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AGREEMENT NO. CE 65/2013 (EP) Post-Construction Ecological Monitoring of River Improvement Works in Upper Lam Tsuen River She Shan River and Upper Tai Po River – Investigation

DETAILED ECOLOGICAL MONITORING REPORT (NO.3)

Prepared By:

ALLIED ENVIRONMENTAL CONSULTANTS LTD.

For:

Drainage Services Department



Acousticians & Environmental Engineers

AEC

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Agreement No. CE65/2013(EP) Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation

Detailed Ecological Monitoring Report (No. 3) Upper Lam Tsuen River

January 2016

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 27 January, 2015

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Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation Agreement No. CE65/2013(EP)

Detailed Ecological Monitoring Report (No. 3) Upper Lam Tsuen River

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Photo 1: Vegetation clearance Photo 2: Vegetation coverage of gabion and river bed in middle section of the river (middle section) Photo 3: Dense vegetation coverage in Lam Tsuen River Photo 4: Hong Kong Newt

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- 1 Introduction
- 1.1 Agreement No. CE65/2013(EP) Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation required detailed ecological survey for Lam Tsuen River and She Shan River during dry season. The collected data are mainly used to compare with baseline parameters in order to assess ecological recovery process and effectiveness of ecological migration proposed and enforced during the construction period.
- 1.2 The scope of the ecological monitoring was detailed in EM & A Manual of the project. In brief, the survey aimed to collect data on abiotic factors such as water quality, substratum characteristics, water flow as well as flora and fauna.
- 1.3 China Hong Kong Ecology Consultants Ltd. was committed by Allied Environmental Consultants Ltd (AEC) to undertake the ecological monitoring tasks for the project since December 2014.
- 1.4 This is the number 3 detailed ecological monitoring report summarizing the data collected from detailed surveys of December in 2015 and January in 2016. It contains the following subsections:
 - Summary of major points
 - Monitoring Methods and Results
 - Summary and Comments

2 Summary of Major Points

- Detailed monitoring surveys were undertaken in December 2015 and January 2016;
- Flora recoded in Lam Tusen River is in a normal growth and more abundant than baseline survey;
- The diversity and abundance of bird, marco-invertebrate were observed with no significant change comparing with baseline level ;
- More species and higher abundance of fish in Lam Tusen River was observed comparing with baseline level;
- The population of Hong Kong Newt in Lam Tusen River was significantly increased following with more colonization of vegetation within the river course; and
- Water parameters showed no difference to baseline level except nitrate level decreased slightly.

3 Monitoring Methodology

3.1 Riparian Vegetation

Riparian vegetation, including aquatic and emergent, was sampled using line transects along the affected river channel and riparian habitat. Species, relative abundance and average heights were recorded. Vegetation surveys were conducted at four selected belt transects with two located at the lower portion (T3 and T4) of the river channel and another two at the upper section (T1 and T2) of the river respectively (**Figure 1**). The belt transects was run across the

river channel in order to collect quantitative data of the vegetation, e.g., species inventory, height, percentage cover. Qualitative data of plants was collected by recording plant species, relative abundance along line transect. Nomenclature and protection status of the species followed those documented in Lai *et al* (2004) and Hong Kong Herbarium (2015).

3.2 Avifauna

Avifauna survey was conducted during post construction monitoring period. Special attention was given to the river channel and corridor area which birds used as feeding and foraging habitat. Avifauna surveys were undertaken in the early morning plus species recorded in the rest of the day when conducting other taxonomic groups (benthic, fish, insect) monitoring. Numerical abundance was recorded at fixed count points within a radius of 30-50m according to landscape feature and visual penetration extent. The duration of the point count of birds was standardized for 10 minutes at each location in order to collect comparable data. Transect count along accessible section of river channel were used in order to collect qualitative data. Binoculars and digital camera were the main items of equipment used. Nomenclature and of species follows the AFCD protection status the website (www.hkbiodiversity.net) and Carey et al (2001).

The point count was conducted at four locations with two located at the lower portion of the river channel (T3&T4) and the other two located at the upper section of the river (T1&T2). The point count and survey transect locations for the bird survey and sampling sites for surveys of other faunal groups and flora were presented in **Figure 1**.

3.3 Adult Odonata Survey

Adult Odonata survey was conducted along transects (**Figure 1**). Binoculars, digital camera and hand net were utilized to aid identification. Numerical abundance, species identity and other notable behavior were recorded. Nomenclature and protection status of the species followed those documented in the AFCD website (<u>www.hkbiodiversity.net</u>), Wilson *et al* (2004) and Tam *et al* (2011). Adult Odonata survey was conducted along line transects in parallel with river channel within the works area where access was permitted.

3.4 Aquatic Macro-invertebrates

Macro-invertebrates in the river channel were surveyed. Sampling was conducted at five sampling locations including two sites located at the lower portion (T3 and T4) of the river channel and another two sites at the upper section (T1 and T2) of the river, as well as the reference site. Those sampling sites covered major type of river habitats, e.g. river pool and riffle (**Figure 1**) Five replicates were taken at each sampling point and pool together for further sample sorting and identification. Kick sampling and hand netting were the survey methodologies for river organisms. Dissection microscope and digital camera were used to aid identification and enumeration. Numerical abundance and species identity were recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net) and other literatures such as Dudgeon (1994).

3.5 Fish and Newt

Fish community and *Paramesotriton hongkongensis* at the specified river channel was monitored by live trapping, hand netting and direct observation methods.

Sampling was conducted at five sampling locations including two sites located at the lower portion (T3 and T4) of the river channel and another two sites at the upper section (T1 and T2) of the river, as well as reference site. Those sampling sites covered major type of river habitats, e.g. river pool and riffle (**Figure 1**). The number of the observed fish and newt was estimated and recorded. Nomenclature and protection status of the species followed those documented in the AFCD website (www.hkbiodiversity.net) and Lee *et al* (2004).

3.6 Abiotic Data Collection

3.6.1 Water Quality Monitoring

Dissolved oxygen level, pH value, conductivity, salinity, BOD and nutrient level (nitrate and ammonium) were measured and analyzed by conventional methods in situ or in laboratory. The instruments for measuring dissolved oxygen level, pH value, conductivity, salinity were model: DO-5510, AZ8685, AZ8361 and AZ8374 respectively. All the instruments were calculated every monitoring month according to the operation manuals in order to obtain the precise result. BOD test took 5 days to complete within darkness incubator with stable temperature at 20°C and was performed using model: DO-5510 for measuring dissolved oxygen. Nutrient levels including nitrate and ammonia were performed in laboratory by applying the In-house method SOP056 (FIA) and SOP057 (FIA) respectively.

3.6.2 Sediment Characteristics

Sediment/substrate characteristics were recorded of sediment cover in percentage e.g. mud, sand, rock, boulder and cemented bottom in the river bed at sampling sites.

3.6.3 Water Flow

Water flow rates in river channel were measured by recording the time taken for a floating object (e.g. floating ball) to cover a measured distance.

The sampling locations for surveys were presented in Figure 1.

4 Monitoring Results

4.1 Vegetation

Detailed surveys were undertaken along the transect at Upper Lam Tsuen River. A total of 64 species were recorded from the survey and the result was more diverse than baseline level, in which only 21 species of vegetation were recorded. The increased vegetation diversity indicated that the improved river has provided a more suitable environment for establishment of vegetation, especially for the design of natural river bed, where vegetation could hold tightly on the rough surface to avoid being washing out by flooding. Most recorded species were wetland species with a few floating aquatic species such as Lemna minor, Pistia stratiotes and submerged plants such as Hydrilla verticillata. An invasive species Brachiaria mutica was the dominant species along the river even though a large scale vegetation clearance work had been carried out in January 2016 (Photo 1). The clearance work may not have great influence in vegetation composition as the cleared out species are mostly fast growing species and will regenerate within a short period. Moreover, it was found that vegetation has generally covered gabion and river bed in most of the area (Photo 2). Most of the plants are in good health, the average height of plant is significantly increasing comparing with the data measured in baseline, the highest plant of 2m was recorded along the survey transect. Dominant flora species were shown in the Table 4.1 marked with relative abundance sign "+++". Results of vegetation survey and belt transect survey were presented in Table 4.1 and Table 4.2.



4.2 Fauna

4.2.1 Avifauna

An avifauna detailed surveys were undertaken along survey transects and at four selected point count locations. In total, 26 species of birds were recorded during the bird surveys. Bird's species composition in Lam Tsuen River has changed in terms of abundance and species richness towards the data collected from baseline to post-construction monitoring, more species and higher abundance recorded were related to the improved river, where provided dense vegetation as their habitats, as well as food source. 2 wetland dependent species were recorded with conservation interest during the detailed surveys including *Egretta garzetta* and *Ardeola bacchus*, they were both listed as "Regional Concern" by Fellowes *et al.* (2002) and observed foraging in the river. In addition, a raptor, *Buteo buteo* was observed hovering above the river, which was scheduled under Endangered Species of Animals and Plants Ordinance (Cap. 586). Transect and Point Count locations were shown on **Figure 1.** Result of bird survey was presented in the **Table 4.3.**

4.2.2 Adult Odonata Survey

Odonata detailed surveys were performed and a list of recorded odonata species at Upper Lam Tsuen River is shown in **Table 4.4**. 3 species of odonata were recorded along the river transect, all recorded species were common and wide spread in Hong Kong. Significant low species richness was shown during current detailed survey when compared with the data collected from different season in baseline level. The peak of emergence has ended up in late autumn for most of the species in Hong Kong. The remaining species recorded from surveys have no specific emergence period, they could be seen throughout the year (Wilson *et al.*, 2004 & Tam *et al.*, 2011). Larvae of odonata were usually collected from kick sampling. Sampling location was shown in **Figure 1**.

4.2.3 Aquatic Macro-invertebrates

Upper Lam Tsuen River was flowing with constant water during survey. Aquatic-net and kick sampling were performed at the river. The river benthic fauna collected was mainly comprised of insects, molluscs and crustaceans. Species composition recorded in detailed surveys was similar to baseline survey. Details of recorded of river benthic fauna refers to **Table 4.5.** Sampling location was shown on **Figure 1**.

4.2.4 Hong Kong Newt

Detailed Surveys of Hong Kong Newt were conducted at Upper Lam Tsuen River. Adult Paramesotriton hongkongensis was observed at the Lam Tsuen River with high abundance during current breeding season. Hong Kong Newt was easily found in some habitats covering with dense vegetation (Photos 3-4). During newt's breeding season from September to March, they are more likely to stay in the river for reproduction rather than terrestrial habitat (Dudgeon, 2003). Following the river structure became more stable and mature, newt's population is expected in positive increase. The increased colonization of vegetation in river bed was the main reason of increased abundance of Hong Kong Newt as riparian vegetation grown along the channel especially along water margin could provide shelter and breeding habitat for Hong Kong Newt. Although vegetation work has been carried out in this month, the cleared species Brachiaria mutica is fast-growing with high adaptability that newt's habitats are not likely to be disturbed. Moreover, the dead plant also could provide ecological function to the river as usual. Record of Hong Kong Newts can be referred to Table 4.6.



4.2.5 River Fish Fauna

Fish detailed surveys were performed at Upper Lam Tsuen River. 17 species of freshwater fish, including species recorded from reference site, were recorded. Comparing with baseline data, more species were recorded assuming river is in a process of restoration and becoming more mature and stable. *Oreochromis niloticus* and *Zacco platypus*es were the dominated species in the river. *Acrossocheilus parallens* were recorded at upper, middle and lower river sections. *Acrossocheilus parallens* is a rare freshwater fish species in Hong Kong. Except *Acrossocheilus parallens*, *Parazacco spilurus* is considered with conservation interest. Fish counting at 2 x 2 meter area were performed and number of fish individuals was lower than baseline survey. Details of recorded of fish fauna refers to **Table 4.6.** Sampling location was shown on **Figure 1**.

4.3 Abiotic Data

Data on water quality and major river hydrological feature (water flow and substratum) of the river were collected and are presented in the **Table 4.7**.

Generally, there were no significant change on most of the parameters measured from baseline and detailed surveys respectively. Lower level of nitrate was measured during detailed survey indicating that water quality was improved due to nitrate absorption by abundant vegetation or decreased sewage discharge. Results of water test were presented in the **Table 4.7**.

The river substratum was comprised of over 85-90% stones or rocks in most of the river sections with moderate water flow (up to 0.2m/second at pool and 0.5m/second at riffle).

5 Summary and Commentary

Detailed ecological monitoring surveys were carried out in December of 2015 and January of 2016 and relevant biotic and abiotic data was collected according to project specification and EM & A Manual. Benthic fauna was temporally de-faunated in river sections due to river bed engineering works during construction period between 2008 and early 2013 and is under recovery process after that period. Abundant vegetation was generally established on the gabion and river bed along the river course, species diversity was higher than baseline survey. Avifauna and marco-invertebrate were recorded with no significant change on their species richness and abundance between baseline and detailed survey. Low species richness of odonata was recorded due to seasonality. Following the river became more stable and mature after the completion of construction, more fish species and higher abundance of newt could be found during the survey.

Major parameters measured from baseline and detailed surveys were similar and retaining in an acceptable level. Nitrate level was decreased in detailed survey. Overall water quality is good and contains low concentration of nutrients.

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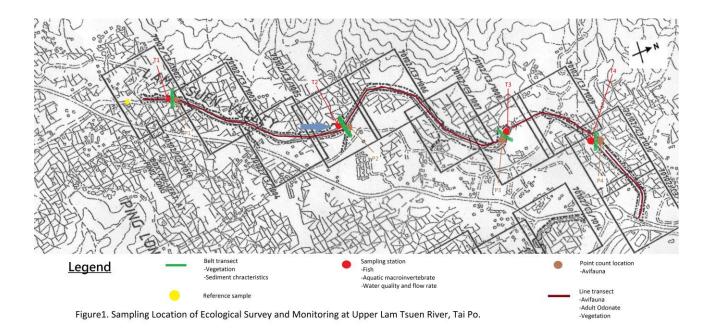
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FIGURES



TABLE

Table 4.1. Flora species recorded along the Lam Tsuen River including riparian habitat.

