each survey location, qualitative survey results were listed with literature review, where appropriate, to obtain a more complete list of species for habitat evaluation and assessment. Quantitative survey results in dry and wet seasons at each location were also presented. Representative photo of the sandy shore habitat is presented in **Plate 4-2**.



Plate 4-2 Representative Photo of Sandy Shore Habitat at Sha Lo Wan

### Sha Chau

Open beaches of coarser sand and gravel were found on Sha Chau. Qualitative and quantitative survey results of intertidal species recorded at the sandy shore habitat of Sha Chau are presented in **Table 4-39 to Table 4-41**. In the qualitative surveys, a total of 18 intertidal species were recorded at the area (see **Table 4-39**).

During the dry season, a total of 12 intertidal species were recorded at the sandy shore habitat. Abundant species was *Littoraria articulata*. Species diversity index ( $H'$ ) was 1.07 and species evenness index ( $J'$ ) was 0.46.

During the wet season, bare coarse sand without any intertidal fauna was recorded at Transect 2. A total of 11 intertidal species were recorded at the sandy shore habitat of Transect 1. *Saccostrea cucullata* was more abundant. Species diversity index ( $H'$ ) was 1.11 and species evenness index ( $J'$ ) was 0.48.

Table 4-39: List of intertidal species recorded at sandy shore of Sha Chau during field survey

Location: Sha Chau	Number of species: 18
Category	Scientific Name
Bivalve	<i>Donax</i> spp.
	<i>Saccostrea cucullata</i>
	<i>Septifer virgatus</i>
Cnidarian	<i>Diadumene lineata</i>
Crustacean	<i>Balanus amphitrite</i>
	<i>Gaetice depressus</i>
	<i>Hemigrapsus penicillatus</i>
	<i>Ocypode ceratophthalma</i>
	<i>Pagurus dubius</i>
	<i>Tetraclita squamosa</i>
Gastropod	<i>Cellana toreuma</i>
	<i>Collisella dorsuosa</i>
	<i>Littoraria articulata</i>
	<i>Monodonta labio</i>
	<i>Nerita squamulata</i>
Lichen, Cyanobacteria and	<i>Chroococcus</i> sp.

<b>Location: Sha Chau</b>	<b>Number of species: 18</b>
<b>Category</b>	<b>Scientific Name</b>
Algae	<i>Corallina</i> spp.
	<i>Ralfsia expansa</i>

Table 4-40: Intertidal species recorded at sandy shore of Sha Chau in the dry season

Location: Sha Chau	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Donax</i> spp.					1	
	<i>Saccostrea cucullata</i>		7%	2%		20%	10%
	<i>Septifer virgatus</i>		1%	1%		1%	1%
Crustacean	<i>Balanus amphitrite</i>	1%	17%	7%			1%
	<i>Ocypode ceratophthalma</i>		1				
	<i>Pagurus dubius</i>						3
Gastropod	<i>Cellana toreuma</i>					1	
	<i>Collisella dorsuosa</i>					1	
	<i>Littoraria articulata</i>	9	52	1			
	<i>Monodonta labio</i>					1	
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.		60%				
	<i>Ralfsia expansa</i>	100%		40%			13%
<b>Total number of species = 12</b>							
<b>Species Diversity Index (<i>H'</i>) = 1.07</b>							
<b>Species Evenness Index (<i>J'</i>) = 0.46</b>							

Table 4-41: Intertidal species recorded at sandy shore of Sha Chau in the wet season

Location: Sha Chau	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Donax</i> spp.			6			
	<i>Saccostrea cucullata</i>		15%	11%			
	<i>Septifer virgatus</i>		2%	1%			
Cnidarian	<i>Diadumene lineata</i>			1			
Crustacean	<i>Balanus amphitrite</i>		1%				
	<i>Gaetice depressus</i>			1			
	<i>Hemigrapsus penicillatus</i>			1			
	<i>Tetraclita squamosa</i>		1%				
Gastropod	<i>Littoraria articulata</i>			1			
	<i>Nerita squamulata</i>			1			
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.			1%			
<b>Total number of species = 11</b>							
<b>Species Diversity Index (<i>H'</i>) = 1.11</b>							
<b>Species Evenness Index (<i>J'</i>) = 0.48</b>							

## Yan O

An open beach of fine sand, coarser sand and gravel was found at Yan O where it is distant from the project area. Qualitative and quantitative survey results of intertidal species recorded at the sandy shore habitat of Yan O are presented in **Table 4-42 to Table 4-44**. As the shoreline of this sandy habitat is relatively short, one transect was deployed for quantitative survey. In the qualitative surveys, a total of 28 intertidal species were recorded at the area (see **Table 4-42**).

During the dry season, a total of 22 intertidal species were recorded at the sandy shore habitat. The most abundant species was *Tapes philippinarum* while other species are not abundant. Species diversity index ( $H'$ ) was 2.06 and species evenness index ( $J'$ ) was 0.67.

During the wet season, a total of 17 intertidal species were recorded at the sandy shore habitat. Abundant species included *Tapes philippinarum* and *Batillaria zonalis*, while other species are occasional. Species diversity index ( $H'$ ) was 1.41 and species evenness index ( $J'$ ) was 0.50.

It was noted that among all the sandy shores surveyed, the sandy shore of Yan O was found having the highest abundance of burrowing bivalve species.

Table 4-42: List of intertidal species recorded at sandy shore of Yan O during field survey

Location: Yan O	Number of species: 28
Category	Scientific Name
Bivalve	<i>Cyclina sinensis</i>
	<i>Donax spp.</i>
	<i>Dosinia japonica</i>
	<i>Marcia hiantina</i>
	<i>Meretrix meretrix</i>
	<i>Saccostrea cucullata</i>
	<i>Septifer virgatus</i>
	<i>Tapes philippinarum</i>
	<i>Tapes variegatus</i>
	<i>Ervilia sp.</i>
	<i>Soletellina diphos</i>
Cnidarian	<i>Diadumene lineata</i>
Crustacean	<i>Balanus amphitrite</i>
	<i>Clibanarius virescens</i>
	<i>Pagurus dubius</i>
	Unidentified juvenile crab
Gastropod	<i>Batillaria multiformis</i>
	<i>Batillaria zonalis</i>
	<i>Cellana grata</i>
	<i>Cerithidea cingulata</i>
	<i>Cerithidea djadjariensis</i>
	<i>Clithon oualaniensis</i>
	<i>Littoraria articulata</i>
	<i>Lunella coronata</i>
	<i>Nassarius festivus</i>
	<i>Nipponacmea concinna</i>
	<i>Patelloida pygmaea</i>

<b>Location: Yan O</b>	<b>Number of species: 28</b>
<b>Category</b>	<b>Scientific Name</b>
Worm	<i>Oligochaeta</i>

Table 4-43: Intertidal species recorded at sandy shore of Yan O in the dry season

Location: Yan O	Season: Dry	Average Abundance/ Percentage Cover		
		Transect 1		
Category	Scientific Name	High	Mid	Low
Bivalve	<i>Donax</i> spp.	2	1	
	<i>Marcia hiantina</i>		1	
	<i>Meretrix meretrix</i>	1		1
	<i>Saccostrea cucullata</i>	16%		6%
	<i>Septifer virgatus</i>	1%		
	<i>Tapes philippinarum</i>		7	20
Cnidarian	<i>Diadumene lineata</i>			1
Crustacean	<i>Balanus amphitrite</i>	1%	1%	1%
	<i>Clibanarius virescens</i>			2
	<i>Pagurus dubius</i>			3
	Unidentified juvenile crab	1		
Gastropod	<i>Batillaria multiformis</i>			1
	<i>Batillaria zonalis</i>			4
	<i>Cellana grata</i>	1		
	<i>Cerithidea cingulata</i>		1	4
	<i>Cerithidea djadjariensis</i>		1	
	<i>Clithon oualaniensis</i>		1	
	<i>Littoraria articulata</i>	3		
	<i>Lunella coronata</i>	1	2	4
	<i>Nassarius festivus</i>		3	4
	<i>Nipponacmea concinna</i>			1
<i>Patelloida pygmaea</i>	1			
<b>Total number of species = 22</b>				
<b>Species Diversity Index (<math>H'</math>) = 2.06</b>				
<b>Species Evenness Index (<math>J'</math>) = 0.67</b>				

Table 4-44: Intertidal species recorded at sandy shore of Yan O in the wet season

Location: Yan O	Season: Wet	Average Abundance/ Percentage Cover		
		Transect 1		
Category	Scientific Name	High	Mid	Low
Bivalve	<i>Cyclina sinensis</i>		3	
	<i>Donax</i> spp.	1	1	
	<i>Dosinia japonica</i>	2	1	
	<i>Marcia hiantina</i>	1	1	
	<i>Meretrix meretrix</i>	1		1
	<i>Tapes philippinarum</i>		5	29
	<i>Tapes variegatus</i>		2	
	<i>Ervilia</i> sp.	1	3	

Location: Yan O	Season: Wet	Average Abundance/ Percentage Cover		
		Transect 1		
Category	Scientific Name	High	Mid	Low
	<i>Soletellina diphos</i>			1
Cnidarian	<i>Diadumene lineata</i>		1	
Crustacean	<i>Balanus amphitrite</i>		3%	
	Unidentified juvenile crab		1	
Gastropod	<i>Batillaria multiformis</i>			1
	<i>Batillaria zonalis</i>			31
	<i>Cerithidea cingulata</i>			4
	<i>Cerithidea djadjariensis</i>			1
Worm	<i>Oligochaeta</i>		1	
<b>Total number of species = 17</b>				
<b>Species Diversity Index (<math>H'</math>) = 1.41</b>				
<b>Species Evenness Index (<math>J'</math>) = 0.50</b>				

### Tai Ho Wan

The sheltered shore at Tai Ho Wan was studied and surveyed. Fine sand and silty sand with some boulders were observed at this flat shore. Qualitative and quantitative survey results of intertidal species recorded are presented in **Table 4-45 to Table 4-47**. From the review of survey data for HZMB HKBCF and the qualitative survey results for this Project, an overall total of 54 intertidal species were recorded at the area (see **Table 4-45**).

During the dry season, a total of 29 intertidal species were recorded at the sandy shore habitat. Abundant species included *Batillaria zonalis* and *Cerithidea cingulata*. *Batillaria multiformis*, *Cerithidea djadjariensis* and *Clithon faba* were frequently recorded, while *Balanus amphitrite*, *Saccostrea cucullata* and *Septifer virgatus* were frequently observed on boulders. Species diversity index ( $H'$ ) was 2.02 and species evenness index ( $J'$ ) was 0.60.

During the wet season, a total of 35 intertidal species were recorded at the sandy shore habitat. Abundant species included *Batillaria zonalis*, *Cerithidea cingulata* and *Cerithidea djadjariensis*. *Nerita chamaeleon* was frequently recorded, while *Balanus amphitrite*, *Saccostrea cucullata* and *Septifer virgatus* were frequently observed on boulders. Species diversity index ( $H'$ ) was 1.93 and species evenness index ( $J'$ ) was 0.54.

Table 4-45: List of intertidal species recorded at sandy shore of Tai Ho Wan

Location: Tai Ho Wan	Number of species: 54	HZMB-HKBCF EIA EBS (2004)	Field Survey
Category	Scientific Name		
Bivalve	<i>Barbatia virescens</i>		Y
	<i>Cyclina sinensis</i>		Y
	<i>Dosinia japonica</i>		Y
	<i>Geloina erosa</i>		Y
	<i>Isognomon isognomum</i>		Y
	<i>Saccostrea cucullata</i>		Y
	<i>Septifer virgatus</i>		Y
	<i>Tapes philippinarum</i>		Y
	<i>Tapes variegatus</i>		Y
	<i>Trapezium sublaevigatum</i>		Y



Location: Tai Ho Wan	Number of species: 54	HZMB-HKBCF EIA EBS (2004)	Field Survey
Category	Scientific Name		
	<i>Terebralia sulcata</i>	Y	
Cnidarian	<i>Diadumene lineata</i>		Y
Crustacean	<i>Balanus amphitrite</i>		Y
	<i>Balanus</i> sp.	Y	Y
	<i>Clibanarius virescens</i>		Y
	<i>Epixanthus frontalis</i>		Y
	<i>Gaetice depressus</i>		Y
	<i>Hemigrapsus penicillatus</i>		Y
	<i>Pagurus dubius</i>		Y
	<i>Parasesarma pictum</i>		Y
	<i>Uca lactea</i>		Y
	Unidentified crab		Y
	Unidentified juvenile crab		Y
Fish	<i>Periophthalmus cantonensis</i>		Y
Gastropod	<i>Assiminea brevicula</i>		Y
	<i>Batillaria multiformis</i>		Y
	<i>Batillaria zonalis</i>	Y	Y
	<i>Cellana toreuma</i>		Y
	<i>Cerithidea cingulata</i>		Y
	<i>Cerithidea djadjariensis</i>	Y	Y
	<i>Cerithidea rhizophorarum</i>	Y	
	<i>Cerithidea</i> sp.	Y	
	<i>Clithon faba</i>		Y
	<i>Clithon ovalaniensis</i>		Y
	<i>Clithon retropictus</i>		Y
	<i>Dostia violacea</i>	Y	
	<i>Nassarius festivus</i>		Y
	<i>Littoraria articulata</i>		Y
	<i>Lunella coronata</i>		Y
	<i>Monodonta labio</i>		Y
	<i>Morula musiva</i>		Y
	<i>Nerita albicilla</i>		Y
	<i>Nerita chamaeleon</i>		Y
	<i>Nerita polita</i>	Y	
	<i>Nerita striata</i>		Y
	<i>Nerita</i> sp.		Y
	<i>Nerita squamulata</i>		Y
	<i>Nipponacmea concinna</i>		Y
	<i>Onchidium verrucosa</i>		Y
	<i>Terebralia sulcata</i>		Y
	Polyplacophora	<i>Acanthopleura japonica</i>	
Worm	<i>Hydroides</i> spp.		Y
	<i>Phascolosoma scolops</i>		Y
	<i>Polycheata</i>		Y

Table 4-46: Intertidal species recorded at sandy shore of Tai Ho Wan in the dry season

Location: Tai Ho Wan	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>			1%			
	<i>Cyclina sinensis</i>					1	
	<i>Geloina erosa</i>				1		
	<i>Saccostrea cucullata</i>	23%	21%	8%	6%	4%	7%
	<i>Septifer virgatus</i>	1%	2%	1%	1%	1%	1%
	<i>Tapes philippinarum</i>						1
	<i>Trapezium sublaevigatum</i>	1			1		2
Cnidarian	<i>Diadumene lineata</i>	1		1			
Crustacean	<i>Balanus amphitrite</i>	2%	1%	1%	1%	2%	1%
	<i>Clibanarius virescens</i>		1				
	<i>Gaetice depressus</i>	1					
	Unidentified juvenile crab	5		2			1
Fish	<i>Periophthalmus modestus</i>	1					
Gastropod	<i>Assiminea brevicula</i>				5		
	<i>Batillaria multiformis</i>	2	2		7	3	14
	<i>Batillaria zonalis</i>	6	14	15	36	30	52
	<i>Cellana toreuma</i>	1					
	<i>Cerithidea cingulata</i>	13	11	9	30	17	26
	<i>Cerithidea djadjariensis</i>		13		8	19	24
	<i>Clithon faba</i>	1		8	3	2	2
	<i>Clithon oualaniensis</i>				1	1	
	<i>Clithon retropictus</i>				2		1
	<i>Nassarius festivus</i>		1	7		2	2
	<i>Nerita albicilla</i>				4	1	1
	<i>Nerita chamaeleon</i>	4	1				
	<i>Nerita</i> sp.	6	21				
	<i>Nerita squamulata</i>				1	1	3
Worm	<i>Hydroides</i> spp.	3	5				
	<i>Phascolosoma scolops</i>	1		1			2
<b>Total number of species = 29</b>							
<b>Species Diversity Index (<math>H'</math>) = 2.02</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.60</b>							

Table 4-47: Intertidal species recorded at sandy shore of Tai Ho Wan in the wet season

Location: Tai Ho Wan	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>			3%			
	<i>Dosinia japonica</i>			1			
	<i>Geloina erosa</i>				7	6	
	<i>Isognomon isognomum</i>			2%			
	<i>Saccostrea cucullata</i>	14%	13%	24%	6%	10%	7%
	<i>Septifer virgatus</i>	1%	2%	8%	2%	2%	2%

Location: Tai Ho Wan	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Tapes variegatus</i>			1			
	<i>Trapezium sublaevigatum</i>	1		2			
Crustacean	<i>Balanus amphitrite</i>	1%	1%	3%	1%	2%	2%
	<i>Epixanthus frontalis</i>			1			
	<i>Hemigrapsus penicillatus</i>	3	2	2			3
	<i>Pagurus dubius</i>	2	1	2			
	<i>Parasesarma pictum</i>					1	
	<i>Uca lactea</i>				1		
	Unidentified crab				1		
Gastropod	<i>Batillaria zonalis</i>	8	5	6	25	23	14
	<i>Cellana toreuma</i>			2			
	<i>Cerithidea cingulata</i>	5	30	10	25	22	27
	<i>Cerithidea djadjariensis</i>	24	37	12	68	50	26
	<i>Clithon faba</i>		1	1		3	5
	<i>Clithon oualaniensis</i>		1				1
	<i>Littoraria arduiniana</i>					2	
	<i>Littoraria articulata</i>					1	1
	<i>Lunella coronata</i>			1			
	<i>Monodonta labio</i>					1	
	<i>Morula musiva</i>			1			
	<i>Nerita albicilla</i>	1		1			
	<i>Nerita chamaeleon</i>		2	2	7	3	1
	<i>Nerita striata</i>	1					
	<i>Nipponacmea concinna</i>			2			
	<i>Onchidium verrucosa</i>				1		
<i>Terebralia sulcata</i>		1					
Polyplacophora	<i>Acanthopleura japonica</i>			2			
Worm	<i>Phascolosoma scolops</i>	1		3			
	<i>Polycheata</i>					2	
<b>Total number of species = 35</b>							
<b>Species Diversity Index (<math>H'</math>) = 1.93</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.54</b>							

## Tung Chung Bay

The protected shore at Tung Chung Bay was studied and surveyed. Fine to silty sand with some boulders were observed at the shore. Qualitative and quantitative survey results of intertidal species recorded are presented in **Table 4-48 to Table 4-50**. From the review of survey data for HZMB HKLR and the qualitative survey results for this Project, an overall total of 89 intertidal species were recorded at the area (see **Table 4-48**).

During the dry season, a total of 41 intertidal species were recorded at the sandy shore habitat. Abundant species included *Batillaria multiformis*, *Cerithidea cingulata*, *Cerithidea djadjariensis* and *Monodonta labio*. *Balanus amphitrite*, *Saccostrea cucullata* and *Septifer virgatus* were frequently observed on boulders or covered pebbles. Species diversity index ( $H'$ ) was 2.23 and species evenness index ( $J'$ ) was 0.60.

During the wet season, a total of 39 intertidal species were recorded at the sand flat habitat. Abundant species included *Cerithidea cingulata*, *Cerithidea djadjariensis* and *Monodonta labio*. *Batillaria zonalis* was frequently recorded, while *Saccostrea cucullata* was frequently observed on bounders. Species diversity index ( $H'$ ) was 2.47 and species evenness index ( $J'$ ) was 0.68.

Table 4-48: List of intertidal species recorded at sandy shore of Tung Chung Bay

Location: Tung Chung Bay	Number of species: 89	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field Survey
Category	Scientific Name			
Bivalve	<i>Anomalocardia squamosa</i>			Y
	<i>Barbatia virescens</i>	Y	Y	Y
	<i>Caecella chinensis</i>		Y	
	<i>Circe</i> sp.		Y	
	<i>Cyclina sinensis</i>			Y
	<i>Irus Irus</i>			Y
	<i>Marcia</i> sp.		Y	
	<i>Ruditapes philippinarum</i>		Y	
	<i>Ruditapes variegatus</i>		Y	
	<i>Saccostrea cucullata</i>		Y	Y
	<i>Septifer virgatus</i>		Y	Y
	<i>Trapezium</i> sp.		Y	
	<i>Trapezium sublaevigatum</i>			Y
Cnidarian	<i>Diadumene lineata</i>			Y
Crustacean	Amphipoda		Y	
	Amphipoda 2		Y	
	<i>Balanus amphitrite</i>		Y	Y
	<i>Balanus reticulatus</i>		Y	
	<i>Balanus</i> sp.	Y	Y	
	<i>Clibanarius</i> spp.			Y
	<i>Clibanarius striolatus</i>		Y	
	<i>Clibanarius virescens</i>			Y
	<i>Gaetice depressus</i>		Y	Y
	<i>Hemigrapsus penicillatus</i>		Y	Y
	<i>Hemigrapsus sanguineus</i>	Y	Y	
	<i>Macrophthalmus boteltobagoe</i>		Y	
	<i>Macrophthalmus erato</i>		Y	
	<i>Microeuraphia withersi</i>			Y
	<i>Pagurus dubius</i>		Y	Y
	<i>Parasesarma pictum</i>			Y
	<i>Parasesarma plicata</i>		Y	
	<i>Uca borealis</i>		Y	
	<i>Uca lactea</i>			Y
	Unidentified crab			Y
Unidentified juvenile crab			Y	
Fish	<i>Periophthalmus cantonensis</i>			Y
Gastropod	<i>Assimineia brevicula</i>			Y
	<i>Batillaria multiformis</i>			Y
	<i>Batillaria</i> spp.		Y	
	<i>Batillaria zonalis</i>	Y		Y

Location: Tung Chung Bay	Number of species: 89	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field Survey
Category	Scientific Name			
	<i>Cellana grata</i>		Y	Y
	<i>Cellana toreuma</i>		Y	Y
	<i>Cerithidea cingulata</i>			Y
	<i>Cerithidea djadjariensis</i>	Y		Y
	<i>Cerithidea</i> sp.	Y	Y	
	<i>Chlorostoma argyrostoma</i>			Y
	<i>Clithon faba</i>			Y
	<i>Clithon oualaniensis</i>		Y	Y
	<i>Echinolittorina vidua</i>		Y	
	<i>Littoraria ardouiniana</i>			Y
	<i>Littoraria articulata</i>			Y
	<i>Littoraria melanostoma</i>			Y
	<i>Littoraria sinensis</i>		Y	
	<i>Lunella coronata</i>		Y	Y
	<i>Monodonta labio</i>		Y	Y
	<i>Morula musiva</i>			Y
	<i>Nassarius festivus</i>		Y	Y
	<i>Nerita albicilla</i>			Y
	<i>Nerita chamaeleon</i>			Y
	<i>Nerita costata</i>		Y	
	<i>Nerita</i> sp.			Y
	<i>Nerita squamulata</i>			Y
	<i>Nerita yoldii</i>		Y	
	<i>Nipponacmea concinna</i>		Y	Y
	<i>Omphalius nigerrimus</i>		Y	
	<i>Patelloida pygmaea</i>			Y
	<i>Planaxis sulcatus</i>			Y
	<i>Terebralia sulcata</i>			Y
	<i>Thais clavigera</i>		Y	
Dentalioid	<i>Dentalioida</i>		Y	
Lichen, Cyanobacteria and Algae	<i>Chroococcus</i> sp.			Y
	<i>Hildenbrandia rubra</i>			Y
Polyplacophora	<i>Acanthopleura japonica</i>			Y
Worm	<i>Aglaophamus dibranchis</i>		Y	
	<i>Ceratonereis</i> sp.			Y
	<i>Chaetonzone</i> sp.		Y	
	<i>Cirratulus</i> sp.		Y	
	<i>Hydroides</i> spp.			Y
	<i>Glycera</i> sp.		Y	
	<i>Mediomastus</i> sp.		Y	
	<i>Nereis</i> sp.		Y	
	Nemertean 2		Y	
	<i>Ochetostoma erythrogrammon</i>			Y
	Oligochaeta			Y
	<i>Perinereis</i> sp.		Y	

