

Breeding biology of Black-faced Spoonbill *Platalea minor*

Chong Jong-Ryol¹, Pak U-Il², Rim Chyu-Yon² & Kim Tok-San²

1. Faculty of Education, Korea University in Japan, 1-700 Ogawa-cho, Kodaira, Tokyo 187, Japan

2. The Society for Animal Protection, The Nature Conservation Union of D.P.R. Korea,
Pyongyang, D.P.R. Korea

The Black-faced Spoonbill *Platalea minor* of East Asia is a rare species (del Hoyo *et al.* 1992). The birds are presently known to breed only on the Korean Peninsula and in Northeast China, and winter on the Janggang River (China), in Taiwan, Hong Kong, and Kyushu (Japan). The wild population of Black-faced Spoonbills is estimated to be 400 individuals, from observations of 286 wintering Spoonbills in Taiwan in December, 1994, and of other wintering flocks in Hong Kong and Japan (Chong unpubl. data). However, not more than 90 Spoonbills are known to breed on the Korean Peninsula. Records of breeding in Far East Russia do not exist (Li *et al.* 1994), and the present status of historic nests in China are unknown (Zhen Zoo Xin 1976, Zhao Zheng Jie 1984, 1985).

The Spoonbills' historic range on the Korean Peninsula included the lower Duman River in north Hamgyong Province, Pyongan Province, Kyonggi Province, Chonra Province, south Gyongsang Province or Cheju Island (Won Hong Gu 1963). The present breeding sites on the Peninsula are 1) Tok-do, Onchon County, south Pyongan Province, 2) Taegam-do and Sogam-do, Jongju County, north Pyongan Prov., 3) Charncha-do, Cholsan County, north Pyongan Prov., 4) Woo-do, Kyonggi Prov., 5) Ui-do and Chilsan-do, Chonra Province.

A lack of information on the species poses problems for its conservation. Comprehensive research to explain the apparent difference between the known numbers of wintering and breeding individuals has not been possible yet, and the Spoonbill's breeding biology itself has not been known. In this paper we report our observations of 5 nests on Tok-do Island, North Korea (DPRK), from courtship to fledging.

Study site and Methods

Tok-do Island (38° 45' N, 124° 58' E), is located within the political unit of Kumsong-ri, Onchon County, south Pyongan Prov. and lies west of Kumsong-ri. The islands circumference is 1.2 km, and its highest elevation is 85 m. A sand beach is revealed at low tides. The north and east sides are steep cliffs, while the south side is not steeply inclined.

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Fig. 1. Study site, Tok-do Island.

Spoonbills nest on the north and west sides.

The flora of Tok-do Island are *Artemisia selengensis*, *Chenopodium album*, *Pteridium aquilinum*, *Lespedeza cyrtobotrya*, *Pueraria lobata*, *Sambucus coreana*, *Fraxinus rhynchophylla*, *Weigela subsessilis* (Fig. 1).

During the study period, birds of 35 species of 22 families (excluding Black-faced Spoonbills) were seen on Tok-do Island. The most common species in the cliff area, those most closely associated with Spoonbills, were *Ardea cinerea*, *Puffinus pelagicus* and *Larus argentatus*.

Five adult pairs, 1 sub-adult and 3 juveniles were present on the island. Observations on one nest were continuously made for 80 days, from May 25 to August 10, 1995, with the other 4 nests providing incidental information. The observation point was located on a promontory of Tok-do Island overlooking the nesting cliff.

Results

Copulation

Copulation by Black-faced Spoonbills began with courtship behavior. The male initiated courtship by preening the female's cheek, head and neck. His mate responds by rubbing the male's head and neck (Fig. 2). This continued for 4 to 5 minutes, after which the male raised his head plumage, bit the female's bill about the mid-point and initiated copulation for 7 to 8 seconds (Fig. 3).