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Mimosaceae Acacia confusa 台灣相思 + + + +				т.	+					

Table 4.1. Flora species recorded along the Lam Tsuen River including riparian habitat.

PartPartPartPartPartPartPartPartPartMancamReamR			_	Baseline monitoring	Detailed	Survey 1	Detailed	Survey 2	Detailed	Survey 3
<table-container>NamenoreJender<thj< th=""><th>Family</th><th>Species name</th><th>Species name in Chinese</th><th>Jul to Aug 08</th><th>Dec-14</th><th>Jan-15</th><th>Jul-15</th><th>Aug-15</th><th>Dec-15</th><th>Jan-16</th></thj<></table-container>	Family	Species name	Species name in Chinese	Jul to Aug 08	Dec-14	Jan-15	Jul-15	Aug-15	Dec-15	Jan-16
MinnoreCalingCal	Mimosaceae	Leucaena leucocephala	銀合歡		+	+	+	+	+	+
MancerInversionPart of part	Mimosaceae	Mimosa pudica	含羞草		+					
<table-container>ManaceParagePara</table-container>	Mimosaceae	Calliandra haematocephala	紅絨球		+	+	+	+	+	+
<table-container>ManaceMargenetionK.R. CPP<td>Moraceae</td><td>Ficus hispida</td><td>對葉榕</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td></table-container>	Moraceae	Ficus hispida	對葉榕	+	+	+	+	+	+	+
<table-container>MynoneAñ.<</table-container>	Moraceae	Ficus variegata	青果榕			+	+	+	+	+
<table-container>NymbNetro<th< td=""><td>Musaceae</td><td>Musa paradisiaca</td><td>大蕉</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td></th<></table-container>	Musaceae	Musa paradisiaca	大蕉	+	+	+	+	+	+	+
<table-container>DiscretaJornalJo</table-container>	Myrtaceae	Cleistocalyx nervosum	水翁		+					
<table-container>DespinationLinking watern with the set of the set o</table-container>	Nyctaginaceae	Bougainvillea spectabilis	勒杜鵑	+	+					
<table-container>OrdinationBBB</table-container>	Oleaceae	Ligustrum sinense	山指甲			+	+	+	+	+
PhanganadaPhangan quiptSig TII <td>Onagraceae</td> <td>Ludwigia erecta</td> <td>美洲水丁香</td> <td></td> <td>++</td> <td>+</td> <td>+</td> <td>+</td> <td>+</td> <td>+</td>	Onagraceae	Ludwigia erecta	美洲水丁香		++	+	+	+	+	+
<table-container>backerphotom partkPAiii<</table-container>	Oxalidaceae	Oxalis corniculata	酢漿草		+	+	+	+	+	+
<table-container>beachMark<th< td=""><td>Plantaginaceae</td><td>Plantago major</td><td>車前草</td><td></td><td>+</td><td></td><td></td><td></td><td></td><td></td></th<></table-container>	Plantaginaceae	Plantago major	車前草		+					
<table-container>PhychamNumberNu</table-container>	Poaceae	Panicum repens		+	+					
<table-container>PaccesPacketPack</table-container>				+	+	++	+	+	+	+
<table-container>backedNon-standSequenceSequenc</table-container>				1			+	+	+	+
<table-container>PancendMaximumMay CPU and Maximum<</table-container>				+	+					
<table-container>PancentPandamantantPartial<</table-container>				++	+	+	+	+	+	+
<table-container>PaccacMaximumTarêIn<td></td><td></td><td></td><td></td><td>+++</td><td>+++</td><td>+++</td><td>+++</td><td>+++</td><td>++</td></table-container>					+++	+++	+++	+++	+++	++
NaccairIndustional poinceStateIndustional poinceStateIndustional poinceStateIndustional poinceStateIndustional poinceStateIndustional poinceIndustional poince <th< td=""><td></td><td></td><td></td><td></td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td></th<>					+	+	+	+	+	+
PaccaPancing maximumKapImage					+	+	+	+	+	+
<table-container>PanceanCalcar graphicERGIndeIn</table-container>					+					
<table-container>PanceachAnnalo lonxiğirînğirînin<td></td><td></td><td></td><td></td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td></table-container>					+	+	+	+	+	+
PaccealChloris virganiREQII<					+					
Phyloganaca Runc tritetifer Stag R I <t< td=""><td></td><td></td><td></td><td></td><td>+</td><td></td><td></td><td></td><td></td><td></td></t<>					+					
Polygonaccam Polygonan chinesse ×k Final Fina					++	+	++	++	+	+
Physicanacy Physican Mydropher K® I <th< td=""><td></td><td></td><td></td><td></td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td></th<>					+	+	+	+	+	+
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Polygonacea Polygonane lapahifolium							Ŧ	т	-	т
PortulacaceaePortulaca lenceaB&BB+Image <thimage<< td=""><td></td><td></td><td></td><td></td><td>+</td><td></td><td></td><td></td><td></td><td></td></thimage<<>					+					
Annuculacea Songrana dukis Bifliffier Annuculacea Annuculacea Songrana dukis Bifliffier Annuculacea Annuculacea Songrana Bifliffier Annuculacea Annuculacea Songrana Bifliffier Annuculacea Annuculacea Annuculacea Bifliffier Annuculacea Annuculacea <t< td=""><td></td><td></td><td></td><td></td><td>+</td><td></td><td></td><td></td><td></td><td></td></t<>					+					
Number Number Number SignalaceaAdma pluiferaNumber Number Number Number SignalaceaAdma pluiferaNumber Number Number Number SignalaceaAdma pluiferaNumber Numb					+					
SapindaceaeDimocrymstonganRefineInternational internati						+	+	+	+	+
ScrophulariaceaScoparia dukis野甘卒Image1mage1mageImage					+					
ScrophulariaceaLindernia anagallisEgg bpImageIma					+					
SolanaceaSolanum nigrumtaktak111 <td>-</td> <td></td> <td></td> <td></td> <td>+</td> <td></td> <td></td> <td></td> <td></td> <td></td>	-				+					
SolanaceaLycopersicon esculentumStiftImage<	*		-		+					
SolanaeeSolanum torvumkhImage					+					
Sterulia lanceolata熊嶺婆ImageI										
SteruliaceaeBytmeria asperaMRRIIIIIIIIThelyperidaceaeCyclosorus parasiticus#ënII<					+	+	+	+	+	+
IndependenceColor Frederic<					+					
Index The problemMacro helpyperis torresianaHeat HellHeat HellHeat HeatHeat<					+					
UmaceaeCeltis sinensisMėdi++	**				+	+	+	+	+	+
UmaceaTrema orientalisgéduğıkI $+$ <td></td> <td></td> <td></td> <td></td> <td>+</td> <td>+</td> <td>+</td> <td>+</td> <td>+</td> <td>+</td>					+	+	+	+	+	+
Image <th< td=""><td>Ulmaceae</td><td>Celtis sinensis</td><td></td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td></th<>	Ulmaceae	Celtis sinensis		+	+	+	+	+	+	+
VirticaceaPilea microphylla $\Xi m m m m m m$ $\Xi m m m m m m$ $\Xi m m m m m m m m m m m m m m m m m m m$				ļ	+	+	+	+	+	+
VerbenaceaeDuranta erecta \mathbb{G}				ļ	+					
UrticaceaBoehmeria niveaSpikImage: spikSpik	Urticaceae	Pilea microphylla	透明草	<u> </u>	+	+	+	+	+	+
VerbeaceaInstance and a canaraBigs $^+$ $^+$ $^+$ $^+$ $^+$ $^+$ $^+$ $^+$ $^+$ $^+$ $^+$ $^+$ $^+$ $^+$ $^ ^-$ <	Verbenaceae	Duranta erecta				+	+	+	+	+
Verbrace Landard canada 資源行 i <td>Urticaceae</td> <td>Boehmeria nivea</td> <td>苧麻</td> <td></td> <td>+</td> <td>+</td> <td>+</td> <td>+</td> <td>+</td> <td>+</td>	Urticaceae	Boehmeria nivea	苧麻		+	+	+	+	+	+
Lemanceae Leman minor β ? $+$ <	Verbenaceae	Lantana camara	馬纓丹	+	+	+	+	+	+	+
Submerged Plant Image: Constraint of the system of the syste	Floating Plant									
Hydrocharitaceae Hydrilla verticillata Image: Sector of the sector of t	Lemnaceae	Lemna minor	浮萍		+	+	+	+	+	+
	Submerged Plant									
	Hydrocharitaceae	Hydrilla verticillata	黑藻		+	+	+	+	+	+
	-			21	95	67	63	63	64	

Note:

+, occurred; ++, common; +++, Species abundant/dominant in the the study area

Table 4.2. Flora species recorded from belt transect survey at the Upper Lam Tsuen River (T1- Upper stream sampling site T4 - Lower stream sampling site)

				Bas	eline	monitoring						Detailed	l Survey - 1							Detai	led Survey -	1		
		Stream	Jul	-08		A	ug-08					D	ec-14								Jan-15			
		Transect	P1	P4		P1	P4	ļ	T	l	T	2	T3	3	T4		T1		Г	2	1	Г3	7	Г4
Family	Species	Chinese name	Height(m) %	Height(m) %	Height(m) %	Height(m) %	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%
Poaceae	Microstegium ciliatum	剛秀竹	0.4 40	0	Τ	0.4 4	0																	
Fabaceae	Pueraria lobata	野葛	0.5 30	0		0.5 3	0								0.6	10)						0.6	
Poaceae	Pennisetum purpureum	象草	3 20	0		3 2	0														3	15	j -	
Araceae	Alocasia odora	海芋	1 10	0		1 1	0								1.8	1							1.8	
Caesalpiniaceae	Cassia alata	翅莢決明		1.	2 10)		1.2 10)															
Magnoliaceae	Michelia alba	白蘭			6 10			6 10)															
Poaceae	Brachiaria mutica	巴拉草		1.	2 70			1.2 70) 1	10	1.5	15	5 1.3	30) 1	5	1	20	1	20	1.3	20) 1	
Moraceae	Ficus hispida	對葉榕																						
Asteraceae	Mikania micrantha	薇甘菊							0.3	18	0.3	18	8 0.3	18	0.3	18	0.4	10	0.4	15	0.3	5	5 0.3	
Musaceae	Musa paradisiaca	大蕉																						
Ulmaceae	Celtis sinensis	朴樹			6 10			6 10)															
Araceae	Pistia stratiotes L.	大漂																						
Urticaceae	Boehmeria nivea	苧麻																						
Asteraceae	Bidens alba	白花鬼針草							0.5	5	0.8	12	2 0.7	10)		1	10	0.4	15	1	15	j -	
Poaceae	Coix lacryma-jobi	薏苡							2	5														
Solanaceae	Solanum nigrum	龍葵																						
Cyperaceae	Cyperus flabelliformis	風車草																						
Poaceae	Miscanthus floridulus	五節芒																						
Euphorbiaceae	Macaranga tanarius	血桐																						
Asteraceae	Wedelia chinensis	蟛蜞菊																						
Commelinaceae	Commelina diffusa	節節草							0.3	12	0.8	22	2		0.3	20	0.4	10	0.4	20)		0.3	
Asteraceae	Erechtites hieracifolia	革命菜																						
Thelypteridaceae	Cyclosorus parasiticus	華南毛蕨																						
Convolvulaceae	Pharbitis nil	牽牛																						
Verbenaceae	Lantana camara	馬纓丹																						
Mimosaceae	Leucaena leucocephala	銀合歡																						
Brassicaceae	Nasturtium officinale	西洋菜											0.3	2	0.1	1					0.3	10	0.1	
Onagraceae	Ludwigia erecta	美洲水丁香							2	25	2	13	3 2	10	1.8	5	2	30	2	10	2	5	5 1.8	
Poaceae	Pennisetum alopecuroides	狼尾草																						
Amaranthaceae	Celosia argentea	青葙											1.5	15	i									
Acanthaceae	Dicliptera chinensis	狗肝菜																						
Bare Gound								Τ		25		20)	15	5	40		20		20)	30)	

P1 - Point count location 1; P4 - Point count location 4

Т	`4
m)	%
).6	10
1.8	1
1.8	1
_	
1	10
0.3	20
_	
_	
0.3	20
5.5	20
0.1 1.8	15
1.0	3
	19

