Nature Conservation Management for Long Valley

BIRD MONITORING PROGRAMME

Programme 2008/10	Spring and Summer	March – August 2008

Summary Report – spring and summer 2008 (March to August)

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1. Background

1.1. The Environmental and Conservation Fund (ECF) supports a joint project: Nature Conservation Management for Long Valley, which aim to enhance the conservation value of this freshwater wetland especially for birds through a management agreement (MA) scheme between the Hong Kong Bird Watching Society (HKBWS), The Conservancy Association (CA) and the local farming community since March 2008.

1.2. The aim of this project is to conserve and enhance the agricultural freshwater wetland and habitat diversity for avifauna and other freshwater wetland-dependent species in Long Valley. The effectiveness of the management practices is reflected by the utilization in the area by birds and the regular Bird Monitoring Programme gathers such data.

1.3. This report presents the results of the bird monitoring programme conducted in spring and summer 2008 (i.e. from March to August).

2. Methodology

Transect Counts

2.1. The bird monitoring programme in both the core and northern parts of Long Valley was conducted by regular transect counts following routes shown in Fig. 1, Fig. 2 and Fig. 3 in order to obtain comparable results and complete coverage of all farmlands in the shortest time. The northern part of Long Valley is a farmland area belonging to Ho Sheung Heung which is separated from the core

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part of Long Valley by Sheung Yue River. All birds encountered in the transects, including seen and heard, were recorded with the species (common) name and field (i.e. farming plot) number, following Figure 1, 2 and 3, where the birds were located. Birds flying in the sky were also marked down but not allocated to any specific field. Bird calls heard which could not be exactly located to a field number was marked as 'Heard'. Transect count was also done in Ho Sheung Heung *feng-shui* wood area (Fig. 3). Surveys were separated into two parts: (1) The core part of Long Valley and (2) The northern part of Long Valley and Ho Sheung Heung *feng-shui* wood. Total surveying times for each of the two parts were maintained at about 3.0 hours and they were conducted simultaneously in the morning.

2.2. In this study, March, April and May were considered as spring which is the main bird migration season and June, July and August were considered as summer in which migration is finished or nearly comes to an end in these months. Surveys were done once per week from Mar to May and August 2008 while surveys were conducted once every fortnight in June and July 2008. A total of 20 surveys were conducted as shown below:

2008 Mar: 7, 14, 20, 26;
2008 Apr: 4, 10, 16, 23;
2008 May: 2, 8, 15, 23, 29;
2008 Jun: 11;
2008 Jul: 1, 19, 25;
2008 Aug: 10, 14, 25, 29.

2.3. Each survey was conducted by two surveyors accredited by HKBWS. One surveyor would cover the core part of Long Valley (Fig. 1) and the other would survey the northern part of Long Valley (Fig. 2) and the *feng-shui* wood at Ho Sheung Heung (Fig.3). On 11th Jun, the survey was done by Ms. Vivian Fu Wing Kan and Ms. Carman Or. All other surveys were conducted by Mr. Sung Yik Hei and Mr. Pang Chun Chiu.

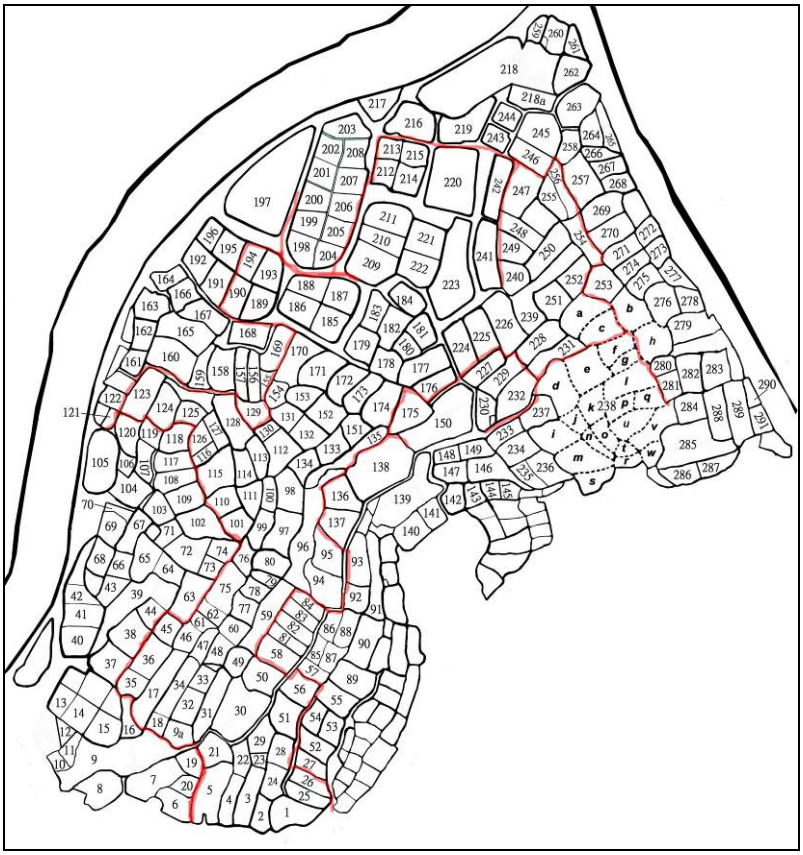

Figure 1. The transect (red line) and field numbers at the core part of Long Valley in this study.

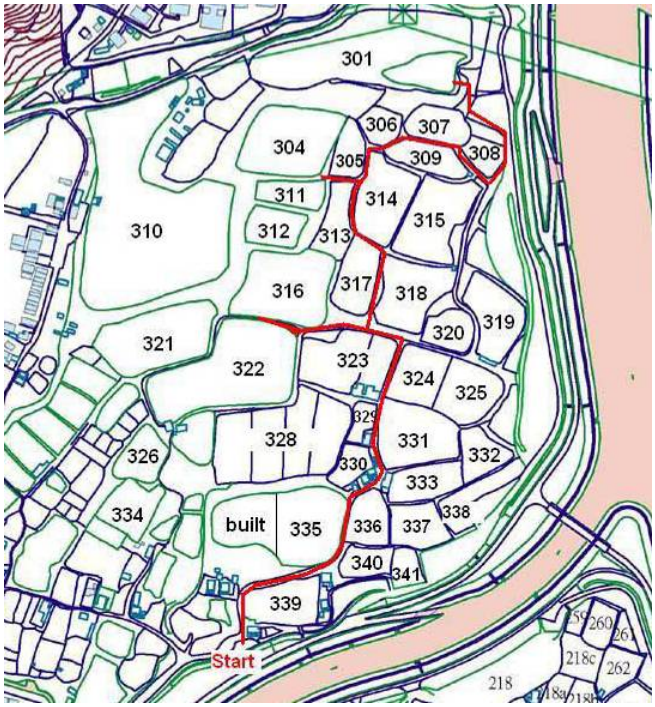

Figure 2. The transect (red line) and field numbers at the northern part of Long Valley in Ho Sheung Heung.

Figure 3. The transect (red line) at the Ho Sheung Heung *feng-shui* wood.

Statistical Analysis

2.6. The total number of birds and Shannon-Wiener index of the surveys in a season were compared with those in the same season of previous years by T-test.

2.7. Comparisons were made on the mean number of birds sampled between managed and unmanaged fields in various habitats including wet agricultural lands, shallow water habitats by T-test.

2.8. Unmanaged fields of similar size that are in close proximity to particular managed fields of wet agricultural lands, shallow water habitats and fish ponds were chosen as control fields. The mean bird density in the control fields were compared with that in managed fields by T-test to determine the difference in attractiveness to birds between managed area and unmanaged area. Yet, no control water flea ponds can be selected as all the water flea ponds were managed. Alternatively, comparison between the mean bird density in water flea ponds in 2008 and that in 2007 was made to show the effect of management on birds.

3. Results

Overview

3.1. The total numbers of birds recorded in each survey in the core part of Long Valley area in spring and summer of 2008 fluctuated like in the previous two years. The peak counts in spring and summer 2008 were 528 on 14 March and 452 on 29 August respectively. The lowest count in spring 2008 was 126 on 29 May while that in summer 2008 was 73 on 11 June. In general, the total number decreased from the start of spring and reached the lowest in early June. The number then increased toward the end of summer with some fluctuations. The pattern was rather similar to those in the last three years since the start of the monitoring programme (Table 1 and Fig. 5). The Shannon indexes of birds counted in the core part in spring and summer were respectively 3.05 (0.15) and 2.77 (0.12) in 2008, 2.72 (0.34) and 2.58 (0.39) in 2007 and 2.47 (0.42) and 2.38 (0.33) in 2006 (Table 2).

Table 1. Numbers in each count, monthly mean figures with SD of birds counted at the core part of Long Valley, spring and summer 2008 and the mean figures (with SD) in 2006 and 2007.

	Spring			Summer		
	March	April	May	June	July	August
Numbers of bird counted in each survey	474, 528, 347, 478	500, 339, 285, 190	370, 171, 134, 152, 126	73	169, 253, 176	266, 230, 363, 452
2008: Mean (SD)	458(78)	330(130)	191(101)	73*	199(47)	328(112)
2007: Mean (SD)	459(71)	292(29)	200(91)	170(19)	270(43)	430(99)
2006: Mean (SD)	289(36)	322(37)	133(44)	268(79)	96(66)	161(34)

Note: Value with asterisk means that only one count was made in the particular month.

Table 2. Mean numbers of species and diversity indices (Shannon index) of birds counted in the core part of Long Valley, spring and summer 2006-2008.

	Spring		Summer	
Mean (SD)	No. of species	Index	No. of species	Index
2006	28.6 (6.61)	2.47 (0.42)	21.8 (4.04)	2.38 (0.33)
2007	31.5 (9.25)	2.72 (0.34)	27.5 (6.05)	2.58 (0.39)
2008	39.4 (7.77)	3.05 (0.15)	27.1 (3.40)	2.77 (0.12)

3.2. The total numbers of birds recorded in the northern part of Long Valley also fluctuated. The peak count in spring 2008 was 199 on 4th April while that in summer 2008 was 298 on 11th June. The lowest count in spring 2008 was 94 on 23rd April while that in summer 2008 was 118 on 29th August. The general trend in spring was similar to that recorded in the core part of Long Valley, which dropped gradually from the start of spring toward the end of May. However, the number did not reach the lowest in June but suddenly increased and reached the peak count of the spring and summer. It then decreased toward the end of July and kept stable throughout August, although the number went up and down a little bit (Table 3 and Fig. 6). The Shannon indexes of birds counted in the northern part of Long Valley were 3.10 (0.15) and 2.82 (0.32) in spring and summer 2008 respectively (Table 4).

Table 3. Numbers in each count, monthly mean figures with SD of birds counted in northern part of Long Valley, spring and summer 2008.

	Spring			Summer		
	March	April	May	June	July	August
Numbers of bird counted	192, 131, 130, 149	199, 130, 140, 94	135, 111, 116, 128, 95	298	203, 123, 160	135, 156, 135, 118
2008: Mean (SD)	151(29)	141(44)	117(16)	298*	162(40)	136(16)

Note: Value with asterisk means that only one count was made in the particular month.

Table 4. Mean numbers of species and diversity indices (Shannon index) of birds counted in the northern part of Long Valley, spring and summer 2008.

	Spring 2008		Summer 2008	
	No. of species	Index	No. of species	Index
Mean (SD)	31.6 (4.46)	3.10 (0.15)	28.6 (3.78)	2.82 (0.32)

3.3. For the *feng-shui* wood, the peak count in spring 2008 was 105 on 10th April while the lowest count was 49 on 2nd May. The lowest count in summer 2008 was 67 on 25th August while the lowest was 21st on 19 July. Bird abundance was the highest in spring and it decreased toward the summer and reached the lowest in June and July. It then climbed up to a mean value of 55 (SD = 12) in August (Table 5). The Shannon indexes of birds counted in the *feng-shui* wood were 2.37 (0.21) and 2.05 (0.21) in spring and summer 2008 respectively (Table 6).

Table 5. Numbers in each count, monthly mean figures with SD of birds counted in the Ho Sheung Heung *feng-shui* wood, spring and summer 2008.