Location: Tung Chung Bay	Number of species: 89	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field Survey
Category	Scientific Name			
	<i>Phascolosoma scolops</i>			Y
	<i>Phascolosoma</i> sp.		Y	
	Ribbon worms (Nemertea)			Y
	<i>Siphonosoma cumanense</i>			Y

Table 4-49: Intertidal species recorded at sandy shore of Tung Chung Bay in the dry season

Location: Tung Chung Bay	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
		High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>		1%	1%			1%
	<i>Saccostrea cucullata</i>	5%	34%	36%	13%	39%	22%
	<i>Septifer virgatus</i>	1%	1%	1%	1%	1%	1%
	<i>Trapezium sublaevigatum</i>		1	2		2	2
Cnidarian	<i>Diadumene lineata</i>		1				
Crustacean	<i>Balanus amphitrite</i>	1%	1%	1%	1%	1%	1%
	<i>Clibanarius</i> spp.		5		1	1	
	<i>Clibanarius virescens</i>			24			
	<i>Gaetice depressus</i>	2	1		1	1	1
	<i>Hemigrapsus penicillatus</i>	1	2	2		2	1
	<i>Pagurus dubius</i>				1	11	2
	<i>Parasesarma pictum</i>	1					
	Unidentified crab	1					
	Unidentified juvenile crab						4
Gastropod	<i>Assimineia brevicula</i>	1					
	<i>Batillaria multiformis</i>	1	9	3	30	19	13
	<i>Batillaria zonalis</i>	1	2	5	37	13	3
	<i>Cellana grata</i>		1				
	<i>Cellana toreuma</i>		2	2		1	3
	<i>Cerithidea cingulata</i>	3	7	13	23	20	29
	<i>Cerithidea djadjariensis</i>	16	12	13	16	22	16
	<i>Clithon faba</i>				1		
	<i>Clithon oualaniensis</i>			1			
	<i>Littoraria articulata</i>	1	7	1	7		1
	<i>Lunella coronata</i>		2	5	1	2	4
	<i>Monodonta labio</i>	3	29	21	15	21	17
	<i>Nassarius festivus</i>				3		1
	<i>Nerita albicilla</i>			3		1	2
	<i>Nerita</i> sp.					1	
	<i>Nerita squamulata</i>		1	3	1	2	2
	<i>Nipponacmea concinna</i>			1	6	12	2
	<i>Patelloida pygmaea</i>			5	3	3	2
<i>Planaxis sulcatus</i>		1					
<i>Terebralia sulcata</i>	1						
Polyplacophora	<i>Acanthopleura japonica</i>	1					
Worm	<i>Ceratonereis</i> sp.		1	1		1	

Location: Tung Chung Bay	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Hydroides</i> spp.		1	1			
	<i>Oligochaeta</i>	1	1			1	
	<i>Phascolosoma scolops</i>			1			1
	Ribbon worms (Nemertea)	1	1				
	<i>Siphonosoma cumanense</i>				2	2	2
<b>Total number of species = 41</b>							
<b>Species Diversity Index (<math>H'</math>) = 2.23</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.60</b>							

Table 4-50: Intertidal species recorded at sandy shore of Tung Chung Bay in the wet season

Location: Tung Chung Bay	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Anomalocardia squamosa</i>	1					
	<i>Barbatia virescens</i>						1%
	<i>Cyclina sinensis</i>					3	1
	<i>Irus Irus</i>	1					
	<i>Saccostrea cucullata</i>	10%	3%	2%	5%	8%	13%
	<i>Septifer virgatus</i>	2%			1%	1%	1%
Crustacean	<i>Balanus amphitrite</i>				1%		2%
	<i>Microeuraphia withersi</i>	1%	1%				
	<i>Hemigrapsus penicillatus</i>	2	2				
	<i>Pagurus dubius</i>					1	1
	<i>Uca lactea</i>					1	1
	Unidentified crab						1
Fish	<i>Periophthalmus modestus</i>					1	
Gastropod	<i>Batillaria multiformis</i>	11			5	2	2
	<i>Batillaria zonalis</i>		10	5	3	2	7
	<i>Cellana grata</i>	11	1				
	<i>Cellana toreuma</i>	6	1			4	8
	<i>Cerithidea cingulata</i>	1	6	8	47	36	10
	<i>Cerithidea djarjariensis</i>	26	7	7	12	11	8
	<i>Chlorostoma argyrostoma</i>						1
	<i>Clithon oualaniensis</i>				5	2	1
	<i>Littoraria arduiniana</i>	1					
	<i>Littoraria articulata</i>	18			2	2	
	<i>Littoraria melanostoma</i>	1					
	<i>Lunella coronata</i>	4	2		1	4	5
	<i>Monodonta labio</i>	28			26	27	8
	<i>Morula musiva</i>	1					1
	<i>Nerita albicilla</i>					1	2
<i>Nerita chamaeleon</i>	1					1	
<i>Nipponacmea concinna</i>	26	1					
Lichen, Cyanobacteria and	<i>Chroococcus</i> sp.	5%					

Location: Tung Chung Bay	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Algae	<i>Hildenbrandia rubra</i>	4%				5%	
Polyplacophora	<i>Acanthopleura japonica</i>	1					2
Worm	<i>Ceratonereis</i> sp.	1					
	<i>Hydroides</i> spp.		3				1
	<i>Ochetostoma erythrogrammon</i>		1				
	<i>Oligochaeta</i>	1	2		3	1	2
	<i>Phascolosoma scolops</i>						5
	Ribbon worms (Nemertea)						1
<b>Total number of species = 39</b>							
<b>Species Diversity Index (<i>H'</i>) = 2.47</b>							
<b>Species Evenness Index (<i>J'</i>) = 0.68</b>							

### San Tau

The protected shore at San Tau was surveyed, with fine to silty sand observed at the shore. Qualitative and quantitative survey results of intertidal species recorded at the sandy shore of San Tau are presented in **Table 4-51 to Table 4-53**. From the review of survey data for HZMB HKLR and the qualitative survey results for this Project, an overall total of 93 intertidal species were recorded at the area (see **Table 4-51**).

During the dry season, a total of 39 intertidal species were recorded at the sandy flat habitat. *Cerithidea djadjariensis* and *Cerithidea cingulata* were abundant species. *Batillaria multiformis*, *Batillaria zonalis*, *Lunella coronata* and *Monodonta labio* were frequently recorded, while *Saccostrea cucullata* and *Septifer virgatus* were frequently observed on bounders. Species diversity index (*H'*) was 2.24 and species evenness index (*J'*) was 0.61.

During the wet season, a total of 34 intertidal species were recorded at the sandy flat habitat. *Cerithidea* spp. were abundant species. *Batillaria multiformis* and *Monodonta labio* were frequently recorded, while *Nipponacmea concinna* and *Saccostrea cucullata* were frequently observed on bounders. Species diversity index (*H'*) was 2.11 and species evenness index (*J'*) was 0.60.

Table 4-51: List of intertidal species recorded at sandy shore of San Tau

Location: San Tau	Number of species: 93	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field survey
Category	Scientific Name			
Bivalve	<i>Barbatia virescens</i>		Y	Y
	<i>Brachidontes variabilis</i>			Y
	<i>Caecella chinensis</i>		Y	
	<i>Cardita leana</i>			Y
	<i>Circe</i> sp.		Y	
	<i>Cyclina sinensis</i>		Y	
	<i>Dosinia japonica</i>		Y	
	<i>Gafrarium pectinatum</i>		Y	
	<i>Glauconome chinensis</i>		Y	
	<i>Perna viridis</i>			Y
	<i>Ruditapes philippinarum</i>		Y	



Location: San Tau	Number of species: 93	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field survey
Category	Scientific Name			
	<i>Ruditapes variegatus</i>		Y	
	<i>Saccostrea cucullata</i>		Y	Y
	<i>Scapharca cornea</i>			Y
	<i>Septifer virgatus</i>		Y	Y
	<i>Soletellina diphos</i>		Y	
	<i>Tapes philippinarum</i>			Y
	<i>Trapezium sublaevigatum</i>			Y
Cnidarian	<i>Diadumene lineata</i>	Y		Y
Crustacean	<i>Amphipoda</i>		Y	
	<i>Balanus albicostatus</i>			Y
	<i>Balanus amphitrite</i>			Y
	<i>Balanus</i> sp.	Y		
	<i>Balanus reticulatus</i>		Y	
	<i>Charybdis japonica</i>	Y		
	<i>Chthamalus malayensis</i>			Y
	<i>Clibanarius striolatus</i>		Y	
	<i>Clibanarius virescens</i>	Y		Y
	<i>Gaetice depressus</i>		Y	Y
	<i>Hemigrapsus penicillatus</i>		Y	Y
	<i>Hemigrapsus sanguineus</i>	Y	Y	Y
	<i>Macrophthalmus boteltobago</i>		Y	
	<i>Macrophthalmus erato</i>		Y	
	<i>Matuta lunaris</i>		Y	
	<i>Metopograpsus quadridentatus</i>			Y
	<i>Nanosesarma minutum</i>		Y	Y
	<i>Pagurus dubius</i>		Y	Y
	<i>Parasesarma plicata</i>		Y	
	<i>Portunus pelagicus</i>		Y	
	<i>Sphaerozius nitidus</i>	Y		
	<i>Tetraclita squamosa</i>		Y	
	<i>Thalmita crenata</i>			Y
	Unidentified juvenile crab			Y
Fish	<i>Bathygobius fuscus</i>			Y
Gastropod	<i>Batillaria multiformis</i>			Y
	<i>Batillaria</i> spp.		Y	
	<i>Batillaria zonalis</i>			Y
	<i>Cellana grata</i>			Y
	<i>Cellana toreuma</i>		Y	Y
	<i>Cellana</i> sp.	Y		
	<i>Cerithidea cingulata</i>			Y
	<i>Cerithidea djadjariensis</i>			Y
	<i>Cerithidea rhizophorarum</i>	Y		
	<i>Cerithidea</i> spp.		Y	
	<i>Clithon faba</i>	Y		Y
	<i>Clithon oualaniensis</i>		Y	Y

Location: San Tau	Number of species: 93	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field survey
Category	Scientific Name			
	<i>Clypeomorus</i> sp.		Y	Y
	<i>Dostia violacea</i>	Y		
	<i>Littoraria articulata</i>	Y		Y
	<i>Littoraria sinensis</i>		Y	
	<i>Lunella coronata</i>			Y
	<i>Monodonta labio</i>	Y	Y	Y
	<i>Nassarius festivus</i>		Y	Y
	<i>Nerita albicilla</i>			Y
	<i>Nerita chamaeleon</i>			Y
	<i>Nerita costata</i>		Y	
	<i>Nerita polita</i>	Y		
	<i>Nerita lineata</i>			Y
	<i>Nerita undata</i>			Y
	<i>Nerita yoldii</i>		Y	
	<i>Nipponacmea concinna</i>			Y
	<i>Notoacmea schrenckii</i>	Y		
	<i>Omphalius nigerrimus</i>		Y	
	<i>Patelloida pygmaea</i>			Y
	<i>Siphonaria laciniosa</i>		Y	
	<i>Thais clavigera</i>		Y	Y
Merostomata	<i>Tachypleus tridentatus</i>		Y	
Polyplacophora	<i>Acanthopleura japonica</i>			Y
	<i>Onithochiton hirasei</i>			Y
Worm	<i>Ampharetidae</i>		Y	
	<i>Aglaophamus dibranchis</i>		Y	
	<i>Chone</i> sp.		Y	
	<i>Cirratulus</i> sp.		Y	
	<i>Euclymene</i> sp.		Y	
	<i>Hydroides</i> spp.			Y
	<i>Nephtys</i> sp.		Y	
	Oligochaeta			Y
	<i>Phascolosoma scolops</i>			Y
	<i>Phascolosoma</i> sp.		Y	
	<i>Spio</i> sp.		Y	
	Ribbon worms (Nemertea)			Y
	Nemertean 1		Y	
	Nemertean 2		Y	

Table 4-52: Intertidal species recorded at sandy shore of San Tau in the dry season

Location: San Tau	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>	1%	2%	2%	1%		1%
	<i>Cardita leana</i>					1	
	<i>Saccostrea cucullata</i>	15%	16%	16%	7%	6%	11%

Location: San Tau	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Septifer virgatus</i>	1%	1%	1%	1%	1%	1%
	<i>Tapes philippinarum</i>			1			1
	<i>Trapezium sublaevigatum</i>	1	1		1	1	1
Cnidarian	<i>Diadumene lineata</i>				1		
Crustacean	<i>Balanus albicostatus</i>			1%	1%	1%	1%
	<i>Balanus amphitrite</i>		1%	1%	1%	1%	1%
	<i>Chthamalus malayensis</i>	1%					
	<i>Clibanarius virescens</i>		5	2	2	2	
	<i>Gaetice depressus</i>	2					
	<i>Hemigrapsus penicillatus</i>	1	1				
	<i>Metopograpsus quadridentatus</i>					1	
	<i>Nanosesarma minutum</i>				1		
	<i>Pagurus dubius</i>	1	1	2	1	1	4
		Unidentified juvenile crab			1		
Gastropod	<i>Batillaria multiformis</i>	12	8	5	10	2	1
	<i>Batillaria zonalis</i>	18	5	2	6	10	
	<i>Cellana grata</i>		1				
	<i>Cellana toreuma</i>	2	6		1		2
	<i>Cerithidea cingulata</i>	26	8	6	19	17	14
	<i>Cerithidea djadjariensis</i>	28	19	10	32	32	29
	<i>Clithon faba</i>	1	2		2		
	<i>Clithon oualaniensis</i>		1				
	<i>Littoraria articulata</i>	1					
	<i>Lunella coronata</i>	2	4	9	7	5	6
	<i>Monodonta labio</i>	5	7	5	2	4	3
	<i>Nassarius festivus</i>			1	2	3	2
	<i>Nerita albicilla</i>	1	1		2		1
	<i>Nerita lineata</i>	1					
	<i>Nipponacmea concinna</i>		3	1			
	<i>Patelloida pygmaea</i>	4	3		1		
		<i>Thais clavigera</i>					1
Polyplacophora	<i>Acanthopleura japonica</i>	1		3	1	1	
	<i>Onithochiton hirasei</i>						2
Worm	Oligochaeta		1				
	<i>Phascolosoma scolops</i>	1	1	2	1	2	1
	Ribbon worms (Nemertea)	1	1	1		1	
<b>Total number of species = 39</b>							
<b>Species Diversity Index (<i>H'</i>) = 2.24</b>							
<b>Species Evenness Index (<i>J</i>) = 0.61</b>							

Table 4-53: Intertidal species recorded at sandy shore of San Tau in the wet season

Location: San Tau	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low

Location: San Tau	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Brachidontes variabilis</i>					1	
	<i>Perna viridis</i>			2%			
	<i>Saccostrea cucullata</i>	10%	3%	4%	6%	10%	10%
	<i>Scapharca cornea</i>						1
	<i>Septifer virgatus</i>			1%	1%	1%	1%
Cnidarian	<i>Diadumene lineata</i>	1	1	1	1		
Crustacean	<i>Balanus amphitrite</i>		1%	3%		1%	3%
	<i>Hemigrapsus penicillatus</i>		1		4		
	<i>Hemigrapsus sanguineus</i>					1	
	<i>Nanosesarma minutum</i>					1	
	<i>Pagurus dubius</i>				2	6	1
	<i>Thalamita crenata</i>					2	
Fish	<i>Bathygobius fuscus</i>				2		
Gastropod	<i>Batillaria multiformis</i>	16	3	5	20	18	
	<i>Batillaria zonalis</i>	3		6			3
	<i>Cellana grata</i>				2	1	
	<i>Cellana toreuma</i>		1	1	9	4	1
	<i>Cerithidea cingulata</i>	59	46	22	19	38	6
	<i>Cerithidea djadjariensis</i>	8	33	44	24	24	19
	<i>Clithon faba</i>				3		
	<i>Clithon oualaniensis</i>	3	3		3		
	<i>Clypeomorus</i> sp.					1	
	<i>Lunella coronata</i>		4	2	6	6	5
	<i>Monodonta labio</i>		3		23	9	
	<i>Nassarius festivus</i>			1	1		
	<i>Nerita chamaeleon</i>					2	1
	<i>Nerita undata</i>				2		
	<i>Nipponacmea concinna</i>	1	2		15	11	
<i>Patelloida pygmaea</i>		10	3	1	7		
Polyplacophora	<i>Acanthopleura japonica</i>	1	2	3	1	2	
Worm	<i>Hydroides</i> spp.					1	1
	Oligochaeta				1	1	
	<i>Phascolosoma scolops</i>		1			1	3
	Ribbon worms (Nemertea)				1		
<b>Total number of species = 34</b>							
<b>Species Diversity Index (<math>H'</math>) = 2.11</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.60</b>							

## Hau Hok Wan

Qualitative and quantitative survey results of intertidal species recorded at a protected sandy shore of Hau Hok Wan are presented in **Table 4-54 to Table 4-56**. From the review of survey data for HZMB HKLR and the qualitative survey results for this Project, an overall total of 84 intertidal species were recorded at the area (see **Table 4-54**).

During the dry season, a total of 43 intertidal species were recorded at the sandy shore habitat. *Batillaria multiformis*, *Batillaria zonalis*, *Cerithidea cingulata* and *Monodonta labio* were more abundant. *Balanus amphitrite*, *Saccostrea cucullata* and *Septifer virgatus* were frequently recorded on boundaries. Species diversity index ( $H'$ ) was 2.30 and species evenness index ( $J'$ ) was 0.61.

During the wet season, a total of 30 intertidal species were recorded at the sandy shore habitat. *Cerithidea djadjarisensis*, *Cerithidea cingulata* and *Batillaria zonalis* were abundant species. *Saccostrea cucullata* and *Septifer virgatus* were frequently recorded on boundaries. Species diversity index ( $H'$ ) was 2.20 and species evenness index ( $J'$ ) was 0.65.

Table 4-54: List of intertidal species recorded at sandy shore of Hau Hok Wan

Location: Hau Hok Wan	Number of species: 84	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field survey
Category	Scientific Name			
Bivalve	<i>Anomalocardia squamosa</i>			Y
	<i>Barbatia virescens</i>	Y	Y	Y
	<i>Caecella chinensis</i>		Y	
	<i>Cyclina sinensis</i>			Y
	<i>Dosinia japonica</i>		Y	
	<i>Glauconome chinensis</i>		Y	
	<i>Irus Irus</i>			Y
	<i>Paphia undulata</i>		Y	
	<i>Ruditapes philippinarum</i>		Y	
	<i>Saccostrea cucullata</i>	Y	Y	Y
	<i>Septifer virgatus</i>		Y	Y
	<i>Tapes philippinarum</i>		Y	Y
	<i>Trapezium sublaevigatum</i>			Y
Cnidarian	<i>Diadumene lineata</i>	Y	Y	Y
Crustacean	<i>Amphipoda</i>		Y	
	<i>Balanus albicostatus</i>			Y
	<i>Balanus amphitrite</i>		Y	Y
	<i>Balanus reticulatus</i>		Y	
	<i>Clibanarius</i> spp.	Y		Y
	<i>Clibanarius striolatus</i>		Y	
	<i>Clibanarius virescens</i>			Y
	<i>Diogenes spinifrons</i>			Y
	<i>Epixanthus frontalis</i>			Y
	<i>Gaetice depressus</i>		Y	Y
	<i>Hemigrapsus penicillatus</i>		Y	Y
	<i>Hemigrapsus sanguineus</i>		Y	
	Isopoda		Y	
	<i>Macrophthalmus boteltobagoe</i>		Y	
	<i>Macrophthalmus erato</i>		Y	
	<i>Matuta lunaris</i>		Y	
	<i>Metopograpsus quadridentatus</i>			Y
	<i>Nanosesarma minutum</i>		Y	
	<i>Pagurus dubius</i>		Y	Y
	<i>Parasesarma plicata</i>		Y	
<i>Philyra carinata</i>		Y		

Location: Hau Hok Wan	Number of species: 84	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field survey
Category	Scientific Name			
	<i>Sphaerozius nitidus</i>		Y	
	<i>Thalamita crenata</i>			Y
	<i>Uca lactea</i>		Y	
	<i>Uca</i> sp.		Y	
	Unidentified crab			Y
	Unidentified juvenile crab			Y
	Unidentified shrimp			Y
Gastropod	<i>Batillaria multiformis</i>			Y
	<i>Batillaria zonalis</i>			Y
	<i>Batillaria</i> spp.		Y	
	<i>Cellana toreuma</i>			Y
	<i>Cellana grata</i>		Y	
	<i>Cerithidea cingulata</i>			Y
	<i>Cerithidea djadjariensis</i>			Y
	<i>Cerithidea rhizophorarum</i>	Y		
	<i>Cerithidea</i> spp.		Y	
	<i>Clithon faba</i>			Y
	<i>Clithon oualaniensis</i>		Y	Y
	<i>Clithon retropictus</i>		Y	
	<i>Glypeomorus</i> sp.		Y	Y
	<i>Echinolittorina radiata</i>			Y
	<i>Littoraria articulata</i>			Y
	<i>Littoraria sinensis</i>		Y	
	<i>Lunella coronata</i>			Y
	<i>Monodonta labio</i>		Y	Y
	<i>Nassarius festivus</i>		Y	Y
	<i>Nerita albicilla</i>			Y
	<i>Nerita</i> sp.			Y
	<i>Nerita chamaeleon</i>			Y
	<i>Nerita squamulata</i>			Y
	<i>Nerita striata</i>			Y
	<i>Nerita polita</i>	Y		
	<i>Nerita yoldii</i>		Y	
	<i>Omphalius nigerrimus</i>		Y	
	<i>Patelloida pygmaea</i>			Y
	<i>Thais luteostoma</i>			Y
	<i>Thais clavigera</i>		Y	
	Unknown Gastropod		Y	
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.			Y
Polyplacophora	<i>Acanthopleura japonica</i>		Y	Y
	<i>Onithochiton hirasei</i>			Y
Worm	<i>Aglaophamus dibranchis</i>		Y	
	<i>Diopatra neapolitana</i>		Y	
	<i>Nereis</i> sp.		Y	

Location: Hau Hok Wan	Number of species: 84	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field survey
Category	Scientific Name			
	Nemertean 3		Y	
	<i>Phascolosoma scolops</i>			Y
	<i>Phascolosoma</i> sp.		Y	
	Ribbon worms (Nemertea)			Y
	<i>Siphonosoma cumanense</i>			Y

Table 4-55: Intertidal species recorded at sandy shore of Hau Hok Wan in the dry season

Location: Hau Hok Wan	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Anomalocardia squamosa</i>			1			
	<i>Barbatia virescens</i>		1%	1%		1%	1%
	<i>Irus Irus</i>			1			
	<i>Saccostrea cucullata</i>	5%	35%	29%	12%	18%	26%
	<i>Septifer virgatus</i>	1%	1%	1%	1%	1%	1%
	<i>Tapes philippinarum</i>			1			2
	<i>Trapezium sublaevigatum</i>			1			1
Cnidarian	<i>Diadumene lineata</i>			1		1	1
Crustacean	<i>Balanus albicostatus</i>					1%	
	<i>Balanus amphitrite</i>	1%	1%	1%	1%	1%	1%
	<i>Clibanarius</i> spp.		3		1	1	1
	<i>Diogenes spinifrons</i>				5		
	<i>Epixanthus frontalis</i>		1				
	<i>Gaetice depressus</i>	2	3	2		1	2
	<i>Hemigrapsus penicillatus</i>		2			1	
	<i>Metopograpsus quadridentatus</i>		1	1		2	
	<i>Pagurus dubius</i>		3		1	1	4
	<i>Thalamita crenata</i>			1			
	Unidentified crab	1					
	Unidentified juvenile crab		2				4
	Unidentified shrimp					1	
Gastropod	<i>Batillaria multiformis</i>	2			18	1	2
	<i>Batillaria zonalis</i>	1	1	3	2	11	10
	<i>Cellana toreuma</i>			1	1	1	
	<i>Cerithidea cingulata</i>	1			30		
	<i>Cerithidea djadjariensis</i>				8	2	
	<i>Clithon faba</i>				10		
	<i>Clithon oualaniensis</i>	1	2		17		
	<i>Clypeomorus</i> sp.					1	6
	<i>Littoraria articulata</i>				1	1	
	<i>Lunella coronata</i>		2	3	7	2	4
	<i>Monodonta labio</i>	4	8		9	6	1
	<i>Nassarius festivus</i>			2	1		1
	<i>Nerita albicilla</i>	1	1	3	2	1	1

