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DISTRIBUTION, ABUNDANCE, AND STATUS OF CUBAN SANDHILL CRANES (*GRUS CANADENSIS NESIOTES*)

XIOMARA GALVEZ AGUILERA^{1,3} AND FELIPE CHAVEZ-RAMIREZ^{2,4}

ABSTRACT.—We conducted the first country-wide survey between 1994 and 2002 to examine the distribution, abundance, and conservation status of Sandhill Crane (*Grus canadensis nesiotes*) populations throughout Cuba. Ground or air surveys or both were conducted at all identified potential areas and locations previously reported in the literature. We define the current distribution as 10 separate localities in six provinces and the estimated total number of cranes at 526 individuals for the country. Two populations reported in the literature were no longer present and two localities not previously reported were discovered. The actual number of cranes at two localities was not possible to evaluate due to their rarity. Only four areas (Isle of Youth, Matanzas, Ciego de Avila, and Sancti Spiritus) each support more than 70 cranes. The remaining locations each have less than 25 individuals. Sandhill Cranes appear to be declining and have almost disappeared in Pinar del Rio and Granma provinces, and in northern Matanzas Province. Identified threats to the remaining populations include habitat modification (woody plant encroachment, agricultural expansion, and fire suppression), predation due to wild hogs (*Sus scrofa*), dogs (*Canis lupus familiaris*), mongoose (*Crossarchus* spp.), and poaching. Received 3 November 2009. Accepted 11 February 2010.

The Cuban subspecies of Sandhill Crane (*Grus canadensis nesiotes*) is one of many endemic bird subspecies and species present in Cuba. Little information regarding distribution or overall ecology (Meine and Archibald 1996) has been published recently or historically on this rare crane despite being one of the largest birds in the country, and the Caribbean. The Cuban Sandhill Crane has unique characteristics relative to the other subspecies. For example, most nests are constructed on dry land (Walkinshaw 1953, Galvez Aguilera et al. 2005), which differs from all other subspecies which nest primarily in association with wetlands (Tacha et al. 1992). The Cuban subspecies of Sandhill Crane is listed as critically endangered (IUCN 1994). Only four populations were known in the early 1990s and the population for Cuba was estimated at between 100 and 200 individuals by different authors.

The first records of Sandhill Cranes in Cuba are from Poey (1851–1855) and Gundlach (1875, 1876) who described the distribution of this species in large savannahs in Cienega de Zapata and pine (*Pinus* spp.)-dominated savannahs east of Guamutas and on the Isle of Pines (currently

named Isle of Youth). Barbour (1943) reported cranes from south of Matanzas Province near Alacranes and Union de Reyes. Bangs and Zappey (1905), Read (1913), Walkinshaw and Baker (1946), and Garrido (1985) described the distribution on the Isle of Youth (Pines) as limited to open plains north of Cienega de Lanier. Walkinshaw (1953) defined the distribution on the Isle of Youth as encompassing the region north of Cienega de Lanier from Siguanea westward to West Port and eastward to Pasadita. They are reported to extend to Sabana Grande on the Isle of Youth during winter. Garcia (1987) summarized the status of endemic subspecies in Cuba and considered cranes rare in all regions where they were previously considered abundant, such as in Guane, Mendoza, and Vinales. Garcia (1987) emphasized the need to protect cranes where they were still present at that time, including Pinar del Rio, Ciego de Avila, Camaguey, Cienega de Zapata, and the Isle of Youth.

