North American Crane Working Group

PROCEEDINGS OF THE NORTH AMERICAN CRANE WORKSHOP

2008

SURVIVAL AND SOURCES OF MORTALITY IN FLORIDA SANDHILL CRANE CHICKS—HATCHING TO FLEDGING

Stephen A. Nesbitt
Stephen T. Schwikert
Marilyn G. Spalding

Nesbitt, S. A., S. T. Schwikert, and M. G. Spalding. 2008. Survival and sources of mortality in Florida sandhill crane chicks—hatching to fledging. Proceedings of the North American Crane Workshop 10:86-89.

SURVIVAL AND SOURCES OF MORTALITY IN FLORIDA SANDHILL CRANE CHICKS – HATCHING TO FLEDGING

STEPHEN A. NESBITT, Florida Fish and Wildlife Conservation Commission, Wildlife Research Laboratory, 1105 S.W. Williston Road, Gainesville, FL 32601, USA

STEPHEN T. SCHWIKERT, Florida Fish and Wildlife Conservation Commission, Wildlife Research Laboratory, 1105 S.W. Williston Road, Gainesville, FL 32601, USA

MARILYN G. SPALDING, Department of Pathobiology, Box 110880, College of Veterinary Medicine, University of Florida, Gainesville, FL 32611, USA

Abstract: Forty-five pairs of Florida sandhill cranes (*Grus canadensis pratensis*) were monitored during the nesting seasons from 1996 through 1999. Thirty-eight chicks were produced from 25 successful nests. Twenty-one of these survived to fledging age. Predation was the source of most (81%) of the mortality for which a cause was determined. Mammals were the primary predator. Average age at time of mortality was 27.2 days for the 17 chicks lost.

PROCEEDINGS OF THE NORTH AMERICAN CRANE WORKSHOP 10:86–89

Key words: chick mortality, Florida, Florida sandhill cranes, *Grus canadensis pratensis*, *Grus*, predation, radio telemetry, survival.

Efforts to establish a population of nonmigratory whooping cranes (*Grus americana*) in Florida began in 1993 (Nesbitt et al. 2001). The overall goal for the Florida reintroduction project is to establish a population of 25 breeding pairs of whooping cranes that are reproducing at a rate consistent with normal (self-sustaining) populations. Past studies of the reproduction of Florida sandhill cranes (*G. canadensis pratensis*) indicate that about half (56.6%) of the chicks hatched survived to the age of natal dispersal (independent of their parents); an average of 295 days old (Nesbitt 1992). Nesbitt (1992) found that 36% of the chick mortality occurred between time of hatching and 10 days of age, but the causes of mortality in these chicks were not determined. Studies of greater sandhill cranes (*G. c. tabida*) in Oregon and California reported that predators were responsible for 58, 77, and 78% of identified cause chick mortality (Littlefield and Lindstedt 1992, Ivey and Scheuering 1997, Desroberts 1997, respectively). Similarly for Florida sandhill cranes Dusek et al. (2005) found that predation was the likely cause of death in 73% of identified causes of mortality of the chicks they studied.

The oldest of the whooping cranes experimentally introduced to Florida were approaching breeding age by the late 1990s, and the first nest with eggs was found in 1999 (Nesbitt et al. 2001). First time nesting efforts among the introduced whooping cranes were often unsuccessful (Folk et al. 2005) and this was also true for first-time-nesting Florida sandhill cranes (Nesbitt 1992).

The objectives of this study were to evaluate causes of death of Florida sandhill crane chicks and to compare those results with results of other studies of wild cranes and with the results we observed with the whooping cranes experimentally introduced to Florida. Also improved understanding of cause of mortality for Florida sandhill crane chicks would allow us to assess if and how chick survival in the introduced whooping cranes differed.

METHODS

We individually marked, and in some cases radio instrumented, members of 30 breeding pairs of sandhill cranes in the Gainesville, Alachua County, Florida region during past studies. These marked adult pairs were monitored during the early nesting season to determine their nest initiation date, as closely as possible. We began daily monitoring of the nest as the expected hatch date approached.

