



## Original article

# Characteristics of the birds community in the islands off the West Coast of Seogwipo City, Korea



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## ABSTRACTS

This study was conducted to survey the status of birds in islands off the west coast of Seogwipo City – Beomseom, Hyeongjeseom, Marado, and Gapado islands – in May and September 2013, as a part of the joint research of the Korean Biodiversity Consortium. As a result, 56 species were observed in those four islands: 167 individuals of 15 species on Beomseom, 79 individuals of 13 species on Hyeongjeseom, 193 individuals of 21 species on Gapado, and 354 individuals of 42 species on Marado; where seven threatened birds were confirmed to inhabit there. *Apus pacificus* is dominant on Beomseom, Hyeongjeseom, and Marado while *Passer montanus* is dominant on Gapado. Species diversity was highest on Marado (2.54) which was followed by Gapado and Beomseom (1.99) and Hyeongjeseom (1.82). These findings will be used as valuable data to protect the biota of the islands off Seogwipo including Beomseom that was a state-designated natural reserve.

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## Introduction

Jeju Special Self-governing Province was designated as one of the world biosphere reserves, the world natural heritage sites, and the global geoparks by United Nations Educational, Scientific and Cultural Organization is a region with superior biodiversity and landscape resources. Jeju Island has its own unique living creatures adapted to its unique environment as a volcanic island. The island is distributed of any and all plants zones ranging from warm-temperate forests to sub-alpine plants and maintains the ecological environment from seashore intertidal zones through parasitic cones (*oreum* in Jeju language), *gotjawal* (the world's one and only unique forests or volcanic topology on Jeju Island with tropical northern and southern limit plants co-existing), and valley forests to the forests zones in Hallasan Mountain (Kim et al., 2012). Particularly, since the island is located in the southernmost part of the Korean peninsula and used as a wintering, breeding, and middle

stopover for migratory birds, the survey findings in Jeju are given significant attention. Recently, biodiversity has sharply decreased due to climate change, reckless catching and collection, introduction of exotic species, destruction of habitats, and increase in pollution sources; among these factors, particularly; climate change is expected to have significant influence on the change in biota in a certain region. In this regard, Jeju Island would be an optimal place to monitor the movement of habitats of those birds that are assumed attributable to climate change and destruction of habitats.

This study was conducted as a part of the joint academic survey of the National Biodiversity Institutions Association in order to understand the status of birds that appear on and around the islands off the west coast of Seogwipo City – Beomseom Island, Hyeongjeseom Island, Marado Island, and Gapado Island – and to prepare the primary data to establish the protective measures to conserve biodiversity in case of the future climate change and so on. So far, the previous studies on the birds in the west coast areas of Seogwipo City were conducted, for example, by: Park (1990), Park and Oh (1991), Oh et al. (1994, 2002), Oh (2014), Park and Kim (1996), Kim (2001, 2008), Kim and Lee (2002), and Kim et al. (2010c).

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## Materials and methods

### Research sites

Research sites are the islands of Seogwipo City including Beomseom Island, Hyeongjeseom Island, Gapado Island, and Marado Island, all off the west coast of Seogwipo City (Figure 1).

Beomseom Island belongs to Beophwan-dong, Seogwipo, an uninhabited island 1.3 kilometers away from Beophwanpogu Port, which is long circle shape in a north-south direction with 440 m long between its east and west and 520 m long between its south and north on the area of 0.84 km<sup>2</sup>. The vegetation in the island includes: *Miscanthus sinensis*, *Machilus thunbergii*, *Castanopsis cuspidata* var. *sieboldii* and *Pinus thunbergii*. Hyeongjeseom Island belongs to Andeok-myeon, Seogwipo City, an uninhabited island 5.5 kilometers away from Sagyerihang Port, which consists of two islands in a north-south direction and the north one of which has the area of 48,061 m<sup>2</sup> and the south one of which is 4,945 m<sup>2</sup>. Its vegetation is rather sparse and its seashore consists of weathered shell and gravels. Gapado Island belongs to Daejeong-eup, Seogwipo, an inhabited island 2.2 kilometers away from Moseulpohang Port, which is 1.4 km long in a north-south direction and 1.5 km in an east-west direction on the area of 0.84 km<sup>2</sup>. In the middle of the island grow barleys while a coast road was paved along the seashore. Marado Island belongs to Daejeong-eup, Seogwipo, which is an inhabited island 7.8 kilometers south away from Moseulpohang Port in the southwest of Jeju Island as well as situated in the southernmost location of the Korean territory. The island forms longer in a north-south direction having east high west low topology. Marado Island is 500 m long in an east-west direction but 1,300 m long in a north-south direction on the area of 0.3 km<sup>2</sup>. Its coastline consists of sea cliff and a total of 24 sea caves have developed along its coastline (Kang, 2004). Most of the land is the plains consisting of grass while in the center of the island develop the colonies of *Pinus thunbergii* and *Miscanthus sinensis*.

