

The Status of Wintering Avifauna in Eastern Areas of Jeju Island

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Abstract: This study was conducted from November 2008 to March 2009. Three eastern areas of Jeju (Hado-ri wintering area, Jongdal-ri and Siheung-ri coastal area, Seongsanpo wintering area) were examined. A total of 12,411 individuals of 79 species were observed in the three areas. By region, the fish farm in Hado-ri was observed to have 5,479 individuals of 55 species, Jongdal-ri and Siheung-ri coastal area 1,669 individuals of 46 species and the fish farm in Seongsanpo 5,253 individuals of 60 species. The dominant species were *Anas strepera* with 3,870 individuals (31.18%), followed by *Anas penelope* with 1,572 individuals (12.67%), *Anas poecilorhyncha* with 1,410 individuals (11.36%), *Fulica atra* with 942 individuals (7.59%), and *Larus argentatus* with 742 individuals (5.98%). For species diversity, Seongsanpo fish farm was 2.77, Jongdal-ri and Siheung-ri coastal area 2.59 and Hado-ri fish farm 2.05. The natural monuments were six species like *Platalea minor*, *Platalea leucorodia*, *Aix galericulata*, *Circus spilonotus*, *Falco peregrinus*, and *Falco tinnunculus*. The endangered species designated by the Ministry of Environment were seven species: *Platalea minor*, *Platalea leucorodia*, *Circus spilonotus*, *Falco peregrinus*, *Pandion haliaetus*, *Buteo buteo*, and *Anser fabalis*.

Key words: Avifauna, Jeju Island, Dominant species, Species diversity

Introduction

Jeju Island including its neighboring islands, both inhabited and uninhabited, served as a habitats for birds that lived on littoral and sea environment and as a stopover for migratory birds (Kim, 2007). In particular, the littoral swamp stretching across Hado-ri, Jongdal-ri, Siheung-ri, Ojo-ri and Seongsan-ri is the largest area in Jeju Island and a vast playground and resting place for waterfowls, so many research and studies have been constantly conducted in the area (Park and Kim, 1981; Park and Yang, 1988; Kim, 1985; Kim et al., 1998; Kang et al., 1995; Kim et al., 1996; Park and Kim, 1997; Park et al., 1999; Oh, 2004; Kim and Oh, 2006).

The coastal area stretching from Hado-ri to Ojo-ri is an important wintering place for the endangered *Platalea minor* and other winter birds and at the same time, it is the very workplace for local residents. It is very important as an educational place and a workplace from an ecological perspective, since it has good ecological conditions that form the ecological network of human, migratory birds and swamp. When Seongsan Ilchulbong (Sunrise Peak) was designated as a UNESCO World Heritage Site in June 2007, much attention was paid to natural resources around

Seongsanpo. Therefore, this study was intended to provide basic data and information for the exploration and protection of the resources by researching birds around Seongsan Ilchulbong (Sunrise Peak).

Target Regions and Method

The studied areas were Hado-ri wintering area (A), the coastal area in Jongdal-ri and Siheung-ri, and Seongsanpo wintering area (C) in the eastern part of Jeju Island (Fig. 1). The study was conducted twice a month from Nov. 2008 to Mar. 2009. Line census and spot census were used together (Bibby et al., 1992) and a pair of binoculars (Nikon 10×25) and a telescope (Nikon, 40×) were used.

Dominant species (Simpson, 1949) and species diversity (Shannon, 1949) were examined on the entire species that appeared in the study area. The reference data was the largest number of individuals observed during a one-time study. The following is the analysis method.

1) Dominance (Dom.)

$$D(\%) = (n_i/N) \times 100$$

(n_i : number of individuals in the species, N : total number of individuals in survey area)

2) Species Diversity (H')

$$H' = -\sum (n_i/N) \times \ln(n_i/N)$$

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Table 1. The List of observed birds at the three wintering areas from Nov. 2008 to Feb, 2009.

