NESTING OF WHITE-NAPED CRANE IN DETROIT ZOOLOGICAL PARK, MICHIGAN

BY LAWRENCE H. WALKINSHAW

THE White-naped Crane, *Grus vipio*, is an inhabitant of eastern Asia. Peters (1934: 152) stated that the species was found during the summer "from Transbaikalia and northwestern Mongolia east through Manchuria to Ussuriland." It winters chiefly in Korea, southwest Japan, and middle China to the Yangtze valley. A few winter in Ussuriland (Grote, 1943: 35).

Blaauw (1897: 50) stated that the White-naped Crane bred repeatedly in the Zoological Garden of Amsterdam. It has also bred in Germany (Hagenbeck, 1940: 348–354); here a pair raised two young in 1933 (the year they were brought from Japan), one each year in 1935, 1936 and 1937, and hatched four young (two killed by hail) in 1938 and two in 1939.

In the United States this species has bred in the New York Zoological Park where one young was raised during 1916 and another in 1943 (Crandall, 1944: 125). Keith Kreag (1946: 4) described the first successful nesting at the Detroit Zoological Park in 1946.

This latter pair attempted to nest during 1945 but the nest was deserted when one of the employees went too close to the nest (Theodor Schroder, verbal communication). They had been purchased during 1941. On June 24, 1946, they hatched a single offspring from one of their two eggs and during June, 1947, another. During 1948, they hatched two young. One of the adults died of chicken cholera during the late fall of 1948. This pair raised only the one 1946 young.

THE NEST

The nest in the wild is usually among the foothill moraines, built in shallow water in the less extensive mountain marshes (Prjevalsky, 1877). Koslova (1935) found it breeding in brush-covered areas.

The four nests built in the large open enclosure of the Detroit Zoological Park have been placed on dry ground. The first two were in practically the same location, about 46 meters from the small lake in the enclosure. The nest in 1947 was even farther from the water. The nest in 1948 was on an "island" almost surrounded by the small lake, but it, like the others, was well up on the higher portion of the ridge. All were well away from the surrounding wall and, as the summer advanced, became better isolated by the tall grass. Apparently all of the nests were constructed with materials at hand—

ADULT WHITE-NAPED CRANE, JULY 4, 1946, DETROIT ZOOLOGICAL PARK, ROYAL OAK, MICHIGAN.

grass and twigs piled into a rather small nest for a crane, not more than one meter in diameter and with very little bulk. In each of these nests two eggs were laid. The incubation period was not determined, but the dates of egg-laying coincided somewhat with the dates the cranes were released into the enclosure.

In 1945, nesting occurred in June. In 1946, one egg hatched June 24, indicating that the eggs were laid about May 25. Blaauw (1897: 50) gave the incubation period as 30 days, as did Hagenbeck (1940). During 1947, Arthur Greenhall and I observed the one young for the first time on June 19. It had been hatched only a few days, indicating that the eggs were laid about May 16. In 1948, the adults were released into the enclosure in mid-April. Both eggs hatched June 1 (Keith Kreag, letter) indicating that the first egg must have been laid about April 30.

In the wild, Prjevalsky (1877) took the earliest young on May 19 at Lake Hanka, and Grote (1943: 35) stated that the young hatch toward the end of May.

According to Theodor Schroder, the eggs were buffy and spotted quite heavily with darker spots.

