

WINTER LIFE OF THE WHOOPING CRANE

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For forty years ornithologists have been considering the Whooping Crane (*Grus americana*) as "doomed to extinction" and have been ready, momentarily, to write its obituary. Only a remnant of a formerly large population survives, and this remnant leads a precarious life because of the species' conspicuousness—large size and white plumage—and its migratory habits. For many reasons, it is a marvel that Whooping Cranes have held on as long as this.

This paper is based on observations and other data obtained prior to the spring of 1945 when the research project on Whooping Cranes, sponsored jointly by the Fish and Wildlife Service and the National Audubon Society, was initiated. Most of the field observations were made at the Aransas National Wildlife Refuge on the southern Texas coast, where Stevenson was stationed as refuge manager from October, 1938, to November, 1941. Observations were made on cranes at such times as the pressure of regular duties would permit. The refuge area, comprising the isolated Blackjack Peninsula in Aransas and Refugio counties, was purchased in 1937 to protect upland and big game species, waterfowl and other birds. A paramount reason for the purchase was the fact that the peninsula is the principal *known* concentration area of Whooping Cranes in winter. Preservation of its wintering grounds is essential in any program for the protection and restoration of the species.

In this paper, for the sake of brevity, all comments on refuge "cranes" refer to the Whooping Crane. The name Sandhill Crane ("sandhills") includes *Grus canadensis canadensis* and *G. c. tabida*, both of which occur on the refuge. No attempt was made to distinguish subspecies in life.

WINTER RANGE

The Whooping Crane formerly wintered in the south Atlantic and Gulf states and in northeastern and central Mexico. Although there is reason to believe that the species was never as abundant as some writers claim, it must have been an extremely numerous migrant and winter resident in central and southern Texas, at least as late as the 1880's. Sennett (1878:61) recorded cranes frequently in 1877 between Corpus Christi and Brownsville. Nehrling (1882:223) classified the whooper as exceedingly abundant in winter in the vicinity of Houston. In the spring of 1884, Benners (1887:83) found immense flocks of Whooping Cranes in Williamson County. Strecker (1927) wrote that this crane was a "favorite game fowl" about the middle of the last century in McLennan County and, at one time, was a very abundant winter resident there. By 1912, Strecker (1912:18) points out that the species had become "uncommon in winter, except in the middle west [?]." Oberholser (1938:194) considers the Whooping Crane as a formerly common and now very rare winter resident of southern Louisiana.

In the past ten or more years, wintering Whooping Cranes have been found only in the coastal region of southwestern Louisiana and along the coast of south Texas (Calhoun to Kenedy counties). The majority of the Texas birds winter on the Aransas Refuge near Austwell. A few were seen by the refuge staff, between 1938 and 1941, on the adjacent Matagorda and St. Joseph islands and the mainland of the vicinity (Green Lake and Welder Point, Calhoun County). Small groups are recorded occasionally on the King Ranch, Kleberg County, and the Kenedy Ranch, Kenedy County. There are no recent records of the species in the lagoon country of Tamaulipas, Mexico, although several searches have been made for it there. Dr. George B. Saunders of the Fish and

Wildlife Service has never seen a whooper in Tamaulipas although he has explored its coast thoroughly in recent years. None has been found there in late years by George Blanchard of Brownsville, who is very familiar with the coast of that state.

The number of cranes on the coastal prairies and marshes of Louisiana has varied in recent years. John J. Lynch (letter, September 10, 1941) saw at least 11 whoopers near White Lake on May 15, 1939. He mentioned that only six birds were present there during the winter of 1940-41. Robert H. Smith saw only three cranes in January, 1944, in Vermilion Parish, south of Gueydan, Louisiana, in his aeroplane flight along

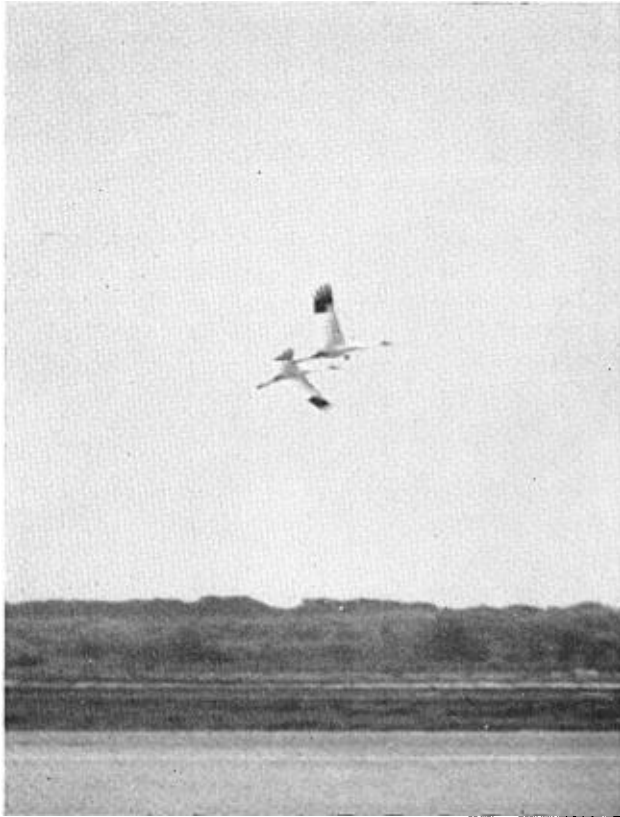


Fig. 38. Whooping Cranes in flight over Redfish Bay, Aransas Refuge, Texas. Photograph by W. B. Perry, January 22, 1939.

that section of the coast. He did not see any whoopers in an aerial reconnaissance of the same area in January, 1945 (reports filed with the Fish and Wildlife Service). Some birds are said to be resident throughout the year in the vicinity of White Lake, Vermilion Parish, and there are persistent reports that they breed there (Stevenson, 1942).

Description of the Aransas Refuge.—The Aransas Refuge consists of some 47,000 acres on Blackjack Peninsula, which is bounded by several bays. This low land is fringed with brackish marsh. The gently rolling interior contains much oak brush, mainly live oak (*Quercus virginiana*) and myrtleleaf oak (*Q. myrtifolia*). Blackjack

oak (*Q. marilandica*) is also common. Associated species are prickly ash (*Xanthoxylum clava-herculis*) and sweet bay (*Persea bordonia*). Interior grasslands contain swales or "wet weather" ponds, dominated by little bluestem (*Andropogon scoparius*) and associated grasses of the genus *Paspalum*. These grasslands are dotted with groves or mottes of live oak. Areas around cattle tanks and some fresh water ponds are covered with Bermuda grass (*Cynodon dactylon*).

