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Distribution and Breeding Status of Chinese Egret *Egretta eulophotes* in South Korea

[1, 2]Jung-Hoon Kang, [3]In Kyu Kim, [3]Hansoo Lee and [2]Shin-Jae Rhim
[1]National Research Institute of Cultural Heritage,
Cultural Heritage Administration, 302-834 Daejeon, Korea
[2]School of Bioresource and Bioscience, Chung-Ang University, 456-756 Ansung, Korea
[3]Korea Institute of Environmental Ecology, 305-509 Daejeon, Korea

Abstract: This study was conducted to clarify the distribution and breeding status of Chinese egret *Egretta eulophotes* for conservation and management in South Korea. The known habitat of the birds in South Korea is confined to 10 sites. All the breeding sites are uninhibited offshore islets in the Yellow Sea, South Korea. Major breeding sites are Napdaekiseom, Hwangseodo, Chilsando, Seomando and Mokdo Islets. Most of the nests are located in dense stands of arrow bamboo *Pseudosasa japonica* and baby brier *Rosa multiflora*. The vegetation of the offshore islets with breeding sites should be maintained and managed to help the birds breed successfully. Human disturbance by photography and egg collection should be prohibited in breeding islands. An action plan based on long-term ecological research should be prepared to aid the conservation of the birds and their habitats.

Key words: Chinese egret, conservation, nest, offshore islet, yellow sea

INTRODUCTION

Chinese egret *Egretta eulophotes* is a globally threatened avian species. The bird is classified as vulnerable by the International Union for Conservation of Nature (IUCN). The global population size is estimated to be 2,600-3,400 individuals (IUCN, 2008; Fang *et al*., 2011). Chinese egret has a patchy distribution and breeds in colonies on offshore islands in the Korean peninsula, China and Russia (Litvinenko and Shibaev, 2000; Guo-An *et al*., 2005). This species is also a non-breeding visitor to Japan, Malaysia, Singapore, Indonesia and Brunei (BLI, 2013).

The birds were known to nest only on islands in the Yellow Sea. Recently a new breeding site was reported on Furugelm Island near the estuary of the Tumangan (Tumen) River in the East Sea (Litvinenko and Shibaev, 2000). The population of this species has been declining dramatically since the 19th century because of large-scale poaching and various forms of human disturbance in tidal mudflats, estuarine habitats and offshore breeding islands (Kushlan and Hancock, 2005; Zhou *et al*., 2010).

There are little information on the ecology of the birds except for some regional descriptions of nest sites and reproductive biology (Yin and Lei, 2002; Ye *et al*., 2003). Some studies on breeding behavior (Guo-An *et al*., 2005) and reproduction (Yin and Lei, 2002) have been conducted in the archipelagoes of China. It is essential to obtain data on the distribution and breeding status of this endangered bird in order to develop plans for its conservation (Huang *et al*., 2010). Chinese egret is designated as Natural Monument No. 361 and protected in South Korea. Knowledge of the birds' ecology and habitat preferences can assist in the conservation and management of the birds and their habitats. This study was conducted to gather basic information on the distribution and breeding status of Chinese egret in South Korea to inform conservation efforts.

MATERIALS AND METHODS

This study on the distribution and breeding status of Chinese egret in South Korea from 1999 to 2013 encompasses a literature review and a field survey. For the literature review, researchers reviewed all papers, reports, articles and books on Chinese egret since 1999, looking for information about the species' distribution. Researchers used this information to estimate the maximum number of individuals at each site.

Researchers conducted the field research in May and June 2013 on offshore islets in the Yellow Sea, South Korea. Researchers chose these islets on the basis of literature review and a questionnaire to avian ecologists about the birds' breeding sites. Researchers decided to survey 5 uninhibited offshore islets (Seomando, Hwangseodo, Mokdo, Chilsando and Mapdaekiseom) where the birds were known to breed.

Corresponding Author: Shin-Jae Rhim, School of Bioresource and Bioscience, Chung-Ang University, 456-756 Ansung, Korea

The field survey was carried out by counting the number of Chinese egrets on each islet. Researchers used the counts to estimate the population size of the birds on each islet (Hur *et al*., 2005). Researchers also recorded the characteristics of the nests and surveyed vegetation types and land cover in the breeding areas.

RESULTS AND DISCUSSION

In South Korea, the Chinese egret is mostly distributed on the offshore islands of the Yellow Sea. Only one individual has been recorded on Udo Islet near Jeju Island in South Sea (Fig. 1). Chilsando Islet, Seomupbel Islet, Seomando Islet, Kanghwado Island and Mokdo Islet were major breeding sites during 1999 and 2004 in the Yellow Sea, South Korea (Table 1). However, breeding sites changed over the course of 10 years. In 2013, new major breeding sites of the birds where nests were observed were the islets of Napdaekiseomt, Hwangseodo, Chilsando, Seomando and Mokdo (Table 2).