Location: Hau Hok Wan	Season: Dry	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Nerita</i> sp.	1	1	1	2		
	<i>Nerita squamulata</i>		2	1	2	2	2
	<i>Patelloida pygmaea</i>		3				
	<i>Thais luteostoma</i>			1			3
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.			1%			
Polyplacophora	<i>Onithochiton hirasei</i>						1
Worm	<i>Phascolosoma scolops</i>	2		2	1	5	2
	Ribbon worms (Nemertea)			1			
	<i>Siphonosoma cumanense</i>						1
<b>Total number of species = 43</b>							
<b>Species Diversity Index (<math>H'</math>) = 2.30</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.61</b>							

Table 4-56: Intertidal species recorded at sandy shore of Hau Hok Wan in the wet season

Location: Hau Hok Wan	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Cyclina sinensis</i>			1			
	<i>Saccostrea cucullata</i>	4%	14%	22%	4%	3%	2%
	<i>Septifer virgatus</i>	1%	1%	1%	1%	1%	1%
	<i>Tapes philippinarum</i>	1				1	
	<i>Trapezium sublaevigatum</i>			5			
Cnidarian	<i>Diadumene lineata</i>		1				
Crustacean	<i>Balanus amphitrite</i>		1%	1%	1%	1%	1%
	<i>Clibanarius virescens</i>		1	1			3
	<i>Epixanthus frontalis</i>				1		
	<i>Gaetice depressus</i>	2	1				
	<i>Hemigrapsus penicillatus</i>	2	3	1		2	1
	<i>Metopograpsus quadridentatus</i>			1			
	<i>Pagurus dubius</i>		2	1			3
Gastropod	<i>Batillaria zonalis</i>		4	7	24	6	8
	<i>Cellana toreuma</i>		2	2		1	
	<i>Cerithidea cingulata</i>	1			36	44	
	<i>Cerithidea djadjariensis</i>		1	7	21	19	38
	<i>Clithon faba</i>			1	3		
	<i>Clithon oualaniensis</i>	2	1		7		
	<i>Echinolittorina radiata</i>	1					
	<i>Littoraria articulata</i>	4	2		1		
	<i>Lunella coronata</i>	1	4	3	2	1	1
	<i>Monodonta labio</i>	2	4	4		1	
	<i>Nassarius festivus</i>		1	1			
	<i>Nerita chamaeleon</i>	2	2	3			
	<i>Nerita squamulata</i>	1	1	1	1	1	1



Location: Hau Hok Wan	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Nerita striata</i>		2	2			
Polyplacophora	<i>Acanthopleura japonica</i>					1	
Worm	<i>Phascolosoma scolops</i>		1	3			
	Ribbon worms (Nemertea)	1	1				
<b>Total number of species = 30</b>							
<b>Species Diversity Index (<i>H'</i>) = 2.20</b>							
<b>Species Evenness Index (<i>J'</i>) = 0.65</b>							

### Sha Lo Wan

Qualitative and quantitative survey results of intertidal species recorded at a protected sandy shore of Sha Lo Wan are presented in **Table 4-57 to Table 4-59**. As the shoreline of this sandy habitat is relatively short, one transect was deployed for quantitative survey. From the review of survey data for HZMB HKLR and the qualitative survey results for this Project, an overall total of 74 intertidal species were recorded at the area (see **Table 4-57**).

During dry season, a total of 41 intertidal species were recorded at the sandy shore habitat. *Cerithidea djadjariensis* was abundant. *Saccostrea cucullata* and *Septifer virgatus* were frequently recorded on boulders. Species diversity index (*H'*) was 2.64 and species evenness index (*J'*) was 0.71.

During wet season, a total of 29 intertidal species were recorded at the sandy shore habitat. *Batillaria zonalis*, *Cerithidea cingulata* and *Cerithidea djadjariensis* were abundant. *Saccostrea cucullata* was frequently recorded on boulders. Species diversity index (*H'*) was 2.19 and species evenness index (*J'*) was 0.65.

Table 4-57: List of intertidal species recorded at sandy shore of Sha Lo Wan

Location: Sha Lo Wan	Number of species: 74	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field survey
Category	Scientific Name			
Bivalve	<i>Barbatia virescens</i>			Y
	<i>Caecella chinensis</i>		Y	
	<i>Cardita leana</i>			Y
	<i>Cyclina sinensis</i>			Y
	<i>Glaucanome chinensis</i>		Y	
	<i>Meretrix meretrix</i>		Y	
	<i>Perna viridis</i>		Y	
	<i>Saccostrea cucullata</i>	Y	Y	Y
	<i>Septifer virgatus</i>		Y	Y
	<i>Striarca symmetrica</i>	Y		
	<i>Trapezium sublaevigatum</i>		Y	Y
Cnidarian	<i>Diadumene lineata</i>	Y	Y	Y
Crustacean	<i>Amphipoda</i>		Y	
	<i>Balanus albicostatus</i>			Y
	<i>Balanus amphitrite</i>		Y	Y
	<i>Balanus reticulatus</i>		Y	
	<i>Charybdis acutifrons</i>		Y	
	<i>Clibanarius virescens</i>			Y

Location: Sha Lo Wan	Number of species: 74	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field survey
Category	Scientific Name			
	<i>Clibanarius</i> spp.	Y	Y	Y
	<i>Diogenes spinifrons</i>			Y
	<i>Epixanthus frontalis</i>			Y
	<i>Gaetice depressus</i>		Y	Y
	<i>Hemigrapsus penicillatus</i>		Y	Y
	<i>Hemigrapsus sanguineus</i>		Y	
	<i>Ligia exotia</i>	Y		
	<i>Macrophthalmus</i> sp.		Y	Y
	<i>Matuta lunaris</i>		Y	
	<i>Metopograpsus quadridentatus</i>			Y
	<i>Nanosesarma minutum</i>		Y	
	<i>Omobranchus fasciolatoceps</i>			Y
	<i>Pagurus dubius</i>		Y	Y
	<i>Parasesarma plicata</i>		Y	
	<i>Portunus pelagicus</i>		Y	
	<i>Scylla serrata</i>		Y	
	<i>Tetraclita japonica</i>			Y
	<i>Uca borealis</i>		Y	
	Unidentified juvenile crab			Y
	Unidentified shrimp			Y
Gastropod	<i>Batillaria multiformis</i>		Y	Y
	<i>Batillaria zonalis</i>		Y	Y
	<i>Cellana grata</i>			Y
	<i>Cellana toreuma</i>			Y
	<i>Cerithidea cingulata</i>		Y	Y
	<i>Cerithidea djadjariensis</i>		Y	Y
	<i>Clithon faba</i>		Y	Y
	<i>Clithon oualaniensis</i>		Y	Y
	<i>Clypeomorus</i> sp.		Y	Y
	<i>Littoraria articulata</i>			Y
	<i>Littoraria sinensis</i>		Y	
	<i>Lunella coronata</i>			Y
	<i>Monodonta labio</i>		Y	Y
	<i>Nassarius festivus</i>		Y	Y
	<i>Nerita albicilla</i>			Y
	<i>Nerita chamaeleon</i>			Y
	<i>Nerita lineata</i>			Y
	<i>Nerita polita</i>	Y		
	<i>Nerita squamulata</i>			Y
	<i>Nerita yoldii</i>		Y	
	<i>Nipponacmea concinna</i>			Y
	<i>Onchidium verrucosa</i>			Y
	<i>Patelloida pygmaea</i>			Y
	<i>Thais clavigera</i>	Y	Y	
	<i>Thais luteostoma</i>		Y	

Location: Sha Lo Wan	Number of species: 74	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field survey
Category	Scientific Name			
	Unknown Gastropod		Y	
Worm	<i>Ceratonereis</i> sp.		Y	Y
	<i>Harmothoe imbricata</i>		Y	
	<i>Nereis</i> sp.		Y	
	<i>Hydroides</i> spp.		Y	Y
	Maldanidae 2		Y	
	Oligochaeta			Y
	<i>Perinereis</i> sp.		Y	
	<i>Phascolosoma scolops</i>		Y	Y
	Ribbon worms (Nemertea)			Y
	Nemertean 1		Y	

Table 4-58: Intertidal species recorded at sandy shore of Sha Lo Wan in the dry season

Location: Sha Lo Wan	Season: Dry	Average Abundance/ Percentage Cover		
		Transect 1		
Category	Scientific Name	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>	1%		3%
	<i>Saccostrea cucullata</i>	12%	14%	28%
	<i>Septifer virgatus</i>	1%	1%	1%
	<i>Trapezium sublaevigatum</i>	2	1	2
Cnidarian	<i>Diadumene lineata</i>		1	
Crustacean	<i>Balanus albicostatus</i>		1%	1%
	<i>Balanus amphitrite</i>		1%	
	<i>Clibanarius virescens</i>		20	13
	<i>Diogenes spinifrons</i>		1	
	<i>Epixanthus frontalis</i>			2
	<i>Gaetice depressus</i>	1	2	1
	<i>Hemigrapsus penicillatus</i>		2	1
	<i>Macrophthalmus</i> sp.	1		
	<i>Metopograpsus quadridentatus</i>		1	
	<i>Pagurus dubius</i>		9	12
	<i>Tetraclita japonica</i>			0
	Unidentified juvenile crab	3		
	Unidentified shrimp	1		
Gastropod	<i>Batillaria multiformis</i>	1	4	5
	<i>Batillaria zonalis</i>	10	4	5
	<i>Cellana grata</i>		1	
	<i>Cellana toreuma</i>	1	1	2
	<i>Cerithidea cingulata</i>	13	5	6
	<i>Cerithidea djadjariensis</i>	26	4	13
	<i>Clithon faba</i>	2	1	
	<i>Clithon oualaniensis</i>	6		
	<i>Littoraria articulata</i>			3
	<i>Lunella coronata</i>	1	1	5

Location: Sha Lo Wan	Season: Dry	Average Abundance/ Percentage Cover		
		Transect 1		
Category	Scientific Name	High	Mid	Low
	<i>Monodonta labio</i>	1	2	2
	<i>Nassarius festivus</i>	2		5
	<i>Nerita albicilla</i>	2	2	1
	<i>Nerita chamaeleon</i>	1		
	<i>Nerita lineata</i>			1
	<i>Nerita squamulata</i>		4	4
	<i>Nipponacmea concinna</i>			1
	<i>Onchidium verrucosa</i>	1		
	<i>Patelloida pygmaea</i>			2
Worm	<i>Ceratonereis</i> sp.			1
	<i>Hydroides</i> spp.	3		
	<i>Phascolosoma scolops</i>	2	1	4
	Ribbon worms (Nemertea)	1	1	
<b>Total number of species = 41</b>				
<b>Species Diversity Index (<i>H'</i>) = 2.64</b>				
<b>Species Evenness Index (<i>J</i>) = 0.71</b>				

Table 4-59: Intertidal species recorded at sandy shore of Sha Lo Wan in the wet season

Location: Sha Lo Wan	Season: Wet	Average Abundance/ Percentage Cover		
		Transect 1		
Category	Scientific Name	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>			1%
	<i>Cardita leana</i>			1
	<i>Cyclina sinensis</i>	1		
	<i>Saccostrea cucullata</i>	2%	20%	27%
	<i>Septifer virgatus</i>	1%	3%	1%
	<i>Trapezium sublaevigatum</i>			1
Cnidarian	<i>Diadumene lineata</i>		1	1
Crustacean	<i>Balanus amphitrite</i>	1%	2%	1%
	<i>Clibanarius</i> spp.		3	32
	<i>Epixanthus frontalis</i>		1	3
	<i>Hemigrapsus penicillatus</i>		1	2
	<i>Metopograpsus quandridentatus</i>		1	
	<i>Pagurus dubius</i>		12	
Fish	<i>Omobranchus fasciolatoceps</i>		1	
Gastropod	<i>Batillaria multiformis</i>	6		
	<i>Batillaria zonalis</i>	5	8	15
	<i>Cellana grata</i>		1	
	<i>Cellana toreuma</i>		1	4
	<i>Cerithidea cingulata</i>	27	17	1
	<i>Cerithidea djadjariensis</i>	23	18	17
	<i>Clithon faba</i>	4	2	

Location: Sha Lo Wan	Season: Wet	Average Abundance/ Percentage Cover		
		Transect 1		
Category	Scientific Name	High	Mid	Low
	<i>Clithon oualaniensis</i>	2		
	<i>Clypeomorus</i> sp.		1	
	<i>Littoraria articulata</i>		3	
	<i>Lunella coronata</i>	1	1	1
	<i>Monodonta labio</i>	1	5	
	<i>Nerita chamaeleon</i>	1	3	
Worm	Oligochaeta		1	
	<i>Phascolosoma scolops</i>		2	7
<b>Total number of species = 29</b>				
<b>Species Diversity Index (<i>H'</i>) = 2.19</b>				
<b>Species Evenness Index (<i>J'</i>) = 0.65</b>				

### Sham Wat Wan

Qualitative and quantitative survey results of intertidal species recorded at a protected sandy shore of Sham Wat Wan are presented in **Table 4-60 to Table 4-62**. From the review of survey data for HZMB HKLR and the qualitative survey results for this Project, an overall total of 94 intertidal species were recorded at the area (see **Table 4-60**).

During dry season, a total of 43 intertidal species were recorded at the sandy shore habitat. *Cerithidea cingulata* and *Cerithidea djadjariensis* were abundant. Juvenile crabs (unidentified) and *Littoraria articulata* were frequently recorded, while *Balanus amphitrite*, *Saccostrea cucullata* and *Septifer virgatus* were frequently recorded on boulders. Species diversity index (*H'*) was 2.45 and species evenness index (*J'*) was 0.66.

During wet season, a total of 54 intertidal species were recorded at the sandy shore habitat. *Cerithidea cingulata* and *Cerithidea djadjariensis* were abundant. *Hemigrapsus penicillatus*, *Hemigrapsus sanguineus*, *Clithon oualaniensis* and *Nerita albicilla* were frequently recorded, while *Balanus amphitrite*, *Saccostrea cucullata* and *Septifer virgatus* were frequently recorded on boulders. Species diversity index (*H'*) was 2.48 and species evenness index (*J'*) was 0.62. A notable species *Upogebia major* was recorded. It is listed as Endangered (EN) by the China Species Red List mainly due to overexploitation in China. It is common in Hong Kong (Chan and Caley, 2003) and Sham Wat is also far from the project footprint. Therefore it is not considered as a species of conservation importance and excluded from detailed impact assessment in the current EIA study.

Table 4-60: List of intertidal species recorded at sandy shore of Sham Wat Wan

Location: Sham Wat Wan	Number of species: 94	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field survey
Category	Scientific Name			
Bivalve	<i>Barbatia virescens</i>	Y		Y
	<i>Cardita leana</i>			Y
	<i>Caecella chinensis</i>		Y	
	<i>Irus Irus</i>			Y
	<i>Isognomon isognomum</i>			Y
	<i>Marcia japonica</i>			Y
	<i>Meretrix meretrix</i>			Y
	<i>Saccostrea cucullata</i>	Y	Y	Y

Location: Sham Wat Wan	Number of species: 94	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field survey	
Category	Scientific Name				
	<i>Scapharca cornea</i>			Y	
	<i>Septifer virgatus</i>		Y	Y	
	<i>Striarca symmetrica</i>	Y			
	<i>Terebralia sulcata</i>	Y			
	<i>Trapezium</i> sp.		Y		
	<i>Trapezium sublaevigatum</i>			Y	
Cnidarian	<i>Diadumene lineata</i>			Y	
Crustacean	<i>Alpheus brevicristatus</i>			Y	
	<i>Alpheus</i> sp.			Y	
	Amphipoda		Y	Y	
	<i>Balanus albicostatus</i>	Y		Y	
	<i>Balanus amphitrite</i>	Y		Y	
	<i>Balanus reticulatus</i>		Y		
	<i>Clibanarius virescens</i>			Y	
	<i>Clibanarius striolatus</i>		Y		
	<i>Diogenes spinifrons</i>			Y	
	<i>Gaetice depressus</i>		Y	Y	
	<i>Hemigrapsus penicillatus</i>		Y	Y	
	<i>Hemigrapsus sanguineus</i>	Y	Y	Y	
	<i>Isopoda</i>		Y		
	<i>Ligia exotica</i>			Y	
	<i>Macrophthalmus erato</i>		Y		
	<i>Macrophthalmus</i> sp.			Y	
	<i>Matuta lunaris</i>		Y		
	<i>Metopograpsus quadridentatus</i>			Y	
	<i>Nanosesarma minutum</i>		Y	Y	
	<i>Ocypode</i> spp.			Y	
	<i>Pagurus dubius</i>		Y	Y	
	<i>Parasesarma pictum</i>			Y	
	<i>Parasesarma plicata</i>		Y		
	<i>Perisesarma bidens</i>		Y		
	<i>Penaeus japonica</i>		Y		
	<i>Scylla</i> sp.			Y	
	<i>Uca</i> sp.		Y		
		Unidentified crab			Y
		Unidentified juvenile crab			Y
		Unidentified shrimp			Y
	<i>Upogebia major</i>			Y	
Fish	<i>Bathygobius meggitti</i>			Y	
	<i>Bathygobius</i> sp.			Y	
Gastropod	<i>Batillaria multiformis</i>			Y	
	<i>Batillaria</i> spp.		Y		
	<i>Batillaria zonalis</i>			Y	
	<i>Cellana grata</i>			Y	
	<i>Cellana toreuma</i>			Y	

Location: Sham Wat Wan	Number of species: 94	HZMB-HKLR EIA EBS (2004)	HZMB-HKLR EIA VES (2009)	Field survey
Category	Scientific Name			
	<i>Cerithidea cingulata</i>	Y		Y
	<i>Cerithidea djadjariensis</i>	Y		Y
	<i>Cerithidea</i> sp.	Y	Y	
	<i>Clithon faba</i>			Y
	<i>Clithon oualaniensis</i>		Y	Y
	<i>Clithon retropictus</i>			Y
	<i>Clithon</i> sp.	Y		
	<i>Dostia violacea</i>	Y		
	<i>Echinolittorina radiata</i>			Y
	<i>Echinolittorina pascua</i>			Y
	<i>Littoraria articulata</i>	Y		Y
	<i>Lunella coronata</i>			Y
	<i>Littoraria sinensis</i>		Y	
	<i>Monodonta labio</i>	Y		Y
	<i>Morula musiva</i>			Y
	<i>Nassarius festivus</i>	Y		Y
	<i>Nerita albicilla</i>			Y
	<i>Nerita chamaeleon</i>			Y
	<i>Nerita costata</i>	Y		
	<i>Nerita polita</i>	Y		
	<i>Nerita</i> sp.		Y	Y
	<i>Nerita squamulata</i>			Y
	<i>Nerita yoldii</i>		Y	
	<i>Nipponacmea concinna</i>			Y
	<i>Planaxis sulcatus</i>			Y
	<i>Thais clavigera</i>	Y		Y
	<i>Thais luteostoma</i>			Y
	<i>Umbonium</i> spp.			Y
Lichen, Cyanobacteria and Algae	<i>Hildenbrandia rubra</i>			Y
	<i>Ulva</i> spp.			Y
Polyplacophora	<i>Acanthopleura japonica</i>			Y
Worm	<i>Ceratonereis</i> sp.			Y
	<i>Hydroides</i> spp.			Y
	Maldanidae 1		Y	
	<i>Nereis</i> sp.		Y	
	Oligochaeta			Y
	<i>Phascolosoma scolops</i>			Y
	<i>Phascolosoma</i> sp.		Y	
	Ribbon worms (Nemertea)			Y
	Tubellaria			Y
	Nemertean 1		Y	

Table 4-61: Intertidal species recorded at sandy shore of Sham Wat Wan in the dry season

Location: Sham Wat Wan	Season: Dry	Average Abundance/ Percentage Cover	
		Transect 1	Transect 2

Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Barbatia virescens</i>			1%			
	<i>Marcia japonica</i>				1%		
	<i>Meretrix meretrix</i>					1	
	<i>Saccostrea cucullata</i>	13%	11%	33%	3%	5%	4%
	<i>Septifer virgatus</i>	1%	1%	1%	1%	1%	2%
	<i>Trapezium sublaevigatum</i>		1	1		1	1
Cnidarian	<i>Diadumene lineata</i>	4	1	2	1	1	7
Crustacean	<i>Balanus albicostatus</i>				1%	1%	
	<i>Balanus amphitrite</i>	1%	1%	6%	1%	3%	1%
	<i>Clibanarius virescens</i>	1	1	1			2
	<i>Diogenes spinifrons</i>						1
	<i>Gaetice depressus</i>	4		1	2	2	
	<i>Hemigrapsus</i> sp.	1	1	1	2	2	1
	<i>Macrophthalmus</i> sp.	1	2				
	<i>Pagurus dubius</i>			1	4	2	2
	Unidentified crab						1
	Unidentified juvenile crab	6	3	5	1	2	4
Gastropod	<i>Batillaria multiformis</i>					7	
	<i>Batillaria zonalis</i>					2	
	<i>Cellana toreuma</i>		1			1	1
	<i>Cerithidea cingulata</i>	3	10	2	2	47	4
	<i>Cerithidea djadjariensis</i>	5	18		1	18	1
	<i>Clithon faba</i>	3	6	1		2	
	<i>Clithon oualaniensis</i>				5	13	
	<i>Clithon retropictus</i>					2	
	<i>Echinolittorina radiata</i>		1				
	<i>Echinolittorina pascua</i>	1					
	<i>Littoraria articulata</i>	7	3	13	3	2	
	<i>Monodonta labio</i>	5	3		1	4	
	<i>Nassarius festivus</i>			2		2	3
	<i>Nerita albicilla</i>				1		
	<i>Nerita chamaeleon</i>	2	5			2	2
	<i>Nerita</i> sp.	1	2	17			
	<i>Nerita squamulata</i>				1		
	<i>Nipponacmea concinna</i>		1				
	<i>Planaxis sulcatus</i>			1			4
	<i>Thais clavigera</i>			1			
<i>Thais luteostoma</i>			1			2	
Lichen, Cyanobacteria and Algae	<i>Ulva</i> spp.	10%			16%		
Worm	<i>Ceratonereis</i> sp.				1		
	<i>Hydroides</i> spp.		2				
	Oligochaeta	1	1		5		1
	<i>Phascolosoma scolops</i>			4			2
<b>Total number of species = 43</b>							
<b>Species Diversity Index (<i>H'</i>) = 2.45</b>							
<b>Species Evenness Index (<i>J'</i>) = 0.66</b>							



Table 4-62: Intertidal species recorded at sandy shore of Sham Wat Wan in the wet season

Location: Sham Wat Wan	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
Bivalve	<i>Cardita leana</i>			2			
	<i>Irus Irus</i>			1			
	<i>Isognomon isognomum</i>						1%
	<i>Saccostrea cucullata</i>	4%	14%	8%	3%	12%	11%
	<i>Scapharca cornea</i>			3			
	<i>Septifer virgatus</i>	1%	2%	3%	1%	2%	4%
	<i>Trapezium sublaevigatum</i>		1				
Cnidarian	<i>Diadumene lineata</i>			1	1	1	1
Crustacean	<i>Alpheus brevicristatus</i>	1				1	
	<i>Alpheus</i> sp.					1	
	<i>Amphipoda</i>				6		
	<i>Balanus amphitrite</i>	3%	1%	2%	1%	2%	1%
	<i>Clibanarius virescens</i>					1	
	<i>Hemigrapsus penicillatus</i>	1	2	1	5	2	2
	<i>Hemigrapsus sanguineus</i>	2		3	2	5	2
	<i>Ligia exotica</i>				8		
	<i>Macrophthalmus</i> sp.		2	1		1	
	<i>Metopograpsus quadridentatus</i>				1		
	<i>Nanosesarma minutum</i>			3		2	
	<i>Ocypode</i> spp.	1	1				
	<i>Pagurus dubius</i>		1				
	<i>Parasesarma pictum</i>					1	
	<i>Scylla</i> sp.						1
	Unidentified shrimp	1					
<i>Upogebia major</i>				1			
Fish	<i>Bathygobius meggitti</i>					2	
	<i>Bathygobius</i> sp.			1			
Gastropod	<i>Batillaria multiformis</i>		8				
	<i>Batillaria zonalis</i>		3	1			1
	<i>Cellana grata</i>		1				
	<i>Cellana toreuma</i>		1				2
	<i>Cerithidea cingulata</i>	24	9		8	3	
	<i>Cerithidea djadjariensis</i>	12	15		3	5	
	<i>Clithon faba</i>		4			1	
	<i>Clithon oualaniensis</i>	10	7	1	2	7	1
	<i>Clithon retropictus</i>				1		
	<i>Littoraria articulata</i>	1			4	1	1
	<i>Lunella coronata</i>						2
	<i>Monodonta labio</i>				4		
	<i>Morula musiva</i>			2			
	<i>Nassarius festivus</i>			1			1
	<i>Nerita albicilla</i>	1	2	8	1	7	4
<i>Nerita chamaeleon</i>		1			1	1	

Location: Sham Wat Wan	Season: Wet	Average Abundance/ Percentage Cover					
		Transect 1			Transect 2		
Category	Scientific Name	High	Mid	Low	High	Mid	Low
	<i>Nipponacmea concinna</i>			5			
	<i>Thais clavigera</i>			2			
	<i>Umbonium</i> spp.					1	
Lichen, Cyanobacteria and Algae	<i>Hildenbrandia rubra</i>				5%	22%	
Polyplacophora	<i>Acanthopleura japonica</i>		1	1			
Worm	<i>Ceratonereis</i> sp.					1	
	<i>Hydroides</i> spp.			2			2
	Oligochaeta	1	2	1	3	2	2
	<i>Phascolosoma scolops</i>		1	13			6
	Ribbon worms (Nemertea)			1			2
	Tubellaria					1	
<b>Total number of species = 54</b>							
<b>Species Diversity Index (<math>H'</math>) = 2.48</b>							
<b>Species Evenness Index (<math>J'</math>) = 0.62</b>							

### Summary of Ecological Baseline Condition of Sandy Shores

Findings of desktop review and qualitative surveys are summarised in **Table 4-63** below.