Table 4.2. Flora species recorded from belt transect survey at the Upper Lam Tsuen River (T1- Upper stream sampling site T4 - Lower stream sampling site)

						iled Survey - 2						Detail	ed Sur							Detailet	1 Survey - 3	,						2 cunicu i	Survey - 3			
		Stream				Jul-15							Aug-15	5						D	ec-15							Jan	n-16			
		Transect	T1		T2	T3		T4		T1		T2		T3		T4		T1	T	2	Т	73	Т	<u>`</u> 4	Т	`1	1	12	1	F3	Т	74
Family	Species	Chinese name	Height(m) 9	% Hei	ight(m) %	Height(m)	%	Height(m)	%	Height(m) 9	% Hei	ght(m)	%	Height(m)	% I	Height(m)	% Height(r	n %	Height(m)	%	Height(m	%	Height(m)	%	Height(m	%	Height(m	%	Height(m	%	Height(m	%
Poaceae	Microstegium ciliatum	剛秀竹																														
Fabaceae	Pueraria lobata	野葛	0.5	10				0.4	5	0.5	10					0.4	5 0.:	5 10)				0.4	5	0.5	10					0.4	
Poaceae	Pennisetum purpureum	象草																														
Araceae	Alocasia odora	海芋																														L
Caesalpiniaceae	Cassia alata	翅莢決明																														l
Magnoliaceae	Michelia alba	白蘭																														1
Poaceae	Brachiaria mutica	巴拉草	0.9	30	1.5 3	0.5	5 70	1	15	1	30	1.5	30	0.8	8 70	1	15 0.	8 5	5 1.5	5 35	1.2	60	1.2	20	0.3	5	0.3	20	0.3	30	0.3	
Moraceae	Ficus hispida	對葉榕													Π																	I
Asteraceae	Mikania micrantha	薇甘菊	0.3	5	0.2	5 0.3	3 5	0.4	5	0.3	5	0.2	5	0.3	3 5	0.4	5 0.1	3 5	5 0.2	2 5	0.3	5	0.4	5	0.3	5	0.2	5	0.3	5	0.4	1
Musaceae	Musa paradisiaca	大蕉													П																	1
Ulmaceae	Celtis sinensis	朴樹													П																	1
Araceae	Pistia stratiotes L.	大漂													\square																	í
Urticaceae	Boehmeria nivea	苧麻													\square																	í
Asteraceae	Bidens alba	白花鬼針草	1 1			0.3	3 5							0.4	1 5						0.4	10)						0.4	10)	1
Poaceae	Coix lacryma-jobi	薏苡	1 1												\square			1 5	5						1	5						1
Solanaceae	Solanum nigrum	龍葵	1 1												\square																	1
Cyperaceae	Cyperus flabelliformis	風車草				0.6	6 2							0.6	5 2																	í
Poaceae	Miscanthus floridulus	五節芒													++			1 10)						1	10						í
Euphorbiaceae	Macaranga tanarius	血桐													++																	í
Asteraceae	Wedelia chinensis	蟛蜞菊	0.3	20	0.2 1	0				0.4	20	0.2	10		++		0.4	4 5	5						0.4	5						í
Commelinaceae	Commelina diffusa	節節草	0.3	20	0.2 2	.0 0.2	2 5	0.4	20	0.3	20	0.2	20	0.2	2 5	0.4	20 0.1	3 10	0.2	2 20	0.2	5	0.4	25	0.3	10	0.2	20	0.2	5	0.4	
Asteraceae	Erechtites hieracifolia	革命菜																														i
Thelypteridaceae	Cyclosorus parasiticus	華南毛蕨										- 1			+			1	1													i
Convolvulaceae	Pharbitis nil	產牛							İ									1	1	1	1		1				1			1	1	
Verbenaceae	Lantana camara											- 1			+			1	1													i
Mimosaceae	Leucaena leucocephala	銀合歡	1 1				+								++					1												i
Brassicaceae	Nasturtium officinale	西洋菜	1 1				+								++			1		1			0.2	10							0.2	i
Onagraceae	Ludwigia erecta	美洲水丁香	1 1				+								++			1	1	1			0.2	10								1
Poaceae	Pennisetum alopecuroides	狼尾草	1 1			0.5	5 5	2	5					0.8	3 5	2	5				1.5	10	2	5					1.5	10	2	í
Amaranthaceae	Celosia argentea	青葙	+ +			0.0								0.0	T I		-				0.4	5	-	, j					0.4	5	_	í
Acanthaceae	Dicliptera chinensis	狗肝菜	+ +				+								++		0.1	3 20)		5.4				0.3	20			5.4			í
Bare Gound		1 1 1 1		15	3	5	13		55		15		35		13		55	30)	40		20)	35	0.5	30		55		50		

P1 - Point count location 1; P4 - Point count location 4

Table 4.3 Avifauna recorded along survey transects and at four selected point count locations of Lam Tsuen River.

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

			1		-	Ba						-		Detail	ed Surv										irvey - 2								y - 3	+-			urvey -	-
						Jul-08			Aug-08				ec-14				Jan-15					ul-14					Aug-14					ec-15		_		Jan-16		
Common Name	Species name	Chinese name	Status	Commonness	A	bundanc		-	bundanc				ndance			-	bundan					undance					undanc					ndance		\perp	-	Abundar	_	_
						P1	P4	С	P1	P4	С	T1	T2	T3 T4	4 C	T1	T2	T3	T4	С	T1	T2	T3	T4	С	T1	T2	T3	T4	С	T1 1	T2 1	T3 T	'4 C	T1	T2	T3	3
arn Swallow	Hirundo rustica	家燕	PM	С	+	1	1					_				_			_	++			3	3	++	3	2	4			\rightarrow	\rightarrow				_	—	╞
lack Drongo	Dicrurus macrocercus	黑卷尾	Sv	С																+			1								\rightarrow	\perp	\rightarrow	\perp	—	_	┶	4
Black Kite	Milvus lineatus	麻鷹	R, RC, Cap.586	с				+			+				+																							
Black-faced bunting	Emberiza spodocephala	灰頭鵐	WV&PM	С							+																											
lack-necked Starling	Sturnus nigricollis	黑領椋鳥	R	С	+++	2	1	++	2		++	2		3 2	2 ++	2		2		++	2	2		2	++	4	3	3		++	5	3		++	r.	4	4	
Black-winged Cuckoo-shrike	Coracina melaschistos	暗灰鵑鵙	PM	с								L																				\perp					\perp	
rown Shrike	Lanius cristatus	紅尾伯勞	PM	С																												\perp	\perp		\perp		\perp	
suzzard (Common Buzzard)	Buteo buteo	普通鵟	WV,Cap.586	С																														+				
hinese Bulbul	Pycnonotus sinensis	白頭鵯	R	С	++	2	3	++++	4	5	++	2	2	3	++	_		3	1	++		2	1	2	++	3		2	2	++	\perp	\perp	2 3	3 ++	+ 3	2	2	4
hinese Pond Heron	Ardeola bacchus	池鷺	R,RC	С	+			++	3	1	+	2	1	3	+	2	2		1	+	1				+				1	+	\rightarrow	1	\rightarrow	+	┿	_	1	4
ommon Kingfisher	Alcedo atthis	普通翠鳥	R	с							+	_	1		+	_	1		_						+			1		+		_		+		<u> </u>	—	4
ommon Koel	Eudynamys scolopacea	噪鵑	R	с	++	1		+			+																			+	1	\perp	\rightarrow	+	1	_	┶	4
ommon Sandpiper	Actitis hypoleucos	磯鷸	WV&PM	с							+	_			+	_			_													_				<u> </u>	—	+
ommon Tailorbird	Orthotomus sutorius	長尾縫葉鶯	R	С	+	1	1	+	1		++		1	1	_	1		1		_	2		2		++	1	2	2		++	_	2	1	++		2	2	_
Crested bulbul	Pycnonotus jocosus	紅耳鵯	R	С	+++	2	3	++	3	4	++++		4	3 2	2 +++	+ 3	2	3		+++	8	3	3	5	+++	7	5	5	5	+++	8	5	5 1	2 +++	+ 6	4	6	1
rested Goshawk	Accipiter trivirgatus	鳳頭鷹	R, CR, Cap.586	U	-										+	+			_	-+	_	_	_	_			_			$ \square$	+	+	+	+	+-	–	+	4
rested Myna	Acridotheres cristatellus	八哥	R	C	++	2		++	2		++	2	3	5	++	-	3	4	2	++	3	2	3	3	++		2	4		++	\rightarrow	+	2	++	+ 2	–	1	+
rested Serpent Eagle	Spilornis cheela	蛇鵰	R, VU, LC	U	-							-+	_	_	_				\rightarrow				-+							-+	\rightarrow	+	+	+	—	–	+	+
Daurian redstart	Phoenicurus auroreus	北紅尾鴝	WV	U G	1						++	-+	1	1 1	+	1			\rightarrow											+	+	+	+	+	+	+	+	4
Domestic pigeon Dusky Warbler	Columba sp.	调和站	ĸ	c c	+			+	3	2	+	,	,		+	+	.	$ \rightarrow $	\rightarrow	_		.	.		_						+	+	+	+	+	+	+-	+
-	Phylloscopus fuscatus	褐柳鶯 ^{座物}	WV	c	1			-				1	1	_	- ·	-	1	_	,	+	2	1	1	2	+	1	1	,	2	+	+	3	+	+	+	+	+	+
Eurasian tree sparrow Great Coucal	Passer montanus Centropus sinensis	麻鹊	R R,VU	c	++	2		+			++	3	1	2	+++	-	3	2	1	++	3		2	3	++	3	2	2	3	++	+	-	+	5 ++		+	2	+
		褐翅鴉鵑	R,VU D	c	-						+	-	1	- 1	+	+			-	-									2		+	+	+	+	+	+	+-	+
Breat Tit Breen Sandpiper	Parus major(commixtus) Tringa ochropus	大山雀 白腰草鷸	R PM&WV	п	-						+	-	-		+	+			-	-					Ŧ				-		+	+	+	-	+	+	+-	┥
irey Heron	Ardea cinerea	口胺早酮 蒼鷺	WV,PRC	C	+						Ŧ	-	-		Ŧ	-			-	-	-	-					-				-	+	+		+	+	+	┥
irey Wagtail	Motacilla cinerea	≧鳥 灰鶴鴞	WV	c	1						+	1		2 1	+	1	1	1	-+	+	-+	-+	1		+	1	1			+	+	1	+	+	+-	1	+	┥
apanese White Eye	Zosterops japonica(simple	·CANA 暗綠繡眼鳥	R	c	+			+			++	3	4	5	++	3		3	-	++	3	3	2	5	++	4	2	3	2	++	-	·	4 4	4 ++	-	6	+	┥
ungle Crow	Corvus macrorhynchus	大咀烏鴉	R	с								-		-	+				-		-	-	-	-	-						+	+	+	+	+	-	+	+
arge Hawk Cuckoo	Cuculus sparverioides	鷹鵑	SV	U								-			+	+			-		-	-	-		-						+	+	+	+	+	+	+	+
esser Coucal	Centropus bengalensis	小鴉鵑	R, VU	С																												+			-	1	1	+
ittle Egret	Egretta garzetta	小白鷺	R, RC	С				+			++	2	1	3 1	++	1	2	3	2	+	1	1	1		+		1		1	+		-	1 7	1 +		1	1	1
ireat Egret	Ardea alba	大白鷺	R,WV, RC	С																+		1															1	1
ittle Swift	Apus affinis	小白腰雨燕	R,SpM	С	++	3																			+			4		++				++	r .			T
/lagpie	Pica pica	喜鹊	R	С				+			+																										T	Т
Aagpie Robin	Copsychus saularis	鹊鸲	R	С	++	1	1	+	1	1	++	1	1	2 2	2 ++	1	1	2	2	++	2	1	1	2	++		2	2		+		1	2	2 +		1	1	Τ
Aandarin Duck	Aix galericulata	鴛鴦	WV	U																																		Τ
Aasked Laughing Thrush	Garrulax perspicillatus	黑臉噪鶥	R	С							++			2 2	2 ++	2				++				3	++				4	+			2	1				
light Heron	Nycticorax nycticorax	夜鸞	R&WV, LC	С																					+				1			\perp	\perp		\perp		\perp	
Jorthern Shoveler	Anas clypeata	琵嘴鴨	WV	С																												\perp	\perp		\perp		\perp	
Dive Backed Pipit	Anthus hodgsoni	樹鷚	WV	С	+	1					+				+			1												+		\perp	\perp	+	\perp		\perp	
laintive Cuckoo	Cacomantis merulinus	八聲杜鵑	SV	С	1	\square									_	1							\square								\perp	\perp	\perp	\perp	—	⊢	+	\downarrow
ted-billed Blue Magpie	Urocissa erythrorhyncha	紅咀藍鵲	R	C	-							-+	\rightarrow		+	+	$\left \right $		_	-+										$ \square$	+	+	+	+	+-	–	+	+
ted-flanked Bluetail	Tarsiger cyanurus	紅脇藍尾鴝	PM&WV	c	-							-+	+		_	_			\rightarrow				-+							-+	\rightarrow	+	+	+	—	–	+	+
tufous Turtle Dove	Streptopelia orientalis	山斑鳩	R	c	-								+		_	_							-+								\rightarrow	+	+	+	—	–	+	+
lufous-backed Shrike	Lanius schach	棕背伯勞	R	C C		┝─┤		+			+	1	+	1	+	+	1		1	-+		\rightarrow	-+		+		1	1		+	+	+	+	+	+	–	+	4
tufous-capped Babbler	Stachyridopsis ruficeps	紅頭穂鶥	R D	c c	-	┝─┤					+	+	+	_	++	-	$\left \right $		+				12								+	+	+	+	+	+	+	+
carlet Minivet liberian Stonechat	Pericrocotus flammeus	赤紅山椒鳥	R WV	с II		┝─┦						+	,	-		+	.	.		++			12								+	+	+	+	+	+	+	+
ooty-headed Bulbul	Saxicola maurus Pycnonotus aurigaster	黑喉石䳭 白喉紅臀鵯	n v	п		┝─┤					++	+	1	1	++	-	1	1	-+	-+			+		+		1			+	+	1	1	+	+-	+-	+	+
potted Dove	Streptopelia chinensis	口喉紅背鴨 珠頸斑鳩	R	c	+		1	+	1		+++	2	3	3 2	2 +++	+ 2	3	5	2	++	2	2	2	4	++	1	2	2	4	++	3	3	+	2 ++	+ 2	+	3	+
potted Dove	Streptopelia chinensis Lonchura punctulata	坏頭斑鳴 斑文鳥	R	c	Ť		1	+	1		++++	2	5	3 2	+++	_	,	8	-	177	-	-	-	-	++	1	-	4	4	**		-	ť	- +++		+	+	┥
/elvet-fronted Nuthatch	Sitta frontalis	班又烏 絨額鳾	R	c	1			-			T-1-T	-	+	<u> </u>		-	\vdash	0	-	-+		-+	+								+	+	+	+	+	+	+	┥
Vhite Wagtail	Motacilla alba	_戦 祖崎 白鶴鴒	WV	c	1			+			++	1	1	2 1	++	1	2	3	2	++			2		++++				8	++	+	+	2	2 ++	1	<u> </u>	+,	┥
White-breasted Waterhen	Amaurornis phoenicurus	日胸海 白胸苦惡鳥	R	c	+	$\left \right $		+			++	1	_	2 1	+++	1	4	5	-	++			-	1	+++				0	**	+	-	ť	- +++		+-	+	-
White-throated Kingfisher	Halcyon smyrnensis	日胸舌悲鳥 白胸翡翠	R, LC	c	† –			F			π'	+	+	<u> </u>	+	+	\vdash		-	-T			+								+	+	+	+	+	+	+	-
White-rumped Munia	Lonchura striata	日勝购幸 白腰文鳥	R	c	1			-				+	+		+	+	\vdash		-	-+			+							+	+	+		+	+	+	+	-
ellow Bellid Prinia	Prinia flaviventris	山辰久 _同 黄腹鷦鶯	R	с	+		1	+			+	1	+	1	+	+			-	+		1	1		+			1		+	+	+	·+-	+	+	+	+	-
ellow Wagtail	Motacilla flava	页版编点 黃鶴鴒	WV&PM	U	f		-					-	+	<u> </u>	+	+			-			-	<u> </u>					·			+	+	+	Ť	+	+	+	-
ütting cisticola	Cisticola juncidis	_{與胸砌} 棕扇尾鶯	WV&PM	с	1						+	+	+		+	+			-	-+			+								+	+	+	+	+	+	+	-
-		111/00/10.103		-	1	19	12		20	13		29	26	49	17	27	23	42	14		27	19	38	34		14	27	36	26		17	21	17	35	15	5 23	13 7	23
lumber of birds							-			-		~	-																								—	10