No.	Scientific name	Korean name	Hado-ri			Jongdal-ri and Siheung-ri			Seongsanpo wintering area			Total	Dom.															
			Nov.	Dec.	Jan.	Feb.	Mar.	Max.	Dom.	Nov.	Dec.			Jan.	Feb.	Mar.	Max.	Dom.										
1	<i>Gavia stellata</i>	아비				1	1	<1.00				1	<1.00		0	0	2	<1.00										
2	<i>Gavia pacifica</i>	회색머리아비				1	1	<1.00				0			0	0	1	<1.00										
3	<i>Podiceps ruficollis</i>	논병아리	18	14	34	6	16	34	<1.00	4	2	3	4	4	<1.00	155	2.95	193	1.56									
4	<i>Podiceps cristatus</i>	빨논병아리						0	<1.00	3	3				3	<1.00	0		3	<1.00								
5	<i>Podiceps nigricollis</i>	검은목논병아리	61	24	21	3	61	1.11	<1.00	23	57	83	58	7	83	4.97	144	63	79	46	6	144	2.74	288	2.32			
6	<i>Phalarocorax capillatus</i>	가마우지						0	<1.00	23	25	24	13	25	1.50	2	<1.00	27	<1.00									
7	<i>Phalarocorax pelagicus</i>	쇠가마우지				1	1	<1.00							0		0	1	<1.00									
8	<i>Nycticorax nycticorax</i>	해오라기						1	<1.00						0		0	1	<1.00									
9	<i>Ardeola bacchus</i>	흰날개해오라기	1	17	7	8	17	<1.00	<1.00	1	3	4	10	2	10	<1.00	5	1	12	10	1	12	<1.00	39	<1.00			
10	<i>Egretta alba modesta</i>	중대백로	10	1	6	3	1	10	<1.00	1	2	7	3		7	<1.00	4	2	2	2	8	8	<1.00	25	<1.00			
11	<i>Egretta garzetta</i>	쇠백로	3					3	<1.00		2	2	1	2	<1.00	4		4		4		4	<1.00	9	<1.00			
12	<i>Egretta sacra</i>	흑로	23	11	7	7	4	23	<1.00	7	8	6	2	1	8	<1.00	34	24	19	13	5	34	<1.00	65	<1.00			
13	<i>Ardea cinerea</i>	왜가리	6	10	9	8	10	<1.00							0	16	14	15	16	10	16	16	<1.00	26	<1.00			
14	<i>Platalea minor</i>	저어새	2	2	2	2	2	2	<1.00						0									2	<1.00			
15	<i>Platalea leucorodia</i>	노랑부리저어새	30	68	76	76	76	1.39							0									1	<1.00	77	<1.00	
16	<i>Anser fabalis</i>	큰기러기	75	138	63	39	138	2.52							0									80	1.52	218	1.76	
17	<i>Tadorna tadorna</i>	흑부리오리						1	<1.00						0									0		1	<1.00	
18	<i>Aix galericulata</i>	원앙	1	35	34	223	47	10	223	4.07	2	13	15	15	15	<1.00	232	312	360	220	199	360	6.84	598	4.82			
19	<i>Anas platyrhynchos</i>	청둥오리	785	249	383	266	102	785	14.33	8	86	114	36	10	114	6.83	31	340	511	139	22	511	9.71	1410	11.36			
20	<i>Anas poecilorhyncha</i>	흰뺨검둥오리	1	7	21			21	<1.00		1	3			3	<1.00	6	6	4	4	26	26	<1.00	50	<1.00			
21	<i>Anas crecca</i>	쇠오리						0							0									1	<1.00	1	<1.00	
22	<i>Anas formosa</i>	가장오리						6	<1.00		2	17			17	1.02	21	45	53	21	16	53	1.01	76	<1.00			
23	<i>Anas falcata</i>	청머리오리	6	2368	2043	2235	490	122	2368	43.22	5	6	42	343	3	343	22.02	95	721	956	1159	171	1159	22.02	3870	31.18		
24	<i>Anas strepera</i>	알락오리	679	553	240	114	68	679	12.39	62	265	254			55	265	11.93	272	451	618	628	148	628	11.93	1572	12.67		
25	<i>Anas penelope</i>	홍머리오리						0							0									1	<1.00	1	<1.00	
26	<i>Anas americana</i>	아메리카홍머리오리						0							0									1	<1.00	1	<1.00	
27	<i>Anas acuta</i>	고방오리	11	5	37	9	4	37	<1.00						4	4	<1.00	36	108	72	66	43	108	2.05	149	1.20		
28	<i>Anas clypeata</i>	넓적부리	25	25	93	42	5	93	1.70		14	10			14	<1.00	47	67	55	104	218	218	4.14	325	2.62			
29	<i>Aythya ferina</i>	흰죽지	22	30	40	59	29	59	1.08	22					29	1.74	119	87	120	76	35	120	2.28	208	1.68			
30	<i>Aythya fuligula</i>	맹기흰죽지	39	50	70	106	127	127	2.32		31	24	3		31	1.86	114	219	208	99	102	219	4.16	377	3.04			
31	<i>Aythya marila</i>	검은머리흰죽지						2	<1.00	14	20	6			20	1.20	5	7	34	19	7	34	<1.00	56	<1.00			
32	<i>Bucephala clangula</i>	흰뺨오리						12	<1.00	2	2				2	<1.00	6	17	36	23	36	36	<1.00	50	<1.00			
33	<i>Mergus serrator</i>	바다비오리						0			4	36	42		42	2.52							0		42	<1.00		
34	<i>Mergus mergamser</i>	비오리	9	19	15	4	19	<1.00			2	1	3		3	<1.00	8	19	6	1	19	19	<1.00	41	<1.00			
35	<i>Pandion haliaeetus</i>	물수리	3	1	1	1	1	3	<1.00	3	2	4	2		4	<1.00	2	6	1	1	1	6	<1.00	13	<1.00			
36	<i>Circus spilonotus</i>	개구리매						0							0								1	<1.00	1	<1.00		
37	<i>Buteo buteo</i>	밀뚱가리	1					1	<1.00						0								0		0	1	<1.00	
38	<i>Falco peregrinus</i>	매						0							1	<1.00							0		0	1	<1.00	
39	<i>Falco tinnunculus</i>	황조롱이						0			1	3	2		3	<1.00	1				1	1	<1.00	4	<1.00			
40	<i>Fallica atra</i>	물닭	518	334	344	353	268	518	9.45	11	16	49	79		79	4.73	111	345	290	326	110	345	6.56	942	7.59			
41	<i>Gallinula chloropus</i>	쇠물닭	1	3	4			4	<1.00						0								0		0		4	<1.00