The presence of Sandhill Cranes has been documented over time in different regions of Cuba; however, few authors have made quantitative estimates of their abundance. The most documented population is that on the Isle of Youth. The status of Cuban Sandhill Cranes in Cuba at the beginning of our field work was not well known and many different estimates of crane numbers had been put forward from a low of 100 to a high of “about” 300 individuals (Meine and Archibald 1996). There have been reports over the past several years on the population size of cranes by different authors, although they are not in agreement. Cuban Sandhill Cranes, from the time

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Gundlach (1875) made his observations when cranes were believed to have been "plentiful", are considered to have decreased (Walkinshaw 1953). Cranes were considered to be more common during the mid 1980s than formerly (Garrido 1985), suggesting that numbers had increased between the 1950s and 1980s. Walkinshaw (1953) suggested that during the early 1950s, Sandhill Cranes had almost disappeared from mainland Cuba. Numbers reported for Cuban Sandhill Cranes have fluctuated from 200 in 1953 (Walkinshaw 1953) to 120 in 1975 (Garrido and Garcia 1975) to more than 200 individuals in the early 1990s (XGA, pers obs.). Most reports citing numbers of cranes in Cuba are estimates based on only limited field research or field surveys, which we believe underestimated actual crane numbers.

Many of the 15 crane species, and several subspecies of more common cranes, are considered to be threatened or endangered (Meine and Archibald 1996). The Cuban Sandhill Crane at the beginning of our work was considered to be critically endangered per the IUCN Red List (IUCN 1994), likely because no reliable information on numbers and distribution was available. The critically endangered designation was based on the belief the populations present were highly fragmented and each numbered less than 50 individuals. We undertook a study to evaluate the current status of the Cuban subspecies of Sandhill Crane in 1995 due to lack of reliable recent information and disagreement among different literature sources on distribution and abundance. Our overall objective was to define the distribution and estimate abundance of the Cuban Sandhill Crane throughout the country. Our specific objectives were to: (1) identify the presence and distribution of different population(s) or subpopulations of this subspecies in Cuba, (2) estimate the number of individuals present at each separate location or population, and (3) evaluate the status and potential conservation problems for each of the distinct populations.

METHODS

Country-wide Surveys.—We initially planned a nation-wide search; however, the entire country is not suitable for cranes and we limited our field surveys to areas deemed appropriate based on vegetation characteristics, topography, and personal knowledge of different areas. A preliminary

evaluation of Sandhill Crane distribution was defined by contacting field personnel of the Empresa Nacional para la Proteccion de Flora y Fauna (National Agency for the Protection of Flora and Fauna, hereafter Flora and Fauna) to identify areas where cranes had been observed in the previous 5 years. Areas reported in the literature as having cranes were included for preliminary evaluation, regardless of whether new or recent observations had been reported. Each site believed to have potential for cranes was visited and presence was confirmed through actual sighting of cranes from air or ground surveys. The number of cranes present at selected sites in each area was estimated from intensive and extensive ground counts.

Aerial surveys were conducted throughout a large portion of the country in areas described on vegetation maps as having characteristics of potentially suitable habitat for Sandhill Cranes (open areas, savannahs, and sparsely forested areas). Open habitat types in Cienega de Zapata, and the provinces of Isle of Youth, Sancti Spiritus, and Camaguey were surveyed at low altitudes (40–60 m) during October 1995 using a fixed-wing airplane. Areas in the provinces of Pinar del Rio, Cienega de Birama, and the northern regions of Matanzas were surveyed from the air in January 1996.

Areas in each province with appropriate vegetation characteristics, or actual sightings following the aerial surveys, were visited to conduct personal interviews with local inhabitants. Three hundred and forty interviews were conducted of between 10 and 20 individuals in each potential region who had lived in the area at least 20 years. Those interviewed included employees of Flora and Fauna, forest rangers, fishermen, farmers, cattle producers, and others who spent much of their time outdoors in areas likely to be used by cranes. Areas where interviews indicated cranes were likely to be present were surveyed extensively by driving and walking routes to estimate the number of cranes present. More intensive and standardized counts were conducted in areas where cranes appeared to be abundant, or widespread.

Population Estimates.—Coordinated point counts were conducted in four areas that appeared to support the largest numbers of cranes to define their distribution and estimate population size. All counts were conducted during February between 1995 and 2002 with a different area sampled each

TABLE 1. Cuban Sandhill Crane populations by location and province.