	Spring 2008			Summer 2008		
	March	April	May	June	July	August
Numbers of bird counted in each survey	79, 89, 98, 53	85, 105, 73, 88	49, 79, 73, 67, 56	48	52, 21, 48	53, 61, 67, 39
Mean (SD)	80(19)	88(13)	65(12)	48*	40(17)	55(12)

Note: Value with asterisk means that only one count was made in the particular month.

Table 6. Mean numbers of species and diversity indices (Shannon index) of birds counted in Ho Sheung Heung *feng-shui* wood, spring and summer 2008.

	Spring 2008		Summer 2008	
	No. of species	Index	No. of species	Index
Mean (SD)	15.8 (2.76)	2.37 (0.21)	11.6 (1.06)	2.05 (0.21)

3.4. Comparing the mean abundance of birds counted at the core part of Long Valley in spring and summer 2008 with the same months in the previous two years (Table 1), the mean value of April 2008 was the highest of the three years while the mean values of March and May 2008 were the second highest. The mean abundance of spring 2008 and 2007 were more or less the same but almost 30% more that that in 2006 (Table 7). However, the difference was not significant ($p > 0.05$). For the summer months of the three years, the mean abundance values of July and August 2008 were the second highest (Table 1). Only one count was conducted during June and the number is the lowest among the three years. The mean abundance of summer 2007 was significantly higher than that of 2006 (Table 8). The mean abundance of 2008 was smaller than that of 2007 but larger than that of 2006 but the differences were not significant.

Table 7. Mean (SD) of the total numbers of the birds in the core part of Long Valley in springs 2006-2008.

	Spring 2006	Spring 2007	Spring 2008	One-way ANOVA
All counts lumped	251(90), n=13	319(132), n=14	315(150), n=13	df = 2, p = 0.309,

Table 8. Mean (SD) of the total numbers of the birds in the core part of Long Valley in summers

2006-2008.

	Summer 2006	Summer 2007	Summer 2008	One-way ANOVA
All counts lumped	169(91) [a], n=14	301(130)[b], n=13	248(118) [ab], n=8	df = 2, p = 0.017

Note: Values sharing different lowercase letter are significantly different, P < 0.05 (Tukey test).

3.5. The mean values of the Shannon index of birds recorded in the core part of Long Valley in spring 2006, 2007 and 2008 were 2.47 (SD = 0.42), 2.72 (SD = 0.34) and 3.05 (SD = 0.15) respectively (Table 9). Significant difference was detected among the three springs (*Kruskal-Wallis* test, p < 0.001). By applying pairwise Mann-Whitney tests, the Shannon index of spring 2008 was significantly higher than that of 2007 (U = 29.5, p < 0.005) and 2006 (U = 7, p < 0.001) while there was no difference between 2007 and 2006 (U = 54.5, p = 0.076). The mean values of the Shannon index in summer 2006, 2007 and 2008 were 2.38 (SD = 0.33), 2.58 (SD = 0.39) and 2.77 (0.12) respectively (Table 10). Significant difference was also detected among the three summers (*Kruskal-Wallis* test, p < 0.05). By applying pairwise Mann-Whitney tests, the mean values of Shannon index of summer 2008 was significantly higher than that of 2006 (U = 15, p < 0.05) but not significantly different from 2007 (U = 42, p = 0.468). There was also no significant difference between the mean value of 2006 and 2007 (U = 56, p = 0.089). The Shannon index of birds counted in the core part of Long Valley by week in the springs and summers from 2006 to 2008 were shown in Figure 7.

Table 9. Mean (SD) of the diversity indices (Shannon index) of birds counted in the core part of Long Valley, spring 2006-2008.

	Spring 2006	Spring 2007	Spring 2008	*Kruskal-Wallis* test
Mean (SD)	2.47 (0.42) [a], n = 13	2.72 (0.34) [a], n = 14	3.05 (0.15) [b], n = 13	df = 2, p < 0.001

Note: Values sharing different lowercase letter are significantly different, P < 0.05 (pairwise Mann-Whitney tests).

Table 10. Mean (SD) of the diversity indices (Shannon index) of birds counted in the core part of Long Valley, summer 2006-2008.

	Summer 2006	Summer 2007	Summer 2008	*Kruskal-Wallis* test
Mean (SD)	2.38 (0.33) [a], n = 14	2.58 (0.39) [ab], n = 13	2.77 (0.12) [b], n = 8	df = 2, p < 0.05

Note: Values sharing different lowercase letter are significantly different, P < 0.05 (pairwise

Mann-Whitney tests).

3.6. The mean values of Shannon index of spring and summer 2008 in the northern part of Long Valley were 3.10 (SD = 0.15) and 2.82 (SD = 0.32) respectively (Table 11). The mean values of Shannon index of spring and summer 2008 in the Ho Sheung Heung *feng-shui* wood were 2.37 (SD = 0.21) and 2.05 (SD = 0.21) (Table 11). These two transects were not done in 2006 and 2007 and no statistical comparison was made.

Table 11. Mean (SD) of the diversity indices (Shannon index) of birds counted in northern part of Long Valley and Ho Sheung Heung *feng-shui* wood, spring and summer 2008.

	Spring 2008	Summer 2008
Northern part of Long Valley	3.10 (0.15)	2.82 (0.32)
Ho Sheung Heung *feng-shui* wood	2.37 (0.21)	2.05 (0.21)

3.7. The mean (SD) figures of the Shannon index of birds counted in the core and northern part of Long Valley in spring 2008 were 3.05 (0.15) and 3.10 (0.15) respectively. There was no significant different between the two figures (T-test, t = 0.75, df = 24, p = 0.459). The mean (SD) figures of Shannon index in summer 2008 were 2.77 (0.12) in the core part and 2.82 (0.32) in the northern part. There was also no significant different between them (T-test, t = 416, df = 14, p = 0.683).

Managed area

3.8. The surveyed area of the core part of Long Valley was 3,182,166 sq.ft. and that of the northern part of Long Valley was 1,020,889 sq.ft., excluding the area of Ho Sheung Heung *feng-shui* wood which was 340,000 sq.ft. Therefore, the total surveyed area is 4,203,056 sq.ft. The total area of agricultural fields in both parts of Long Valley managed by the Hong Kong Bird Watching Society and the Conservancy Association was gradually increasing in the current study period (Table 12).

Table 12. Total surveyed area of managed and unmanaged fields in the core and northern parts of Long Valley by the HKBWS and CA in spring and summer 2008.

Months	Area of managed fields (sq. ft.)	Area of unmanaged fields (sq. ft.)	Total	% of fields managed
March	0	4,203,056	4,203,056	0

April	380,203	3,822,853	4,203,056	9.0
May	425,303	3,777,753	4,203,056	10.1
June	468,003	3,735,053	4,203,056	11.1
July	505,677	3,697,379	4,203,056	12.0
August	519,573	3,683,483	4,203,056	12.4

3.9. No significant difference was found between the number of birds per unit area recorded in managed and unmanaged fields in spring 2008 (Mann-Whitney Rank Sum Test, $U = 21$, $p = 0.085$) (Table 13). However, the number of birds per unit area recorded in managed fields was significantly higher than that in unmanaged fields in summer 2008 (Mann-Whitney Rank Sum Test, $U = 0$, $p < 0.001$) (Table 13).

Table 13. Total numbers of birds (SD) and the mean bird density (SD) recorded in managed and unmanaged fields in the whole surveyed area in the core and northern parts of Long Valley, spring and summer 2008.

	Mean bird density in managed field (per 10^5 sq.ft.)	Mean bird density in unmanaged field (per 10^5 sq.ft.)	Mann-Whitney Rank Sum Test
Spring	12.4 (10.9)	5.4 (2.6)	$U = 21$, $p = 0.085$, n.s.
Summer	21.4 (11.5)	3.8 (1.8)	$U = 0$, $p < 0.001$

3.10. The ratio of the number of birds per unit area in managed fields to that in unmanaged fields of the same year reflected the utilization of managed fields by birds. The ratios of spring 2007 and 2008 were 0.65 and 2.30 respectively. The ratios of summer 2007 and 2008 are 1.63 and 5.63 respectively. Birds were more concentrated in managed fields than in unmanaged fields in both spring and summer 2008 when comparing to those in 2007 (Table 14).

Table 14. Mean (SD) numbers of birds in all managed and unmanaged fields per unit area in all seasons in 2006 and 2007, spring 2008 and summer 2008.

	Autumn 06	Winter 06-07	Spring 07	Summer 07	Autumn 07	Winter 07-08	Spring 08	Summer 08
Managed fields	26.9 (12.1)	17.2 (8.1)	9.3 (6.4)	6.7 (3.5)	19.0 (9.5)	22.9 (11.4)	12.4 (10.9)	21.4 (11.5)
Unmanaged fields	14.7 (4.3)	18.0 (4.1)	14.4 (5.9)	4.1 (2.2)	20.3 (6.4)	15.7 (3.0)	5.4 (2.6)	3.8 (1.8)

Wet agricultural land (WAL)

3.11. In the current study period, the management practice of difference WAL fields were started at different months. Therefore, the total areas of managed WAL and control field were different among months (Table 15).

Table 15. Total area of managed WAL and control fields in the core and northern part of Long Valley in spring and summer 2008.

Months	Total area of managed fields (sq. ft.)	Total area of control fields (sq. ft.)
March	0	0
April	111730	95831
May	111730	95831
June	140384	107596
July	146519	124485
August	153817	124485

Note: All the management of WAL area started in April. Data of March is excluded from statistical analysis.

3.12. The management practice of WAL in spring and summer 2008 comprised of planting of Paddy Rice, Water Chestnut, Chinese Arrowhead, Water Lily and Lotus.

3.13. There was no significant difference between the mean number of birds per unit area in managed WAL area and that in control fields in spring 2008 (Mann-Whitney Rank Sum Test, U = 30, P = 0.353). However, the mean bird density in managed WAL area was significantly higher than that in control fields in summer 2008 (Mann-Whitney Rank Sum Test, U = 6, P = 0.006).

3.14. The mean bird density in the managed WAL in spring 2008 is 60% lower than that in spring 2006 and was 68% less than that in spring 2007. However, the differences were not significant as shown by one-way ANOVA (Table 16).

Table 16. Mean (SD) bird density (per 100,000 sq. ft.) in WAL and its control in spring 2006 - 2008.

	Spring 2006	Spring 2007	Spring 2008	One-way ANOVA
Managed fields	40.6 (75.3), n=13	51.1 (35.5), n=14	16.2 (14.3), n=9	df = 2, p = 0.288
Control fields	9.2 (18.3)	39.3 (38.9)	13.4 (16.7)	

3.15. The mean bird density in the managed WAL in summer 2008 was 68% lower than that in summer 2007, but 35% higher than that in summer 2006. Whilst mean bird density in summer 2007 was significantly higher than that of 2006, no significant differences were found in the mean density of birds between the summer of 2008 and 2007, and 2008 and 2006 respectively (Table 17).

Table 17. Mean (SD) bird density (per 100,000 sq. ft.) in WAL and its control per unit area (100,000 sq. ft.) in summer 2006 - 2008.

	Summer 2006	Summer 2007	Summer 2008	One-way ANOVA
Managed fields	19.8(19.8) [a], n=13	93.0 (113.3)[b], n=14	30.4 (20.3) [ab], n=9	df = 2, p = 0.021.
Control fields	3.3 (4.8)	10.2 (8.0)	9.5 (6.6)	

Note: Values sharing different lowercase letters are significantly different, P<0.05 (Tukey test).

Shadow Water Habitat (SWH)

3.16. The management practice of different fields of SWH started in different months in the current study period (Table 18).

Table 18. Total area of managed SWH and control fields in the core and northern parts of Long Valley in spring and summer 2008.

Months	Total area of managed fields (sq. ft.)	Total area of control fields (sq. ft.)
March	0	0
April	204473	190995
May	204473	190995
June	218520	190995
July	250058	230434
August	256656	230434

Note: All the management of WAL area started in April. Data of March is excluded from statistical analysis.