Table 1. Continued

No.	Scientific name	Korean name	Jongdal-ri and Sihung-ri												Seongsampo wintering area						Total	Dom.				
			Hado-ri						Jongdal-ri and Sihung-ri						Seongsampo wintering area											
			Nov.	Dec.	Jan.	Feb.	Mar.	Max.	Dom.	Nov.	Dec.	Jan.	Feb.	Mar.	Max.	Dom.	Nov.	Dec.	Jan.	Feb.	Mar.	Max.	Dom.			
42	<i>Vanellus vanellus</i>	댕기물떼새	10	2	9	22	<1.00	0	<1.00	0	16	<1.00	0	0	0	<1.00	0	0	0	0	0	0	0	22	<1.00	
43	<i>Charadrius alexandrinus</i>	황물떼새				10	<1.00	0	<1.00	0	16	<1.00	0	0	0	<1.00	0	0	0	0	0	0	0	16	<1.00	
44	<i>Charadrius dubius</i>	꼬마물떼새			12	10	<1.00	10	<1.00															10	<1.00	
45	<i>Calidris alpina</i>	민물도요					<1.00	12	<1.00	15	25	3.30	4	8	55	3.30	4	8	8	3	3	3	3	<1.00	75	<1.00
46	<i>Tringa totanus</i>	붉은발도요			1	1	<1.00	0	<1.00	0	0	0	1	1	0	0	1	1	1	1	1	1	1	<1.00	3	<1.00
47	<i>Actitis hypoleucos</i>	깎작도요				2	<1.00	2	<1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<1.00	2	<1.00
48	<i>Limosa lapponica</i>	큰뺨부리도요					<1.00	0	<1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<1.00	2	<1.00
49	<i>Numenius arquata</i>	마도요					<1.00	0	<1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<1.00	1	<1.00
50	<i>Larus argentatus</i>	채갈매기					<1.00	0	<1.00	13	4	192	302	320	320	19.17	70	64	422	184	60	422	8.02	742	<1.00	
51	<i>Larus schistisagus</i>	큰재갈매기					<1.00	0	<1.00	0	2	6	5	6	6	<1.00	5	5	2	2	2	2	2	<1.00	11	<1.00
52	<i>Larus heuglini</i>	줄무늬노랑발 갈매기					<1.00	0	<1.00	0	0	0	0	0	0	<1.00	0	0	2	2	2	2	2	<1.00	2	<1.00
53	<i>Larus crassirostris</i>	팽이갈매기	3	2	5	4	<1.00	5	<1.00	2	2	95	3	2	95	<1.00	380	20	167	70	380	7.22	475	<1.00		
54	<i>Streptopelia orientalis</i>	멧비둘기	1	1	2	2	<1.00	2	<1.00	0	0	0	0	0	0	<1.00	5	7	2	9	5	9	9	<1.00	17	<1.00
55	<i>Alcedo atthis</i>	물총새					<1.00	0	<1.00	0	0	0	0	0	0	<1.00	0	1	1	1	1	1	1	<1.00	3	<1.00
56	<i>Alauda arvensis</i>	중다리					<1.00	0	<1.00	0	0	0	0	0	0	<1.00	0	0	0	0	0	0	0	<1.00	1	<1.00
57	<i>Motacilla lugens</i>	백할미새	1	1	1	1	<1.00	1	<1.00	1	1	<1.00	4	3	3	<1.00	4	3	3	2	2	4	<1.00	6	<1.00	
58	<i>Motacilla grandis</i>	검은등할미새					<1.00	0	<1.00	0	1	<1.00	1	1	1	<1.00	1	1	1	1	1	1	1	<1.00	1	<1.00
59	<i>Motacilla flava</i>	긴발톱할미새					<1.00	0	<1.00	0	0	<1.00	0	0	0	<1.00	0	1	1	1	1	1	1	<1.00	1	<1.00
60	<i>Motacilla citreola</i>	노랑할미새					<1.00	5	<1.00	0	0	<1.00	0	0	0	<1.00	0	0	0	0	0	0	0	<1.00	5	<1.00