ATTITUDE TOWARD OTHER BIRDS

Several species of cranes were kept in the open enclosure, an area of about 2.4 acres. Two other White-naped Cranes (one raised by the nesting pair in 1946), five Sarus Cranes (*Grus antigone antigone*), two Lilford Cranes (*Grus grus lilfordi*), 13 Demoiselle Cranes (*Anthropoides virgo*), seven Stanley Cranes (*Anthropoides paradisea*), seven Crowned Cranes—five (*Balearica pavonina pavonina*), two (*Balearica pavonina regulorum*)—two Storks, five African Rose Pelicans (*Pelecanus onocrotalus* or *rufescens*), 41 Flamingos of three species (*Phoenicopterus ruber, chilensis,* and *antiquorum*), two hen Turkeys (*Meleagris gallopavo*), two African Vultures, three Dorcas gazelles and one mara were also in the enclosure. In addition, several other species of birds at times flew in from other pens. These included the Egyptian Goose (*Alopochen aegyptiacus*), Canada Goose (*Branta canadensis*), Mallard (*Anas platyrhynchos*) and Black Duck (*Anas rubripes*). Several Peacocks (*Pavo*) and Guinea Fowl (*Numida meleagris galeata*) also used the enclosure.

On April 14, 1947, in the winter enclosure, I observed the pair of White-naped Cranes with these other cranes, including their one young of 1946. The male repeatedly chased other cranes away from his mate, even the young bird the pair had raised the previous year.

Outside, in the open enclosure, the behavior of the male and female White-naped Cranes was almost identical. The crane which was not incubating always watched the other birds and mammals. It always remained somewhere near the nest, either in the water, at the feeding area or near by on the island.

If the Dorcas gazelle approached the area, this crane immediately took after it on foot, chasing it to the far corner of the enclosure. If the other two White-naped Cranes approached, they were driven away much more quickly than were other species of birds, except the Stanley Cranes. These latter cranes were attacked with the same vigor. All of the cranes, Lilford, Sarus, Crowned, Demoiselle, and Stanley, were driven away. One pair of Sarus Cranes, especially, and a pair of Lilford Cranes were shown more "respect." Often they approached to within 25 meters of the nest; here the White-naped Crane met them and often herded them back toward the corner by walking back and forth in front of them. Sometimes they did not herd and then were shown more "respect"; at this time the White-naped Crane often laid down on the ground with head erect. There appeared to be a definite boundary where this was done, sometimes by the male and sometimes by the female. At times they were only about four meters from the Sarus Cranes who were always together. When the White-naped Crane did this, the Sarus Cranes called in unison as they stood with heads up and backs to each other.

On one occasion the male Sarus Crane attacked the female White-naped Crane. The male White-naped Crane, which was incubating the eggs, rushed from the nest and both he and his mate attacked the male Sarus Crane with such intensity that he ran to the far corner of the island.

The storks, pelicans, flamingos, geese, sometimes the ducks, the vultures and peacocks were all attacked when they approached the region of the nest, and all showed great "respect" for the pair of White-naped Cranes.

The White-naped Cranes paid little attention to the Guinea Fowl and smaller birds. Often they walked past resting ducks which they had pecked at only a few minutes earlier.

ATTITUDE TOWARD EACH OTHER

The crane sitting on the eggs spent nearly all of the time incubating. The other crane of the pair roamed the vicinity, usually preening, feeding, or defending territory. When approaching the nest, it usually moved with head down. When the nest was reached, the head was raised as the other bird stood up. However, only once at the nest

did they call in unison and that was at 4:16 p. m. May 28 when they changed places. The male called a slow '*Groooa-groooa-groooa*,' the female a much shriller '*Kuk-kuk-kuk-kuk*.' The other time they called in unison was when they drove the male Sarus Crane from their territory. On that occasion they stood with backs toward each other, the male with his tertial feathers arched over his back, neck arched back and bill pointed forward at a 45-degree angle. The female stood with wings down and head and neck straight up. Both called in unison, the male having a deeper call and the female a much shriller one. The calls and the actions were almost identical with those of the pair of Sarus Cranes when they won an earlier bout. This call was given at 1:02 p. m. May 28.

Often when changing places at the nest, the incubating crane turned around and around, working with the eggs while the mate stood patiently within a meter's distance waiting for a turn at incubation. At other times it rose and left the nest and eggs immediately when the other crane approached.