The main wintering area for cranes is the "east shore flats," a brackish water flat adjacent to San Antonio, Mullet and Aransas bays. This open country is 12 miles in length, averaging slightly under one mile in width. The flat extends from Mustang Lake south to Dunham Point and Cape Carlos. The vegetation of the region is dominated by salt grass (*Distichlis spicata*), saltwort (*Batis maritima*), glasswort (*Sali-cornia*), and salt-flat grass (*Monanthochloe littoralis*). The inland margin of the flat is dominated by needle cordgrass (*Spartina spartinae*). Tidewater inlets and some of the depressions (ephemeral ponds) are bordered with salt marsh cordgrass (*Spartina alterniflora*). For an account of aquatic invertebrates of the area, the reader is referred to Allen (1942), and, for a description of vegetation types, to Halloran (1943).

CENSUSES OF REFUGE CRANES

In the period of October, 1938, to May, 1945, the number of cranes on the refuge has varied from 15 to 26 individuals. The number of adults and young birds and extreme dates of arrival and departure are listed in table 1, which is based on field data collected by Everett Beaty and Stevenson and by Earl W. Craven (1946).

Table 1
Numbers of the Whooping Crane Present on Aransas Refuge

Season	Total	Families		Other Adults ²	Extreme Dates
		Adults	Young ¹		
1938-1939	18	8	4	6	Oct. 21-May 6
1939-1940	22	10	7	5	Oct. 21-May 1
1940-1941	26	8	5	13	Oct. 22-
1941-1942	15	4	2	9	Oct. 21-May 5
1942-1943	19	6	4	9	Oct. 31-Mar. 23
1943-1944	21	10	5	6	Oct. 29-Apr. 21
1944-1945	18	6	3	9	Oct. 20-May ?
Totals	139	52	30	57	

¹Birds in juvenal plumage.

²White birds, essentially in adult plumage; age unknown.

The seasonal totals in table 1 indicate the maximum number of individuals observed on the refuge each winter. In making counts, care was taken to avoid any possible duplication of individual birds. Most of the cranes spent the entire winter season on the refuge, although there was some dispersal to surrounding islands and the neighboring mainland.

The number of immature birds (young of the year) noted in relation to adults was small. In the 1939-40 season, there were present two family groups, each of which contained two young birds. In each of the two seasons, 1940-41 and 1942-43, one family group containing two young was recorded. No set of "twins" was observed in the previous or subsequent winters. Each young bird or set of twins was always accompanied by two adults. There were more "unemployed" adults, on the average, than parents. Some of these could have been pairs that lost their young. Possibly some were too old to breed; others may not have been sexually mature.

No data are available as to the exact date the majority of the birds arrived on the Gulf Coast each autumn. Other duties prevented the refuge staff from searching for cranes daily in late October and November. Nine birds were present on the refuge October 29, 1939, on November 5, 1942, and November 6, 1938, and seven birds on November 2, 1940. Some birds do not arrive on the refuge until the second week in November, or possibly later. In the spring, it was also difficult to determine the exact date any particular group departed for the north. Most cranes leave the refuge in late March or early April. Eight or nine birds remained as late as April 22, 1939, some of which were gone the next day, and 15 were present on April 6, 1942. In 1940, some birds left for the north the first week in April while a family group, observed April 20, apparently departed the same day. The family group observed through the summer of 1941 remained on the refuge until at least October 10 (Stevenson, 1942) and three birds seen October 27 were probably of this family.

It is interesting to compare refuge dates with those from Nebraska, through which state the species migrates in spring and fall. Swenk (1933) analyzed records for the period 1912-1933 and found that spring migration took place between March 10 and May 6 (the majority seen March 29 to April 14) and fall migration between September 14 and October 28. All Nebraska dates given by Brooking (1943), who compiled records for the years 1934-1943, and by other authors in the Nebraska Bird Review, July, 1943-December, 1944, fall within these extremes. Autumn dates for the refuge fall toward the end of the migration period for Nebraska, or later, and cranes which subsequently migrated north have been found on the refuge as late in the spring as they have been seen in Nebraska. In some of the older references there are November records of cranes in Canada and the northern United States.

CRANE POPULATIONS AND MIGRATION

It is worthy of mention that more cranes have been reported in Nebraska in spring migration than have been observed there during the fall flight and on the Aransas Refuge. This suggests the possibility that there are other important wintering grounds whose location is unknown. The lack of comprehensive data for the whole wintering territory, as well as from the breeding grounds, has led to some speculation on the size of the continental population of Whooping Cranes.

A study of the Nebraska Bird Review, 1937 to 1944, reveals reports of sizable flocks of Whooping Cranes seen in spring in the Great Bend region of the Platte River, Nebraska. These reports suggest that the birds may linger in this region in spring migration. They also support a premise that the population of the species is greater than has been suspected. There is reason to believe that at least 150 individuals were present in the area in the spring of 1937. A single flock of 50 or 60 birds was seen wading in the Platte River near Lexington, on or about April 30, 1937 (Kingsley, 1937). H. E. Weakly (1937) saw 31 cranes in flight near North Platte on May 4, 1937. Since these observations were made only a few days apart, possibly the same flock was involved. Other fair-sized flocks were observed in 1938 by Brooking (1943) who records a flock of 32 birds at Lowell, Kearney County, April 2, and 17 birds near Wood River, Hall County, April 7. Brooking reported only two small groups for the spring of 1939.

In 1940, 10 or 12 whoopers were found 10 miles west of North Platte on March 22, and 15 birds near Elwood, March 24 (Weakly, 1940). Since there were 20 cranes on the Aransas Refuge during a part of April, 1940, the total United States population that spring was at least 30 birds and probably much greater.

