

# **WATERBIRD REPORT**

**Trial on Improvements to the High Tide  
Roosting Habitat for Migratory Waterbirds at  
*Gei wai* #16/17 Mai Po Nature Reserve 2005-06  
(Tender Ref.: AFCD/SQ/21/05)**

**July 2006**



**WWF Hong Kong  
1 Tramway Path  
Central  
Hong Kong**

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## 1. INTRODUCTION

### 1.1 Background

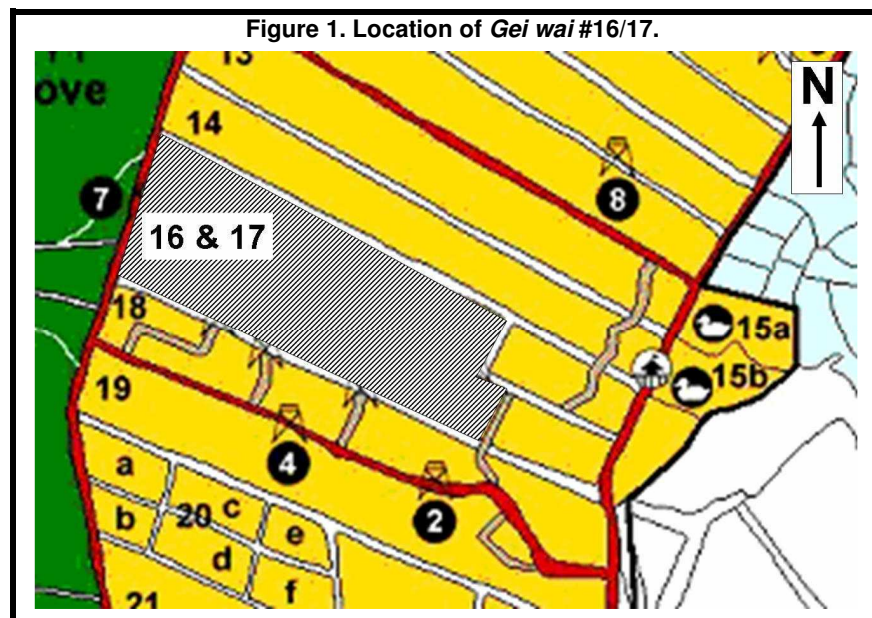
1.1.1 Over the winter and spring period 2005-06, the World Wide Fund for Nature Hong Kong completed two waterbird related studies in the *gei wai* #16/17 high tide roost at Mai Po Nature Reserve (Figure 1). Both studies are ecological monitoring components associated with trial habitat improvement works on the high tide roost as per the contract AFCD SQ/21/05. A similar trial and waterbird study was completed in 2004-05 (Anon, 2005b).

1.1.2 The improvement works included (1) reprofiling of the large island (known as no. 1) to reduce its overall physical dimensions to be more attractive to waterbirds (mainly shorebirds) (2) creation of 3 smaller islands to provide suitable roosting areas for waterbirds (primarily shorebirds) and (3) the removal of 0.99 hectares of silt and rank vegetation to enlarge the *gei wai* for the benefit of all waterbirds. Works were carried out in late summer 2005 and completed by the end of October 2005.

1.1.3 The waterbird study aims are twofold:

- To directly assess the impact of the 2005 earthmoving works upon waterbird numbers (including shorebirds) and distribution inside *gei wai* #16/17.
- To better understand wintering Anatidae use of *gei wai* #16/17 to inform future habitat management decisions.

1.1.4 The purpose of this report is to outline the avifauna monitoring work methodologies, present results and basic findings. The subsequent 'Final Report' (in prep) brings together the avifauna monitoring results, trial habitat management works and provides technical details and practical issues relating to the trial.



## 2. METHODOLOGY

### 2.1 Winter Anatidae Count

2.1.1 Between late October 2005 and late April 2006, fifteen individual Anatidae counts were completed on *gei wai* #16/17. Counts were undertaken on a bi-weekly basis, although during January and February, two extra counts were completed to coincide with the expected peak influx of Anatidae.

2.1.2 Survey dates were selected to (1) coincide with evening/dusk high tides in Deep Bay as these are known to increase the total number of Anatidae inside Mai Po Nature Reserve (Anon, 2002 & Anon, 2005d) and (2) be carried out within 1-2 days of the Hong Kong Bird-watching Society's Monthly Ramsar Site Waterbird Count to facilitate better data interpretation (as recommended in Anon, 2005d). Because the desired tidal conditions do not occur between October to December, survey dates had to be chosen in consideration of the best available tidal conditions and the need to collect data from dates approximately 2 weeks apart (Table 1).

**Table 1. Winter Anatidae Count Dates, Times and Associated Tidal Conditions : Winter 2005/06.**

Date	Sunset <sup>1</sup> (Time)	Observation Period	Tide <sup>1</sup>		
			Preceding Condition	Height <sup>2</sup>	Condition <sup>3</sup>
31 October 2005	17:47	17:02 – 18:02	0.8m@15:57	1.3m	↑
14 November 2005 <sup>4</sup>	17:40	16:55 – 17:55	0.8m@15:32	1.7m	↑
30 November 2005	17:38	16:53 – 17:53	1.1m@15:26	1.8m	↑
19 December 2005 <sup>4</sup>	17:43	16:58 – 17:58	1.3m@17:24	1.7m	↑
29 December 2005	17:49	17:04 – 18:04	1.2m@14:34	1.8m	↑
09 January 2006	17:56	17:11 – 18:11	1.0m@11:51	2.1m	↑
15 January 2006	18:00	17:15 – 18:15	1.1m@16:03	1.2m	↑
23 January 2006 <sup>4</sup>	18:06	17:21 – 18:21	2.0m@16:14	1.8m	↓
07 February 2006	18:15	17:30 – 18:30	2.1m@17:10	2.0m	↓
20 February 2006 <sup>4</sup>	18:23	17:38 – 18:38	2.1m@14:05	1.4m	↓
27 February 2006	18:26	17:41 – 18:41	0.9m@16:21	1.5m	↑
09 March 2006	18:30	17:45 – 18:45	0.5m@01:56	2.1m	↔
22 March 2006 <sup>4</sup>	18:35	17:50 – 18:50	2.4m@13:57	1.4m	↓
18 April 2006 <sup>4</sup>	18:44	17:59 – 18:59	2.7m@12:07	0.8m	↓
25 April 2006	18:47	18:02 – 19:02	0.7m@15:18	1.4m	↑

1 – Data from the HK Observatory (tide data relates to Tsim Bei Tsui tidal station)

2 – At mid-point of observation period

3 – General tidal condition during observation period (↑ = Rising, ↓ = Falling, ↔ = coincides with max or min tide)

4 – Dates selected to be within 1-2 days of the HKBWS Monthly Ramsar Site Waterbird Count.

2.1.3 Each survey involved the counting of Anatidae over a 1-hour period using a 15-minute interval system; three counts before and one immediately after sunset. A 15-minute interval is sufficient to count the expected number of Anatidae and identify individual taxa correctly. Count locations included any one of the five bird-watching hides located around the perimeter of the *gei wai*.