This courtship behavior and copulation continued until the day before the final egg was laid. Extra-pair copulation was not observed.



Fig. 2. Courtship behavior of Black-faced Spoonbill.



Fig. 3. Copulation of Black-faced Spoonbills.

Nesting

Of the 5 nests observed, 2 were old Spoonbill nests, 2 were old Grey Heron *Ardea cinerea* nests and 1 was a new Spoonbill nest. Re-used Heron nests were 40 cm and 80 cm in diameter, while the re-used Spoonbill nests were 20 cm and 50 cm. Nests were placed 42.4 m high on the cliff, and were between 1.2 m and 1.5 m from each other.

Black-faced Spoonbills were observed to build a new nest by placing 1 or 2 sticks on the substrate before egg laying, and then adding more sticks during incubation. It reached 50 cm

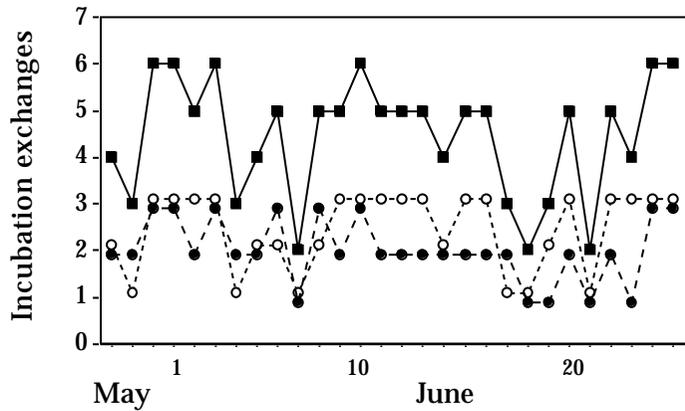


Fig. 4. Fluctuation in numbers of incubation exchanges by Black-faced Spoonbills during incubation period. \blacksquare : incubation exchange from male to female, \bullet : from female to male, \circ : total time of exchanges.

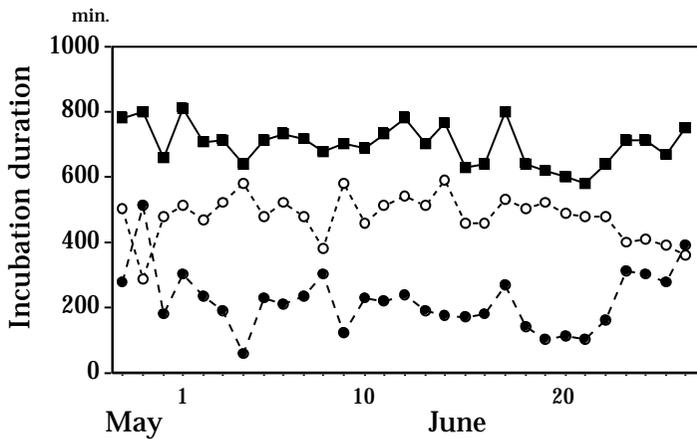


Fig. 5. Fluctuation in incubation duration of Black-faced Spoonbills during incubation period. \circ : female, \bullet : male, \blacksquare : total.

at the widest point, and 20 cm at the narrowest. All pairs were observed to supplement the nest during incubation, brooding and fledging. The male brought sticks to the nest, and passed them to the female who placed them in the nest with her bill. Addition of sticks may insure that the chicks do not fall out as the nest deteriorates during the nestling period, and may imprint them with this nesting behavior.

Egg laying and brooding

The Spoonbills laid one egg every other day, until the clutch size of three was reached ($N = 5$). Eggs observed were oval, and white with small brown spots. Two pairs had their first

Table 1. Date of egg laying and number of eggs in each nest.

Nest No.	Date of egg laying	Number of eggs	re-nesting	
			Date of egg laying	Number of eggs
1	29 May	3		
2	23 May*	3	8 Jun	3
3	5 Jun*	2	27 Jun	2
4	8 Jun	3		
5	?		1 Jul**	3

*First eggs, damaged by *Larus argentatus*, began to breed after supplementary egg-laying.