3.17. The management practice of SWH included water level maintenance, ploughing and weeding.

3.18. In spring 2008, there was no significant difference between the mean bird density in managed SWH and that in control fields (Mann-Whitney Rank Sum Test, U = 24, P = 0.144). However, the mean bird density in managed SWH in summer 2008 was significantly higher than that in control fields (T-test, t = 2.91, df = 14, P = 0.01).

3.19. There was 45% decrease in the mean bird density in managed SWH from spring 2007 to spring 2008 and 66% drop from spring 2006 to spring 2008. However, there was no significant difference between data from these three springs (Table 19).

Table 19. Mean (SD) bird density (per 100,000 sq. ft.) in managed SWH and its control in spring 2006 - 2008.

	Spring 2006	Spring 2007	Spring 2008	One-way ANOVA test
Managed fields	36.0 (60.5), n=13	22.6 (21.4), n=14	12.3(13.3), n=9	df = 2, p = 0.380,
Control fields	3.0 (3.6)	1.5 (2.4)	5.6 (4.6)	

3.20. The mean bird density in managed SWH in summer 2008 is 54% higher than 2007 summer and 56% higher than 2006 summer. Yet, data from summer 2006, summer 2007 and summer 2008 are not significantly different (Table 20).

Table 20. Mean (SD) bird density (per 100,000 sq. ft.) in managed SWH and its control in summer 2006 - 2008.

	Summer 2006	Summer 2007	Summer 2008	One-way ANOVA test
Managed fields	10.9 (11.9) , n=14	11.0 (12.9) , n=13	16.9(9.2) , n=8	df = 2, p = 0.462
Control fields	1.5 (2.4)	9.0 (3.9)	6.6 (3.9)	

Fish Pond

3.21. Management practices of fish ponds began in May 2008, these practices included fish pond resumption and margin planting (Table 21).

Table 21. Total area of managed fish pond and control fields in the core and northern parts of Long Valley in spring and summer 2008.

	Total area of managed fields (sq.	Total area of control fields (sq.

	ft.)	ft.)
March to April	0	0
May to August	45100	80579

Note: The bird data from March to April is excluded from analysis as there is no fish pond managed in this period.

3.22. The mean bird density in managed fishpond fields in spring 2008 was about 10 times higher than that in control fields (Table 22), however, there was no significant difference (Mann-Whitney Rank Sum Test, U = 5.5, P = 0.138).

Table 22. Mean (SD) bird density (per 100,000 sq. ft.) in fish pond and its control in spring 2008.

	Spring 2008
Managed Fishpond	1.1 (1.0)
Control Fishpond	0.1 (0.1)

3.23. The mean bird density in managed fishpond fields in summer 2008 was around 5 times higher than that in control fishpond (Table 23), but there was no significant difference (Mann-Whitney Rank Sum Test, U = 22, P = 0.286).

Table 23. Mean (SD) bird density (per 100,000 sq. ft.) in fish pond and its control in summer 2008.

	Summer 2008
Managed Fish Pond	1.6 (2.1)
Control Fish Pond	0.3 (0.2)

Water flea pond

3.24. In the period from April to August 2008, five water flea ponds of total area 64000 sq. ft. were managed. Water level management, fertilizers and fish stocking were done in this period.

3.25. Comparison of the mean number of birds in water flea ponds per unit area between 2006, 2007 and 2008 were conducted instead of comparison between managed fields and control fields as there was no control field. There was no significant difference in the mean bird density in water flea ponds between spring 2006 spring 2007 and spring 2008,and between summer 2006, summer 2007 and summer 2008 respectively (Table 24).

Table 24. Mean (SD) bird density (per 100,000 sq. ft.) in water flea ponds in spring and summer 2006 - 2008

	2006	2007	2008	Statistical analysis
Spring	0.6 (0.6)	0.5 (0.4)	0.47 (0.45)	One-way ANOVA test: df = 2, p = 0.628
Summer	0.3 (0.2)	1.2 (1.3)	2.1 (2.8)	*Kruskal-Wallis* test: df = 2, p = 0.186

Bird Distribution

3.26. Some of the target bird species of the MA project and species that are restrict to certain habitats were grouped into 7 categories according to their taxonomy, behaviour and habitat preference. Categories are listed as follow:
Ardeids (incl. Egrets, Herons and Bitterns)
Gallinago sp. (incl. Common Snipe, Fantail Snipe and Swinhoe Snipe)
Greater Painted Snipe
Waders (incl. Sandpipers, Black-winged Stilts, Plovers, Stints, Greenshanks etc.)
Wagtails (incl. Yellow Wagtail only)
Pipits
Stonechat

3.27. Distribution of the categories in the core part of Long Valley during spring and summer 2008 were mapped by calculating the density of these species in each farmland, i.e. total number of bird counted on a farmland divided by the area of corresponding farmland. Figure 10 to 16 showed the distribution of the 7 categories. Density is divided into six gradients:
Gradient 1: No bird recorded
Gradient 2: 20% of maximum density
Gradient 3: 40% of maximum density
Gradient 4: 60% of maximum density
Gradient 5: 80% of maximum density
Gradient 6: Highest density

4. Discussion

4.1. The trends in the abundance of birds in the core and northern parts of Long Valley in spring 2008 were similar to those in the previous two years as the numbers dropped from early spring toward the summer. This is likely

because visitors and migrants were leaving Long Valley toward the end of the spring migration. In summer 2008, the abundance of birds in the core part of Long Valley dropped to the lowest point of 73 on 11 June. However, the abundance at the northern part rose to the peak which is 298 on the same day (11 June) and remained high on 1 July where 203 was recorded. These high numbers were largely due to large flocks of Scaly-breasted Munia *Lonchura punctulata* which reached 130 individuals on 11 June. Furthermore, Eurasian Tree Sparrow *Passer montanus* and Black-collared Starling *Sturnus nigricollis* were in high number in the northern part of Long Valley during the summer. This may be due to the notably higher density of fruit trees there which attracted more resident birds to perch and provided them with nesting sites.

4.2. The mean values of bird abundance in the *feng-shui* wood are 76.5 (SD = 17.1) in spring and 48.6 (SD = 14.0) in summer. Fewer birds and bird species were recorded during the summer than in spring. It is likely because most of the migratory birds had left the *feng-shui* wood such as leaf warblers *Phylloscopus* spp. and most cuckoos had stopped calling in the summer period. Also, most of the birds are inactive in the hot days so that they were harder to detect. In this spring and summer, most of the birds recorded in FSW were common birds which can be found in urban area, e.g. Chinese Bulbul *Pycnonotus sinensis*, Common Tailorbird *Orthotomus sutorius*, Eurasian Tree Sparrow *Passer montanus*, Japanese White-eye *Zosterops japonicus*, Oriental Magpie Robin *Copsychus saularis,* Red-whiskered Bulbul *Pyxcnonotus jocosus* and Spotted Dove *Strepopelia chinensis*. Woodland dependent birds, e.g. flycatcher sp. and thrush sp. were absent or present in very low abundance. The attractiveness of the *feng-shui* wood to birds appears weak. The management practice i.e. planting tree seedlings is not yet effective as the tree seedlings were only planted in April 2007 by the Conservancy Association. The management effect would unlikely be apparent before the canopy of the planted area is formed, which means more than 10 years from now if the planting site will not be burned in the future. Prolonged monitoring is needed to evaluate the ecological value of the regenerating *feng-shui* wood and its attractiveness to birds.

4.3. There are differences in the bird composition between the core and the northern parts of Long Valley. In the core part of Long Valley, waterbird species including Wood Sandpiper *Tringa glareola*, Snipe *Gallinago* sp., and Little Ringed Plover *Charadrius dubius* were commonly recorded in transect surveys, however, these species are scarce in the northern part of Long Valley. There are

more fish ponds in the northern part than in the core part of Long Valley, this attracts fish eating birds including Pied Kingfisher *Ceryle rudis* and Grey Heron *Ardea cinerea* to the northern part of Long Valley.

4.4. Despite the differences in the bird composition between the core and the northern parts of Long Valley, the Shannon index of birds counted between two parts are not significantly different in both spring and summer 2008. Though the total area of the northern part is smaller than that of the core part, it seems that the northern part of Long Valley still provides considerable habitat diversity for birds

4.5. The utilization of managed fields by birds was higher in both spring and summer 2008 than in 2007. This reflects that the management launched in 2008 such as the farmland bank re-construction work is more effective in attracting birds than that in 2007 as birds were more concentrated in the managed fields in 2008. However, we should interpret this with some cautions as the standard deviations are high.

4.6. The mean figure of Shannon index of birds counted in the core part of Long Valley in spring 2008 is significantly higher than that in 2007. This may be due to higher species richness recorded in spring 2008 than in 2007. In the current studying period, birds species heard were counted in the survey while they were not counted in the previous years. Therefore, secretive birds that call were more easily recorded in this year but not in previous years. Cuckoos including Large Hawk Cuckoo *Hierococcyx sparverioides*, Indian Cuckoo *Cuculus micropterus*, Plaintive Cuckoo *Cacomantis merulinus* and Common Koel *Eudynamys scolopacea* are the main additional species. Also, more waders were recorded in May 2008 than in 2007 such as Long-toed Stint *Calidris subminuta* and Temminck's Stint *Calidris temminckii* on 16 Apr 2008, Oriental Pratincole *Glareola maldivarum*, Pacific Golden Plover *Pluvialis fulva* and Red-necked Stint *Calidris ruficollis* recorded on 8 May 2008. These suggest that the additional habitats provided in Long Valley due to the Management Agreement are becoming more attractive to the migrating waders. Bitterns were recorded in late May 2008 while they were not counted in the same period in previous years. Moreover, Bright-capped Cisticola *Cisticola exilis* had stayed in the core part of Long Valley until 4 Apr 2008 which was a record as they normally would not stay in Long Valley for such a prolonged period.

4.7. The mean numbers of birds per unit area in managed WAL and SWH in spring are higher than that in the control fields. However, the differences are not significant. The mean numbers of birds per unit area in managed WAL and SWH in summer are significantly higher than that in corresponding control fields. The effectiveness of managed WAL and SWH to birds is more prominent in summer than in spring. A possible reason is that managed area become more stable and more area were managed from the beginning of this spring to the end of this summer, thus more birds were attracted to managed fields. In addition, since management practices started in April 2008, data recorded in March was not counted under managed area in spring 2008. Moreover, this may also imply that managed WAL and SWH are attractive to resident birds. These resident bird species include Black-collared Starling *Sturnus nigricollis*, Cattle Egret *Bubulcus ibis*, Black Drongo *Dicrurus macrocercus*, Chinese Pond Heron *Ardeola bacchus*, Crested Myna *Acridotheres cristatellus*, Little Egret *Egretta garzetta*, Long-tailed Shrike *Lanius schach*, Oriental Magpie Robin *Copsychus saularis*, Spotted Dove *Steptopelia chinensis*, White Wagtail *Motacilla alba* and White-breasted Waterhen *Amaurornis phoenicurus*.

4.8. Comparing the mean figures of bird counts of managed Wet Agricultural Lands and Shallow Water Habitats from 2006 to 2008, the mean figures in spring 2008 decrease in both WAL and SWH though the differences are not significant (See table 11 and 14). This may be because of the expansion of managed area causing a dilution effect as birds are distributed in a larger managed area. By comparing the total area of managed WAL from 2006 to 2008, it changed from 15,000 sq.ft. in 2006, to 23,500 sq.ft. in 2007 and finally 111,730 sq.ft. in 2008. The managed area was expanded by 375% from 2007 to 2008. Furthermore, the mean bird density in WAL in 2008 is 18.0 while it is 12.0 in 2007 and 6.5 in 2006. For SWH, the situation is similar to that of WAL, the managed area was expanded by 60.7% from 2007 (127,200 sq.ft.) to 2008 (204,473 sq.ft.). The mean bird density in SWH in 2008 is 25.0 while it is 28.8 in 2007 and 17.3 in 2006. Therefore, we suspect the management is still effective though the mean figures dropped. The mean figure of bird counts of managed WAL per unit area in 2007 is exceptionally high when compared to 2006 and 2008. Yet no significant difference is found between that in 2007 and 2008. The high bird density may be due to the natural fluctuation where prolonged monitoring is required to acquire a better and representative picture.