A rather encouraging crane record is supplied by Dr. William Rowan in his letter,

dated December 12, 1943, to W. F. Kubichek of the Fish and Wildlife Service. Dr. Rowan wrote that a Mr. Bendick saw a flock of 100 Whooping Cranes flying over his farm near Lacombe, Alberta, in the fall of 1941. Mr. Bendick, who had been familiar with the species for many years, stated that the cranes flew so low that one bird injured a wing on a telephone wire and was forced down. A short time later, another flock of 20 cranes passed over the farm, making a total of 120 cranes seen by Mr. Bendick that autumn.

From the recorded evidence at hand, and by the process of elimination, we have reached the conclusion that many Whooping Cranes migrate non-stop, in autumn, from Canada to Nebraska (mainly the Platte River region) where they stop and feed for a few days or more. Following this, the birds continue non-stop to the Gulf Coast. This procedure is reversed in spring migration. There are few recent crane records for

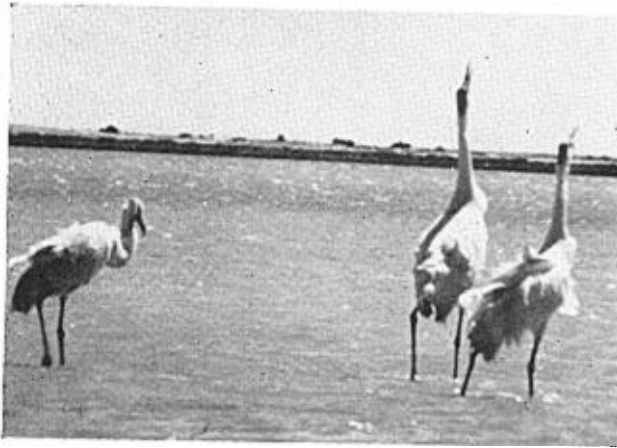


Fig. 39. Family at Mustang Lake; adults greeting other cranes coming in to feed. Photograph by Mr. and Mrs. W. F. Kubichek, March, 1940.

localities outside this path. Kalmbach (1942) observed two Whooping Cranes at the Kit Carson National Wildlife Refuge, Cheyenne County, Colorado, on October 15, 1941. On October 24, 1943, a single Whooping Crane was found on the Salt Plains National Wildlife Refuge, near Cherokee, Oklahoma, by Refuge Manager Seth H. Low (report in files of the Fish and Wildlife Service). Six cranes, constituting two families, were later seen by Mr. Low on the refuge, November 4 and 5. Apparently a 1912 record of the Whooping Crane in Oklahoma, listed by Nice (1931), is the last published account of the species in that state.

BEHAVIOR

Study of the Whooping Crane's behavior was a difficult one because of the bird's wariness and our desire to keep it so. The literature is full of references to the whooper's "extreme shyness," a common attribute of the Gruidae. It was seldom possible to approach on foot and remain, for study purposes, within one-half mile of the birds in open country without alarming them, nor were they approached closely when this could be avoided. It was generally possible to drive an auto or motor-boat within 300 or 400 yards of the birds without disturbing them and these vehicles were used as

"blinds." At baited feeding grounds and certain watering places, however, we watched cranes at length from our well-protected nearby burlap blinds.

An attempt was made to differentiate individuals in a flock as to sex with indifferent success since adults are alike in color and practically the same size (*vide* Ridgway and Friedmann, 1941:10). However, of the adults of a family group, one was generally somewhat larger. We assumed from the size and mannerisms of the larger bird that it was the male.

Although the Whooping Crane is the tallest and one of the largest of American birds and its color pattern and form should make it easily identifiable, it is still possible to mistake other birds, seen at a distance, for whoopers. For example, a distant White Pelican, preening its breast feathers while standing on a hummock, can be, and has been, mistaken for a crane. American Egrets and the Wood Ibis, in certain postures, have also been so misidentified.

In good light, Whooping Cranes can be seen at distances up to two miles with the naked eye at an elevation of six feet. However, checking with binoculars to confirm distant observations is generally desirable. Of course, if the birds can be heard calling, they are easily identified.

Most of our observations were made with 7× or 10× binoculars. No telescope was available, except for a few days' use.

Intraspecific behavior.—On the refuge, Whooping Cranes are retiring in nature. Ordinarily they do not associate with other species of birds nor do pairs (presumably mated birds) or family groups associate with each other. Various writers refer to the whooper's tendency to split into small groups on the winter range. The pairs observed on the refuge may have represented birds unsuccessful in rearing young. The Whooping Crane probably mates for life as do various species of cranes (Blyth and Tegetmeier, 1881; Hume and Marshall, 1881; Blaauw, 1897). Small groups of cranes which were in white plumage may have represented one or two pairs with their young in second-year plumage, or immatures traveling together. It appears customary for whooper families to remain together through all or most of the young's first year. This trait has been noted in various gruids (Hume and Marshall, 1881; Blaauw, 1897).

Several authors mention the extreme solicitude of various species of cranes for their offspring and cite examples of parental affection. In referring to the Asiatic White Crane (*Grus leucogeranus*) on its wintering ground in India, Hume and Marshall (1881) make this comment: "The watchful care and tender solicitude evinced by the old birds for their only child is most noticeable. They never suffer the young one to stray from their side, and, while they themselves are seldom more than 30 yards apart, and generally much closer, the young, I think, is invariably somewhere between them."

It was noted that young whoopers were almost always flanked by their parents and that the parents seldom ranged more than 20 or 30 feet from a youngster. Even in family groups containing two young, the parents kept a close watch of their offspring. These immature birds were generally side by side, flanked by their parents, with only 15 or 20 feet separating one adult from a young bird. As the winter advances into March and April, a youngster may wander farther and farther away (a hundred yards or more) from its parents, which then seem to show less concern for its welfare.

On their feeding grounds, whoopers, particularly pairs and families, set up more or less definite territories, the boundaries of which are more closely observed and guarded if the group contains a young bird. Adult males of a family group are belligerent most noticeably when two families occupy contiguous feeding areas. Two family groups, each containing three birds, were present at Mustang Lake during the

winters of 1938-39 and 1939-40. This lake, a shallow lagoon connected with San Antonio Bay, is one and one-half miles in length, with a maximum width of one-half mile. One group ranged on the northern half of the lake and adjacent shore; the other occupied the southern half and shore. Disagreements occurred whenever one large adult, assumed to be a male, ventured into the region used by the other group. One morning when Stevenson approached the lake, he noticed the "north" group feeding along the shore near the arbitrary boundary line. Near them was the male of the "south" group. The two males quietly "squared off" about four feet apart and darted their bills at each other. Both would jump about six inches off the ground, flapping their wings. Then they stood facing each other for fully three minutes. Finally the "south" male leisurely walked south 300 yards to rejoin his family on the lake shore. In this instance, each male might have considered the other an intruder and thus acted in defense of his rights. Only once during the two winters were the two families on their *natural* feeding grounds observed feeding together. Behavior at the baited grounds along the lake shore was unusual; this is described below.

