

# Appendix 12.1 Literature Review

## Literature Review

### 1 Background

- 1.1 The purpose of the literature review is to identify existing information on the terrestrial habitats and species present within the study area in order to identify any information gaps and take into account such information gaps in the design of terrestrial ecological surveys. A series of materials, including relevant EIA studies, academic research papers, results of ecological research or monitoring done by government authorities such as the Agriculture, Fisheries and Conservation Department (AFCD) or non-government organisations, have been reviewed to gather relevant data on the terrestrial flora and fauna species present in the study area.
- 1.2 Relevant EIA reports and studies that provide a considerable amount of information on the terrestrial ecology of North Lantau from Sham Wat to Tai Ho Wan and Chek Lap Kok have been reviewed. The EIA reports and studies that have been reviewed include:
- Hong Kong - Zhuhai - Macao Bridge: Hong Kong Boundary Crossing Facilities and Hong Kong Link Road Final 9 Months Ecological Baseline Survey (Mouchel, 2004);
  - Hong Kong - Zhuhai - Macao Bridge: Hong Kong Link Road Verification Survey of Ecological Baseline Final Report (Asia Ecological Consultants Ltd, 2009);
  - Tuen Mun - Chek Lap Kok Link (TM-CLKL) - Investigation Final EIA Report (AECOM, 2009);
  - Hong Kong - Zhuhai - Macao Bridge: Hong Kong Boundary Crossing Facilities (HKBCF) and Hong Kong Link Road (HKLR) - Investigation Final EIA Report (ARUP, 2009);
  - EIA Study for Construction of Lung Kwu Chau Jetty Final EIA Report (Maunsell, 2002);
  - EIA Study for Tung Chung New Town Development Extension – Draft (ARUP, 2013);
  - Lantau Logistics Park Development – Feasibility Study Final Report (ARUP, 2008); and
  - Hong Kong International Airport Approved Plant Species List (Revision 4.0: July 2013) (AAHK, 2013)
- 1.3 Relevant literature that have been reviewed include:
- Hong Kong Biodiversity (AFCD Newsletters, 2002-2012);
  - AFCD Unpublished Biodiversity Database (AFCD, 2002 to 2013);
  - Hong Kong Butterfly Inventory (Green Power Hong Kong, 2008 to 2012);
  - A Field Guide to the Terrestrial Mammals of Hong Kong (Shek, 2006);

- A Field Guide to the Amphibians of Hong Kong (Chan *et al.* 2005);
- Field Guide to the Dragonflies of Hong Kong, 2nd Edition (Wilson, 2004);
- The Dragonflies of Hong Kong (Wilson, 2011);
- Field Guide to the Freshwater Fish of Hong Kong (Lee *et al.* 2004);
- Ecology of the Birds of Hong Kong (Wong *et al.* 2009);
- The Avifauna of Hong Kong (Carey, *et al.* 2001);
- Hong Kong Bird Reports (Hong Kong Bird Watching Society, 2007 to 2011);
- Freshwater Fish in Hong Kong (Lam & Cheung, 2002);
- Ecological and Conservation Importance of Tung Chung, Lantau (KFBBG, 2013)

## 2 Habitat and Flora

### Major Habitats

- 2.1 The study areas for terrestrial ecology are shown in **Drawings MCL/P132/EIA/12-001 to MCL/P132/EIA/12-007**.
- 2.2 The majority of the areas on the airport island are developed areas on reclaimed land, where the vegetation is actively managed by the Landscape Team of Airport Authority Hong Kong (AAHK). A primary goal of the landscape management is to ensure that birds are not attracted across the airfield to minimise the risk of bird strike. The only exception is Scenic Hill at the southeastern corner of the airport island, which is dominated by shrubby grasslands with a patch of secondary woodland on the north-facing slope and a strip of plantation at the periphery. The coastline around the airport island is dominated by artificial structure, for example, artificial seawall.
- 2.3 In North Lantau, along the coastline from Sham Wat Wan to Tung Chung Bay, the hill slopes at back shore are dominated by tall shrublands with a few patches of secondary woodlands, plantation woodlands and several streams. Patchy village settlements can be found near the shore. The coastline is largely natural with sandy shores, rocky shores, mudflats and mangroves.
- 2.4 The area east of Tung Chung Bay is largely developed in Tung Chung Town Centre at the seaside, and the coastline along this part of North Lantau is dominated by an artificial seawall.
- 2.5 From Pak Mong to Tai Ho Wan, secondary woodlands, tall shrublands and shrubby grasslands are common. Village settlement surrounded by cultivated land can also be found. The coastline at Tai Ho Wan is largely natural, covered with rocky shores, mangroves and salt marshes.
- 2.6 Lung Kwu Chau, Tree Island and Sha Chau are small outlying islands dominated by tall shrubland.

### Floral Species of Conservation Interest

- 2.7 With regard to flora species, 27 floral species of conservation interest have been recorded in various studies (AECOM, 2009; ARUP, 2008; ARUP, 2013; Asia Ecological Consultants Ltd, 2009; Mouchel, 2004). Twenty-three of them are terrestrial species and the remaining four are seagrasses, which are discussed in detail in **Chapter 13**.
- 2.8 The orchid species Banana Orchid *Acampe rigida* has been reported in the shrubby grassland near Hau Hok Wan (Mouchel, 2004). It is legally protected and listed under the Forestry Regulations (Cap. 96 sub. leg.) and the Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong.
- 2.9 A patch of Chinese Antirhea *Antirhea chinensis* has been recorded within the secondary woodland on the northwestern part of Tai Ho Wan near Pak Mong (AECOM, 2009). Although, this species is considered common and not legally protected in Hong Kong, it is a key protected wild species in mainland China.
- 2.10 Several tree specimens and seedlings of Incense Tree *Aquilaria sinensis* have been reported along the footpath near the tall shrubland from Hau Hok Wan to Sha Lo Wan and within the secondary woodland of the Scenic Hill (Asia Ecological Consultants Ltd, 2009). It has also been recorded within the secondary woodland in Tung Chung (KFBG, 2013), on the northwest of Tai Ho Wan (AECOM, 2009; ARUP, 2008) and in the plantation behind Pak Mong (AECOM, 2009). Although this species is considered locally common, it is listed under the Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong and is a Category II protected species in mainland China.
- 2.11 Silver-back Artocarpus *Artocarpus hypargyreus* has been found within the secondary woodland next to the mangrove at Tai Ho Wan (AECOM, 2009). This species is considered locally common and not legally protected in Hong Kong. However, it is a Category III protected species in mainland China.
- 2.12 The orchid species Bamboo Orchid *Arundina graminifolia* has been recorded near Hau Hok Wan and Tai Ho Wan (AECOM, 2009; Mouchel, 2004). Although it is considered locally common, it is legally protected and listed under the Forestry Regulations (Cap. 96 sub. leg.) and the Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong.
- 2.13 *Cansjera rheedii* has been recorded in secondary woodland, tall shrubland and shrubby grassland at various locations in North Lantau (ARUP, 2008; Asia Ecological Consultants Ltd, 2009; Mouchel, 2004). This species is has a restricted distribution, and is not legally protected in Hong Kong.
- 2.14 Approximately six patches of the rare sedge *Carex tristachya* have been found spreading along both sides of the footpath near the tall shrubland near Hau Hok Wan (Mouchel, 2004). It is considered to be a very rare species, but there is no legal protection for it in Hong Kong.

- 2.15 Biond's Hackberry *Celtis biondii* has been recorded at various locations in secondary woodland and tall shrubland in North Lantau (AECOM, 2009; ARUP, 2008; Asia Ecological Consultants Ltd, 2009; Mouchel, 2004). This species is considered rare, but is not legally protected in Hong Kong.
- 2.16 Lamb of Tartary *Cibotium barometz* has been recorded in secondary woodland in North Lantau (ARUP, 2013; Mouchel, 2004). This species is considered common in Hong Kong but "Vulnerable" in China. It is listed under the Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong and is a Category II protected species in Mainland China.
- 2.17 The orchid species Bee Orchid *Cleisostoma simondii* has been recorded in the shrubby grassland near Hau Hok Wan (Mouchel, 2004). It is legally protected and listed under the Forestry Regulations (Cap. 96 sub. leg.) and the Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong.
- 2.18 Small Persimmon *Diospyros vaccinioides* has been recorded in secondary woodland at Tai Ho (AECOM, 2009) and near Tung Chung Bay (ARUP, 2013). This species is considered common and not legally protected in Hong Kong. However, it is listed as "Critically Endangered" under the IUCN Red List of Threatened Species.
- 2.19 Clammy Hop Seed *Dodonaea viscosa* has been reported along the back of the Sha Lo Wan Beach (Mouchel, 2004). This species is considered rare but is not legally protected in Hong Kong.
- 2.20 The insectivorous herb Indian Sundew *Drosera indica* has been found along the shoreline from Hau Hok Wan to Kau Liu (Mouchel, 2004) and on the rock surface of a stream at Hau Hok Wan (Asia Ecological Consultants Ltd, 2009). It is considered very rare but is not legally protected in Hong Kong.
- 2.21 The orchid species Pale Purple Eulophia *Eulophia graminea* has been found within the tall shrubland near Hau Hok Wan and at Sha Lo Wan (Mouchel, 2004) and within the stone crevices along a stream at Hau Hok Wan (Asia Ecological Consultants Ltd, 2009). It is legally protected and listed under the Forestry Regulations (Cap. 96 sub. leg.) and the Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong.
- 2.22 Little-leaved Rourea *Gmelina chinensis* has been recorded in secondary woodland and tall shrubland at various locations in North Lantau (ARUP, 2013; Asia Ecological Consultants Ltd, 2009; KFBG, 2013; Mouchel, 2004). It is considered locally common but rare in China. It is not legally protected in Hong Kong.
- 2.23 *Ligustrum punctifolium* has been recorded in mangrove area near Tung Chung Stream (ARUP, 2013; KFBG, 2013). This species is considered rare, but is not legally protected in Hong Kong.
- 2.24 Pitcher Plant *Nepenthes mirabilis* has been found within the secondary woodland in northeastern Tai Ho Wan (AECOM, 2009) and along the stream bank of Tung Chung Stream (KFBG, 2013). It is legally protected and listed under the Forestry Regulations (Cap. 96 sub. leg.) and the Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong.

- 2.25 Hong Kong Pavetta *Pavetta hongkongensis* has been observed in secondary woodland and tall shrubland at various locations, such as Hau Hok Wan and Tai Ho Wan, within the study area (AECOM, 2009 & ARUP, 2013; Asia Ecological Consultants Ltd, 2009 & Mouchel, 2004). This species is considered common in Hong Kong. However, it is legally protected and listed under the Forestry Regulations (Cap. 96 sub. leg.).
- 2.26 Red Azalea *Rhododendron simsii* has been recorded on the airport island (AAHK, 2013) and in developed areas in Tung Chung (ARUP, 2013). Wild populations are legally protected under the Forestry Regulations (Cap. 96 sub. leg.). However, it is likely that the observed individuals were planted in landscape areas as ornamental plants.
- 2.27 The orchid species Hong Kong *Spiranthes hongkongensis* has been recorded along the streamside of Tung Chung Stream (KFBG, 2013). It is legally protected and listed under the Forestry Regulations (Cap. 96 sub. leg.) and the Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong.
- 2.28 Portia Tree *Thespesia populnea* has been recorded at numerous locations along the coastal and associate mangrove habitats in North Lantau (AECOM, 2009; ARUP, 2008; Asia Ecological Consultants Ltd, 2009; Mouchel, 2004). It has restricted distribution but is not legally protected in Hong Kong.
- 2.29 Spiny-fruited *Uvaria calamistrata* has been recorded in North Lantau near Tung Chung (ARUP, 2013). This species is considered rare, but is not legally protected in Hong Kong.
- 2.30 Indian Yellow-eyed Grass *Xyris indica* has been recorded in grassland habitat near Tai Ho (ARUP, 2008). This species is considered to have a restricted distribution, but is not legally protected in Hong Kong.