4.9. The management of fish ponds is new in the renewed management agreement.

The mean bird density in managed fish ponds is five times and ten times higher than that in control fish ponds in spring 2008 and summer 2008. Although there is no significant difference shown by statistical analysis, it seems that the management practices on fish ponds are effective to raise the abundance of birds.

4.10 For the water flea ponds, there has been no observable difference in the attractiveness to birds in spring and summer from 2006 and 2008. Nevertheless, the water flea ponds are particularly favorable as perching and feeding sites to Barn Swallows *Hirundo rustica* as an average of 20 individuals were recorded in the bird surveys in August, with a maximum of 35 individuals on 25thAugust. This is possibly due to high abundance of aquatic and flying invertebrates in the water flea ponds.

4.11 In the surveys on 25th August 2008, there was a total of 43 Black-winged Stilt *Himantopus himantopus* recorded which is the highest count of this species since the regular bird survey started in 2006. Over 70% of these individuals were found in managed fields especially the water flea ponds and shallow water habitats. This shows that the management agreement is effective in providing suitable roosting and foraging sites for Black-winged Stilt.

4.12. There are some notable sightings recorded in spring and summer 2008 They includes:

Citrine Wagtail *Motacilla citreola*
A scarce passage migrant and winter visitor which favours freshwater marsh area. One sighting, possibly the same individual, was recorded on 10th, 16th and 23th April in the core part of Long Valley respectively.

Schrenck's Bittern *Ixobrychus eurhythmus*
A scarce passage migrant which occurs in freshwater marshes and agricultural fields. 7 individuals and 2 individuals were recorded in both parts of Long Valley on 23th May and 29th May respectively.

Red-necked Stint *Calidris ruficollis*
An abundant spring passage migrant usually occurs in Deep Bay area which has been recorded in the core part of Long Valley from casual sighting before. Yet, this species was firstly recorded in the regular bird survey on 8th May

2008.

Great Bittern *Botaurus stellaris*
A scarce winter visitor to Deep Bay and scarce spring and rare autumn passage migrant which has been recorded in the core part of Long Valley from casual sighting. The first record in the regular bird survey was taken on 11th June 2008.

Pechora Pipit *Anthus gustavi*
A scarce spring passage migrant which was recorded on 2nd May 2008.

Bright-capped Cisticola *Cisticola exilis*
A scarce winter visitor which usually inhabits in grasslands and bushes. The latest record of this species is on 11th March 1997 (Carey et al., 2001). From the regular bird survey in spring 2008, 1 individual was observed on 7th March 2008, 14th March 2008, 26th March 2008 and 4th April 2008 respectively and 2 individuals were seen on 14th March 2008. The record on 4th April 2008 is probably the latest record of this species in Hong Kong. The prolonged period of this species staying in Hong Kong in recent years may be due to the occurrence of suitable breeding habitats. In fact, there was sighting of juvenile of this species in August 2008 in Sha Tau Kok area which possibly shows successful breeding of this species in Hong Kong.

4.13. From the distribution map shown in Figure 10 to 16, not all of the categories were attracted to the managed fields. Managed wetland habitat, i.e. WAL and SWH could effectively attract the *Gallinago* sp., while these habitats are also important for Ardeids and waders. However, wagtail and pipits were attracted to active agricultural fields. Most of the fields recorded with Greater Painted Snipe are abandoned or left fallow which indicates that Greater Painted Snipe prefers habitats that are of very low human activity. The habitat preference of Common Stonechat could not be detected from Figure 16 since farmlands recorded with stonechat are scattered and include different kinds of habitats.

Reference

Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville D.S., Turnbull M. and Young, L. (2001): The

Avifauna of Hong Kong. Hong Kong Bird Watching Society, Hong Kong.

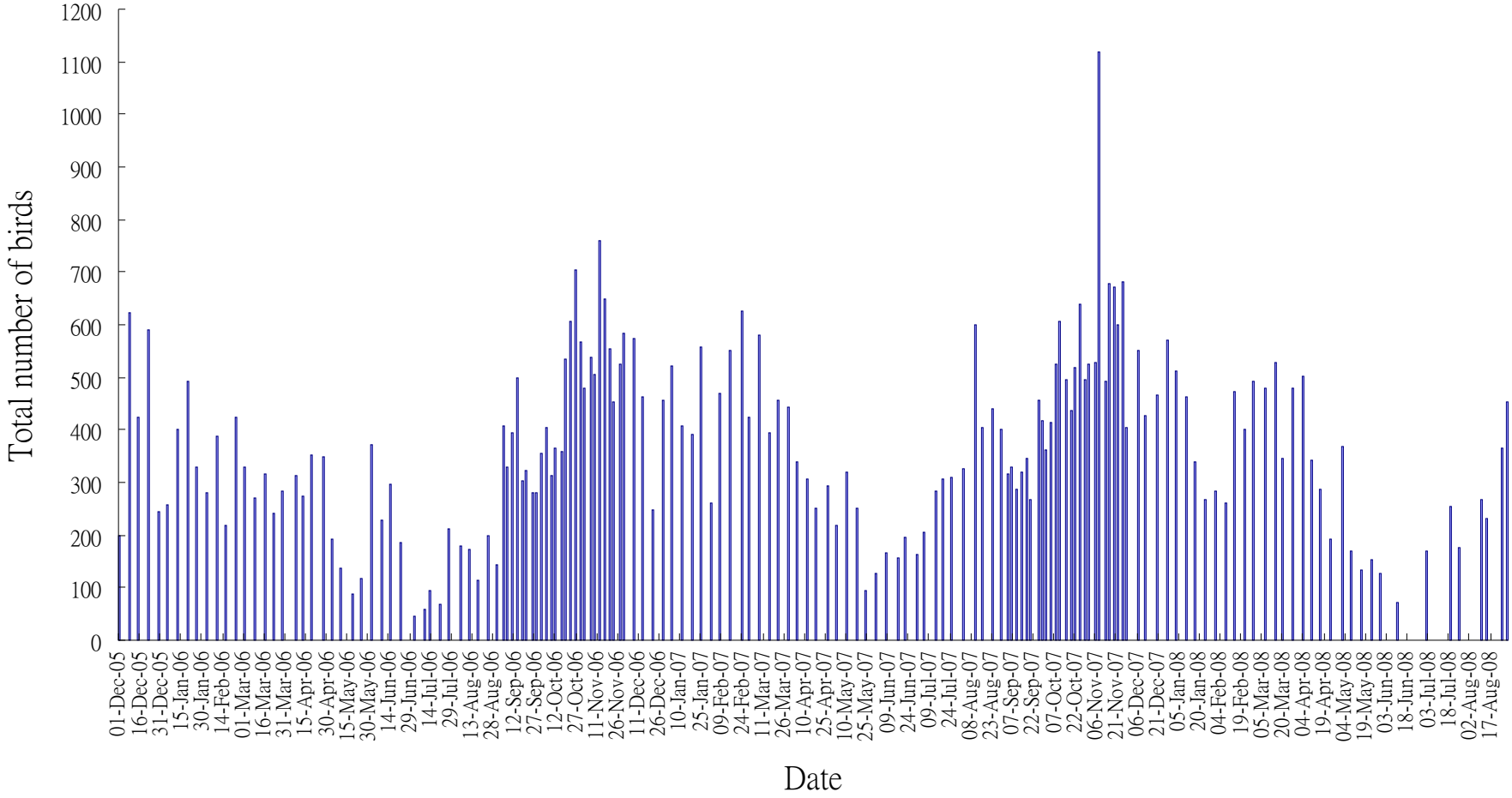

Figure 5. Total numbers of birds recorded in the core part of Long Valley from December 2005 to August 2008.

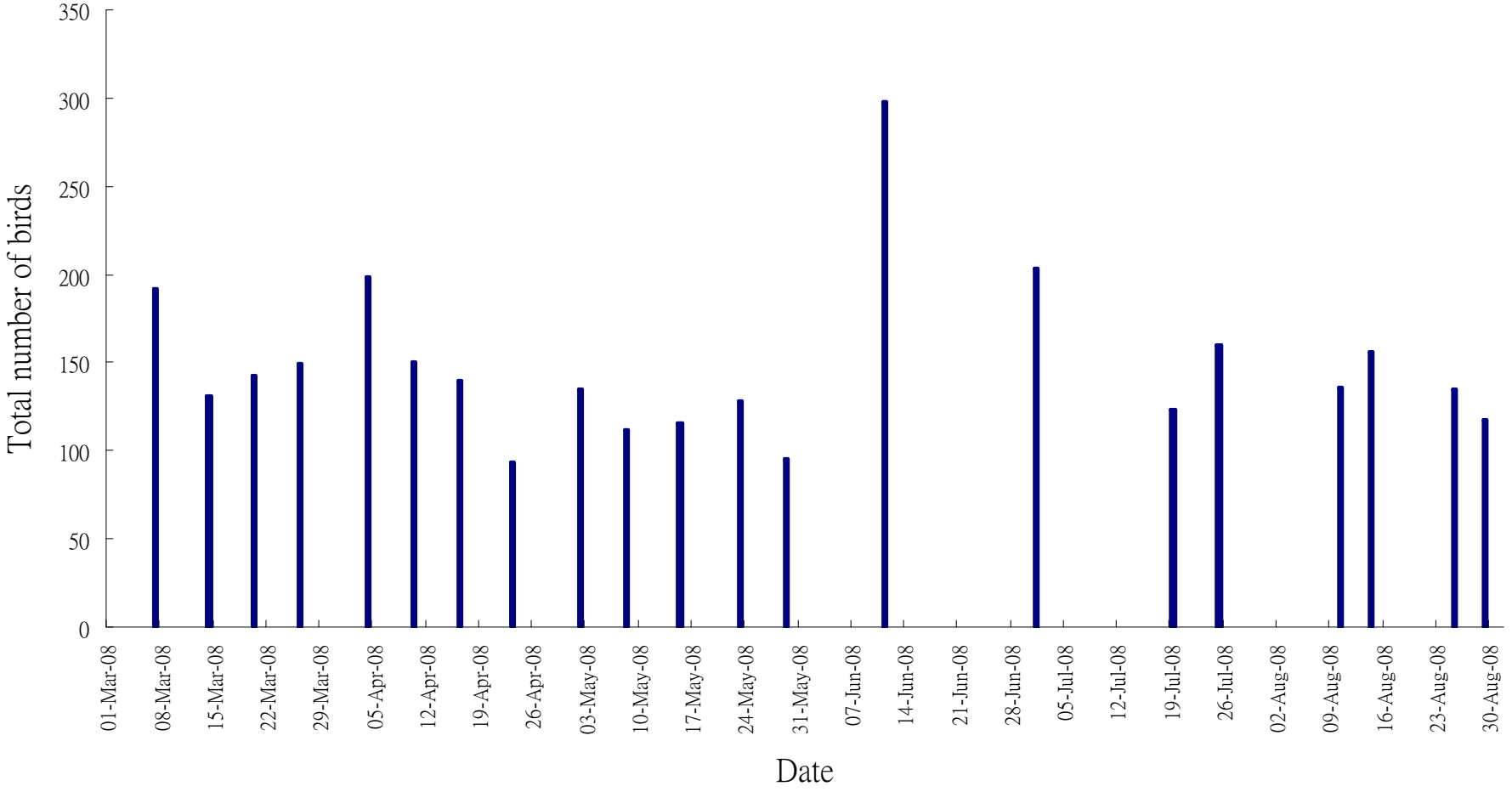

Figure 6. Total number of birds recorded in the northern part of Long Valley from March 2008 to August 2008.

Appendix 1. Total numbers, numbers of species and diversity indices (Shannon index) of birds counted in the core part of Long Valley, spring 2006, 2007 and 2008.