Newly hatched chicks were captured as soon after hatching as possible, when hand capture was comparatively easy. These young (<10-days-old) chicks were radio instrumented with miniature (2g) transmitters (Advanced Telemetry Systems, Isanti, Minn.). These transmitters had an expected life of 10 days and an effective range of 0.5 km. The transmitters were glued to the skin on the back between the wings with skin-adhering epoxy glue (Titan Corp., Lynnwood, Wash.). After the first year of using these transmitters, we learned that gluing a piece of cotton fabric to the back of the transmitter before we glued it to the bird improved adhesion of the transmitter to the bird.

At 10 days of age, the birds were recaptured and a larger transmitter (about 5 g) was surgically inserted under the skin on the back. This second transmitter was expected to last 60 days and had an effective range of 1 km. The method of attachment was a modification of one used previously in Oregon and California (Ivey and Scheuering 1997, Desroberts 1997, Stern et al. 1986). The modifications were developed by M. Spalding in consultation with G. Olsen (Patuxent Wildlife Research Center, USGS) and are described by Spalding et al. (2001).

At 60 days of age the birds were recaptured and the inserted transmitter was removed and replaced with a traditional leg-band-mounted transmitter (Melvin et al. 1983). These latter two types of radio transmitter included a sensor that would switch into mortality mode (faster transmitter pulse rate) if the bird (radio) had not moved in the previous 6 hours. This signaled us that the bird had died or the transmitter had come off.

To replace radios that had failed or fallen off in older, more mobile chicks we used a different method of capture than the one we used for newly hatched chicks. The process involved stationing an observer in an inconspicuous position with a view of an area where, based on past behavior, the family was expected to be feeding. One or more other people served as a capture team. The observer and the capture team stayed in voice contact using walkie-talkies while the observer watched the family's movements through a telescope. Once the family had moved into an area where the chick's movements could easily be observed, the observer would signal the capture team to rush the family with the intention of causing the chick to hide. The observer would follow the chick and direct the capture team to the exact spot where the chick had hidden. This proved to be the most effective way of capturing highly mobile chicks, because we did not need to random search the chick's last known location and, in the process, run the risk of stepping on the hidden chick during the course of the search.

Captures were planned for morning or evening because this was the time of day when families are most active, and when temperatures would be coolest, so handling would be less stressful. We attempted to obtain a blood sample when chicks were handled for general health monitoring. Also a portion of each blood sample was used for gender determination (Goodpasture et al. 1992).

Chicks were monitored twice daily (0700 - 1000h and 1600 - 1900h) to determine if mortality occurred during the day or overnight. Twice-daily monitoring continued until the chicks could fly well (90 days of age). Monitoring was reduced after 90 days to once every 2 or 3 days because mortality after fledging was significantly reduced (Nesbitt 1992).

To test the effect of the transmitter or multiple captures on survival, we used 9 chicks from 5 pairs as controls. These chicks were never captured, but we were able to determine the outcome by monitoring their parents. We used a Kaplan-Meier procedure available in the software package JMP (SAS Institute Inc, Cary, North Carolina, USA) to analyze survival results.

RESULTS

We monitored 42 nests between 17 February 1996 and 22 May 1999. At least 1 chick hatched in 25 of these nests. Eggs in the other 17 nests did not hatch because of flooding (31%), infertility (15%), abandonment (15%), predation (8%), or unknown causes (31%). Twenty-one of the 38 chicks that hatched survived to successfully fledge (Table 1).

Six of the 17 chicks that did not survive were lost to unknown causes. Of the other 11 chicks, predation was identified as the cause of death for 9 (82%), 1 died as a result of snakebite, and the other died after becoming entangled in a fence. Avian predators (hawks and owls would be the most likely in Florida) were more of a factor in the death of younger chicks, while mammalian predators (bobcats [*Lynx rufus*] and coyotes [*Canis latrans*]) were more likely to take older chicks. The median age at death was 17 days (mean age was 27.2 ± 23.2 SD days, range 4-70 days).

The survival rate to 90 days of age for the 38 chicks that hatched was 0.553. Survival rate for males was 0.50, 0.80 for females, and 0.45 for gender unknown. These rates did not differ significantly from random ($P > 0.16$). Survival rates to 90 days for the 29 radio instrumented chicks was 0.48 and 0.78 for the 9 non-instrumented chicks; these rates did not differ significantly from random ($P = 0.137$). We were particularly interested in evaluating any effects our capture, handling, and radio attachment might have had on mortality, so we compared the 2 survival curves for the radio instrumented and noninstrumented chicks using a nonparametric Log-Rank test. Again the difference in the 2 curves was not significant ($P = 0.15$).