**First date of egg-laying was not identified but it seemed to be supplementary egg-laying.

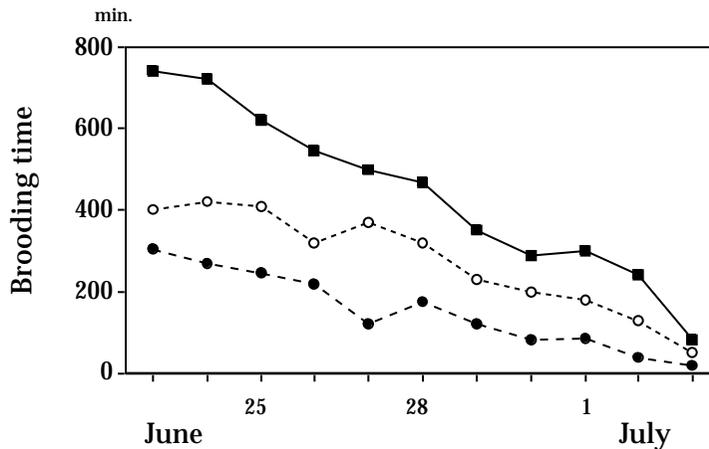


Fig. 6. Fluctuation in brooding time of Black-faced Spoonbills during nestling period. ○ : female, ● : male, ■ : total.

clutches of 3 eggs destroyed by *Larus argentatus* on May 23 and June 5. Both pairs laid second clutches of three eggs within 2 weeks (Table 1).

The incubation period was 26 days in each of the 5 nests. Incubation duties were shared by males and females, and 4.4 ± 1.3 (SD) ($N = 29$) exchanges/day were common (Fig. 4). Of 342.6 daylight hours recorded, females incubated 105.6 hours (30.8 %), and males 237.0 hours (69.2 %) (Fig. 5). Night incubation (19:00 H to 07:00) was done solely by the female. They often turned the eggs during incubation exchanges. On the 25th day of incubation, just before hatching, adults placed small twigs in the nest.

Brooding

The brooding period was 40 days. The adults brood the chicks until 11 days after hatching. The brooding time of the male was 92.3 hours (65.8 %), and of the female was 47.9 hours (34.2 %). Total observation time was 140.2 hours (Fig. 6). Brooding time decreased throughout nestling period.

During the fledging period, the female attended the chick 104.3 hours (46.4 %), and the male was in attendance 120.6 hours (53.6 %) of the 224.9 total observation hours (Fig. 7).

Main food items of Spoonbill were fish (mainly *Acanthogobius flavinanus*). The chick was

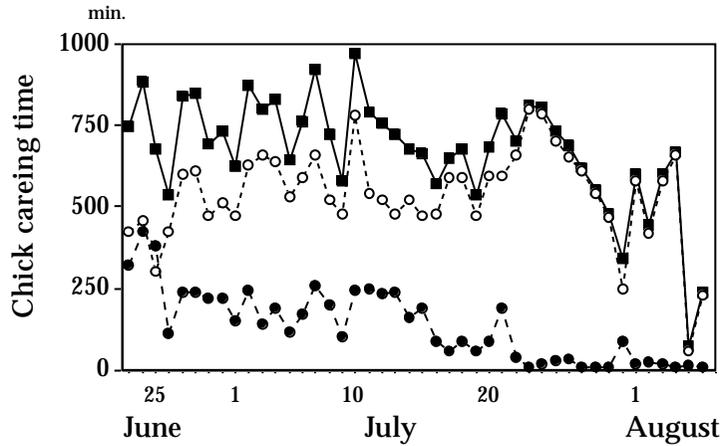


Fig. 7. Fluctuation in chick caring time of Black-faced Spoonbills during nestling season. \square : female, \circ : male, \triangle : total.