Spring 2006				Spring 2007				Spring 2008			
Date	Total no.	No. of species	Index	Date	Total no.	No. of species	Index	Date	Total no.	No. of species	Index
2 Mar	329	31	2.65	1 Mar	423	43	3.11	7 Mar	474	46	3.21
9 Mar	272	36	2.67	8 Mar	579	37	2.75	14 Mar	528	46	3.01
16 Mar	317	33	2.87	15 Mar	395	47	3.02	20 Mar	347	37	3.06
23 Mar	240	35	1.94	22 Mar	456	37	2.65	26 Mar	478	39	2.83
29 Mar	282	33	2.94	29 Mar	443	32	2.79	4 Apr	500	51	3.30
7 Apr	312	32	2.67	4 Apr	318	37	2.93	10 Apr	339	48	3.20
13 Apr	275	32	2.77	12 Apr	304	34	2.98	16 Apr	285	47	3.01
19 Apr	353	30	2.35	18 Apr	251	34	3.04	23 Apr	190	40	3.20
27 Apr	349	26	1.59	26 Apr	293	35	2.76	2 May	370	37	2.83
4 May	191	27	1.91	3 May	220	25	2.56	8 May	171	34	3.11
10 May	137	26	2.85	10 May	316	25	2.30	15 May	134	27	2.88
19 May	87	15	2.42	17 May	248	19	1.98	23 May	152	30	2.99
25 May	117	16	2.44	24 May	93	15	2.42	29 May	126	30	3.06
				31 May	124	21	2.94				
Mean (SD)	251 (90)	28.6 (6.61)	2.47 (0.42)		319 (132)	31.5 (9.25)	2.72 (0.34)		315 (150)	39.4 (7.77)	3.05 (0.15)

Appendix 2. Total numbers, numbers of species and diversity indices (Shannon index) of birds counted in the core part of Long Valley, summer 2006, 2007 and 2008.

Summer 2006				Summer 2007				Summer 2008			
Date	Total no.	No. of species	Index	Date	Total no.	No. of species	Index	Date	Total no.	No. of species	Index
1 Jun	365	25	1.83	7 Jun	166	18	2.04	11 Jun	73	22	2.71
8 Jun	227	18	1.93	16 Jun	152	19	1.78	1 Jul	169	28	2.96
15 Jun	298	26	1.80	21 Jun	197	21	2.08	19 Jul	253	31	2.83
22 Jun	185	20	2.32	30 Jun	164	22	2.41	25 Jul	176	24	2.68
2 Jul	47	14	2.38	5 Jul	207	25	2.76	10 Aug	266	28	2.76
9 Jul	59	16	2.60	13 Jul	280	27	3.01	14 Aug	230	24	2.59
13 Jul	96	22	2.77	18 Jul	291	32	2.69	25 Aug	363	31	2.90
20 Jul	68	20	2.73	25 Jul	301	32	3.07	29 Aug	452	29	2.69
27 Jul	211	20	2.18	2 Aug	325	31	2.71				
5 Aug	180	27	2.61	11 Aug	592	32	2.70				
11 Aug	174	25	2.65	16 Aug	403	29	2.69				
17 Aug	113	21	2.41	23 Aug	433	38	2.88				
24 Aug	202	25	2.40	30 Aug	396	31	2.72				
30 Aug	143	26	2.70								
Mean (SD)	169 (91.1)	21.8 (4.04)	2.38 (0.33)		301 (130)	27.5 (6.05)	2.58 (0.39)		248 (118)	27.1 (3.40)	2.77 (0.12)

Appendix 3. Total numbers, numbers of species and diversity indices (Shannon index) of birds counted in agricultural fields in the northern part of Long Valley, spring and summer 2008.

Spring 2008				Summer 2008			
Date	Total no.	No. of species	Index	Date	Total no.	No. of species	Index
7 Mar	192	30	2.92	11 Jun	298	33	2.31
14 Mar	131	28	3.04	1 Jul	203	29	2.95
20 Mar	130	36	3.32	19 Jul	123	22	2.39
26 Mar	149	33	3.16	25 Jul	160	25	2.73
4 Apr	199	35	3.12	10 Aug	135	32	3.13
10 Apr	130	41	3.39	14 Aug	156	32	3.14
16 Apr	140	37	3.26	25 Aug	135	28	2.99
23 Apr	94	29	3.11	29 Aug	118	28	2.88
2 May	135	31	3.07				
8 May	111	29	3.06				
15 May	116	26	2.90				
23 May	128	29	2.96				
29 May	95	27	2.96				
Mean (SD)	135 (31.5)	31.6 (4.46)	3.10 (0.15)		166 (59.8)	28.6 (3.78)	2.82 (0.32)

Appendix 4. Total numbers, numbers of species and diversity indices (Shannon index) of birds counted in the *feng-shui* wood in Ho Sheung Heung, spring and summer 2008.

Spring 2008				Summer 2008			
Date	Total no.	No. of species	Index	Date	Total no.	No. of species	Index
7 Mar	79	19	2.48	11 Jun	48	12	2.13
14 Mar	89	18	2.48	1 Jul	52	12	2.13
20 Mar	98	15	2.16	19 Jul	21	12	1.54
26 Mar	53	13	2.10	25 Jul	48	10	2.16
4 Apr	85	15	2.42	10 Aug	53	12	2.16
10 Apr	105	17	2.44	14 Aug	61	12	2.06
16 Apr	73	16	2.47	25 Aug	67	13	2.19
23 Apr	88	19	2.59	29 Aug	39	10	1.99
2 May	49	12	2.05				
8 May	79	20	2.67				
15 May	73	16	2.49				
23 May	67	15	2.40				
29 May	56	11	2.02				
Mean (SD)	76.5 (17.1)	15.8 (2.76)	2.37 (0.21)		48.6 (14.0)	11.6 (1.06)	2.05 (0.21)

Appendix 5. Total numbers of birds in fields adopted with pilot conservation management agreement projects by HKBWS and CA (Area of managed and unmanaged fields based on table 12), spring and summer 2008.

	Date	Total bird numbers in managed field	Total bird numbers in managed field per 10^5 sq.ft.	Total bird numbers in unmanaged field	Total bird numbers in unmanaged field per 10^5 sq.ft.
Spring	4 Apr	146	38.4	354	9.3
	10 Apr	70	18.4	271	7.1
	16 Apr	57	15.0	229	6.0
	23 Apr	28	7.4	165	4.3
	2 May	22	5.2	348	9.2
	8 May	47	11.1	124	3.3
	15 May	25	5.9	110	2.9
	23 May	35	8.2	117	3.1
	29 May	10	2.4	116	3.1
Mean (SD)		48.9 (40.9)	12.4 (10.9)	203.8 (100.3)	5.4 (2.6)
Summer	11 Jun	54	11.5	19	0.5
	1 Jul	44	8.7	127	3.4
	19 Jul	109	21.6	144	3.9
	25 Jul	54	10.7	122	3.3
	10 Aug	144	27.7	124	3.4
	14 Aug	89	17.1	143	3.9
	25 Aug	198	38.1	167	4.5
	29 Aug	186	35.8	266	7.2
Mean (SD)		109.8 (60.6)	21.4 (11.5)	139.0 (67.6)	3.8 (1.8)

Appendix 6. Lists of the managed SWH during spring and summer 2008.

Month	Managed Fields
March	Nil
April	39a, 44, 77, 78, 79, 136, 137, 224, 225, 226, 227, 229, 230, 238e, 238l, 238p, 238q, 307
May	39a, 44, 77, 78, 79, 136, 137, 224, 225, 226, 227, 229, 230, 238e, 238l, 238p, 238q, 307
June	39a, 44, 77, 78, 79, 136, 137, 224, 225, 226, 227, 229, 230, 238e, 238l, 238p, 238q, 307
July	39a, 44, 77, 78, 79, 123, 124, 125, 136, 137, 224, 225, 226, 227, 229, 230, 238e, 238f, 238g, 238l, 238p, 307
August	39a, 44, 77, 78, 79, 123, 124, 125, 136, 137, 224, 225, 226, 227, 229, 230, 238e, 238f, 238g, 238l, 238p, 238q, 307

Appendix 7. Lists of the managed WAL during spring and summer 2008.

Month	Managed Fields
March	Nil
April	49, 60, 218a, 218c, 241, 242, 257, 266, 267, 307, 308
May	49, 60, 218a, 218c, 241, 242, 257, 266, 267, 307, 308
June	49, 60, 218a, 218c, 241, 242, 257, 266, 267, 307, 308
July	49, 60,125, 218a, 218c, 238b, 238h, 241, 242, 257, 266, 267, 307, 308
August	49, 60,125, 218a, 218c, 238b, 238h, 241, 242, 257, 264, 266, 267, 307, 308

Appendix 8. Lists of the managed fish ponds during spring and summer 2008.

Month	Managed Fields
March	Nil
April	Nil
May	223
June	223, 311

July	223, 311
August	223, 311

Appendix 9. Lists of the managed waterflea ponds during spring and summer 2008.

Month	Managed Fields
March	Nil
April	209, 210, 211, 221, 222
May	209, 210, 211, 221, 222
June	209, 210, 211, 221, 222
July	209, 210, 211, 221, 222
August	209, 210, 211, 221, 222

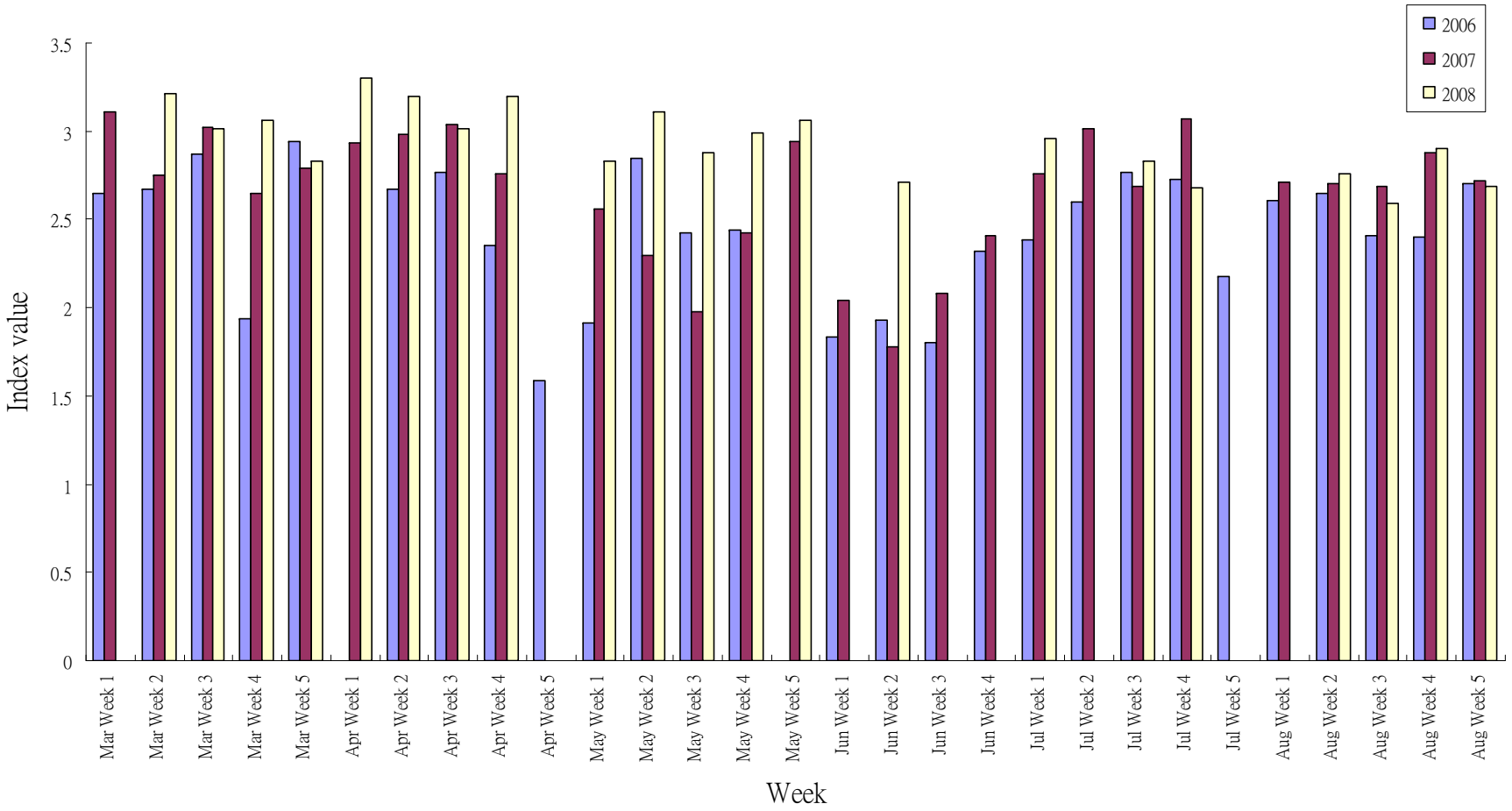

Figure 7. A weekly trend of Shannon Index of birds recorded in the core part of Long Valley area in springs and summers 2006 – 2008.