There is little additional evidence for a significant decline in this bird's population over the last 10 years. All the breeding sites of the birds were uninhibited offshore islets on the Yellow Sea. Chinese egret population increased on Napdaekiseom Islet near Chilsando Islet and Hwanseodo Islet near Youngheungdo Island. However, observed numbers of the birds dramatically decreased on Chilsando Islet, Seomupbeol Islet, Kanghwado Island and Mokdo Islet. Of note, Chinese egrets were not recorded on Seomupbeol Islet and Kanghwado Island in 2013 (Table 1 and 2).

Several colonial breeding assemblages of Chinese egret, great egret *E. alba* and little egret *E. garzetta* have been reported in recent studies. Photographers and egg collectors cause major disturbances to Chinese egrets in South Korea (CHA, 2004).

Most Chinese egret nests are built in bushes of arrow bamboo *Pseudosasa japonica* and baby brier *Rosa multiflora*. Some of the nests are made in rape *Brassica campestris* and broad elaeagnus *Elaeagnus macrophylla*. The locations of nests were different among breeding offshore islands. On Chilsan Island and Napdaekiseom Islet, all the nests were located on the ground. However, on the islets of Seomando and Mokdo, the nests were both on the ground and 55-130 cm above the ground. Further studies on the differences in nest location should be conducted on the breeding islands.

Most of the vegetation on Napdaekiseom and Mokdo Islets was composed of arrow bamboo. The dense coverage of arrow bamboo is suitable for Chinese egrets as a breeding site (NRICH, 2011). Because of good nesting conditions, the breeding colony of the birds may increase on Napdaekiseom and Mokdo Islets. On Seomando and Hwangseodo Islets, baby brier and fiveleaf *Akebia quinata* were dominant and harbored major nesting sites. Baby brier and fiveleaf should be maintained for nesting purposes on Seomando and

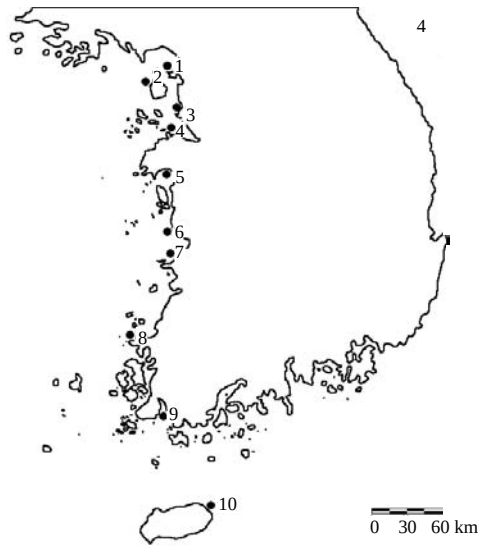

Fig. 1: Distribution of Chinese egret *Egretta eulophotes* from 1999 to 2013 in South Korea. 1: Kanghwado Island; 2: Seomando Islet/Seomupbeol Islet; 3: Sihwaho Lake; 4: Youngheungdo Island/Hwangseodo Islet; 5: Cheonsuman Bay; 6: Mokdo Islet; 7: Yubudo Island; 8: Chilsando Islet/Napdaekiseom Islet; 9: Kocheonamho Lake; 10: Udo Islet

Table 1: Observed number of Chinese egret *Egretta eulophotes* from 1999 to 2004 in South Korea

Area	No. of individuals
Kanghwado Island	153
Seomando Islet	180
Seomupbeol Islet	200
Sihwaho Lake	4
Youngheungdo Island	49
Cheonsuman bay	18
Mokdo Islet	104
Yubudo Island	1
Chilsando Islet	372
Kocheonamho Lake	11
Udo Islet	1

Table 2: Breeding status of Chinese egret *Egretta eulophotes* at major breeding sites in 2013

Site	No. of individuals	No. of nests
Seomando Islet	60	30
Hwangseodo Islet	314	108
Mokdo Islet	36	18
Chilsando Islet	76	31
Napdaekiseom Islet	360	150

Hwangseodo Islets. There was little vegetation on Chilsando Islet. Because of the lack of vegetation, the breeding colony could be decline on Chilsando Islet. Restoration of vegetation would maintain the breeding colony and even increase it in this area.

For conservation of Chinese egret, human disturbance by photography and egg collection should be prohibited on the breeding offshore islets (Kim, 2006; MOL and TMA, 2009). Moreover, the islets of Seomando, Hwangseodo, Mokdo and Napdaekiseom should be designated as Natural Monuments by the Cultural Heritage Administration for the conservation and management of the birds.

Up to this point, researchers lacked exact data on the breeding biology of the birds in South Korea. Long-term ecological research is needed to further understand the ecology of Chinese egret.

CONCLUSION

Small islands on the Yellow Sea are important sites for waterbirds on the East Asian-Australasian flyway. For conservation and management of threatened species, it is essential to understand the distribution, breeding status and ecology of the species. The detailed information and research presented here may provide the basis for an action plan to conserve the birds and their habitats.

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