Province	Location	Population ^a	Estimated number	Status	Protected by ^b
Pinar del Rio	Guane	1	<10	Stable	ENPFF/CGB
	Consolacion Sur	2†	0	Extirpated	NA
Matanzas	Cienega de Majaguillar	3	<12	Unknown	ENPFF
	Cienega de Zapata	4	120	Increasing	EFI/(AP)
Sancti Spiritus	Cienega de las Guayaberas	5	71	Stable	ENPFF (AP)
Ciego de Avila	Moron Norte	6	102	Stable	ENPFF (AP)
	Jucaro	7	Present	Stable?	ENPFF
Camaguey	Sabana de Lesca	8	24	Stable	CGB
	Cayo Romano	9	16	Unknown	ENPFF (AP)
Granma	Cienega Birama	10†	?	Not confirmed	ENPFF (AP)
Isle of Youth	Los Indios (11) and Sabana Grande (12)	11, 12	171	Increasing	ENPFF (AP)

^a Figure 1.

^b ENPFF = Empresa Nacional para la Proteccion de Flora y Fauna (National Agency for the Protection of Flora and Fauna), EFI = Empresa Forestal Integral (Integrated Forestry Agency), CGB = Cuerpo de Guardabosques (Forest Ranger Corps), AP = Protected Area.

† = not confirmed.

year. Methods used for counts were those developed by the International Crane Foundation and used in Wisconsin (Meine and Archibald 1996) and Mississippi (Hereford et al. 2001) for other subspecies of Sandhill Cranes. Counts were conducted by systematically establishing observation points 1.5–2 km apart throughout the entire area to be sampled. Ground counts conducted in the four areas with the largest numbers of cranes consisted of between 16 and 40 points. Two to four observers at each point recorded the number of cranes observed, time of observation, direction from observation point, and direction of flight. Between 300 and 500 persons participated in the counts at each location surveyed. Two hours of observation were conducted before sunset during an evening followed by 2 hrs of observation the next morning beginning at sunrise.

We recorded number of birds seen, time of

observation, and direction of flight at each sample location to eliminate duplicate observations. The maximum number of birds, after eliminating duplicate counts, was considered the total for that area.

RESULTS

Distribution and Abundance.—We defined the distribution of Cuban Sandhill Cranes as consisting of 10 separate localities and presumed to consist of nine separate populations in six provinces (Table 1, Fig. 1). We estimated 526 cranes for the entire country. The total cranes counted in each of the areas with largest numbers of cranes varied from 71 in Guayaberas to 171 on the Isle of Youth (Table 2) for a total of 464 cranes in the four areas with the largest populations. We estimated all other sites combined to have 62 cranes (Table 1) based on site visits,

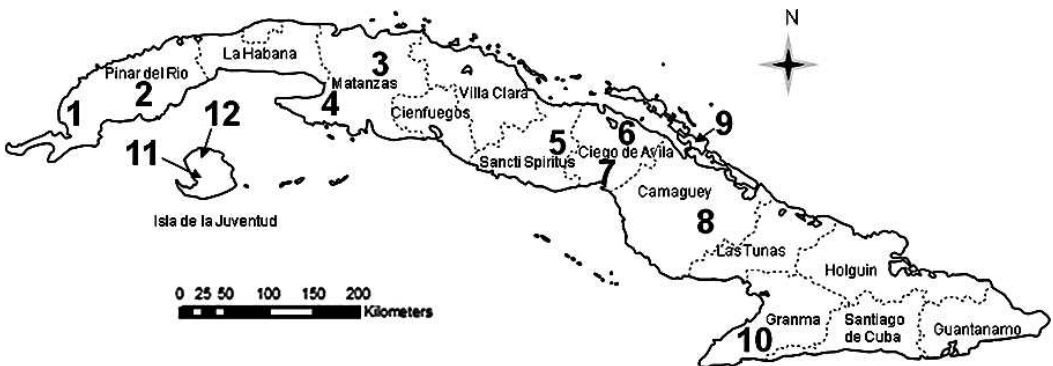


FIG. 1. Distribution of Sandhill Crane populations in Cuba. Numbers represent the location of populations corresponding with data in Table 1.