2.1.4 Final peak counts for each Anatidae species during a designated count was obtained by taking the highest number from all four interval counts. In total, 15 individual counts, totalling 60 interval counts, were completed over the winter period.

## 2.2 Waterbird Count and Area Use Study

2.2.1 During April and May 2006, the location and number of all waterbirds (classification provided in Appendix 1) using *gei wai* #16/17 was recorded on 12 separate occasions (Table 2). Survey date selection included (1) to coincide with the expected peak shorebird migration period in Hong Kong (April and May), (2) be conducted during high Deep Bay daytime tides (greater than or equal to 2.5m) because these are known to increase the number of waterbirds inside Mai Po Nature Reserve (Anon, 2002 & Anon, 2005d) and (3) mimic (where possible) the 2005 survey dates used for the baseline data set (Anon, 200b).

2.2.2 Each occasion involved a 1-hour waterbird survey on a Deep Bay rising/flow tide followed by a 1-hour survey on a falling/receding tide (Table 2). This provided information on the influence of tidal conditions upon waterbird numbers and generates more data upon preferred area use within the *gei wai*.

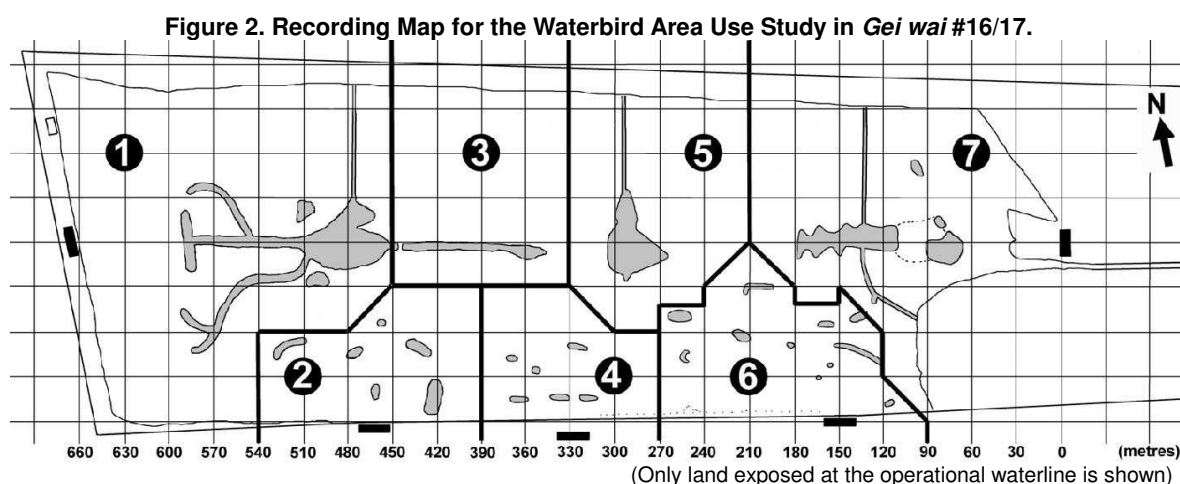
2.2.3 During each 1-hour survey, all waterbirds were mapped onto a 1:3000 scale map of *gei wai* #16/17 (Figure 2) and assigned to a 30m x 30m grid square. Low height bamboo marker posts at grid intersections, sight lines of distant objects on the horizon (i.e. tall buildings in Shenzhen) and observations from different hides, all enabled waterbirds to be mapped accurately and confidently. A predetermined species recording order, based upon expected bird species and general family size, was used for consistency and ease of reference in the text (Appendix 1).

**Table 2. Survey Dates, Times and Associated Tidal and Water Level Conditions for the Waterbird Area Use Study.**

Date	Water depth at start (cm) <sup>1</sup>	Count 1 (Time)	High Tide <sup>2</sup>	Water depth at start (cm) <sup>1</sup>	Count 2 (Time)
01 April 2006	44.5	10:14 – 10:14	2.5m @ 11:44	46.0	12:14 – 13:14
15 April 2006	46.0	09:13 – 10:13	2.5m @ 10:47	46.5	11:17 – 12:17
16 April 2006	45.5	08:40 – 09:40	2.6m @ 11:10	47.0	11:40 – 12:40
17 April 2006	46.5	09:06 – 10:06	2.7m @ 11:36	47.5	12:06 – 13:06
02 May 2006	43.0	09:25 – 10:25	2.6m @ 11:55	41.0	12:25 – 13:25
13 May 2006	42.0	08:09 – 09:09	2.6m @ 09:39	44.0	10:09 – 11:09
14 May 2006	44.0	07:36 – 08:36	2.8m @ 10:06	45.0	10:36 – 11:36
16 May 2006	44.0	08:40 – 09:40	2.9m @ 11:10	46.0	11:40 – 12:40
17 May 2006	42.0	09:19 – 10:19	2.8m @ 11:49	44.5	12:19 – 13:19
19 May 2006	42.0	11:06 – 12:06	2.5m @ 13:36	43.5	14:06 – 15:06
26 May 2006	41.0	07:25 – 08:25	2.6m @ 08:55	41.5	09:25 – 10:25
27 May 2006	39.0	07:53 – 08:53	2.7m @ 09:23	43.5	09:53 – 10:53

<sup>1</sup> – Fixed gauge board located at the former *gei wai* #16 sluice gate. 46.0cm is regarded as the normal operational waterline.

<sup>2</sup> – Data from HK Observatory (relates to Tsim Bei Tsui tidal station).



### 3. RESULTS

#### 3.1 Winter Anatidae Count Data

3.1.1 Data collected from the field-based counts is presented in Appendix 2 and shown according to each count date with the peak number of birds for each species given. A summary is presented in Table 3.

3.1.2 Over the winter period the highest peak monthly Anatidae counts occurred in February (1,309) and December (1,005) (Table 3 & Figure 3). In 4 of the 7 survey months, peak monthly counts greater than 350 birds were recorded, but less than 50 individuals in March and April.

3.1.3 In total 6 Anatidae species were recorded. However a single male Falcated Duck (recorded on 18<sup>th</sup> April 2006) is considered to be of domesticated origin and therefore omitted from the data set and subsequent analysis (the bird was noted and photographed by Hong Kong birdwatchers with a red ribbon tied on the right tarsus).

Table 3. Winter Anatidae Count Summary : Winter 2005/06.

Species	Count Date														
	31-Oct-05	14-Nov-05	30-Nov-05	19-Dec-05	29-Dec-05	09-Jan-06	15-Jan-06	23-Jan-06	07-Feb-06	20-Feb-06	27-Feb-06	09-Mar-06	22-Mar-06	18-Apr-06	25-Apr-06
Common Teal	11	61	376	140	<b>594</b>	223	0	0	312	0	0	30	0	0	0
Eurasian Wigeon	42	69	<b>82</b>	55	21	62	8	0	8	3	0	7	4	0	0
Garganey	<b>310</b>	0	8	0	5	0	0	0	0	0	0	5	0	0	0
Northern Pintail	43	123	160	80	175	61	14	0	<b>980</b>	0	61	0	0	0	0
Northern Shoveler	0	149	51	30	<b>210</b>	5	8	0	9	0	28	3	0	1	0
<b>TOTAL</b>	<b>*406</b>	402	<b>*677</b>	305	<b>*1005</b>	<b>*351</b>	30	0	<b>*1309</b>	3	89	<b>*45</b>	4	<b>*1</b>	0

Numbers in **bold** = Highest species or total count in *gei wai* #16/17 during the winter period

\* = Taken as the monthly peak count

Figure 3. Peak Monthly Winter Anatidae Counts in *Gei wai* #16/17 : Winter 2005/06.