Birds of a small flock of "white" cranes generally fed in harmony although differences were noticed among individuals. Several times we found flocks of four to eight cranes which contained a single young. This composition was only transitory, however, as the young, with its parents, soon separated from the others. One morning at Dunham Point, a family and a pair of cranes were found feeding some 40 feet apart. The larger of the pair, presumably a male, walked over to the family, the male of which then poked at it with his bill. This caused the intruder to jump up and then fly back to its companion.

At other times, we encountered males which exhibited belligerent attitudes. We once watched three adults drinking at a small overflow pool at the Flowing Well, an artesian well on the refuge. A family group flew in at low altitude alighting about 25 yards from the pool. The male bird then walked to the pool and faced the three birds. Then with head lowered, neck poker-stiff, and wings half-opened, he sounded a *kroo* note or two and feinted at one of the three cranes. These three then flew off about 25 yards and, shortly afterward, disappeared behind some oak brush about one-fourth mile away.

Behavior of another male parent was observed at this well by Everett Beaty and Stevenson on January 30, 1941. To quote from their notes:

"We arrived at the well and entered the blind without disturbing a crane family. The adults preen for some time. The male yawns a couple of times and twice scratches his head with a foot. The adults are quiet but the young keeps sounding its "chick" call. Three white cranes fly in from the south. The adults sound off a warning cry with heads skyward. The three stop 100 yards south, answering with a goose-like 'onk.' Four more cranes fly over, coming from the north. Again the warning call is given by the parents. The four circle once, then fly on south, out of sight. The male takes notice of the three cranes and stalks towards them, his mate and young following slowly. He hurries, half running, and the intruders fly before he gets near them. They fly about 300 yards, dropping into Mustang Slough. The male starts back, overtakes his family, and they all stroll back to the well.

"The family drifts aimlessly about the small pool near the well, starts to drink, moves back, then all drink like chickens, the water drooling from their mouths. They begin eating corn and wheat we had scattered at the pool. Then they must hear cranes in the distance (we can't) and begin a series of duets (*ti-ker-lee-ah*), repeated many times. Sometimes the female led in calling. Soon the adults give an excited trumpet call and then three cranes fly in, stopping about 100 yards south. This may be the same group here previously. This time the male advances with neck thrust out. He's in a rush and this time flies. The three also take off and the male meets them in the air. They pull out quickly while the male lands where they had been and then walks slowly back to his family."

Family groups appeared to tolerate one another only when there were baited areas available for joint use. In March, 1940, two blinds were constructed at Mustang Lake

in front of which grain and chopped vegetables were scattered. Here we had an opportunity to watch the greeting ceremony given by one family when welcoming the other. To quote from Stevenson's notes:

"March 10. As I enter the blind, one group (group A) is in the lake, 300 yards north, the other (group B) 300 yards southeast. After 90 minutes, group A comes in to feed in front of the blind. When group B arrives 15 minutes later, group A flies to a point 100 yards south in the lake. Group B, after stopping for a few seconds, then flies to within 10 yards of the other flock. Both adults of family B give the recognition call (*kiddle-doo-du-du*) while heads are skyward and wings drooping. They advance together with their young, moving slowly toward the other group. The male of family A is attentive to this performance but his mate keeps on feeding."

This ceremony was observed several times at this blind. Sometimes all four adults of the two groups, arriving at the blind at about the same time, would greet each other with the recognition or greeting call. This chorus would continue at some length. The birds kept their necks fully extended and almost vertical and their wings drooped slightly while they called. Young birds were more or less indifferent to this ceremony, although they sometimes joined in the calls with slightly belated "peeps."

Behavior in relation to other animals.—Whooping Cranes commonly migrate with Sandhill Cranes (*Grus canadensis*), and this fact was frequently mentioned by early ornithologists, some of whom mistook the latter species for the young of the whooper. That this association has not been observed more often in recent years is due, undoubtedly, to the Whooping Crane's rarity. On the wintering grounds, where both species occur, the whooper rarely associates with sandhills. This behavior was noted as early as 1845 by McCall (1852:223).

Ordinarily Whooping Cranes remain by themselves, in small groups, scattered over the east-shore flats of the Aransas Refuge. On these flats, we have seen cranes feeding in the company of Roseate Spoonbills, and Reddish and American egrets, with apparent harmony. The young crane, which remained on the refuge in the summer of 1941, once had the misfortune to walk into an area where Black-necked Stilts had their young. Six noisy stilts attacked the bird, worrying it until it would lunge, in vain, at them. The crane finally moved off and was left in peace. One autumn day we watched a coyote while it passed within 12 yards of an adult whooper. The crane showed no noticeable reaction to the animal's presence, although it was aware of it.

Whooping Cranes associated with other birds and with white-tailed deer in their quest for drinking water or for feed at baited grounds. At the Flowing Well, birds showed a certain amount of tolerance for each other, although whoopers seemed to resent too much "crowding" (Stevenson, 1943). Each winter, ducks, Canada geese and smaller representatives of the *Branta canadensis* group, deer, cranes, and Rio Grande Turkeys, as well as cattle, came to the well to drink at its overflow pond. Whoopers often drove back geese or caracaras which attempted to drink alongside them, but did allow several turkeys to drink with them on one occasion. Late one afternoon we watched several deer drink water at a small pond, with three adult cranes. At times, sandhills fought for drinking privileges with each other and with the whoopers which dwarfed them in size. The latter won any argument. Contrary to our expectations, sandhills acted rather shy at the well and were much more suspicious of our blinds than were Whooping Cranes.