TABLE 2. Estimates of Sandhill Crane abundance in the four largest populations in Cuba.

Category	Isle of Youth	Cienega de Zapata	Guayaberas	Moron Norte
Survey period	February 1998	February 1999	February 1998	February 2002
# Count stations	52	26	16	32
Cranes obs./point	5.3	6.3	9.1	6.5
Range	1–22	1–21	4–16	2–18
Estimated total cranes	171	120	71	102

ground-based surveys, direct observations, and knowledge of local people. We confirmed crane presence for Jucaro (#7, Fig. 1) but have no estimate of abundance.

We could not confirm presence of cranes during our study or based on local people's knowledge, for two locations previously reported (Walkinshaw 1949). These included the region of Consolacion del sur in Pinar del Rio Province and Cienega de Birama in Granma Province (#'s 2 and 10, respectively; Fig. 1). Only a rough estimate of numbers is available for two other localities due to the rarity of crane observations in those areas. These localities are Cienega de Majaguillar in northern Matanzas Province and Cayo Romano key, off the northern coast of Camaguey Province (#'s 3 and 9, respectively; Fig. 1).

Provincial Reports

Pinar Del Rio Province.—Interviews with 30 local residents suggested crane presence in a small area over the entire time period they could remember. We confirmed crane presence in 1996 in the area of Guane (#1, Fig. 1) with no more than 10 individuals likely remaining. Locals suggested cranes were more common through the 1990s but had decreased significantly in recent years. Large areas were planted with Caribbean pine (*Pinus caribaea*) in the 1970s, which apparently caused many areas to become wooded and less suitable for cranes. Our last visit to the area in 2002 confirmed the presence of one chick; however, even fewer cranes were apparent than in 1996.

Threats to cranes in this province include habitat modification, presence of large agricultural operations including hog (*Sus scrofa*) farming, and extensive hunting activities, some of which are reported to be illegal. The area where cranes are present is under management and protection by Forestry Agency authorities, and hunting has been limited due to concerns expressed to authorities regarding the critical situation for

cranes in the area. However, the low number of cranes present and the small area of habitat available will make it difficult for cranes to increase in this locality in the future.

Matanzas Province.—Cienega de Zapata (#4, Fig. 1) in the southern portion of the province has long been known to support cranes. Crane presence was confirmed from aerial surveys in 1995 and, in 1996, five nests were found in different sections of the wetlands. We estimated 120 cranes during the ground point counts conducted in Cienega de Zapata in 1998. We recorded a new locality in the northern area of the province not previously reported as supporting cranes called Cienega de Majaguillar (#3, Fig. 1) with an estimate of <12 cranes. The situation of these cranes appears to be similar to that of the precarious population in Pinar del Rio.

There are several threats to cranes in this area. There is loss of open savannah due to increases in woody shrubs and trees such as cayput (*Galaleuca quinquenerva*), believed to be a consequence of decreased use of prescribed fires since the 1970s. Significant populations of wild hogs and dogs (*Canis lupus familiaris*) are present and could threaten Sandhill Cranes.

Sancti Spiritus Province.—Sandhill Cranes are present in the Cienega de Guayaberas and, according to those interviewed, have been present for at least 40 years (#5, Fig. 1). A ground point count conducted in 1998 estimated 71 cranes. The area suitable for cranes is <12 km² and is decreasing due to invasion by exotic woody plants such as marabou (*Dichrostachys glomerata*), which eliminates open spaces. Large areas have also been modified for rice cultivation and this practice continues to increase. The presence of water buffalo (*Bubalus bubalis*) has caused overgrazing in some areas further contributing to invasion of exotic woody plants.

