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NESTING, DEVELOPMENT OF THE YOUNG, AND PARENTAL BEHAVIOR OF A PAIR OF FLORIDA SANDHILL CRANES

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Although the major features of the biology of the Florida Sandhill Crane (*Grus canadensis pratensis*) are known (Bent 1926, Thompson 1970, Walkinshaw 1949, 1973a, 1976), information is lacking on many details of the behavior, life history, and ecology of this non-migratory subspecies. This paper describes some aspects of nesting activity, growth and development of the young, and parental behavior of a pair of Florida Sandhills observed over a 12-month period in an area 8 km southeast of the town of Lake Placid, Highlands County, Florida.

STUDY AREA AND METHODS

The habitat of the territory consisted of improved pasture with scattered cabbage palm (*Sabal palmetto*)-live oak (*Quercus virginiana*) hammocks and small bayheads comprised of loblolly (*Gordonia lasianthus*), red (*Persea borbonia*), and white bays (*Magnolia virginiana*). The nest was located within 30 m of a well-traveled paved road. Neither the adults during incubation nor the family group after hatching paid much attention to vehicles passing by or stopped on the shoulder nearby. This situation provided an excellent opportunity for observations.

The nest containing 2 eggs was discovered on 21 February 1976, and 2 young were first seen on 14 March. On the previous day an adult was still on the nest and assumed to be incubating, although it may have been brooding. The size and appearance of the chicks when first observed indicated that, if not just hatched, they could not have been more than 1 or 2 days old. For purposes of the following account, the young are assumed to have hatched between 13 and 14 March (day 0). One of the young disappeared between 19 and 22 March. I observed the family daily from 14 to 20 March, at 1 to 5-day intervals from 20 March to 1 May, from 2 to 5 times a month from May through August, and 6 times between October 1976 and February 1977. Observation periods during each visit ranged from 15 min to 3 h; total observation time was approximately 40 h.

Nesting Activity

The nest was located in the middle of a 0.5-ha flooded area in an improved pasture in full view from the road. When discovered, the nest did not have a distinct zone of open water around it. However, by 4 March a zone about 0.3 m wide had been cleared by the adults gathering vegetation to build up the nest in response to rising water levels following heavy rain. They either stood in the water facing away from the nest and pulled up rooted vegetation and deposited it behind them in the water near the edge of the nest or directly on the platform or stood on the nest and pulled up pieces of vegetation from around the edge. The entire head and neck and sometimes the upper breast were submerged for 2 or 3 sec as the birds rooted for material. Once while standing on the nest, the male gently rolled an egg with his beak then moved small pieces of vegetation around in the center of the nest.

The incubating adult sat low on the nest with the head back on the shoulder or tucked under the wing or with head and neck extended flat on the nest. The latter position may have been a response to the vehicle parked on the nearby road shoulder. On only one occasion between 21 February and 14 March, when the chicks appeared, was the other member of the pair seen in the vicinity (60 m away) of the nest while one was incubating.

The cranes were not observed using the original nest after the chicks hatched, but accessory nests constructed of dry grass were used as rest sites by the young during the day and for brooding the young at night. One such nest was used the day the young hatched and was apparently built close to the time of hatching. It was located about 23 m from the original nest at the base of a tussock of broom sedge (*Andropogon* sp.) near the edge of the flooded area in about 7-10 cm of water. It was about 30 cm in diameter. One adult was observed pulling up grass and adding it to the edge of the platform on the day of hatching, and the female was seen adding material to the nest the following day. Another, smaller, platform of dry grass was used by the young for resting during the second day after hatching, but at dusk they were back on the first accessory nest being brooded by the female. Although the young were not seen using accessory nests after the third day, a new platform (2/3 size of original nest) was constructed about 9 m from the original nest between 4 and 7 April. On 8 April another new platform appeared to have been started about 45 m from the original nest. No evidence of fresh construction of accessory nests was noted after 8 April.