SpM - Spring migrant; Sv-Summer Visitor

C - transect survey; P1 - Point count location 1; P4 - Point count location 4

+, occurred; ++, common; +++, abundant/dominant species in the the study area

Commonness and status were decided accroding to AFCD biodiversity website (www.hkbiodiversity.net)

All bird species are under protection of Wild Animals Protection Ordinance (Cap. 170)

Endangered Species of Animals and Plants Ordinance (Cap. 586)

RC : Regional concern Fellowes et al (2002)

LC : Local Concern Fellowes et al (2002)

PRC: Potential Regional onver Fellowes et al (2002)

CR: Rare in China Red Data Book Status

VU: Vulnerable in China Red Data Book Status

					Baseline mo	onitoring	Detailed	Survey -1	Detailed	Survey -2	Detailed	Survey -3
Species	Common name	Chinese name	Status	Common- ness	Jul-08	Aug-08	Dec-14	Jan-15	Jul-15	Aug-15	Dec-15	Jan-16
Acisoma panorpoides panorpoides	Asian Pintail	錐腹蜻	NP	VC					+			
Brachythemis contaminata	Asian Amberwing	黃翅蜻	NP	VC								
Ceriagrion auranticum ryukyuanum	Orange-tailed Sprite	琉球橘黃蟌	NP	VC				+	+	+		
Coeliccia cyanomelas	Blue Forest Damsel	黃紋長腹蟌	NP	VC								
Copera marginipes	Yellow Featherlegs	黃狹扇蟌	NP	VC	+				+	+		
Crocothemis servilia servilia	Crimson Darter	红蜻	NP	VC	+	+	+	+	+	+		
Euphaea decorata	Black-banded Gossamerwing	方帶幽蟌	NP	VC						+		
Ictinogomphus pertinax	Common Flangetail	霸王葉春蜓	NP	С					+	+		
Ischnura senegalensis	Common Blue Jewel	褐斑異痣蟌	NP	VC								
Mnais lacteola	Indochinese Copperwing	煙翅綠色蟌	P, LC	С								
Nannophya pygmaea	Scarlet Dwarf	侏紅小蜻	P, LC	С								
Neurobasis chinensis	Chinese Greenwing	華艷色蟌	NP	VC			+		+	+		
Neurothemis fulvia	Russet Percher	網脈蜻	NP	VC					+	+		
Neurothemis tullia tullia	Pied Percher	截斑脈蜻	NP	С								
Orthetrum chrysis	Red-faced Skimmer	華麗灰蜻	NP	VC	+	+				+		
Orthetrum glaucum	Common blue skimmer	黑尾灰蜻	NP	VC								
Orthetrum luzonicum	Marsh Skimmer	呂宋灰蜻	NP	VC					+	+		
Orthetrum pruinosum neglectum	Common Red Skimmer	赤褐灰蜻	NP	VC					+	+		+
Orthetrum sabina sabina	Green Skimmer	狹腹灰蜻	NP	VC								
Pantala flavescens	Wandering Glider	黃蜻	NP	VC	+	+	+		+	+	+	+
Paracercion calamorum duyeri	Dusky Lilysquatter	葦尾蟌	P, LC	С								
Prodasineura autumnalis	Black Threadtail	烏齒原蟌	NP	VC					+	+		
Pseudagrion rubriceps rubriceps	Orange-faced Sprite	丹頂斑蟌	NP	UC		+						
Rhinocypha perforata perforata	Common Blue Jewel	三斑鼻蟌	NP	VC		+			+	+		
Rhyothemis variegata arria	Variegated Flutterer	斑麗翅蜻	NP	С								
Trithemis aurora	Crimson Dropwing	曉褐蜻	NP	VC			+	+	+	+		
Trithemis festiva	Indigo Dropwing	慶褐蜻	NP	VC					+	+	+	+
Zygonyx iris insignis	Emerald Cascader	彩虹蜻	P,PGC	VC								

Note: NP - Not protected in Hong Kong; P-Protection in Hong Kong

"VC" – Very Common; "UC" – Uncommon; "C" - Common

"+" - Species exists in the study area

"++" - Species common in the study area

"+++" - Species abundant/dominant in study area

Commonness and status were decided accroding to AFCD biodiversity website (www.hkbiodiversity.net)

LC- Local Concern - Fellowes et al (2002)

PGC - Potential Global Concern - Fellowes et al (2002)

Table 4.5 Aquatic Macro invertebrates recorded at Lam Tsuen River (T1upper river channel sampling site . T4 - lower river channel sampling site)

				E	Baseline	monitor	ing			Ι	Detaielo	l Surve	ey - 1							Detaiel	d Survey - 2								Det	aield Survey - 3				
Species	Chinese name	Sampli	ing point	Ju	ıl-08	Au	g-08		Dec	c-14				Jan-1	5			Jul-1	5			Aug-1	15			Dec	e-15				Ja	n-16		
	-	Status	Commonness			r Upper n stream		Reference point	e T1	T2	ТЗ Т	r4 Repo	eferenc oint	e T1	Г2 Т.	3 T4	Reference point	T1	Г2	Т3 Т4	Reference point	T1	T2	T3 T4	Reference point	T1	T2	Т3	T4	Reference point	T1	T2	T3	T4
Molluscs				!																	4				1				-	1				
Biomphalaria sp.		NP	VC		+	+	+	+	+	+	+ +	+		+ -	+ +	+				+				+					+					+
Brotia hainanensis		NP	VC	+++	++	++	++	++	++	+	+ +	- +-	+	++	+ +	+	++	++	++ -	+ ++	++	++	++	+ ++	+ ++	++	++	++	++	++	++	++	++	++
Melanoides tuberculata	瘤擬黑螺	NP	VC		+		+				+ +	-			+	+			-	+ +				+ +				+	+				+	++
Pomacea canaliculata	蘋果螺	NP	VC		+		+	+	+		+ +	· +		+ -	+ +	+	++	++	++ -	++ ++	++	++	++	++ ++	+ ++	++	++	++	+++	++	++	++	++	+++
Radix plicatulus	羅白螺	NP	VC		+	+	+	+	+	+	+ +	+		+ -	+ +	+	+	+	+ -	+ +	+	+	+	+ +	+	+	+	+	+	+	+	+	+	+
Sinotaia quadrata	田螺	NP	VC		+		+	+	+	+	+ +	+		+ -	+ +	+	+	+	+ -	+ +	+	+	+	+ +	+	+	+	+	+	+	+	+	+	+
Insects																																		
Baetis sp.		NP	VC	+	+	+	+	+	+		+	· +		+	+	+	+		-	+ +	+			+ +	+			+	+	+			+	+
Caenis sp.		NP	VC																						+	+	+	+	+	+	+	+	+	+
Chironomus sp.	蠓幼虫	NP	VC	+	+	+	+	+	+	+	+ +	+		+ -	+ +	+	+	+	+ -	+ +	+	+	+	+ +	+	+	+	+		+	+	+	+	
Electrogenas sp.		NP	VC					+	+	+	+	+		+			+	+	+ -	+	+	+	+	+	+	+	+			+	+	+		
Hydropsyche sp.		NP	VC					+		+		+		-	F		+	+	+		+	+	+		+	+	+		+	+	+	+		+
Indobaetis sp.		NP	VC	+	+	+	+	+	+	+	+ +	· +		+	+	+	+	+	+	+	+	+	+	+				+					+	
Mnais sp.		NP	VC							+	+			-	+ +				-	+				+	+	+	+	+	+	+	+	+	+	+
Orthetrum sp.		NP	VC	+	+			+	+	+	+	· +		-	F	+			+ -	+ +			+	+ +			+	+	+			+	+	+
Crustaceans																																		
Caridina cantanensis	廣東米蝦	NP	VC	+	+	+	+	+	++	++	++ +	+ +		++ -	++ +-	+ ++	++	++	++ -	++ ++	++	++	++	++ ++	+ ++	++	++	++	++	++	++	++	++	++
Cryptopotamon anacoluthon	鰓刺溪蟹	NP	VC	+		+					+				+				-	+				+				+	+				+	+
Macrobrachium hainanense	海南沼蝦	NP	VC	+	+	+	+	+	+	+	+ +	- +		+ -	+ +	+	+		+ -	+ +	+		+	+ +	+		+	+	+	+		+	+	+
Somanniathelphusa zanklon	束腰蟹	NP	VC	+		+																							Т					

Note: NP - Not protected in Hong Kong; P - Protected in Hong Kong

"VC" – Very Common; "UC" – Uncommon; "C" - Common; "R" - Rare

+, occurred; ++, common; +++, abundant/dominant Species in the the study area

Reference point was the sampling location outside the works area.

Table 4.6 Fish species and amphibians at Upper Lam Tsuen River (T1- upper river channel sampling site . T4 - lower river channel sampling site)

				В	aseline r	nonitori	ng			I	Detiale	ed Su	irvey - 1				Τ			D	etaile	d Survey 2								De	tailed	Survey 3				ľ
				Ju	1-08	Aug	g-08		Dec-	-14				Jan-1	5			J	Jul-15	5			Aug	-15				Dec	c-15				Jar	n-16		
			Sampling point	Upper stream	Lower stream	Upper stream		Reference	T1	T2	Т3	T4	Reference	T1 7	Г2 Т.	3 T4	4 Re	eference	T1	T2 1	T3 T2	Referenc	e T1	T2	T3	T4	Reference	T1	T2	Т3	T4	Reference	T1	T2	T3	T4
Species	Chinese name	Status	Commonness																									1								
Fish																					Τ															
Acrossocheilus parallens	側條光唇魚	P, PGC	R		+		+		++	++	++	++		++ -	++ +-	+ ++	F		+	+ ·	+ +		+	+	+	+			+	+	++			+	+	++
Channa maculate	斑鱧	NP	Common				+														+					+		Г <u> </u>			+					
Cirrhina molitorella	鯪魚	NP	С																									i T								
Clarias fuscus	胡子鯰	NP	С									+				+					+					+		í —			+				+	
Cyprinus carpio var. viridiviolaceus	錦鯉	NP	С									Т									+				+									+		
Gambusia affinis	食蚊魚	NP	VC			+	+	+	+	+	+	+	+	+	+ +	+		+	+	+ ·	+ +	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Liniparhomaloptera disparis	擬平鰍	NP	С					+	+	+	+	Т	+	+	+ +			+	+	+ ·	÷	+	+	+	+		+	+	+	+		+	+	+	+	
Misgurnus anguillicaudatus	泥鰍	NP	Common	+		+		+		+	+	+	+		+	+		+	+	+ •	+ +	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Oreochromis niloticus	尼羅口孵非鲫	NP	С		+		+		+	+	+	+		+	+ +	+		+	++	++ +	+ ++	+ +	++	++	++	++	+	+	++	++	++	+	+	++	++	++
Parazacco spilurus	異鱲	V and	Common	+		+		+	+	+	+	+	+	+	+ +	+		+	+	+ •	+ +	+	+	+	+	+	+	i T	+	+	+	+		+	+	+
Poecilia reticulate	孔雀花魚將	NP	VC			+	+			+	+				+					+ •	+ +			+	+	+		i T	+	+	+			+	+	+
Pseudogastromyzon myersi	麥氏擬腹吸鰍	NP	С		+	+	+	+	+	+	+		+	+	+ +			+	+			+	+				+	+				+	+			
Pterocryptis cochinchinensis	黃鯰	NP	С					+	+	+			+		+			+				+					+	i T				+				
Puntius semifasciolatus	七星魚	NP	С	++	+	++	+	+	+	++	++	+	+	+ -	++ +-	+ +		+	+	++ +	+ +	+	+	++	++	+	+	+	++	++	+	+	+	++	++	+
Rhinogobius spp.	鰕虎魚	NP	C/UN/R		+	+	+	+	++	++	++	+	+	++ •	++ +-	+ ++	F	+	++	++ +	+ ++	+ +	++	++	++	++	+	++	++	++	++	+	++	++	++	++
Schistura fasciolata	橫紋南鰍	NP	С		+	+	+	+	+	+	+		+	+	+			+	++	++		+	++	++			+	++	++			+	++	++		
Xiphophorus hellerii	劍尾魚	NP	С	+	+	+	+		+	++	++	+		+ ·	++ +-	+ +		+	+	++ •	+ +	+	+	++	+	+	+	+	++	+	+	+	+	++	+	+
Xiphophorus variatus	雜色劍尾魚	NP	С			+	+				+	+			+					+ ·	F			+	+				+	+				+	+	
Zacco platypus	寛鰭鱲	NP	С	+	++	+	++	+	++	++	+	+	+	++ •	++ +	+		+	++	++ •	+ +	+	++	++	+	+	+	+	++	++	+	+	+	++	++	++
2x2m fish counting		Number of	of fish	70	60	75	60	60	60	60	50	50	50	50	60 60) 60)	12	15	18	8 7	15	12	16	10	10	55	40	45	45	40	60	50	50	50	40
Amphibian												Т							Τ																	
Paramesotriton hongkongensis	香港瘰螈	P (Cap 170, NT, PGC)	R	+		+	+	+	+	+	+ -	+ +	-	+ +	+	+	+		+	+ +	+	+	+	+	+ +	+ +	+	+	÷	+	÷	+	÷	÷	+	+
Fejervarya limnocharis	澤蛙	NP	VC																									í								

Note: NP – Not protected in Hong Kong "VC" – Very Common; "UC" – Uncommon; "C" - Common; "R" - Rare

+, occurred; ++, common; +++, abundant/dominant Species in the the study area

-V – Listed as vulnerable in China Fish Red Data Book

-Reference point was the sampling location outside the works area used to

compare the with the data within works area.

