STATUS OF THE CUBAN SANDHILL CRANE RESEARCH AND CONSERVATION PROGRAM

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Abstract.—Although it is the largest bird in Cuba and the Caribbean islands, the Cuban Sandhill Crane's (*Grus canadensis nesiotes*) ecology and reproductive biology have remained unstudied. Before 1994, when our research began, only four supposedly isolated populations of cranes were recognized. Our study has had four general objectives: (1) to determine the numbers of individuals in the different populations and examine the degree of protection for each, (2) to evaluate the negative factors affecting the populations, (3) to develop a massive and systematic program of environmental education for the crane and its environment, and (4) to expand the knowledge about the reproductive ecology, molecular genetics, and habitat management for the species. In 1996, we determined the existence of 11 crane populations and identified four subpopulations with sufficient habitat to support a large number of individuals. After six years of surveys and research, we have identified 13 localities in three islands in the Cuban archipelago with 600 cranes. Many of these estimates are the result of counts made with the participation of the local residents made during five popular festivals in various localities in Cuba. The majority of cranes is concentrated in the Isla de Pinos (Isla de la Juventud). From 1995 to 1999, we found 41 crane nests in that location, and 28 of those, containing a total of 50 eggs, were monitored through hatching. The reproductive period extends from late February until early June, with March and April being the period of peak activity. The mean clutch size for 25 nests was 1.77 eggs. From our observations, we determined cranes prefer dry, open habitat. At 17 measured nests, the outside diameter varied from 40.0 to 94.0 cm, with a mean of 66.9 cm; the nest bowl diameter varied from 40.0 to 80.0 cm, with a mean of 60.2 cm. The distance between nests averaged 2.86 km. We report on the measurements of 11 eggs. The eggs of the Cuban population are smaller and weigh less than those of Florida cranes. Among the most important actions to be effected are to: (1) determine size of crane populations in areas not yet surveyed, (2) band and radio-mark several individuals in the Isla de Pinos population, (3) establish management techniques using fire and change of grasses, and (4) continue the environmental education program throughout Cuba.

Resumen.—ESTADO DEL PROGRAMA DE INVESTIGACIÓN Y CONSERVACIÓN DE LA GRULLA CUBANA. Es muy poco lo que se conoce de la ecología y reproducción de la Grulla Cubana (*Grus canadensis nesiotes*) a pesar de ser el ave más grande del país y del Caribe insular. Antes de 1994, cuando se inicia este programa, sólo se conocían cuatro poblaciones supuestamente aisladas. Los objetivos generales que pretendía cumplir eran: determinar la composición numérica de las diferentes poblaciones y su grado de conservación, evaluar los factores negativos, desarrollar un programa de educación ambiental masivo y sistemático, y ampliar los conocimientos acerca de la ecología reproductiva, genética molecular y manejo de hábitat para esta especie. En 1996 se corroboró la existencia de 11 poblaciones y se identificaron cuatro subpoblaciones con hábitat lo suficientemente extenso como para albergar un gran número de individuos. Luego de seis años de búsqueda e investigación se han identificado 13 localidades en tres de las islas del archipiélago cubano con 600 individuos. Muchos de estos estimados son el resultado de conteos realizados con la participación de los pobladores locales en festivales populares celebrados en cinco ocasiones y en varias localidades del país. En la isla de Pinos (isla de la Juventud) se concentra la mayor población de grullas. De 1995 a 1999 se localizaron 41 nidos en esta localidad, y 28 de ellos se monitorearon hasta la eclosión, registrándose un total de 50 huevos. El período reproductivo se extiende desde finales de febrero hasta principios de junio, siendo un período de mayor actividad los meses de marzo y abril. El tamaño promedio de nidada en 25 nidos fue de 1.77 huevos. Según las observaciones de este trabajo, las grullas prefieren hábitats abiertos y secos. En las mediciones efectuadas a 17 nidos, el diámetro mayor varió de 40.0 a 94.0 cm., con una media de 66.9 cm., y el diámetro menor de 40.0 a 80.0 cm., promediando 60.2 cm. La distancia entre nidos tuvo una media de 2.86 km. Se midieron 11 huevos, reportándose sus medidas. Se determinó que los huevos de la subespecie cubana son de menor talla y peso que los de la Florida. Como acciones futuras a realizar en el proyecto se destaca: conocer los efectivos poblacionales en las localidades que faltan, anillar e identificar mediante radios algunos ejemplares de la población de la isla de Pinos, establecer técnicas de manejo del hábitat con uso del fuego y cambio de pastos, y continuar la labor de educación ambiental en todo el país.