### 3 Avifauna

- 3.1 Pelagic bird species spend a significant portion of their lives on open water, rarely venturing to land except to breed. Pelagic bird species are seldom recorded in the open water to the north of the airport island. This area has not been identified as a main migratory pathway for pelagic birds, in comparison with the southern and eastern part of Hong Kong waters where abundance of these species is higher (Wong *et al.* 2009).
- 3.2 Waterbirds, particularly species associated with intertidal habitats, are commonly found on Sha Chau, Lung Kwu Chau and along the North Lantau coastline. In particular, the Lung Kwu Chau, Tree Island and Sha Chau were designated as SSSI in recognition of their migratory bird habitats. In Year 2011, an egretty developed on Sheung Sha Chau Island (Anon, 2012a).
- 3.3 Sha Chau provides favourable nesting conditions such as its isolation from developed areas and proximity to the sea. The Sha Chau egretty is monitored by the Hong Kong Bird Watching Society (HKBWS) as part of their Egretty Counts Programme. The programme is commissioned by AFCD. The egretty counts performed between May and June 2011 revealed that Sha Chau supported 56 nests of Little Egrets, which was the highest count among all surveyed colonies that year (Anon, 2012a). Two nests of Great Egret and six nests of Black-crowned Night Heron were

also recorded (Anon, 2012a). The number of nests on Sheung Sha Chau Island increased in the summer of 2012. The monitoring of the egretty conducted between April and July 2012 discovered that the number of nests of Little Egrets increased from 56 to 69, which was the highest number among all colonies of the same species in Hong Kong. The number of Black-crowned Night Heron nests also showed an increasing trend from six in 2011 to 22 in 2012 while that of Great Egret remained unchanged (Anon, 2012b). The egretty monitoring programme continued in 2013; the results showed that the number of Little Egret nests dropped from 69 to 40, Great Egret nests increased by one, whilst Black-crowned Night Heron increased from 22 to 40. In 2013, Sha Chau egretty was the second largest egretty in Hong Kong (Anon, 2013).

- 3.4 With regard to bird species occurrence along coastal habitat of North Lantau, the ecological survey conducted in North Lantau near the airport island have identified an array of bird species. The avifauna surveys conducted by AFCD, casual observations by HKBWS, as well as the Tuen Mun – Chek Lap Kok Link (TM-CLKL) EIA study, Hong Kong Zhuhai Macao Bridge – Hong Kong Link Road (HZMB-HKLR) EIA study, Tung Chung New Town Development Extension EIA study and the feasibility study of Lantau Logistics Park have identified 138 species from Lung Kwu Chau, Tree Island and Sha Chau SSSI and Sham Wat to Tai Ho Wan including Chek Lap Kok (AFCD, 2002-2013; AECOM, 2009, Mouchel, 2004; Asia Ecological Consultants Ltd, 2009; ARUP, 2013; ARUP, 2008).
- 3.5 According to Fellowes *et al.* (2002), two species are of “Global Concern”. Scarce spring migrant, the Swinhoe’s Egret and common winter visitor, the Red-billed Starling, are both globally concerned species (Fellowes *et al.* 2002). Swinhoe’s Egret is categorized as “Endangered” by the China Red Data Book and “Vulnerable” by the IUCN (Zheng & Wang, 1998; IUCN, 2013) whilst the Red-billed Starling is evaluated as a “Least Concern” species (IUCN, 2013). There were three Swinhoe’s Egrets recorded in Tung Chung Bay in April 2004 (Mouchel, 2004). On the other hand, 40 Red-billed Starlings were recorded in San Tau during the HZMB-HKLR survey in December 2003 and four individuals were recorded in Tung Chung Bay in January 2004 (Mouchel, 2004).
- 3.6 In September 2003, over 700 Cattle Egrets and Little Egrets from the Northwest and Northeast New Territories were recorded in Tung Chung Bay (Mouchel, 2004). However, no similar record with high abundances of these two species was recorded again in Tung Chung Bay since September 2003.
- 3.7 Habitats on Sha Chau and Lung Kwu Chau are generally not considered as productive for terrestrial species. However, in the seaside woodland on the southwestern part of Lung Kwu Chau a White-bellied Sea Eagle *Haliaeetus leucogaster* nest has been established (So & Lee, 2010). The Lung Kwu Chau breeding pair had a productivity rate of 80% across five active breeding years. In the harsh breeding season in 2007/08, the Lung Kwu Chau pair was the only one of the seven active breeding pairs in Hong Kong that successfully raised a fledging (So & Lee, 2010).
- 3.8 A full list of avifauna species reported from the literature review is presented in **Annex A**

#### **Avifauna of the Airport Island**



- 3.9 Bird strike information in relation to the existing airport operation was collected from AAHK as reported by the pilots. In the past five years, i.e. from 2008 to 2012, the number of confirmed bird strike cases within the airport boundary, i.e. defined as area within 500 ft. of the altitude from the airport footprint, ranged from 11 (0.33 per 10,000 ATM) to 21 (0.68 per 10,000 ATM) per year.
- 3.10 Bird strikes pose a potential safety threat as they can cause damage to aircraft. To mitigate the bird strike hazard, the Bird Control Unit under AAHK adopts several bird strike preventive measures including the use of bird distress calls and ultrasonic repellers during aircrafts' take off and landing, as well as vegetation grooming that minimises habitat attractiveness to birds. Bird surveys on the airfield are also conducted on a daily basis for record keeping purpose.
- 3.11 The bird survey information is useful for understanding the use of the airport runway by birds and the potential bird species that may benefited from the third runway project. The survey generally divides the existing runways into North Runway and South Runway. The bird patrols usually cover the daylight period from 06:30 to 19:30.
- 3.12 Based on the survey results from the past five years, i.e. from 2008 to 2012, most of the bird species recorded are common open country birds that normally occur in open fields and open grasslands. The species communities comprise of residents, winter visitors and passage migrants. The most abundant species recorded are Eurasian Tree Sparrow, Richard's Pipit, Crested Myna, White Wagtail and the ardeid species.
- 3.13 Other than the airfield bird survey, AAHK also engage expert consultants to conduct monthly bird surveys to provide expert analysis of avifauna use patterns at HKIA and to verify Bird Control Unit's data. Bird records from AAHK's Bird Control Unit and expert consultant surveys are presented in **Table 1**.
- 3.14 The monthly bird survey results of the survey conducted by the expert consultants from December 2011 to November 2012 were extracted for analysis to verify the data collected by the AAHK's Bird Control Unit. The majority of the recorded birds were open country bird species. It was also noted that a few open field associated wader species, such as Little Ringed Plover, Oriental Pratincole and Pacific Golden Plover, were found in the runway.
- 3.15 Based on the surveys carried out by the AAHK's Bird Control Unit and expert consultants, the monthly variation of bird population is presented in **Annex B** and a list of species found in the airside of the airport during expert consultants' survey is presented in **Annex C**. Both data sets showed a seasonal pattern in bird numbers, where the bird numbers were highest during autumn and the numbers were comparatively lower in other seasons. The peak in autumn could be attributed to the autumn migration movement when passage migrants move southwardly from North to South. They would probably stop over at runway open area before further journey.

Table 1: Species record of existing runways

Species Name	Common Name	Conservation Status	AA Bird Control Unit Survey	Expert Consultant Survey	North Runway	South Runway
<i>Acridotheres cristatellus</i>	Crested Myna	-	√	√	√	√
<i>Actitis hypoleucos</i>	Common Sandpiper	-		√	√	

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Species Name	Common Name	Conservation Status	AA Bird Control Unit Survey	Expert Consultant Survey	North Runway	South Runway
<i>Alcedo atthis</i>	Common Kingfisher	-	√	√	√	√
<i>Anthus cervinus</i>	Red-throated Pipit	LC		√	√	
<i>Anthus hodgsoni</i>	Olive-backed Pipit	-		√	√	
<i>Anthus richardi</i>	Richard's Pipit	-	√	√	√	√
<i>Apus nipalensis</i>	House Swift	-		√		√
<i>Ardeola bacchus</i>	Chinese Pond Heron	RC		√	√	
<i>Bubulcus coromandus</i>	Eastern Cattle Egret	-		√	√	√
<i>Calidris alba</i>	Sanderling	LC		√	√	
<i>Calidris canutus</i>	Red Knot	LC		√	√	
<i>Calidris ruficollis</i>	Red-necked Stint	LC		√	√	
<i>Charadrius alexandrinus</i>	Kentish Plover	RC		√	√	
<i>Charadrius dubius</i>	Little Ringed Plover	LC		√	√	
<i>Charadrius leschenaultii</i>	Greater Sand Plover	RC		√	√	
<i>Cisticola juncidis</i>	Zitting Cisticola	LC		√	√	√
<i>Copsychus saularis</i>	Oriental Magpie Robin	-		√	√	√
<i>Corvus macrorhynchos</i>	Large-billed Crow	-	√	√	√	√
<i>Dicrurus macrocerus</i>	Black Drongo	-	√	√	√	√
<i>Egretta alba</i>	Great Egret	RC		√		
<i>Egretta garzetta</i>	Little Egret	RC;		√	√	√
<i>Egretta intermedia</i>	Intermediate Egret	RC		√	√	
<i>Falco tinnunculus</i>	Common Kestrel	CITES II	√	√	√	√
<i>Glareola maldivarum</i>	Oriental Pratincole	LC		√	√	√
<i>Halcyon smyrnensis</i>	White-throated Kingfisher	(LC)	√	√	√	√
<i>Hirundo rustica</i>	Barn Swallow	-	√	√	√	√
<i>Lanius schach</i>	Long-tailed Shrike	-	√	√	√	√
<i>Larus sp.</i> <sup>^</sup>	Gull sp.	-		√	√	
<i>Milvus migrans</i>	Black Kite	RC; CITES II	√	√	√	√
<i>Monticola solitarius</i>	Blue Rock Thrush	-	√	√	√	√
<i>Motacilla alba</i>	White Wagtail	-	√	√	√	√
<i>Numenius sp.</i> <sup>^</sup>	Whimbrel sp.	-		√	√	
<i>Passer montanus</i>	Eurasian Tree Sparrow	-	√	√	√	√
<i>Pica pica</i>	Eurasian Magpie	-	√	√	√	√
<i>Pluvialis fulva</i>	Pacific Golden Plover	LC		√	√	
<i>Saxicola stejnegeri</i>	Stejneger's Stonechat	-		√	√	

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Species Name	Common Name	Conservation Status	AA Bird Control Unit Survey	Expert Consultant Survey	North Runway	South Runway
<i>Spilopelia chinensis</i>	Spotted Dove	-		√		√
<i>Streptopelia orientalis</i>	Oriental Turtle Dove	-		√	√	

Notes: Conservation Status comprise information of Level of Concern; China Red Data Book; CITES/IUCN. The Level of Concern follows Fellowes *et al.* 2002: GC = Global Concern; PRC = Potential Regional Concern; RC = Regional Concern; LC = Local Concern; ( ) = assessment based on restricted nesting or roosting sites.

