Status of wintering populations of the baikal teal (Anas formosa) in Geumgang River, Korea

Jae-Pyoung Yu, Sung-Woo Han, In-Hwan Paik, Seon-Deok Jin, Woon Kee Paek*

A R T I C L E   I N F O
Article history:
Received 19 March 2014
Received in revised form
27 March 2014
Accepted 1 April 2014
Available online 24 April 2014

Keywords:
Number of individuals
Freezing
Geumgang estuary barrage
Flat water

A B S T R A C T
This study investigated the daily changes of individual numbers of the baikal teal migrating in Geumgang River from November in 2008 to March in 2009 and from November, 2011 to February, 2012. The finding from 2008 to 2009 showed that the highest number of 500,000 individuals (November, 2008) with an average of 146,582 ± 123,705 individuals were recorded. The finding from 2011 to 2012 indicated that the highest number of 250,000 individuals (January, 2012) with an average of 61,696 ± 63,407 individuals. The baikal teal’s population was increased in the early wintering period was not observed in the mid-wintering period when the Geumgang River became frozen. On the other hand, the population tended to increase again in the late wintering period when the river began to thaw. As the baikal teals prefer flat water areas without currents, they were mainly observed in the upper stream of Geumgang estuary barrage but not in the downstream.

Introduction

The Baikal Teal (Anas formosa) is a common migratory bird wintering in Korea. More than about 95% of its total population around the world winters (Won and Kim, 2012). Since the early 20th century, its number of individuals had been large enough to be recorded as the most common duck in East Asia. In the mid-20th century, however, the baikal teal was classified as an endangered species because the number of this species drastically decreased due to reckless hunting and destruction of its habitats (Won and Kim, 2012). The IUCN classified it as VU (Vulnerable) on the IUCN Red List. In 2011, however, it was classified as LC (Least Concern) as the number of individuals of the baikal teal has recently been increased (BirdLife International 2013).

Based on the previous records in Gyeonggi-do areas, Austin (1948) believed this species as a passage migrant observed in Korea in spring and fall; however, in 1984, the large number of wintering groups of the baikal teal (5,000 individuals) were firstly observed at Junam Reservoir in winter. Since the number of its individuals increased to 20,000~40,000 in 1986, the baikal teal had constantly wintered until the early 1990s (Yu and Hahm, 1994). Since the mid-1990s, however, the wintering groups had been decreased in Junam Reservoir. On the other hand, the wintering groups increased in the reclaimed lands and reservoirs in the west coast, such as Cheonsuman Bay, Geumgang estuary, Donglim Reservoir, and Yeongamho Lake (Kang and Cho, 1996, 1998). Currently, at least 300,000~600,000 individuals of the baikal teal winter (Ministry of Environment, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, Won and Kim, 2012).

The population of the baikal teal wintering in Korea has been reported in ‘Simultaneous Census of Birds in Winter’ which has been conducted annually between January and February by the Ministry of Environment since 1999. In addition, several researches on its wintering ecology and behaviors were also carried out (Kang and Cho, 1996, 1998). Most of the researches investigating the wintering populations of the baikal teal in Geumgang River have been conducted once or twice a month during the wintering period (Lee, 2000, Lee et al., 2001, Kim et al., 2004, Kang et al., 2010). Nevertheless, there has been no research investigating the daily changes of distribution status of the baikal teal during the wintering period.

This study, therefore, investigated the changes of population of the baikal teal, aiming to provide the fundamental data to be used
for protecting and preserving the baikal teal representing Geumgang estuary as a migratory bird sanctuary.

Materials and methods

Study area

The Geumgang River originates in Subun-ri, Jangsu-eup, Jangseongun, Jeollabuk-do. It flows in Daecheong Dam after passing through Okcheon-gun, Chungcheongbuk-do. Then, it flows in Jeollabuk-do before meeting the Mihocheon stream again. Finally, it empties into the west sea after flowing through Geumgang estuary barrage. As the construction of the Geumgang estuary barrage was completed in 1990, the Geumgangho Lake was formed because the inflow of river water and seawater to the estuary became blocked off. Since it has small alluvial bars and reed beds, the Geumgangho Lake is a popular migratory bird sanctuary in which waterbirds such as the baikal teals. Moreover, wide farmland areas formed around the Geumgangho Lake are good feeding places for winter migratory birds (Figure 1).