Key words: *breeding biology*, *conservation*, *Cuba*, *ecology*, *environmental education*, Grus canadensis nesiotes, *population*, *Sandhill Crane*, *status*

INTRODUCTION

BEFORE HUMAN COLONIZATION, 90% of Cuba was covered by forest, whereas grasslands did not occupy extensive areas. Since colonization, harvest of precious wood has resulted in extensive deforestation. Subsequently, plantations of crops, such as coffee, tobacco, and sugarcane, occupied large areas of land. By the end of the 19th century, original forests covered only 56% of the island, and by the mid-20th century, only 14% remained in a relatively pristine state. In the 1960s, a policy of systematic reforestation was established in Cuba. Although forest cover has increased to 22%, a high loss of biodiversity continues.

Historical reports suggest that the Cuban Sandhill Crane (*Grus canadensis nesiotes*) depends on natural grasslands and wetlands for breeding. These habitats were never abundant in Cuba, but have not escaped destruction by man. Grasslands and wetlands have been subject to overexploitation, drainage, and the effects of deforestation in upland areas, which have resulted in changes in the seasonal hydrology and ultimately in loss of crane nesting habitat.

Little is known about Cuban Sandhill Crane ecology and reproduction despite the fact that it is the largest bird in Cuba and the Caribbean islands, and is considered endangered. Gundlach (1876) reported Cuban Sandhill Cranes from the Ciénaga de Zapata, Viñales, east of Guamutas, and Isla de Pinos (now Isla de la Juventud). Only four populations, believed to be distinct, were known from the white sand grasslands of Pinar del Río, Isla de Pinos, Ciénaga de Zapata, and Lesca grasslands (Garrido and García 1975) until Berovides and Gálvez (1995) and Gálvez and Perera (1995) reported additional crane populations.

In 1992, Gálvez and collaborators designed a project that included research and conservation of crane populations. It was not until 1994, however, with the support of the International Crane Foundation, that this project could be initiated, with the following objectives:

- Determine the distribution of Cuban Sandhill Cranes throughout the country.
- Determine the size of the distinct populations and their status.
- Evaluate factors that may be negatively affecting the habitats of the populations.
- Develop a wide-scale and systematic environmental education program that would immediately address threats such as hunting and clearing of riparian vegetation.
- Study the reproductive ecology of the crane.
- Conduct molecular genetics studies of the crane.
- Propose habitat management conducive to population recovery.
- Develop captive breeding techniques for eventual reintroduction of captive-produced cranes to the wild.

RESULTS AND DISCUSSION

Initially, a map of potential crane habitats was developed. These habitats originally occupied 30% of the country but in many cases had been reduced or eliminated by agricultural activity. Also, we solicited public response to a series of questionnaires we developed and confirmed presence or absence of cranes during visits to areas near open natural habitats that we had identified.

We exhaustively surveyed the 23 localities in historical reports and which were volunteered in response to the questionnaires. From these surveys we confirmed the existence of 11 crane populations in 1996 (Gálvez 1997). After preliminary visits to all provinces in Cuba, we arrived at several conclusions that allowed us to improve project design. Among these conclusions was the fact that cranes that remained in the 11 sites had been there for over 30 years, and habitat at all sites had suffered several alterations. Of the 11 verified subpopulations, 7 (64%) were within protected areas. Local inhabitants were unaware of the importance of the species and the remnant habitat patches where cranes were still found. We determined that development of a censusing method that targeted these remaining populations, spread over a wide area, was needed.