### Method

The on-site and literature surveys were conducted in parallel: the on-site survey was conducted in a way to survey the species and

their number of individuals appearing on each island and surrounding waters before coming on shore and then to survey those while walking around each island or walking through narrow trails after coming on shore. The surveyors used the observation tools such as telescope (40×) and binoculars (10×) to grasp each species and the number of individuals in a way of naked eye examination, twittering, nasute, excrement and trace of nests, and check of bodies and so on. The survey period was from 27 May through 31 May, 2013 during spring and from 2 September through 6 September, 2014 during autumn.

When analyzing the community of individual populations, dominance value (Simpson, 1949) and species diversity (Shannon and Weaver, 1949) were analyzed on the entire appearing species; while the number of individuals by season was recorded of the largest number observed in the survey once regardless of the frequency of monthly surveys, in the following way.

#### 1) Dominance (Dom.)

Dom. =  $(n_i/N) \times 100(\%) / (n_i)$  (n<sub>i</sub>: Number of observed individuals of the i<sup>th</sup> species; N: Total number of individuals)

#### 2) Species Diversity (H')

H' =  $-\sum(n_i/N) \times \ln(n_i/N)$  (n<sub>i</sub>: Number of observed individuals of the i<sup>th</sup> species, N: Total number of individuals)

## Results and discussion

As a result, the species observed on four islands were a total of 56 species: 16 species and 167 individuals on Beomseom Island, 13 species and 79 individuals on Hyeongjeseom Island, 21 species and 193 individuals on Gapado Island, and 42 species and 354 individuals on Marado Island (Table 1). The species commonly observed on those four islands include 3 species such as: *Egretta sacra*, *Falco peregrinus*, *Apus pacificus*, *Hirundo rustica*, *Locustella pleskei*, and *Monticola solitarius* while the species observed only on one island include 35 species such as *Anas poecilorhyncha*, *Gavia stellata*, *Butorides striata*, *Bubulcus ibis*, *Egretta garzetta*, *Pernis ptilorhynchus*, *Accipiter soloensis*, *Butastur indicus*, *Himantopus himantopus*, *Actitis hypoleucos*, *Heteroscelus brevipes*, *Calidris subminuta*, *Calidris alpina*, *Synthliboramphus wumizusume*, *Columba janthina*, *Cuculus micropterus*, *Halcyon pileata*, *Alcedo atthis*, *Upupa epops*, *Oriolus chinensis*, *Dicrurus macrocercus*, *Terpsiphone atrocaudata*, *Cisticola juncidis*, *Urosphena*



Figure 1. The location map of the survey sites in Seogwipo City, Korea.

**Table 1**  
Birds observed in the western sites of Seogwipo city on Jeju island in 2013 (A: Beomseom, B: Hyeongjeseom, C: Gapado, D: Marado).