Ciego de Avila Province.—Sandhill Cranes have been reported in this province since the beginning of the 20th century. Crane presence was

confirmed via aerial and ground surveys in 1995 and 1996 in the northern portion of the province (#6, Fig. 1), but not in the south (#7, Fig. 1). We did not obtain a count of cranes in the south but did confirm their presence. We estimated 102 and 101 cranes were present in the northern area of the province based on point counts conducted in 1997 and 2002, respectively. Chicks were observed in this area in 1995 and 1996. Northern Ciego de Avila supports one of the largest populations of cranes in Cuba and is a priority area for protection. The case for protection was made to government authorities. A 250,000-ha protected area was established in summer 2004 that will limit and control expansion of habitat alterations in the entire region. However, agriculture, cattle grazing, and tree plantations continue and could affect crane habitat in the future.

Potential threats in this area include extensive livestock grazing, exotic plants and animals, and habitat fragmentation due to agriculture and tree plantations. Cattle grazing is expanding and there is an effort to establish non-native grasses for livestock forage. Feral water buffalo are present, which has led to overgrazing and erosion in some areas. Invasive plants include casuarina (*Casuarina equisetifolia*) and marabou, which are rapidly increasing and causing reduction of open savannahs. The hydrological regime of this area has been affected by deforestation of native plants, road construction, and sugar cane fields, which could flood crane nests and drown chicks. The presence of sugar cane fields provides cover for mongoose (*Crossarchus* spp.) and black rats (*Rattus rattus*), which depredate crane eggs.

Camaguey Province.—Historical Sandhill Crane localities (#8, Fig. 1) in this province included Sabanas de Lesca and Meseta de San Felipe. Surveys of local people suggested cranes were no longer present but we observed six cranes flying in 1994. At least 12 pairs were observed in a 2001 ground survey in the Meseta de San Felipe. A previously unreported area was key Cayo Romano off the northern coast (#9, Fig. 1), which is believed to have had cranes for at least 30 years. No extensive count was possible during our work in this area but biologists who visited the site estimated that ~16 cranes are present on this key.

Principle threats in this area include possible future mining activities and military exercises (Cayo Romano) that occur in the area occupied by cranes. Wild dogs are known to be present in the area.

Granma Province.—A single recent visual observation was reported in interviews for this province in the region of Birama in the delta of Rio Cauto (#10, Fig. 1). Interviews suggested cranes were common in the 1970s through the mid 1980s, but decreased in number through the early 1990s and are now believed to be completely absent. Our ground searches conducted yearly between 1999 and 2002 could not confirm the presence of cranes in this area. Habitat modifications in areas of previous crane use include development of wetlands for rice production. We believe cranes have been extirpated from this province.

Isle of Youth Province.—Isle of Youth is a well known area for Cuban Sandhill Cranes (#'s 11 and 12, Fig. 1). The type specimen for this subspecies was collected from the Isle of Youth (Bangs and Zappey 1905). Two ground counts were conducted on the Isle of Youth using the same points in 1995 and 1998, yielding estimates of 115 and 171 cranes, respectively. The 1995 value is similar to that reported by Walkinshaw (1953) of 100 cranes for the Isle of Youth. We believe the 1998 count is more accurate as it was conducted over 2 days during one morning and one afternoon, compared to the 1995 count which was conducted only during the morning.

Threats present include cattle grazing activity and herding during the nesting period. Illegal hunting and fishing activities cause disturbance to the cranes in this area.

Conservation Status of Populations

Eight of 10 areas supporting Sandhill Cranes are under some form of protection, either as protected areas or other schemes managed by Flora y Fauna. These include Birama, Cayo Romano, Norte de Moron, Cienega de Guayaberas, Cienega de Zapata, Majaguillar, Jucaro, and Los Indios/Sabana Grande. Two more were under management by the Forestry Agency in Matanzas Province (Empresa Integral Forestal de Cienega de Zapata). Areas where Sandhill Cranes were present in Guane in Pinar del Rio Province and Lesca in Camaguey Province were also managed by the Forestry Agency.