61	<i>Anthus rubescens</i>	발중다리	1				<1.00	1	<1.00	8	8	<1.00	9	7	6	<1.00	9	7	6	6	9	9	<1.00	18	<1.00	
62	<i>Anthus hodgsoni</i>	횡등새					<1.00	0	<1.00	0	0	<1.00	1	1	1	<1.00	1	1	2	2	2	2	<1.00	2	<1.00	
63	<i>Hypisypetes amaurotis</i>	작박구리	5	2	3	7	<1.00	1	<1.00	0	0	<1.00	3	2	4	<1.00	3	2	4	4	4	4	<1.00	11	<1.00	
64	<i>Lanius schach</i>	긴꼬리떼까치					<1.00	0	<1.00	0	0	<1.00	0	0	0	<1.00	0	0	1	1	1	1	<1.00	1	<1.00	
65	<i>Lanius bucephalus</i>	떼까치	1	1	1	2	<1.00	2	<1.00	1	2	<1.00	1	1	1	<1.00	1	1	1	2	2	2	<1.00	5	<1.00	
66	<i>Phoenicurus aureus</i>	딱새	2	1	1	2	<1.00	2	<1.00	1	1	<1.00	1	2	2	<1.00	1	2	1	2	2	2	<1.00	5	<1.00	
67	<i>Monticola solitarius</i>	바다직박구리	2	1	3	2	<1.00	3	<1.00	2	3	<1.00	4	1	1	<1.00	4	2	1	2	1	2	<1.00	9	<1.00	
68	<i>Turdus naumanni eunomus</i>	개동지빠귀					<1.00	0	<1.00	0	0	<1.00	0	0	0	<1.00	0	0	0	1	1	1	<1.00	1	<1.00	
69	<i>Turdus dauma</i>	호랑지빠귀					<1.00	0	<1.00	0	1	<1.00	1	1	1	<1.00	1	1	1	1	0	0	0	<1.00	1	<1.00
70	<i>Cettia diphone</i>	휘파람새					<1.00	1	<1.00	0	0	<1.00	0	1	2	<1.00	0	1	2	2	2	2	<1.00	4	<1.00	
71	<i>Parus major</i>	박새	1	3	1	3	<1.00	3	<1.00	0	0	<1.00	0	3	1	<1.00	0	3	1	2	3	3	<1.00	6	<1.00	
72	<i>Zosterops japonicus</i>	동박새					<1.00	0	<1.00	0	0	<1.00	0	0	0	<1.00	0	0	7	7	7	7	<1.00	7	<1.00	
73	<i>Emberiza cioides</i>	멧새	2	2	5	2	<1.00	2	<1.00	1	1	<1.00	2	1	2	<1.00	2	2	1	1	2	2	<1.00	5	<1.00	
74	<i>Emberiza elegans</i>	노랑턱멧새					<1.00	5	<1.00	0	0	<1.00	0	0	0	<1.00	0	7	5	11	2	11	<1.00	16	<1.00	
75	<i>Emberiza spodocephala</i>	축새					<1.00	0	<1.00	0	0	<1.00	0	0	0	<1.00	0	0	0	2	2	2	<1.00	2	<1.00	
76	<i>Carduelis sinica</i>	방울새	9	11	7	17	<1.00	5	<1.00	5	2	3	1	5	<1.00	8	7	15	11	9	15	15	<1.00	37	<1.00	
77	<i>Passer montanus</i>	참새	15	5	2	13	<1.00	3	<1.00	3	2	7	6	3	7	<1.00	5	10	18	2	9	18	<1.00	40	<1.00	
78	<i>Sturnus cineraceus</i>	찌르레기	2	2	5	5	<1.00	5	<1.00	5	5	<1.00	5	2	5	<1.00	5	5	5	0	0	0	<1.00	10	<1.00	
79	<i>Pica pica</i>	까치	9	12	4	8	<1.00	3	<1.00	3	2	3	5	2	5	<1.00	20	8	16	14	11	20	<1.00	37	<1.00	
Species			37	35	40	33	26	55	21	31	35	32	15	46	40	43	40	42	30	60	79					
Individuals			4696	3582	4083	1750	841	5479	206	581	1107	1002	422	1669	1990	3154	4277	3401	1233	5263	12411					
Species Diversity			1.57	1.57	1.82	2.28	2.14	2.05	2.43	2.03	2.57	2.03	0.96	2.59	2.69	2.55	2.55	2.31	2.48	2.71	2.55					