Display.—Whooping Cranes, like other members of the Gruidae, are famous for their dances, aerial evolutions, and other forms of display. Most observations of dancing birds have been made on the bird's breeding grounds. However, "mating dances" during migration have been recorded by observers in Nebraska and Canada. Whoopers and other cranes have also been known to conduct dances in confinement (Blaauw, 1897:

19-20). A Mr. Blackburn, keeper at the National Zoological Park in Washington, told us that one Whooping Crane, probably a male, which was caged there, often danced alone, and, at times, with a Demoiselle Crane (*Anthropoides virgo*).

Witherby *et al.* (1940:451) point out that the Common Crane (*Grus grus grus*) of Europe and Africa may carry on dances and other ceremonies in singles, pairs or groups not only in or near the "pairing season," but in migration or winter quarters. These actions appear to be the expression of general excitement or liveliness and are not primarily sexual. In view of these observations and the fact that dancing cranes have been seen on the refuge from March to June, we are inclined to think that some antics of display may merely represent "letting off steam," with no sexual correlation.

In the spring of 1939, a bird was watched dancing near its companion, and on April 2 and 4, the dancing and fluttering of a pair was observed. On April 8, Stevenson watched a "courting" pair on the east-shore flats. The day was sunny, about 60° F. According to his notes:

"At 8:45 a.m. I found a pair feeding in a shallow pond. One bird, I presume to be a male, walks east leisurely, the female following about 75 yards behind. Both stop on some high ground. Suddenly the male, facing away from the female, starts pumping his neck up and down four or five times. His body is tilted downward. He walks a bit with body crouched, his breast about 10 inches off ground, and pumps his neck a few more times. Then, with wings spread, he circles quickly with dancing steps, meanwhile raising and lowering his neck. With flapping wings and continued bowing, he advances toward the female. When near her, he turns away, then back, then walks, stooped over, to her side. The female has shown no response but appears to be watching him. She preens for a few minutes while he scans the flats. Then both preen until 9 a.m.

"The male starts bowing again, crouching with neck pulled in and breast almost touching the ground. Bowing, he walks toward her, then turns and stands erect; then he hops as though crippled to a point 40 feet away. The female flies low and alights a few feet from him. He flaps his wings, then with poker-neck and head skyward, calls two or three high "kroo" notes. I think she is calling also. He hops two or three feet high with wings half-open. Then, with wings spread he runs away from her, turns quickly, and approaches her. She spreads her wings and bobs her head a time or two. In bowing the male crouches low with neck partially extended and the head almost touching the ground. The birds feed about 20 feet apart for 15 minutes, then hop into the air and fly in a wide circle, alighting one-quarter mile from the take-off point. The male pumps his neck and circles the female a few times with wings spread. At 9:25 a.m. the birds began feeding again and I left the scene."

On this occasion, it was noticed that the female took very little part in display. She did fly to the male when he seemed to ignore her. Her only display consisted of spreading her wings and pumping motions of the neck.

The adults of the family which remained on the refuge during the summer of 1941 were observed displaying from May 16 to as late as June 30. No evidence of nesting was obtained. Since this pair was mated, presumably for life, the display, in which both participated, may have been a normal physiological response preliminary to breeding or was merely an expression of general well-being. In this connection, it was interesting to watch the male's reaction to his offspring during the spring and early summer, which led us to believe that the display had sexual import. In late May the immature bird remained one-fourth mile to one mile away from the pair. At various times, we watched the male drive the young away when it ventured close to the pair. On June 27, Robert P. Allen saw the young bird fly toward the pair and alight nearby. The male ran toward it with wings spread and, when near it, raised his head high, probably calling. The young then flew off a half-mile. The young did not return to its parents until August and from then on the birds were always seen together.

Call notes.—The Whooping Crane's call is loud and resonant. Some of the notes are rather musical, albeit discordant, without the guttural quality of the sandhill's voice. The voice has considerable carrying power and we have heard crane calls from

a distance of at least two miles. One of the loud, piercing calls, is likened by Marguerite Stevenson to that of a child's intake of breath (much amplified) while suffering from whooping cough. Some of the calls may be written as follows:

Klōōk or *kū-lōōk*. An alarm. High pitched and musical. Sometimes repeated rapidly.

Kēr-lēē'-oo. A high pitched shrill whoop; the first syllable somewhat trilled. An alarm note. A variation is:

Tī-kēr-lēē'-ah. First two syllables short and merged. First syllable sometimes repeated three or four times. The most frequently used danger signal, similar to certain Sandhill Crane alarms but higher pitched.

Krōō. A challenge. Used by males of family groups.

Kid-dle-dōō'-dū-dū. A common recognition call or greeting. May indicate safe feeding.

In addition, there are several conversational notes, for example, a low, raucous, guttural *krawr* similar to that used by Sandhill Cranes, and a goose-like *onk* note.

The greeting call frequently is given by a pair in duet and may be repeated eight to



Fig. 40. Crane tracks in mud near Mustang Lake. Compare with raccoon and cow tracks. Photograph by W. B. Perry, January 20, 1939.

ten times, the female's call at slightly higher pitch than the male's and following his by a split-second. A similar type of "duet" (the *Doppelschlag* of German writers) is described in the Common Crane by Witherby *et al.* (1940:451) who state that "the deeper note uttered by one bird (either sex) and a higher one uttered by the other are repeated in such a regular alternation that they sound like the notes of one bird."

A young bird often joins its parents in calling but its voice cannot be heard at a

distance. The single note is a high, soft, plaintive *peep*, actually of fair volume, but a ridiculous "baby chick" call for such a large bird.

Flight and stride.—The flight is regular with steady wing beats. The legs are fully extended, held slightly below the horizontal. Of birds that we timed, the beat averaged two per second or even faster, but this may have been a more rapid rate than usual. The wings of refuge birds in flight were always in motion. No planing flight or soaring in circles was observed, nor did we hear birds calling in flight as has been recorded for migrant cranes or those on the breeding grounds. Formation in flight varied; small flocks of cranes were noted flying in single file, echelon, a "V," or abreast.

In taking off, a bird generally spreads its wings and there is a half-run of from two to five steps before it is aloft. Sometimes a bird will spring into the air from a crouching position. In alighting, the legs are trailed, then moved forward when the bird is about 10 yards from its stopping point.

We watched a family, which had been feeding in six inches of water, take off from Mustang Lake. The male, with wings spread, ran about 20 steps, skipping over the surface of the water before he became airborne. Upon returning to the lake, he made five or six steps on the surface before coming to a stop.