^ The record is considered problematic in species identification therefore only the genus level is included in this summary table.

### Hong Kong Bird Report Records at Chek Lap Kok

- 3.16 In relation to the bird records in Chek Lap Kok, the casual bird records compiled in the annual Hong Kong Bird Report published by the HKBWS were reviewed. A bird list in Chek Lap Kok (including the SkyCity Nine Eagles Golf Course) was produced based on review of five years' Hong Kong Bird Report (i.e. from 2007 to 2011). Also, reliable observation record published on the HKBWS's online public forum which will be incorporated in the coming bird report was also included in the bird list for Chek Lap Kok as showed in **Table 2**.
- 3.17 Owing to bird watchers' interest, the bird list produced based on their casual reports contains a variety of migratory species but lack common residential species. On one hand, the bird families recorded in vegetated area in the airport island include flycatcher, thrush and warblers. On the other hand, some open field-associated wader species, such as Little Ringed Plover, Greater Sand Plover, Lesser Sand Plover and Oriental Plover have also been recorded in Chek Lap Kok area. It is presumed that the open field-associated species use the airport island as a temporary stop-over place.

Table 2 Hong Kong Bird Reports records at Chek Lap Kok

Species Name	Common Name	Conservation Status	CLK	Specified Locations	
				Northeastern Roundabout	CLK Golf Course
<i>Actitis hypoleucos</i>	Common Sandpiper	-	√	√	√
<i>Alauda gulgula</i>	Oriental Skylark	LC	√		
<i>Anthus hodgsoni</i>	Olive-backed Pipit	-	√	√	
<i>Anthus richardi</i>	Richard's Pipit	-		√	
<i>Anthus rubescens</i>	Buff-bellied Pipit	LC			√
<i>Ardea alba</i>	Great Egret	PRC(RC)	√		
<i>Ardeola bacchus</i>	Chinese Pond Heron	PRC(RC)		√	
<i>Bubulcus coromandus</i>	Eastern Cattle Egret	-	√		
<i>Calidris ruficollis</i>	Red-necked Stint	LC	√		
<i>Calidris subminuta</i>	Long-toed Stint	LC	√		
<i>Charadrius alexandrinus</i>	Kentish Plover	RC	√		
<i>Charadrius dubius</i>	Little Ringed Plover	(LC)	√		

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Species Name	Common Name	Conservation Status	CLK	Specified Locations	
				Northeastern Roundabout	CLK Golf Course
<i>Charadrius leschenaultii</i>	Greater Sand Plover	RC	√		
<i>Charadrius mongolus</i>	Lesser Sand Plover	LC	√		
<i>Charadrius veredus</i>	Oriental Plover	LC	√		
<i>Cyanoptila cyanomelana</i>	Blue-and-white Flycatcher	-		√	
<i>Dicurus macrocercus</i>	Black Drongo	-	√		
<i>Egretta sacra</i>	Pacific Reef Heron	(LC), CRDB R, China Protected Species II	√		
<i>Emberiza aureola</i>	Yellow-breasted Bunting	RC, IUCN EN	√		
<i>Falco tinnunculus</i>	Common Kestrel	China Protected Species II, CITES II	√		
<i>Ficedula narcissina</i>	Narcissus Flycatcher	-		√	
<i>Ficedula zanthopygia</i>	Yellow-rumped Flycatcher	-		√	
<i>Gallinago gallinago</i>	Common Snipe	-			√
<i>Geokichla citrina</i>	Orange-headed Thrush	LC		√	
<i>Glareola maldivarum</i>	Oriental Pratincole	LC	√		
<i>Halcyon smyrnensis</i>	White-throated Kingfisher	(LC)		√	
<i>Himantopus himantopus</i>	Black-winged Stilt	RC	√		√
<i>Jynx torquilla</i>	Eurasian Wryneck	-		√	
<i>Lanius bucephalus</i>	Bull-headed Shrike	-	√		
<i>Lanius cristatus</i>	Brown Shrike	-	√	√	
<i>Luscinia calliope</i>	Siberian Rubythroat	-		√	
<i>Monticola solitarius</i>	Blue Rock Thrush	-	√	√	
<i>Motacilla alba</i>	White Wagtail	-	√		√
<i>Muscicapa dauurica</i>	Asian Brown Flycatcher	-		√	
<i>Oriolus chinensis</i>	Black-naped Oriole	LC		√	
<i>Phalacrocorax carbo</i>	Great Cormorant	PRC	√		
<i>Phoenicurus aureoreus</i>	Daurian Redstart	-		√	
<i>Phylloscopus borealis</i>	Arctic Warbler	-		√	
<i>Phylloscopus fuscatus</i>	Dusky Warbler	-		√	
<i>Phylloscopus inornatus</i>	Yellow-browed Warbler	-		√	
<i>Phylloscopus tenellipes</i>	Pale-legged Leaf Warbler	-		√	
<i>Pluvialis fulva</i>	Pacific Golden Plover	LC	√		
<i>Prinia inornata</i>	Plain Prinia	-	√		
<i>Recurvirostra avosetta</i>	Pied Avocet	RC			√
<i>Rostratula benghalensis</i>	Greater Painted-snipe	LC	√		
<i>Saxicola stejnegeri</i>	Stejneger's Stonechat	-		√	
<i>Spodiopsar cineraceus</i>	White-cheeked Starling	PRC		√	
<i>Streptopelia orientalis</i>	Oriental Turtle Dove	-		√	
<i>Sturnia sinensis</i>	White-shouldered Starling	(LC)		√	
<i>Tachybaptus ruficollis</i>	Little Grebe	LC			√
<i>Terpsiphone paradisi</i>	Asian Paradise-Flycatcher	LC		√	

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Species Name	Common Name	Conservation Status	CLK	Specified Locations	
				Northeastern Roundabout	CLK Golf Course
<i>Tringa glareola</i>	Wood Sandpiper	LC	√		
<i>Tringa nebularia</i>	Common Greenshank	RC	√		
<i>Turdus chrysolaus</i>	Brown-headed Thrush	LC	√		
<i>Turdus hortulorum</i>	Grey-backed Thrush	-		√	
<i>Turdus merula</i>	Common Blackbird	-		√	

Notes: Conservation Status based on Fellowes *et al.* 2002, IUCN 2013, China Red Data Book of Endangered Animals (CRDB), China Protected Species, CITES Appendices and AFCD Biodiversity Database (2012).

All wild birds in Hong Kong are protected under Wild Animals Protection Ordinance (Cap. 170).

PRC = Potential Regional Concern; RC = Regional Concern; LC = Local Concern; ( ) = assessment based on restricted nesting or roosting sites; IUCN: EN = Endangered VU = Vulnerable; CRDB: R = Rare.

Northeastern Roundabout locates north of the taxi station of Airport, between Terminal 1 and Terminal 2.

### Avifauna Species of Conservation Interest

3.18 Overall, 160 avifauna species were reported from this literature review, of which 36 species are of conservation interest.

3.19 **Table 3** below summarised the conservation status and recorded locations of the 36 species of conservation interest. The approximate locations of the avifauna species of conservation interest reported from the literature review are presented in **Drawings MCL/P132/EIA/12-023a, 025a, 026, 027a and 028a** based on the best available information.

Table 3: Avifauna of conservation interest reported from literature review

Species Name	Common Name	Level of Concern	IUCN	CRDB	China Protected Species	CITES	Protection Ordinance	CLK	NL
<i>Accipiter gularis</i>	Japanese Sparrowhawk					II	Cap. 586		√
<i>Accipiter soloensis</i>	Chinese Sparrowhawk					II	Cap. 586		√
<i>Accipiter trivirgatus</i>	Crested Goshawk			R	II	II	Cap. 586		√
<i>Accipiter virgatus</i>	Besra				II	II	Cap. 586		√
<i>Aquila fasciata</i>	Bonelli's Eagle	(RC)		R	II	II	Cap. 586		√
<i>Ardea alba</i>	Great Egret	PRC(RC)						√	√
<i>Ardea cinerea</i>	Grey Heron	PRC						√	√
<i>Ardeola bacchus</i>	Chinese Pond Heron	PRC(RC)						√	√
<i>Bubo bubo</i>	Eurasian Eagle Owl	RC		R	II	II	Cap. 586		√
<i>Butastur</i>	Grey-faced			R	II	II	Cap. 586		√

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Species Name	Common Name	Level of Concern	IUCN	CRDB	China Protected Species	CITES	Protection Ordinance	CLK	NL
<i>Bubo indicus</i>	Buzzard								
<i>Buteo japonicus</i>	Eastern Buzzard				II	II	Cap. 586		√
<i>Centropus sinensis</i>	Greater Coucal			V	II				√
<i>Chalcophaps indica</i>	Common Emerald Dove			V					√
<i>Charadrius alexandrinus</i>	Kentish Plover	RC						√	
<i>Charadrius leschenaultii</i>	Greater Sand Plover	RC						√	
<i>Corvus torquatus</i>	Collared Crow	LC	NT						√
<i>Egretta eulophotes</i>	Swinhoe's Egret	GC	VU	E	I				√
<i>Egretta garzetta</i>	Little Egret	RC						√	√
<i>Egretta intermedia</i>	Intermediate Egret	RC						√	√
<i>Egretta sacra</i>	Pacific Reef Heron	LC		R	II			√	√
<i>Emberiza aureola</i>	Yellow-breasted Bunting	RC	VU					√	√
<i>Falco peregrinus</i>	Peregrine Falcon	(LC)			II	I	Cap. 586		√
<i>Falco subbuteo</i>	Eurasian Hobby	(LC)			II	II	Cap. 586		√
<i>Falco tinnunculus</i>	Common Kestrel					II	Cap. 586	√	√
<i>Garrulax canorus</i>	Chinese Hwamei					II	Cap. 586		√
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	(RC)		I	II	II	Cap. 586		√
<i>Himantopus himantopus</i>	Black-winged Stilt	RC						√	√
<i>Ketupa zeylonensis</i>	Brown Fish Owl	RC			II	II	Cap. 586		√
<i>Milvus migrans</i>	Black Kite	(RC)			II	II	Cap. 586	√	√
<i>Otus lettia</i>	Collared Scops Owl				II	II	Cap. 586		√
<i>Phalacrocorax carbo</i>	Great Cormorant	PRC						√	
<i>Recurvirostra avosetta</i>	Pied Avocet	RC						√	
<i>Spilornis cheela</i>	Crested	LC		V	II	II	Cap. 586		√

Species Name	Common Name	Level of Concern	IUCN	CRDB	China Protected Species	CITES	Protection Ordinance	CLK	NL
	Serpent Eagle								
<i>Spodiopsar cineraceus</i>	White-cheeked Starling	PRC						√	
<i>Spodiopsar sericeus</i>	Red-billed Starling	GC							√
<i>Tringa nebularia</i>	Common Greenshank	RC						√	

Notes: Conservation Status based on Fellowes *et al.* 2002, IUCN 2013, China Red Data Book of Endangered Animals (CRDB), China Protected Species, CITES Appendices and AFCD Biodiversity Database (2012).  
All wild birds in Hong Kong are protected under Wild Animals Protection Ordinance (Cap. 170)  
Cap. 586 = Protection of Endangered Species of Animals and Plants Ordinance  
GC = Global Concern; PRC = Potential Regional Concern; RC = Regional Concern; LC = Local Concern; ( ) = assessment based on restricted nesting or roosting sites; IUCN: EN = Endangered, VU = Vulnerable, NT = Near Threatened; CRDB: E = Endangered, V = Vulnerable, R = Rare, I = Indeterminate