DISCUSSION

We confirmed Cuban Sandhill Cranes to be more widespread than previously reported (Garrido 1985, Garcia 1987, Meine and Archibald 1996). However, presence of cranes in two areas

that previously supported them (Walkinshaw 1949) could not be confirmed. The abundance of cranes estimated during this study for Cuba is higher than all previously reported estimates, leading to reclassifying the Cuban Sandhill Crane from critically endangered in 1994 to vulnerable in 1997. Our estimate of 526 cranes is significantly greater than the estimated 103 individuals of the endangered Mississippi Sandhill Crane (*Grus canadensis pulla*) (Hereford et al. 2001), but lower than the 4,000–6,000 estimated for Florida Sandhill Cranes (*G. c. pratensis*) (Tacha et al. 1994).

The present distribution is broader than expected, but at least two previously documented sites appear to no longer support cranes. We have no explanation for causes of the disappearance of Sandhill Cranes from these areas, except to note significant habitat changes have occurred in those areas. A series of threats was identified for all of the present populations. At least two populations, those in Guane in Pinar del Rio and Birama in Granma, are so low that it is likely they have already disappeared or will do so soon. The estimates are unreliable for other localities and are possibly optimistic, and should be re-evaluated in the field (Cayo Romano and Sabana de Lesca in Camaguey, and Majaguillar in northern Matanzas Province).

We could not identify causes of population disappearance or decreases, but important factors may include population isolation effects and degradation and decreases in available habitat. Decreases in size or fragmentation of habitat could contribute to population declines in some areas as alterations are visible throughout the entire country. The Mississippi Sandhill Crane's low productivity and endangered status is attributed in large part to habitat fragmentation (Valentine 1970; S. G. Hereford, pers. comm.). All existing populations are separated by distances greater than the longest known dispersal movement by non-migratory Sandhill Cranes (up to 48.3 km in Florida; Nesbitt et al. 2002). We have limited data on potential movements and dispersal of Cuban Sandhill Cranes but, of 10 radio-marked birds on the Isle of Youth, a single crane moved >18 km during 1 year (Galvez Aguilera 2002). Even shorter movements (10.5 km by Florida Sandhill Cranes in Georgia; Bennett 1989) are reported for other non-migratory Sandhill Cranes.

Four significant populations appear to be stable and perhaps increasing: (1) Isle of Youth, (2)

northern Ciego de Avila, (3) Ciénega de Zapata in Matanzas, and (4) Ciénega de Guayaberas in Sancti Spiritus. Delineation of a new 250,000-ha protected area in 2004 that encompasses all crane areas in northern Ciego de Avila Province resulted in the four largest populations being at least partially within the boundaries of a protected area. However, that does not guarantee protection as several threats are present regardless of whether they are in or outside a protected area boundary. Woody plant encroachment continues in many areas within Reserves, due to elimination of natural fire regimes, and is a serious problem of concern for several federal agencies (FC-R, pers. obs.). Feral domestic (hogs and dogs) and introduced animals (mongoose) continue to be threats to nesting cranes in all four areas; however, the exact effect of each one of these predators has not been quantified. Predation is a problem that affects other non-migratory populations and is the major cause of mortality for the Mississippi Sandhill Crane (S. G. Hereford, pers. comm.).

We have been working directly in the Isle of Youth over the last few years and recently in Ciego de Avila to better evaluate the specific threats to cranes and develop appropriate or responsive management plans. Some Reserve personnel are trying to implement counts at regular intervals to document population trends. The trend and conservation status of Cuban Sandhill Cranes may not be entirely known until we can ascertain whether numbers are increasing or decreasing over time. Possible direct actions to enhance declining populations could include exchange of individuals from one population to another or from potential captive breeding efforts. Captive breeding programs for cranes do not exist in Cuba, but are present and successful in other countries. Indirect actions to expand or improve nesting habitat could include management activities including instituting prescribed fire programs, and elimination and management of invasive woody plants, as has been done for the Mississippi Sandhill Crane (Valentine and Hereford 1997). Limiting agriculture and forestry plantation expansion in protected areas where cranes are present could also help expand or improve nesting habitats. Control of potential domestic and introduced predators is another action that could be taken in areas where predators are a problem.

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