A number of measurements of crane tracks were taken on the bare flats near Mustang Lake. The stride is long and the bird can cover the ground rather rapidly when so disposed. The stride of one individual which had been searching for food, was found, upon measuring 42 steps, to average 18.3 inches (14 to 20½ inches). That of one bird, presumably walking at a natural gait, averaged 23¼ inches (21-24½) and of another, 23 inches (20-25). A well-made crane track is easily identified (fig. 40) and can be distinguished from that of sandhills by its greater dimensions. In fairly hard mud, the track averages 5 to 5½ inches in length, with an overall width of 7 inches. Ordinarily the print of only the three anterior toes is made. No imprint is made by the elevated hind toe except in soft mud in which the three anterior toes penetrate to a depth of one inch or more.

Feeding habits.—Although the Whooping Crane is classed as an omnivorous feeder, its predominant food is animal matter. Most of the cranes spend nearly the entire winter period on the east-shore flats. Some feeding is done in and along brackish ponds and in the tidal lagoons or sloughs. Occasionally the birds hunt for food in shallow waters of the surrounding bays, just off the refuge's shores.

The birds spend much of the day in search of food. We have seen them feeding before sunrise and as late as 7 p.m. in February, when it was almost dark. The day's feeding activities are interspersed with rest periods during which the birds preen and occasionally sleep. A crane may stand (or rarely sit) and preen for as much as a half-hour at a time. Sometimes, an adult and its young will sleep while standing on one leg, with the neck laid on the back, the head buried behind a wing. At these times, the mate acts as sentry.

Adults appear to interrupt food searches to scan the flats more often if young birds are with them than otherwise. In general, adults seldom search the ground for food for more than 15 to 30 seconds. One of a pair generally raises its head every few seconds for a quick view of the surroundings.

It was difficult to determine the type of food obtained by cranes which fed in shallow inlets and ponds. A great deal of probing in the muddy bottom of these waters was done. J. J. Lynch saw cranes probing for mantis-shrimps, which they obtained and ate, and W. F. Kubichek watched one pick up a mantis-shrimp, "swish" it in the water, and then swallow the entire animal.

The cranes which frequented Mustang Lake often probed in mud while standing in 12-15 or more inches of water. They walked slowly with heads lowered and necks curved while searching for food. The bill was held pointed downward ready to stab at



Fig. 41. Adult Whooping Cranes at overflow pool, Flowing Well; Sandhill Cranes (*Grus canadensis*) in background. Photograph by J. O. Stevenson, December 12, 1939.

an object. In probing, the heads were held under water and the sense of touch appeared to play an important part in finding food. Occasionally all three of a family group held their heads under water for 10 or more seconds and both adults for as much as 20 seconds. One male, in a five-minute period, probed with his head under water 19 times. The length of time under water averaged five seconds (maximum of 11 seconds). Birds seldom fed in the lake when its surface was choppy. This may have been due to its physical unattractiveness, inability of birds to see the bottom due to murkiness, or both. On rainy days or days with strong winds, birds on the flats would face the wind and hunt for food about as much of the time as they did on calm, clear days.

Along the shores of Mustang Lake and other lagoons, we found remains of many crabs (*Callinectes*) which cranes had eaten. At times, the remains of razor clams (*Solen?*) were also observed. Everett Beaty of the refuge staff had several chances, while surveying, to watch cranes through the telescope of a transit while they captured mullet in San Antonio Bay.

On January 24, 1941, Mr. Beaty and Stevenson, while making a motor-boat run down the Intracoastal Waterway, watched two adult cranes at close range on Cape Carlos. These birds were picking up small snails from bare ground. They also nipped the tips of new *Salicornia* shoots and were apparently eating the fleshy leaves of saltwort.

At times in late fall or winter, cranes inhabited the oak-brush dotted grasslands of the refuge interior for periods of a few days to several weeks. They also tended, on occasion, to seek protection of oak brush in times of heavy storms. Presumably much of their food in this area consisted of acorns. We did see them at times chasing grasshoppers with indifferent success. Mr. Thomas Webb of Victoria, Texas, who lived on the peninsula about 1910, told us that both Whooping and Sandhill cranes often fed in winter on blackjack, live oak and "pin oak" (*Q. myrtifolia*) acorns. The late J. A. Brundrett of Rockport, who lived on the peninsula about 1885, mentioned that whoop-

ers often alighted in farm fields in the area. They ate some corn and sweet potatoes, but spent much of the time in the brush, hunting for blackjack acorns. There is a specimen in the Biological Surveys Collection in Washington which was taken on Padre Island, Texas, on November 10, 1891; the label reads, "wt. 18 lbs., feeding on acorns."

In connection with the refuge planting program for geese, a field at Acquillas Well was sown to oats in the fall of 1939. A pair of whoopers visited the field on November 3 and fed with Canada geese on the sprouting oats. In February and March, 1942, some of the interior area of the refuge was burned for the purpose of controlling oak brush. Care was taken not to burn in or near areas used by cranes. However, the cranes were attracted to these burns, and, along with other wildlife, fed on new *Andropogon* and *Paspalum* grasses which came up.

Cranes relished corn as food when this was available to them. A family group spent January and February, 1941, on farmlands near Austwell, feeding on waste corn as close as 100 yards from the Austwell-refuge road. At the Flowing Well on the refuge, cranes ate grain put out to attract waterfowl for photographic purposes. The cranes picked out shelled corn but showed less interest in wheat and grain sorghums which comprised most of the feed.