This initial fieldwork also allowed us to identify general threats to the habitat and thus make a preliminary list of the conservation issues:

- A large percentage of wetlands has been drained and converted to agriculture, mainly sugar cane.
- Other wetlands have been drained for peat extraction and channels and dikes have been built, altering the hydrology in some coastal grasslands.
- Fire suppression in some grasslands has encouraged conversion to thick brush in areas that previously were used by cranes.
- Destruction of native vegetation and soil erosion has occurred because of intensive cattle grazing.
- Deforestation has occurred around flooded areas with resulting loss of protection and balance of

Table 1. Populations of the Cuban Sandhill Crane (*Grus canadensis nesiotes*) at 13 sites as determined by surveys, 1994–1999.

Province	Locality	Estimated population size	Comments
Pinar del Río		Fewer than 50	Composed of 2 groups
Matanzas	Ciénaga de Zapata	At least 130	
	Ciénaga Majadigal	Fewer than 30	
Isla de Pinos		115 (1995) 170 (1998)	
Sancti Spiritus	Yaguajay	74	
Ciego de Ávila	Morón	107	
	Southern section	Fewer than 30	
Camagüey	Northern section	60	Composed of 3 groups
Granma	Biramas	Unconfirmed	

hydrological regimes.

- Introduced mammals, such as dogs, cats, feral pigs, and mongooses, have depredated crane eggs and chicks.
- We discovered poaching, especially in the central and western regions of Cuba.
- In Pinar del Río and Isla de Pinos, natural grasslands with open pine groves of *Pinus tropicalis* have been converted to pine plantations of *Pinus caribea*.

During this period, four subpopulations were determined to have sufficient habitat to sustain a large number of individuals. Development of a censusing technique to determine actual size of each population is needed.

After six years (1994–1999) of research, 13 sites on three islands of the archipelago (Cuba, Isla de Pinos, and Cayo Romano) have been identified as having crane populations. Total crane numbers have been estimated at 600 individuals (Table 1). Many of these population estimates result from counts performed with the participation of local people. Involving the communities around sites where cranes are found is an important component of the project. This commitment is a part of the environmental education program and the popular Support Endangered Birds festivals that have been celebrated on five occasions in several localities throughout the country (Gálvez *et al*. 1999). An indication of the success of our environmental education program is the crane population increase (from 115 cranes in 1995, to 170 in 1998) in Isla de Pinos since initiating our conservation efforts (Table 1).

The research to determine basic biology of the sandhill crane has been conducted primarily in the Isla de Pinos, where the largest population is found. Investigations are based at Los Indios Ecological Reserve. Population estimates of Cuban Sandhill Cranes were conducted in this reserve as early as 1989, 1991, and 1992, when an estimated 32 individuals survived (Berovides and Gálvez 1995). In the future, results from these efforts will be used as a tool to recommend management strategies for other Cuban Sandhill Crane populations.

Isla de Pinos is second in size and importance of the more than 4000 islands and cays that compose the Cuban archipelago. The Ciénaga de Lanier divides the island into two areas that have completely different soil and vegetation types. The southern section is characterized by karstic soils covered by semideciduous forest that is relatively well preserved, whereas the northern section is characterized by a dome-like elevation, with a radial hydrological net and a series of eroded and denuded plains where different vegetation types have been established. The largest extensions of these plains are occupied by pines and palm savannas, especially in the western plains. In the grasslands of northern Ciénaga de Lanier, both the Cuban Sandhill Crane and Cuban Parrot (*Amazona leucocephala*) are found, especially in the Los Indios Ecological Reserve.

From 1995 to 1999, 41 crane nests were found, 28 of which we monitored until hatching and produced 50 eggs. Nests were located primarily by searching on foot (because of lack of transportation), which made coverage of the 3500-ha area difficult. The breeding period is from late February until early June, with activity peaks in March and April. These dates coincide with data from Bennett and Bennett

(1990) and Dwyer and Tanner (1992) for *Grus canadensis pratensis* in Florida.

Layne (1983) and Bennett and Bennett (1990) reported that rains during the dry season (before nesting season) correlated with breeding success, whereas rains in the spring lowered breeding success because of flooding of nests and mortality of chicks due to pneumonia. In Cuba, a similar situation occurs, except the rains before nesting occur in October and November and not in December as on the continent. In nests monitored in 1997 and in 1999, when precipitation was lower than the historical average, we found an increase in reproductive success. Undoubtedly, favorable climate conditions, coupled with changes in management policies in the reserve (cattle were restricted from the area and anti-fire trenches were dug in 1996), have contributed to these results.