DISCUSSION

The smaller, limited-life, glue-on transmitters were effective on the smaller birds, but only for a few days. Three transmitters fell off before 4 days, and 2 others fell off before the end of the 10-day period. Recapturing these birds to apply the inserted transmitters was more labor intensive than if the transmitters had remained attached. When the transmitters lasted for the required 10 days, recapture of the birds for health check and replacing the transmitter was a simple procedure. Premature transmitter failure was a source of frustration for us and put additional stress on the chicks that had to be recaptured.

The type of glue and the attachment method seems to be an important consideration in the life of the transmitter. Gluing the small piece of material to the transmitter before it is glued to the bird was beneficial. Being careful to glue the transmitter directly to the chick's skin also improved the longevity of the attachment. We saw no adverse effects associated with the inserted transmitters when the birds were recaptured and the transmitters removed at 60 days.

Predation was the most frequently identified source of mortality. This result is consistent with the conclusions of the other studies of sandhill crane chick survival. Both bobcats and coyotes occur in the study area and are known predators of young and adult cranes in Florida (Nesbitt and Badger 1995, Nesbitt et al. 2001). We had suspected that some of the chick deaths seen in the past had been the result of inattentive parents;

Table 1. Fate of 38 Florida sandhill crane chicks monitored in Florida, 1996 through 1999 nesting season.

Adult pair ID	Clutch size	Chick #	Exp. (E) or control (C)	Hatch date	Gender	Age at death (days)	Cause
BWB	2	1	E	6 Mar 96	Female	Fledged	
107	2	1	E	5 May 96	Unknown	4	Unknown
NEW	2	1	E	25 Apr 96	Female	45	Mammal predation
134	2	1	E	1 May 96	Unknown	8	Unknown
126	2	1	E	5 May 96	Female	17	Avian Predation
		2	E	7 May 96	Male	17	Avian Predation
096	2	1	E	22 May 96	Unknown	6	Unknown
		2	E	25 May 96	Unknown	6	Unknown
CUTTLER	2	1	E	24 May 96	Unknown	20	Mammal Predation
		2	E	26 May 96	Unknown	45	Fence Injury
WAR	2	1	E	5 May 96	Unknown	10	Mammal Predation
		2	E	7 May 96	Unknown	8	Mammal Predation
NEW	2	1	E	16 Mar 97	Male	Fledged	
		2	E	18 Mar 97	Female	Fledged	
CUTTLER	2	1	E	9 Mar 97	Male	Fledged	
		2	E	10 Mar 97	Female	Fledged	
126	1	1	E	26 Mar 97	Unknown	Fledged	
134	1	1	E	4 Apr 97	Male	37	Mammal Predation
BWB	1	1	E	21 Apr 97	Male	70	Mammal Predation
107	1	1	E	14 May 97	Female	Fledged	
096	1	1	E	20 Apr 97	Female	Fledged	
CUTTLER	2	1	C	10 Apr 98	Unknown	67	Unknown
		2	C	12 Apr 98	Unknown	Fledged	
BWB	U	1	C	1 Apr 98	Unknown	Fledged	
BWB	2	1	C	12 Mar 99	Unknown	4	Unknown
		2	C	15 Mar 99	Unknown	Fledged	
107	2	1	C	18 Mar 99	Unknown	Fledged	
		2	C	20 Mar 99	Unknown	Fledged	
CUTTLER	2	1	C	21 Mar 99	Unknown	Fledged	
		2	C	23 Mar 99	Unknown	Fledged	
CATO	2	1	E	20 Mar 99	Female	Fledged	
		2	E	22 Mar 99	Male	Fledged	
126	1	1	E	21 Apr 99	Female	Fledged	
Red	2	1	E	22 May 99	Male	60	Snake Bite
134	2	1	E	3 May 99	Male	Fledged	
		2	E	5 May 99	Female	Fledged	
096	2	1	E	24 Apr 99	Unknown	38	Unknown
		2	E	26 Apr 99	Unknown	Fledged	

however, desertion or parental neglect was not a factor in any of the deaths for which a cause could be identified. Disease or parasite infections also were not seen as an important cause of mortality among the 38 chicks we studied. Intraspecific aggression or sibling aggression was also not detected as causes of mortality.