Study methods

This study investigated the survey points and the individual numbers of the baikal teal (Anas formosa) migrating in Geumgang estuary on a daily basis from November in 2008 to March in 2009 (4 months; excluding January in 2009) and from November in 2011 to February in 2012 (4 months). Point census method was used to investigate the total number of individuals from the major survey points where the baikal teal was concentrated (Bibby et al., 1992), Binoculars (10 × 25, Nikon) and telescopes (× 15 ~ 45, Nikon) were used to classify the species and to calculate the individual numbers.

In addition, in order to investigate the current status of distribution of the baikal teals wintering in Korea, this study analyzed the data from ‘Simultaneous Census of Birds in Winter’ which has been conducted annually in January or February for 14 years (1999~2012) by the Ministry of Environment. The findings below present the daily changes of individual numbers of the baikal teals migrating in Geumgangho Lake from November in 2008 to March in 2009 (excluding January in 2009) and from November in 2011 to February in 2012. The finding from 2008 to 2009 showed that the highest number of 500,000 individuals (21 November, 2008) with an average of 146,582 ± 123,705 individuals were recorded. The finding from 2011 to 2012 indicated that the highest number of 250,000 individuals (31 January, 2012) with an average of 61,696 ± 63,407 individuals. In the survey between 2011 and 2012, the highest number of individuals was decreased by 50%, compared to that in the survey between 2008 and 2009. The average number of individuals was also decreased by about 40%. Moreover, the number of the baikal teals migrating to the Geumgang River during the early wintering period from November to December was decreased more drastically in 2011 than in 2008. After the end of January, however, the numbers of individuals in 2009 and 2012 showed similar results around 60,000 (Table 1). When it comes to the changes of temperatures during the survey period, the average temperature in November 2008 (8.79 °C) was about 2.56 °C lower than that in 2011 (11.35 °C). In December, on the other hand, the average temperature in 2008 was about 2.01 °C higher than that in 2011. This result showed that the temperature difference in 2011 was relatively very large, compared to that in 2008. Additionally, the average temperatures between January and March in 2012 were lower than those in 2009. The overall temperature in average between November and March in following year showed that the overall average between 2011 and 2012 (3.03 ± 5.83 °C) was about 1.29 °C lower than that between 2008 and 2009 (4.32 ± 4.86 °C) (Table 1). The significant changes of temperature during the early wintering period in 2008 and 2011 might result from the fact that the changes of surrounding environment, such as Saemangeum constructions, influenced the fluctuating numbers of wintering the baikal teals.

Figure 1. Map showing the survey points (●) and distribution areas (■) of the baikal teals at Geumgang River, Korea.
Table 1
Monthly average number of individuals and temperature of the baikal teals at Geumgang River.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2008~2009</td>
<td>NI</td>
<td>265,007</td>
<td>202,677</td>
<td>48,210</td>
<td>72,374</td>
<td>146,582</td>
<td></td>
</tr>
<tr>
<td></td>
<td>STD</td>
<td>120,277</td>
<td>93,578</td>
<td>67,917</td>
<td>51,864</td>
<td>123,705</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T(°C)</td>
<td>8.79</td>
<td>3.02</td>
<td>-0.08</td>
<td>3.50</td>
<td>6.41</td>
<td>4.32</td>
</tr>
<tr>
<td></td>
<td>STD</td>
<td>3.93</td>
<td>4.21</td>
<td>3.43</td>
<td>3.30</td>
<td>4.12</td>
<td>4.86</td>
</tr>
</tbody>
</table>

| 2011~2012  | NI     | 95,500 | 36,884 | 52,903 | 62,649 | 61,696 |
|            | STD    | 28,748 | 40,787 | 89,413 | 63,515 | 63,407 |
|            | T(°C)  | 11.35  | 1.01   | -1.08  | -0.75  | 4.65   | 3.03            |
|            | STD    | 4.81   | 3.54   | 2.84   | 3.78   | 2.68   | 5.83            |

NI: number of individuals, T: temperature, Avg.: average, STD: standard deviation.