Table 4-63: Species number at each sandy shore obtained from literature review and qualitative surveys

Location	Sha Chau	Yan O	Tai Ho Wan <sup>(1)</sup>	Tung Chung Bay <sup>(1,2)</sup>	San Tau <sup>(1,2)</sup>	Hau Hok Wan <sup>(1,2)</sup>	Sha Lo Wan <sup>(1,2)</sup>	Sham Wat Wan <sup>(1,2)</sup>
No. of intertidal species	18	28	54	89	93	84	74	94

Source of Literature Review: (1) EBS, HZMB HKBCF & HKLR EIA (2004)

(2) VES, HZMB HKBCF & HKLR EIA (2009)

Findings of quantitative surveys for this Project at different survey locations are summarised in **Table 4-64** below.

Table 4-64: Species number, diversity index ( $H'$ ) and evenness index ( $J'$ ) recorded at each sandy shore

Survey Location	Sha Chau		Yan O		Tai Ho Wan		Tung Chung Bay		San Tau		Hau Hok Wan		Sha Lo Wan		Sham Wat Wan		
	D	W	D	W	D	W	D	W	D	W	D	W	D	W	D	W	
Season <sup>(1)</sup>																	
Number of species	12	11	22	17	29	35	41	39	39	34	43	30	41	29	43	54	
$H'$	1.07	1.11	2.06	1.41	2.02	1.93	2.23	2.47	2.24	2.11	2.30	2.20	2.64	2.19	2.45	2.48	
$J'$	0.46	0.48	0.67	0.50	0.60	0.54	0.60	0.68	0.61	0.60	0.61	0.65	0.71	0.65	0.66	0.62	

(2) D = dry season; W = wet season

At Tai Ho Wan, Tung Chung Bay, San Tau and Sham Wat Wan, relatively large area of mudflats were also identified. In fact, these areas contained a mixed habitat of sandy/silty soft shore in estuarine environment (influenced by stream flowing downhill), as reflected by the species richness, species diversity index and species evenness index recorded at the sandy shores of these areas. Findings in the relatively sandy

portion of these areas would be summarised with relevant mudflat communities to be discussed in habitat evaluation.

Open sandy shore habitat at Sha Chau and Lung Kwu Chau area is species-poor as reflected by the low species diversity obtained from both literature review (Maunsell, 2002) and field survey results. In comparison, the open sandy shore habitat at Yan O has relatively higher species diversity and evenness. Abundant species at Yan O were found to be *Tapes philippinarum* and *Littoraria articulata*. On the other hand, at sheltered sandy shores of Hau Hok Wan and Sha Lo Wan with fine/silty sand, the species diversity and evenness are higher than those of open sandy shores. Abundant species were found to be *Cerithidea cingulata* and *Cerithidea djadjariensis*. Nevertheless, all species recorded were common in Hong Kong. No species of conservation importance was recorded at this habitat.

#### 4.4 Mangroves and Intertidal Mudflats

Surveys at mangrove and mudflat were conducted at the following locations:

- Tai Ho Wan
- Tung Chung Bay
- San Tau
- Yan O
- Sham Wat Wan

For each survey location, qualitative survey results were listed with literature review, where appropriate, to obtain a more complete list of species for habitat evaluation and assessment. Quantitative survey results in dry and wet seasons at each location were also presented.

##### Tai Ho Wan

Qualitative and quantitative survey results of intertidal species recorded at the mangrove and mudflat of Tai Ho Wan are presented in **Table 4-65 to Table 4-67**. From the review of survey data for HZMB HKBCF, TMCLKL, AFCD's Biodiversity Survey and the qualitative survey results for this Project, an overall total of 115 intertidal species were recorded at the area (see **Table 4-65**). Intertidal species of conservation importance including seagrass *Halophila beccarii*, horseshore crabs *Carcinoscorpius rotundicauda* and *Tachypleus tridentatus* were recorded.

At the mangrove and mudflat habitat, a total of 42 intertidal species were recorded during dry season. Abundant species included *Batillaria zonalis*, *Cerithidea cingulata* and *Cerithidea djadjariensis*, while *Littoraria melanostoma* and *Terebralia sulcata* were frequently recorded. Fauna species diversity index (*H'*) was 2.32 and species evenness index (*J'*) was 0.62.

During wet season, a total of 45 intertidal fauna species were recorded. *Batillaria zonalis* and *Cerithidea cingulata* were the most abundant, while *Cerithidea djadjariensis* and *Clithon oualaniensis* were frequently recorded. Fauna species diversity index (*H'*) was 1.43 and species evenness index (*J'*) was 0.38.

Table 4-65: List of intertidal species recorded at mangrove and mudflat habitat of Tai Ho Wan

Location: Tai Ho Wan	Number of species: 115	AFCD Survey	HZMB EIA EBS (2004)	TMCLKL EIA (2008-09)	Field Survey
Category	Scientific Name				
Plant	<i>Acanthus ilicifolius</i>				Y
	<i>Acrostichum aureum</i>	Y			
	<i>Aegiceras corniculatum</i>	Y			Y
	<i>Avicennia marina</i>	Y			Y

Location: Tai Ho Wan	Number of species: 115	AFCD Survey	HZMB EIA EBS (2004)	TMCLKL EIA (2008-09)	Field Survey
Category	Scientific Name				
	<i>Bruguiera gymnorrhiza</i>	Y			
	<i>Clerodendrum inerme</i>				Y
	<i>Excoecaria agallocha</i>	Y			
	<i>Halophila beccarii</i>				Y
	<i>Kandelia obovata</i>	Y			Y
Bivalve	<i>Anomalocardia squamosa</i>				Y
	<i>Barbatia virescens</i>				Y
	<i>Brachidontes variabilis</i>	Y			Y
	<i>Coecella chinensis</i>	Y			
	<i>Cyclina sinensis</i>				Y
	<i>Fulvia</i> sp.			Y	
	<i>Geloina erosa</i>	Y		Y	Y
	<i>Isognomon isognomum</i>	Y		Y	
	<i>Parasesarma pictum</i>				Y
	<i>Perna viridis</i>	Y		Y	
	<i>Platevindex mortoni</i>	Y			
	<i>Saccostrea cucullata</i>	Y	Y	Y	Y
	<i>Septifer virgatus</i>	Y			Y
	<i>Tapes philippinarum</i>				Y
	<i>Trapezium sublaevigatum</i>				Y
Cnidaria	<i>Diadumene lineata</i>				Y
Crustacean	<i>Alpheus</i> spp.			Y	
	<i>Balanus albicostatus</i>				Y
	<i>Balanus amphitrite</i>				Y
	<i>Balanus reticulatus</i>			Y	
	<i>Balanus</i> sp.		Y	Y	
	<i>Capitulum mitella</i>			Y	
	<i>Chthamalus malayensis</i>	Y			
	<i>Clibanarius virescens</i>				Y
	<i>Clibanarius</i> spp.			Y	
	<i>Eriocheir japonica</i>	Y			
	<i>Gaetice depressus</i>				Y
	<i>Helice tientsinensis</i>		Y		
	<i>Helice</i> sp.			Y	Y
	<i>Hemigrapsus penicillatus</i>	Y			Y
	<i>Hemigrapsus sanguineus</i>		Y	Y	
	<i>Ligia exotica</i>			Y	Y
	<i>Macrophthalmus</i> sp.				Y
	<i>Metaplex longipes</i>	Y			
	<i>Metopograpsus quadridentatus</i>	Y			Y
	<i>Pagurus dubius</i>				Y
	<i>Perisesarma bidens</i>				Y
	<i>Scylla paramamosain</i>	Y		Y	
	<i>Sesarma (Parasesarma) pictum</i>	Y			
	<i>Sesarma (Perisesarma) bidens</i>	Y		Y	Y
	<i>Sesarmops sinensis</i>				Y
	<i>Uca acuta</i>	Y			

Location: Tai Ho Wan	Number of species: 115	AFCD Survey	HZMB EIA EBS (2004)	TMCLKL EIA (2008-09)	Field Survey
Category	Scientific Name				
	<i>Uca arcuata</i>	Y			
	<i>Uca borealis</i>	Y			
	<i>Uca crassipes</i>	Y		Y	
	<i>Uca lactea</i>	Y			
	Unidentified juvenile crab				Y
Fish	<i>Bathygobius fuscus</i>				Y
	<i>Bathygobius meggitti</i>				Y
	<i>Periophthalmus cantonensis</i>				Y
	<i>Periophthalmus modestus</i>	Y		Y	
Gastropod	<i>Assiminea brevicula</i>				Y
	<i>Batillaria multiformis</i>	Y			Y
	<i>Batillaria zonalis</i>	Y	Y	Y	Y
	<i>Brachidontes</i> sp.			Y	
	<i>Cellana testudinaria</i>			Y	
	<i>Cellana toreuma</i>				Y
	<i>Cerithidea alata</i>	Y			
	<i>Cerithidea cingulata</i>	Y			Y
	<i>Cerithidea djadjariensis</i>	Y	Y	Y	Y
	<i>Cerithidea microptera</i>			Y	
	<i>Cerithidea rhizophorarum</i>	Y	Y	Y	Y
	<i>Cerithidea</i> sp.		Y		
	<i>Chlorostoma argyrostoma</i>			Y	
	<i>Clithon faba</i>	Y			Y
	<i>Clithon oualaniensis</i>	Y		Y	Y
	<i>Clithon retropictus</i>				Y
	<i>Clithon</i> sp.		Y		
	<i>Clypeomorus moniferum</i>			Y	
	<i>Ellobium chinensis</i>			Y	Y
	<i>Littoraria arduiniana</i>	Y			Y
	<i>Littoraria articulata</i>			Y	Y
	<i>Littoraria melanostoma</i>	Y		Y	Y
	<i>Littoraria pallescens</i>	Y			Y
	<i>Littoraria sinensis</i>	Y			
	<i>Lunella coronata granulata</i>	Y		Y	
	<i>Monodonta labio</i>	Y		Y	Y
	<i>Morula musiva</i>	Y			
	<i>Nassarius</i> sp.			Y	Y
	<i>Nerita albicilla</i>	Y		Y	Y
	<i>Nerita chamaeleon</i>	Y			Y
	<i>Nerita lineata</i>			Y	
	<i>Nerita litterata</i>	Y			
	<i>Nerita polita</i>		Y	Y	
	<i>Nerita striata</i>				Y
	<i>Nerita squamulata</i>				Y
	<i>Nerita violacea</i>	Y	Y		
	<i>Neritina (Dostia) violacea</i>				Y
	<i>Onchidium hongkongensis</i>	Y			
	<i>Onchidium verrucosa</i>				Y

Location: Tai Ho Wan	Number of species: 115	AFCD Survey	HZMB EIA EBS (2004)	TMCLKL EIA (2008-09)	Field Survey
Category	Scientific Name				
	<i>Patelloida saccharina</i>			Y	
	<i>Peasiella</i> spp.				Y
	<i>Planaxis sulcatus</i>			Y	
	<i>Serpulorbis imbricatus</i>			Y	
	<i>Terebralia sulcata</i>	Y	Y	Y	Y
	<i>Thais clavigera</i>			Y	
	<i>Turbo articulatus</i>			Y	
Horseshoe Crab	<i>Carcinoscorpius rotundicauda</i>				Y
	<i>Tachypleus tridentatus</i>	Y			Y
Lichen, Cyanobacteria and Algae	<i>Ulva</i> spp.				Y
	<i>Corallina</i> spp.				Y
Worm	<i>Hydroides</i> spp.				Y
	<i>Oligochaeta</i>				Y
	<i>Phascolosoma scolops</i>				Y
	<i>Sipunculus nudus</i>			Y	
	Ribbon worms ( <i>Nemertea</i> )				Y

Table 4-66: Intertidal species recorded at mangrove and mudflat habitat of Tai Ho Wan in the dry season

Location: Tai Ho Wan	Season: Dry	Average Abundance (mobile species) / Average Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
Bivalve	<i>Barbatia virescens</i>	1%	
	<i>Cyclina sinensis</i>		1
	<i>Geloina erosa</i>	2	1
	<i>Saccostrea cucullata</i>	15%	5%
	<i>Septifer virgatus</i>	1%	1%
	<i>Tapes philippinarum</i>		1
	<i>Trapezium sublaevigatum</i>	1	1
Cnidarian	<i>Diadumene lineata</i>	1	
Crustacean	<i>Balanus albicostatus</i>		2%
	<i>Balanus amphitrite</i>	1%	1%
	<i>Clibanarius virescens</i>	1	
	<i>Gaetice depressus</i>	1	
	<i>Macrophthalmus</i> sp.	1	
	<i>Perisesarma bidens</i>	1	
	<i>Sesarma (Chiromantes) bidens</i>	1	1
	Unidentified juvenile crab	4	2
Fish	<i>Periophthalmus cantonensis</i>	1	
Gastropod	<i>Assiminea brevicula</i>	6	5
	<i>Batillaria multiformis</i>	2	10
	<i>Batillaria zonalis</i>	11	31
	<i>Cellana toreuma</i>	1	
	<i>Cerithidea cingulata</i>	15	27
	<i>Cerithidea djadjariensis</i>	17	20
	<i>Cerithidea rhizophorarum</i>	2	2
	<i>Clithon faba</i>	5	2
	<i>Clithon oualaniensis</i>		1
	<i>Clithon retropictus</i>		1

Location: Tai Ho Wan	Season: Dry	Average Abundance (mobile species) / Average Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
	<i>Littoraria ardouiniana</i>		1
	<i>Littoraria articulata</i>	6	
	<i>Littoraria melanostoma</i>	9	3
	<i>Littoraria pallescens</i>	3	2
	<i>Nassarius festivus</i>	4	2
	<i>Nerita albicilla</i>		2
	<i>Nerita chamaeleon</i>	3	
	<i>Nerita</i> sp.	14	
	<i>Nerita squamulata</i>		2
	<i>Onchidium verrucosa</i>	2	1
	<i>Terebralia sulcata</i>	4	7
Lichen, Cyanobacteria and Algae	<i>Ulva</i> spp.		43%
Worm	<i>Hydroides</i> spp.	4	
	<i>Oligochaeta</i>	4	
	<i>Phascolosoma scolops</i>	1	2
<b>Total number of species = 42</b>			
<b>Species Diversity Index (<i>H'</i>) = 2.32</b>			
<b>Species Evenness Index (<i>J'</i>) = 0.62</b>			

Table 4-67: Intertidal species recorded at mangrove and mudflat habitat of Tai Ho Wan in the wet season

Location: Tai Ho Wan	Season: Wet	Average Abundance (mobile species) / Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
Bivalve	<i>Anomalocardia squamosa</i>	2	
	<i>Brachidontes variabilis</i>	1	
	<i>Cyclina sinensis</i>	2	1
	<i>Geloina erosa</i>	1	1
	<i>Saccostrea cucullata</i>	2%	2%
	<i>Trapezium sublaevigatum</i>	1	
Crustacean	<i>Balanus albicostatus</i>	1%	
	<i>Balanus amphitrite</i>	2%	1%
	<i>Helice</i> sp.	1	1
	<i>Hemigrapsus penicillatus</i>		1
	<i>Ligia exotica</i>	1	
	<i>Metopograpsus quadridentatus</i>	2	1
	<i>Pagurus dubius</i>	2	
	<i>Parasesarma pictum</i>	2	1
	<i>Sesarma (Chiromantes) bidens</i>	1	2
	<i>Sesarmops sinensis</i>	1	
	<i>Unidentified juvenile crab</i>	2	1
Fish	<i>Bathygobius fuscus</i>		1
	<i>Bathygobius meggitti</i>	5	
	<i>Periophthalmus cantonensis</i>	1	1
Gastropod	<i>Batillaria multiformis</i>	2	
	<i>Batillaria zonalis</i>	122	76
	<i>Cerithidea cingulata</i>	92	87
	<i>Cerithidea djadjariensis</i>	12	34

Location: Tai Ho Wan	Season: Wet	Average Abundance (mobile species) / Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
	<i>Cerithidea rhizophorarum</i>	4	
	<i>Clithon faba</i>	3	3
	<i>Clithon oualaniensis</i>	5	15
	<i>Clithon retropictus</i>		2
	<i>Ellobium chinensis</i>		1
	<i>Littoraria arduiniana</i>	1	2
	<i>Littoraria articulata</i>	6	
	<i>Littoraria melanostoma</i>	2	4
	<i>Monodonta labio</i>	1	
	<i>Nassarius festivus</i>	3	1
	<i>Nerita albicilla</i>	3	
	<i>Nerita chamaeleon</i>	2	
	<i>Nerita striata</i>	1	
	<i>Neritina (Dostia) violacea</i>	2	
	<i>Peasiella</i> spp.	3	
	<i>Terebralia sulcata</i>	3	4
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.	1%	
Worm	<i>Hydroides</i> spp.	1	
	Oligochaeta		2
	<i>Phascolosoma scolops</i>	1	1
	Ribbon worms (Nemertea)	1	1
<b>Total number of species = 45</b>			
<b>Species Diversity Index (<i>H'</i>) = 1.43</b>			
<b>Species Evenness Index (<i>J'</i>) = 0.38</b>			

### Tung Chung Bay

The qualitative and quantitative survey results of intertidal species recorded at the mangrove and mudflat of Tung Chung Bay are presented in **Table 4-68 to Table 4-70**. From the review of data for HZMB baseline monitoring survey, AFCD's Biodiversity Survey and the qualitative survey results for this Project, an overall total of 110 intertidal species were recorded at the area (see **Table 4-68**). Intertidal species of conservation importance including horseshore crabs *Carcinoscorpius rotundicauda* and *Tachypleus tridentatus* were recorded.

At the mangrove habitat, a total of 51 intertidal species were recorded during dry season. Abundant species included *Batillaria multiformis*, *Cerithidea cingulata* and *Cerithidea djadjariensis*, while *Assimineia brevicula*, *Littoraria melanostoma*, *Monodonta labio*, *Terebralia sulcata* and *Saccostrea cucullata* were frequently recorded. Fauna species diversity index (*H'*) was 2.61 and species evenness index (*J'*) was 0.66.

During wet season, a total of 37 intertidal species were recorded. *Batillaria multiformis*, *Cerithidea cingulata* and *Cerithidea djadjariensis* were abundant. Fauna species diversity index (*H'*) was 1.79 and species evenness index (*J'*) was 0.49.

In addition, it was observed during every field survey that a significant number of people (ranging from 30 to 100) undertook clam digging and oyster picking in the entire Tung Chung Bay area (including San Tau).