"Cap 170" - List in Wild Animials Protection Ordinance (Cap.170)

"NT" - Near Treatened in IUCN Red List Status

"PGC"-Potential Golal Concern by Fellowes et al (2002)

Table 4.7 Abotic data for Upper Lam Tsuen River(T1- upperriver channel sampling sitesampling site)

	Baseline monitoring				Detailed	Survey -1							Detailed	Survey - 2	2						Detailed	Survey -	3		
Parameter / date	8-Aug		De	c-14			Ja	n-15			Ju	1-15			Au	g-15			De	c-15			Jan	-16	
Replicate		T1	T2	T3	T4	T1	T2	Т3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4
DO (mg/L)	9.2	7.2	8.1	8.2	8.2	8.9	9.2	9.3	9.2	8.3	8.2	8.0	8.3	8.4	8.3	8.3	8.3	8.0	8.1	7.9	8.1	7.9	7.8	8.2	8.1
рН	7.49	8.5	8.4	8.2	8.2	7.9	8.2	8.3	7.9	7.7	7.8	7.8	7.8	7.7	7.7	7.6	7.7	7.7	7.5	7.6	7.6	7.8	7.9	7.7	7.7
Nitrate (mg N/L)	0.36	0.9	1	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.9	0.8	0.8	0.8	0.9	0.8	0.8	0.8	0.9	0.8	0.8	0.8	0.9
Ammonia (mg/L)	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Salinity (ppt)	<0.1	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Conductivity (µS/cm)	60	112	92	86	67	156	153	152	163	42	32	35	55	36	42	46	38	36.0	33.0	42.0	62.0	32.0	36.0	40.0	45.0
BOD (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Water flow at pool (m/s)	0.1-0.3		0.0	3-0.2			0.0	3-0.2			0.0	3-0.2			0.0	3-0.2			0.03	3-0.2			0.03	-0.2	
Water flow at riffle (m/s)	0.4-0.7		0.2	2-0.5			0.2	2-0.5			0.	2-0.5			0.2	-0.5			0.2	-0.5			0.2	-0.5	
Sand (%)	15	5	5	5 8	10	5	5	8	10	5	5	8	10	5	5	8	10	5	5	8	10	5	5	8	10
Stone (%)	80	93	90	90	75	93	90	90	75	93	90	90	75	93	90	90	75	93	90	90	75	93	90	90	75
Mud (%)	5	2	5	5 2	15	2	5	2	15	2	5	2	15	2	5	2	15	2	5	2	15	2	5	2	15

Agreement No. CE65/2013(EP) Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation

Detailed Ecological Monitoring Report (No. 3) She Shan River

January 2016

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Moosh

January 28, 2016

January 28, 2016

Ecology Team: China Hong Kong Ecology Consultants

Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation

Agreement No. CE65/2013(EP Detailed Ecological Monitoring Report (No. 3) She Shan River

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- 6 References

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Table 4.2: Flora species recorded from belt transect survey at the She Shan River.

Table 4.3: Avifauna recorded along survey transects and at three selected point count locations at She Shan River.

Table 4.4: Odonata species recorded at the She Shan River

Table 4.5: Aquatic Macro invertebrates and other fauna recorded at She Shan River.

Table 4.6: Fish species and Hong Kong Newt recorded at She Shan River.

Table 4.7: Abiotic data for She Shan River.

1 Introduction

- 1.1 Agreement No. CE65/2013(EP) Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation required a post-construction ecological monitoring programme when the project completed. The collected data are mainly used to assess ecological recovery process and effectiveness of ecological migration proposed and enforced during the construction period.
- 1.2 The scope of the ecological monitoring was detailed in EM & A Manual of the project. In brief, the survey aimed to collect data on abiotic factors such as water quality, substratum characteristics, water flow as well as flora and fauna.
- 1.3 China Hong Kong Ecology Consultants Ltd. was committed by Allied Environmental Consultants Ltd (AEC) to undertake the ecological monitoring tasks for the project from December 2014.
- 1.4 This is the number 3 detailed ecological monitoring report summarizing the data collected from detailed surveys of December in 2015 and January in 2016. It contains the following subsections:
 - Summary of major points
 - Monitoring Methods and Results
 - Summary and Comments

2 Summary of Major Points

- Detailed monitoring surveys were undertaken in December in 2015 and January in 2016;
- Fauna and flora along the drainage project sections is in a process of reestablishing or restoration;
- All fauna are recorded increase in abundance and species richness compared with baseline level; and
- Few individuals of *Paramesotriton hongkongensis* abundance were found in middle section of the river.

3 Monitoring Methodology

3.1 Riparian Vegetation

Riparian vegetation, including aquatic and emergent, was sampled using line transects along the affected river channel and riparian habitat. Species, relative abundance and average heights were recorded. Vegetation survey was conducted at three selected belt transects located at the upper (T1), middle (T2) and lower portion (T3) of the river channel respectively (**Figure 1**). The belt transects was run across the river channel in order to collect quantitative data of vegetation, e.g., species inventory, height, percentage cover. Qualitative data of plants was collected by recording plant species along line transect, e.g., species inventory, relative abundance. Nomenclature and protection status of the species has followed those documented in the Lai *et al* (2004) and Hong Kong Herbarium (2015).

3.2 Avifauna

Avifauna survey was conducted during the post construction monitoring period. Special attention was given to those stream channel area which birds used as feeding and foraging habitat. Avifauna surveys were undertaken in the early morning plus species recorded in the rest of the day when conducting other taxonomic groups (benthic, fish, insect) monitoring. Numerical abundance was recorded at fixed count points within a radius of 30 to 50m according to landscape feature and visual penetration extent. The duration of the point count of birds was standardized for 10 minutes at each location in order to collect comparable data. Transect count along accessible section of river channel were used in order to collect qualitative data. Binoculars and digital camera were the main items of equipment used. Nomenclature and protection status of the species has followed in the AFCD website (www.hkbiodiversity.net) and Carey *et al* (2001).

The point count was conducted at three locations located at the lower (T3), middle (T2) and upper (T1) portion of the river channel respectively. The point count and survey transect locations for the bird survey and sampling sites for surveys of other faunal groups and flora were presented in **Figure 1**.

3.3 Adult Odonata Survey

Adult Odonata survey was conducted along transects (**Figure 1**). Binoculars, digital camera and hand net were utilized to aid identification. Numerical abundance, species identity and other notable behavior were recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (<u>www.hkbiodiversity.net</u>), Wilson *et al* (2004) and Tam *et al* (2011). Adult Odonata survey was conducted along line transects in parallel with river channel within the works area where access was permitted.

3.4 Aquatic Macro-invertebrates

Macro-invertebrates in the riverbed were surveyed. Four sampling sites were selected to collect necessary macro-invertebrate fauna for ecological monitoring information, which covered upper (T1), middle (T2) and lower (T3) sections of the river respectively, as well as reference site (**Figure 1**). Five replicates were taken at each sampling point and pool together for further sample process. Kick sampling and hand netting were the survey methodologies for stream organisms. Dissection microscope and digital camera were used to aid identification and enumeration. Numerical abundance, species identity was recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net), and other literatures such as Dudgeon (1994).

3.5 Fish Population and Hong Kong Newt

Fish community at the specified river channel was monitored by live trapping, hand netting and direct observation methods. The Hong Kong newt was surveyed by direct observation and hand netting as well.

Sampling was conducted at four proposed sampling locations at upper (T1), middle (T2), lower (T3) sections and reference site respectively. Those sampling sites covered major type of stream habitats, e.g. river pool and riffle (**Figure 1**). The number of the observed fish was estimated and recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net) and Lee *et al* (2004).

3.6 Abiotic Data Collection

3.6.1 Water Quality Monitoring

Dissolved oxygen level, pH value, conductivity, salinity, BOD and nutrient level (nitrate and ammonium) were sampled and analyzed by conventional methods in situ or in laboratory. The instruments for measuring dissolved oxygen level, pH value, conductivity, salinity were model: DO-5510, AZ8685, AZ8361 and AZ8374 respectively. All the instruments were calculated every monitoring month according to the operation manuals in order to obtain the precise result. BOD test took 5 days to complete within darkness incubator with stable temperature at 20°C and was performed using model: DO-5510 for measuring dissolved oxygen. Nutrient levels including nitrate and ammonia were performed in laboratory by applying the In-house method SOP056 (FIA) and SOP057 (FIA) respectively.

3.6.2 Sediment Characteristics

Sediment/substrate characteristics were recorded of sediment cover in percentage e.g. mud, sand, rock, boulder and cemented bottom in the stream bed at sampling sites.

3.6.3 Water Flow

Water flow rates in river channel were measured by recording the time taken for a floating object (e.g. floating ball) in a measured distance. The sampling locations for surveys were presented in **Figure 1**.

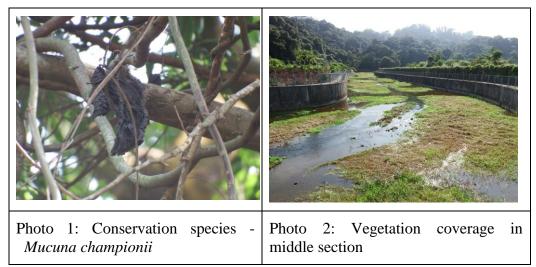
4 Monitoring Results

4.1 Vegetation

Detailed surveys were undertaken along the transect at She Shan River. In total, 62 flora species was recorded within the survey transects along the river course. With the comparison of 50 species recorded in baseline level, more species were recorded during detailed surveys including 1 species with conservation interest. It is *Mucuna championii* (Photo 1), was recorded in the adjacent woodland of the river, was classified as endangered in China status.

Middle to lower section of the river was made up with concrete so that only species with good acceptability could establish onto the river bed. In addition, vegetation in these sections were regularly got cleared by the workers (Photo 2). Only upper section could support more diverse vegetation, however, upper section is currently dominated by an invasive species *Brachiaria mutica*. A vegetable, *Nasturtium officinale* was being planted in middle section of the river. Most recorded species were wetland species. The height of the dominated riparian grass and herb species were in a range from 0.3m to 2m as

observed along survey transect. Dominant flora species were shown in the **Table 4.1** marked with relative abundance sign "+++". Vegetation has generally covered the riverbed and riparian habitat in upper sections and partially covered the riverbed in middle to lower section.



4.2 Fauna

4.2.1 Avifauna

An avifauna detailed surveys were undertaken along survey transects and at four selected point count locations. A total of 31 species of birds were recorded during the bird surveys. Bird's species composition in She Shan River has changed in terms of abundance and species richness towards the data collected from baseline to post-construction monitoring, more species and higher abundance recorded were related to the improved river, where provided dense vegetation as their habitats, as well as food source.

Some of wetland dependent species including Ardeola bacchus and Egretta garzetta are considered as Regional Concern by Fellowes et al. (2002), they were always found foraging in the river. 4 raptors were observed hovering above different section of the river, they were Spilornis cheela, Milvus lineatus, Accipiter trivirgatus and Buteo buteo and were all listed under Endangered Species of Animals and Plants Ordinance (Cap. 586). Among them, Milvus lineatus and Spilornis cheela were considered as Regional Concern and Local Concern respectively by Fellowes et al. (2002), while Spilornis cheela was also classified as Vulnerable in China Red Data Book. Accipiter trivirgatus was also listed in China Red Data Book as Rare species. Moreover, Dicrurus leucophaeus and Centropus sinensis were also recorded with conservation importance. Centropus sinensis is considered as Vulnerable in China Red Data Book Status and Dicrurus leucophaeus was the first record in She Shan River, which is a scarce winter visitor and considered as Local Concern by Fellowes et al. (2002). Transect and Point Count locations were shown on Figure 1. Result of bird survey was presented in the Table 4.3.

4.2.2 Adult Odonata Survey

Odonata detailed surveys were performed and a list of recorded odonata species at Upper Lam Tsuen River is shown in **Table 4.4**. 3 species of odonata were recorded along the river transect, all recorded species were common and wide spread in Hong Kong. Low species richness of odonata was recorded compared with baseline level as surveys were undertaken in different season. Most of the odonata species in Hong Kong are likely to emerge in wet season so that lower species richness in current dry season was due to seasonality (Wilson et al., 2003 & Tam et al., 2011). Odonata larvae were usually collected from kicking sampling. Sampling location was shown in **Figure 1**.

4.2.3 Aquatic Macro-invertebrates

The river benthic fauna collected was mainly comprised of insects, molluscs, crustaceans and as well as fish. Details of recorded benthic fauna refer to **Table 4.5**. Sampling location was shown on **Figure 1**.

4.2.4 Hong Kong Newt

From the detailed surveys, only two individuals of Hong Kong Newts were recorded in the middle section, where covered with dense vegetation. Hong Kong Newt is listed in Wild Animals Protection Ordinance (Cap. 170) and classified as "Near Threatened" under IUCN Red List Status and as "Potential Global Concern" by Fellowes *et al.* (2002). Record of Hong Kong Newts can be referred to **Table 4.6.**

4.2.5 Fish Fauna

Fish surveys were performed at She Shan River and total 13 species of freshwater fish were recorded. Native fish *Zacco platypus* and *Oreochromis niloticus* were abundant species dominating in the river channel. Among the recorded fish, *Parazacco spilurus* is classified as "Vulnerable" in Red China Data Book, it was commonly observed along the river with low abundance. The composition of fish species was similar to baseline level with slightly increased by few species indicating that the improved river is stable and mature enough to support more species. Details of recorded of fish fauna refers to **Table 4.6.** Sampling location was shown on **Figure 1**.