No.	Scientific name	Site A	Site B	Site C	Site D	Total	Dom.
1	<i>Anas poecilorhyncha</i>		7			7	0.88
2	<i>Gavia stellata</i>		1			1	0.13
3	<i>Ixobrychus sinensis</i>		1	1		2	0.25
4	<i>Butorides striata</i>			4		4	0.50
5	<i>Ardeola bacchus</i>			1		1	0.13
6	<i>Bubulcus ibis</i>				22	22	2.77
7	<i>Ardea cinerea</i>	1			1	2	0.25
8	<i>Egretta garzetta</i>				2	2	0.25
9	<i>Egretta sacra</i>	2	2	4	4	12	1.51
10	<i>Falco peregrinus</i>	1	5	2	2	10	1.26
11	<i>Pernis ptilorhynchus</i>				4	4	0.50
12	<i>Accipiter soloensis</i>				1	1	0.13
13	<i>Butastur indicus</i>				1	1	0.13
14	<i>Himantopus himantopus</i>				1	1	0.13
15	<i>Actitis hypoleucos</i>			2		2	0.25
16	<i>Heteroscelus brevipes</i>				8	8	1.01
17	<i>Chlidris subminuta</i>				2	2	0.25
18	<i>Calidris alpina</i>				12	12	1.51
19	<i>Synthliboramphus wumizusume</i>		1			1	0.13
20	<i>Columba janthina</i>	12				12	1.51
21	<i>Streptopelia orientalis</i>	4		2	1	7	0.88
22	<i>Cuculus micropterus</i>				1	1	0.13
23	<i>Cuculus canorus</i>			1	1	2	0.25
24	<i>Apus pacificus</i>	68	35	27	122	252	31.78
25	<i>Eurystomus orientalis</i>			3	1	4	0.50
26	<i>Halcyon pileata</i>		2			2	0.25
27	<i>Alcedo atthis</i>	1				1	0.13
28	<i>Upupa epops</i>				1	1	0.13
29	<i>Lanius bucephalus</i>	1			1	2	0.25
30	<i>Oriolus chinensis</i>			1		1	0.13
31	<i>Dicrurus macrocercus</i>				4	4	0.50
32	<i>Terpsiphone atrocaudata</i>				1	1	0.13
33	<i>Pica pica</i>			13	8	21	2.65
34	<i>Hirundo rustica</i>	6	16	30	19	71	8.95
35	<i>Cisticola juncidis</i>				16	16	2.02
36	<i>Microscelis amaurotis</i>	11		2	4	17	2.14
37	<i>Urosphena squameiceps</i>		1			1	0.13
38	<i>Cettia diphone</i>	7		2	2	11	1.39
39	<i>Locustella pleskei</i>	17	2	1	10	30	3.78
40	<i>Acrocephalus orientalis</i>			2		2	0.25
41	<i>Phylloscopus inornatus</i>				1	1	0.13
42	<i>Phylloscopus borealis xanthodryas</i>				8	8	1.01
43	<i>Phylloscopus tenellipes</i>				2	2	0.25
44	<i>Phylloscopus coronatus</i>		2		2	4	0.50
45	<i>Zosterops japonicus</i>	22				22	2.77
46	<i>Monticola solitarius</i>	2	4	4	15	25	3.15
47	<i>Muscicapa griseisticta</i>				2	2	0.25
48	<i>Muscicapa sibirica</i>				1	1	0.13
49	<i>Muscicapa dauurica</i>				1	1	0.13
50	<i>Cyanoptila cyanomelana</i>				1	1	0.13
51	<i>Passer montanus</i>			83	58	141	17.78
52	<i>Motacilla flava</i>				2	2	0.25
53	<i>Motacilla cinerea</i>			2	1	3	0.38
54	<i>Carduelis sinica</i>	12		6	6	24	3.03
55	<i>Coccothraustes coccothraustes</i>				1	1	0.13
56	<i>Emberiza cioides</i>				1	1	0.13
No. of species		15	13	21	42	56	
No. of individuals		167	79	193	354	793	
Species diversity (H')		1.99	1.82	1.99	2.54	2.65	

*squameiceps*, *Acrocephalus orientalis*, *Phylloscopus inornatus*, *Phylloscopus borealis xanthodryas*, *Phylloscopus tenellipes*, *Muscicapa griseisticta*, *Muscicapa sibirica*, *Muscicapa dauurica*, *Cyanoptila cyanomelana*, *Motacilla flava*, *Coccothraustes coccothraustes*, and *Emberiza cioides*. The dominant species observed were: 68 individuals of *Apus pacificus* on Beomseom Island (40.72%) followed by 22 individuals of *Zosterops japonica* (13.17%) and 17 individuals of *Locustella pleskei* (10.18%); 35 individuals of *Apus pacificus* (44.30%) on Hyeongjeseom Island followed by 16 individuals of *Hirundo rustica* (20.25%) and 7 individuals of *Anas poecilorhyncha* (8.86%); 83 individuals of *Passer*

*montanus* (43.01%) on Gapado Island followed by 30 individuals of *Hirundo rustica* (15.54%) and 27 individuals of *Apus pacificus* (13.99%); and 122 individuals of *Apus pacificus* (34.46%) on Marado Island followed by 58 individuals of *Passer montanus* (16.38%) and 22 individuals of *Bubulcus ibis* (6.21%). Species diversity was indicated the highest on Marado Island (2.54) followed by Gapado and Beomseom Islands (1.99) and Hyeongjeseom Island (1.82).