Table 4-68: List of intertidal species recorded at mangrove and mudflat habitat of Tung Chung Bay

Location: Tung Chung Bay		Number of species: 110		
Category	Scientific Name	AFC D Survey	HZMB BEMR	Field Survey
Plant	<i>Acanthus ilicifolius</i>			Y
	<i>Acrostichum aureum</i>	Y		Y
	<i>Aegiceras corniculatum</i>	Y		Y
	<i>Avicennia marina</i>			Y
	<i>Bruguiera gymnorrhiza</i>	Y		Y
	<i>Clerodendrum inerme</i>			Y
	<i>Excoecaria agallocha</i>	Y		Y
	<i>Hibiscus tiliaceus</i>			Y
	<i>Kandelia obovata</i>	Y		Y
	<i>Paspalum vaginatum</i>			Y
	<i>Phragmites australis</i>			Y
	<i>Suaeda australis</i>			Y
Bivalve	<i>Anodontia stearnsiana</i>		Y	
	<i>Barbatia signata</i>		Y	
	<i>Barbatia virescens</i>		Y	Y
	<i>Brachidontes variabilis</i>	Y		
	<i>Caecella chinensis</i>		Y	
	<i>Cyclina orientalis</i>	Y		
	<i>Cyclina sinensis</i>	Y	Y	Y
	<i>Dosinia japonica</i>		Y	
	<i>Geloina erosa</i>	Y	Y	Y
	<i>Saccostrea cucullata</i>	Y	Y	Y
	<i>Septifer virgatus</i>			Y
	<i>Tapes philippinarum</i>	Y	Y	
	<i>Trapezium sublaevigatum</i>			Y
	<i>Xenostrobus atrata</i>		Y	
Cnidarian	<i>Diadumene lineata</i>			Y
Crustacean	<i>Amphipoda</i> spp.		Y	
	<i>Balanus amphitrite</i>		Y	Y
	<i>Chthamalus malayensis</i>	Y		
	<i>Clibanarius</i> spp.		Y	Y
	<i>Clibanarius virescens</i>			Y
	<i>Clistocoeloma merguiensis</i>			Y
	<i>Epixanthus</i> sp.		Y	
	<i>Gaetice depressus</i>	Y		Y
	<i>Hemigrapsus penicillatus</i>	Y	Y	Y
	<i>Macrophthalmus erato</i>		Y	
	<i>Metopograpsus quadridentatus</i>	Y		Y
	<i>Nanosesarma minutum</i>		Y	
	<i>Parasesarma pictum</i>			
	<i>Pagurus dubius</i>		Y	Y
	<i>Perisesarma bidens</i>			Y
	<i>Philyra carinata</i>		Y	
	<i>Portunus</i> sp.		Y	
	<i>Scylla paramamosain</i>	Y		
	<i>Sesarma (Perisesarma) bidens</i>	Y	Y	Y
	<i>Sesarma (Perisesarma) fasciata</i>		Y	
<i>Sesarmops sinensis</i>			Y	

Location: Tung Chung Bay		Number of species: 110		
Category	Scientific Name	AFC D Survey	HZMB BEMR	Field Survey
	<i>Thalamita crenata</i>	Y	Y	
	<i>Uca acuta</i>	Y		
	<i>Uca arcuata</i>	Y		
	<i>Uca borealis</i>	Y	Y	
	<i>Uca crassipes</i>	Y		
	<i>Uca lactea</i>	Y	Y	Y
	<i>Uca vocans</i>		Y	
Fish	<i>Bathygobius fuscus</i>			Y
	<i>Omobranchus fasciolatoceps</i>		Y	
	<i>Periophthalmus cantonensis</i>			Y
	<i>Periophthalmus modestus</i>	Y		
Gastropod	<i>Assiminea brevicula</i>			Y
	<i>Batillaria multiformis</i>		Y	Y
	<i>Batillaria zonalis</i>	Y	Y	Y
	<i>Clithon faba</i>			Y
	<i>Cellana grata</i>			Y
	<i>Cellana toreuma</i>		Y	Y
	<i>Cerithidea cingulata</i>	Y	Y	Y
	<i>Cerithidea djadjariensis</i>		Y	Y
	<i>Cerithidea rhizophorarum</i>	Y	Y	Y
	<i>Clithon faba</i>	Y		
	<i>Clithon oualaniensis</i>	Y		Y
	<i>Clithon retropictus</i>			Y
	<i>Echinolittorina radiata</i>		Y	
	<i>Ellobium chinensis</i>	Y		
	<i>Ellobium polita</i>	Y		
	<i>Lepidozona</i> sp.		Y	
	<i>Littoraria arduiniana</i>	Y		Y
	<i>Littoraria articulata</i>			Y
	<i>Littoraria melanostoma</i>	Y	Y	Y
	<i>Littoraria pallescens</i>			Y
	<i>Lunella coronata</i>		Y	Y
	<i>Monodonta labio</i>	Y	Y	Y
	<i>Morula musiva</i>	Y		
	<i>Nassarius festivus</i>		Y	Y
	<i>Nassarius semiplicatus</i>		Y	
	<i>Nerita albicilla</i>	Y		Y
	<i>Nerita lineata</i>	Y		
	<i>Nerita polita</i>		Y	
	<i>Nerita squamulata</i>			Y
	<i>Nerita violacea</i>	Y		
	<i>Nipponacmea concinna</i>			Y
	<i>Onchidium hongkongensis</i>			Y
	<i>Onchidium verrucosa</i>			Y
<i>Patelloida pygmaea</i>		Y	Y	
<i>Patelloida saccharina</i>		Y		
<i>Planaxis sulcatus</i>		Y	Y	
<i>Terebralia sulcata</i>	Y	Y	Y	
<i>Thais clavigera</i>		Y		

Location: Tung Chung Bay	Number of species: 110	AFCD Survey	HZMB BEMR	Field Survey
Category	Scientific Name			
Horseshoe Crab	<i>Carcinoscorpius rotundicauda</i>			Y
	<i>Tachypleus tridentatus</i>		Y	Y
Polyplacophora	<i>Acanthopleura japonica</i>			Y
Worm	<i>Ceratonereis</i> sp.			Y
	<i>Hydroides</i> spp.			Y
	<i>Maldanidae</i> spp.		Y	
	<i>Nemertea</i> spp.		Y	Y
	<i>Nereididae</i> spp.		Y	
	Oligochaeta		Y	Y
	<i>Phascolosoma scolops</i>			Y
	<i>Polynoidae</i> spp.		Y	
	<i>Siphonosoma cumanense</i>		Y	Y
	<i>Sipunculus nudus</i>		Y	

Table 4-69: Intertidal species recorded at mangrove and mudflat habitat of Tung Chung Bay in the dry season

Location: Tung Chung Bay	Season: Dry	Average Abundance (mobile species) / Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
Bivalve	<i>Barbatia virescens</i>	1%	1%
	<i>Saccostrea cucullata</i>	20%	18%
	<i>Septifer virgatus</i>	1%	1%
	<i>Trapezium sublaevigatum</i>	1	2
Cnidarian	<i>Diadumene lineata</i>	1	
Crustacean	<i>Balanus amphitrite</i>	1%	1%
	<i>Clibanarius</i> spp.	2	4
	<i>Clibanarius virescens</i>	24	1
	<i>Gaetice depressus</i>	2	1
	<i>Hemigrapsus penicillatus</i>	2	2
	<i>Pagurus dubius</i>	1	4
	<i>Parasesarma pictum</i>	1	
	<i>Perisesarma bidens</i>	3	4
	<i>Sesarmops sinensis</i>		2
	<i>Uca lactea</i>	1	2
	Unidentified crab	1	
	Unidentified juvenile crab		4
Fish	<i>Periophthalmus cantonensis</i>		1
Gastropod	<i>Assiminea brevicula</i>	5	15
	<i>Batillaria multiformis</i>	5	26
	<i>Batillaria zonalis</i>	3	17
	<i>Cellana grata</i>	1	
	<i>Cellana toreuma</i>	2	2
	<i>Cerithidea cingulata</i>	11	29
	<i>Cerithidea djadjariensis</i>	20	25
	<i>Cerithidea rhizophorarum</i>	2	7
	<i>Clithon faba</i>	1	1
	<i>Clithon oualaniensis</i>	1	
	<i>Littoraria ardouiniana</i>	7	8
	<i>Littoraria articulata</i>	3	5
	<i>Littoraria melanostoma</i>	6	7
	<i>Littoraria pallescens</i>	4	3

Location: Tung Chung Bay	Season: Dry	Average Abundance (mobile species) / Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
	<i>Lunella coronata</i>	3	3
	<i>Monodonta labio</i>	13	13
	<i>Nassarius festivus</i>		2
	<i>Nerita albicilla</i>	2	2
	<i>Nerita</i> sp.		1
	<i>Nerita squamulata</i>	2	2
	<i>Nipponacmea concinna</i>	1	7
	<i>Onchidium hongkongensis</i>		1
	<i>Onchidium verrucosa</i>	3	3
	<i>Patelloida pygmaea</i>	5	2
	<i>Planaxis sulcatus</i>	1	
	<i>Terebralia sulcata</i>	5	4
Polyplacophora	<i>Acanthopleura japonica</i>	1	
Worm	<i>Ceratonereis</i> sp.	1	1
	<i>Hydroides</i> spp.	1	
	Oligochaeta	1	1
	<i>Phascolosoma scolops</i>	1	1
	Ribbon worms (Nemertea)	1	
	<i>Siphonosoma cumanense</i>		2
<b>Total number of species = 51</b>			
<b>Species Diversity Index (<i>H'</i>) = 2.61</b>			
<b>Species Evenness Index (<i>J'</i>) = 0.66</b>			

Table 4-70: Intertidal species recorded at mangrove and mudflat habitat of Tung Chung Bay in the wet season

Location: Tung Chung Bay	Season: Wet	Average Abundance (mobile species) / Average Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
Bivalve	<i>Cyclina sinensis</i>	1	1.6
	<i>Geloina erosa</i>	1	
	<i>Saccostrea cucullata</i>	10%	2%
	<i>Septifer virgatus</i>		1%
Crustacean	<i>Balanus amphitrite</i>		1%
	<i>Clibanarius virescens</i>	4	1
	<i>Clistocoeloma merguensis</i>		4
	<i>Metopograpsus quadridentatus</i>		2
	<i>Pagurus dubius</i>	4	2
	<i>Perisesarma bidens</i>	2	
	<i>Sesarma (Chiramantes) bidens</i>	1	3
	<i>Sesarmops sinensis</i>	4	
	Unidentified crab	2	2
	Unidentified juvenile crab	2	1
Fish	<i>Bathygobius fuscus</i>		1
Gastropod	<i>Batillaria multiformis</i>	68	80
	<i>Batillaria zonalis</i>	34	6
	<i>Cellana grata</i>		1
	<i>Cerithidea cingulata</i>	26	52
	<i>Cerithidea djadjariensis</i>	24	68
	<i>Cerithidea rhizophorarum</i>	7	
	<i>Clithon faba</i>	3	7

Location: Tung Chung Bay	Season: Wet	Average Abundance (mobile species) / Average Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
	<i>Clithon oualaniensis</i>	3	2
	<i>Clithon retropictus</i>	1	
	<i>Littoraria ardouiniana</i>	2	3
	<i>Littoraria articulata</i>	2	2
	<i>Littoraria melanostoma</i>	4	3
	<i>Lunella coronata</i>	1	2
	<i>Monodonta labio</i>	2	1
	<i>Nassarius festivus</i>	5	6
	<i>Nerita</i> sp.	1	
	<i>Nerita squamulata</i>	1	
	<i>Onchidium verrucosa</i>	1	2
	<i>Terebralia sulcata</i>	3	2
Horseshoe Crab	Unidentified juvenile horseshoe crab	1	1
Worm	<i>Oligochaeta</i>		1
	<i>Siphonosoma cumanense</i>	7	
<b>Total number of species = 37</b>			
<b>Species Diversity Index (<i>H'</i>) = 1.79</b>			
<b>Species Evenness Index (<i>J'</i>) = 0.49</b>			

## San Tau

Qualitative survey results of intertidal species recorded at the mangrove and mudflat of San Tau are presented in **Table 4-71 to Table 4-73**. From the review of data for HZMB baseline monitoring survey, AFCD's Biodiversity Survey and the qualitative survey results for this Project, an overall total of 128 intertidal species were recorded at the area (see **Table 4-71**). Intertidal species of conservation importance including seagrasses *Halophila ovalis*, *Halophila minor* and *Zostera japonica*, horseshoe crabs *Carcinoscorpius rotundicauda* and *Tachypleus tridentatus* were recorded.

A total of 54 intertidal species were recorded during dry season. Abundant species included *Cerithidea cingulata*, *Cerithidea djadjariensis* and *Saccostrea cucullata*, while *Batillaria multiformis*, *Batillaria zonalis*, *Clypeomorus coralia*, *Littoraria articulata*, *Lunella coronata*, *Monodonta labio*, *Saccostrea cucullata* and *Terebralia sulcata* were frequently recorded. Fauna species diversity index (*H'*) was 2.59 and species evenness index (*J'*) was 0.65.

During wet season, a total of 60 intertidal species were recorded. Abundant species included *Batillaria multiformis*, *Cerithidea cingulata* and *Cerithidea djadjariensis*, while *Batillaria zonalis*, *Clypeomorus coralia*, *Lunella coronata* and *Saccostrea cucullata* were frequently recorded. Fauna species diversity index (*H'*) was 2.30 and species evenness index (*J'*) was 0.56.

Table 4-71: List of intertidal species recorded at mangrove and mudflat habitat of San Tau

Location: San Tau	Number of species: 128	AFCD Survey	HZMB BEMR	Field Survey
Category	Scientific Name			
Plant	<i>Aegiceras corniculatum</i>	Y		Y
	<i>Avicennia marina</i>	Y		Y
	<i>Bruguiera gymnorrhiza</i>	Y		Y
	<i>Cerbera manghas</i>			Y
	<i>Excoecaria agallocha</i>	Y		Y
	<i>Halophila ovalis</i>	Y		Y
	<i>Halophila minor</i>	Y		

Location: San Tau	Number of species: 128	AFCD Survey	HZMB BEMR	Field Survey
Category	Scientific Name			
	<i>Hibiscus tiliaceus</i>			Y
	<i>Kandelia obovata</i>	Y		Y
	<i>Limonium sinense</i>			Y
	<i>Lumnitzera racemosa</i>	Y		
	<i>Pandanus tectorius</i>			Y
	<i>Paspalum vaginatum</i>			Y
	<i>Sesuvium portulacastrum</i>			Y
	<i>Zostera japonica</i>	Y		Y
Bivalve	<i>Anomalocardia squamosa</i>		Y	Y
	<i>Barbatia signata</i>		Y	
	<i>Barbatia virescens</i>		Y	Y
	<i>Brachidontes variabilis</i>	Y		Y
	<i>Caecella chinensis</i>		Y	
	<i>Cardita leana</i>			Y
	<i>Cyclina sinensis</i>			Y
	<i>Donax</i> spp.			Y
	<i>Dosinia japonica</i>		Y	
	<i>Geloina erosa</i>	Y		Y
	<i>Saccostrea cucullata</i>	Y		Y
	<i>Septifer virgatus</i>			Y
<i>Tapes philippinarum</i>		Y	Y	
Cnidaria	<i>Diadumene lineata</i>			Y
Crustacean	<i>Trapezium sublaevigatum</i>			Y
	<i>Alpheus distinguendus</i>		Y	
	<i>Balanus albicostatus</i>	Y		Y
	<i>Balanus amphitrite</i>		Y	Y
	<i>Charybdis</i> sp.		Y	
	<i>Chiromantes sereni</i>	Y		
	<i>Chthamalus malayensis</i>	Y		Y
	<i>Clibanarius virescens</i>			Y
	<i>Microeuraphia withersi</i>			Y
	<i>Gaetice depressus</i>	Y		Y
	<i>Hemigrapsus penicillatus</i>	Y	Y	Y
	<i>Hemigrapsus sanguineus</i>	Y		
	<i>Heteropanope glabra</i>	Y		
	<i>Macrophthalmus</i> sp.		Y	Y
	<i>Metaplex elegans</i>	Y		
	<i>Metopograpsus frontalis</i>	Y		
	<i>Metopograpsus quadridentatus</i>	Y		Y
	<i>Nanosesarma minutum</i>		Y	Y
	<i>Oratosquilla kemp</i>		Y	
	<i>Pagurus dubius</i>			Y
	<i>Parasesarma pictum</i>			Y
	<i>Perisesarma fasciata</i>		Y	
	<i>Portunus pelagicus</i>	Y		
	<i>Scopimera globosa</i>	Y		
	<i>Scylla serrata</i>			Y
	<i>Scylla paramamosain</i>	Y		
<i>Sesarma (Chiromantes) dehaani</i>	Y			

Location: San Tau	Number of species: 128	AFCD Survey	HZMB BEMR	Field Survey
Category	Scientific Name			
	<i>Sesarma (Parasesarma) pictum</i>	Y		
	<i>Sesarma (Parasesarma) plicata</i>	Y		
	<i>Sesarma (Perisesarma) bidens</i>	Y		Y
	<i>Sesarmops sinensis</i>			Y
	<i>Thalamita crenata</i>	Y		
	<i>Tmethypocoelis ceratophora</i>	Y		
	<i>Uca arcuata</i>	Y		
	<i>Uca borealis</i>	Y		Y
	<i>Uca crassipes</i>	Y		
	<i>Uca lactea</i>	Y		Y
	<i>Varuna litterata</i>	Y		
Fish	<i>Bathygobius</i> sp.			Y
	<i>Periophthalmus cantonensis</i>			Y
	<i>Periophthalmus modestus</i>	Y	Y	
Gastropod	<i>Assimineia brevicula</i>			Y
	<i>Batillaria multiformis</i>	Y	Y	Y
	<i>Batillaria zonalis</i>	Y	Y	Y
	<i>Cassidula crassiuscula</i>	Y		
	<i>Cassidula plectrematoides</i>	Y		
	<i>Cellana grata</i>			Y
	<i>Cellana toreuma</i>		Y	Y
	<i>Cerithidea alata</i>	Y		
	<i>Cerithidea cingulata</i>	Y	Y	Y
	<i>Cerithidea djadjariensis</i>	Y	Y	Y
	<i>Cerithidea rhizophorarum</i>	Y	Y	Y
	<i>Clithon faba</i>	Y		Y
	<i>Clithon oualaniensis</i>	Y	Y	Y
	<i>Clithon retropictus</i>	Y		
	<i>Clithon souverbiana</i>	Y		
	<i>Clypeomorus coralia</i>			Y
	<i>Clypeomorus pellucida</i>	Y		
	<i>Ellobium chinensis</i>	Y		
	<i>Ellobium polita</i>	Y		
	<i>Lepidozona</i> sp.		Y	
	<i>Littoraria arduiniana</i>	Y	Y	Y
	<i>Littoraria articulata</i>			Y
	<i>Littoraria melanostoma</i>	Y		Y
	<i>Littoraria pallescens</i>	Y		Y
	<i>Littoraria sinensis</i>	Y		
	<i>Lunella coronata</i>	Y	Y	Y
	<i>Monodonta labio</i>	Y	Y	Y
	<i>Nassarius festivus</i>	Y	Y	Y
	<i>Nerita albicilla</i>	Y		Y
	<i>Nerita chamaeleon</i>	Y		Y
	<i>Nerita lineata</i>	Y		Y
	<i>Nerita litterata</i>	Y		
	<i>Nerita polita</i>		Y	
<i>Nerita squamulata</i>	Y		Y	
<i>Nerita violacea</i>	Y			

Location: San Tau	Number of species: 128	AFCD Survey	HZMB BEMR	Field Survey
Category	Scientific Name			
	<i>Nipponacmea concinna</i>			Y
	<i>Onchidium hongkongensis</i>	Y		Y
	<i>Onchidium verrucosa</i>			Y
	<i>Patelloida pygmaea</i>			Y
	<i>Patelloida saccharina</i>		Y	
	<i>Planaxis sulcatus</i>		Y	
	<i>Platevindex mortoni</i>	Y		
	<i>Tectus pyramis</i>			Y
	<i>Terebralia sulcata</i>	Y		Y
	<i>Thais clavigera</i>	Y		Y
	<i>Turritella terebra</i>		Y	
Horseshoe Crab	<i>Carcinoscorpius rotundicauda</i>			Y
	<i>Tachypleus tridentatus</i>		Y	Y
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.			Y
Polyplacophora	<i>Acanthopleura japonica</i>			Y
	<i>Onithochiton hirasei</i>			Y
Worm	<i>Goniadidae</i> spp.		Y	
	<i>Maldanidae</i> spp.		Y	
	<i>Nemertea</i> spp.			Y
	<i>Oligochaetae</i> spp.			Y
	<i>Phascolosoma scolops</i>			Y
	<i>Siphonosoma cumanense</i>			Y
	<i>Turbellaria</i>			Y

Table 4-72: Intertidal species recorded at mangrove and mudflat habitat of San Tau in the dry season

Location: San Tau	Season: Dry	Average Abundance (mobile species) / Average Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
Bivalve	<i>Barbatia virescens</i>	2%	1%
	<i>Cardita leana</i>		1
	<i>Geloina erosa</i>	2	4
	<i>Saccostrea cucullata</i>	15%	7%
	<i>Septifer virgatus</i>	1%	1%
	<i>Tapes philippinarum</i>	1	1
	<i>Trapezium sublaevigatum</i>	1	1
	Unidentified Bivalve on rock	1	
Cnidarian	<i>Diadumene lineata</i>		1
Crustacean	<i>Balanus albicostatus</i>	1%	1%
	<i>Balanus amphitrite</i>	1%	1%
	<i>Chthamalus malayensis</i>	1%	
	<i>Clibanarius</i> spp.	5	7
	<i>Clibanarius virescens</i>	4	3
	<i>Microeuraphia withersi</i>	1%	
	<i>Gaetice depressus</i>	2	
	<i>Hemigrapsus penicillatus</i>	1	
	<i>Metopograpsus quadridentatus</i>		1
	<i>Nanosesarma minutum</i>		1
	<i>Pagurus dubius</i>	2	3
	<i>Perisesarma bidens</i>	4	2
	<i>Sesarmops sinensis</i>		1



Location: San Tau	Season: Dry	Average Abundance (mobile species) / Average Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
	Unidentified juvenile crab	1	
Gastropod	<i>Assiminea brevicula</i>	21	
	<i>Batillaria multiformis</i>	7	11
	<i>Batillaria zonalis</i>	9	8
	<i>Cellana grata</i>	1	
	<i>Cellana toreuma</i>	3	2
	<i>Cerithidea cingulata</i>	11	25
	<i>Cerithidea djadjariensis</i>	20	37
	<i>Cerithidea rhizophorarum</i>	6	
	<i>Clithon faba</i>	1	2
	<i>Clithon oualaniensis</i>	1	
	<i>Littoraria ardouiniana</i>	5	2
	<i>Littoraria articulata</i>	11	6
	<i>Littoraria melanostoma</i>	13	12
	<i>Littoraria pallescens</i>	1	2
	<i>Lunella coronata</i>	5	5
	<i>Monodonta labio</i>	10	4
	<i>Nassarius festivus</i>	1	3
	<i>Nerita albicilla</i>	2	2
	<i>Nerita lineata</i>	1	
	<i>Nerita squamulata</i>	8	
	<i>Nipponacmea concinna</i>	4	
	<i>Onchidium hongkongensis</i>	3	
	<i>Onchidium verrucosa</i>	4	2
<i>Patelloida pygmaea</i>	3	1	
<i>Terebralia sulcata</i>	8	7	
<i>Thais clavigera</i>		1	
Polyplacophora	<i>Acanthopleura japonica</i>	2	1
	<i>Onithochiton hirasei</i>		2
Worm	Oligochaeta	1	
	<i>Phascolosoma scolops</i>	2	1
	Ribbon worms (Nemertea)	1	1
<b>Total number of species = 54</b>			
<b>Species Diversity Index (<i>H'</i>) = 2.59</b>			
<b>Species Evenness Index (<i>J'</i>) = 0.65</b>			

Table 4-73: Intertidal species recorded at mangrove and mudflat habitat of San Tau in the wet season

Location: San Tau	Season: Wet	Average Abundance (mobile species) / Average Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
Bivalve	<i>Anomalocardia squamosa</i>		1
	<i>Barbatia virescens</i>	1%	
	<i>Brachidontes variabilis</i>		1
	<i>Cyclina sinensis</i>	3	4
	<i>Donax</i> spp.		5
	<i>Geloina erosa</i>	1	
	<i>Saccostrea cucullata</i>	5%	3%
	<i>Septifer virgatus</i>	1%	1%
	<i>Tapes philippinarum</i>	3	1

Location: San Tau	Season: Wet	Average Abundance (mobile species) / Average Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
	<i>Trapezium sublaevigatum</i>	2	1
Horseshoe Crab	<i>Tachypleus tridentatus</i>	1	
Crustacean	<i>Balanus albicostatus</i>		1%
	<i>Balanus amphitrite</i>	1	
	<i>Chthamalus malayensis</i>		1%
	<i>Clibanarius virescens</i>	1	1
	<i>Gaetice depressus</i>		2
	<i>Hemigrapsus penicillatus</i>	2	
	<i>Macrophthalmus</i> sp.	1	
	<i>Nanosesarma minutum</i>		1
	<i>Pagurus dubius</i>	3	3
	<i>Parasesarma pictum</i>		1
	<i>Scylla serrata</i>	1	
	<i>Sesarma (Chiromantes) bidens</i>	2	
	<i>Uca borealis</i>		4
	Unidentified juvenile crab	4	2
	Unidentified shrimp	1	
Fish	<i>Bathygobius</i> sp.	1	
	<i>Periophthalmus cantonensis</i>	2	
Gastropod	<i>Assimineia brevicula</i>		3
	<i>Batillaria multiformis</i>	34	18
	<i>Batillaria zonalis</i>	7	5
	<i>Cellana grata</i>		1
	<i>Cellana toreuma</i>	3	1
	<i>Cerithidea cingulata</i>	22	29
	<i>Cerithidea djadjariensis</i>	30	26
	<i>Cerithidea rhizophorarum</i>		4
	<i>Clithon faba</i>	1	1
	<i>Clithon oualaniensis</i>	2	2
	<i>Clypeomorus coralia</i>	18	5
	<i>Littoraria ardouiniana</i>	2	3
	<i>Littoraria articulata</i>	5	5
	<i>Littoraria melanostoma</i>	5	3
	<i>Littoraria pallescens</i>		1
	<i>Lunella coronata</i>	5	3
	<i>Monodonta labio</i>	3	3
	<i>Nassarius festivus</i>	3	2
	<i>Nerita albicilla</i>	1	1
	<i>Nerita chamaeleon</i>	3	1
	<i>Nipponacmea concinna</i>	1	3
	<i>Onchidium hongkongensis</i>	2	
	<i>Onchidium verrucosa</i>		1
	<i>Patelloida pygmaea</i>	2	2
	<i>Tectus pyramis</i>	1	
	<i>Terebralia sulcata</i>	1	5
	Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.	34%
Polyplacophora	<i>Acanthopleura japonica</i>	2	2
Worm	Oligochaeta	1	2
	Ribbon worms (Nemertea)		1

<b>Location: San Tau</b>	<b>Season: Wet</b>	<b>Average Abundance (mobile species) / Average Percentage Cover (sessile species)</b>	
<b>Category</b>	<b>Scientific Name</b>	<b>Transect 1</b>	<b>Transect 2</b>
	<i>Siphonosoma cumanense</i>	2	4
	Turbellaria	2	
<b>Total number of species = 60</b>			
<b>Species Diversity Index (<i>H'</i>) = 2.30</b>			
<b>Species Evenness Index (<i>J</i>) = 0.56</b>			

## Yan O

Qualitative survey results of intertidal species recorded at the mangrove and mudflat of Yan O are presented in **Table 4-74 to Table 4-76**. From the review of data for AFCD's Biodiversity Survey and the qualitative survey results for this Project, an overall total of 85 intertidal species were recorded at the area (see **Table 4-74**). Intertidal species of conservation importance including seagrass *Halophila ovalis* and horseshore crab *Tachypleus tridentatus* were recorded.