4.3 Abiotic Data

Data on water quality and major stream hydrological feature (water flow and substratum) of the stream were collected and are presented in the **Table 4.7**.

The overall data collected from detailed survey and baseline lever were similar except the river substratum has changed significantly. The river substratum was comprised of over 30-80% stones or rocks in large proportion of the river sections with slow water flow (up to 0.2m/second at pool and 0.5m/second at riffle). Generally, the water was clean and nutrient levels were moderate as a result of effluent from nearby cultivation lands, but the impact from the effluent is anticipated. Results of water test are presented in the **Table 4.7**.

5 Summary and Commentary

Detailed ecological monitoring surveys were carried out in December 2015 and January 2016. The relevant biotic and abiotic data was collected according to project specification and EM & A Manual. *Paramesotriton hongkongensis* was recorded with small abundance. Following the river became more stable and mature after the completion of construction, the species richness and abundance of fauna have increased compared with baseline level.

Aquatic plants and riparian vegetation were generally established at new drainage channel. Vegetation has completely covered the gabion wall mainly in upper sections and partially covered the river bed along the river channel. Higher diversity of vegetation was recorded compared with baseline level. Moreover, a conservation species, *Mucuna championii* was recorded during the survey.

The water quality of the river was generally good along river channel and most of the parameters are similar to baseline level except greatly change in river substratum.

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FIGURE

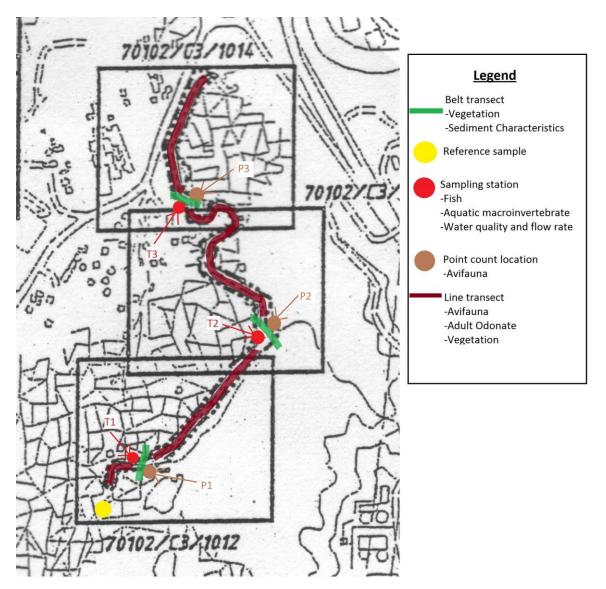


Figure 1. Sampling Location of Ecological Survey and Monitoring at She Shan River, Tai Po.

TABLE

Table 4.1. Flora species recorded along the She Shan River including riparian habitat.

				Baseline monitoring	Detailed	Survey 1	Detailed	Survey 2	Detailed	Survey 3
Family	Species name	Species name in Chinese	Conservation Status	Jul to Aug 08	Dec-14	Jan-15	Jul-15	Aug-15	Dec-15	Jan-16
Riparian Plant	•		•					-		-
Acanthaceae	Dicliptera chinensis	狗肝菜			+					
Acoraceae	Acorus gramineus	金錢蒲			+					
Amaranthaceae	Alternanthera philoxeroides	空心蓮子草		+	+					
Amaranthaceae	Celosia argentea L.	青葙			+					
Apiaceae	Oenanthe javanica	水芹								
Aquifoliaceae	Ilex rotunda	鐵冬青		+						
Araceae	Alocasia odora	海芋		+	+	+	+	+	+	+
Araceae	Colocasia esculenta	芋		+	+	+	+	+	+	+
Araceae	Syngonium podophyllum	合果芋		+	+					
Araceae	Pistia stratiotes	大薸				+	+	+	+	+
Asteraceae	Bidens alba	白花鬼針草		+	++	+	++	++	++	++
Asteraceae	Synedrella nodiflora	金腰箭		+	+		+	+	+	+
Asteraceae	Mikania micrantha	薇甘菊		+	++	++	++	++	++	++
Asteraceae	Erigeron karvinskianus	加勒比飛蓬		+	+		+	+	+	+
Asteraceae	Eclipta prostrata	體腸		+	+	+	+	+	+	+
Asteraceae	Gynura divaricata	白子菜			+		+	+	+	+
Asteraceae	Ageratum conyzoides	勝紅薊			+	+	+	+	+	+
Asteraceae	Emilia sonchifolia	一點紅			+	+	+	+	+	+
Asteraceae	E rechtites hieraciifolius	梁子菜			+		+	+	+	+
Asteraceae	Y oungia japonica	黃鵗菜			+	+	+	+	+	+
Asteraceae	S pilanthes paniculata	金鈕扣			+	+	+	+	+	+
Athyriaceae	Callipteris esculenta	菜蕨		+	+	+	+	+	+	+
Begoniaceae	Begonia cucullata var.hookeri	四季秋海棠			+					
Blechnaceae	Blechnum orientale	烏毛蕨			+					
Brassicaceae	Nasturtium officinale	西洋菜		+	+	+	+	+	++	++
Brassicaceae	R orippa indica	塘葛菜			+	+	+	+	+	+
Brassicaceae	C apsella bursa-pastoris	齊菜			+					
Caesalpiniaceae	Bauhinia championii	缺葉藤				+	+	+	+	+
Caryophyllaceae	Drymaria diandra	荷蓮豆		+		+	+	+	+	+
Caryophyllaceae	Myosoton aquaticum	鵝腸菜			+	+	+	+	+	+
Chenopodiaceae	Chenopodium ficifolium	小藜			+		+	+	+	+
Commelinaceae	Commelina diffusa	節節草		+	++ +	+++	++	++	++	++
Convolvulaceae	Pharbitis nil	牽牛		+	+					
Convolvulaceae	Ipomoea aquatica	蕹菜							+	+
Convolvulaceae	Ipomoea cairica	五爪金龍		+	+	+	+	+	+	+
Cucurbitaceae	Solena amplexicaulis	茅瓜								
Cuscutaceae	Cuscuta australis	南方菟絲子				+	+	+	+	+
Cyperaceae	Cyperus sp.	莎草			+	+	+	+	+	+
Cyperaceae	Cyperus involucratus	風車草			+	+	+	+	+	+
Euphorbiaceae	Macaranga tanarius	血桐		+	+	+	+	+	+	+
Euphorbiaceae	Aporusa dioica	銀柴		+						
Fabaceae	Mucuna championii	港油麻藤	EN							+
Fabaceae	Pueraria lobata	野葛		+	++	+	++	++	++	++
Fabaceae	Sesbania cannabina	田菁			+					
Lauraceae	Cinnamomum burmannii	陰香		+	+					
Lygodiaceae	Lygodium japonicum	海金沙			+					
Magnoliaceae	Michelia alba	白蘭		+	+					
Malvaceae	Hibiscus rosa-sinensia	大紅花	1			+	+	+	+	+
Mimosaceae	Mimosa pudica	含羞草		+	+					
	•									

Table 4.1. Flora species recorded along the She Shan River including riparian habitat.

				Baseline monitoring	Detailed	Survey 1	Detailed	Survey 2	Detailed	Survey 3
Family	Species name	Species name in Chinese	Conservation Status	Jul to Aug 08	Dec-14	Jan-15	Jul-15	Aug-15	Dec-15	Jan-16
Mimosaceae	C alliandra haematocephala	紅絨球			+	+	+	+	+	+
Moraceae	Broussonetia papyrifera	構樹		+						
Moraceae	Ficus hispida	對葉榕		+	+	+	+	+	+	+
Moraceae	Ficus pumila	薜荔		+	+					
Moraceae	Ficus variolosa	變葉榕		+						
Moraceae	Ficus variegata	青果榕				+	+	+	+	+
Musaceae	Musa paradisiaca	大蕉		+	+		+	+	+	+
Myrsinaceae	Maesa perlarius	鲫魚胆		+						
Myrtaceae	Cleistocalyx operculatus	水翁		+	+		+	+	+	+
Onagraceae	Ludwigia hyssopidolia	草龍			+		+	+	+	+
Onagraceae	Ludwigia erecta	美洲水丁香			++	+	+	+	+	+
Oxalidaceae	Averrhoa carambola	楊桃		+						
Oxalidaceae	Oxalis corniculata	酢醬草					+	+	+	+
Plantaginaceae	Plantago major	昨 窗早 車前草			+		ŕ		-	-
Poaceae	Panicum maximum	^{単 前 早} 大黍		+	+	+	+	+	+	+
Poaceae	Panicum repens	-		+	- -	- -	1		+	
Poaceae	Brachiaria mutica	枯骨草 巴拉草			+	+++++	++++	+	+	++++
Poaceae		家草		++	+++	+++	++++	+++	++++	++++
	Pennisetum purpureum	-		+	+	++	+	+	+	+
Poaceae	Coix lacryma-jobi	薏苡		++	+	+	+	+	+	+
Poaceae	Microstegium ciliatum	剛秀竹			++	+	+	+	+	+
Poaceae	Miscanthus floridulus	五節芒			+	+	+	+	+	+
Poaceae	Pennisetum alopecuroides	狼尾草			+		+	+	+	+
Poaceae	Digitaria radicosa	紅尾翎	_			+	+	+	+	+
Polygonaceae	Polygonum hydropiper	水蓼	_	+	+	+	+	+	+	+
Polygonaceae	Polygonum glabrum	光蓼					+	+	+	+
Polygonaceae	Polygonum chinense	火炭母		+	+		+	+	+	+
Polygonaceae	Rumex trisetifer	假菠菜			+	+	+	+	+	+
Polygonaceae	Polygonum lapathifolium	大馬蓼			+		+	+	+	+
Rubiaceae	Hedyotis hedyotidea	牛白藤		+						
Sapindaceae	Dimocarpus longan	龍眼		+						
Solanaceae	Solanum torvum	水茄		+	+	+	+	+	+	+
Solanaceae	Solanum americanum	少花龍葵			+					
Thelypteridaceae	Cyclosorus parasiticus	華南毛蕨				+	+	+	+	+
Ulmaceae	Celtis sinensis	朴樹		+	+		+	+	+	+
Ulmaceae	Celtis timorensis	樟葉朴		+						
Ulmaceae	Trema orientalis	異色山黃麻			+					
Ulmaceae	Trema tomentosa	山黄麻			+					
Urticaceae	Boehmeria nivea	苧麻		+	+					
Urticaceae	Pilea microphylla	透明草		+	+		+	+	+	+
Urticaceae	Pouzolzia zeylanica	霧水葛		+	+					
Verbenaceae	Vitex quinata	山牡荆		÷					İ	İ
Polygonaceae	Polygonum perfoliatum	杠板歸			+	+	+	+	+	+
Verbenaceae	Lantana camara	馬纓丹		+	+	+	+	+	+	+
Floating Plant	+	1	-!	Į	!	!	•	1	1	ļ
Araceae	Pistia stratiotes	大薸							+	+
Lemnaceae	Lemna minor	浮萍		1	+					
Submerged Plant		1117	1	1	ľ	I	1		1	1
	Hydrilla varticillata	NI 35				1				
Hydrocharitaceae	Hydrilla verticillata	黑藻			+		+	+	+	+
Number of species				48	72	42	59	59	61	6

Note:

"+" - Species exists in the study area "++" - Species common in the study area

"+++" - Species abundant/dominant in study area

En- Endangered in China Status

Table 4.2. Flora species recorded from belt transect survey at the She Shan River

(T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

						Baseline	e monitoring									Detailed	d Survey 1					
		Stream		J	ul-08			A	ug-08				De	c-14					Jan-1	5		
		Transect	P1			P3	P1			P3	T1		Т	2	Т	3	T1		T2		T:	3
Family	Species	Chinese name	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%
Commelinaceae	Commelina diffusa	節節草			0.	2 2	0		1)	6 1	10	0 1	50	0.	1 2	2 0.5	10	0.8	70	0.3	40
Poaceae	Panicum repens	枯骨草	0.3	3	5																	
Asteraceae	Mikania micrantha	薇甘菊							0.	2	7 0.3	3	5 1	15	0.	3 2	2 0.4	10	0.5	15		
Brassicaceae	Nasturtium officinale	西洋菜																				
Moraceae	Ficus microcarpa	細葉榕			0.	7	5		0.	5	7											
Moraceae	Ficus hispida	對葉榕				3 1	0		-	3 1	0											
Poaceae	Microstegium ciliatum	剛秀竹	0.5	5	5		0	.5	3													
Fabaceae	Pueraria lobata	野葛			0.	3	5 0	.5	3 0.	3	5											
Araceae	Colocasia esculenta	芋							0.	2	5											
Urticaceae	Boehmeria nivea	苧麻	1.5	5 3	0			2	7			1										1
Asteraceae	Bidens alba	白花鬼針草									1	1 1	2 0.5	5	0.	8 10)					
Poaceae	Pennisetum purpureum	象草	-	3 5	0	1 6	0	3	30	2 6	0											
Poaceae	Coix lacryma-jobi	薏苡										1			15	1	1					1
Amaranthaceae	Alternanthera philoxeroides	空心蓮子草	0.2	2 1	0		0	.2	7													
Poaceae	Panicum maximum	大黍																				
Moraceae	Broussonetia papyrifera	構樹																				
Polygonaceae	Polygonum chinense	火炭母																				
Onagraceae	Ludwigia hyssopidolia	草龍																				
Cyperaceae	Cyperus sp.	莎草																				
Poaceae	Miscanthus floridulus	五節芒										1										1
Poaceae	Brachiaria mutica	巴拉草									1.8	3 70	0 1.8	25	1.	5 8	8 1.5	80	1	5	1	1 25
Blechnaceae	Blechnum orientale	烏毛蕨																				
Poaceae	Pennisetum alopecuroides	狼尾草									2	2 10	0 3	2								1
Araceae	Alocasia macrorrhizos	海芋																				
Lemnaceae	L emna minor	浮萍																				
Polygonaceae	Polygonum hydropiper	水蓼								1			1	1								
Cyperaceae	Cyperus involucratus	風車草											1.7	1					1.5	5		
Onagraceae	Ludwigia erecta	美洲水丁香								1	1.5	5	1			2 5	5				2	2 10
Convolvulaceae	Ipomoea cairica	五爪金龍								1												1
Bare Gound	ŧ												,	1		72	2	0		5		25