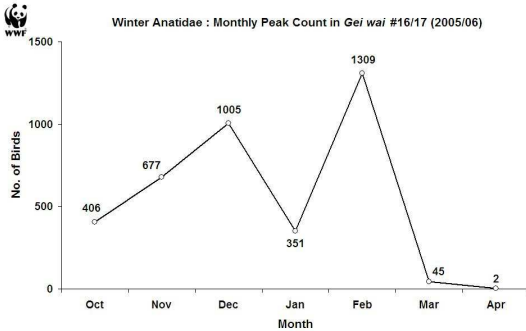
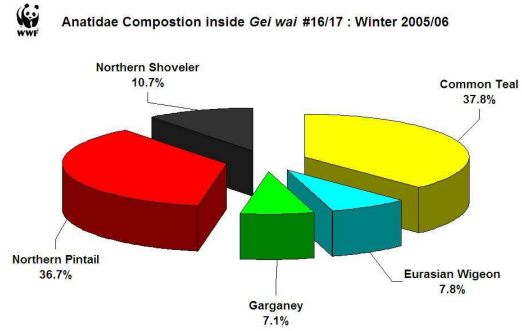


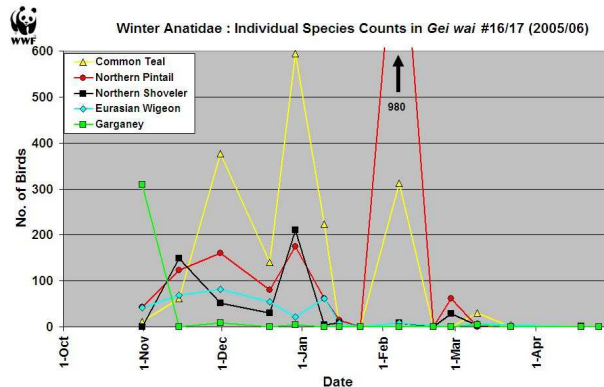
Figure 4. Anatidae Species Composition in *Gei wai* #16/17 : Winter 2005/06.



3.1.4 The most abundant Anatidae species was Common Teal with a mean count of 116.5 individuals and high count of 594 (29 December). Secondly Northern Pintail recorded at a similar abundance level (mean = 113.1, peak = 980 on 07 February). Collectively these two species comprise 74.5% of the entire Anatidae winter data set (Figure 4). Of the remaining species, the count of 310 Garganey (31 October 2005) is among the highest in Hong Kong in recent years (i.e. the maximum HKBWS total Deep Bay count of Garganey from the last 5 winter periods was 112 in February 2003).

3.1.5 Trends observed for the recorded species (Figure 5) show, with the exception of the 07 February count, Anatidae generally ceased using the *gei wai* for roosting after early January. Also use of the *gei wai* by Garganey was almost entirely confined to October.

Figure 5. Individual Anatidae Species Trends in *Gei wai* #16/17 : Winter 2005/06.



- 3.1.6 A comparison between the Ramsar Site Anatidae population and *gei wai* #16/17 count data (Table 4) shows that ~ 5% of the Ramsar population utilised the *gei wai* for roosting in November and December 2005.

Table 4. Comparison of the Anatidae Count Data between *Gei wai* #16/17 and the Ramsar Site : Winter 2005/06.

<i>Gei wai</i> #16/17		Ramsar Site*		<i>Gei wai</i> #16/17 /Ramsar (%)
WWF HK Count Date	Total no. of Anatidae	HKBWS Count Date	Total no. of Anatidae	
14-Nov-05	402	13-Nov-05	7355	5.5%
19-Dec-05	305	18-Dec-05	6150	5.0%
23-Jan-06	0	22-Jan-06	3241	0%
19-Feb-06	3	19-Feb-06	9571	<0.1%
22-Mar-06	4	19-Mar-06	2921	0.1%
18-Apr-06	1	16-Apr-06	113	<0.1%

\* - HKBWS data (Anon, 2006b).

### 3.2 Waterbird Counts

- 3.2.1 Data collected from the field-based counts is presented in Appendices 3 and 4 and shown according to each count date with the peak number of birds for each species given. Both the 2005 and 2006 data sets are presented.

#### *Spring 2006*

- 3.2.2 The total number of waterbirds counted in 2006 varied between 613 (27<sup>th</sup> May) and 5,971 (17<sup>th</sup> April) individuals (mean = 2,471.2). The total number of species recorded from all 12 counts was 56 (mean = 30.8) with a peak of 38 species on 17<sup>th</sup> April (Appendix 3).
- 3.2.3 The most abundant waterbird groups were 'Tringa' (mean = 1045.0) and 'Avocets and Stilts' (mean = 695.8) (Table 5) accounting for 70.4% of the entire spring data set.

Table 5. Abundance of Waterbird Groups and Species on *Gei wai* #16/17 during Spring 2006.

2006		
Mean Count		Waterbird Group
Range	Value	
>100	1045.0	9 (Tringa)
	695.8	3 (Avocets & Stilts)
	322.6	6 (Calidrids)
	106.2	10 (Scolopacidae other)
50-100	90.1	7 (Godwits and Dowitchers)
	88.5	11 (Plovers)
25-50	49.0	8 (Curlews and Whimbrels)
	35.7	4 (Gulls & Terns)
	26.2	1 (Ardeidae)
0-25	9.5	2 (Black-faced Spoonbill)
	1.9	12 (Waterbirds other)
	0.8	5 (Anatidae)

\*Species <5.0 mean count not shown

2006		
Mean Count		Species*
Range	Value	
>250	654.1	Pied Avocet
	318.5	Common Redshank
	316.7	Common Greenshank
	287.7	Marsh Sandpiper
100-250	237.7	Red-necked Stint
	112.5	Spotted Redshank
	100.8	Terek Sandpiper
50-100	86.3	Black-tailed Godwit
25-50	42.4	Greater Sand Plover
	41.9	Black-winged Stilt
	41.8	Curlew Sandpiper
	40.3	Eurasian Curlew
	35.3	Grey Plover
	32.3	Gull-billed Tern
5-25	23.1	Great Knot
	10.6	Sharp-tailed Sandpiper
	10.3	Great Egret
	9.5	Black-faced Spoonbill
	9.2	Grey Heron
	8.7	Wood Sandpiper
	8.3	Whimbrel
	6.1	Pacific Golden Plover
	5.3	Red Knot

- 3.2.4 The four most abundant species in 2006 (i.e. with mean counts > 250 individuals) were Pied Avocet (mean = 654.1), Common Redshank (mean = 318.5), Common

Greenshank (mean = 316.7) and Marsh Sandpiper (Mean = 287.7) (Table 5). Twenty-three species were recorded with mean counts >5.0 individuals. The counts of Nordmann's Greenshank (max count 5 – 19<sup>th</sup> May), Swinhoe's Egret (max count 1 – 4 dates in May) and Black-faced Spoonbill (max count 27 – 15<sup>th</sup> April) are of conservation interest (Birdlife International, 2000).