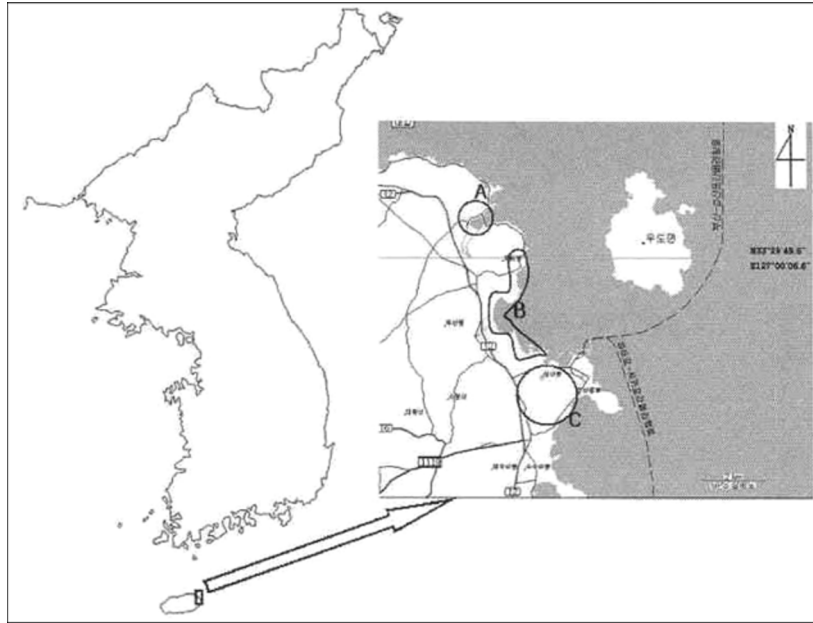


Fig. 1. The Map of survey areas (A: Hado-ri, B: Jongdal-ri and Siheung-ri, C : Seongsanpo).