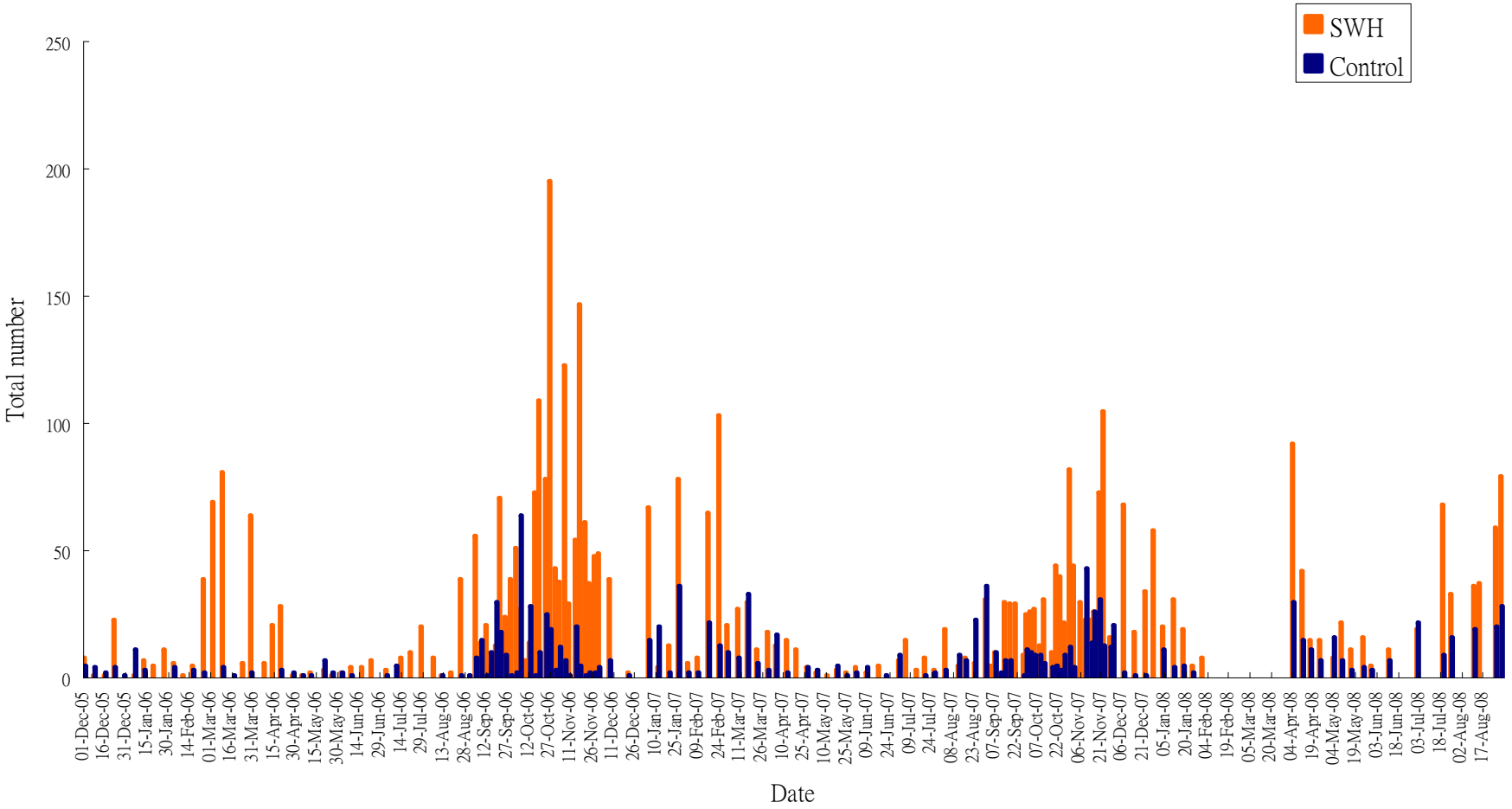

Figure 8. Total numbers of birds recorded in Shallow Water Habitat (SWH) in the core part of Long Valley from Dec 2005 to Aug 2008 (and the northern part after Apr 2008). Note: No management measure was taken from February 2008 to March 2008.

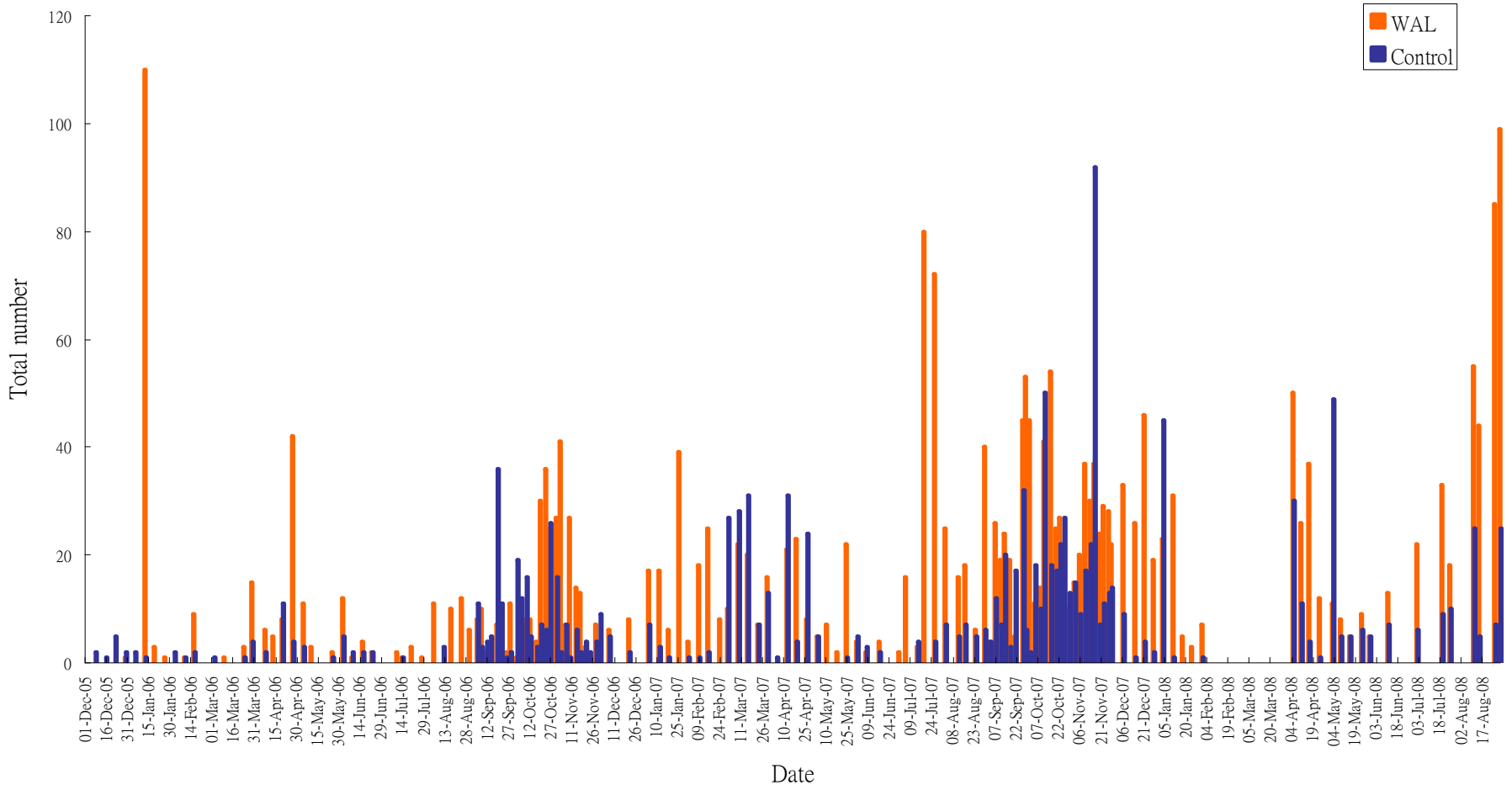

Figure 9. Total numbers of birds recorded in Wet Agricultural Lands (WAL) in the core part of Long Valley from Dec 2005 to Aug 2008 (and the northern part after Apr 2008). Note: No management measure was taken from February 2008 to March 2008

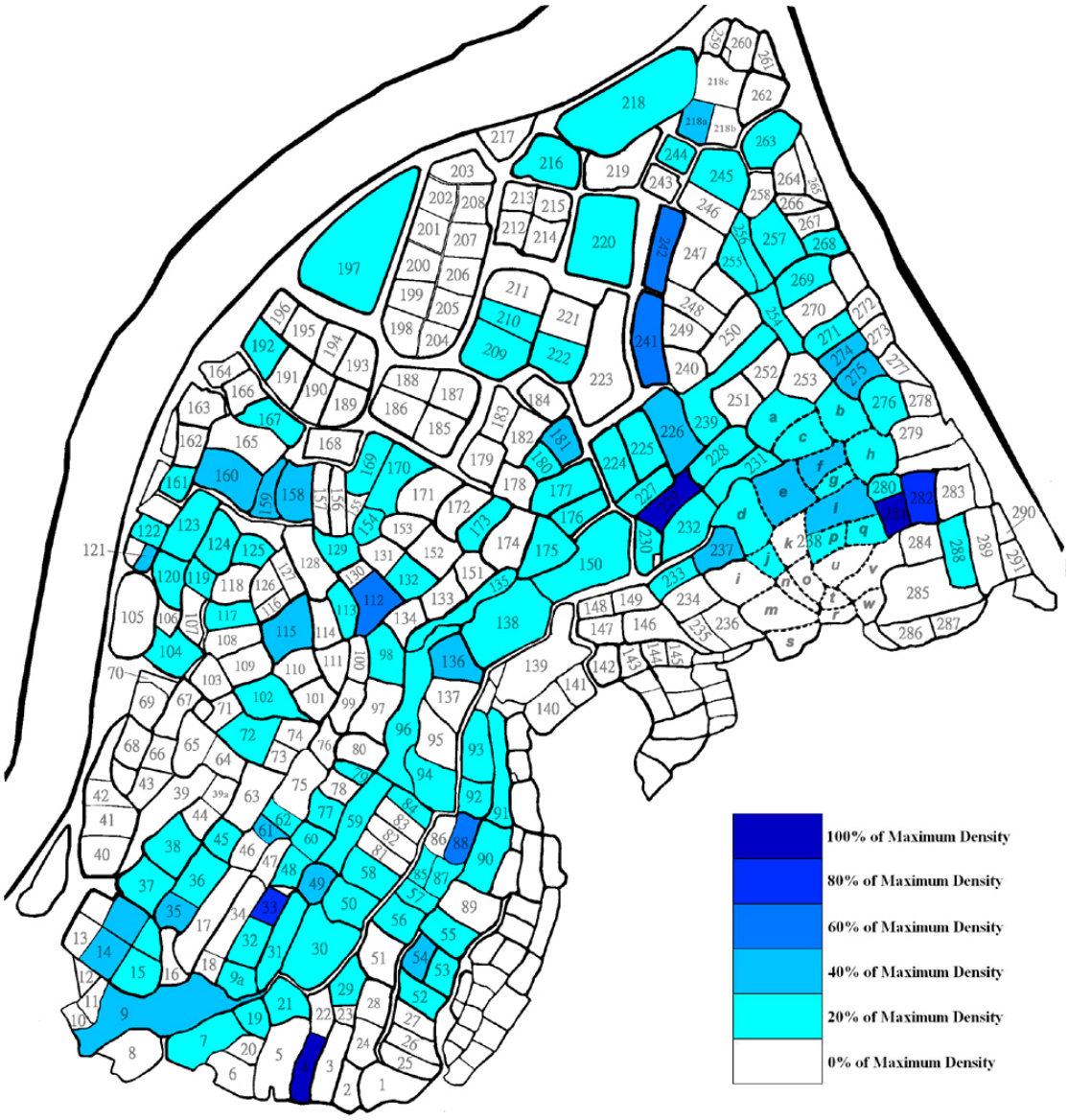

Figure 10. Distribution map of Ardeids in the core part of Long Valley during spring and summer 2008.