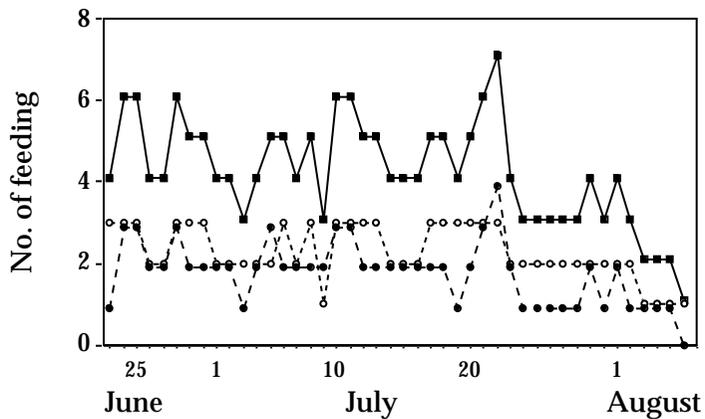


Fig. 8. Fluctuation in times of feeding of Black-faced Spoonbills during nestling season. \square : female, \circ : male, \triangle : total.

fed 4.1 ± 1.3 times/day ($N = 44$), and number of feedings decreased during late nestling period (Fig. 8).

Day 3 (June 26)

Eyes were opened. Soft pinfeathers were seen in the skin. The bill's tip was sharp.

Day 9 (July 2)

Body was covered with grey pinfeathers. Bill was skin colored, and the bill's tip rounded. The chick began to walk and hunger call "choruruk."

Day 14 (July 7)

Covered with white feathers, and the head plumage covered the ear. Competently

walked and preened. The "lores" became black, and the bill changed into a spoon shape. Black spots have appeared on the primaries.

Day 26 (July 19)

The chick's bill was light black in color and the length half of the adult's, while the body size was slightly smaller than the adult. Wings were fully feathered, and the tail 5 cm in length. The legs became black. Exercised often, and kept balance by flapping the wings.

Day 30 (July 23)

The adults breeding plumage was disappearing, as plumes were dropped and the yellow breast became lighter.

Day 38 (July 31)

One chick of the primary nest spent a night in a different nest, but did not beg from the adult there and was not fed.

Day 40 (August 2)

The chicks bill had a black spot on the end of the bill, and the bill size was 3/5 that of the adults. The body size was still smaller than the adult. The chick fledged around the 40th day. The adults and the fledged chicks flew together, exercising and feeding.

Breeding Success

The 5 pairs laid a total of 20 eggs during the season. Six eggs (of 2 nests) were predated by *Larus argentatus* before brooding. Spoonbills successfully hatched 9 (64.3 %) of their 14 brooded eggs. This low hatching success is a result of 3 eggs from a single nest being destroyed by *Larus argentatus* on the 20th day of incubation (July 7), a further 3 eggs of one nest and 2 eggs of another did not hatch. Excluding the predated nests, hatching success was 81.8 %. Six chicks reached fledging, which is 42.8 % of eggs laid, and 66.6% of chicks hatched. Cause of chick mortality was falling from the nest, which occurred on the 18th, 20th and 26th day after hatching.

Conclusion

It is difficult to compare the breeding success of Black-faced Spoonbills on Tok-do Island with that of other breeding sites, because there are few previous records on the species breeding biology. Information on clutch sizes before 1960 reports 4 to 6 eggs as a normal clutch (Won 1963), but all clutches observed on Taegam-do and Sogam-do Islands since 1981 have had no more than 3 eggs (Pak, unpubl. data).

Larus argentatus was an important natural enemy of the nesting Spoonbills. Gulls destroyed eggs of 3 nests during the study period. Two nests were predated early in the breeding cycle, and the adults laid second clutches, but the third nest was predated too late during incubation for re-nesting.