Compared to the previous studies (Park, 1990, Park and Kim, 1996, Kim and Lee, 2002, Oh, 2006, Oh et al., 2010, Oh, 2014) on Beomseom Island, one species of *Alcedo atthis* was added;

compared to Kim and Lee (2002) on Hyeongjeseom Island, 7 species were added including *Gavia stellate*, *Ixobrychus sinensis*, *Falco peregrinus*, *Synthliboramphus wumizusume*, *Halcyon pileata*, *Hirundo rustica*, and *Locustella pleskei*. 3 species found on Beomseom Island – *Ixobrychus sinensis*, *Synthliboramphus wumizusume*, and *Halcyon pileata* – were the remains of feather, assumed to be attacked by falcons. Compared to the survey by Kim (2001) on Gapado Island, 3 species were added including *Falco peregrinus*, *Cuculus canorus*, and *Pica pica* while compared to Kim (2008) and Kim et al. (2010c) on Marado Island, 4 species were added including *Himantopus himantopus*, *Butastur indicus*, *Chlidris subminuta*, and *Coccothraustes coccothraustes*, respectively. In the meantime, comprehending the previous literature surveys and this survey confirmed a total of 171 species observed on those 4 islands off coast of Seogwipo (Appendix 1).

This survey confirmed 7 species of threatened birds such as *Falco peregrinus*, *Pernis ptilorhynchus*, *Accipiter soloensis*, *Columba janthina*, *Terpsiphone atrocaudata*, *Synthliboramphus wumizusume* and *Locustella pleskei* (Table 2). *Falco peregrinus* was observed on the islands of Hyeongjeseom, Gapado, and Marado, respectively; particularly found 3 young birds on Hyeongjeseom Island. *Falco peregrinus* is a resident bird breeding steep cliffs of oreum or sea cliffs on Jeju Island (Kim et al., 2010a, Kim, 2013). This species indicates the narrow scope of feeding activities within 300 m during breeding period (Ikeda et al., 1990) but tends to expand the scope of activities up to oreums located in the middle mountain areas or the subalpine zone of Hallasan Mountain after such breeding period. Rapacious birds prefer to sea cliffs, some of mountain rocks, and forests as their breeding site while some of rapacious birds consider distance to water resources, species of trees for nesting, height and breast height of those species of trees for nesting, degree of the developments of surrounding vegetation, and lower layer structure when selecting a breeding site (Titus and Mosher, 1981). Thus, it is suggested that the natural breeding sites on seashore of (un) inhabited islands off coast Jeju Island – an optimal breeding place for *Falco peregrinus* – be managed for conservation.

In addition, 3 species with higher mobility were observed on Marado Island including *Pernis ptilorhynchus*, *Accipiter soloensis*, and *Butastur indicus*, these rapacious birds of which are migratory birds passing through Jeju Island mostly in spring and autumn. Since Jeju Island holds the habitat environment ranging from coast intertidal zones, farmlands, oreum, and subalpine zones – where those rapacious birds can secure their views – as well as is being situated in a geopolitical location, it is being used as a middle stopover or wintering place for rapacious birds with higher mobility. As revealed in the previous studies reporting that the western and southern islands area including Jeju Island in Korea

are used as a major immigration route for rapacious birds (Kwon et al., 2006, Kim, 2009, Choi et al., 2009), Kim et al., 2010b, 2011a), considering Jeju Island to be an important location as their breeding place or middle stopover, any artificial threatening factors against them should be minimized.

*Columba janthina* is a species distributing on and around uninhabited islands in the East Asia including Korea and Japan, mostly breeding in subtropical and warm temperate evergreen forests (Baptista et al., 1994). According to the survey conducted by Oh et al (1994), *Columba janthina* lays eggs from early March through middle of May and incubates egg for 18 days and broods over egg for about 30 days. This species lays only one egg and broods over the egg mostly in the species of tree such as *Sambucus sieboldiana*, *Litsea japonica*, *Elaeagnus macrophylla*, *Machilus thunbergii*, and *Pinus thunbergii*; and feeds fruits and leaves of trees showing a variety of selective feeds depending on fruiting season of fruits of trees. The species distributes on Jeju Island particularly on its islands such as Beomseom, Seopseom, Munseom, Jigwido, Marado, Chujado, and Sasudo (Park and Kim, 1996, Kim, 2006, Oh et al., 2010, Kim and Oh, 2009, Kim et al., 2010c) while being observed on Beomseom Island in this survey.