BEHAVIOR AT THE NEST

I watched these White-naped Cranes at their nest from daylight until dark on May 28, 1948, and from daylight until 12:30 p. m. on May 29, 1948.

On May 28, 1948, the lowest Detroit temperature was 53° F. at 6 a. m. and the highest 82° F. at 4 p. m., dropping back to 76° at 8 p. m. (Eastern Standard Time). On May 29, 1948, it was much cooler, reaching a high of about 68° F. The sky was clear most of the time on May 28, but was slightly overcast at times, and overcast during the morning of May 29, clearing as the day advanced. There was no rain.

The White-naped Crane when settling down onto the eggs did exactly as other cranes do. One foot was placed on either side of the eggs so that when the bird was down the eggs were between the feet. While sitting on the eggs, the crane often had the head and neck erect. At other times the head was partly tucked into the feathers of the scapular region. This was also the sleeping position on the nest.

When the incubating crane turned the eggs, it stood up. Then, with lowered head it turned the eggs with the bill. Often it turned these many times before settling down, then raised itself several times before appearing to be "satisfied" with its position.

The periods of attentiveness at the nest are given in Table 1. The female White-naped Crane was at the nest May 27 from dark until 8:20 a. m. on May 28, or 230 daylight minutes (probably more than 12 hours altogether). Then, in periods of 57, 58, 55, and 63 minutes, and

one period of 73 minutes, she totaled 536 minutes on the nest between 4:30 a. m. May 28 and 12:30 p. m. May 29.

The male was on the nest for periods of 113, 112, 74, and 65 minutes on May 28 and for 16 hours and 36 minutes during the evening, night and morning of May 28 and 29. In addition, he was at the nest for an unfinished period of 13 minutes between 12:17 and 12:30 p. m. May 29, for a total of 903 daylight minutes and 470 minutes of darknesss.

During the above time, the female stood up, preened, turned the eggs, and worked with the nest-material for a total of 25 minutes. These periods on May 28 were between 6:01 a. m. and 4:14 p. m.; the duration of time when she was standing was from 30 seconds to five minutes; the average of 12 times was 125 seconds. The elapsed periods between rising on eight occasions averaged 28 minutes and ranged from one to 114 minutes.

On May 29, the male rose for the first time in the morning at 5:11 a. m. During 15 periods that he was working with the nest and eggs, he was up for an average of 133 seconds (total time, 33 minutes and 25 seconds). The extremes were 30 seconds and four minutes. The average time between the eight times the male rose from the eggs was 80.5 minutes, ranging between 41 and 139 minutes.

During 32 hours, this pair of cranes was at its nest 31 hours and 49 minutes. The other 11 minutes they were only a few meters away. The eggs were actually incubated for 30 hours and 51 minutes. On May 28, the birds left the eggs for only three periods of three, four, and four minutes, respectively.

FEEDING, DRINKING, BATHING

On May 28, the female fed chiefly between 8:25 and 9:20 a. m. and 6:45 to 8:40 p. m., and from 4:30 until 10:29 a. m. on May 29. The male fed on May 28 between 5:25 and 7:45 a. m. and then from 5:28 until 5:45 p. m. During the morning of May 29, he fed from 11:10 to 11:35 a. m. The female fed for 197 minutes and the male for 117 minutes during May 28 and the forenoon of May 29.

Most of the feeding was on grain thrown in by the caretaker. Fish were also thrown into the enclosure, but the cranes did not eat many of these. Some were thrown onto the island within 10 meters of the nest. Even of these the cranes did not eat many. The pelicans and the storks worked in swift dashes to get what they could before the cranes chased them away.