Results and Discussion

As a result, a total of 12,411 individuals of 79 species were observed. By region, 5,479 individuals of 55 species were spotted in the fish farm in Hado-ri, 1,669 individuals of 46 species in the Jongdal-ri and Siheung-ri coastal area and 5,253 individuals of 60 species in the fish farm of Seongsanpo (Table 1). The dominant species were *Anas strepera* with 3,870 individuals (31.18%), followed by *Anas penelope* with 1,572 individuals (12.67%), *Anas poecilorhyncha* with 1,410 individuals (11.36%), *Fulica atra* with 942 (7.59%), and *Larus argentatus* with 742 individuals (5.98%). The number of individuals began to rise from November when birds started to prepare for the winter, and reached its peak in January. The fish farm in Hado-ri reached its peak in November. This is because winter migratory birds tend to flock together in Hado-ri at the beginning of arrivals. In particular, this trend was outstanding in the most dominant and second most dominant species, *Anas strepera* and *Anas penelope*. At the beginning of bird arrivals, the fish farm in Hado-ri showed much higher number of individual birds, but then the numbers of individuals increased in Siheung-Jongdal coastal area and the fish farm in Seongsanpo. This is because migratory birds arrived in Hado-ri first, then scattered around. Hado-ri showed a sharper drop in the number of wintering birds after February than Jongdal-ri and Siheung-ri coastal area and the fish farm in Seongsanpo. This can be attributable to the movement of early-arriving birds from Hado-ri to other areas, but it is presumed that many migratory birds flew to the breeding places via fish farm in Seongsanpo.

The fish farm in Seongsanpo showed the greatest species diversity of 2.77 followed by Jongdal-ri and Siheung-ri coastal areas (2.59) and Hado-ri (2.05). This is because specific species like *Anas strepera* and *Anas penelope*, the two most dominant species, occupied most of species diversity.

The natural monuments observed in the study were six species: *Platalea minor* (No. 205-1), *Platalea leucorodia* (No. 205-2), *Aix galericulata* (No. 327), *Circus spilonotus* (No. 323-3), *Falco peregrinus* (No. 323-7), and *Falco tinnunculus* (No. 324-3). The endangered species designated by the Ministry of Environment were seven species: *Platalea minor*, *Platalea leucorodia*, *Circus spilonotus*, *Falco peregrinus*, *Pandion haliaetus*, *Buteo buteo*, and *Anser fabalis*. (Table 1) The species constantly observed during the study period were five species: *Platalea minor*, *Platalea leucorodia*, *Anser fabalis*, *Pandion haliaetus*, and *Falco tinnunculus* while four species (*Aix galericulata*, *Circus spilonotus*, *Buteo buteo*, and *Falco peregrinus*) were observed only one time during the period.

The three study areas (Seongsanpo, Jongdal-ri and Siheung-ri, and Hado-ri) are thought to pose great importance to migratory birds that come to the eastern part of Jeju Island to pass the winter. Rare migratory birds including *Platalea minor*, tend to regularly arrive in the areas and the fish farms in Seongsanpo and Hado-ri are the northern tips of the wintering place for *Platalea minor*. In this study, maximum 26 individuals were found to pass the winter in these areas, which accounted for 1.3 percent of 2,041 individuals that were observed in the simultaneous monitoring of the wintering grounds across the world in January 2009. Thus, the study confirmed that the area was

an important wintering ground for *Platalea minor*. As the area needs to be preserved for *Platalea minor*, an endangered species, systemic protective measures are imperative in line with Seongsan Ilchulbong (Sunrise Peak), a UNESCO World Heritage Site.

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