A total of 39 intertidal species were recorded during dry season. Abundant species included *Batillaria zonalis*, *Tapes philippinarum*, *Cerithidea djadjariensis* and *Saccostrea cucullata*, while *Lunella coronata*, *Monodonta labio* and *Nassarius festivus* were frequently recorded. Fauna species diversity index (*H'*) was 2.63 and species evenness index (*J*) was 0.71.

During wet season, a total of 54 intertidal species were recorded. Abundant species included *Monodonta labio*, *Saccostrea cucullata*, *Nerita albicilla*, *Batillaria zonalis* and *Clibanarius virescens*, while *Diadumene lineata*, *Cellana toreuma*, *Cerithidea* spp. and *Balanus amphitrite* were frequently recorded. Fauna species diversity index (*H'*) was 2.83 and species evenness index (*J*) was 0.72.

Table 4-74: List of intertidal species recorded at mangrove and mudflat habitat of Yan O

<b>Location: Yan O</b>	<b>Number of species: 85</b>	<b>AFCD Survey</b>	<b>Field Survey</b>
<b>Category</b>	<b>Scientific Name</b>		
Plant	<i>Aegiceras corniculatum</i>	Y	Y
	<i>Avicennia marina</i>	Y	
	<i>Bruguiera gymnorhiza</i>	Y	
	<i>Excoecaria agallocha</i>	Y	
	<i>Halophila ovalis</i>	Y	
	<i>Hibiscus tiliaceus</i>		Y
	<i>Kandelia obovata</i>	Y	Y
	<i>Lumnitzera racemosa</i>	Y	
Bivalve	<i>Anomalocardia flexuosa</i>		Y
	<i>Anomalocardia squamosa</i>	Y	Y
	<i>Barbatia oblique</i>	Y	
	<i>Barbatia virescens</i>		Y
	<i>Cyclina sinensis</i>		Y
	<i>Donax</i> spp.		Y
	<i>Geloina erosa</i>	Y	
	<i>Marcia hiantina</i>		Y
	<i>Meretrix meretrix</i>		Y
	<i>Saccostrea cucullata</i>	Y	Y
	<i>Septifer virgatus</i>		Y
	<i>Tapes philippinarum</i>	Y	Y
	<i>Tapes variegata</i>	Y	
	<i>Trapezium sublaevigatum</i>		Y

Location: Yan O	Number of species: 85	AFCD Survey	Field Survey
Category	Scientific Name		
Cnidaria	<i>Diadumene lineata</i>	Y	Y
Crustacean	<i>Balanus albicostatus</i>		Y
	<i>Balanus Amphitrite</i>		Y
	<i>Chasmagnathus convexus</i>	Y	
	<i>Chthamalus malayensis</i>		Y
	<i>Clibanarius virescens</i>		Y
	<i>Diogenes spinifrons</i>		Y
	<i>Epixanthus frontalis</i>		Y
	<i>Gaetice depressus</i>		Y
	<i>Hemigrapsus penicillatus</i>	Y	
	<i>Hemigrapsus sanguineus</i>		Y
	<i>Ligia exotica</i>		Y
	<i>Metopograpsus quadridentatus</i>	Y	Y
	<i>Nanosesarma minutum</i>		Y
	<i>Pagurus dubius</i>		Y
	<i>Parasesarma pictum</i>		Y
	<i>Scopimera globosa</i>	Y	
	<i>Scylla paramamosain</i>	Y	Y
	<i>Scylla serrata</i>		Y
	<i>Sesarma (Parasesarma) pictum</i>	Y	
	<i>Sesarma (Perisesarma) bidens</i>	Y	Y
	<i>Tetraclita squamosa</i>		Y
	<i>Thalamita crenata</i>	Y	
	<i>Uca borealis</i>	Y	
<i>Uca crassipes</i>	Y		
Fish	<i>Boleophthalmus pectinirostris</i>	Y	
	<i>Omobranchus fasciolatoceps</i>		Y
	<i>Periophthalmus cantonensis</i>		Y
Gastropod	<i>Periophthalmus modestus</i>	Y	
	<i>Batillaria multiformis</i>	Y	Y
	<i>Batillaria zonalis</i>	Y	Y
	<i>Cellana grata</i>		Y
	<i>Cellana toreuma</i>		Y
	<i>Cerithidea cingulata</i>	Y	
	<i>Cerithidea djadjariensis</i>	Y	Y
	<i>Clithon faba</i>	Y	Y
	<i>Clithon oualaniensis</i>	Y	Y
	<i>Ellobium chinensis</i>	Y	
	<i>Littoraria arduiniana</i>	Y	Y
	<i>Littoraria articulate</i>		Y
	<i>Littoraria melanostoma</i>	Y	Y
	<i>Littoraria pallescens</i>		Y
	<i>Lunella coronate</i>	Y	Y
	<i>Monodonta labio</i>	Y	Y
	<i>Morula musiva</i>		Y
	<i>Nassarius festivus</i>		Y
	<i>Nerita albicilla</i>	Y	Y
	<i>Nerita chamaeleon</i>	Y	Y
<i>Nerita lineata</i>	Y		

Location: Yan O	Number of species: 85	AFCD Survey	Field Survey
Category	Scientific Name		
	<i>Nerita squamulata</i>		Y
	<i>Nipponacmea concinna</i>		Y
	<i>Patelloida pygmaea</i>		Y
	<i>Terebralia sulcata</i>	Y	
	<i>Thais clavigera</i>		Y
	<i>Thais luteostoma</i>		Y
Horseshoe Crab	<i>Tachypleus tridentatus</i>	Y	
Polyplacophora	<i>Acanthopleura japonica</i>		Y
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.		Y
Worm	<i>Hildenbrandia rubra</i>		Y
	<i>Ceratonereis</i> sp.		Y
	Oligochaeta		Y
	<i>Phascolosoma scolops</i>		Y
	Ribbon worms ( <i>Nemertea</i> )		Y

Table 4-75: Intertidal species recorded at mangrove and mudflat habitat of Yan O in the dry season

Location: Yan O	Season: Dry	Average Abundance (mobile species) / Percentage Cover (sessile species)
Category	Scientific Name	Transect 1
Bivalve	<i>Anomalocardia flexuosa</i>	1
	<i>Barbatia virescens</i>	1%
	<i>Cyclina sinensis</i>	1
	<i>Donax</i> spp.	2
	<i>Marcia hiantina</i>	1
	<i>Meretrix meretrix</i>	1
	<i>Saccostrea cucullata</i>	7%
	<i>Septifer virgatus</i>	1%
	<i>Tapes philippinarum</i>	12
Cnidarian	<i>Diadumene lineata</i>	4
Crustacean	<i>Balanus albicostatus</i>	1%
	<i>Balanus amphitrite</i>	1%
	<i>Chthamalus malayensis</i>	1%
	<i>Clibanarius virescens</i>	2
	<i>Epixanthus frontalis</i>	2
	<i>Gaetice depressus</i>	1
	<i>Metopograpsus quandridentatus</i>	1
	<i>Pagurus dubius</i>	2
	<i>Scylla serrata</i>	1
	Unidentified juvenile crab	1
Gastropod	<i>Batillaria multiformis</i>	1
	<i>Batillaria zonalis</i>	18
	<i>Cellana grata</i>	1
	<i>Cellana toreuma</i>	3
	<i>Cerithidea cingulata</i>	3
	<i>Cerithidea djadjarisensis</i>	12
	<i>Clithon faba</i>	1
	<i>Clithon oualaniensis</i>	1
	<i>Littoraria articulata</i>	2

Location: Yan O	Season: Dry	Average Abundance (mobile species) / Percentage Cover (sessile species)
Category	Scientific Name	Transect 1
	<i>Littoraria melanostoma</i>	1
	<i>Lunella coronata</i>	4
	<i>Monodonta labio</i>	8
	<i>Nassarius festivus</i>	3
	<i>Nerita albicilla</i>	2
	<i>Nerita chamaeleon</i>	5
	<i>Nipponacmea concinna</i>	3
	<i>Patelloida pygmaea</i>	1
	<i>Thais clavigera</i>	1
Polyplacophora	<i>Acanthopleura japonica</i>	2
<b>Total number of species = 39</b>		
<b>Species Diversity Index (<math>H'</math>) = 2.63</b>		
<b>Species Evenness Index (<math>J'</math>) = 0.71</b>		

Table 4-76: Intertidal species recorded at mangrove and mudflat habitat of Yan O in the wet season

Location: Yan O	Season: Wet	Average Abundance (mobile species) / Percentage Cover (sessile species)
Category	Scientific Name	Transect 1
Bivalve	<i>Anomalocardia squamosa</i>	2
	<i>Barbatia virescens</i>	2%
	<i>Meretrix meretrix</i>	1
	<i>Saccostrea cucullata</i>	8%
	<i>Scapharca cornea</i>	1
	<i>Septifer virgatus</i>	1%
	<i>Tapes philippinarum</i>	1
	<i>Trapezium sublaevigatum</i>	1
Cnidarian	<i>Diadumene lineata</i>	4
Crustacean	<i>Balanus amphitrite</i>	1%
	<i>Chthamalus malayensis</i>	1%
	<i>Clibanarius virescens</i>	8
	<i>Diogenes spinifrons</i>	1
	<i>Epixanthus frontalis</i>	1
	<i>Gaetice depressus</i>	2
	<i>Hemigrapsus sanguineus</i>	1
	<i>Ligia exotica</i>	1
	<i>Nanosesarma minutum</i>	2
	<i>Pagurus dubius</i>	2
	<i>Parasesarma pictum</i>	1
	<i>Sesarma (Chiromantes) bidens</i>	2
	<i>Tetraclita squamosa</i>	2
	Unidentified juvenile crab	3
Unidentified shrimp	1	
Fish	<i>Omobranchus fasciolatoceps</i>	1
	<i>Periophthalmus cantonensis</i>	1
Gastropod	<i>Batillaria multiformis</i>	1
	<i>Batillaria zonalis</i>	18
	<i>Cellana toreuma</i>	3
	<i>Cerithidea cingulata</i>	6
	<i>Cerithidea djadjariensis</i>	11

Location: Yan O	Season: Wet	Average Abundance (mobile species) / Percentage Cover (sessile species)
Category	Scientific Name	Transect 1
	<i>Clithon faba</i>	1
	<i>Littoraria arduiniana</i>	1
	<i>Littoraria articulata</i>	3
	<i>Littoraria melanostoma</i>	1
	<i>Littoraria pallescens</i>	1
	<i>Lunella coronata</i>	3
	<i>Monodonta labio</i>	13
	<i>Morula musiva</i>	2
	<i>Nassarius festivus</i>	2
	<i>Nerita albicilla</i>	4
	<i>Nerita chamaeleon</i>	2
	<i>Nerita squamulata</i>	3
	<i>Nipponacmea concinna</i>	3
	<i>Patelloida pygmaea</i>	3
	<i>Thais clavigera</i>	2
	<i>Thais luteostoma</i>	3
Lichen, Cyanobacteria and Algae	<i>Corallina</i> spp.	1%
	<i>Hildenbrandia rubra</i>	1%
Polyplocophora	<i>Acanthopleura japonica</i>	1
Worm	<i>Ceratonereis</i> sp.	2
	Oligochaeta	1
	<i>Phascolosoma scolops</i>	3
	Ribbon worms (Nemertea)	1
<b>Total number of species = 54</b>		
<b>Species Diversity Index (<i>H'</i>) = 2.83</b>		
<b>Species Evenness Index (<i>J'</i>) = 0.72</b>		

### Sham Wat Wan

Qualitative survey results of intertidal species recorded at the mangrove and mudflat of Sham Wat Wan are presented in **Table 4-77 to Table 4-79**. From the review of data for AFCD's Biodiversity Survey and the qualitative survey results for this Project, an overall total of 52 intertidal species were recorded at the area (see **Table 4-77**). Intertidal species of conservation importance including seagrass *Halophila beccarii*, horseshore crabs *Carcinoscorpius rotundicauda* and *Tachypleus tridentatus* were recorded.

A fringe of mangroves was observed at part of the backshore of Sham Wat Wan. The number of mangrove species was low without any significant mangrove stands formed in the area, quantitative survey at mangrove was not considered at Sham Wat Wan.

In mudflat habitat of Sham Wat Wan, a total of 9 intertidal species were recorded during dry season. Abundant species included *Cerithidea djadjariensis*, *Cerithidea cingulata* and *Nassarius festivus*. Fauna species diversity index (*H'*) was 1.51 and species evenness index (*J'*) was 0.68.

During wet season, a total of 18 intertidal species were recorded. Abundant species included *Cerithidea djadjariensis*, *Cerithidea cingulata* and *Saccostrea cucullata*. Fauna species diversity index (*H'*) was 0.78 and species evenness index (*J'*) was 0.27.

Table 4-77: List of intertidal species recorded at mangrove and mudflat habitat of Sham Wat Wan

Location: Sham Wat Wan	Number of species: 52	AFCD Survey	Field Survey
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Category	Scientific Name		
Plant	<i>Aegiceras corniculatum</i>	Y	
	<i>Avicennia marina</i>	Y	
	<i>Bruguiera gymnorrhiza</i>	Y	
	<i>Halophila beccarii</i>		Y
	<i>Kandelia obovata</i>	Y	
Bivalve	<i>Brachidontes variabilis</i>	Y	
	<i>Cyclina sinensis</i>		Y
	<i>Donax</i> spp.		Y
	<i>Geloina erosa</i>	Y	
	<i>Isognomon isognomum</i>		Y
	<i>Saccostrea cucullata</i>	Y	Y
	<i>Soletellina diphos</i>		Y
Crustacean	<i>Balanus albicostatus</i>		
	<i>Chthamalus malayensis</i>	Y	
	<i>Clibanarius virescens</i>		Y
	<i>Gaetice depressus</i>	Y	
	<i>Hemigrapsus penicillatus</i>	Y	
	<i>Macrophthalmus</i> sp.		Y
	<i>Metopograpsus frontalis</i>	Y	
	<i>Metopograpsus quadridentatus</i>	Y	
	<i>Pagurus dubius</i>		Y
	<i>Scylla paramamosain</i>	Y	
	<i>Sesarma (Parasesarma) pictum</i>	Y	
	<i>Sesarma (Perisesarma) bidens</i>	Y	
	<i>Uca lactea</i>	Y	
<i>Uca borealis</i>		Y	
Fish	<i>Bathygobius</i> sp.		Y
	<i>Periophthalmus modestus</i>	Y	
Gastropod	<i>Batillaria zonalis</i>	Y	Y
	<i>Cerithidea cingulata</i>	Y	Y
	<i>Cerithidea djadjariensis</i>		Y
	<i>Cerithidea rhizophorarum</i>	Y	
	<i>Clithon faba</i>	Y	
	<i>Clithon oualaniensis</i>	Y	Y
	<i>Littoraria ardouiniana</i>	Y	
	<i>Littoraria melanostoma</i>	Y	
	<i>Littoraria sinensis</i>	Y	
	<i>Monodonta labio</i>	Y	Y
	<i>Natica</i> sp.		Y
	<i>Nassarius festivus</i>		Y
	<i>Nerita albicilla</i>	Y	
	<i>Nerita lineata</i>	Y	
	<i>Nerita violacea</i>	Y	
	<i>Onchidium hongkongensis</i>	Y	
<i>Terebralia sulcata</i>	Y		
<i>Thais clavigera</i>	Y		
Horseshoe Crab	<i>Carcinoscorpius rotundicauda</i>		Y
	<i>Tachypleus tridentatus</i>		Y
Worm	<i>Nemertea</i> spp.		Y
	<i>Oligochaeta</i> spp.		Y



Location: Sham Wat Wan	Number of species: 52	AFCD Survey	Field Survey
Category	Scientific Name		
	<i>Phascolosoma scolops</i>		Y
	<i>Siphonosoma cumanense</i>		Y

Table 4-78: Intertidal species recorded at mudflat habitat of Sham Wat Wan in the dry season

Location: Sham Wat	Season: Wet	Average Abundance (mobile species) / Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
Bivalve	<i>Cyclina sinensis</i>	2	2
	<i>Donax</i> spp.	2	
Crustacean	Unidentified juvenile crab	1	
Gastropod	<i>Batillaria zonalis</i>	1	
	<i>Cerithidea cingulata</i>	6	2
	<i>Cerithidea djadjariensis</i>	8	2
	<i>Clithon oualaniensis</i>	2	2
	<i>Nassarius festivus</i>	4	2
Worm	Oligochaeta	2	2
<b>Total number of species = 9</b>			
<b>Species Diversity Index (<math>H'</math>) = 1.51</b>			
<b>Species Evenness Index (<math>J'</math>) = 0.68</b>			

Table 4-79: Intertidal species recorded at mudflat habitat of Sham Wat Wan in the wet season

Location: Sham Wat	Season: Wet	Average Abundance (mobile species) / Percentage Cover (sessile species)	
Category	Scientific Name	Transect 1	Transect 2
Bivalve	<i>Isognomon isognomum</i>		1
	<i>Saccostrea cucullata</i>	1%	15%
	<i>Soletellina diphos</i>	1	
Crustacean	<i>Clibanarius virescens</i>	1	
	<i>Macrophthalmus</i> sp.	1	
	<i>Pagurus dubius</i>	1	
	<i>Uca borealis</i>	1	
	Unidentified juvenile crab		1
	Unidentified shrimp		1
Fish	<i>Bathygobius</i> sp.	1	1
Gastropod	<i>Batillaria zonalis</i>	6	
	<i>Cerithidea cingulata</i>	7	
	<i>Cerithidea djadjariensis</i>	39	20
	<i>Monodonta labio</i>		1
	<i>Nassarius festivus</i>	1	1
	<i>Natica</i> sp.	1	
Worm	Ribbon worms (Nemertea)	1	2
	<i>Siphonosoma cumanense</i>	2	1
<b>Total number of species = 18</b>			
<b>Species Diversity Index (<math>H'</math>) = 0.78</b>			
<b>Species Evenness Index (<math>J'</math>) = 0.27</b>			

## Summary of the Ecological Baseline Condition of Mangrove and Intertidal Mudflat Habitat

Findings of desktop review and qualitative surveys are summarised in **Table 4-80** below.

Table 4-80: Species number at each mangrove and mudflat obtained from literature review and qualitative surveys

Location	Tai Ho Wan	Tung Chung Bay	San Tau	Yan O	Sham Wat Wan
No. of intertidal species	115	110	128	85	52

Findings of quantitative surveys for this Project at different survey locations are summarised in **Table 4-81** below.

Table 4-81: Species number, diversity index ( $H'$ ) and evenness index ( $J'$ ) recorded at each mangrove and mudflat habitat

Survey Location	Tai Ho Wan		Tung Chung bay		San Tau		Yan O		Sham Wat Wan	
	D	W	D	W	D	W	D	W	D	W
Season <sup>(1)</sup>										
Number of species	42	45	51	37	54	60	39	54	9	18
$H'$	2.32	1.43	2.61	1.79	2.59	2.30	2.63	2.83	1.51	0.78
$J'$	0.62	0.38	0.66	0.49	0.65	0.56	0.71	0.72	0.68	0.27
Number of species (sandy shore)	29	35	41	39	39	34	22	17	43	54
$H'$ (sandy shore)	2.02	1.93	2.23	2.47	2.24	2.11	2.06	1.41	2.45	2.48
$J'$ (sandy shore)	0.60	0.54	0.60	0.68	0.61	0.60	0.67	0.50	0.66	0.62

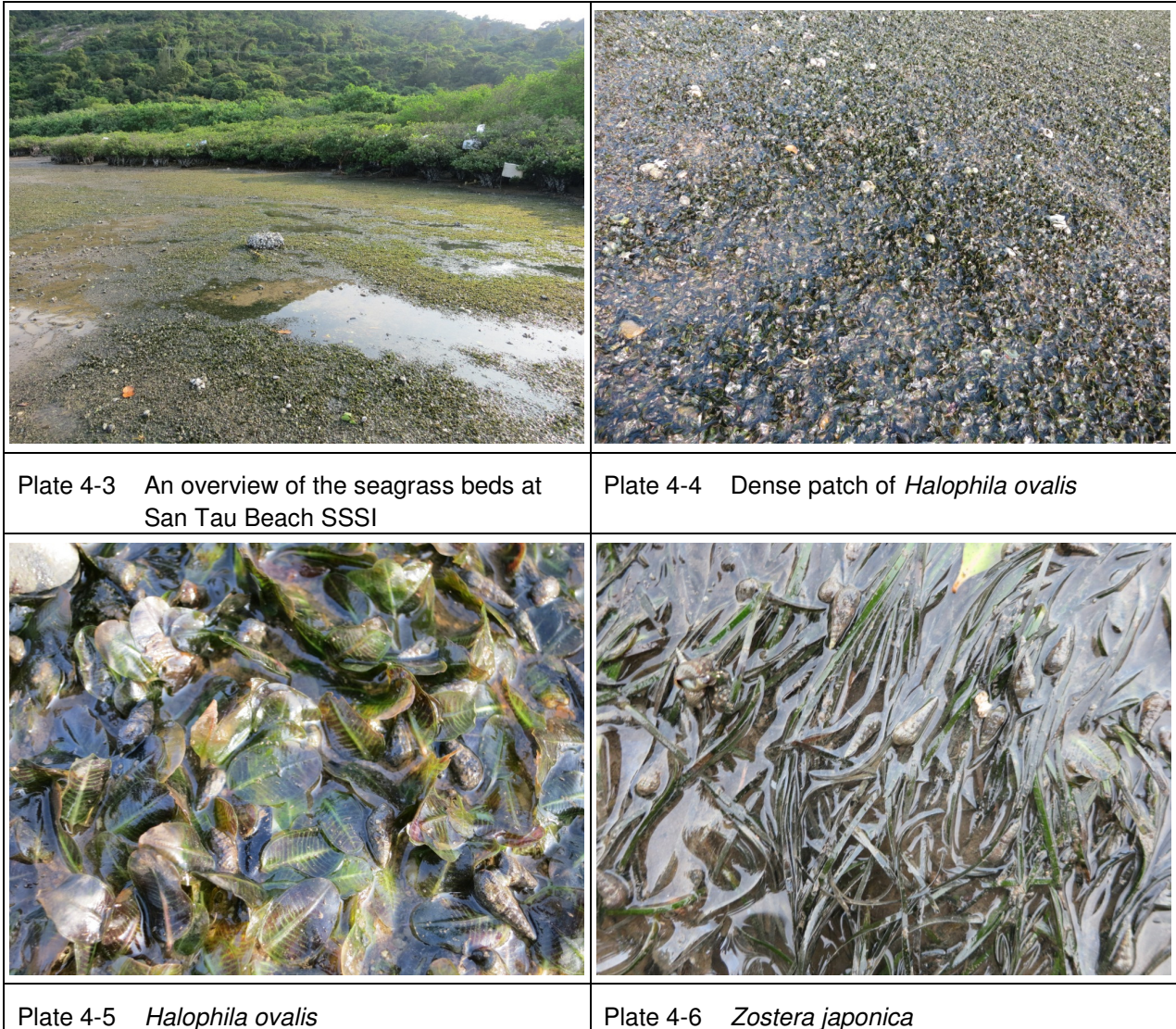
From desktop review and field survey results, overall the species diversity and evenness at the mangrove and mudflat habitats are high. Abundant species found at the mangrove and mudflat habitats were *Batillaria multiformis*, *Batillaria zonalis*, *Cerithidea djadjariensis* and *Cerithidea cingulata*. Species of conservation importance including *Halophila beccarii*, *Halophila ovalis*, *Zostera japonica*, *Tachypleus tridentatus* and *Carcinoscorpius rotundicauda* were recorded at this habitat. The ecological importance of mangrove and mudflat habitats is high. The two intertidal communities of conservation importance, seagrasses and horseshoe crabs, were surveyed qualitatively in focus and are further discussed in details in the following sections.