Spoonbills of Tok-do Island feed in the reclaimed land of Kumsong-ri, and the shallow waters nearby. From observations of the chicks being fed at Tok-do, it appears that their main diet is *Acanthogobbius flavinanus*. Other research on stomach contents of some

individuals has found 1) 90 % fish, 9% shrimp and 1% crab, 2) 100 % clams, and another 3) contained larvae of *Diptera* and *Lepidoptera* (Insect) (Won 1963). It is possible to research the available prey in the area of Tok-do, and the birds' feeding habits.

Tok-do Island is an important breeding area for Spoonbills, and also *Egretta eulophotes*, 200 pairs of which breed there. Presently the island is designated as a State Natural Monument of the DPRK, and thus we would like to encourage an active management scheme. Possible management programs to improve breeding success would be to move the *Larus argentatus* colony to the Island's south side. Research should be designed so that it does not disturb the breeding birds. Conservation of the feeding sites is crucial to the continuing success of the Spoonbill colony, and to the bio-diversity of wetlands on the Korean Peninsula.

On a larger scale, comprehensive investigation of potential breeding sites on the Korean Peninsula and in Liaoning Province, People's Republic of China, is a high priority. Through research, and by increasing the public's awareness of this species, we can enter a new phase of conservation for this endangered and beautiful bird of the wetlands.

Summary

The breeding biology of Black-faced Spoonbill *Platalea minor* was studied in Tok-do Island (38° 45' N, 124° 58' E), D.P.R. Korea during late May to early August, 1995. Black-faced Spoonbills' nests were placed 42.4 m high on the cliff, and were between 1.2 m and 1.5 m from each other. Of the 5 nests observed, 2 were old Spoonbill nests, 2 were old Grey Heron *Ardea cinerea* nests and 1 was a new Spoonbill nest.

The clutch size was three ($N = 5$). Eggs observed were oval, and white with small brown spots. Two pairs had their first clutches of 3 eggs destroyed by *Larus argentatus*. Both pairs laid second clutches of three eggs within 2 weeks.

The incubation period was 26 days in each of the 5 nests. Incubation duties were shared by males and females, and 4.4 ± 1.3 (SD) ($N = 29$) exchanges/day.

The brooding period was 40 days. Main food items of spoonbill is fish (mainly *Acanthogobius flavinanus*). Number of feedings/day 4.1 ± 1.3 ($N = 44$), and number of feedings decreased in late nestling period.

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クロツラヘラサギの繁殖生態

鄭 鍾烈¹・朴 宇日²・林 秋淵²・金 徳山²

1. 朝鮮大学校師範教育学部. 〒187 東京都小平市小川町1-700

2. 朝鮮民主主義人民共和国科学院自然保護センター. 平壤市中区域

1. クロツラヘラサギ *Platalea minor* の繁殖生態を朝鮮民主主義人民共和国平安南道温泉郡金城里トクト(徳島, 38° 58' N, 124° 58' E) で1995年5月下旬から8月上旬までの約80日間調査を行った。
2. クロツラヘラサギは古巣やアオサギの巣を奪って利用し, 新しい巣をつくるのはまれであった。巣の補修は抱卵から育雛まで全期間にわたって行なわれた。巣は地上から30 m以上, 平均42.4 mの位置の岩棚につくられた。
3. 抱卵日数は26日間で, 雌雄の交代回数は1日平均4.4回で, 昼間は雄, 夜間はメスが抱卵した。育雛期間は40日間で, 1日の給餌回数は, 1日平均4.1回だった。給餌回数は育雛期がすすむにつれて減少した。ヒナに与えた食物はほとんどがハゼ *Acanthogobius flavinanus* であった。
4. クロツラヘラサギの繁殖に影響を与える要因とこれからの保護問題に対して考察を行なった。

キ - ワ - ド : クロツラヘラサギ, 繁殖生態, 保護