### Spring 2005 & 2006 Comparison

- 3.2.5 The mean waterbird count increased by 13.2% in 2006. This increase is largely a result of significant changes in the number of 'Avocets and Stilts' (+670.5%) (Tables 5 and 6). Other waterbird groups showing notable changes include 'Scolopacidae other' (+140.8%), 'Curlews and Whimbrels' (+71.3%) and 'Calidrids' (-47.6%).

**Table 6. Abundance of Waterbird Groups and Species on Gei wai #16/17 during Spring 2005.**

2005			2005		
Mean Count		Waterbird Group	Mean Count		Species*
Range	Value		Range	Value	
>100	1133.7	9 (Tringa)	>250	496.7	Marsh Sandpiper
	615.9	6 (Calidrids)		424.5	Red-necked Stint
	102.3	11 (Plovers)		323.8	Spotted Redshank
50-100	92.2	7 (Godwits and Dowitchers)	100-250	186.4	Common Greenshank
	90.3	3 (Avocets & Stilts)		164.8	Curlew Sandpiper
	44.1	10 (Scolopacidae other)		122.6	Common Redshank
	31.2	4 (Gulls & Terns)	50-100	90.9	Greater Sand Plover
	28.6	8 (Curlews and Whimbrels)		89.5	Black-tailed Godwit
	27.7	1 (Ardeidae)		68.2	Pied Avocet
0-25	12.4	2 (Black-faced Spoonbill)	25-50	36.2	Terek Sandpiper
	5.1	5 (Anatidae)		27.5	Gull-billed Tern
	0.4	12 (Waterbirds other)		5-25	22.1
		19.4	Eurasian Curlew		
		17.5	Little Egret		
		16.1	Great Knot		
		12.4	Black-faced Spoonbill		
		8.2	Whimbrel		
			5.4	Great Egret	

\*Species <5.0 mean count not shown

- 3.2.6 Mean species diversity decreased from 31.5 to 30.8, but the total number of species recorded increased by 1 between the spring periods. In 2006, 27.8% more species were recorded with mean counts greater than 5.0 individuals (Tables 5 and 6).

### Shorebird Group (Waterbird Groups 3 & 6-11 Only) Comparison Between Gei wai #16/17 and the Ramsar Site

- 3.2.7 A comparison of the percentage of each shorebird group utilising *gei wai* #16/17 at high tide (Table 7) shows a more even representation of the groups in 2006 (after earthmoving works) and large increases in 'Avocets and Stilts' (mainly Pied Avocet) and 'Scolopacidae other' (mainly Terek Sandpiper). 'Calidrids' were considerably less represented in 2006 (-50.4% decline).

**Table 7. Comparison of Shorebird Groups (Waterbird Groups 3 & 6-11 Only) on Gei wai #16/17 and the Ramsar Site at High Tide during Spring 2005 & 2006.**

Waterbird Group	2005			2006		
	Mean Count			Mean Count		
	A - 16/17 <sup>1</sup>	B – Ramsar <sup>1</sup>	A:B	A - 16/17 <sup>1</sup>	B – Ramsar <sup>1</sup>	A:B
3 (Avocets and stilts)	90.3	968.2	9.3%	695.8	1501.9	46.3%
6 (Calidrids)	615.9	582.5	~100%	322.6	649.9	49.6%
7 (Godwits and dowitchers)	92.2	246.6	37.4%	90.1	236.8	38.0%
8 (Curlews and whimbrels)	28.6	24.8	~100%	49.0	60.3	81.3%
9 (Tringa)	1133.7	1966.9	57.6%	1045.0	2243.6	46.6%
10 (Scolopacidae other)	44.1	115.4	38.2%	106.2	150.8	70.4%
11 (Plovers)	102.3	121.1	84.5%	88.5	140.6	62.9%

<sup>1</sup> – Data from Appendices 3 & 4

### 3.3 Waterbird Area Use Data

3.3.1 Results show an increase in the overall mean density of waterbirds (per hectare) inside *gei wai* #16/17 between years from 178.7 to 187.1 (+4.7%). Waterbird density increased in four zones (1, 5, 6 and 7) and declined in the other three zones between the two periods. Significant changes were Zone 6 (+419.6%), Zone 1 (+101.8%), Zone 3 (-77.3%) and Zones 2 & 4 (both ~ -50%).

3.3.2 Notable results include:

- An increase in 'Avocets and Stilts' in all zones except Zone 3.
- 'Ardeids' increased considerably in Zones 3 and 6, but declined in Zones 1 and 2.
- 'Curllews and Whimbrels' showed a spatial redistribution between years and a strong preference for Zones 3, 4 and 7 in 2006.
- 'Tringa' showed a strong preference in 2006 for Zone 1, whilst Zones 2, 3 and 4 all declined significantly.
- 'Plovers' showed a clear preference for Zones 6 and 7 (containing the newly profiled islands) in 2006 and moved away from their more generalised distribution in 2005 (Zones 2-5).
- The distribution of 'Gulls and Terns' remained unchanged between years with Zone 3 being preferred.

**Table 8. Mean Waterbird Group Densities within each Zone in *Gei wai* #16/17 during Spring 2005.**

Waterbird Group		Mean Waterbird Group Density (per hectare) : 2005						
		ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7
1	Ardeidae	2.4	5.1	1.0	4.5	2.4	0.3	1.7
2	Black-faced Spoonbill	0.0	0.0	0.2	7.7	2.2	1.3	0.1
3	Avocet & Stilts	1.9	1.8	18.8	4.0	27.9	3.2	2.8
4	Gulls & Terns	3.2	0.0	12.4	0.4	0.2	0.0	0.0
5	Anatidae	0.2	2.4	0.1	1.4	0.7	3.5	0.2
6	Calidrids	60.8	23.4	106.1	49.0	59.1	1.1	58.7
7	Godwits & Dowitchers	0.1	1.3	40.5	3.4	20.4	0.1	0.0
8	Curllews & Whimbrels	2.4	10.6	3.3	0.9	0.3	0.0	0.0
9	Tringa	41.3	122.8	262.6	319.8	61.2	24.9	13.1
10	Scolopacidae other	6.5	1.6	2.7	1.5	6.5	0.1	0.9
11	Plovers	13.7	3.8	6.2	1.7	18.4	1.6	2.2
12	Waterbirds other	0.0	0.0	0.1	0.0	0.1	0.1	0.1
<b>TOTAL</b>		<b>132.6</b>	<b>172.8</b>	<b>454.0</b>	<b>394.2</b>	<b>199.4</b>	<b>36.3</b>	<b>79.8</b>
<b>OVERALL RANK</b>		<b>5</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>7</b>	<b>6</b>