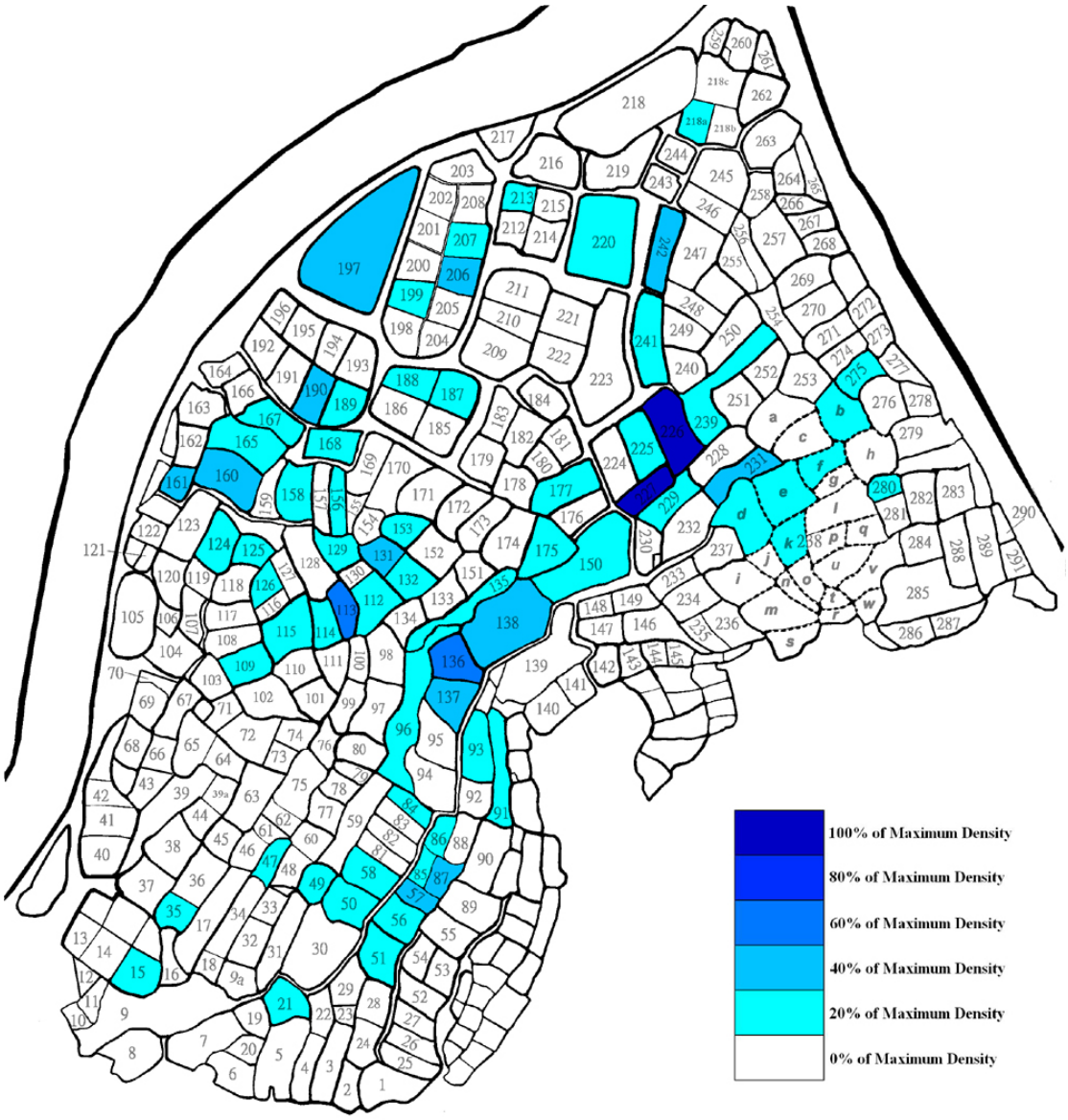

Figure 11. Distribution map of *Gallinago* sp. in the core part of Long Valley during spring and summer 2008.

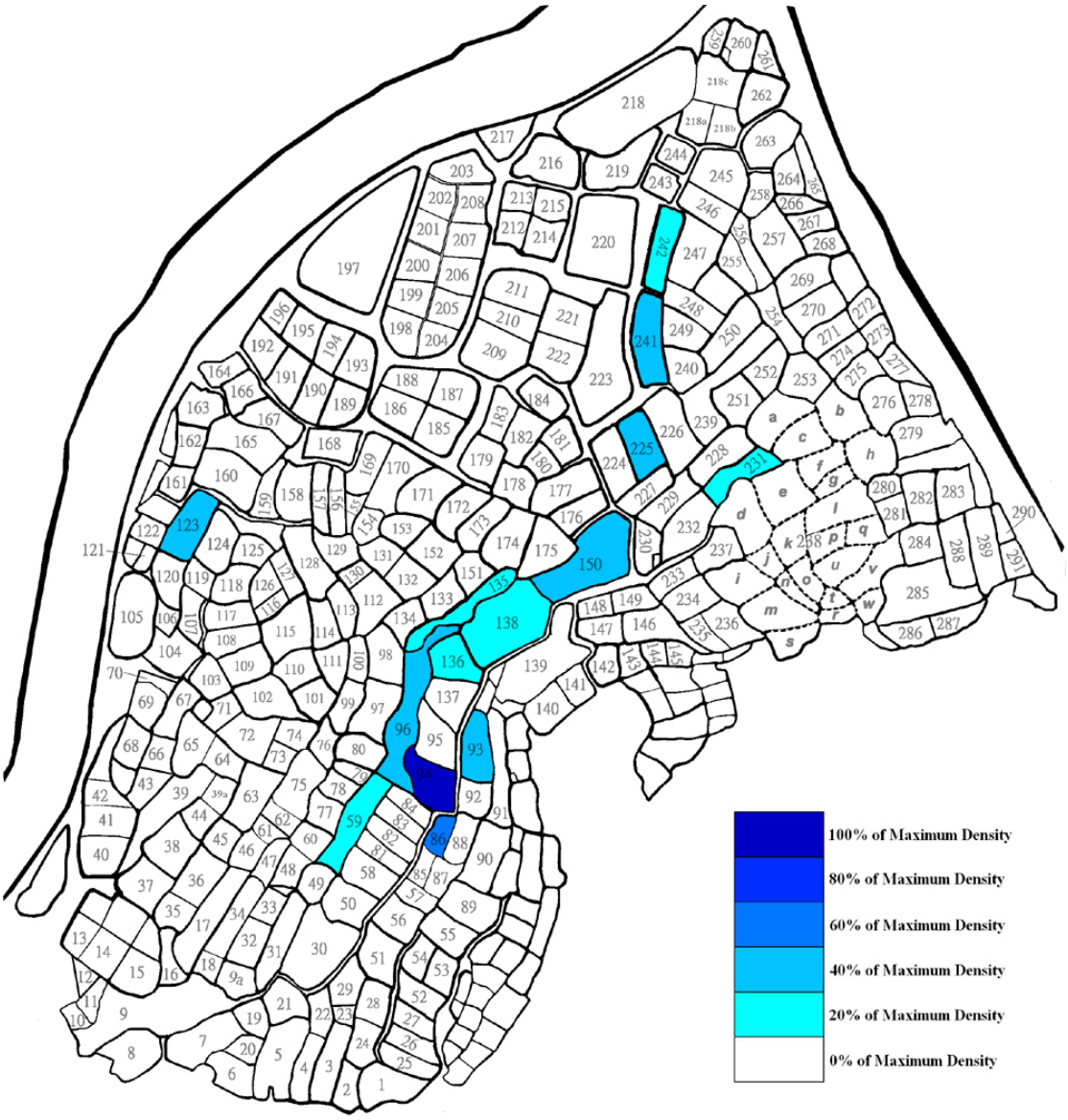

Figure 12. Distribution map of Greater Painted Snipe in the core part of Long Valley during spring and summer 2008.

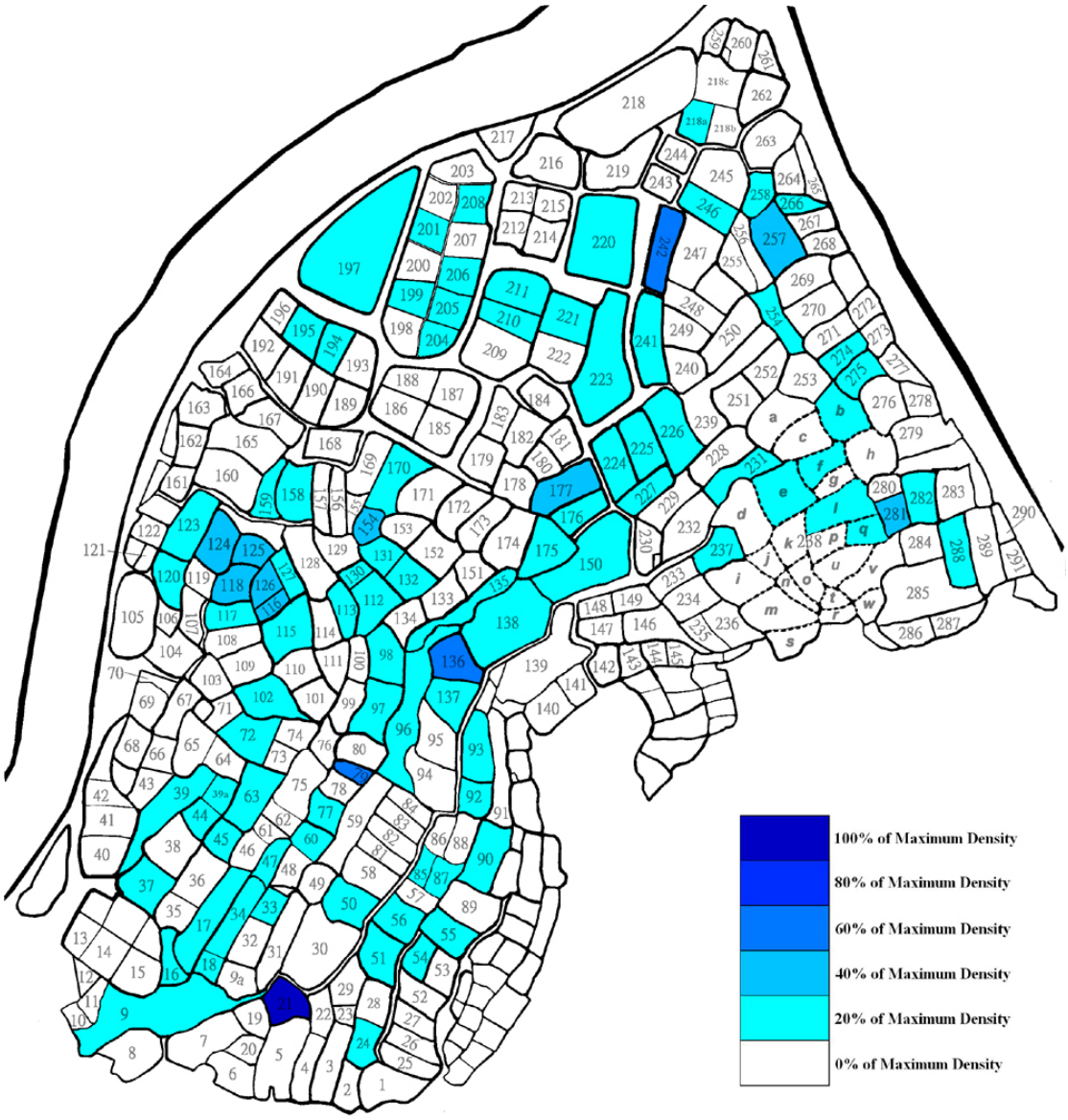

Figure 13. Distribution map of waders in the core part of Long Valley during spring and summer 2008.