The presence of extra nests in Florida Sandhill crane nesting territories has been previously documented by Bent (1926), Thompson (1970), and Walkinshaw (1973a). However, their use as rest and brooding sites for the young apparently has not been noted earlier. The literature suggests the occurrence of accessory nests in other Sandhill Crane populations is variable. Valentine and Noble (1970) noted that inactive nests usually were found around occupied nests of Mississippi Sandhill Cranes (*G. c. pulla*). However, no mention is made of accessory nests in the relatively numerous reports on nesting in the Greater Sandhill (*G. c. tabida*) and Lesser Sandhill (*G. c. canadensis*) (Bent 1926, Bieniasz 1979, Boise 1976, Drewien 1973, Howard 1977, Littlefield and Ryder 1968, Walkinshaw 1949, 1973a, 1973b). It thus appears that accessory nests are a more frequent, if not exclusive, phenomenon in the two southern, non-migratory sandhill subspecies. This difference may be related to more aquatic nest site preferences in the southern populations which result in the young having to spend more time in water during early life than in the case of the northern races (Walkinshaw 1965). In addition to their function as resting and brooding sites for chicks, accessory or "dummy" nests also may have adaptive value by serving to confuse predators.

A flock of about 30 wintering Greater Sandhills was seen within 400 m of the nest on one occasion and 8 others foraged within 90 m of the nest on another date, both times in view of the incubating adult. On neither occasion did the incubating crane show any concern over the proximity of the northern birds nor did its mate put in an appearance. Following the departure of the Greater Sandhills in early March, no other cranes were observed in the nest area until 20 August, when another pair appeared 0.3 km north of the nest site. On 27 August, this pair was observed closer to the nest site. On neither occasion was the family in the vicinity. However, on 3 October, the neighboring pair and the family group were foraging about 300 m apart on opposite sides of a small hammock. Two days later, the pair was foraging in close proximity to the former nest site while the family group was absent from the area. On 29 December, the family and another pair, probably a different one than that mentioned above, were feeding close together about 0.8 km from the nest site.

These observations indicate that, under some conditions at least, nesting Florida Sandhills are relatively tolerant of wintering Greater Sandhills in the vicinity of the nest and that in late summer territorial boundaries between resident pairs tend to break down.

Walkinshaw (1976) also noted that families with young over 3 months old sometimes foraged in close proximity or roosted together. I also have frequently observed loose aggregations of Florida Sandhills in south-central Florida in late summer and fall prior to the arrival of the migrant flocks. These aggregations appear to differ from Greater Sandhill flocks in being more loosely organized, with the individual pairs and family groups tending to keep somewhat apart. Florida Sandhill aggregations also seem to be less vocal than the wintering flocks of Greater Sandhills.

Growth and Development of Young

There was no discernible difference in size of the chicks during the period from hatching until the disappearance of one at 5 days of age. Observations on growth and development of the surviving individual to about a year of age are as follows:

14 March (day 0)—Estimated height at shoulder 10 cm; color bright golden-tawny; gait somewhat awkward when chicks tried to move rapidly.

27 March (day 13)—Estimated height 20-25 cm; movements better coordinated than earlier.

2 April (day 19)—Estimated height 25-28 cm; no distinct feather tracts visible, but feathers possibly coming in in scapular region; still golden-brown on back, head, and nape; sides of neck and area around eyes gray in contrast to brown of adjacent areas.

7 April (day 24)—Coloration duller and paler than earlier.

25 April (day 42)—Wing coverts appear to be coming in.

10 May (day 57)—About 2/3 adult size; well-feathered.

14 May (day 61)—Down no longer apparent; crown and face gray; nape tan, in contrast to gray of adult; bill light-colored and still relatively short compared to adult.

9 June (day 87)—Still noticeably smaller than either adult; bill becoming darker but still lighter-colored and relatively shorter than adult; crown, occiput, and nape pale buffy tan; face paler than adult, less distinct separation of whitish and darker areas than in adult; general body plumage paler and grayer than adult; greater and median coverts with pale buff margins; tertials not down-curved as in adult.

30 June (day 108)—Obviously smaller than either adult; crown now reddish brown, but light area on side of head below crown not as clearly defined as in adult; eye still brown; bill noticeably paler than adult; wing coverts uniform color, no intermixed browner feathers as in adult at this time; tertials down-curved but shorter than adult; first observed flight.

1 August (day 140)—Slightly smaller than adult female; grayer than adults; no red on crown, although forehead appears somewhat brighter reddish-brown than earlier; eye pale straw color; bill color of adult's, but appears duller, shorter, and less down-curved at tip; tertials similar

to adult; neck pale gray, feathers with pale buff margins; wing coverts a mixture of grayish and brownish feathers indicating post-juvenal molt.

18 August (day 157)—Same size as adult female, but more lightly built; distinct reddish coloration on forehead, but not as bright as adult.