Contents of 17 droppings, collected by Stevenson on the east flats between Mustang Lake and Cape Carlos, were identified by the staff of the Patuxent Research Refuge,

Table 2
Contents of Faecal Droppings of Whooping Cranes

Number of samples	Date	Location	Contents	Percentage
4	Jan. 30, 1940; Mar. 1, 1940.....	Mustang Lake and False Live Oak Point.....	Fragments of "blue crab" (<i>Callinectes</i>)	1
			Many fragments of many pelecypods, apparently chiefly "short-razor clams" (<i>Tagellus gibbus</i>) ..	99
			Fish bones, trace.....
			<i>Halodule?</i> sp., trace.....
1	Dec. 1, 1940.....	Cape Carlos	Fragments of acorns (<i>Quercus</i> sp.)	100
3	Jan. 23, 1941.....	Rattlesnake Point	Fragments of <i>Callinectes</i> (<i>sapidus?</i>)	4
			Fragments of pelecypod (<i>Solen?</i>)	95
3	Jan. 23, 1941.....	Cape Carlos	Fragments of <i>Callinectes</i> (probably <i>sapidus</i>) and a smaller-sized crab; fish scales (unidentified)	100
6	Jan. 24, 1941.....	½ mile east of Brahmas Well.....	Numerous fragments of <i>Callinectes (sapidus?)</i> and smaller-sized crab.....	60
			Fragments of razor clam (<i>Solen?</i>)	20
			Bones of fish, resembling mullet (<i>Mugil</i> sp.)	20

principally Francis M. Uhler, for whose cooperation we are grateful. Most of the food items taken by cranes on the east flats were determined from droppings found on bare mud flats. The small mounds of solid material were generally composed of macerated

shell fragments of bivalves with occasional fragments of crab skeletons. Very little vegetable material was present in most droppings; some of this may have been ingested accidentally. Contents of "scats" (aggregated) are itemized in table 2.

LOCAL NAMES

The following vernacular names for the Whooping Crane are, for the most part, supplementary to those listed by McAtee (1923:39). They are names used in southern Texas and Tamaulipas, Mexico, which are based on the bird's color or call notes. Names in frequent use in Aransas, Refugio and Calhoun counties, Texas, are: white crane, whooper, whooping crane, trumpet crane, white stork, and, for young birds, pink crane or red crane. Old residents and market hunters told me that the generally accepted name was "bugle crane."

Mr. G. E. Blanchard informed me that Mexicans of the Brownsville region call the bird *viejo del agua* ("the old man of the water") and that this name is used by Mexicans of coastal Tamaulipas. The more intelligent Mexicans, who are familiar with the species in Tamaulipas and on the King Ranch of southern Texas, recognize the whooper as a crane; there it is called *grulla blanca* to differentiate it from the Sandhill Crane, which is known as *grulla ploma* or *grulla plumbea*.

NOTES ON COLORATION AND PLUMAGES

Opportunities were had to make notes on the color of the plumage and soft parts of young and adult cranes. These observations were checked and re-checked using 10× binoculars when the birds were within 25 to 100 feet of a blind.

Adults.—The plumage of adults, in walking or standing position, appears entirely white, except for the top of the head. When the wings are in normal folded position, the black primaries, upper primary coverts and alula are hidden. The sexes are alike in color.

The amount of red and black of the bare areas of the head (crown, lores and malar region), and the size of the black, post-occipital patch, varies among individuals. The red coloring is noticeable only when the light strikes the head at the proper angle; otherwise, the naked areas of the head generally appear black. A small area of bare skin between the rami is also red.

The color of the iris in both sexes is a lustrous yellow. The bill is olive-gray, tipped with dark gray. In certain lights the bill appears dull yellow in color. The base of the bill, contrary to the portraits by bird artists, including Audubon, is pink or rosaceous which color is more extensive on the upper mandible. The tarsi and toes are dark gray to blackish; the lower surface of the three anterior toes is grayish-rose in color.

No information was obtained in the field on the molt of adults. It is presumably similar to that of the Little Brown Crane (*G. c. canadensis*) in which Bent (1926:236) states there is ". . . a complete molt from August to December; the flight feathers are molted in August, but the molt of the body plumage and wing coverts is not finished until December. The prenuptial molt, if any, must be very limited; it probably involves only a renewal of some of the contour plumage." This type of molt, in which birds are flightless for a short period, has been observed in caged Whooping Cranes and other caged cranes (*G. japonensis*, *G. grus*, *G. leucogeranus*, *G. antigone*, *G. vipio* and *Anthropoides paradisea*), according to Blaauw (1897:vii), and in *Grus grus* in the wild.

We were unable to determine composition, by sex and age, of those groups of from three to seven "white" cranes observed, at times, on the refuge. Perhaps these units represented one or two families, the immatures of which were second-year birds, groups



Fig. 42. Adult and young Whooping Cranes at Mustang Lake. Photograph by J. O. Stevenson, March 14, 1940.

of unmated adult birds traveling together, or possibly were groups consisting of immature, second-year, birds. In the Asiatic White Crane, Hume and Marshall (1881:14), in commenting on birds wintering in India, mention that “. . . it is usual to find either a pair of old ones accompanied by a single young one, or small parties of five or six, which then, as far as I can judge, consist exclusively of birds of the second year.”

Young or juvenal plumage.—The juvenal plumage is alike in both sexes. This plumage is described by Ridgway and Friedmann (1941:9). The young whooper is quite different in color from the young of *Grus canadensis*. The former has considerable white in the plumage with a heavy “buffy ochraceous” wash, while the entire plumage of the latter is “brownish washed with rusty.” In some lights, young whoopers appear almost orange in color.

The bill of the young Whooping Crane is darker than that of the adult, and the pink patch at the base of the upper mandible is more extensive. A patch of bare skin between the rami has a rose wash. The iris is whitish-yellow, dull in comparison to that of adults. In our notes, we described the tarsi of an October bird as “dark grayish-green.”

Oddly enough, juvenal birds in flight at a distance are often difficult to distinguish from their parents. In a good light, however, the mottled pattern of the head, neck, back, and wings, may be seen. The young in autumn is about the same size as an adult female. In young birds of the same age, there is some variation in the amount of white in the plumage, as might be expected.

As the winter advances, the juvenal plumage becomes progressively whiter and

regions of the head become bare. Bent (1926:225) states that, "Apparently a partial molt of the contour feathers occurs in winter and spring, producing an advance toward maturity." One young, seen in profile and full-face on January 30, 1941, had a crescent area in front of each eye (lores and malar region) which was darker than the rest of the head and becoming black. Immature refuge birds in March and April have much white in the body plumage. The head, apparently, is still entirely feathered. The head and upper neck are cinnamon, the crown, lores and malar stripe much darker.