Much of the feeding time was spent probing in the earth, apparently for earthworms. Much time was spent capturing grasshoppers and similar insects in the tall grass. Once one of the White-naped Cranes

TABLE 1

ATTENTIVE PERIODS OF WHITE-NAPED CRANE AT NEST IN DETROIT ZOOLOGICAL PARK, MAY 28 AND 29, 1948

Female at nest	*Female fed*	*Male at nest*	*Male fed*
	MAY 28		
All night until 8:20 a. m. May 28			5:25– 5:40 a. m.
	8:25–8:45 a. m.		6:45– 7:05 a. m.
	8:48–9:05 a. m.	8:20–10:13 a. m.	7:22– 7:45 a. m.
	9:06–9:20 a. m.		10:17–10:20 a. m.
10:13–11:10 a. m.			
		11:10 a. m.–1:02 p. m.	
			1:06– 1:18 p. m.
1:06– 2:04 p. m.			
	3:02–3:18 p. m.	2:04– 3:18 p. m.	
3:21– 4:16 p. m.		4:20– 5:25 p. m.	5:28– 5:45 p. m.
5:25– 6:28 p. m.	6:45–6:54 p. m.		
	7:02–7:20 p. m.		
	7:50–7:52 p. m.		
	7:53–8:40 p. m.	6:28 p. m. all night until 11:04 a. m. May 29	
	MAY 29		
	4:30– 4:46 a. m.		
	4:48– 4:55 a. m.		
	7:30– 7:35 a. m.		
	8:52– 9:02 a. m.		
	10:13–10:29 a. m.		
11:04 a. m.–12:17 p. m.			11:10–11:35 a. m.
			12:15–12:17 p. m.
		12:17–12:30 p. m.	
TOTAL			
May 28, 463 minutes	143 minutes	364 minutes	90 minutes
May 29, 73 minutes	54 minutes	1009 minutes	27 minutes
Periods ranged in length from 55 minutes to 12 + hours		Periods ranged in length from 65 minutes to 16 hours and 36 minutes	
Average of 172 minutes for 6 periods (including one night)		Average of 274 minutes for 5 periods (including one night)	

pulled what appeared to be crayfish from the lake bank and threshed it back and forth against some stones before swallowing it entire.

Drinking was in much the same manner as in a chicken—lowering the bill into the water, shovelling it forward to get the water, and then raising it rapidly and swallowing.

The birds bathed once or twice daily. Lowering themselves into the water breast first, the entire body was then lowered so that practically nothing but the neck and head protruded above the water. They remained under water only a few seconds, then rose swiftly, shaking the feathers.

The male left the water where he was roosting on May 28, at 4:30 a. m. On May 29, the female left at 4:30 a. m. She had remained in exactly the same position all night. She stood in water about 20 to 30 centimeters deep and had her head tucked underneath the scapular feathers. She went to roost on May 28 at 8:40 p. m. in the late dusk.

Much of their spare time was spent preening. The feathers of the breast, back, rump, neck and wings were worked over for long periods of time by the standing, non-incubating crane. Occasionally, the incubating crane worked with the feathers of the back, neck, rump, and wing as it sat on the eggs.

THE YOUNG BIRDS

At hatching, the young of the White-naped Crane are downy like other baby cranes. They are practically the same color and size as young Sandhill Cranes, *Grus canadensis*. The down along the posterior portion of the head and body and neck is darker brown than the rest of the plumage. When first hatched, the bill and legs are lighter colored than they are later. During the first month the legs become elongated, the "knees" becoming very large. These are still lighter colored throughout than in adults, as is the bill. The down at one month of age becomes more tawny, a little darker on the back than on the lower parts.

During the late summer the young molt into a plumage similar to that of the adults. However, they retain some brown feathers on the side and back of the neck even until the following spring. The white nape is present by three months, but the cheeks are still feathered. By the spring after hatching, the cheeks become bare but not as red as in the adult. On September 28, 1946, when I examined the youngster which hatched June 24, 1946, the eye was still very dark in color, much different from the yellow eye of the adult. By April 14, 1947, this bird had a yellow-colored eye like the adult.

The call of the downy young was similar to that of the downy Sandhill Crane, a plaintive '*Peeep*' or '*Peeer.*' This call was given during the first winter, at least until April of the following year.