## 4.5 Baseline Conditions of Intertidal Communities with Conservation Importance

### 4.5.1 Seagrass Beds

#### San Tau Beach Site of Special Scientific Interest (SSSI)

Two species of seagrass, *Halophila ovalis* and *Zostera japonica*, were found at San Tau Beach SSSI. Photographic records of the seagrass beds are presented in **Plate 4-3 to Plate 4-6**.



*Zostera japonica* was found along the mangrove fringe with a length of approximately 30 m. During the wet season in 2012, *Z. japonica* was recorded with an area of about 90 m<sup>2</sup>; while it was recorded with an area of about 60 m<sup>2</sup> during the dry season in 2012.

*Halophila ovalis* was found abundant, covering the mudflats in dense patches next to *Z. japonica* and extended seaward. During the wet season in 2012, *H. ovalis* was recorded with an area of about 1,190 m<sup>2</sup>; while it was recorded with an area of about 580 m<sup>2</sup> during the dry season in 2012.

Fauna species associated with the seagrass beds at San Tau Beach SSSI are listed in **Table 4-82**. One individual of horseshoe crab *Tachypleus tridentatus* was found at the edge of the seagrass bed.

Table 4-82: Records of fauna species associated with the seagrass beds at San Tau Beach SSSI

Species Name	Remarks
<i>Acanthopleura japonica</i>	found on pebbles; in low abundance
<i>Batillaria multiformis</i>	
<i>Batillaria zonalis</i>	

Species Name	Remarks
<i>Cerithidea cingulata</i>	
<i>Cerithidea djadjariensis</i>	
<i>Clibanarius virescens</i>	
<i>Clithon faba</i>	
<i>Clithon oualaniensis</i>	
<i>Lunella coronata</i>	
<i>Monodonta labio</i>	
<i>Nassarius festivus</i>	
<i>Nerita chamaeleon</i>	
<i>Saccostrea cucullata</i>	found on pebbles; in low abundance
<i>Tachypleus tridentatus</i>	
Unidentified juvenile crab	

### Sham Wat Wan Mudflat

Several patches of seagrass species *Halophila beccarii* were found at the mudflat of Sham Wat Wan in the wet season of 2013. Photographic records of the seagrass beds are presented in **Plate 4-7 to Plate 4-10**.



Plate 4-7 An overview of the seagrass beds at Sham Wat



Plate 4-8 A patch of *Halophila beccarii*

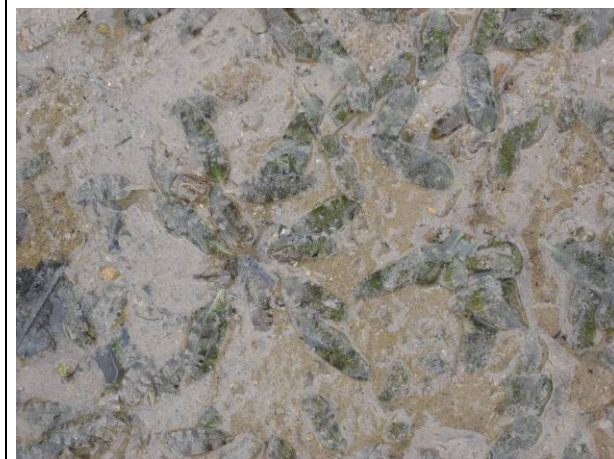


Plate 4-9 *Halophila beccarii*



Plate 4-10 Close view of *Halophila beccarii*

Seagrass beds of *Halophila beccarii* were small and patchy. The largest patch was recorded with an area of 0.42 m<sup>2</sup>. The estimated total area of the seagrass beds recorded was 3.09 m<sup>2</sup>. Fauna species associated with the seagrass beds are listed in **Table 4-83**.

Table 4-83: Records of fauna species associated with the seagrass beds at Sham Wat Wan

Species Name	Remarks
<i>Cerithidea djadjariensis</i>	in high abundance
<i>Cerithidea cingulata</i>	in high abundance
<i>Pagurus dubius</i>	
<i>Diogenes spinifrons</i>	
Unidentified juvenile crab	

### Tai Ho Wan Mudflat

Two patches of seagrass species *Halophila beccarii* were found at the mudflat of Tai Ho Wan in the wet season of 2013. Photographic records of the seagrass beds are presented in **Plate 4-11 to Plate 4-12**.



The two seagrass beds of *Halophila beccarii* were small. Estimated area of the larger patch was 2.34 m<sup>2</sup> while that of the smaller patch was only 0.22 m<sup>2</sup>. The total area of the seagrass beds recorded was therefore 2.56 m<sup>2</sup>. Fauna species associated with the seagrass beds are listed in **Table 4-84**.

Table 4-84: Records of fauna species associated with the seagrass beds at Tai Ho Wan

Species Name
<i>Batillaria zonalis</i>
<i>Cerithidea cingulata</i>
<i>Cerithidea djadjariensis</i>
<i>Nassarius festivus</i>

Surveys for seagrass at Yan O Wan, where seagrass beds had been reported, were also undertaken but no seagrass patch was found.

### Summary of the Ecological Baseline Condition of Seagrass Beds

Seagrass beds recorded from literature review and field surveys within the study area are summarised in **Table 4-85** below. A total of four seagrass species were recorded.

Table 4-85: Sizes of seagrass beds recorded from literature review and field survey

Location	Source	<i>Zostera japonica</i>	<i>Halophila ovalis</i>	<i>Halophila minor</i>	<i>Halophila beccarii</i>
San Tau	Review	20 m <sup>2</sup> [1]	3820 m <sup>2</sup> [1]	Max. 1.5 m <sup>2</sup> [2]	--
	Survey	90 m <sup>2</sup>	1190 m <sup>2</sup>	--	--
Sham Wat Wan	Review	--	--	--	small patches [4]
	Survey	--	--	--	3.09 m <sup>2</sup>
Tai Ho Wan	Review	--	--	--	0.09 m <sup>2</sup> [3]
	Survey	--	--	--	2.56 m <sup>2</sup>
Yan O Wan	Review	--	7500 m <sup>2</sup> [1]	--	--

Source of literature review: [1] Distribution of seagrasses in Hong Kong (Kwok et al., 2005)  
[2] VES, HZMB HKBCF & HKLR EIA (2009)  
[3] EBS, HZMB HKBCF & HKLR EIA (2004)  
[4] AFCD Biodiversity Survey

The presence of seagrass beds at San Tau was verified in this survey with two seagrass species *Zostera japonica* and *Halophila ovalis* recorded. No *Halophila minor* was found in this survey, so the most up-to-date status of this seagrass species is regarded as the record at San Tau in 2009. The presence of seagrass beds of *Halophila beccarii* at Tai Ho Wan was also verified in this survey. Recently, no seagrass beds were found at Tung Chung Bay or Yan O. On the other hand, it is worth noting that a new locality of *Halophila beccarii* was found at Sham Wat Wan in this survey. With reference to Kwok et al. (2005), this Sham Wat Wan locality represents the most western extent of distribution of seagrass beds in Hong Kong.

#### 4.5.2 Horseshoe Crab Breeding and Nursery Sites

During the course of survey, a total of 108 horseshoe crab individuals were recorded within the study area at Sham Wat Wan, Hau Hok Wan, San Tau, Tung Chung Bay and Tai Ho Wan. Details of the survey records are presented in **Table 4-86**.

Table 4-86: Horseshoe Crabs recorded during the course of survey

Location	Date	Species	Prosoma width (cm)	No. of individuals	Remarks
Hau Hok Wan	15/08/2012	Un-identified juvenile	1	2	
San Tau	06/06/2012	<i>Tachypleus tridentatus</i>	4	3	
		<i>Tachypleus tridentatus</i>	5	2	
		<i>Tachypleus tridentatus</i>	5.5	1	
		<i>Tachypleus tridentatus</i>	7	1	
		<i>Tachypleus tridentatus</i>	11	1	associated with seagrass bed
		<i>Tachypleus tridentatus</i>	12	1	caught in a crab net
	06/11/2012	<i>Tachypleus tridentatus</i>	2	2	
	20/06/2013	<i>Carcinoscorpius rotundicauda</i>	4	1	
		<i>Tachypleus tridentatus</i>	4	2	
<i>Tachypleus tridentatus</i>		various	16	caught by research students	
		Un-identified juvenile	≤2	1	
Sham Wat Wan	04/07/2012	<i>Carcinoscorpius rotundicauda</i>	6	2	
		<i>Tachypleus tridentatus</i>	3	2	
		<i>Tachypleus tridentatus</i>	4	1	
		<i>Tachypleus tridentatus</i>	5	2	
		<i>Tachypleus tridentatus</i>	6	2	

Location	Date	Species	Prosoma width (cm)	No. of individuals	Remarks
	05/07/2012	<i>Carcinoscorpius rotundicauda</i>	2	1	
		<i>Carcinoscorpius rotundicauda</i>	3	1	
		<i>Carcinoscorpius rotundicauda</i>	5	1	
		<i>Carcinoscorpius rotundicauda</i>	7	2	
		<i>Tachypleus tridentatus</i>	4	2	
		<i>Tachypleus tridentatus</i>	5	2	
		Un-identified juvenile	≤1	8	
		Un-identified juvenile	≤2	1	
	19/08/2013	<i>Carcinoscorpius rotundicauda</i>	2.5	1	
		<i>Carcinoscorpius rotundicauda</i>	3	2	
		<i>Tachypleus tridentatus</i>	2	3	
		<i>Tachypleus tridentatus</i>	2.5	2	
		<i>Tachypleus tridentatus</i>	3	4	
		<i>Tachypleus tridentatus</i>	3.5	2	
		<i>Tachypleus tridentatus</i>	4.5	1	
		<i>Tachypleus tridentatus</i>	5	1	
		Un-identified juvenile	≤2	3	
	Tai Ho Wan	30/07/2012	<i>Carcinoscorpius rotundicauda</i>	1.5	4
<i>Carcinoscorpius rotundicauda</i>			2	2	
<i>Carcinoscorpius rotundicauda</i>			2.5	5	
<i>Carcinoscorpius rotundicauda</i>			3	7	
<i>Carcinoscorpius rotundicauda</i>			4	1	
<i>Carcinoscorpius rotundicauda</i>			5	2	
<i>Carcinoscorpius rotundicauda</i>			12	1	caught in a plastic bag
<i>Tachypleus tridentatus</i>			4	1	
31/07/2012		<i>Carcinoscorpius rotundicauda</i>	2	1	
12/03/2013	<i>Carcinoscorpius rotundicauda</i>	2	1		
Tung Chung Bay	21/05/2012	<i>Tachypleus tridentatus</i>	4	3	
	03/07/2012	<i>Carcinoscorpius rotundicauda</i>	3.5	1	
TOTAL COUNT				108	

The two horseshoe crab species, *Tachypleus tridentatus* and *Carcinoscorpius rotundicauda* were both recorded within the study area. *T. tridentatus* was recorded at San Tau, Tung Chung Bay, Sham Wat Wan and Tai Ho Wan, while *C. rotundicauda* was recorded at Tung Chung Bay, Sham Wat Wan and Tai Ho Wan. Individuals of juvenile horseshoe crab were also found at Hau Hok Wan and Sham Wat Wan. They could not be identified to species level due to the indistinct characteristics.

It was observed that *T. tridentatus* was the abundant horseshoe crab species at San Tau and Tung Chung Bay; while *C. rotundicauda* was abundant at Tai Ho Wan. At Sham Wat Wan, both species were found in similar abundance. No mating activity of horseshoe crab was observed during the course of survey.

### Summary of the Ecological Baseline Condition of Horseshoe Crab

Horseshoe crabs recorded from literature review and field survey within the North Western Water Control Zone are summarized in **Table 4-87** below.

Table 4-87: Horseshoe Crabs recorded from literature review and field survey

Location	Source	<i>Carcinoscorpius rotundicauda</i>	<i>Tachypleus tridentatus</i>	Un-identified
Tai Ho Wan	Review	(1) (5) (6)	(6)	(6)
	Survey	✓	✓	--
Tung Chung Bay	Review	(4) (5) (6)	(1) (2) (3) (5) (6)	--
	Survey	✓	✓	--
San Tau	Review	(1) (4)	(1) (2) (3) (4) (5) (6)	(6)
	Survey	✓	✓	✓
Hau Hok Wan	Review	(1)	(1)	--
	Survey	--	--	✓
Sha Lo Wan	Review	--	--	(6)
	Survey	--	--	--
Sham Wat Wan	Review	--	(1) (5)	(1) (2)
	Survey	✓	✓	✓

Source of literature review: (1) EBS, HZMB HKBCF & HKLR EIA (2004)  
 (2) VES, HZMB HKBCF & HKLR EIA (2009)  
 (3) BEMR, HZMB HKLR (2012)  
 (4) TMCLKL EIA (2009)  
 (5) Shin et al. (2009)  
 (6) Earlier record (as mentioned in literature review section of HZMB HKBCF & HKLR EIA)

From the significant number of horseshoe crab juveniles and sub-adults recorded in literature review and survey, it was identified that Sham Wat Wan, San Tau, Tung Chung Bay and Tai Ho Wan were some of the nursery grounds of horseshoe crabs in Hong Kong.

In summary, five species of conservation importance were recorded from the intertidal habitats from field survey. These included the three seagrass species *Halophila beccarii*, *Halophila ovalis* and *Zostera japonica*, and the two horseshoe crab species *Tachypleus tridentatus* and *Carcinoscorpius rotundicauda*. *H. beccarii* is listed as “Vulnerable” under IUCN Red. All three seagrass species are locally rare (Hu, 2003; Xing et al., 2000). For the two horseshoe crab species, *C. rotundicauda* is listed as “Vulnerable” while *T. tridentatus* is listed as “Endangered” under China Species Red List, and both species are described as declining in range in Hong Kong due to water pollution and loss of nursery grounds (Morton and Lee, 2003). Therefore these five species are considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text. In addition, mangrove plant species recorded are common in Hong Kong and would not be subject to detailed assessment as presented in the main text.



## 5. Baseline Condition of Estuarine and Marine Fauna

### 5.1 Estuarine Fauna

The estuarine fauna survey were conducted between March and August 2013 covering both dry and wet seasons at six locations including Tai Ho, Tung Chung, San Tau, Sha Lo Wan, Hau Hok Wan, and Sham Wat (the survey locations are presented in **Drawings MCL-P132-EIA-12-010 to 014**. Dates of estuarine fauna surveys are provided in **Table 1 of Appendix 12.3**).

#### Estuarine Macroinvertebrates

During the whole course of stream/estuarine macroinvertebrate survey covering both dry and wet seasons, a total number of 96 estuarine macroinvertebrate species were recorded. These species belong to eight Phyla including Cnidaria, Platyhelminthes, Annelida, Sipuncula, Echiura, Mollusca, Arthropoda and Echinodermata. All estuarine macroinvertebrates recorded during the field survey were presented in **Annex C** with detail in abundance, recorded locations, seasonal difference and biodiversity indices of different survey locations. The diversity indices of estuarine macroinvertebrate at different survey locations were extracted and presented in **Table 5-1** below.

The dominant species recorded in both dry and wet seasons was *Saccostrea cucullata*. In the dry season, Tung Chung had the highest species diversity index ( $H'$ : 2.59) while both Tung Chung and Sha Lo Wan had the highest species evenness index ( $J'$ : 0.64). For the wet season, Sha Lo Wan had both the highest  $H'$  and  $J'$  indices (2.92 and 0.73 respectively) while Hau Hok Wan also had the highest  $J'$  index as Sha Lo Wan.

Table 5-1: Species Diversity Index and Species Evenness Index of Estuarine Macroinvertebrate at Different Survey Locations

Indices		Tai Ho	Tung Chung	San Tau	Sha Lo Wan	Hau Hok Wan	Sham Wat
(H)	Dry Season	2.03	2.59	1.14	2.55	2.38	2.14
	Wet Season	2.31	2.75	1.96	2.92	2.78	2.70
(J)	Dry Season	0.49	0.64	0.51	0.64	0.63	0.55
	Wet Season	0.61	0.68	0.63	0.73	0.73	0.68

The greasyback shrimp *Metapeaneus ensis* was recorded in Tai Ho, Tung Chung Bay, Sha Lo Wan and Sham Wat. It is listed as “Vulnerable” under the China Species Red List due to over-exploitation. However, it is actually common in mangroves and estuarine areas in Hong Kong (Leung, 1999 and Vance, 1999). Therefore, it is excluded from the ecological impact assessment in the current EIA study.

#### Estuarine Fishes

During the whole course of stream/estuarine macroinvertebrate survey covering both dry and wet seasons, a total number of 59 estuarine fishes species were recorded. All estuarine fishes recorded during the field surveys were presented in **Annex D** with details on commonness, conservation status, abundance, recorded locations, seasonal difference and biodiversity indices of different survey locations. The diversity indices of estuarine fishes at different survey locations were extracted and presented in **Table 5-2** below.

In the dry season, Sham Wat has the highest species diversity index ( $H'$ : 2.37) while Hau Hok Wan had the highest species evenness index ( $J'$ : 0.76). In the wet season, Tai Ho had both the highest  $H'$  and  $J'$  indices (2.83 and 0.79 respectively).

Table 5-2: Species Diversity Index and Species Evenness Index of Estuarine Fishes at Different Survey Locations

Indices		Tai Ho	Tung Chung	San Tau	Sha Lo Wan	Hau Hok Wan	Sham Wat
$(H')$	Dry Season	2.04	2.30	1.65	1.96	2.14	2.37
	Wet Season	2.83	2.24	1.84	2.15	2.17	2.54
$(J')$	Dry Season	0.65	0.72	0.69	0.74	0.76	0.73
	Wet Season	0.79	0.64	0.72	0.62	0.74	0.71

The dominant species recorded in the dry season was *Chelon* sp. (784 individuals) while that recorded in the wet season was *Mugil cephalus* (514 individuals). Among the 59 species, seven are either rare species in Hong Kong or with protection status under IUCN or China Species Red List. They include the Red Stingray *Dasyatis akajei*, the Mozambique Tilapia *Oreochromis mossambicus*, Banded mulletgoby *Hemigobius hoevenii*, Indo-Pacific tropical sand goby *Favonigobius reichei*, Archpatch puffer *Takifugu ocellatus*, Spotted Seahorse *Hippocampus kuda* and Seaweed Pipefish *Syngnathus schlegeli*.

The Red Stingray *Dasyatis akajei* is listed as “Near Threatened” under IUCN Red List and “Endangered” under China Species Red List. It was recorded in Tai Ho, Sha Lo Wan and Sham Wat. Due to its international and regional protection status, and the unknown local population status, this species is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text.

Mozambique Tilapia *Oreochromis mossambicus* is listed as “Near Threatened” under IUCN Red List. Seven individuals of Mozambique Tilapia were recorded in Tung Chung while 126 individuals were recorded in Sham Wat. However, it is an invasive species to Hong Kong competing with indigenous fish for food resource and habitats. It is originally native to the eastern coast of Africa and Middle East, but has been popularly introduced throughout the world for culturing. It is common and widespread in brackish waters, freshwaters ponds ditches, rivers and reservoirs. The fish is also cultivated in some local fish farms. Therefore, the Mozambique Tilapia is not considered to be of conservation importance in the current EIA study.

Banded mulletgoby *Hemigobius hoevenii* is rare in Hong Kong. It was only recorded in a few streams and estuaries on Lantau Island. It was only recorded in Tai Ho during the surveys, 55 individuals were found in during the dry season and 2 individuals were found during the wet season in Tai Ho. Therefore, it is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text.

Archpatch puffer *Takifugu ocellatus* is regarded as a species of “Local Concern” (Fellowes *et al.*, 2002). It is also a rare species in Hong Kong (AFCD, 2013), therefore it is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text. A total of six individuals were recorded in Sham Wat, Sha Lo Wan and Hau Hok Wan.

The Indo-Pacific tropical sand goby *Favonigobius reichei* was listed as “Near Threatened” under IUCN Red List. ). However, as it is commonly found in intertidal waters throughout Hong Kong (Lee *et al.*, 2004), it is excluded from the impact assessment in the current EIA study. A total number of 192 individuals were recorded during dry season and 62 individuals were recorded during wet season.

Seahorses face the threat of overfishing for their qualities for traditional medicine and aquarium purposes. The Spotted Seahorse *Hippocampus kuda* was listed as “Vulnerable” under the IUCN Red List and “Endangered” under China Species Red List. It has been evaluated as uncommon in Hong Kong (To *et al.*,

2013). Therefore, it is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text. One individual of Spotted Seahorse was found in Tai Ho during the wet season.

Seaweed Pipefish *Syngnathus schlegeli* has been evaluated as rare in Hong Kong. Only one individual of Seaweed Pipefish *Syngnathus schlegeli* was recorded in the dry season at Tai Ho. However, it was recorded in almost all survey locations except San Tau during the wet season and the highest number of *Syngnathus schlegeli* was recorded in Tung Chung with eight individuals. It is considered relevant to this EIA study as stipulated in the Study Brief, and would be subjected to more detailed assessment as presented in the main text.

After screening, 5 estuarine species are considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text. They are Red Stingray *Dasyatis akajei*, Banded mulletgoby *Hemigobius hoeverii*, Archpatch puffer *Takifugu ocellatus*, Spotted Seahorse *Hippocampus kuda* and Seaweed Pipefish *Syngnathus schlegeli*. As the habitat of *Dasyatis akajei* is primarily marine, it has been grouped as marine fishes in the impact assessment.