**Table 9. Mean Waterbird Group Densities within each Zone in *Gei wai* #16/17 during Spring 2006.**

Waterbird Group		Mean Waterbird Group Density (per hectare) : 2006						
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
1	Ardeidae	1.1	1.2	3.6	1.8	3.4	1.3	2.3
2	Black-faced Spoonbill	0.4	1.1	0.4	0.1	0.9	1.4	1.2
3	Avocet & Stilts	3.5	8.6	6.4	95.1	143.1	140.7	61.0
4	Gulls & Terns	2.0	0.0	16.7	0.1	0.0	0.0	0.3
5	Anatidae	0.1	0.0	0.0	0.5	0.0	0.0	0.0
6	Calidrids	66.3	0.2	2.9	1.6	11.4	6.2	5.4
7	Godwits & Dowitchers	9.7	0.0	5.2	19.4	8.3	3.3	2.0
8	Curllews & Whimbrels	1.4	0.0	6.6	16.5	0.0	0.0	7.3
9	Tringa	145.7	72.7	58.0	67.4	65.1	26.7	23.6
10	Scolopacidae other	24.6	0.0	1.1	0.1	0.1	0.1	0.7
11	Plovers	12.3	0.3	1.9	0.4	3.6	9.0	6.5
12	Waterbirds other	0.4	0.0	0.1	0.0	0.0	0.0	0.0
<b>TOTAL</b>		<b>267.5</b>	<b>84.1</b>	<b>102.9</b>	<b>202.9</b>	<b>235.9</b>	<b>188.5</b>	<b>110.2</b>
<b>OVERALL RANK</b>		<b>1</b>	<b>7</b>	<b>6</b>	<b>3</b>	<b>2</b>	<b>4</b>	<b>5</b>

## 4. DISCUSSION

- 4.1.1 Wintering Anatidae are shown to utilise *gei wai* #16/17 greater in the first half of winter (before mid January). This includes up to 5% of the Ramsar Site Anatidae Population. Observations in the field noted Anatidae feeding upon grassy vegetation which had flourished whilst the *gei wai* was temporarily drained for earthmoving works (early September to late October). Once this vegetation had been either eaten or died back, Anatidae numbers declined. Such a decline, which is not witnessed in other ponds or *gei wai* inside Mai Po Nature Reserve or the Ramsar Site, suggests that the availability of fodder may be the dominant factor influencing Anatidae usage. This ‘unplanned’, but potentially beneficial effect may have implications for future management.
- 4.1.2 Between spring 2005 and spring 2006, the mean no. of waterbirds using *gei wai* #16/17 increased by 13.2% and, the no. of species with mean counts >5.0, increased by 27.8%. In addition, a more even representation of the Ramsar Site shorebird groups was apparent. This suggests that in 2006, the *gei wai* is more attractive to a wider variety of waterbird species than in 2005.
- 4.1.3 Several shorebird groups remain under-represented on *gei wai* #16/17 despite the undertaking of earthmoving works between 2001 and 2005. This study’s data, together with an assessment of the current provision provided by *gei wai* #11, should aid the design of further high tide roosts at Mai Po Nature Reserve i.e. the proposed conversion of *gei wai* #21 (WWF-HK, 2006).
- 4.1.4 The waterbird area use study shows a more widespread waterbird distribution within the *gei wai* in 2006. In general, waterbirds reduced their dependency on the centralised areas of the *gei wai*. Waterbirds in Zones 6 and 7, where the reprofiled main island and 3 new smaller ones are located, increased by +419.3% and +38.1% respectively.
- 4.1.5 The influence of tidal condition upon the number of waterbird species and groups is of interest (Table 10). The majority of species were recorded in greater abundance during the falling tide observation period (30-90 minutes after peak tide) compared with the rising tide period (90-30 minutes before peak tide). In particular, most ‘Tringa’ species and Greater Sand Plover. Terek Sandpiper, belonging to the ‘Scolopacidae other’ waterbird group, is the only abundant species to be recorded in lower numbers during the falling tide period. These findings may have implications for future waterbird counts on *gei wai* #16/17.

**Table 10. Comparison of Waterbird Species and Group Counts Before and After High Tide.**

Waterbird Species	% difference*
Common Redshank	+915.2
Marsh Sandpiper	+868.3
Spotted Redshank	+718.7
Curlew Sandpiper	+615.4
Common Greenshank	+317.1
Greater Sand Plover	+128.0
Black-faced Spoonbill	+88.5
Black-tailed Godwit	+79.3
Pied Avocet	+67.8
Little Egret	+65.0
Gull-billed Tern	+47.5
Grey Heron	+41.9
Red-necked Stint	+33.8
Grey Plover	+31.2
Whimbrel	+24.6
Great Egret	+22.1
Eurasian Curlew	+16.7
Sharp-tailed Sandpiper	+14.4
Black-winged Stilt	+11.7
Great Knot	+0.6
Terek Sandpiper	-5.2

Waterbird Group	% difference
1 Ardeidae	+16.6
2 Black-faced Spoonbill	+88.5
3 Avocet & Stilts	+71.1
4 Gulls & Terns	+62.2
6 Calidrids	+54.1
7 Godwits & Dowitchers	+73.1
8 Curlews & Whimbrels	+11.0
9 Tringa	+222.9
10 Scolopacidae other	-1.1
11 Plovers	+26.7

Data set combined from 2005 and 2006  
 \*Species with a mean count <5.0 (for both years) are omitted

- 4.1.5 Several on-site factors affected the quality of data including; feral dogs flushing waterbirds on two occasions, a Peregrine Falcon (believed to be the same bird) attacked waterbirds during two counts, differences in water levels between counts, the availability of other high-tide roosts locally (particularly *gei wai* #8 and #11) and weather conditions influencing migration movements.

## 5. MONITORING RECOMMENDATIONS

- 5.1.1 Recommendations to improve the quality of data collection (and interpretation) for Anatidae counting include:
- Conduct counts at other ponds or *gei wai* to provide a more comprehensive understanding of wintering Anatidae within the Nature Reserve. In particular all freshwater ponds (#20a-f, #24a-g, #15a-b) and *gei wai* #8.
  - Continue to coincide one count per month with the HKBWS monthly Ramsar Site waterbird count to facilitate a better understanding of wintering Anatidae importance of the Nature Reserve in a Deep Bay context.
  - Continue to conduct counts at periods of high tide in Deep Bay (it is noted that very few tides over 1.8m coincide with evening count times during October, November or December).
  - Record all Spot-billed Duck sightings to taxa/race level to provide information for a currently under-researched area of ornithology in Hong Kong.
- 5.1.2 It is recommended to further investigate if the observed early winter Anatidae use of *gei wai* #16/17 is related to the establishment of grassy vegetation in late summer whilst temporarily drained down.
- 5.1.3 Spring shorebird data relating to *gei wai* #16/17 should be extracted from the HKBWS Ramsar Site shorebird counts (subvented by AFCD) and analysed every few years to determine the percentage of shorebirds utilising the *gei wai*. Therefore it is not necessary to continue direct counting.
- 5.1.4 A repeat of the Waterbird Area Use Study is recommended in 5 years time or following further enhancement work, to determine if the distribution of birds has significantly changed.

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## Appendix 1. Waterbird Species Recording Order and Groupings for the Waterbird Study.