On September 28, 1946, when the White-naped Crane was three months of age, Keith Kreag and I watched the parents feed it things which they picked from the ground; it also picked up quite a little material.

I wish to thank Mr. Frank G. McInnis, Director, Mr. Theodor Schroder, Mr. Keith Kreag and Mr. Arthur M. Greenhall, all of the Detroit Zoological Park, for helping me in making these studies.

SUMMARY

The White-naped Crane bred in the Detroit Zoological Park for four consecutive years, 1945 to 1948. Eggs were laid between April 30 and May 25, approximately. Two eggs were laid in each nest. The eggs were buffy with darker spots, and the nests were built on dry land not far from water. Four young have hatched during three summers, and one was reared to adulthood. Two eggs were deserted.

The young resembled the downy Sandhill Crane during the first month but developed the white nape by three months of age. The one young was driven away by the male, when it was nearly a year old, and was not tolerated near the nest by either the male or female.

Both adults incubated the eggs. On two successive nights, the male incubated one night and the female the other. During 32 hours of observation, the parents were at the nest all but 11 minutes. The female stood up, preened, worked with the eggs and nest for 25 minutes and the male for 33 minutes so that the eggs were actually incubated for 30 hours and 51 minutes of the 32 hours.

Defense activities started even before the adults were released into the open enclosure where they nested. The male would not tolerate other White-naped Cranes approaching closely to his mate. When nesting started, both cranes defended the nest site from other large birds, including all species of cranes in the enclosure, as well as pelicans, flamingos, geese, vultures, peafowls, and storks. Dorcas gazelles were also chased. Actual fights took place between the White-naped Cranes and larger species such as the Sarus Crane. At times both male and female White-naped Cranes laid down on the ground along their definite territorial boundary only a few meters in front of the Sarus Cranes. On one occasion, one left the nest, and both attacked the male Sarus Crane, driving him away.

When calling, the male had a deeper voice. He often raised his tertial feathers over his back and held his head farther back than the female who did not raise her wings but pointed her bill straight up. Voices were not quite as loud as in the Sandhill Cranes. The young gave a plaintive '*Peeer*' call and continued this until the following spring.

The female was observed to feed the young when it was three months of age.

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1703 Wolverine Tower, Battle Creek, Michigan, January 31, 1949.

A PRELIMINARY STUDY OF THE AVIAN ADRENAL

BY FRANK A. HARTMAN AND ROBERT H. ALBERTIN

EXPERIMENTS have demonstrated that the adrenal is as important in birds as it is in mammals. Parkins (1931) reported an average survival of 80 hours following a two-stage adrenalectomy in the fowl. The symptoms resembled those of the cat and dog after a similar operation. Miller and Riddle (1942) were able to maintain young adrenalectomized pigeons an average of nine days by the addition of a salt mixture to their diet. Herrick and Torstveit (1938) destroyed the adrenals in male fowls in which the testes were large. They were given adrenal extract for a few days and then salt solution. Within a few weeks they had the appearance of typical capons, and the testes were reduced to a fraction of their original size, indicating that the adrenals were essential for their normal functioning. Beyond these observations little study has been made of the functions of the adrenal in the bird, but it is presumed that they are similar to those of the mammalian gland. However, more work is needed to demonstrate this.

The adrenal gland is an organ which is called upon in various stresses to increase its activities many-fold (Hartman and Brownell, 1949: 121, 258). No class of vertebrates shows greater range of variety or intensity of stresses to which it is exposed than that of the birds. Therefore, a study of the structure and function of the adrenal in this group should be very profitable.

Riddle (1923) noted the effects of ovulation and disease on adrenal weight in the dove and pigeon. Others have observed the changes in the fowl with age (Hartman and Brownell, 1949: 37). The study of the structure of the avian adrenal has also been limited largely to domestic forms (Hartman and Brownell, 1949: 24 and 56). Aside