## 5.2 Marine Fishes and Other Fauna

Marine fishes and other fauna survey in open waters covering the proposed land formation footprint, sites of conservation importance and adjacent waters were conducted as part of the fisheries survey under Chapter 14 Fisheries Impact (the survey locations are presented in **Drawings MCL-P132-EIA-14-007 to 009**). The dates of the fisheries survey can be found in **Table 14.1** of **Chapter 14**. A detailed list of species recorded is provided in **Annex E**. Eighteen are with conservation status in either IUCN or China Species Red List. They are *Aetobatus flagellum* (Longheaded eagle ray), *Bahaba taipingensis* (Chinese bahaba), *Carcinoscorpius rotundicauda* (horseshoe crab), *Collichthys lucidus* (Lion head croaker), *Dasyatis zugei* (Pale-edged stingray), *Dendrophysa russellii* (Goatee croaker), *Diagramma pictum* (Painted sweetlips), *Epinephelus bruneus* (Long-tooth grouper), *Epinephelus coioides* (Orange-spotted grouper), *Fenneropenaeus merguensis* (Chinese white prawn), *Hippocampus kuda* (Spotted seahorse), *Johnius macrorhynchus* (Big-snout croaker), *Larimichthys crocea* (Yellow croaker), *Metapenaeus affinis* (Jinga shrimp), *Metapenaeus joyneri* (Shiba shrimp), *Oreochromis mossambicus* (Mozambique Tilapia), *Otolithes ruber* (Tiger-toothed croaker) and *Scomberomorus commerson* (Banded tuna).

*Aetobatus flagellum* (Longheaded eagle ray) was recorded in project footprint. It is listed as “Endangered” in the IUCN Red List. The local status is unknown and it is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text.

*Bahaba taipingensis* (Chinese bahaba) was reported to be found in Fau Lau and Tai O area by fishermen. It is listed as “Critically Endangered” in the IUCN Red List. However, as its reported location is far away from the project footprint to be potentially affected by the project, it is excluded from the impact assessment in the current EIA study.

As mentioned in Section 4, *Carcinoscorpius rotundicauda* is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text.

*Collichthys lucidus* (Lion head croaker) was recorded in SCLKCMP, project footprint and the northern and western Chek Lap Kok waters with high abundance. It is listed as “Vulnerable” in the China Species Red List. However, it is reported as the top ten species caught by fishermen in the study area. Therefore, it is excluded from the impact assessment in the current EIA study.

*Dasyatis zugei* (Pale-edged stingray) was recorded in the project footprint and the northern and western Chek Lap Kok waters. It is listed as “Near threatened” under the IUCN Red list and the local status is

unknown. It is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text.

*Dendrophysa russellii* (Goatee croaker) was recorded in the Brothers, SCLKCMP, project footprint and the northern and western Chek Lap Kok waters. It is listed as “Vulnerable” under the IUCN Red list and the local status is unknown. It is therefore considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text.

*Diagramma pictum* (Painted sweetlips), which is listed as “Vulnerable” in the China Species Red List, was recorded in the project footprint. It was considered as common and moderately abundant in Hong Kong waters (Sadovy, 2000; To et al. 2013). The species is therefore excluded from the ecological impact assessment in the current EIA study.

*Epinephelus bruneus* (Long-tooth grouper) was recorded in the northern Chek Lap Kok waters, the project footprint and the Brothers. It is listed as “Vulnerable” in the IUCN Red List and is found to be locally rare (To et al., 2013). Therefore, it is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text.

*Epinephelus coioides* (Orange-spotted grouper) was recorded in the project footprint. It is listed as “Near Threatened” in the IUCN Red List and is found to be locally rare (To et al., 2013). Therefore, it is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text.

*Fenneropenaeus merguensis* (Chinese white prawn) was recorded in the Brothers, SCLKCMP, the northern and western Chek Lap Kok waters and the project footprint. It is listed as “Endangered” in the China Species Red List. However, it is excluded from the ecological impact assessment in the current EIA study as it is a common commercial prawn species.

*Hippocampus kuda* (Spotted seahorse) was listed as “Vulnerable” under the IUCN Red List and “Endangered” under China Species Red List. It has been evaluated as uncommon in Hong Kong (To et al., 2013). Therefore, it is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text. One individual of Spotted Seahorse was found at the Brothers, while another was caught at northern Chek Lap Kok waters.

*Johnius macrorhynus* (Big-snout croaker) was recorded in the Brother, SCLKCMP, the northern and western Chek Lap Kok waters and the project footprint. It is listed as “Vulnerable” in the China Species Red List. However, it is excluded from the ecological impact assessment in the current EIA study as it was a common fish species recorded in CMP EM&A trawl surveys.

*Larimichthys crocea* (Yellow croaker) was recorded in the western Chek Lap Kok waters. It is listed as “Vulnerable” in the China Species Red List and is reported to be in great decline (Cheung and Sadovy, 2004). Therefore, it is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text.

*Metapenaeus affinis* (Jinga shrimp) and *Metapenaeus joyneri* (Shiba shrimp) were recorded in SCLKCMP, the northern and western Chek Lap Kok waters and the project footprint. They are listed as “Vulnerable” in the China Species Red List. However, they are excluded from the ecological impact assessment in the current EIA study as they are common commercial prawn species.

*Oreochromis mossambicus* (Mozambique Tilapia) was recorded in northern Chek Lap Kok waters. It is listed as “Near Threatened” in the IUCN Red List. However, as mentioned in Section 5.1 above, it is not considered as a species of conservation importance in the current EIA study.

*Otolithes ruber* (Tiger-toothed croaker) was recorded in SCLKCMP and the project footprint. It is listed as “Vulnerable” in the China Species Red List and the local status is unknown. Therefore, it is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text.

*Scomberomorus commerson* (Banded tuna) was recorded in the Brothers and the northern Chek Lap Kok waters. It is listed as “Near Threatened” in the IUCN Red List and the local status is unknown. Therefore, it is considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text.

After screening, ten marine species are considered relevant to this EIA study and would be subject to more detailed assessment as presented in the main text. They are *Aetobatus flagellum* (Longheaded eagle ray), *Carinoscorpius rotundicauda* (horseshoe crab), *Dasyatis zugei* (Pale-edged stingray), *Dendrophysa russellii* (Goatee croaker), *Epinephelus bruneus* (Long-tooth grouper), *Epinephelus coioides* (Orange-spotted grouper), *Hippocampus kuda* (Spotted seahorse), *Larimichthys crocea* (Yellow croaker), *Otolithes ruber* (Tiger-toothed croaker) and *Scomberomorus commerson* (Banded tuna).

### Fish Trawl Survey

The survey area was divided into six regions, three of which fell within the proposed land formation footprint within and outside the existing HKIAAA and the immediately adjacent area (F1A and F1B, F2A and F2B, F3A and F3B), one was in western waters of existing HKIA (F4A and F4B), and two others were in northern Lantau waters identified as spawning areas for commercial fisheries in previous studies (F5A and F5B, F6A and F6B). For each region, the average species richness (i.e. number of species), average abundance, average yield, average species diversity (Shannon-Wiener index  $H'$ ) and average evenness (Shannon's equitability  $J'$ ) were calculated (Table 5-3 and Table 5-4). Evenness measures how well distributed abundance is among species, while  $H'$  is a measure of the species diversity which takes into account both species richness and evenness. It has been shown that species diversity is positively correlated with CPUE and income per unit effort (IPUE) (Stelzenmüller et al., 2009), and hence the biodiversity indices may also serve as indicators of fisheries production in terms of weight and value.

During the dry season, species diversity was the highest within the proposed land formation footprint and the immediately adjacent area (F1A, F1B, F3A and F3B), and the lowest in the northern water of Chek Lap Kok (F3A and F3B). The highest abundance and biomass were recorded within the proposed land formation footprint (F2A and F2B) mainly due to *Turritella terebra*.

During the wet season, the overall species diversity was similar. Both number and weight percentage of commercial species decreased, showing that there was an increase of non-commercial species. Highest species diversity occurred in northern waters of Chek Lap Kok (F6A and F6B) while lowest species diversity was observed in the western waters of Chek Lap Kok (F4A and F4B). The highest abundance and biomass were found within the proposed land formation footprint (F1A and F1B).

Table 5-3 Summary Table for Fish Trawl Survey Results (Dry Season)

Location	Transects	Avg. No. of Species	Avg. $H'$	Avg. $J'$	Avg. Abundance	Avg. Yield (g)
Within land formation footprint and the immediately adjacent area	F1A, F1B	36	2.05	0.57	402.2	6,927
	F2A, F2B	28	1.65	0.50	375.0	9,483
	F3A, F3B	34	2.20	0.63	633.7	7,958
Western Waters of Chek Lap Kok	F4A, F4B	27	1.83	0.56	450.7	6,807
Northern Waters of Chek	F5A, F5B	26	1.61	0.50	384.0	5,006

Location	Transects	Avg. No. of Species	Avg. $H'$	Avg. $J'$	Avg. Abundance	Avg. Yield (g)
Lap Kok	F6A, F6B	29	1.85	0.55	274.7	4,195
Overall	F1A – F6B	71	2.25	0.53	2520.2	40,374

Table 5-4 Summary Table for Fish Trawl Survey Results (Wet Season)

Location	Transects	Avg. No. of Species	Avg. $H'$	Avg. $J'$	Avg. Abundance	Avg. Yield (g)
Within land formation footprint and the immediately adjacent area	F1A, F1B	36	1.84	0.52	1176.5	17,354
	F2A, F2B	32	1.73	0.51	934.3	18,895
	F3A, F3B	37	2.21	0.62	720.2	11,529
Western Waters of Chek Lap Kok	F4A, F4B	31	1.58	0.46	955.8	11,979
Northern Waters of Chek Lap Kok	F5A, F5B	33	2.14	0.61	428.0	5,766
	F6A, F6B	31	2.28	0.67	581.8	8,022
Overall	F1A – F6B	76	2.25	0.52	4796.7	73,544

### Purse Seine Survey

During the dry season (**Table 5-5**), *Thryssa kammalensis* (Kammal thryssa) and *Sardinella albella* (White sardinella) are the species with the highest abundance in almost all of the survey sites. Other common species included the gizzard shads *Nematalosa nasus* and *Konosirus punctatus*. The highest species diversity was observed in proposed Brothers Marine Park (P1A and P1B) while the lowest species diversity was found within the northern water of Chek Lap Kok (P5A and P5B). The highest abundance was recorded in northern water of Chek Lap Kok (P4A and P4B) while the lowest abundance was recorded within land formation footprint (P3A and P3B). The highest biomass was recorded in SCLKC Marine Park (P2A and P2B) while the lowest biomass was recorded within proposed Brothers Marine Park (P1A and P1B).

During the wet season (**Table 5-6**), *S. albella* was the most abundant species, along with *Alepes djedaba* (shrimp scad) and *Thryssa kammalensis* (anchovy). Both species richness and diversity increased as compared to the dry season. Highest species diversity was within the land formation footprint and inside the HKIAAA (P3A and P3B), while the lowest diversity was recorded at the proposed Brothers Marine Park (P1A and P1B). The highest abundance and biomass were recorded in SCLKCMP (P2A and P2B) while the lowest abundance and biomass were recorded within the land formation footprint and inside the HKIAAA (P3A and P3B).

Table 5-5 Summary Table for Purse Seine Survey Results (Dry Season)

Location	Transects	Avg. No. of Species	Avg. $H'$	Avg. $J'$	Avg. Abundance	Avg. Yield (g)
Proposed Brothers Marine Park	P1A, P1B	10	1.45	0.68	174.0	1,912.
SCLKC Marine Park	P2A, P2B	13	1.19	0.46	305.3	14,963
Within land formation footprint	P3A, P3B	8	1.12	0.57	239.3	10,227
Western Waters of Chek Lap Kok	P4A, P4B	13	1.37	0.54	416.8	8,372
Northern Waters of Chek Lap Kok	P5A, P5B	11	0.73	0.30	767.3	7,316

Location	Transects	Avg. No. of Species	Avg. $H'$	Avg. $J'$	Avg. Abundance	Avg. Yield (g)
Overall	P1A – P5B	26	1.54	0.48	1902.5	42,789

Table 5-6 Summary Table for Purse Seine Survey Results (Wet Season)

Location	Transects	Avg. No. of Species	Avg. $H'$	Avg. $J'$	Avg. Abundance	Avg. Yield (g)
Proposed Brothers Marine Park	P1A, P1B	12	1.30	0.54	213.8	1,597
SCLKC Marine Park	P2A, P2B	19	1.76	0.61	282.3	3,167
Within land formation footprint	P3A, P3B	13	2.00	0.77	55.8	1,099
Western Waters of Chek Lap Kok	P4A, P4B	15	1.81	0.67	193	2,931
Northern Waters of Chek Lap Kok	P5A, P5B	12	1.54	0.64	114.3	2,521
Overall	P1A – P5B	32	2.15	0.63	859.0	11,315

### Gill Net Survey

During the dry season (**Table 5-7**), the highest species diversity was recorded at SCLKC Marine Park (P2A and P2B), and the lowest diversity was within the northern waters of Chek Lap Kok (P5A and P5B). In terms of abundance and biomass, the highest was found in SCLKC Marine Park (P2A and P2B) while the lowest was found within land formation footprint (P3A, P3B).

In contrast to the purse seine surveys results, during the wet season (**Table 5-8**) species richness and diversity decreased compared to the dry season. Species such as *T.toreumaticus* and small crabs *Charybdis* sp. proliferated. The highest diversity was recorded at the proposed Brothers Marine Park (P1A, P1B) while the lowest diversity was recorded at the western waters of Chek Lap Kok (P4A, P4B). The highest abundance was recorded in northern waters of Chek Lap Kok (P5A, P5B) while the lowest abundance was recorded within land formation footprint (P3A, P3B). The highest biomass was recorded in the proposed Brothers Marine Park (P1A, P1B) while the lowest abundance was recorded in the SCLKC Marine Park (P2A, P2B).

Table 5-7 Summary Table for Gill Net Survey Results (Dry Season)

Location	Transects	Avg. No. of Species	Avg. $H'$	Avg. $J'$	Avg. Abundance	Avg. Yield (g)
Proposed Brothers Marine Park	P1A, P1B	6	1.59	0.90	14.0	515
SCLKC Marine Park	P2A, P2B	9	1.66	0.90	21.3	766
Within land formation footprint	P3A, P3B	5	1.36	0.92	11.3	425
Western Waters of Chek Lap Kok	P4A, P4B	7	1.64	0.92	15.3	646
Northern Waters of Chek Lap Kok	P5A, P5B	4	1.04	0.74	21.8	467
Overall	P1A – P5B	19	2.42	0.83	83.5	2,819

Table 5-8 Summary Table for Gill Net Survey Results (Wet Season)

Location	Transects	Avg. No. of Species	Avg. $H'$	Avg. $J'$	Avg. Abundance	Avg. Yield (g)
Proposed Brothers Marine Park	P1A, P1B	9	1.59	0.74	32.8	1,084
SCLKC Marine Park	P2A, P2B	4	0.82	0.59	32.3	511
Within land formation footprint	P3A, P3B	5	0.81	0.53	22.8	702
Western Waters of Chek Lap Kok	P4A, P4B	5	0.75	0.54	39.5	658
Northern Waters of Chek Lap Kok	P5A, P5B	6	1.20	0.68	43.5	963
Overall	P1A – P5B	17	1.46	0.52	170.8	3,918

### Hand Line Survey

During the dry season (**Table 5-9**), *Sebastiscus marmoratus* (common rockfish) was recorded with the highest abundance. The highest abundance was recorded at proposed Brothers Marine Park (H1) and the lowest abundance was within land formation footprint (H3). The biomass recorded at proposed Brothers Marine Park (H1) was the highest and the lowest biomass was recorded in the northern waters of Chek Lap Kok.

During the wet season (**Table 5-10**), both species richness and diversity improved. *Sebastiscus marmoratus* was also recorded with high abundance. The highest species diversity was recorded at SCLKC Marine Park (H2) and the lowest diversity was within the land formation footprint (H3). The abundance and biomass in proposed Brothers Marine Park and SCLKCMP were the highest. The lowest abundance and biomass were recorded in the western waters of Chek lap Kok.

Table 5-9 Summary Table for Hand Line Survey Results (Dry Season)

Location	Transects	Avg. No. of Species	Avg. $H'$	Avg. $J'$	Avg. Abundance	Avg. Yield (g)
Proposed Brothers Marine Park	H1	2	0.43	0.64	20.5	861
SCLKC Marine Park	H2	2	0.64	0.92	6.0	269
Within land formation footprint	H3	3	0.81	0.95	3.8	133
Western Waters of Chek Lap Kok	H4	2	0.35	1	6.3	182
Northern Waters of Chek Lap Kok	H5	2	0.52	0.95	2.0	105
Overall	H1 – H5	7	1.11	0.59	39.5	1551

Table 5-10 Summary Table for Hand Line Survey Results (Wet Season)

Location	Transects	Avg. No. of Species	Avg. $H'$	Avg. $J'$	Avg. Abundance	Avg. Yield (g)
Proposed Brothers Marine Park	H1	5	1.01	0.81	11.5	579
SCLKC Marine Park	H2	5	1.13	0.88	12.5	570



Location	Transects	Avg. No. of Species	Avg. $H'$	Avg. $J'$	Avg. Abundance	Avg. Yield (g)
Within land formation footprint	H3	4	1.06	0.97	6.0	320
Western Waters of Chek Lap Kok	H4	2	0.65	0.89	4.0	379
Northern Waters of Chek Lap Kok	H5	3	0.85	0.95	6.5	683
Overall	H1 – H5	12	1.94	0.88	40.5	2530

### **Proposed land formation footprint**

Trawling, purse seine, gill net and hand line surveys were conducted within the proposed land formation footprint. A total of 148 species were recorded (**Appendix 14-3**). The top five dominant species recorded in terms of abundance were *Temnopleurus toreumaticus*, *Turritella terebra*, *Siphonosoma* sp., *Johnius belangerii* and *Leiognathus brevirostris*, which accounted for 74% of abundance of all species. In terms of biomass, the top five dominant species were *Temnopleurus toreumaticus*, *Johnius belangerii*, *Siphonosoma* sp., *Turritella terebra*, and *Konosirus punctatus*, which contributed to 68% of total yield.

Species of conservation importance included longheaded eagle ray *Aetobatus flagellum*, pale-edged stingray *Dasyatis zugei*, Goatee croaker *Dendrophysa russelii*, long-tooth grouper *Epinephelus bruneus*, orange-spotted grouper *Epinephelus coioides* and tiger-toothed croaker *Otolithes ruber*.

The eagle ray and stingray are marine and brackish species, usually as bycatch of bottom trawl and demersal fisheries (Fishbase, 2013). Longheaded eagle ray is listed as “Endangered” under the IUCN Red List, with a trend of decreasing population (IUCN, 2013). Pale-edged stingray is listed as “Near Threatened” under the IUCN Red List, but the population trend is unknown (IUCN, 2013). Orange-spotted grouper is a marine, brackish and reef-associated species that inhabits turbid coastal reefs. Juveniles are common in shallow waters of estuaries over sand, mud, gravel and mangroves (Fishbase, 2013). This species is listed as “Near Threatened” under the IUCN Red List with a declining population trend (IUCN, 2013). Long-tooth grouper is a marine species which inhabits rocky reefs and also found on muddy grounds, with juveniles occur in shallow waters (Fishbase, 2013). The population of this species is in a declining trend and listed as “Vulnerable” under the IUCN Red List (IUCN, 2013). The species Goatee croaker, Longsnout stinger and Tiger-toothed croaker are listed as “Vulnerable” under the China Species Red List, but the population trend are unknown.

### **Northern Chek Lap Kok waters outside proposed project footprint**

Trawling, purse seine, gill net and hand line surveys were conducted in northern Chek Lap Kok area. A total of 121 species were recorded. The top five dominant species recorded in terms of abundance were *Turritella terebra*, *Thryssa kammalensis*, *Charybdis* sp., *Leiognathus brevirostris* and *Philine aperta*, which accounted for 72% of abundance of all species. In terms of biomass, the top five dominant species were *Turritella terebra*, *Charybdis* sp., *Thryssa kammalensis*, *Leiognathus brevirostris* and *Siphonosoma* sp., which contributed to 53% of total yield.

Species of conservation importance included pale-edged stingray *Dasyatis zugei*, Goatee croaker *Dendrophysa russelii*, long-tooth grouper *Epinephelus bruneus* and banded tuna *Scomberomorus commerson*.

### **Western Chek Lap Kok waters**

Trawling, purse seine, gill net and hand line surveys were conducted in western Chek Lap Kok water. A total of 105 species were recorded. The top five dominant species recorded in terms of abundance were *Temnopleurus toreumaticus*, *Turritella terebra*, *Thryssa kammalensis*, *Leiognathus brevirostris* and *Charybdis* sp., which accounted for 73% of abundance of all species. In terms of biomass, the top five dominant species were *Temnopleurus toreumaticus*, *Turritella terebra*, *Sardinella albella*, *Charybdis* sp., and *Thryssa*, which contributed to 58% of total yield.

Species of conservation importance included pale-edged stingray *Dasyatis zugei*, Goatee croaker *Dendrophysa russellii*, and Yellow croaker *Larimichthys crocea*,

### **The Brothers**

Purse seine, gill net and hand line surveys were conducted within the proposed Brothers Marine Park. Trawling survey was not conducted in this proposed marine park for minimising the disturbance to seabed. A total of 74 species were recorded. The number of species recorded was relatively less than other survey areas as trawling survey was not conducted in this location. The top five dominant species recorded in terms of abundance were *Thryssa kammalensis*, *Sardinella albella*, *Alepes djedaba*, *Sebastiscus marmoratus* and *Temnopleurus toreumaticus*, which accounted for 75% of abundance of all species. In terms of biomass, the top five dominant species were *Sardinella albella*, *Thryssa kammalensis*, *Konosirus punctatus*, *Sebastiscus marmoratus* and *Siganus canaliculatus*, which contributed to 48% of total yield.

Species of conservation importance included goatee croaker *Dendrophysa russellii*, long-tooth grouper *Epinephelus bruneus* and banded tuna *Scomberomorus commerson*.

### **SCLKCMP**

Purse seine, gill net and hand line surveys were conducted in SCLKC Marine Park. Trawling survey was not conducted for minimising the disturbance to seabed. A total of 68 species were recorded. The top five dominant species recorded in terms of abundance were *Nematalosa nasus*, *Sardinella albella*, *Collichthys lucidus*, *Valamugil cunnesius* and *Leiognathus brevisrostris*, which accounted for 70% of abundance of all species. In terms of biomass, the top five dominant species were *Nematalosa nasus*, *Sardinella albella*, *Valamugil cunnesius*, *Ilisha elongata* and *Pampus argenteus*, which contributed to 81% of total yield.

Species of conservation importance included Goatee croaker *Dendrophysa russellii* and tiger-toothed croaker *Otolithes ruber*.

### **Spawning and nursery ground**

Based on results of ichthyoplankton and fish post-larvae survey, generally low densities and family richness were recorded across the survey area. The results have been used to help determine the magnitude of potential impacts associated with the project. Furthermore, results of fish trawl, purse seine, gill net, hand line, ichthyoplankton and fish post-larvae survey only identified one *Hippocampus kuda* ichthyoplankton at the Brothers, one *Hippocampus kuda* post-larvae at northern Chek Lap Kok waters (excluding project footprint) and one *Dendrophysa russellii* post-larvae at western Chek Lap Kok waters. For other species of conservation importance, no ichthyoplankton or post-larvae had been identified within the study area. Therefore, the results suggested that northern Chek Lap Kok waters is not an important spawning or nursery ground for all identified fish species of conservation importance.

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