According to Ridgway and Friedmann (1941:9), "The length of time required to attain adult plumage is not known. It is similarly not definitely known whether there are any progressive changes in young birds or whether the adult plumage is acquired by a postjuvencal molt at the end of the first year." We can offer little on the subject except to mention that a young refuge bird, when not more than 15 months old, was indistinguishable *in the field* from its parents. This bird was one of a family group which arrived on the refuge in October or November, 1940, and remained there in 1941 until October or later. Notes taken on the young's plumage in the late spring and summer months are quoted here:

"May 16.—At a distance the young looks like an adult. It is as large as the male and larger than the female—a male? A little cinnamon on tertials and wing coverts; head almost white. May 18.—In profile, young shows a conspicuous black crescent in front of eye. Slight amount of cinnamon on back of head, wing coverts and tertials. June 11.—(Young probably hatched a year ago this month.) Crown, lores and malar region apparently bare. In good light, head on, black shows to crown; some red in forehead; malar stripe black. June 16.—Good light. No brown on head or neck; most of body pure white. Lots of red in crown; some red in malar stripe. June 30.—Using 19.5× telescope in very good sunlight at 300 yards. Feathering of head all white—no brown. Bill as in adults including pink spot. Much red in crown and malar region. A few brown wing coverts and a few cinnamon-tipped tertials. A couple of brown-tipped tail feathers. August 25.—Young pure white—similar to parents. No cinnamon on wings."

In September and October, one individual which fed slightly apart from the others was assumed to be the immature. However, in plumage and head markings, it appeared identical with the others.

The age at which Whooping Cranes breed is unknown. In the Little Brown Crane, Bent (1926:236) describes a partial prenuptial molt which "produces a fresh, brown first nuptial plumage, in which I think some birds breed" and mentions that the young does not become fully adult (as far as plumage is concerned) until it is two and one-half years of age. Hume and Marshall (1881:16) state that *Grus leucogeranus* does not breed until the close of the second year. Some museum specimens of "white" Whooping Cranes have a few buff feathers scattered in the body plumage or wings. Mershon (1928) quoted F. Bradshaw as stating that a Whooping Crane, shot on October 29, 1927, at Estavan, Saskatchewan, had one or two small buff-colored feathers on the wings which might indicate a two-year-old bird, not yet in mature plumage. It would seem that there is a possibility that this bird and others in similar plumage might have been less than a year and one-half old.

CONSERVATION AND MANAGEMENT

The Whooping Crane is the most valuable species on the Aransas Refuge, from combined scientific, sentimental, and aesthetic standpoints. A "laissez-faire" policy of management has been adopted which is perhaps the best policy after all. No known deaths have occurred in the refuge or vicinity, and all birds observed have appeared to be healthy. Insofar as possible, disturbance of the birds has been kept to a minimum and a large feeding and resting area is available for their use. Certainly there is more than adequate range and "elbow room" for all the whoopers in existence.

The present habit of cranes to frequent the east flats, possibly because of increasing invasion of prairie by oak brush, has its dangers in that the cranes range near the Intracoastal Waterway which skirts, and for a short distance, cuts across the heart of the main feeding grounds. There is an increasing amount of traffic on this canal. Since cranes apparently do not fear small boats, any illegal target shooting could be disastrous. Frequent patrol of the canal and refuge shoreline is needed. Possibly a method may be developed in the present experiments on oak brush control by mechanical or other means to maintain large tracts of the refuge's interior in a grassland condition, attractive to, and providing greater safety for, Whooping Cranes.

In our experience, cranes acted less shy than frequent references in the literature on the species would indicate. Perhaps this is due to the protection afforded the bird on the refuge. However, there is always danger that the birds may gain a false sense of security, which would operate against their welfare, along the Waterway, for example.

Other factors threatening the species in the Gulf region are the increasing practices of oil exploration and drilling for oil in marshland and bay areas. During the war, airplanes used in training Army and Navy flyers caused disturbance to refuge cranes and some dispersal to adjacent areas. As far as is known, this activity had no permanent ill effects on the birds. However, the machine gun and practice bomb ranges operated by the Army Air Forces on Matagorda Island and plane activity in the vicinity probably jeopardized the lives of some cranes. It is a miracle if none was killed by some trigger-happy pilots.

The migratory habits of the Whooping Crane suggest countless hazards. There is evidence that some birds have been killed in recent years in Nebraska and disposed of when the killer learned of the birds' protection under federal and state law. It is hoped that an educational campaign, such as is in progress, will have the desired results. It is also hoped that suitable refuges for the birds can be established in Nebraska.

It appears that in the past few years a small population of cranes has resided throughout the year in southern Louisiana. Local residents assert that in the White Lake region, cranes actually nest and rear young to maturity, but there is no irrefutable evidence of this. If the observations prove to be accurate, a totally unexpected opportunity to conserve the species is thus presented. Even in the White Lake marshes, however, Whooping Cranes are in danger of elimination.

There must be many decimating factors at work on the cranes' breeding grounds, some of them controllable. As for the habits of the species which are not controllable and which thus make its salvation difficult, it may be stated that: (1) the species is migratory; (2) vast areas of wild land are required for breeding purposes; (3) the adults are noisy and lively on the nesting grounds, rendering themselves conspicuous and, therefore, easily detected; (4) the species is monogamous; (5) it is likely that the birds do not breed until they are several years of age; (6) usually only two eggs are laid; (7) adults, presumably, are flightless for a period in summer during the post-nuptial molt; (8) presumably the young, as in *G. canadensis* and other gruids, cannot fly until they are several months of age; (9) the young are dependent for a considerable time on their parents for food; (10) if one member of a family is shot, the others remain close to the wounded or dead bird, placing themselves in a vulnerable position.

On the other hand, certain factors and characteristics of the species have operated for its welfare and are helping to keep it alive today. Cranes are protected by federal law under the Migratory Bird Treaty Act and by state laws. The bird is retiring in nature and inherently wary. The parents protect their young until they are capable of

taking care of themselves. Adults can probably hold their own with most predators, except man. Apparently whoopers are long-lived if zoo records are any indication (up to 38 years, according to Flower, 1938). No critical or fatal diseases have been recorded for wild Whooping Cranes. There is a record of a 14-year-old bird which died at the National Zoological Park, diagnosed as "generalized tuberculosis," and the autopsy on another bird, at least 9 years old, revealed "aspergillosis."

It is hoped that workers engaged in the current research program on the Whooping Crane will determine what factors, good and bad, are in operation, particularly on the nesting grounds, and that the results of this educational and research work will point the way to saving this magnificent native bird for all time.

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