We would not recommend using inserted transmitters for any crane chicks < 10 days of age because of the size and weight of the radios. We would avoid using the full-sized leg-band transmitter on any crane chick < 55 days. Though we did not find a significant difference in survival between the experimental and control group of chicks, one should not ignore the possibility of adverse effects whenever we are deciding if, when, or how to radio-instrument juvenile cranes.

Based on results from this and earlier studies, the first chicks produced by inexperienced pairs of the experimentally introduced whooping cranes will likely not survive to fledge. It may take a year or more of failure before a pair raises their first chick to fledging. We anticipate that the main source of mortality for these first chicks will be from predation. If disease, parasite infection, or parental neglect were found to be major (> 30%) cause of whooping crane chick mortality in Florida, then that would be a cause for concern.

ACKNOWLEDGMENTS

The Florida Fish and Wildlife Conservation Commission, Nongame Trust Fund and the United States Fish and Wildlife Service through Section 6 of the Endangered Species Act (PL 93-205) provided funding for this study. The Florida Department of Environmental Protection, C. L. Brice and Company, and Dr. W. Murphy kindly allowed access to their property. We wish to thank G. L. Ivey for his review and suggested improvements to this manuscript. Funding for this work was supported in part by the USFWS via Cooperative Agreement No. 401814-J-035.

LITERATURE CITED

DesRoberts, K. J. 1992. Survival and habitat use of greater sandhill crane colts on Modoc National Wildlife Refuge, California. Proceedings of the North American Crane Workshop 7:18–23.

Dusek, R. J., K. G. Spalding, D. J. Forrester, N. Komar, and J. F. Day. 2005. Morbidity and mortality factors in pre-fledged Florida sandhill cranes (*Grus canadensis pratensis*) chicks. Proceedings of the North American Crane Workshop 9:7–13.

Folk, M. J., S. A. Nesbitt, S. T. Schwikert, J. A. Schmidt, K. A. Sullivan, T. J. Miller, S. B. Baynes, and J. M. Parker. 2005. Breeding biology of re-introduced nonmigratory whooping cranes in Florida. Proceeding of the North American Crane Workshop 9:105–109.

Goodpasture, C., G. Seluja, and G. F. Gee. 1992. Karyotype and identification of sex in two endangered crane species. Pages 219–224 *in* D. A. Wood, editor. Proceedings of the 1988 North American Crane Workshop. Florida Game Freshwater Fish Commission, Nongame Wildlife Program Technical Report 12. Tallahassee, Florida, USA.

Ivey, G. L., and E. J. Scheuering. 1997. Mortality of radio-equipped sandhill crane colts at Malheur National Wildlife Refuge, Oregon. Proceedings of the North American Crane Workshop 7:14–17.

Littlefield, C. D., and S. M. Lindstedt. 1992. Survival of juvenile greater sandhill cranes at Malheur National Wildlife Refuge, Oregon. Pages 21–32 *in* D. A. Wood, editor. Proceedings of the 1988 North American Crane Workshop. Florida Game Freshwater Fish Commission, Nongame Wildlife Program Technical Report 12. Tallahassee, Florida, USA.

Melvin, S. M., R. C. Drewien, S. A. Temple, and E. G. Bizeau. 1983. Leg-band attachment of radio transmitters for large birds. Wildlife Society Bulletin 11:282–285.

Nesbitt, S. A. 1992. First reproductive success and individual productivity in sandhill cranes. Journal of Wildlife Management 56: 573–577.

Nesbitt, S. A., and L. C. Badger. 1995. Coyote preys on young Florida sandhill crane. Florida Field Naturalist 23:15–16.

Nesbitt, S. A., M. J. Folk, K.A. Sullivan, S. T. Schwikert, and M. G. Spalding. 2001. An update of the Florida whooping crane release project through June 2000. Proceedings of the North American Crane Workshop 8:62–73.

Spalding, M. G., S. A. Nesbitt, S. T. Schwikert, and R. J. Dusek. 2001 The use of radio transmitters to monitor survival of sandhill crane chicks. Proceedings of the North American Crane Workshop 8:213–215.

Stern, M. A., G. J. Pampush, K. Kristensen, and R. E. Delcarlo. 1986. Survivorship, habitat use and causes of mortality in juvenile Sandhill Cranes. Unpublished Report. The Nature Conservancy, Portland, Oregon, USA.