## 4 Herpetofauna

### Amphibian

- 4.1 The literature review of publications and unpublished information from the government (Mouchel, 2004; Asian Ecological Consultants Ltd, 2009; Chan *et al.* 2005; AFCD, 2002 – 2013 and ARUP, 2013) identified 14 amphibian species in North Lantau from Sham Wat to Tai Ho Wan including the airport island. Among the 14 amphibian species, five species are of conservation interest, namely the Short-legged Toad *Xenophrys brachykolos*, Lesser Spiny Frog *Quasipaa exilispinosa*, Chinese Bullfrog *Hoplobatrachus chinensis*, Hong Kong Newt *Paramesotriton hongkongensis* and Romer's Tree Frog *Liuixalus romeri*.
- 4.2 The Short-legged Toad recorded by the Hong Kong Biodiversity Survey conducted by AFCD between 2002 and 2013 is regarded as “Endangered” (IUCN, 2013) and considered to be of “Potential Global Concern” (Fellowes *et al.* 2002). It is possibly endemic to Hong Kong and is widespread and locally common within protected areas on Hong Kong Island (Chan *et al.* 2005).
- 4.3 The Lesser Spiny Frog is regarded as “Vulnerable” (IUCN, 2013) and is considered to be of “Global Concern” (Fellowes *et al.* 2002). It was recorded in Sham Wat, Sha Lo Wan, Hau Hok Wan, San Tau and Tai Ho Wan during the HZMB-HKLR EIA ecological surveys (Mouchel, 2004). In Hong Kong, the Lesser Spiny Frogs are common and widespread within protected areas in the territory.
- 4.4 A Chinese Bullfrog was previously recorded in a drain at Scenic Hill (Asia Ecological Consultants Ltd, 2009). This species is regarded as a Class II Protected Animal in China and is considered to be of “Potential Regional Concern” in Hong Kong because of the depletion of wild populations as food items (Fellowes *et al.* 2002, Chan *et al.* 2005).

- 4.5 The Hong Kong Newt is regarded as “Potential Global Concern” by Fellowes *et al.* (2002) and “Near Threatened” by IUCN (2013). It is also protected by the Wild Animals Protection Ordinance (Cap. 170).
- 4.6 The Romer’s Tree Frog is endemic to Hong Kong and is of very high conservation interest. It is regarded as “Endangered” by IUCN (2013) and as “Potential Global Concern” by Fellowes *et al.* (2002). It is also listed under the Wild Animals Protection Ordinance (Cap. 170).
- 4.7 During the EIA study of the HKIA in early 1990s, an isolated population of Romer’s Tree Frog on Chek Lap Kok was identified to be facing adverse impact of the new airport development. In order to safe-guard the Chek Lap Kok population, the EIA study of the new airport development identified a series of mitigation measures including investigations of the Romer’s Tree Frog habitat utilisation, breeding habits, larval development, biotic interactions and over-wintering behaviour; development of a conservation programme for Romer’s Tree Frog; collation and synthesis of existing scientific data on the biology and ecology of the Romer’s Tree Frog; and establishment and maintenance of a breeding population of Romer’s Tree Frog in the laboratory under a controlled environment. Subsequently, a comprehensive ecological study on the Romer’s Tree Frog was initiated by The University of Hong Kong (HKU) and the World Wide Fund for Nature (WWF), funded by the Royal Hong Kong Jockey Club, to implement the recommendations. The study was undertaken by a research student at HKU between 1992 and 1995. Through that study, over 300 Romer’s Tree Frogs of the Chek Lap Kok population were removed from the site prior to vegetation clearance and were then bred successfully in a laboratory at HKU. New localities of Romer’s Tree Frog were identified. Some 400 adults, 600 young frogs and over 1000 captive bred tadpoles were released to several sites within Hong Kong including Tai Lam Country Park, Tai Po Kau Nature Reserve and Tsiu Hang Special Area (Greiner – Maunsell, 1991 and 1998). A list of amphibian of conservation interest that has been previously recorded in North Lantau are presented in **Table 4**.
- 4.8 The approximate locations of the amphibian species of conservation interest identified from the literature are also presented in **Drawings MCL/P132/EIA/12-023b, 024, 025b, 027b, and 028b**.

Table 4: Amphibian species of conservation interest recorded in previous surveys within the study area

Common Name	Scientific Name	Status in Hong Kong	Conservation Status (Level of Concern; China Red Data Book; CITES/IUCN)	Recorded Location	
				CLK	NL
Chinese Bullfrog	<i>Hoplobatrachus chinensis</i>	Fairly Common and widespread in NT and Lantau	PRC; Class II protected	✓	
Romer’s Tree Frog	<i>Liuixalus romeri</i>	Endemic to Hong Kong. Locally Common in protected areas	PGC; IUCN Endangered; Cap. 170	✓	✓
Hong Kong Newt	<i>Paramesotriton hongkongensis</i>	Widely distributed in mountain streams throughout New Territories, Lantau Island and Hong Kong Island	PGC; IUCN Near Threatened; Cap. 170		✓
Lesser Spiny Frog	<i>Quasipaa exilispinosa</i>	Common and Widespread in protected areas	PGC; IUCN Vulnerable		✓
Short-legged Toad	<i>Xenophrys brachykolos</i>	Possibly endemic to Hong Kong. Widespread and locally common within the protected areas on Hong Kong Island	PGC; IUCN Endangered		✓

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Notes: Status based on Chan *et al.* 2005

Conservation Status based on Fellowes *et al.* 2002, CITES Appendices and China Red Data Book of Endangered Animals: Amphibia and Reptila (1998). PGC = Potential Global Concern; GC = Global Concern; PRC = Potential Regional Concern; RC = Regional Concern; LC = Local Concern

Location: CLK = Chek Lap Kok (Scenic Hill) and NL = North Lantau

## Reptile

- 4.9 A total of 24 reptile species were identified from the literature review. Five out of these species are of conservation interest including Tokay Gecko *Gekko reevesii* (Rosler *et al.* 2010), Chinese Cobra *Naja atra*, King Cobra *Ophiophagus hannah*, Common Rat Snake *Ptyas mucosus* and Burmese Python *Python bivittatus*.
- 4.10 The Tokay Gecko is the largest gecko species in Hong Kong. The first record of this species in Hong Kong was in Tung Chung (Karsen *et al.* 1998). It is rare and being regarded as a species of regional concern. Tokay Gecko was recorded at Sham Wat, San Shek Wan and San Tau (Mouchel, 2004).
- 4.11 The population of Chinese Cobra in southern China was believed to be decreasing (Mouchel, 2004). Chinese Cobra is a CITES Appendix II species with potential concern globally (Fellowes *et al.* 2002) and is restricted to southern China (Karsen *et al.* 1998). It is also listed as “Vulnerable” in the China Red Data Book of Endangered Animals (Zhao, 1998) and in the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). It has been recorded at Scenic Hill during the AFCD biodiversity surveys.
- 4.12 Being the world’s largest venomous snake, the CITES Appendix II species, King Cobra is constantly under potential regional threat. This species is protected under Cap. 586 in Hong Kong and is listed as “Vulnerable” on the IUCN Red List (IUCN, 2013). Moreover, it is regarded as a “Critically Endangered” species in the China Red Data Book of Endangered Animals. King Cobra is a very uncommon species and is distributed unevenly throughout the New Territories and Lantau Island. It was recorded in North Lantau by AFCD’s biodiversity survey (AFCD, 2002 to 2013).
- 4.13 The Common Rat Snake is a CITES Appendix II species which is listed as “Endangered” in China Red Data Book of Endangered Animals and under the protection of Cap. 586. Although it is of potential conservation interest at the regional level, it is common and widespread throughout Hong Kong (Fellowes *et al.* 2002; Karsen *et al.* 1998). It was recorded at Tung Chung Bay during the HZMB-HKLR baseline ecological surveys (Mouchel, 2004). Moreover, it was also recorded on Sha Chau and Lung Kwu Chau during AFCD’s Biodiversity Survey between 2002 and 2013. A list of reptiles of conservation interest previously recorded in North Lantau and Sha Chau and Lung Kwu Chau is presented in **Table 5**.
- 4.14 Burmese Python is the largest snake in Hong Kong. It is of “Potential Regional Concern” (Fellowes *et al.* 2002), and is regarded as “Vulnerable” under IUCN Red List (IUCN, 2013). It is also listed as “Critically Endangered” under China Red Data Book of Endangered Animals. Burmese Python is listed in the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) and it is the only snake species listed in the Wild Animal Protection

Ordinance (Cap. 170). An individual was observed swimming at the mouth of Tung Chung Stream in 2012 (KFBG, 2013).

- 4.15 The approximate locations of the reptile species of conservation interest identified from the literature are also presented in **Drawings MCL/P132/EIA/12-023b, 024, 025b, 027b, and 028b.**

Table 5: Reptile species of conservation interest recorded in previous surveys within the study area

Common Name	Scientific Name	Status in Hong Kong	Conservation Status (Level of Concern; China Red Data Book; CITES/IUCN)	Recorded Location	
				CLK	NL/SC&LKC
Tokay Gecko	<i>Gekko reevesii</i>	Rare	RC		√
Chinese Cobra	<i>Naja atra</i>	Common	PRC; Vulnerable; CITES II; Cap.586	√	
King Cobra	<i>Ophiophagus hannah</i>	Very Uncommon	PRC; Critically Endangered; CITES II; IUCN Vulnerable; Cap. 586		√
Common Rat Snake	<i>Ptyas mucosus</i>	Common and Widespread	PRC; Endangered; CITES II; Cap.586		√
Burmese Python	<i>Python bivittatus</i>	Common and Widespread	PRC; Critically Endangered; IUCN Vulnerable; Cap. 170; Cap. 586		√

Notes: Status based on Karsen *et al.* 1998

Conservation Status based on Fellowes *et al.* 2002, CITES Appendices and China Red Data Book of Endangered Animals: Amphibia and Reptila (1998). PGC = Potential Global Concern; GC = Global Concern; PRC = Potential Regional Concern; RC = Regional Concern; LC = Local Concern

Cap. 586 = Protection of Endangered Species of Animals and Plants Ordinance

Location: CLK = Chek Lap Kok (Scenic Hill); NL = North Lantau and SC&LKC = Sha Chau and Lung Kwu Chau

## 5 Macroinvertebrate (Butterfly and Dragonfly)

### Butterfly

- 5.1 Ninety species of butterflies were recorded within the study area in North Lantau, Sha Chau and Lung Kwu Chau during the EIA study of HZMB-HKLR (Mouchel, 2004). Combined with the species recorded by AFCD's Biodiversity Survey, the results of the butterfly survey conducted at San Tau by Green Power Hong Kong and the ecological survey conducted by Kadoorie Farm and Botanic Garden at Tung Chung, a total of 158 species of butterflies were recorded within the aforementioned areas (AFCD, 2002 to 2013; Green Power Hong Kong, 2008 to 2012; KFBG, 2013). The majority of these butterflies are common and abundant in Hong Kong except 39 rare or very rare species.
- 5.2 The butterfly species of conservation interest recorded within the study area with specified locations are presented in **Table 6** and their approximate locations identified from the literature are also presented in **Drawings MCL/P132/EIA/12-023b, 024, 025b, 027b, and 028b.**

Table 6: Butterfly species of conservation interest recorded in previous surveys within the study area