*Locustella pleskei* is a summer bird breeding on the surrounding islands of Jeju Island, found on 4 areas including the islands of Beomseom, Hyeongjeseom, and Marado during this survey. *Terpsiphone atrocaudata* is also a summer bird breeding mostly in the valleys of Hallasan Mountain or gotjawal forests on Jeju Island (Kim et al., 2011b), found one individual on Marado Island. *Synthliboramphus wumizusume* tends to form a group with a few individuals in the waters around Marado Island (Kim, 2008) and seems to be sometimes attacked by falcons, which was confirmed on Hyeongjeseom Island with the trace of bodies predated by falcons during this survey.

Recently, as the number of tourists visiting Jeju Island becomes increasingly greater, the types of tourism such as tracking of *olle* esplanades, cruise ship tourism, and fishing leisure activities seem to increase more and more. Since the bird fauna of the region isolated as an island indicates the trend of change in biological species depending on the changes in ecological environment of the island or climate change, it is of ecological importance. In particular, the region of islands is smaller – accounting for only 3% – compared to the area of land on earth; however, to such an extent as to about 15% of all known birds or plants until now existing on islands, it is of higher biological value (Whittaker, 1998). Furthermore, the success rate of breeding and the habitat preference may be negatively affected by the entrance of people in case of the birds breeding on islands. The (un) inhabited islands off west coast Seogwipo City – the survey sites during this survey – are being used as a breeding site of certain birds including *Falco peregrinus*, *Columba janthina*, *Egretta sacra*, *Monticola solitaries*, and *Locustella pleskei*. The four survey islands were all selected as a breeding site for *Egretta sacra* and *Monticola solitaries*, among which *Egretta sacra* is a white heron preferring to sea cliffs with shelves much more developed (Kim et al., 2005). Therefore, protecting the wild birds inhabiting on Jeju Island including (un)inhabited islands off coast Seogwipo City requires continuing the elimination of any intervening factor by humans, the ban on damaging to the original habitats, and the monitoring of rare birds and so on. In addition, the areas in and around Seogwipo City in the southernmost location in Korea are the optimal place to detect the appearance of subtropical birds that tend to go northwards due to climate change. Since there are some evidences that subtropical birds come to Jeju Island in such consecutive cases as the first success of breeding by *Ardea cinerea* in Jungmun-dong, Seogwipo City in April 2013 and the exhaustion of *Sula leucogaster* in the waters of Seogwipo City in June 2013

**Table 2**  
Threatened species observed in the western sites off Seogwipo city, on Jeju Island in 2013.

No.	Species name	Number of natural monument	Grade of endangered species	Red list	
				IUCN <sup>1)</sup>	Korea <sup>2)</sup>
1	<i>Falco peregrinus</i>	323-7	I	LC	VU
2	<i>Pernis ptilorhynchus</i>		II		VU
3	<i>Accipiter soloensis</i>	323-2		LC	VU
4	<i>Columba janthina</i>	215	II	NT	VU
5	<i>Synthliboramphus wumizusume</i>		II	VU	EN
6	<i>Terpsiphone atrocaudata</i>		II	NT	VU
7	<i>Locustella pleskei</i>		II	VU	VU

<sup>1)</sup> IUCN. 2011. IUCN Red List of Threatened Species: <http://www.iucnredlist.org>.

<sup>2)</sup> Korean Red List of Threatened Species (National Institute of Biological Resources, 2012).

including the appearance of *Dicrurus macrocercus* on Marado Island during this survey, it is required to conduct more specific monitoring on the frequency of appearance of subtropical birds and the status of breeding, and the future possibility for the breeding of the species that has yet to breed on Jeju Island.

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**Appendix 1. The list of birds observed in Beomseom, Hyeongjeseom, Gapado and Marado off Jeju Island<sup>1)</sup>.**