Bird Group	Type <sup>1</sup>	Family	Description Used in Report Text	Bird Species
1	W	Ardeidae	Ardeidae	<i>Ardea cinerea</i> <i>Egretta alba</i> <i>Egretta garzetta</i> <i>Egretta intermedia</i> <i>Egretta eulophotes</i> <i>Bubulcus ibis</i> <i>Ardea purpurea</i>
2	W	Threskiornithidae	Black-faced Spoonbill	<i>Platalea minor</i>
3	W&S	Recurvirostridae	Avocets & Stilts	<i>Himantopus himantopus</i> <i>Recurvirostra avosetta</i>
4	W	Laridae	Gulls & Terns	<i>Larus ridibundus</i> <i>Larus saundersi</i> <i>Sterna albifrons</i> <i>Sterna caspia</i> <i>Sterna nilotica</i> <i>Sterna hirunda</i> <i>Chlidonias leucoptera</i>
5	W	Anatidae	Anatidae	<i>Anas clypeata</i> <i>Anas penelope</i> <i>Anas poecilorhyncha</i> <i>Tadorna ferruginea</i> <i>Anas crecca</i>
6	W&S	Scolopacidae	Calidrids <sup>2</sup>	<i>Calidris acuminata</i> <i>Calidris alba</i> <i>Calidris canutus</i> <i>Calidris ferruginea</i> <i>Calidris minuta</i> <i>Calidris ruficollis</i> <i>Calidris subminuta</i> <i>Calidris tenuirostris</i> <i>Limicola falcinellus</i>
7	W&S	Scolopacidae	Godwits & Gowitchers	<i>Limnodromus scolopaceus</i> <i>Limnodromus semipalmatus</i> <i>Limosa lapponica</i> <i>Limosa limosa</i>
8	W&S	Scolopacidae	Curlews & Whimbrels	<i>Numenius arquata</i> <i>Numenius madagascariensis</i> <i>Numenius minutus</i> <i>Numenius phaeopus</i>
9	W&S	Scolopacidae	Tringa	<i>Tringa nebularia</i> <i>Tringa totanus</i> <i>Tringa stagnatilis</i> <i>Tringa guttifer</i> <i>Tringa erythropus</i> <i>Tringa glareola</i>
10	W&S	Scolopacidae	Scolopacidae other	<i>Actitis hypoleucos</i> <i>Arenaria interpres</i> <i>Heteroscelus brevipes</i> <i>Phalaropus lobatus</i> <i>Philomachus pugnax</i> <i>Rostratula benghalensis</i> <i>Xenus cinereus</i> <i>Gallinago gallinago</i>
11	W&S	Charadriidae	Plovers	<i>Charadrius alexandrinus</i> <i>Charadrius dubius</i> <i>Charadrius leschenaultii</i> <i>Charadrius mongolus</i> <i>Pluvialis fulva</i> <i>Pluvialis squatarola</i>
12	W	Others	Waterbirds other	<i>Gallinula chloropus</i> <i>Glareola maldivarum</i> <i>Tachybaptus ruficollis</i> <i>Phalacrocorax carbo</i> <i>Motacilla flava</i>

<sup>1</sup> – W = Waterbird, S = Shorebird

<sup>2</sup> – The group is referred to as Calidrids although the species *Limicola falcinellus* is included because of similar morphological characteristics and roosting habitat characteristics

## Appendix 2. Winter Anatidae Count Data

Date	Common Name	Latin Name	No. of Birds	Weather/ Comments
31-Oct-05	Common Teal	<i>Anas crecca</i>	11	Hazy conditions Gei wai reflooded after works Harrier flushed all birds at 17:45
	Eurasian Wigeon	<i>Anas penelope</i>	42	
	Garganey	<i>Anas querquedula</i>	310	
	Northern Pintail	<i>Anas acuta</i>	43	
	<b>Total</b>		<b>406</b>	
14-Nov-05	Common Teal	<i>Anas crecca</i>	61	Overcast conditions
	Eurasian Wigeon	<i>Anas penelope</i>	69	
	Northern Pintail	<i>Anas acuta</i>	123	
	Northern Shoveler	<i>Anas clypeata</i>	149	
	<b>Total</b>		<b>412</b>	
30-Nov-05	Common Teal	<i>Anas crecca</i>	376	Hazy conditions
	Eurasian Wigeon	<i>Anas penelope</i>	82	
	Garganey	<i>Anas querquedula</i>	8	
	Northern Pintail	<i>Anas acuta</i>	160	
	Northern Shoveler	<i>Anas clypeata</i>	51	
	<b>Total</b>		<b>677</b>	
19-Dec-05	Common Teal	<i>Anas crecca</i>	140	Dry and cold
	Eurasian Wigeon	<i>Anas penelope</i>	55	
	Northern Pintail	<i>Anas acuta</i>	80	
	Northern Shoveler	<i>Anas clypeata</i>	30	
	<b>Total</b>		<b>305</b>	
29-Dec-05	Common Teal	<i>Anas crecca</i>	594	Blustery conditions
	Eurasian Wigeon	<i>Anas penelope</i>	21	
	Garganey	<i>Anas querquedula</i>	5	
	Northern Pintail	<i>Anas acuta</i>	175	
	Northern Shoveler	<i>Anas clypeata</i>	210	
	<b>Total</b>		<b>1005</b>	
09-Jan-06	Common Teal	<i>Anas crecca</i>	223	Cold and hazy
	Eurasian Wigeon	<i>Anas penelope</i>	62	
	Northern Pintail	<i>Anas acuta</i>	61	
	Northern Shoveler	<i>Anas clypeata</i>	5	
	<b>Total</b>		<b>351</b>	
15-Jan-06	Eurasian Wigeon	<i>Anas penelope</i>	8	Dry and hazy
	Northern Pintail	<i>Anas acuta</i>	14	
	Northern Shoveler	<i>Anas clypeata</i>	8	
	<b>Total</b>		<b>30</b>	
23-Jan-06	No birds	-	0	Cold and windy
	<b>Total</b>		<b>0</b>	
07-Feb-06	Common Teal	<i>Anas crecca</i>	312	Hazy and dry
	Eurasian Wigeon	<i>Anas penelope</i>	8	
	Northern Pintail	<i>Anas acuta</i>	980	
	Northern Shoveler	<i>Anas clypeata</i>	9	
	<b>Total</b>		<b>1309</b>	

## Appendix 2. Winter Anatidae Count Data (Continued)

Date	Common Name	Latin Name	No. of Birds	Weather/ Comments
20-Feb-06	Eurasian Wigeon	<i>Anas penelope</i>	3	Overcast conditions
		<b>Total</b>	<b>3</b>	
27-Feb-06	Northern Pintail Northern Shoveler	<i>Anas acuta</i>	61	Medium rain and cold Unusual tidal surge (2.1m at 18:10)
		<i>Anas clypeata</i>	28	
		<b>Total</b>	<b>89</b>	
09-Mar-06	Common Teal Eurasian Wigeon Garganey Northern Shoveler	<i>Anas crecca</i>	30	Very hazy Difficult conditions to identify Anatidae to species level
		<i>Anas penelope</i>	7	
		<i>Anas querquedula</i>	5	
		<i>Anas clypeata</i>	3	
		<b>Total</b>	<b>45</b>	
22-Mar-06	Eurasian Wigeon	<i>Anas penelope</i>	4	Humid and overcast
		<b>Total</b>	<b>4</b>	
18-Apr-06	Falcated Duck* Northern Shoveler	<i>Anas falcata</i>	1	Humid and overcast
		<i>Anas clypeata</i>	1	
		<b>Total</b>	<b>2</b>	
25-Apr-06	No birds	-	0	Overcast conditions
		<b>Total</b>	<b>0</b>	

\* - Regarded as a non-wild bird (refer to 3.1.3).