Scientific Name	Common Name	Commonness (Chan <i>et al.</i> 2011)	Conservation Interest (Fellowes <i>et al.</i> 2002)	Conservation interest under AFCD Assessment (Chan <i>et al.</i> 2011)	Recorded Location	
					CLK	NL/SC&LKC
<i>Aeromachus jhora</i>	Grey Scrub Hopper	R				√
<i>Appias albina darada</i>	Common Albatross	R	LC	√		√
<i>Arhopala bazalus turbata</i>	Powdered Oak Blue	R				√
<i>Arhopala birmana birmana</i>	Burmese Bush Blue	VR	LC	√		√
<i>Baoris farri farri</i>	Paintbrush Swift	R				√
<i>Bibasis oedipodea belesis</i>	Orange Awlet	VR				√
<i>Caltoris bromus bromus</i>	Colon Swift	VR				√
<i>Caltoris cahira</i>	Dark Swift	R				√
<i>Catochrysops strabo strabo</i>	Forget-me-not	VR				√
<i>Celastrina lavendularis limbata</i>	Plain Hedge Blue	VR	LC	√		√
<i>Cirrochroa tyche mithila</i>	Common Yeoman	VR	LC	√		√
<i>Deudorix epijarbas menesicles</i>	Cornelian	R				√
<i>Dichorragia nesimachus formosanus</i>	Constable	R	LC	√		√
<i>Eurema brigitta rubella</i>	Small Grass Yellow	R	LC	√		√
<i>Eurema laeta betheseba</i>	Spotless Grass Yellow	VR				√
<i>Hasora chromus chromus</i>	Banded Awl	R				√
<i>Jamides alecto alocina</i>	Metallic Cerulean	VR				√
<i>Jamides celeno celeno</i>	Common Cerulean	R				√
<i>Junonia hierta hierta</i>	Yellow Pansy	R				√
<i>Lamproptera curius walkeri</i>	White Dragontail	R	LC	√		√
<i>Leptotes plinius</i>	Oriental Striped Blue	VR		√		√
<i>Megisba malaya sikkima</i>	Malayan	VR	LC	√		√
<i>Neptis soma tayalina</i>	Sullied Sailer	VR	LC	√		√

Scientific Name	Common Name	Commonness (Chan <i>et al.</i> 2011)	Conservation Interest (Fellowes <i>et al.</i> 2002)	Conservation interest under AFCD Assessment (Chan <i>et al.</i> 2011)	Recorded Location	
					CLK	NL/SC&LKC
<i>Pachliopta aristolochiae goniopeltis</i>	Common Rose	R				√
<i>Papilio dialis</i>	Southern Chinese Peacock	VR	LC	√		√
<i>Papilio xuthus xuthus</i>	Swallowtail	R				√
<i>Parnara bada bada</i>	Oriental Straight Swift	R				√
<i>Pelopidas conjunctus conjunctus</i>	Conjoined Swift	R				√
<i>Phalanta phalantha phalantha</i>	Common Leopard	VR				√
<i>Potanthus pava pava</i>	Yellow Band Dart	VR				√
<i>Potanthus trachala trachala</i>	Lesser Band Dart	R				√
<i>Tajuria cippus malcolmi</i>	Peacock Royal	R	LC	√		√
<i>Taraka hamada isona</i>	Lesser Forest Blue	R	LC	√		√
<i>Telicota colon stinga</i>	Pale Palm Dart	R	LC	√		√
<i>Telicota ohara formosana</i>	Dark Palm Dart	R				√
<i>Troides aeacus aeacus</i>	Golden Birdwing	R	LC	√		√
<i>Udaspes folus</i>	Grass Demon	R				
<i>Vanessa cardui</i>	Painted Lady	R	LC	√		√
<i>Zizula hylax</i>	Tiny Grass Blue	-		√		√

Notes: Commonness: VR = Very Rare, R = Rare, UC = Uncommon, C = Common, VC = Very Common

LC = Local Concern

Location: CLK = Chek Lap Kok (Scenic Hill); NL = North Lantau and SC&LKC = Sha Chau and Lung Kwu Chau

### Odonate

5.3 A total of 33 dragonfly species were identified within the study area based on the literature review of past EIA studies and government information (Mouchel, 2004; AFCD, 2002 to 2013). Two of these species are of conservation interest, namely the Small Hooktail *Meligomphus moluami* and Emerald Cascader *Zygonyx iris insignis* (Fellowes *et al.* 2002).

5.4 The Small Hooktail which has been recorded near a stream in San Tau, is globally threatened (Fellowes *et al.* 2002; Mouchel, 2004) whilst the abundant Emerald Cascader (Tam *et al.* 2008)

which is considered to be of “Potential Global Concern” (Fellowes *et al.* 2002) has been recorded in North Lantau during the AFCD’s surveys (AFCD, 2002 to 2013).

- 5.5 Records of dragonfly species of conservation interest within the study area with specified locations are presented in **Table 7** and their approximate locations identified from the literature review were also presented in **Drawings MCL/P132/EIA/12-023b, 024, 025b, 027b, and 028b.**

Table 7: Dragonfly species of conservation interest recorded in previous surveys within the study area

Scientific Name	Common Name	Commonness (Wilson <i>et al.</i> 2011)	Conservation Interest (Fellowes <i>et al.</i> 2002)	Recorded Location	
				CLK	NL
<i>Meligomphus moluani</i>	Small Hooktail	C	GC		√
<i>Zygonyx iris insignis</i>	Emerald Cascader	A	PGC		√

Notes: Wilson *et al.* 2011

Commonness: A = Abundant, C = Common, Ed = Endemic and U = Uncommon

Conservation Interest: LC = Local Concern, PGC = Potential Global Concern and GC = Global Concern

## 6 Stream Fauna

### Freshwater Fish

- 6.1 The lowland freshwater streams are considered to be one of the most endangered habitats in Hong Kong (AECOM, 2009). Approximately 140 freshwater fish species have been recorded in Hong Kong (Lam & Cheung, 2002). Diverse aquatic communities in North Lantau are supported by freshwater streams that are generally unaffected by pollution (Mouchel, 2004).
- 6.2 Streams in Sham Wat, San Shek Wan, Sha Lo Wan, San Tau, Hau Hok Wan, Tung Chung Bay, Pak Mong, Tai Ho and near the North Lantau Highway were surveyed during the HZMB-HKLR EIA study. Among all the streams, Tai Ho Stream has the highest species richness with 75 freshwater fish species recorded (AFCD, 2002-2013; AECOM, 2009; Mouchel, 2004). Designated as a SSSI in 1999, Tai Ho Stream is not only known for its non-fragmented stream, riparian and tributary habitat but also its importance to Ayu *Plecoglossus altivelis* as the species’ only breeding site in Hong Kong (AFCD, 2013).
- 6.3 Nine freshwater fish species of conservation interest were previously recorded within the study area by AFCD’s Biodiversity Survey, the TM-CLKL and HZMB-HKLR EIA studies and by KFBG’s ecological survey (AFCD, 2002-2013; AECOM, 2009; Mouchel, 2004; KFBG, 2013).
- 6.4 Five species, namely the Beijiang Thick-lipped Barb *Acrossocheilus beijiangensis*, Giant Mottled Eel *Anguilla marmorata*, White-line Chest-sculptured Sisoridfish *Glyptothorax pallozonum*, Rice Fish *Oryzias curvinotus* and Purple Neon Goby *Stiphodon atropurpureus* have been identified as species of “Global Concern” (Fellowes *et al.* 2002).
- 6.5 The Beijiang Thick-lipped Barb is rare and appears in several streams in Hong Kong (Lee *et al.* 2004). During the HZMB-HKLR baseline ecological survey, one individual was recorded in Tung

- Chung Stream (Mouchel, 2004). The Beijiang Thick-lipped Barb is listed as “Least Concern” under IUCN (2013) with a decreasing trend of population.
- 6.6 The Giant Mottled Eel is not only categorized as “Endangered” in the China Red Data Book of Endangered Animals but also listed under Class II protection in mainland China (Zheng & Wang, 1998; AECOM, 2009). The Giant Mottled Eel is listed as “Least Concern” under IUCN (2013) with a stable population trend.
- 6.7 The White-line Chest-sculptured Sisoridfish is considered as “Species of Conservation Concern” by AFCD’s assessment. This species is possibly restricted to North Lantau and one individual was recorded in the mid-stream section of Tung Chung Stream during KFBG’s ecological survey (KFBG, 2013).
- 6.8 The Rice Fish, which has been recorded in Tung Chung Bay, San Tau and Hau Hok Wan, is uncommon in the wild and is categorised as “Vulnerable” in the China Red Data Book (Mouchel, 2004; Zheng & Wang, 1998; Asia Ecological Consultants Ltd., 2009). The Rice Fish is listed as “Data Deficient” under IUCN (2013) with a decreasing population trend.
- 6.9 The Purple Neon Goby is an amphidromous species which listed as “Species of Conservation Concern” by AFCD’s assessment. It is distributed in Indo-West Pacific region including Indonesia, Malaysia, Philippines, China and Japan. In Hong Kong, it is previous found in few streams in North-East of New Territories and on Lantau Island. A pair of the Purple Neon Gobies were recorded in a section just upstream from the Channelized Section at Shek Lau Po during KFBG’s ecological survey (KFBG, 2013).
- 6.10 According to Fellowes *et al.* (2002), Ayu *Plecoglossus altivelis* is of “Regional Concern”. Ayu is rare in Hong Kong and their population were reported to be under decline locally, regionally and globally (Mouchel, 2004). It is a migratory anadromous fish that moves up rivers with clean water and spawns in the lower reaches of rivers in autumn. Its larvae enter the sea during winter and the young move upstream to the middle reaches of river for feeding in spring. It was only recorded once in May 2004 by Mouchel (2004).
- 6.11 Some species with conservation interests that had not been identified by Fellowes *et al.* (2002) are either listed in the IUCN Red List or the China Red Data Book of Endangered Animals. The Mud Carp *Cirrhinus molitorella* is considered as “Near Threatened” and the Common Carp *Cyprinus carpio* is listed as “Vulnerable” on the IUCN Red List (2013). In addition, the Predaceous Chub *Parazacco spilurus* is categorized as “Vulnerable” in the China Red Data Book (Zheng & Wang, 1998).
- 6.12 The wild populations of the Common Carp is considered as “Vulnerable” by the IUCN and it is not common in streams. However, it can be found in many reservoirs and is cultivated in fishponds as it is a very important commercial fish in southern China. As fishponds were not found in the study area and the Common Carp reported from the literature review has previously been recorded in natural streams, it is assumed to be from the wild population. Therefore, it can be considered to be of conservation interest.



- 6.13 Mozambique Tilapia *Oreochromis mossambicus* is considered as “Near Threatened” by IUCN (2013). However, it is an invasive species to Hong Kong, competing with indigenous fish for food resource and habitats. It is originally native to the eastern coast of Africa and Middle East, but has been popularly introduced throughout the world for aquaculture. In Hong Kong, it is common and widespread in brackish waters, freshwaters pond ditches, rivers and reservoirs. The fish is also cultivated in some local fish farms. Therefore, it is not considered to be a species of conservation interest. Information on freshwater fish species commonness, conservation status and locations of species of conservation interest previously recorded within the study area are shown in **Table 8** and the approximate locations identified from the literature are also presented in **Drawings MCL/P132/EIA/12-025b, 027b, and 028b**.