No.	Korean name	Scientific name	Beomseom						Hyeong-jeseom		Gapado		Marado			This survey	
			I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII		
1	흰뺨검둥오리	<i>Anas poecilorhyncha</i>							○								○
2	쇠오리	<i>Anas crecca</i>							○								
3	아비	<i>Gavia stellata</i>															
4	습새	<i>Calonectris leucomelas</i>		○	○	○	○				○		○	○			
5	뽕논병아리	<i>Podiceps cristatus</i>											○				
6	갈색얼가니새	<i>Sula leucogaster</i>											○				
7	덤불해오라기	<i>Ixobrychus sinensis</i>													○		○
8	열대붉은해오라기	<i>Ixobrychus cinnamomeus</i>													○		
9	붉은해오라기	<i>Gorsachius goisagi</i>												○			
10	해오라기	<i>Nycticorax nycticorax</i>								○	○		○	○			
11	검은뎡기해오라기	<i>Butorides striatus</i>											○	○	○	○	○
12	흰날개해오라기	<i>Ardeola bacchus</i>											○	○	○	○	○
13	황로	<i>Bubulcus ibis</i>											○	○	○	○	○
14	검은해오라기	<i>Ixobrychus flavicollis</i>											○				
15	왜가리	<i>Ardea cinerea</i>				○		○			○		○				○
16	중대백로	<i>Egretta alba modesta</i>											○		○		
17	중백로	<i>Egretta intermedia</i>								○		○	○	○	○		
18	쇠백로	<i>Egretta garzetta</i>				○		○			○		○	○	○	○	○
19	흑로	<i>Egretta sacra</i>	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
20	가마우지	<i>Phalacrocorax filamentosus</i>	○			○		○	○	○	○	○	○	○	○		
21	쇠가마우지	<i>Phalacrocorax pelagicus</i>								○	○	○	○	○	○		
22	황조롱이	<i>Falco tinnunculus</i>									○	○	○	○	○		
23	비둘기조롱이	<i>Falco amurensis</i>				○		○							○		
24	매	<i>Falco peregrinus</i>	○	○											○		○
25	물수리	<i>Pandion haliaetus</i>													○		○
26	벌매	<i>Pernis ptilorhynchus</i>													○		○
27	붉은배새매	<i>Accipiter soloensis</i>													○		○
28	조롱이	<i>Accipiter gularis</i>				○									○		○
29	새매	<i>Accipiter nisus</i>													○		
30	참매	<i>Accipiter gentilis</i>	○			○											
31	왕새매	<i>Butastur indicus</i>															○
32	말뚝가리	<i>Buteo buteo</i>									○				○		
33	장다리물떼새	<i>Himantopus himantopus</i>															○
34	당기물떼새	<i>Vanellus vanellus</i>										○					
35	개펄	<i>Pluvialis squatarola</i>										○					
36	검은가슴물떼새	<i>Pluvialis fulva</i>															○
37	꼬마물떼새	<i>Charadrius dubius</i>									○	○		○	○		
38	왕눈물떼새	<i>Charadrius mongolus</i>										○		○			
39	큰물떼새	<i>Charadrius veredus</i>									○				○		
40	깍도요	<i>Gallinago gallinago</i>												○			
41	바늘꼬리도요	<i>Gallinago stenura</i>															○
42	중부리도요	<i>Numenius phaeopus</i>									○	○					○
43	뺨뺨도요	<i>Tringa ochropus</i>									○						○
44	알락도요	<i>Tringa glareola</i>													○		○
45	뒷부리도요	<i>Xenus cinereus</i>										○					
46	깜짝도요	<i>Tringa hypoleucos</i>				○		○				○		○	○	○	○
47	노랑발도요	<i>Tringa brevipes</i>										○		○	○	○	○
48	꼬까도요	<i>Arenaria interpres</i>															○
49	붉은가슴도요	<i>Calidris canutus</i>															○
50	세가락도요	<i>Crocethia alba</i>													○		
51	종달도요	<i>Calidris subminuta</i>															○
52	머추라기도요	<i>Calidris acuminata</i>													○		
53	민물도요	<i>Calidris alpina</i>										○					○
54	송곳부리도요	<i>Limicola falcinellus</i>										○					
55	지느러미발도요	<i>Phalaropus lobatus</i>													○		○
56	괭이갈매기	<i>Larus crassirostris</i>										○		○			
57	갈매기	<i>Larus canus</i>							○		○	○	○				
58	재갈매기	<i>Larus argentatus</i>										○		○			
59	줄무늬노랑발갈매기	<i>Larus heuglini</i>										○		○			
60	큰재갈매기	<i>Larus schistisagus</i>										○		○			
61	제비갈매기	<i>Sterna hirundo</i>															○
62	구레나룻제비갈매기	<i>Chlidonias hybrida</i>															○
63	빨쇠오리	<i>Synthliboramphus wumizusume</i>													○		○

(continued)