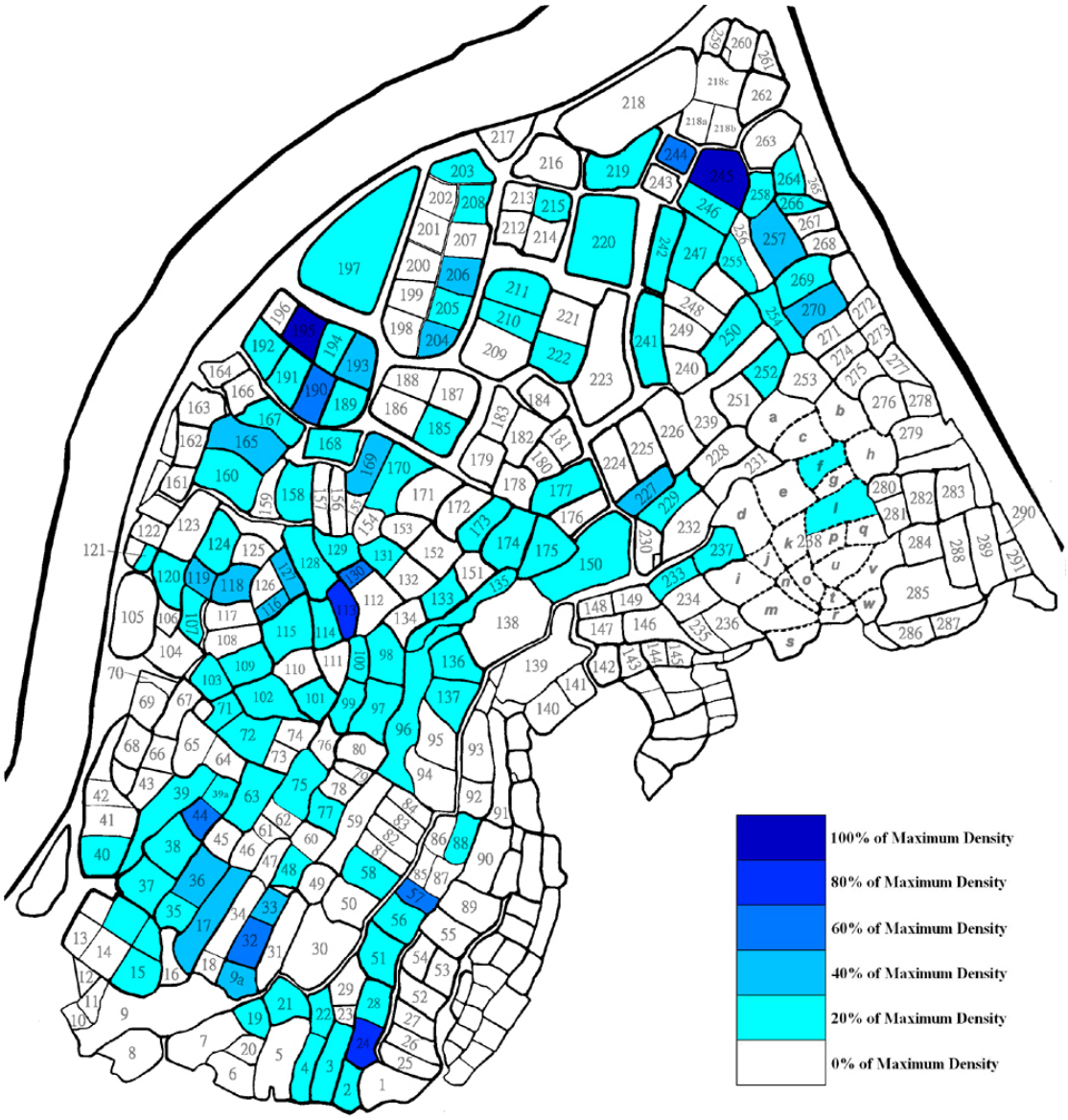

Figure 14. Distribution map of wagtail in the core part of Long Valley during spring and summer 2008.

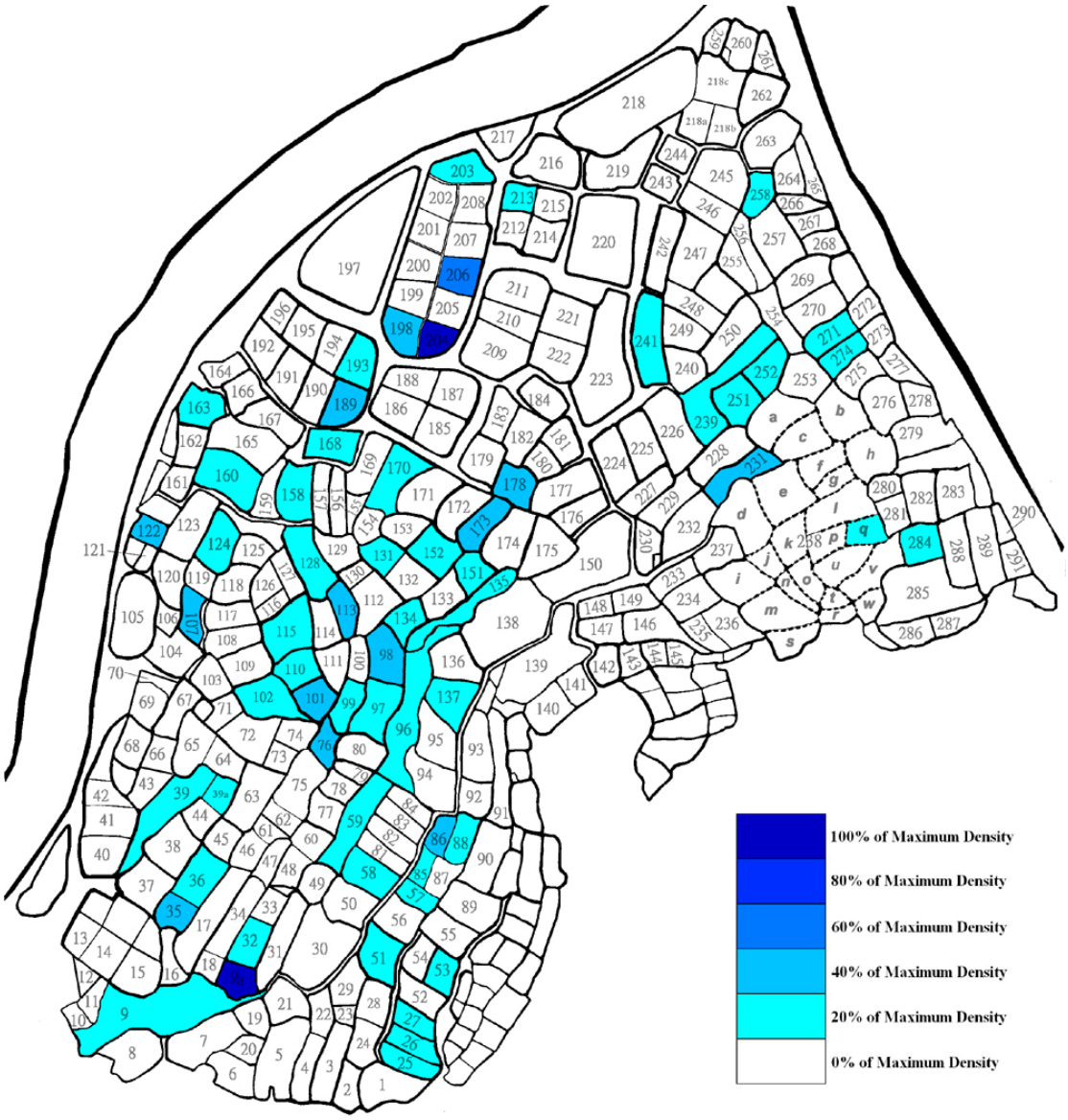

Figure 15. Distribution map of pipits in the core part of Long Valley during spring and summer 2008.

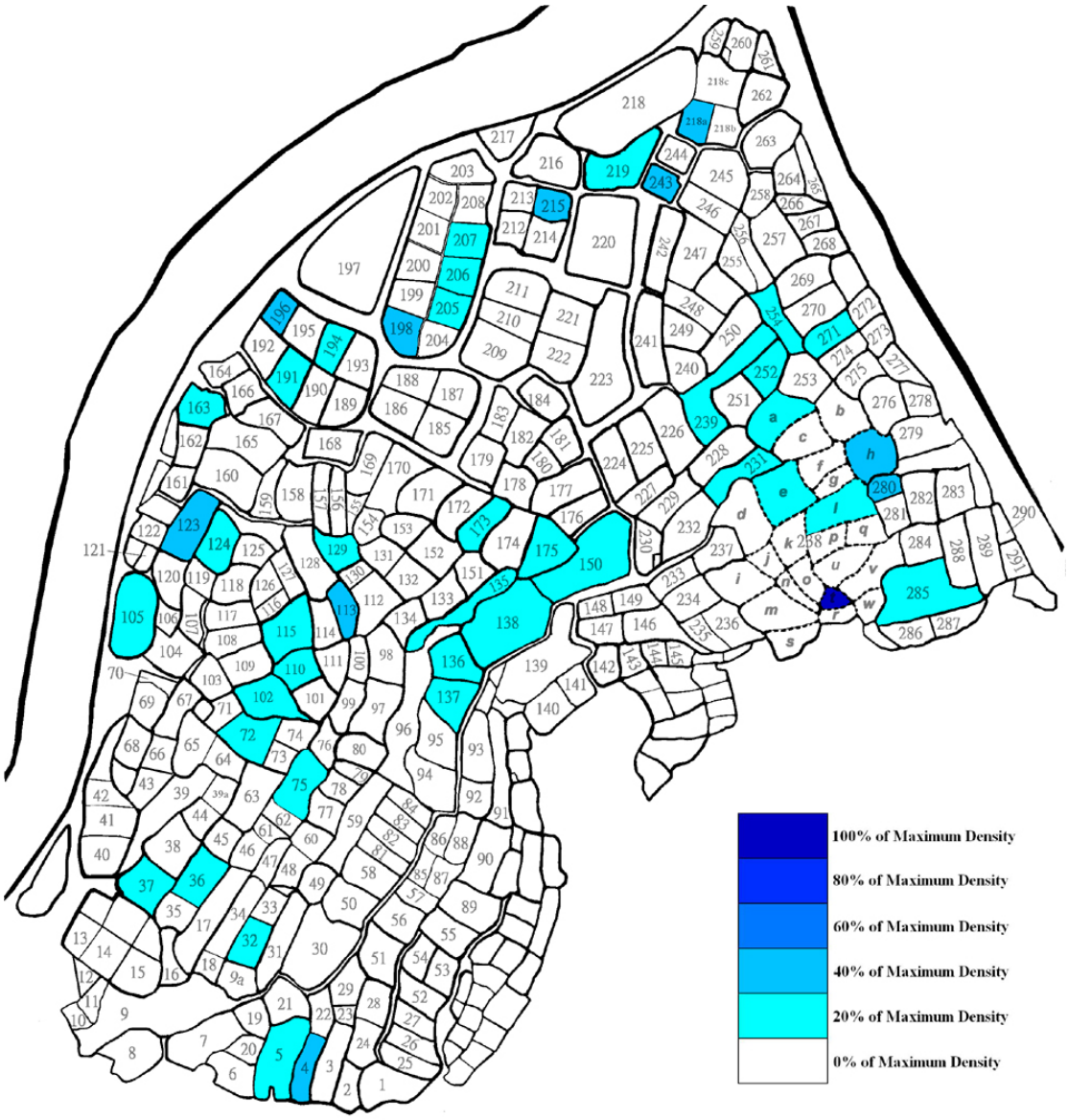

Figure 16. Distribution map of stonechat in the core part of Long Valley during spring and summer 2008.