### Appendix 3 : Peak Waterbird Species Counts on Gei wai #16/17 : 2005

Bird Group	Species	31-Mar-05	12-Apr-05	13-Apr-05	14-Apr-05	26-Apr-05	27-Apr-05	28-Apr-05	29-Apr-05	10-May-05	11-May-05	24-May-05	25-May-05	Mean	S.D
7	Asian Dowitcher	<i>Limnodromus semipalmatus</i>		1	1	2				2	3	1		0.8	1.0
7	Bar-tailed Godwit	<i>Limosa lapponica</i>	3		5	10								1.7	3.1
2	Black-faced Spoonbill	<i>Platalea minor</i>			6	3			32	38	36	18	16	12.4	15.2
4	Black-headed Gull	<i>Larus ridibundus</i>			1		3		2		3	2	2	1.4	1.2
7	Black-tailed Godwit	<i>Limosa limosa</i>	403	248	340	36	17	10	14	4	4	1	1	89.5	149.3
3	Black-winged Stilt	<i>Himantopus himantopus</i>		6	3	1			2	53	44	64	62	22.1	31.5
6	Broad-billed Sandpiper	<i>Limicola falcinellus</i>		1		3			5	11	7	3	1	2.6	3.5
4	Caspian Tern	<i>Sterna caspia</i>	2		1	4				1				0.8	1.2
9	Common Greenshank	<i>Tringa nebularia</i>	38	13	11	16	43	119	17	71	998	881	7	186.4	354.1
12	Common Moorhen	<i>Gallinula chloropus</i>				1			1					0.2	0.4
9	Common Redshank	<i>Tringa totanus</i>	131	59	107	13		616	2		253	231	25	222.2	178.4
10	Common Sandpiper	<i>Actitis hypoleucos</i>						1						1.5	2.6
6	Curlew Sandpiper	<i>Calidris ferruginea</i>	43	72	49	49	173	995	32	4	253	230	12	164.8	275.7
8	Eurasian Curlew	<i>Numenius arquata</i>	40	16	22	18	18	19	15	20	12	15	24	19.4	7.3
5	Eurasian Wigeon	<i>Anas penelope</i>	2	13	11				20	1				4.3	6.7
8	Far Eastern Curlew	<i>Numenius madagascariensis</i>					2		1					0.9	0.9
1	Great Egret	<i>Egretta alba</i>	3	12	4	3		1		10	6			3.5	3.5
6	Great Knot	<i>Calidris tenuirostris</i>						2	3					0.8	1.3
11	Greater Sand Plover	<i>Charadrius leschenaultii</i>	31	214	68	158	51	77	16	133	151	101	91	90.9	63.9
1	Grey Heron	<i>Ardea cinerea</i>	15	1	12	5	5	1						3.9	4.9
11	Grey Plover	<i>Pluvialis squatarola</i>	2		6	4	4	4		9	7			3.0	3.2
10	Grey-tailed Tattler	<i>Heteroscelus brevipes</i>												0.6	1.4
4	Gull-billed Tern	<i>Sterna nilotica</i>			47	155	57	27	8	8	5			27.5	39.2
1	Intermediate Egret	<i>Egretta intermedia</i>	2			1								0.8	1.3
11	Kentish Plover	<i>Charadrius alexandrinus</i>	2	4	3		4	1		2			2	1.5	1.6
11	Lesser Sand Plover	<i>Charadrius mongolus</i>			2	3	7	3			15	5	4	3.6	4.2
8	Little Curlew	<i>Numenius minutus</i>					1							0.1	0.3
1	Little Egret	<i>Egretta garzetta</i>	65	6	14	27	9	6	11	12	18	6	24	17.5	16.7
12	Little Grebe	<i>Tachybaptus ruficollis</i>												0.3	0.3
11	Little Ringed Plover	<i>Charadrius dubius</i>	1		1	3	1	1						0.6	0.9
6	Little Stint	<i>Calidris minuta</i>	1					1	2					0.5	0.8
4	Little Tern	<i>Sterna albifrons</i>				2	1					2	1	0.6	0.8
7	Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>				1								0.2	0.4
6	Long-toed Stint	<i>Calidris subminuta</i>				1	4			2		1		0.8	1.3
9	Marsh Sandpiper	<i>Tringa stagnatilis</i>	1226	1985	1417	795	490	25		17		2	3	496.7	698.3
9	Nordmann's Greenshank	<i>Tringa guttifer</i>				2	1		2			3		1.0	1.0
5	Northern Shoveler	<i>Anas clypeata</i>		1	1									0.3	0.5
12	Oriental Pratincole	<i>Glareola maldivarum</i>										1		0.2	0.4
11	Pacific Golden Plover	<i>Pluvialis fulva</i>		7	2	10	1	11					1	2.7	4.2
10	Painted Snipe	<i>Rostratula benghalensis</i>											2	0.3	0.6
3	Pied Avocet	<i>Recurvirostra avosetta</i>	20	8	265	6		1		1	242	186	28	68.2	100.7
6	Red Knot	<i>Calidris canutus</i>				3	3				3		2	0.7	1.2
10	Red-necked Phalarope	<i>Phalaropus lobatus</i>	2	5	4	2	1	1						1.3	1.7
6	Red-necked Stint	<i>Calidris ruficollis</i>	9	15	70	84	193	825	285	76	1455	1910	135	424.5	635.2
5	Ruddy Shelduck	<i>Tadorna ferruginea</i>									1			0.1	0.3
10	Ruddy Turnstone	<i>Arenaria interpres</i>				2	2							0.3	0.6
10	Ruff	<i>Philmachus pugnax</i>	1			1		1						0.3	0.5
6	Sanderling	<i>Calidris alba</i>	4	2		3		6	4	7		2	1	2.6	2.3
4	Saunders's Gull	<i>Larus saundersi</i>		2	2	2	1	2		1				0.8	0.9
6	Sharp-tailed Sandpiper	<i>Calidris acuminata</i>			4	2	3	2		13				3.5	4.0
5	Spot-billed Duck	<i>Anas poecilorhyncha</i>				1				1	2	6	9	0.4	0.8
9	Spotted Redshank	<i>Tringa erythropus</i>	276	629		321	524	585		763	774	2	6	323.8	319.6
10	Terek Sandpiper	<i>Xenus cinereus</i>	6	43	24	44	31	13		3	53	139	29	36.2	37.2
8	Whimbrel	<i>Numenius phaeopus</i>	2	3	3	2	10	19	3	2	14	16	11	8.2	6.3
9	Wood Sandpiper	<i>Tringa glareola</i>				19	6	11		2				3.2	6.0
	<b>Total No. of Birds</b>	<b>2352</b>	<b>3472</b>	<b>2537</b>	<b>1843</b>	<b>2300</b>	<b>2823</b>	<b>431</b>	<b>216</b>	<b>4452</b>	<b>4710</b>	<b>523</b>	<b>545</b>	<b>2183.9</b>	<b>1545.2</b>
	<b>Total No. of Species</b>	<b>32</b>	<b>30</b>	<b>32</b>	<b>41</b>	<b>37</b>	<b>37</b>	<b>18</b>	<b>16</b>	<b>43</b>	<b>37</b>	<b>29</b>	<b>24</b>	<b>31.5</b>	<b>8.7</b>
Comments			Peregrine attack at 10:45		Disturbance on Island no. 1 at 11:47 (Researchers)	Peregrine attack at 09:30	Peregrine attack at 09:35	Many small waders birds on gei wai 8 and 11	High water level due to overnight heavy rain		High water level due to overnight heavy rain	Disturbance on Island no. 3 by birdwatcher at 08:30			