#### Freshwater Macroinvertebrate

- 6.14 Nineteen freshwater macroinvertebrate species were recorded in the study area during previous biodiversity surveys and EIA studies (Asia Ecological Consultant, 2009, AECOM, 2009; AFCD, 2002-2013). Two freshwater macroinvertebrate species of conservation interest have been recorded.
- 6.15 Greasyback Shrimp *Metapenaeus ensis* is common in mangrove and estuarine areas in Hong Kong (Leung, 1999 and Vance, 1999). All four *Metapenaeus* species, including *M. ensis*, found in Hong Kong are considered to be “Vulnerable” in China due to over-exploitation (ARUP, 2009). Juveniles of Greasyback Shrimp have been recorded in streams located in San Tau and Sha Lo Wan (ARUP, 2009).
- 6.16 An endemic freshwater crab *Somanniathelphusa zanklon* which is regarded as “Endangered” by IUCN Red List due to its restricted distribution and decline in habitat quality because of the use of pesticides in agricultural practices. Two juveniles of this species have been recorded in a small stream, a potential nursery habitat for this species, in San Tau (ARUP, 2009).
- 6.17 Information on freshwater macroinvertebrate species commonness, conservation status and locations of species of conservation interest previously recorded within the study area are shown in **Table 8** and the approximate locations identified from the literature were also presented in **Drawings MCL/P132/EIA/12-025b, 027b, and 028b**.

Table 8: Freshwater fauna of conservation interest recorded in previous surveys within the study area

Species Name	Common Name	Commonness	Conservation Status	Stream Locations
<b>Freshwater Fish</b>				
<i>Acrossocheilus beijiangensis</i>	Beijiang Thick-lipped Barb	R	GC*; Least Concern***	TC
<i>Anguilla marmorata</i>	Giant Mottled Eel	Un	GC*; Least Concern***; Class II protected~	SW, TH
<i>Cirrhinus molitorella</i>	Mud Carp	-	Near Threatened***	TC
<i>Cyprinus carpio</i>	Common Carp	[Un]	Vulnerable***	TC
<i>Glyptothorax pallozonum</i>	White-line Chest-sculptured Sisoridfish	-	GC*, Species of Conservation	TC

Species Name	Common Name	Commonness	Conservation Status Concern (AFCD Assessment)	Stream Locations
<i>Oryzias curvinotus</i>	Rice Fish	Un	GC*; Data Deficient***	TC
<i>Parazacco spilurus</i>	Predaceous Chub	C	Vulnerable**; Data Deficient***	SW, SLW, ST, TC, PM, TH
<i>Plecoglossus altivelis</i>	Ayu	R	RC*; Data Deficient***	TH
<i>Stiphodon atropurpureus</i>	Purple Neon Goby	-	GC*	TC
<b>Freshwater Macroinvertebrate</b>				
<i>Metapenaeus ensis</i>	Greasyback Shrimp	C (Leung 1999, Vance 1999)	Vulnerable****	ST, SLW
<i>Somanniathelphusa zanklon</i>	Freshwater Crab Species	-	Endemic, Endangered***	ST

Notes: Species and Locations Recorded are based on ARUP, 2009; AECOM, 2009; Mouchel, 2004; AFCD, 2002-2013.

Status: C = Common, Un = Uncommon, [ ] = Restricted distribution (uncommon in the wild/streams/species was only recorded in Lantau), R = Rare (based on AFCD biodiversity database and Lee *et al.* 2004), A = Abundant, F = Frequent (\*Status on artificial reefs based on Wilson, 2003)

Conservation status: GC = Global concern, RC = Regional concern, LC = Local concern (based on \*Fellowes *et al.* 2002; \*\*Zheng & Wang, 1998; \*\*\*IUCN, 2013; \*\*\*\*ARUP, 2009; ~AECOM, 2009).

Stream locations: SW = Sham Wat, SLW = Sha Lo Wan, ST = San Tau, TC = Tung Chung, PM = Pak Mong, TH = Tai Ho

## 7 Terrestrial Mammal

- 7.1 Twenty-three terrestrial mammal species were previously recorded within the study area by AFCD's biodiversity surveys conducted between 2002 to 2013 and relevant EIA studies.
- 7.2 Six of the 23 species were non-flying mammals, namely Chinese Pangolin *Manis pentadactyla*, Chinese Ferret Badger *Melogale moschata*, Indian Muntjac *Muntiacus muntjak*, Chestnut Spiny Rat *Niviventer fulvescens*, Wild Boar *Sus scrofa* and Brown Musk Shrew *Suncus murinus*. They are all common species except for the Chinese Pangolin, which is a rare species.
- 7.3 The Chinese Pangolin is listed as "Endangered" under IUCN and "Vulnerable" under the Chinese Red Data Book. It is also under the protection of the Wild Animals Protection Ordinance (Cap. 170). It was recorded by the AFCD's biodiversity surveys conducted in North Lantau between 2002 to 2013.
- 7.4 Among the remaining five common non-flying mammals, four are also of conservation interest. They are Chinese Ferret Badger, Indian Muntjac, Wild Boar and Brown Musk Shrew.
- 7.5 The Chinese Ferret Badger, Wild Boar and Indian Muntjac have been recorded on Lantau Island by camera traps (Shek *et al.* 2007). The skull of wild boar was also recorded on Sha Lo Wan beach (Asia Ecological Consultants, 2009). The Chinese Ferret Badger and Wild Boar are protected under Cap. 170.

- 7.6 Sightings of Indian Muntjacs have been recorded at Sham Shek Tsuen between Sham Wat and San Shek and the Brown Musk Shrew has been recorded at a village located in Sham Wat (Mouchel, 2004). They were rated as “Potential Regional Concern” according to Fellowes *et al.* (2002).
- 7.7 A total of 17 species of bats were identified within the study area from the literature. All bats species are protected locally under Cap. 170.
- 7.8 Unidentified insectivorous bats were observed at Tai Ho Wan, Sham Wat and San Shek Wan (ARUP, 2009). During the TM-CLKL ecological survey, unidentified Pipistrelle *Pipistrellus* sp. were recorded in Tai Ho (AECOM, 2009), they were rated as rare and species of conservation interest according to the AFCD assessment.
- 7.9 Four bat species were previously reported in Tung Chung (Lin, 2001). These included Leschenault’s Rousette Bat *Rousettus leschenaultii*, Chinese Horseshoe Bat *Rhinolophus rouxi*, Lesser Bamboo Bat *Tylonycteris pachypus* and Himalayan Leaf-nosed Bat *Hipposideros armiger*. All four species were rated as “Local Concern” according to Fellowes *et al.* (2002).
- 7.10 Two species of non-cave dwelling bats have been recorded in Tai Ho and nearby areas (Shek *et al.* 2007) including Japanese Pipistrelle *Pipistrellus abramus* and Brown Noctule *Nyctalus noctula*. Japanese Pipistrelle, a very common species in Hong Kong, is of local concern whilst the Brown Noctule is common but is ranked as “Potential Regional Concern” (Fellowes *et al.* 2002).
- 7.11 Sixteen species of bats were previously recorded on northern Lantau from Sham Wat to Tai Ho according to the unpublished data from the AFCD’s biodiversity survey between February 2002 and January 2013. They are Leschenault’s Rousette *Rousettus leschenaultii*, Chinese Horseshoe Bat *Rhinolophus sinicus*, Lesser Bamboo Bat *Tylonycteris pachypus*, Himalayan Leaf-nosed Bat *Hipposideros armiger*, Pomona Leaf-nosed Bat *Hipposideros pomona*, Least Horseshoe Bat *Rhinolophus pusillus*, Japanese Pipistrelle *Pipistrellus abramus*, Brown Noctule *Nyctalus noctula*, Short-nosed Fruit Bat *Cynopterus sphinx*, Lesser Bent-winged Bat *Miniopterus pusillus*, Common Bent-winged Bat *Miniopterus schreibersii fuliginosus*, Chinese Myotis *Myotis chinensis*, Rickett’s Big-footed Myotis *Myotis ricketti*, Dark Whiskered Bat *Myotis muricola*, Intermediate Horseshoe Bat *Rhinolophus affinis*, and Lesser Yellow Bat *Scotophilus kuhlii*.
- 7.12 Information of terrestrial mammal of conservation interest previous recorded in the study area are shown in **Table 9**.

Table 9: Terrestrial mammals of conservation interest recorded in previous surveys within the study area

Species Name	Common Name	Commonness	Conservation Status	Recorded Locations
<b>Flying Mammals</b>				
<i>Cynopterus sphinx</i>	Short-nosed Fruit Bat	C	LC, Cap. 170	SW to TH
<i>Hipposideros armiger</i>	Himalayan Leaf-nosed Bat	C	LC, Cap. 170	SW to TH, TC
<i>Hipposideros pomona</i>	Pomona Leaf-nosed Bat	C	LC, Cap. 170	SW to TH
<i>Miniopterus pusillus</i>	Lesser Bent-winged Bat	Un	LC, Cap. 170	SW to TH
<i>Miniopterus schreibersii fuliginosus</i>	Common Bent-winged Bat	C	LC, Cap. 170	SW to TH

Species Name	Common Name	Commonness	Conservation Status	Recorded Locations
<i>Myotis chinensis</i>	Chinese Myotis	Un	LC, CRDB (V), Cap. 170	SW to TH
<i>Myotis muricola</i>	Whiskered Myotis, Dark Whiskered Bat	R	Cap. 170	SW to TH
<i>Myotis ricketti</i>	Rickett's Big-footed Myotis	C	LC, Cap. 170	SW to TH
<i>Nyctalus noctula</i>	Brown Noctule	C	PRC, Cap. 170	SW to TH
<i>Pipistrellus abramus</i>	Japanese Pipistrelle	C	LC, Cap. 170	SW to TH
<i>Pipistrellus sp.</i>	-	R	Cap. 170	TH
<i>Rhinolophus affinis</i>	Intermediate Horseshoe Bat	Un	LC, Cap. 170	SW to TH
<i>Rhinolophus pusillus</i>	Least Horseshoe Bat	Un	PRC, Cap. 170	SW to TH, PM
<i>Rhinolophus sinicus</i>	Chinese Horseshoe Bat	C	LC, Cap. 170	TC, SW to TH
<i>Rousettus leschenaultii</i>	Leschenault's Rousette	C	LC, Cap. 170	SW to TH, PM, TC
<i>Scotophilus kuhlii</i>	Lesser Yellow Bat	Un	LC, Cap. 170	SW to TH
<i>Tylonycteris pachypus</i>	Lesser Bamboo Bat	C	LC, CRDB (R), Cap. 170	TC, SW to TH
<b>Non-flying Mammals</b>				
			IUCN (Endangered), CRDB (V), Cap. 170	
<i>Manis pentadactyla</i>	Chinese Pangolin	R		SW to TH
<i>Melogale moschata</i>	Chinese Ferret Badger	C	Cap. 170	NL
<i>Muntiacus muntjac</i>	Indian Muntjac	C	PRC	TH to SW, SLW, ST
<i>Suncus murinus</i>	Brown Musk Shrew	C	PRC	TH to SW
<i>Sus scrofa</i>	Wild Boar	C	Cap. 170	NL, SLW

Notes: Species and Locations Recorded are based on ARUP, 2009; AECOM, 2009; Mouchel, 2004; AFCD, 2002-2013.