29 December (day 290)—Plumage indistinguishable from adults, although red on crown appears slightly duller.

19 February (day 342)—Plumage predominantly gray, in contrast to adults which are stained rusty at this time.

Sutton (1946) and Walkinshaw (1973a) described the color of recently-hatched Florida Sandhill chicks, and Walkinshaw (1973a, 1976) gave weights and measurements of young 1 or 2 days old. Baldwin (1977) compared growth in weight and various body dimensions of four subspecies of Sandhill Cranes, including *pratensis*, under captive conditions. Plumage development of Florida Sandhills has apparently not been previously described. Development of the Florida young observed in this study appeared to be generally similar to that of a captive-reared Greater Sandhill from Michigan described by Walkinshaw (1949), although perhaps somewhat slower. Baldwin (1977) noted that growth of *pratensis* was relatively slow compared to northern populations with shorter breeding seasons and that young from higher latitudes were able to fly at earlier ages. I first observed the *pratensis* young in flight when it was 108 days of age, although it may have been capable of flying earlier. Walkinshaw (1976) stated that Florida Sandhills are able to fly at 3 months of age. In contrast, Drewien (1973) reported that young Greater Sandhills begin flying at 65-75 days of age.

Parental Behavior

When the young were first discovered on 14 March, they were with the female on the first accessory nest. The male was nearby. The chicks moved around actively or rested sitting erect on their tarsi or laying down on the platform. The next day the family was observed foraging about 10 m from the nest in water 15-20 cm deep. The adults stayed in a restricted area and moved slowly so that the young could keep up. The young remained close to the parents, struggling through dense grass and readily swimming in open water. If the adults got too far ahead, the young would hasten to catch up, running after them with wings outspread. After about 2 hr of foraging the adults led the young to an accessory nest. The female added vegetation to the platform for several minutes, then laid down with the young but did not actually brood them. The male

moved off a few meters, then returned to stand and preen beside the platform. During the next several days, the family remained in the flooded area near the nest, the adults occasionally foraging without the young. Walkinshaw (1976) recorded young only 2 days of age accompanying the parents as far as 0.4 km from the nest.

By 20 March, the family had ranged up to 0.4 km from the nest site into drier pasture habitat. The adults now tended to move more rapidly, and the chicks had no trouble keeping up. The family was seen on each of 9 visits I made to the area between 2 April and 1 May. Once (7 April) they were 0.5 km from the nest site, but the other times were within 23 to 120 m ($\bar{X}$=56 m) of it. After 1 May, the family tended to forage at greater distances from the nest site and was seen in the field less frequently. However, the cranes occasionally returned to the vicinity of the nest. On 10 of 13 visits I made to the nest area between 10 May and 18 August, the family was located within 0.3 to 0.8 km ($\bar{X}$=0.54 km) of the nest site. They were found on 3 out of 7 visits from 3 October 1976 to 19 February 1977 within 45 m to 0.8 km ($\bar{X}$=0.42 km) of the nest site.

Feeding behavior was first observed (15 March) on the day after the chicks appeared. The adults and chicks moved slowly in water 15 to 20 cm deep mostly pecking at objects on vegetation at heights of about 5 to 8 cm above the water line, although the adults occasionally picked up items at or just beneath the water surface. The young would extend 8 to 10 cm to peck at an object on vegetation, and on one occasion a chick watched as an adult pecked at something at the surface of the water then pecked at the same spot. I could not determine whether the chicks actually caught anything during their feeding attempts. The adults would frequently pause with the head down and food item held in the tip of the bill, whereupon a chick would quickly pick it out from the side, sometimes striking at the food item several times before succeeding in getting it. I could not identify any of the prey items, but, judging from the feeding behavior, assume they were insects and/or spiders.

On 2 April, while the family foraged in a wet area of the pasture, the chick remained continually within 0.5-1 m of an adult and was often closer. When the adults waded through deeper water, the young readily swam along with them. Both adults fed the chick, but during the approximately 20-min period I observed it received food more often from the female. Occasionally the young pecked at the grass, but I could not tell if it obtained any food items. When an adult would begin pecking in the grass, the young would quickly move up and stand near its head. Once the female picked up an

item and waited with head down until the chick came up and took the food item from her bill. During this period the young also was seen pecking at the ground, usually where an adult had been working.