No.	Korean name	Scientific name	Beomseom						Hyeong-jeseom		Gapado		Marado			This survey
			I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	
64	흑비둘기	<i>Columba janthina</i>	○	○	○	○	○	○						○	○	
65	멧비둘기	<i>Streptopelia orientalis</i>						○	○			○	○	○	○	
66	검은등뺨꾸기	<i>Cuculus micropterus</i>											○	○	○	
67	뺨꾸기	<i>Cuculus canorus</i>											○	○	○	
68	두견	<i>Cuculus poliocephalus</i>		○										○	○	
69	소쩍새	<i>Otus scops</i>											○	○	○	
70	솔부엉이	<i>Ninox scutulata</i>											○	○	○	
71	속독새	<i>Caprimulgus indicus</i>											○	○	○	
72	칼새	<i>Apus pacificus</i>		○	○			○	○	○	○	○	○	○	○	
73	쇠칼새	<i>Apus nipalensis</i>	○											○	○	
74	파랑새	<i>Eurystomus orientalis</i>		○		○				○					○	
75	청호반새	<i>Halcyon pileata</i>						○					○	○	○	
76	물총새	<i>Alcedo atthis</i>									○		○	○	○	
77	후투티	<i>Upupa epops</i>										○	○	○	○	
78	푸른날개팔색조	<i>Pitta moluccensis</i>												○	○	
79	개미잡이	<i>Jynx torquilla</i>											○	○	○	
80	참새	<i>Lanius tigrinus</i>											○	○	○	
81	때까치	<i>Lanius bucephalus</i>	○	○							○			○	○	
82	노랑때까치	<i>Lanius cristatus</i>											○	○	○	
83	괴꼬리	<i>Oriolus chinensis</i>											○	○	○	
84	검은바람까마귀	<i>Dicrurus macrocercus</i>												○	○	
85	긴꼬리딱새	<i>Terpsiphone atrocaudata</i>				○								○	○	
86	까치	<i>Pica pica</i>												○	○	
87	어치	<i>Garrulus glandarius</i>					○							○	○	
88	때까마귀	<i>Corvus frugilegus</i>												○	○	
89	박새	<i>Parus major</i>		○	○	○										
90	갈색제비	<i>Riparia riparia</i>													○	
91	제비	<i>Hirundo rustica</i>					○	○		○	○	○	○	○	○	
92	귀제비	<i>Hirundo daurica</i>										○	○	○	○	
93	흰털발제비	<i>Delichon urbica</i>											○	○	○	
94	흰턱제비	<i>Delichon dasypus</i>													○	
95	쇠종다리	<i>Calandrella brachydactyla</i>													○	
96	종다리	<i>Alauda arvensis</i>								○	○	○	○	○	○	
97	개개비사촌	<i>Cisticola juncidis</i>												○	○	
98	직박구리	<i>Microscelus amaurotis</i>		○	○			○	○						○	
99	술새	<i>Cettia squameiceps</i>		○	○	○				○	○	○	○	○	○	
100	휘파람새	<i>Cettia diphone</i>	○	○	○	○	○	○		○	○	○	○	○	○	
101	알락꼬리쭈뎀	<i>Locustella ochotensis</i>												○	○	
102	섬개개비	<i>Locustella pleskei</i>	○		○		○							○	○	
103	큰부리개개비	<i>Acrocephalus aedon</i>												○	○	
104	개개비	<i>Acrocephalus arundinaceus</i> <sup>1</sup>		○						○				○	○	
105	쇠개개비	<i>Acrocephalus bistrigiceps</i>											○	○	○	
106	술새사촌	<i>Phylloscopus fuscatus</i>												○	○	
107	긴다리술새사촌	<i>Phylloscopus schwarzi</i>												○	○	
108	노랑허리술새	<i>Phylloscopus proregulus</i>												○	○	
109	노랑눈썹술새	<i>Phylloscopus humei</i>												○	○	
110	술새	<i>Phylloscopus borealis</i>		○		○	○	○						○	○	
111	되술새	<i>Phylloscopus tenellipes</i>												○	○	
112	산술새	<i>Phylloscopus occipitalis</i>												○	○	
113	동박새	<i>Zosterops japonica</i>	○	○	○	○	○	○						○	○	
114	상모술새	<i>Regulus regulus</i>												○	○	
115	굴뚝새	<i>Troglodytes troglodytes</i>		○		○	○	○		○	○	○	○	○	○	
116	복방쇠찌르레기	<i>Sturnus aturinus</i>												○	○	
117	쇠찌르레기	<i>Sturnus philippensis</i>												○	○	
118	붉은부리찌르레기	<i>Sturnus sericeus</i>												○	○	
119	찌르레기	<i>Sturnus cineraceus</i>								○	○	○	○			
120	호랑지빠귀	<i>Turdus dauma</i>									○	○	○			
121	되지빠귀	<i>Turdus hortulorum</i>									○	○	○			
122	검은지빠귀	<i>Turdus cardis</i>												○	○	
123	붉은배지빠귀	<i>Turdus chrysolaus</i>												○	○	
124	흰눈썹붉은배지빠귀	<i>Turdus obscurus</i>												○	○	
125	흰배지빠귀	<i>Turdus pallidus</i>	○			○				○	○	○	○	○	○	
126	개똥지빠귀	<i>Turdus naumanni eunomus</i>									○	○	○	○	○	
127	흰눈썹울새	<i>Erithacus svecicus</i>												○	○	
128	진홍가슴	<i>Erithacus calliope</i>										○	○	○	○	
129	쇠유리새	<i>Erithacus cyane</i>												○	○	
130	울새	<i>Erithacus sibilans</i>												○	○	
131	유리딱새	<i>Tarsiger cyanurus</i>									○	○	○	○	○	
132	딱새	<i>Phoenicurus auroreus</i>	○							○	○	○	○	○	○	
133	검은딱새	<i>Saxicola torquata</i>									○	○	○	○	○	
134	검은등사막딱새	<i>Oenanthe pleschanka</i>												○	○	
135	바다직박구리	<i>Monticola solitarius</i>	○	○		○	○	○	○	○	○	○	○	○	○	
136	제비딱새	<i>Muscicapa griseisticta</i>												○	○	