Average clutch size per nest (N = 25) was 1.77, similar to 1.72 found by Nesbitt (1988) in the Florida subspecies. During our study, we observed an increase in pairs with chicks and the number of chicks per 100 adults, which reached 28.5. Number of nests lost also decreased during the years of our study, in 1999 reaching 14.7%, which is similar to the 15% reported for *G. c. pratensis* by Dwyer (1990) and Dwyer and Tanner (1992).

Our observations indicate that cranes prefer open and dry habitats, similar to the observations of Walkinshaw (1982) and Dwyer (1990). It appears that the Cuban subspecies of crane prefers to nest on dry soils. Nests are constructed on quartz-sand soils and iron-quartz soils, with sparse natural grasses or pines. Trees and shrubs are also sparse and dispersed. Palm and pine shrubs are isolated and the herbaceous layer is composed of Ciperaceae, Eriocaulaceae, and Poaceae. Nests are placed in open areas within the grasslands and are readily visible, although they are typically near dense vegetation that functions as a visual barrier to other pairs. These "screens" were usually 24–60 m from the crane nest. Most nests were small, some barely visible as the slope of the terrain increased. Distance between nests averaged 2.86 km.

The predominant species of herbs are *Sorghastrum* sp. and *Trachypogon filifolius*, which is used in nest construction. The herbaceous material is sometimes so sparse that nests are minimal and eggs are laid directly on the sandy soil. Mean nest depth was 3.4 cm (R = 0.9 to 7.0 cm). Because cranes prefer dry soils vs. flooded areas for nesting, nest depth in Cuba was much lower than values reported by Thompson (1970) for Florida cranes. In 1995, however, we observed a nest that the pair reinforced as the May rains intensified, eventually reaching a depth of 5–15 cm. Nests (N = 17) averaged 66.9 cm (R = 40.0–94.0 cm) in outside diameter, and 60.2 cm (R = 40.0 to 80.0 cm) in inside diameter.

We measured 11 infertile or abandoned eggs, which averaged 90.72 mm (R = 85.55–97.00) x 56.55 mm (R = 51.31–60.65). Weights averaged 127.2 g (R = 99.8–107.6). Walkinshaw (1982) obtained values for 168 *G. c. pratensis* eggs, which averaged 93.5 mm (80.9–107.6 mm) x 59.8 mm (53.7–67.0 mm), and 168.7 g. Although our sample size was smaller, these values suggest that the eggs of the Cuban subspecies are smaller in size and mass than those of Florida birds. We have also observed different color patterns in these birds compared with the mainland birds.

In all observations, pairs with chicks were found on sandy quartz soils where sparse pines predominated.

During the initial stages of our investigations, we have:

- Updated distribution of the Cuban Sandhill Crane.
- Implemented censusing methods that allowed estimation of the populations in Cuba.
- Identified conservation issues and the threats to the habitat in the four populations that will determine survival of the species.
- Implemented massive environmental education campaigns in the provinces where the four crane populations are found with the goal of increasing awareness about the species and interest in saving it.
- Increased knowledge of crane biology and their relationship to the ecosystem, which has allowed us to identify some management actions such as controlled burns, which will be initiated shortly.
- Initiated collection of tissue samples for genetic studies that will help to guide management and conservation.

FUTURE PLANS

Our future plans are to:

- Estimate numbers in localities not visited to date.
- Conduct an ecological evaluation of habitat characteristics for those populations outside protected areas and propose these areas for inclusion in the national system of protected areas.
- Band and place radiotransmitters on some individuals in Isla de Pinos to study population pa-

rameters, movements, habitat selection, and inter- and intraspecific relationships.
- Continue studies on reproductive biology.
- Establish management techniques using fire and planting of grasses to restore and recover nesting habitat.
- Determine carrying capacity for small populations before instituting management techniques favoring increase in populations.
- Continue the environmental education program and systematically present it in all areas near the 13 crane populations identified.
- Establish a captive population to increase our knowledge of reproductive biology and recuperate decimated populations.

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