P1 - Point count location 1; P3 - Point count location 3

Table 4.2. Flora species recorded from belt transect survey at the She Shan River

(T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

	,T2 - middle stream section and T3 - 1							Detailed S	urvey 2										D	Detailed Su	rvey 3				
		Stream			Jul-	15			Ĺ		Au	g-15					Dec-1	5			Ĺ		Jan	-16	
		Transect	T1			T2		Т3	T1			2	1	ГЗ	T1			T2	Т	3	T1		Т	2	Т
Family	Species	Chinese name	Height(m)	%	Height(m) %	Height(m)) %	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)) %	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)
Commelinaceae	Commelina diffusa	節節草			0.	3 25	5				0.3	15					0.3	3 10	0.2	5			0.3	5	0.2
Poaceae	Panicum repens	枯骨草																							
Asteraceae	Mikania micrantha	薇甘菊	0.4	4 10	0 0.	4 10)		0.5	10	0.4	5			0.	5 1	0 0.5	5 10			0.5	10	0.5	5	
Brassicaceae	Nasturtium officinale	西洋菜																					0.3	10	
Moraceae	Ficus microcarpa	細葉榕																							
Moraceae	Ficus hispida	對葉榕																							
Poaceae	Microstegium ciliatum	剛秀竹																							
Fabaceae	Pueraria lobata	野葛																							
Araceae	Colocasia esculenta	芋																							
Urticaceae	Boehmeria nivea	苧麻		1																					
Asteraceae	Bidens alba	白花鬼針草	0.9) 1:	5		0.3	2	0.9	15			0.5	2	2	1 3	0				1	30			
Poaceae	Pennisetum purpureum	象草		1																					
Poaceae	Coix lacryma-jobi	薏苡		1 :	2				1	2						1	2				1	2			
Amaranthaceae	Alternanthera philoxeroides	空心蓮子草																							
Poaceae	Panicum maximum	大黍		1																					
Moraceae	Broussonetia papyrifera	構樹		1																					
Polygonaceae	Polygonum chinense	火炭母		1																					
Onagraceae	Ludwigia hyssopidolia	草龍		1																					
Cyperaceae	Cyperus sp.	莎草													1										
Poaceae	Miscanthus floridulus	五節芒																							
Poaceae	Brachiaria mutica	巴拉草	0.8	3 60	0	1 50	0.8	10	0.9	60	1	35	0.9	10	0.	3 3	0 1	1 5	1	1	0.3	15	1	5	1
Blechnaceae	Blechnum orientale	烏毛蕨													1										
Poaceae	Pennisetum alopecuroides	狼尾草													1										
Araceae	Alocasia macrorrhizos	海芋	İ												Ì										
Lemnaceae	L emna minor	浮萍					1	1	İ	İ	İ		İ 👘	l I	1										
Polygonaceae	Polygonum hydropiper	水蓼		1				1		1			1			1									
Cyperaceae	Cyperus involucratus	風車草			1.	2 5	5	1	İ	İ	1.2	5	l –	l I	1		1.2	2 5	0.4	2			1.2	5	0.4
Onagraceae	Ludwigia erecta	美洲水丁香		1			1.5	50		1			1.5	50		1			0.3	5					0.3
Convolvulaceae	Ipomoea cairica	五爪金龍		1	0.	3 5	5	1			0.3	5	1			1	0.3	3 5					0.3	5	
Bare Gound				1	3	10)	38		13		40		38	3	2	8	70		87		43		70	

P1 - Point count location 1; P3 - Point count location 3

Т	
Height(m) 0.2	%
0.2	5
1	5
0.4	2
0.4 0.3	5
	83

Table 4.3 Avifauna recorded along survey transects and at three selected point count locations at She Shan River.

(T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

		1		1	<u> </u>		seline n	1				_		Detaile	d Surve					_		iled Su	rvey 2							etailed	Survey			
						Jul-08			Aug-08	;		Dec-1	4			Ja	n-15			Jul-1	5			Aug-	15			Dec	-15			Jan	n-16	
Common Name	Species name	Chinese name	Status	Commonness		bundar			bundan			Abunda			-		ndance			bunda				Abund		_		Abund					Idance	_
		七米 戸	CNN LC		C	P1	P3	С	P1	P3	С	T1	T2	T3	С	T1	T2	T3	С	T1	T2	T3	С	T1	T2	T3	C	T1	T2	T3	С	T1	T2	Т
Ashy Drongo	Dicrurus leucophaeus	灰卷尾	SWV, LC	U	-								_	-							2	2		4			+		1					┢
Barn Swallow	Hirundo rustica	家燕	PM	C									_	_					++		2	2	++	4	_					7				┢
Black Drongo	Dicrurus macrocercus	黑卷尾	Sv	C								$ \vdash$	_												_		++	<u> </u>		1			-	┢
Black Kite	Milvus lineatus	麻鷹	R, RC, Cap.586	С		<u> </u>		+			+		_	_	+										-						+		2	┢
Black-necked Starling	Sturnus nigricollis	黑領椋鳥	R	С	+	<u> </u>		+	2		+	2	_	_	+		2	2	++	2		2	++		3		+				+			┢
Buzzaia (Common	Garrulax chinensis	黑喉噪鶥	R	С																			+		1									┶
Duggord)	¹¹ Buteo buteo	普通鵟	WV, Cap 586	U											+												+	$ \rightarrow $		1				┶
Chestnut Bulbul	Hemixos castanonotus	栗背短腳鵯	R,WV	С																											++		6	┶
Chinese Bulbul	Pycnonotus sinensis	白頭鵯	R	С	+		2	+			+		2	2	+	1		3	++	2	2	2	++		2	2	++		3	2	++	2	2	4
Chinese Pond Heron	Ardeola bacchus	池鷺	R,RC	С	++		3	+	1	2	+		1		++	1	2	2	+			1	+	1			+			1	+		1	
Common Emerald Dove	Chalcophaps indica	綠翅金鳩	R,VU	S																			+		1									
Common Kingfisher	Alcedo atthis	普通翠鳥	R	С																							+		1		+		1	
Common Koel	Eudynamys scolopacea	噪鵑	R	С																											+			
Common Sandpiper	Actitis hypoleucos	磯鷸	WV&PM	С															+			1	+		1									
Common Tailorbird	Orthotomus sutorius	長尾縫葉鶯	R	С	+	1		+	1		++	1	1		++	2	1	1	+	2	2		++	2	2		+				+	1	2	\square
Crested bulbul	Pycnonotus jocosus	紅耳鵯	R	С		1		++	3	2	+++	2	3	2	+++	3	2	4	+++	5	5	7	+++	3	3	8	+++	7	6	7	+++	3	12	1
Crested Goshawk	Accipiter trivirgatus	鳳頭鷹	R, CR, Cap.586	U	1			-			-				+	-						-				-+		-	<u> </u>	-	+	-	<u> </u>	Ť
Crested Myna	Acridotheres cristatellus	八哥	R	C	1	1		+		2	+				+			3	++	2	2	1	++			3		-+	\rightarrow		+			+
Crested Serpent Eagle	Spilornis cheela	蛇鵰	R, VU, LC, Cap	с П	1	1		<u> </u>		~			+	+				5		-	~		+	+	1	-		-+	\rightarrow		+		<u> </u>	+
1 0	Columba sp.	追	502 D	C	<u> </u>	2		+	1	2	++				++								Ŧ	-	1				\rightarrow		т			+
Domestic pigeon		Log	K	U U	+	2		+	1	2							-													1			1	┿
Dusky Warbler	Phylloscopus fuscatus	褐柳鶯	WV	Ű							++	+ +	-	_	++	1	2	1	+	1	1	-	+	1	1		+		1	1	+		1	+
Eurasian tree sparrow	Passer montanus	麻鵲	R	С	-			+	2		+++		5	3	+++	2	4	3	++	3	3	3	++	_	2	4	++		6	5	++	3	4	-
Fork-tailed Sunbird	Aethopyga christinae	叉尾太陽鳥	R	С																			+		2						+			┶
Great Coucal	Centropus sinensis	褐翅鴉鵑	R,VU	С	+	1	2	+	1	1	+				+		1						+		1						+		1	┶
Great Egret	Ardea alba	大白鷺	R,RC	U											+																			
Great Tit	Parus major(commixtus)	大山雀	R	С																														
Green Sandpiper	Tringa ochropus	白腰草鷸	PM&WV	U																							+			1				
Grey Heron	Ardea cinerea	蒼鷺	WV,PRC	С																														
Grey Wagtail	Motacilla cinerea	灰鶺鴒	WV	С							+		1		+		1	2	+			1	+			1	+	1		1	+			
Japanese White Eye	Zosterops japonica(simplex)	暗綠繡眼鳥	R	С							+			3	+			4	+		3	3	+	3	3		++		5	3	++		7	(
Large Hawk Cuckoo	Cuculus sparverioides	鷹鵑	SV	U							+																							1
Little Egret	Egretta garzetta	小白鷺	R,RC	C	+			+			+	2	1	1	+	1	2	1	+			1	+			1	+	1			+	1		+
Magpie Robin	Copsychus saularis	鵲鴝	R	C	+	1		+	1		+	-	1		+	1	1	2	+	2		2	+		1	2	+	-	2		+		2	
Night Heron	Nycticorax nycticorax	夜鷺	R,LC	U	T	1			1				1	-	1	1	1	2	Т	2		2	-	-	1	2	1		-2		-		2	ť
			WV	C	-							+ +												-+	-+			-+	\rightarrow					╋
Olive Backed Pipit	Anthus hodgsoni	樹鷚		с 																								\rightarrow						╋
Oriental Dollarbird	Eurystomus orientalis	三寶鳥	PM	U								+ +											+	_	1	_								+
Plaintive Cuckoo	Cacomantis merulinus	八聲杜鵑	SV	С																														_
Plain Prinia	Prinia inornata	純色鷦鶯	R	С																							++	$ \rightarrow $			+			┶
Rufous-backed Shrike	Lanius schach	棕背伯勞	R	С	+			+			+				+				+	1			+	1			+				+			
Rufous-capped Babbler	Stachyridopsis ruficeps	紅頭穗鶥	R	С							+				+				+		1		+		1						+			
Scarlet Minivet	Pericrocotus speciosus	赤紅山椒鳥	R	С]					
Sooty-headed Bulbul	Pycnonotus aurigaster	白喉紅臀鵯	R	С																														
Spotted Dove	Streptopelia chinensis	珠頸斑鳩	R	С	+	1	1	+	2	1	+	1	2	2	+	2	3	4	++	3	3	4	++	2	3	2	++		3	4	++	3	1	4
Spotted Munia	Lonchura punctulata	斑文鳥	R	U							+	5			+		5																	Γ
Stejneger's Stonechat	Saxicola stejnegeri	黑喉石䳭	PM,WV	С	1	1																					+		-		+			\square
White Wagtail	Motacilla alba	白鶺鴒	WV	c		1		+	1		++	1	2	2	++	1	2	2	+		1	1	+		1		+	1	\rightarrow	1	+	1		1
White-breasted Waterhen	Amaurornis phoenicurus	白胸苦惡鳥	R	C	+	1		+					-	-+	+							-	-+	+		-+		-+	\rightarrow	-				f
Yellow Bellid Prinia	Prinia flaviventris	黄腹鷦鶯	R	C	† .	1		· ·											+		1	1	+		1		+	-+	\rightarrow		+			+
		<u></u>		1-	-	5	8		15	10		15	19	15		15	16	17	4	21	24	33	·	17	31	23		10	27	34	-	14	42	3
Number of birds		1			-				<u> </u>				-				16						_	_		_	_					-		_
No. of species				1	11	4	4	16	10	6	21	9	11	7	24	10	13	14	19	10	12	15	25	8	19	8	21	4	8	12	27	7	13	1
-																																		
Note: R – Resident; WV – V	Winter visitor; PM – Passage mig	, ,	,		•																													
Note: R – Resident; WV – V SpM – Spring migrant; Sv -	- Summer visitorC - transect cou	nt; P1 – Point count lo	ocation 1; P3 – Poi																															
Note: R – Resident; WV – V SpM – Spring migrant; Sv – +, occurred; ++, common; –	- Summer visitorC – transect cou +++, abundant/dominant specie	nt; P1 – Point count lo s in the the study area	ocation 1; P3 – Poi	nt count location 3																														
Note: R – Resident; WV – V SpM – Spring migrant; Sv – +, occurred; ++, common; - Commonness and status we	- Summer visitorC – transect cou +++, abundant/dominant specie ere decided accroding to AFCD b	nt; P1 – Point count lo s in the the study area iodiversity website (w	ocation 1; P3 – Poi	nt count location 3																														
Note: R – Resident; WV – V SpM – Spring migrant; Sv – +, occurred; ++, common; - Commonness and status we All bird species are under pr	- Summer visitorC – transect cou +++, abundant/dominant specie ere decided accroding to AFCD b protection of Wild Animals Prote	nt; P1 – Point count lo s in the the study area iodiversity website (w ection Ordinance (Cap.	ocation 1; P3 – Poi	nt count location 3																														
Note: R – Resident; WV – V SpM – Spring migrant; Sv - +, occurred; ++, common; - Commonness and status we All bird species are under p Endangered Species of Anin	- Summer visitorC – transect cou +++, abundant/dominant specie ere decided accroding to AFCD b protection of Wild Animals Prote mals and Plants Ordinance (Cap.	nt; P1 – Point count lo s in the the study area iodiversity website (w ection Ordinance (Cap.	ocation 1; P3 – Poi	nt count location 3																														
Note: R – Resident; WV – V SpM – Spring migrant; Sv – +, occurred; ++, common; - Commonness and status we All bird species are under pr Endangered Species of Anii RC : Regional concern Fello	 Summer visitorC – transect cou +++, abundant/dominant specie ere decided accroding to AFCD b protection of Wild Animals Prote mals and Plants Ordinance (Cap. owes et al (2002) 	nt; P1 – Point count lo s in the the study area iodiversity website (w ection Ordinance (Cap.	ocation 1; P3 – Poi	nt count location 3																														
Note: R – Resident; WV – V SpM – Spring migrant; Sv - +, occurred; ++, common; - Commonness and status we All bird species are under pr Endangered Species of Anin RC : Regional concern Fell LC : Local Concern Fellowe	Summer visitorC – transect cou +++, abundant/dominant specie re decided accroding to AFCD b orotection of Wild Animals Prote mals and Plants Ordinance (Cap. owes <i>et al</i> (2002) es <i>et al</i> (2002)	nt; P1 – Point count lo s in the the study area iodiversity website (w ection Ordinance (Cap.	ocation 1; P3 – Poi	nt count location 3																														
Note: R – Resident; WV – V SpM – Spring migrant; Sv - +, occurred; ++, common; - Commonness and status we All bird species are under pr Endangered Species of Anin RC : Regional concern Fell LC : Local Concern Fellowe	Summer visitorC – transect cou +++, abundant/dominant specie re decided accroding to AFCD b rotection of Wild Animals Prote mals and Plants Ordinance (Cap. owes <i>et al</i> (2002) es <i>et al</i> (2002) acern Fellowes <i>et al</i> (2002)	nt; P1 – Point count lo s in the the study area iodiversity website (w ection Ordinance (Cap.	ocation 1; P3 – Poi	nt count location 3																														