Status: C = Common, Un = Uncommon, R = Rare (based on AFCD biodiversity database)

Conservation status: GC = Global concern, RC = Regional concern, LC = Local concern, PGC = Potential Global Concern (based on Fellowes *et al.* 2002)

CRDB: R = Rare, V = Vulnerable

Cap. 170 = Wild Animals Protection Ordinance

Locations: SW = Sham Wat, SLW = Sha Lo Wan, ST = San Tau, HH = Hau Hok Wan, TC = Tung Chung, NL = North Lantau, PM = Pak Mong, TH = Tai Ho

## 8 Information Gaps Identified from Literature Review

- 8.1 The flora and fauna communities of North Lantau are largely well documented from recent EIA studies and governmental ecological studies.
- 8.2 Key ecological resources, such as the distribution of the Hong Kong endemic Romer's Tree Frog, the location of butterfly hot spots in North Lantau and the status of the Sha Chau egret are well identified from available literature. However, there is a lack of information regarding the avifauna communities utilising the environment surrounding the existing airport island especially the north Lantau waters. The existing artificial seawall and open waters just to the north of the existing North Runway may be utilised by some groups of birds such as ardeids and seabirds. These

habitats will be transformed or reclaimed due to the project, resulting in potential impacts to these avifauna. Also, the increase in aircraft movement associated with the operation of the third runway is anticipated to have potential impact on avifauna. Because of the aforementioned reasons, tailor-designed avifauna surveys are necessary to fill this information gap and to collect up-to-date information for the impact assessment.

- 8.3 Moreover, all previous records of terrestrial mammals are in inland areas of North Lantau distant from the project area and the existing information of terrestrial mammals from the literature review is sufficient to demonstrate baseline condition of terrestrial mammals in North Lantau. As a result, no ecological surveys for terrestrial mammals are proposed for this assessment.

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**Annex A Avifauna Species Full list (Literature Reivew)**

Species name	Common name	Level of Concern	IUCN	CRDB	China Protected Speceis	CITES
<i>Accipiter gularis</i>	Japanese Sparrowhawk					II
<i>Accipiter soloensis</i>	Chinese Sparrowhawk					II
<i>Accipiter trivirgatus</i>	Crested Goshawk			R	II	II
<i>Accipiter virgatus</i>	Besra				II	II
<i>Acridotheres cristatellus</i>	Crested Myna					
<i>Acrocephalus bistrigiceps</i>	Black-browed Reed Warbler					
<i>Actitis hypoleucos</i>	Common Sandpiper					
<i>Aethopyga christinae</i>	Fork-tailed Sunbird					
<i>Alauda gulgula</i>	Oriental Skylark	LC				
<i>Alcedo atthis</i>	Common Kingfisher					
<i>Amaurornis phoenicurus</i>	White-breasted Waterhen					
<i>Anthus cervinus</i>	Red-throated Pipit	LC				
<i>Anthus hodgsoni</i>	Olive-backed Pipit					
<i>Anthus richardi</i>	Richard's Pipit					
<i>Anthus rubescens</i>	Buff-bellied Pipit	LC				
<i>Apus nipalensis</i>	House Swift					
<i>Apus pacificus</i>	Pacific Swift	(LC)				
<i>Aquila fasciata</i>	Bonelli's Eagle	(RC)		R	II	II
<i>Ardea alba</i>	Great Egret	PRC(RC)				
<i>Ardea cinerea</i>	Grey Heron	PRC				
<i>Ardeola bacchus</i>	Chinese Pond Heron	PRC(RC)				
<i>Bubo bubo</i>	Eurasian Eagle Owl	RC		R	II	II
<i>Bubulcus coromandus</i>	Eastern Cattle Egret					
<i>Butastur indicus</i>	Grey-faced Buzzard			R	II	II
<i>Buteo japonicus</i>	Eastern Buzzard				II	II
<i>Butorides striata</i>	Striated Heron	LC				
<i>Calidris alba</i>	Sanderling	LC				
<i>Calidris canutus</i>	Red Knot	LC				
<i>Calidris ruficollis</i>	Red-necked Stint	LC				
<i>Calidris subminuta</i>	Long-toed Stint	LC				
<i>Caprimulgus affinis</i>	Savanna Nightjar					
<i>Carpodacus erythrinus</i>	Common Rosefinch	LC				
<i>Centropus sinensis</i>	Greater Coucal			V	II	
<i>Ceryle rudis</i>	Pied Kingfisher	(LC)				
<i>Cettia fortipes</i>	Brownish-flanked Bush Warbler					
<i>Chalcophaps indica</i>	Common Emerald Dove			V		
<i>Charadrius alexandrinus</i>	Kentish Plover	RC				
<i>Charadrius dubius</i>	Little Ringed Plover	(LC)				
<i>Charadrius leschenaultii</i>	Greater Sand Plover	RC				
<i>Charadrius mongolus</i>	Lesser Sand Plover	LC				
<i>Charadrius veredus</i>	Oriental Plover	LC				
<i>Clamator coromandus</i>	Chestnut-winged Cuckoo					
<i>Cisticola juncidis</i>	Zitting Cisticola	LC				
<i>Columbia sp.</i>	Domestic pigeon					
<i>Copsychus saularis</i>	Oriental Magpie Robin					
<i>Coracina melaschistos</i>	Black-winged Cuckooshrike	LC				
<i>Corvus macrorhynchos</i>	Large-billed Crow					
<i>Corvus torquatus</i>	Collared Crow	LC	NT			
<i>Cuculus micropterus</i>	Indian Cuckoo					
<i>Cyanoptila cyanomelana</i>	Blue-and-white Flycatcher					
<i>Delichon dasypus</i>	Asian House Martin					
<i>Dendrocitta formosae</i>	Grey Treepie	LC				
<i>Dicaeum cruentatum</i>	Scarlet-backed Flowerpecker					
<i>Dicrurus hottentottus</i>	Hair-crested Drongo					
<i>Dicaeum ignipetus</i>	Fire-breasted Ploverpecker					
<i>Dicrurus leucophaeus</i>	Ashy Drongo	LC				
<i>Dicrurus macrocercus</i>	Black Drongo					
<i>Egretta eulophotes</i>	Swinhoe's Egret	GC	VU	E	I	
<i>Egretta garzetta</i>	Little Egret	(RC)				
<i>Egretta intermedia</i>	Intermediate Egret	RC				
<i>Egretta sacra</i>	Pacific Reef Heron	LC		R	II	
<i>Emberiza aureola</i>	Yellow-breasted Bunting	RC	EN			
<i>Emberiza fucata</i>	Chestnut-eared Bunting	LC				
<i>Emberiza pusilla</i>	Little Bunting					
<i>Emberiza rutila</i>	Chestnut Bunting					
<i>Emberiza spodocephala</i>	Black-faced Bunting					
<i>Eudynamys scolopacea</i>	Common Koel					
<i>Eurystomus orientalis</i>	Oriental Dollarbird					
<i>Falco peregrinus</i>	Peregrine Falcon	(LC)			II	I
<i>Falco subbuteo</i>	Eurasian Hobby	(LC)			II	II
<i>Falco tinnunculus</i>	Common Kestrel				II	II

Species name	Common name	Level of Concern	IUCN	CRDB	China Protected Speceis	CITES
<i>Ficedula mugimaki</i>	Mugimaki Flycatcher					
<i>Ficedula narcissina</i>	Narcissus Flycatcher					
<i>Ficedula parva</i>	Red-breasted Flycatcher					
<i>Ficedula zanthopygia</i>	Yellow-rumped Flycatcher					
<i>Francolinus pintadeanus</i>	Chinese Francolin					
<i>Gallinago gallinago</i>	Common Snipe					
<i>Garrulax canorus</i>	Chinese Hwamei					II
<i>Garrulax perspicillatus</i>	Masked Laughingthrush					
<i>Geokichla citrina</i>	Orange-headed Thrush	LC				
<i>Glareola maldivarum</i>	Oriental Pratincole	LC				
<i>Gracupica nigricollis</i>	Black-collared Starling					
<i>Halcyon pileata</i>	Black-capped Kingfisher	(LC)				
<i>Halcyon smyrnensis</i>	White-throated Kingfisher	(LC)				
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	(RC)		I	II	II
<i>Hemixos castanonotus</i>	Chestnut Bulbul					
<i>Hierococcyx sparverioides</i>	Large Hawk Cuckoo					
<i>Himantopus himantopus</i>	Black-winged Stilt	RC				
<i>Hirundapus cochinchinensis</i>	White-vented Needletail					
<i>Hirundo rustica</i>	Barn Swallow					
<i>Horornis diphone</i>	Japanese Bush Warbler					
<i>Ixobrychus sinensis</i>	Yellow Bittern	LC				
<i>Jynx torquilla</i>	Eurasian Wryneck					
<i>Ketupa zeylonensis</i>	Brown Fish Owl	RC			II	II
<i>Lanius bucephalus</i>	Bull-headed Shrike					
<i>Lanius cristatus</i>	Brown Shrike					
<i>Lanius schach</i>	Long-tailed Shrike					
<i>Larus sp.</i>	Gull sp.					
<i>Lonchura punctulata</i>	Scaly-breasted Munia					
<i>Luscinia calliope</i>	Siberian Rubythroat					
<i>Luscinia sibilans</i>	Rufous-tailed Robin					
<i>Milvus migrans</i>	Black Kite	RC			II	II
<i>Monticola solitarius</i>	Blue Rock Thrush					
<i>Motacilla alba</i>	White Wagtail					
<i>Motacilla cinerea</i>	Grey Wagtail					
<i>Montacilla flava</i>	Yellow Wagtail					
<i>Muscicapa dauurica</i>	Asian Brown Flycatcher					
<i>Myophonus caeruleus</i>	Blue Whistling Thrush					
<i>Numenius phaeopus</i>	Whimbrel	LC				
<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	(LC)				
<i>Orthotomus sutorius</i>	Common Tailorbird					
<i>Oriolus chinensis</i>	Black-naped Oriole	LC				
<i>Otus lettia</i>	Collared Scops Owl				II	II
<i>Parus cinereous</i>	Cinereous Tit					
<i>Passer montanus</i>	Eurasian Tree Sparrow					
<i>Pericrocotus solaris</i>	Grey-chinned Minivet	LC				
<i>Phalacrocorax carbo</i>	Great Cormorant	PRC				
<i>Phoenicurus aureus</i>	Daurian Redstart					
<i>Phylloscopus borealis</i>	Arctic Warbler					
<i>Phylloscopus fuscatus</i>	Dusky Warbler					
<i>Phylloscopus goodsoni</i>	Goodson's Leaf Warbler	LC				
<i>Phylloscopus inornatus</i>	Yellow-browed Warbler					
<i>Phylloscopus proregulus</i>	Pallas's Leaf Warbler					
<i>Phylloscopus tenellipes</i>	Pale-legged Leaf Warbler					
<i>Pica pica</i>	Common Magpie					
<i>Pluvialis fulva</i>	Pacific Golden Plover	LC				
<i>Prinia flaviventris</i>	Yellow-bellied Prinia					
<i>Prinia inornata</i>	Plain Prinia					
<i>Pycnonotus aurigaster</i>	Sooty-headed Bulbul					
<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul					
<i>Pycnonotus sinensis</i>	Chinese Bulbul					
<i>Rallina eurizonoides</i>	Slaty-legged Crake					
<i>Recurvirostra avosetta</i>	Pied Avocet	RC				
<i>Rostratula bengalensis</i>	Greater Painted-snipe	LC				
<i>Saxicola ferreus</i>	Grey Bush Chat	LC				
<i>Saxicola stejnegeri</i>	Stejneger's Stonechat					
<i>Saxicola torquata</i>	Common Stonechat					
<i>Scolopax rusticola</i>	Eurasian Woodcock					
<i>Serinus mozambicus</i>	Yellow-fronted Canary					
<i>Spilornis cheela</i>	Crested Serpent Eagle	LC		V	II	II
<i>Spilopelia chinensis</i>	Spotted Dove					
<i>Spodiopsar cineraceus</i>	White-cheeked Starling	PRC				
<i>Spodiopsar sericeus</i>	Red-billed Starling	GC				