The population of the baikal teal migrating to Geumgang River tended to move northwards after wintering from November to March in the next year. The population of the baikal teal of which number increased in the early wintering period was not observed in the mid-wintering period when Geumgang River became frozen (more than 50% frozen for about 27 days: 27 December, 2011~17 January, 2012; 24~28 January, 2012). On the other hand, the population tended to increase again in the late wintering period when the river began to thaw (Figure 2). The baikal teals sleep or rest in flocks at safe reservoirs or swampy places during the daytime, whereas they begin to move at sunset and generally feed at nearby farmlands at night (Won, 1981, Allport et al., 1990). As the river becomes frozen from the late December and January because of the decreased temperature, the Geumgang River is not an appropriate place for the baikal teals to sleep and rest. In this sense, it is speculated that the baikal teals migrate to other places which are not frozen (Kang and Cho, 1996, Won and Kim, 2012). Moreover, the baikal teal is considered to prefer flat water areas without currents, in that it was mainly observed in the upper stream of Geumgang estuary barrage but not in the downstream. This might be because their energy consumption while resting at flat water is less than at retarding basins. An increasing number of land reclamation projects concentrated around the west coast result in the increase of nearby farmlands and flat water such as artificial reservoirs and lakes. As a result, this change can provide appropriate habitats to wintering ducks including the baikal teals. Therefore, it is speculated that it can be one of the factors to the increasing number of wintering ducks including the baikal teals in the west coast areas (Kang and Cho, 1996, Lee, 2000, Choi et al., 2007).

The status of the baikal teal (Anas formosa) wintering in Korea

According to the data from the ‘Simultaneous Census of Birds in Winter’ conducted by the Ministry of Environment, the baikal teal has been observed more than once in 78 areas all over the country. The number of individuals of the baikal teals wintering in Korea showed the highest number of 1,063,280 individuals in 2009 and the lowest number of 185,838 individuals in 2001 with the annual average of 440,806 ± 259,131.65 individuals (Figure 3). About 200,000~450,000 individuals wintered from 1999 to 2006, whereas the number was rapidly increased over 800,000 individuals in 2007. It has been increased up to about 600,000~1,000,000 individuals until 2010, exceeding the annual average number of individuals. Since then, it tended to decrease again below the annual average until 2012 (Figure 3).

Of the 78 areas where the baikal teal has been observed in Korea, Chungcheongnam-do has the most number of areas (22 areas), followed by Jeollanam-do (18 areas) and Daegu and Gyeongsangbuk-do (12 areas) (Table 2). Moreover, the baikal teals have been observed in 52 areas (approximately 66% of the total) located in the west coast areas including Seoul and Gyeonggi-do, Chungcheongnam-do, Jeollabuk-do, and Jeollanam-do (Table 2). Regionally observed number of individuals of the baikal teal showed that Jeollabuk-do including Geumgang River recorded the largest average number of individuals (256,385.6 individuals) and the highest number of 740,005 individuals (recorded on 20 January, 2007), followed by Jeollanam-do (163,327.8 individuals in average: the highest number of 565,002 individuals, recorded on 23 January, 2010) and Chungcheongnam-do (18,336.5 individuals in average: the highest number of 74,005 individuals, recorded on 13 January, 2009). 99% of the total number of wintering the baikal teal individuals was mainly

Figure 2. Daily changes in the number of individuals of the baikal teals at Geumgang River.

Figure 3. Yearly changes in the number of individuals of the baikal teals in Korea (The red line is the average value). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)
concentrated in the west coast areas such as Jeollabuk-do, Jeollanam-do, and Chungcheongnam-do (Table 2, Figure 4).

Until the early 1990s, Junam Reservoir showed the highest number of 20,000~40,000 individuals (Yu and Hahm, 1994); however, the number had been decreased since then. In Geumgang estuary, the highest number of 300,000 individuals was observed, which indicates that its wintering population has been increasing (Kang et al., 2010). After the mid-1990s, the population of the baikal teals started to increase along the west coast areas. This result implies that the areas which are suitable reservoirs and lakes, which result from an increasing number of land reclamation projects concentrated around the west coast areas. This study is supported and funded by National Science Museum of Korea, Gunsan City (The study on the changes of birds in Geumgang River and Saemangeum areas), and the Ministry of Science, ICT and Future Planning (NRF-2008-2004707). Many thanks to the Gunsan branch of the Korean Association for Bird Protection for the assistance and cooperation throughout the site survey in this study.

Acknowledgments

This study is supported and funded by National Science Museum of Korea, Gunsan City (The study on the changes of birds in Geumgang River and Saemangeum areas), and the Ministry of Science, ICT and Future Planning (NRF-2008-2004707). Many thanks to the Gunsan branch of the Korean Association for Bird Protection for the assistance and cooperation throughout the site survey in this study.

References