## Appendix 5. Waterbird Group Counts for *Gei wai* #16/17 : 2005 & 2006

### Summary of Peak Waterbird Group Counts for all 12 Observation Periods inside *Gei wai* #16/17 during Spring 2005.

WATERBIRD GROUP	Waterbird Group Count : 2005												Mean	S.D
	31-Mar-05	12-Apr-05	13-Apr-05	14-Apr-05	26-Apr-05	27-Apr-05	28-Apr-05	29-Apr-05	10-May-05	11-May-05	24-May-05	25-May-05		
1	86	19	30	36	15	9	14	16	31	14	37	25	27.7	20.6
2	0	0	6	3	0	32	0	0	38	36	18	16	12.4	15.2
3	20	14	268	7	10	3	1	1	305	230	92	132	90.3	115.5
4	4	40	50	144	62	3	12	9	7	9	3	3	31.2	40.9
5	2	14	12	0	0	0	20	4	4	3	2	0	5.1	6.6
6	68	157	154	191	380	1838	323	80	1746	2156	160	138	615.9	792.7
7	407	249	346	47	19	11	0	0	16	8	2	1	92.2	150.3
8	44	19	25	20	31	39	20	22	27	31	36	29	28.6	8.0
9	1671	2686	1535	1166	1680	744	25	73	2041	1889	36	58	1133.7	925.4
10	13	49	29	49	35	18	0	10	76	170	31	49	44.1	44.9
11	37	225	82	180	68	97	16	1	159	163	105	94	102.3	68.5
12	0	0	0	0	0	1	0	0	2	1	1	0	0.4	0.7
<b>TOTAL</b>	<b>2352</b>	<b>3472</b>	<b>2537</b>	<b>1843</b>	<b>2300</b>	<b>2823</b>	<b>431</b>	<b>216</b>	<b>4452</b>	<b>4710</b>	<b>523</b>	<b>545</b>	<b>2183.7</b>	<b>1545.2</b>
<b>RANK</b>	<b>6</b>	<b>3</b>	<b>5</b>	<b>8</b>	<b>7</b>	<b>4</b>	<b>11</b>	<b>12</b>	<b>2</b>	<b>1</b>	<b>10</b>	<b>9</b>		

### Summary of Peak Waterbird Group Counts for all 12 Observation Periods inside *Gei wai* #16/17 during Spring 2006.

WATERBIRD GROUP	Waterbird Group Count : 2006												Mean	S.D
	01-Apr-06	15-Apr-06	16-Apr-06	17-Apr-06	02-May-06	13-May-06	14-May-06	16-May-06	17-May-06	19-May-06	26-May-06	27-May-06		
1	66	21	32	14	19	26	10	14	7	14	19	72	26.2	21.2
2	0	27	6	0	4	12	3	16	25	11	2	8	9.5	9.2
3	15	1103	1650	1589	999	564	540	503	488	470	225	204	695.8	527.9
4	6	71	72	220	1	7	6	6	23	14	2	0	35.7	63.4
5	1	6	0	0	0	1	1	0	0	0	0	0	0.8	1.7
6	87	87	106	189	4	494	533	823	602	823	62	61	322.6	311.3
7	160	58	69	658	23	12	9	25	22	18	14	13	90.1	183.9
8	162	43	44	61	24	37	33	40	42	28	37	37	49.0	36.8
9	3501	655	2098	3008	234	674	861	502	447	442	59	59	1045.0	1165.3
10	3	17	62	67	1	102	93	223	254	164	181	107	106.2	84.1
11	101	84	116	165	0	67	125	105	118	87	43	51	88.5	43.7
12	1	0	0	0	0	0	0	21	0	0	0	1	1.9	6.0
<b>TOTAL</b>	<b>4103</b>	<b>2172</b>	<b>4255</b>	<b>5971</b>	<b>1309</b>	<b>1996</b>	<b>2214</b>	<b>2278</b>	<b>2028</b>	<b>2071</b>	<b>644</b>	<b>613</b>	<b>2471.2</b>	<b>1567.0</b>
<b>RANK</b>	<b>3</b>	<b>6</b>	<b>2</b>	<b>1</b>	<b>10</b>	<b>9</b>	<b>5</b>	<b>4</b>	<b>8</b>	<b>7</b>	<b>11</b>	<b>12</b>		

## Appendix 6. Shorebird Group Counts for the Ramsar Site : Spring 2005 and 2006

**Summary of Shorebird Group Counts on the Ramsar Site during Spring 2005 (used for comparison purposes in 3.2.7)**

Shorebird Group Count : 2005													
SHOREBIRD GROUP	31-Mar-05	11-Apr-05	13-Apr-05	15-Apr-05	23-Apr-05	25-Apr-05	28-Apr-05	10-May-05	12-May-05	23-May-05	27-May-05	Mean	S.D
3	4020	1644	1583	1235	690	69	620	323	201	115	150	968.2	1167.4
6	32	171	195	122	965	1306	203	1619	1513	202	79	582.5	631.4
7	453	533	349	501	419	413	27	7	9	1	1	246.6	232.4
8	31	14	40	16	24	28	37	12	29	20	22	24.8	9.1
9	2917	2054	3686	3821	1164	2402	1247	1741	2489	72	43	1966.9	1275.6
10	12	60	20	49	278	44	196	148	174	152	136	115.4	84.6
11	41	125	93	116	165	181	32	171	222	104	82	121.1	59.3

[Source: HKBWS data (Anon, 2005a)]

**Summary Table of Shorebird Group Counts on the Ramsar Site during Spring 2006 (used for comparison purposes in 3.2.7)**

Shorebird Group Count : 2006										
SHOREBIRD GROUP	01-Apr-06	14-Apr-06	17-Apr-06	03-May-06	13-May-06	16-May-06	19-May-06	25-May-06	Mean	S.D
3	4727	2554	1611	1111	567	527	539	379	1501.9	1496.9
6	101	142	312	932	446	1347	1652	267	649.9	589.4
7	212	522	973	110	11	24	23	19	236.8	344.2
8	181	43	51	82	24	48	15	38	60.3	52.7
9	3711	4806	4620	2759	828	679	434	112	2243.6	1960.4
10	3	38	95	190	188	213	255	224	150.8	93.1
11	150	414	215	33	59	108	87	59	140.6	124.9

[Source: HKBWS data (Anon, 2006a)]

**Note :**  
**Only HKBWS count dates within 1 day either side of the WWF-HK count dates are used for comparison purposes**