Table 4.4. Odonate species recorded at the She Shan River

					Baseline m	nonitoring	Detailed	Survey 1	Detailed	Sruvey 2	Detailed	Sruvey 3
Species	Common name	Chinese name	Status	Commo nness	Jul-08	Aug-08	Dec-14	Jan-15	Jul-15	Aug-15	Dec-15	Jan-16
Agriocnemis pygmnalis	Wandering Midget	黃尾小蟌	NP	VC								
Brachythemis contaminata	Asian Amberwing	黃翅蜻	NP	VC								
Ceriagrion auranticum ryukyuanum	Orange-tailed Sprite	琉球橘黃蟌	NP	VC					+	+		
Copera ciliata	Black-knees Featherleg		NP	VC								
Copera marginipes	Yellow Featherlegs	黃狹扇蟌	NP	VC					+	+		
Crocothemis servilia servilia	Crimson Darter	红蜻	NP	VC	+	+	+	+	+	+		
Diplacodes trivialis	Blue Percher	紋藍小蜻	NP	VC	+							
Ictinogomphus pertinax	Common Flangetail	霸王葉春蜓	NP	С					+	+		
Ischnura senegalensis	Common Bluetail	褐斑異痣蟌	NP	VC								
Nannophya pygmaea	Scarlet Dwarf	侏紅小蜻	NP	С								
Neurobasis chinensis chinensis	Chinese Greenwing	華艷色蟌	NP	VC						+		
Neurothemis fulvia	Russet Percher	網脈蜻	NP	VC					+	+		
Orthetrum chrysis	Red-faced Skimmer	華麗灰蜻	NP	VC	+	+				+		+
Orthetrum glaucum	Common blue skimmer	黑尾灰蜻	NP	VC								
Orthetrum luzonicum	Marsh Skimmer	呂宋灰蜻	NP	VC					+			
Orthetrum pruinosum neglectum	Common Red Skimmer	赤褐灰蜻	NP	VC					+			
Orthetrum Sabina sabina	Green Skimmer	狹腹灰蜻	NP	С	+	+						
Pantala flavescens	Wandering Glider	黃蜻	NP	VC	+	+			+	+	+	+
Prodasineura autumnalis	Black Threadtail	烏齒原蟌	NP	VC					+	+		
Pseudagrion pruinosum fraseri	Ferruginous-faced Sprit	赤斑蟌	NP	С								
Pseudagrion rubriceps rubriceps	Orange-faced Sprite	丹頂斑蟌	NP	UC	+							
Rhinocypha perforata perforata	Common Blue Jewel	三斑鼻蟌	NP	VC					+	+		
Rhyothemis variegata arria	Variegated Flutterer	斑麗翅蜻	NP	С					+	+		
Trithemis aurora	Crimson Dropwing	曉褐蜻	NP	VC			+	+	+	+		
Trithemis festiva	Indigo Dropwing	慶褐蜻	NP	VC					+	+	+	+
Zygonyx iris insignis	Emerald Cascader	彩虹蜻	P,PG	VC								

Note: NP - Not protected in Hong Kong ; P - Protected in Hong Kong

"VC" - Very Common; "UC" - Uncommon; "C" - Common

"+" - Species exists in the study area

"++" - Species common in the study area

"+++" – Species abundance in the study area

Commonness and status were decided accroding to AFCD biodiversity website (www.hkbiodiversity.net)

LC- Local Concern - Fellowes et al (2002)

PGC - Potential Global Concern - Fellowes et al (2002)

Table 4.5 Aquatic Macro invertebrates recorded at She Shan River.

(T1- Upper stream section, T2 - middle stream section, T3 - Lower stream section)

	Status Common - ness Upper stream Lower stream Upper stream Lower stream Reference T1 T2 T3 R								iled Surv	ey 1						Detaile	d Survey 2							Detail	ed Survey 3					
Species	Chinese name	Sampli	ng location	Jul	l-08	Aug	g-08		Dec-14			J	an-15			Ju	l-15			Aug-	15			Γ	Dec-15			J	an-16	
		Status						Reference	T1 /	Т2 Т	3 Refe	rence T	1 T	2 T3	Refe	ence T1	T2	Т3	Reference	T1	T2	T3	Reference	T1	T2	Т3	Reference	T1	T2	T3
Mollusks																								-						
Anodonta woodiana	背角無齒蚌	NP	VC																										T	
Biomphalaria sp.		NP	VC	+	+	+	+		+				+	+		- +	+		+	+	+		+	+	+		+	+	+	
Brotia hainanensis		NP	VC	+	+	+	+	+	+	+		+	+	+	+	- +	+		+	+	+		+	+	+		+	+	+	
Corbicula fluminea	河蜆	NP	VC							+							+				+				+				+	
Melanoides tuberculata	瘤擬黑螺	NP	VC	+	+	+	++	+	+	+	+	+	+	+ +			+	+	+	+	+	+	+	+	++	+	+	+	++	+
Pomacea canaliculata		NP	VC	+	++	+	+	+	+	+	+	+	+	+ +	+	+ +	+ ++	++	++	++	++	++	+	++	++	+	+	++	++	+
Radix plicatulus		NP	VC	+	+	+	+	+	+	+	+	+	+	+ +		- +	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Sinotaia quadrata	田螺	NP	VC	+	+	+	++	+	+	+	+	+	+	+ +		+	+	++	+	+	+	++	+	+	++	++	+	+	++	++
Insects			1							-						-				1	•				1		1			R
Baetis sp.		NP	VC	+	+	+	+			+				+			+				+				+				+	
Caenis sp.		NP	VC	+	+	+	+																							
Chironomus sp.	蠓幼虫	NP	VC	+	+	++	++	+	+	+	+	+	+	+ +	- 4	- +	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Euphaea sp.		NP	VC							+				+		+	+			+	+			+	+			+	+	
Indobaetis sp.		NP	VC	+	+	+	+	+		+		+	+	+	+	· +	+		+	+	+		+	+	+		+	+	+	
Odonate larvae		NP	VC																		+			+	+			+	+	
Orthetrum spp.		NP	VC					+	+	+	+	+	+	+ +	- 4	· +	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Pseudagrion spp.		NP	UC					+		+		+	+	+		+	+			+	+			+	+			+	+	
Pseudocloeon sp.		NP	VC	+	+	+	+	+		+		+		+																
Serratella sp.		NP	VC	+	+	+	+						+	+		+				+				+				+		
Crustaceans																														
Caridina cantanensis	廣東米蝦	NP	VC														+				+			+	+			+	+	
Cryptopotamon anacoluthon	鰓刺溪蟹	NP	VC																						+				+	

Note: NP – Not protected in H P - protected species in Hong Kong "VC" – Very Common; "UC" – Uncommon; "C" - Common

"+" - Species exists in the study area

"++" - Species common in the study area

"+++" - Species abundance in the study area

- Reference point was the sampling location outside the works

area used to compare the with the data within works area.

Table 4.6 Fish species and Hong Kong Newt recorded at She Shan River

(T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

					Baseline	monitorin	g			Detai	iled Su	urvey 1						Detaile	ed Survey 2							Detaile	ed Survey 3			
				Ju	1-08	Aug	g-08	I	Dec-14				Jan-15	i		Jı	ul-15			Aug-1	5			Dec-1	5			Jan-1	6	
Species		Status	Commonness		Lower stream	Upper stream	Lower stream	Reference	T1 '	Г2 Т.	3 Re	eference	T1 7	Г2	Г3 I	Reference	T1 7	Г2 Т3	Referenc	e T1	T2	T3	Reference	T1	T2	Т3	Reference	T1	T2	Т3
Channa maculata	斑鱧	NP	С										+					+			+				+				+	
Clarias gariepinus	革胡子鲶	NP	VC							+				+				+ +			+	+			+	+			+	+
Gambusia affinis	食蚊魚	NP	VC			++	++	+	+	+ ·	+	+	+	+	+	+	+	+ +	+	+	+	+	+	+	+	+	+	+	+	+
Misgurnus anguillicaudatus	泥鰍	NP	С							+			+	+		+	+	+	+	+	+		+	+	+		+	+	+	
Oreochromis niloticus	尼羅口孵非鯽	NP	С			+	++	+	+	+ -	+	+	+	+	+	+	+	++ +-	+ +	++	++		+	++	++		+	++	++	+
Parazacco spilurus	異鱲	NP, V	С	+	++	+	++	+	+	+ -	+	+	+	+	+	+	+	+ +	+	+	+	+	+	+	+		+	+	+	
Poecilia reticulata	孔雀花魚將	NP	VC			++	++			-	+				+			+ +			+	+			+	+			+	+
Pterocryptis cochinchinensis	越南隱鰭鯰	NP	С							+				+				+			+				+					
Puntius semifasciolatus	七星魚	NP	С	+++	++	+++	+++	+	+	+ ·	+	+	+	+	+	+	+	+ +	+	+	+		+	+	+		+	+	+	
Rhinogobius spp.	鰕虎魚	NP	С			+	+	+	+	+ -	+	+	+	+	+	+	+	+ +	+	+	+	+	+	+	+	+	+	+	+	+
Xiphophorus hellerii	劍尾魚	NP	С	+	+	++	++	+		+ -	+	+		+	+	+	+	+ +	+	+	+		+	+	+		+	+	+	
Xiphophorus variatus	雜色劍尾魚	NP	С			+	+			+				+				+ +			+	+			+	+			+	+
Zacco platypus	寛鰭鱲	NP	С	++	+	+	+	+	++	++ -	+	+	++	++	+	+	+	++ +	+	+	++	+	+	++	++	+	+	++	++	+
		2x2m fi	sh number	80	60	80	60	60	50	50 4	40	50	40	40	50	15	8	15 8	20	10	20	10	55	50	40	35	55	45	35	25
Amphibian																														1
Paramesotriton hongkongensis	香港瘰螈	P, Cap 170, NT, PGC	R							+				+											+				+	

Note: NP – Not protected in Hong Kong

"VC" – Very Common; "UC" – Uncommon; "C" - Common

"+" - Species exists in the study area

"++" - Species common in the study area

"+++" – Species abundance in the study area

- Reference point was the sampling location outside the works area used to compare

the with the data within works area.

"Cap 170" - List in Wild Animials Protection Ordinance (Cap.170)

"NT" - Near Treatened in IUCN Red List Status

"PGC"-Potential Golal Concern by Fellowes et al (2002)

'V" - Vulerable - in Red China Data Book

Table 4.7 Abotic data for the Upper She Shan River(T1-Upper stream section, T2 - middle stream section and T3 - Lowerstream section)

	Baseline monitoring			Detailed	Survey 1					Detailed	Survey 2					Detailed	Survey 3		
Stream	Aug-08		Dec-14			Jan-15			Jul-15			Aug-15			Dec-15			Jan-16	
Replicate		T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
DO (mg/L)	8.9	8.5	8.6	8.6	8.6	8.6	8.7	8.2	8.0	8.2	8.1	8.0	8.1	8	7.8	8	7.8	7.7	7.8
рН	7.29	8.2	8.5	8.4	9.0	8.8	8.8	7.8	7.7	7.9	7.6	7.7	7.6	7.6	7.6	7.5	7.9	7.8	7.8
Nitrate (mg N/L)	0.5	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.5	0.5	0.4	0.5	0.5	0.4	0.5	0.5	0.4	0.5	0.5
Ammonia (mg N/L)	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Salinity (ppt)	<0.1	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Conductivity (µS/cm)	90	127	132	121	156	162	147	39	45	28	32	38	46	32	29	42	29	35	32
BOD (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Water flow at pool (m/s)	0.1-0.3	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2
Water flow at riffle (m/s)	0.4-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5
Sand (%)	55	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Stone (%)	25	80	80	30	80	80	30	80	80	30	80	80	30	80	80	30	80	80	30
Mud (%)	30	5	5	2	5	5	2	5	5	2	5	5	2	5	5	2	5	5	2
Concrete (%)	0	10	10	63	10	10	63	10	10	63	10	10	63	10	10	63	10	10	63