Species name	Common name	Level of Concern	IUCN	CRDB	China Protected Speceis	CITES
<i>Streptopelia orientalis</i>	Oriental Turtle Dove					
<i>Sturnia sinensis</i>	White-shouldered Starling	(LC)				
<i>Tachybaptus ruficollis</i>	Little Grebe	LC				
<i>Tarsiger cyanurus</i>	Red-flanked Bluetail					
<i>Terpsiphone</i>	Asian Paradise-Flycatcher	LC				
<i>Tringa glareola</i>	Wood Sandpiper	LC				
<i>Tringa nebularia</i>	Common Greenshank	RC				
<i>Turdus cardis</i>	Japanese Thrush					
<i>Turdus chrysolaus</i>	Brown-headed Thrush	LC				
<i>Turdus hortulorum</i>	Grey-backed Thrush					
<i>Turdus merula</i>	Common Blackbird					
<i>Turdus pallidus</i>	Pale Thrush					
<i>Urocissa erythrorhyncha</i>	Blue Magpie					
<i>Urosphena squameiceps</i>	Asian Stubtail					
<i>Yuhina castaniceps</i>	Chestnut-collared Yuhina	(LC)				
<i>Zoothera aurea</i>	White's Thrush					
<i>Zosterops japonicus</i>	Japanese White-eye					

Level of Concern – LC = Local Concern, RC = Regional Concern, PRC = Potential Regional Concern, PGC = Potential Global Concern, GC = Global Concern.

Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence. (Fellowes et al. 2002)

IUCN: EN = Endangered, VU = Vulnerable, NT = Near Threatened.

CRDB – China Red Data Book of Endangered Animals: E = Endangered, V = Vulnerable, R = Rare, I = Indeterminate

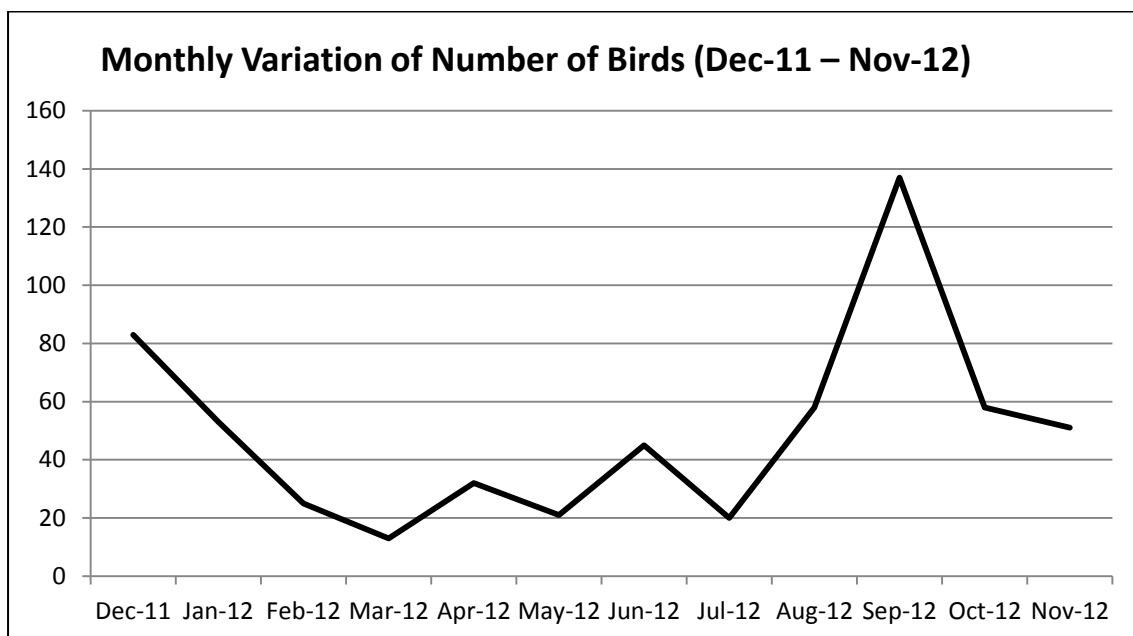
## **Annex B Monthly Variation of Number of Birds recorded by AAHK's Airfield Bird Surveys.**

### **Monthly Variation of Number of Birds Recorded by Expert Consultant's Monthly Surveys**

**(Dec-11-Nov-12)**

<b>Month</b>	<b>Total Number of Birds</b>
<b>Dec-2011</b>	83
<b>Jan-2012</b>	53
<b>Feb-2012</b>	25
<b>Mar-2012</b>	13
<b>Apr-2012</b>	32
<b>May-2012</b>	21
<b>Jun-2012</b>	45
<b>Jul-2012</b>	20
<b>Aug-2012</b>	58
<b>Sep-2012</b>	137
<b>Oct-2012</b>	58
<b>Nov-2012</b>	51

Note: A total number of 12 surveys were conducted. The time period of each survey ranged from 1 to 2 hrs.

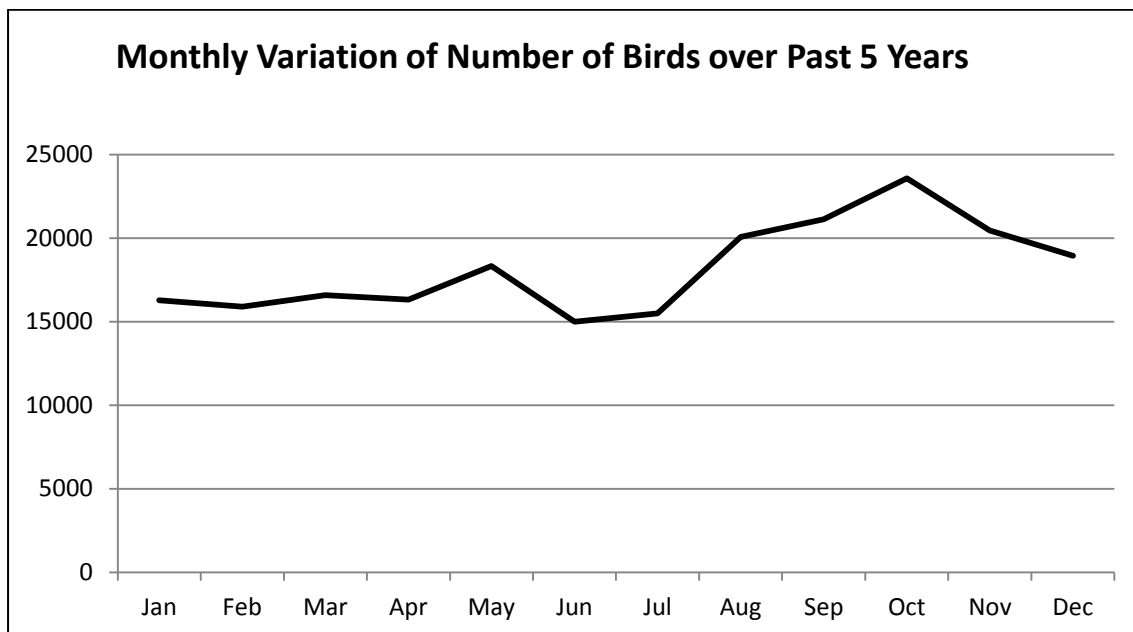




**Monthly Variation of Number of Birds Recorded by AA Bird Control Unit's Daily Surveys over Past 5 Years (Years 2008 - 20012)**

Month	Total Number of Birds
Jan	16278
Feb	15904
Mar	16583
Apr	16322
May	18342
Jun	15008
Jul	15505
Aug	20087
Sep	21128
Oct	23585
Nov	20461
Dec	18948

Note: A total number of about 1827 daily surveys were conducted during the last 5 years. The time period of each survey was about 13hrs.



**Annex C AAHK's Expert Consultant Airfield Bird Survey - Species and Abundance Against Survey Date**  
**Birds Recorded by Expert Consultant (Airside Data Only)**

Species Name	Common Name	Conservation Status	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Grand Total
<i>Acridotheres cristatellus</i>	Crested Myna		1				7	10	18	4	21	24	3	2	90
<i>Actitis hypoleucos</i>	Common Sandpiper		1				1								2
<i>Anthus cervinus</i>	Red-throated Pipit	LC					2								2
<i>Anthus hodgsoni</i>	Olive-backed Pipit				2										2
<i>Anthus richardi</i>	Richard's Pipit		19	31	9	9	2	1		7	9	33	20	37	177
<i>Apus nipalensis</i>	House Swift						3								3
<i>Bubulcus coromandus</i>	Eastern Cattle Egret							1		1					2
<i>Calidris alba</i>	Sanderling	LC					2								2
<i>Calidris ruficollis</i>	Red-necked Stint	LC					1								1
<i>Charadrius alexandrinus</i>	Kentish Plover	RC					2								2
<i>Charadrius dubius</i>	Little Ringed Plover	(LC)				2									2
<i>Charadrius leschenaultii</i>	Greater Sand Plover	RC					3								3
<i>Copsychus saularis</i>	Oriental Magpie Robin													2	2
<i>Dicrurus macrocercus</i>	Black Drongo										1	3			4
<i>Egretta garzetta</i>	Little Egret	RC	23	2						2		1	2	5	35
<i>Falco tinnunculus</i>	Common Kestrel	China Protected Species II, CITES Appendix II	1	1										2	4
<i>Hirundo rustica</i>	Barn Swallow								2		4	18		1	25
<i>Lanius schach</i>	Long-tailed Shrike		1	2							1	1			5
<i>Larus</i> sp.	Gull sp.				5										5
<i>Milvus migrans</i>	Black Kite	(RC), China Protected Species II, CITES Appendix II	2	2		1		1	4		1		1		12
<i>Monticola solitarius</i>	Blue Rock Thrush		1	1							1	2			5
<i>Motacilla alba</i>	White Wagtail		2	1	2	1	4		1			3	1		15
<i>Numenius</i> sp.	Whimbrel sp.	LC										3			3
<i>Passer montanus</i>	Eurasian Tree Sparrow		32	9	7		5	7	20	6	20	49	30	2	187
<i>Pluvialis fulva</i>	Pacific Golden Plover	LC		4											4
<i>Saxicola stejnegeri</i>	Stejneger's Stonechat												1		1
<i>Spilopelia chinensis</i>	Spotted Dove							1							1
<b>No. of Species:</b>			<b>10</b>	<b>9</b>	<b>5</b>	<b>4</b>	<b>11</b>	<b>6</b>	<b>5</b>	<b>5</b>	<b>8</b>	<b>10</b>	<b>7</b>	<b>7</b>	<b>27</b>
<b>Total No. of Individuals:</b>			<b>83</b>	<b>53</b>	<b>25</b>	<b>13</b>	<b>32</b>	<b>21</b>	<b>45</b>	<b>20</b>	<b>58</b>	<b>137</b>	<b>58</b>	<b>51</b>	<b>596</b>

Level of Concern – LC = Local Concern, RC = Regional Concern, PRC = Potential Regional Concern

Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence. (Fellowes et al. 2002)