On 25 April (day 42), the young was observed picking up food items itself as well as obtaining food from the adults. On 9 June (day 87), the young was still being fed by both parents. As earlier, the adults would pause with food in the bill and the young would take it. Once it appeared that the adult laid the food item on the ground, and the chick picked it up. The young also remained close to the adults and probed in the same areas. Adults were not seen feeding the chick after 30 June (day 108). On 18 August, the family was busily engaged in feeding on insects on vegetation several cm above ground, and the young seemed as adept as the adults in capturing prey. The juvenile was still closely associated with the pair when they were observed on 23 January and 19 February. As earlier, it would frequently walk to the place where an adult was vigorously probing and begin to probe in the same spot.

Adult defensive behavior was observed on several occasions. On 15 March, when the chicks were about a day old, a flock of White Ibis (*Eudocimus alba*) flew into the marsh where the family was foraging. As the ibis approached to land near the cranes, the adults quickly moved close together, stretching their necks upward, and emitted guard calls simultaneously. The 2 young immediately ran to them from about 1 m away and stood upright between them. A few minutes later a Snowy Egret (*Egretta thula*) landed near the family, and the adults instantly gave low, gutteral rattles and guard calls and moved between the heron and chicks.

On 22 March a Red-shouldered Hawk (*Buteo lineatus*) flew over the family at a height of about 15 m. Although the hawk showed no interest in the cranes, the adults immediately moved close together, with the young between them, assumed an erect posture with beak pointed up, and gave brief guard calls. As the hawk passed directly overhead, one adult spread its wings slightly in a shielding or defensive gesture.

When the chick was 19 days old, the family was approached by a cow as they foraged in a pasture. When the cow was about 10 m away, the adults gave brief guard calls. The chick moved slightly closer to the female but otherwise paid little attention to the cow. When the cow came within 3 m, both adults uttered guard calls and positioned themselves between the chick and cow. The chick then moved close beside the female. As the cow continued to advance,

both adults turned to face it, the male slightly in front. Then the male, standing with trunk and neck almost vertical and beak angled down, partly opened his wings and, holding them out to the side and nearly vertical, advanced quickly towards the cow, which promptly retreated. This display ("Spread Wing Display" of Voss 1977, "Distraction Display" of Walkinshaw 1965) is also used by other sandhill subspecies as well as other crane species (Walkinshaw 1965).

When faced with a possibly dangerous situation, an adult would give low, gutteral rattle notes as it walked away. This vocalization elicited an immediate following response by the young. On one occasion just before the family took flight at my close approach, the juvenile (then about 108 days old) appeared to utter the same vocalization.

When disturbed, adults tended to spread the tertials vertically. This was more often observed in the male than female. He was also more alert to possible danger and showed a greater tendency to "stand guard" and remain nearer the source of a disturbance than his mate.

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ALSO RECEIVED

A bibliography of south Florida wading birds.—James A. Kushlan, M. Christine Baumann, and Linda C. McEwan. 1978. South Florida Research Center Report T-514, 27 pp. Available from the authors, SFRC, Everglades National Park, P. O. Box 279, Homestead, FL 33030.—This useful publication contains about 400 references (with brief annotations) for Ciconiiform birds occurring from Lake Okeechobee to the lower Florida Keys.

Selected vertebrate endangered species of the seacoast of the United States.—National Fish and Wildlife Laboratory. 1980. Biological Services Program, U.S. Fish and Wildlife Service, FWS/OBS-80/01. 58 pamphlets. Available from National Coastal Ecosystems Team, USFWS, NASA-Slidell Complex, 1010 Gause Blvd., Slidell, LA 70458.—These 5-16 page pamphlets come in a 3-ring binder stout enough to hold the original 58 as well as the future species accounts and revisions of the original 58. Each pamphlet is designed as an independent document with its own black and white cover photograph and title page. The standard format for the text includes legal status, reasons for current status, description, range (including map), habitat, diet, nesting, population, reproduction, authorities, management, and selected references.

The species included are those occurring along or within 100 km of the seacoast of the U.S., thus covering essentially all of Florida. The 23 Florida vertebrates covered include 1 fish, 1 frog, 4 sea turtles, 2 crocodilians, 6 mammals, and Brown Pelican, Everglade Kite, Peregrine Falcon, Ivory-billed Woodpecker, Red-cockaded Woodpecker, Bachman's Warbler, Cape Sable Sparrow and Dusky Seaside Sparrow.

The pamphlets are well done, authoritative and up-to-date. Readers of the journal who are concerned about environmental education should write for a set of the Florida pamphlets (or even the entire set) and donate them to the key person in the local area who is active in environmental education.