(continued on next page)

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No.	Korean name	Scientific name	Beomseom						Hyeong-jeseom		Gapado		Marado			This survey
			I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	
137	솔딱새	<i>Muscicapa sibirica</i>		○		○							○	○	○	
138	쇠솔딱새	<i>Muscicapa latirostris</i>											○	○	○	
139	흰눈썹황금새	<i>Ficedula zanthopygia</i>											○	○		
140	황금새	<i>Ficedula narcissina</i>											○	○		
141	노랑딱새	<i>Ficedula mugimark</i>											○	○		
142	큰유리새	<i>Cyanoptila cyanomelana</i>											○		○	
143	참새	<i>Passer montanus</i>				○	○			○	○	○	○	○	○	
144	긴발톱할미새	<i>Motacilla flava</i>											○		○	
145	노랑할미새	<i>Motacilla cinerea</i>				○				○	○	○	○	○	○	
146	알락할미새	<i>Motacilla alba</i>								○			○	○		
147	검은턱할미새	<i>Motacilla alba ocularis</i>											○			
148	백할미새	<i>Motacilla alba lugens</i>								○			○			
149	큰발총다리	<i>Anthus novaeseelandiae</i>											○	○		
150	황동새	<i>Anthus hodgsoni</i>											○	○		
151	붉은가슴발총다리	<i>Anthus cervinus</i>											○	○		
152	흰등발총다리	<i>Anthus gustavi</i>											○	○		
153	한국발총다리	<i>Anthus roseatus</i>											○	○		
154	발총다리	<i>Anthus spinoletta</i>											○	○		
155	되새	<i>Fringilla montifringilla</i>											○	○		
156	방울새	<i>Carduelis sinica</i>	○	○	○	○	○	○		○	○		○	○	○	
157	검은머리방울새	<i>Carduelis spinus</i>								○			○	○		
158	붉은양진이	<i>Carpodacus erythrinus</i>											○			
159	콩새	<i>Coccothraustes coccothraustes</i>													○	
160	밀화부리	<i>Eophona migratoria</i>												○		
161	멧새	<i>Emberiza cioides</i>											○	○	○	
162	흰배멧새	<i>Emberiza tristrami</i>											○	○	○	
163	붉은뺨멧새	<i>Emberiza fucata</i>											○	○		
164	쇠붉은뺨멧새	<i>Emberiza pusilla</i>											○	○		
165	노랑눈썹멧새	<i>Emberiza chrysophrys</i>											○	○		
166	속새	<i>Emberiza rustica</i>											○	○		
167	노랑턱멧새	<i>Emberiza elegans</i>											○	○	○	
168	검은머리속새	<i>Emberiza aureola</i>											○	○		
169	꼬까참새	<i>Emberiza rutila</i>											○	○		
170	무당새	<i>Emberiza sulphurata</i>											○	○		
171	축새	<i>Emberiza spodocephala</i>											○	○		
No. of species			14	19	9	26	17	22	7	2	21	48	28	126	115	57

<sup>1</sup> I, VII: Park, 1990, II: Park & Kim, 1996, III, VIII: Kim and Lee, 2002, IV: Oh, 2006, V: Oh et al., 2010, VI: Oh, 2014, IX, XI: Park and Oh, 1991, X: Kim, 2001, XII: Kim, 2008, XIII: Kim et al., 2009, Kim et al., 2010b.

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