

Papers in the Biological Sciences

Papers in Ornithology

University of Nebraska - Lincoln

Year 1982

Whooper Recount: A close look at these
endangered cranes reveals that, while
their numbers are increasing, their rate of
increase is actually declining

Paul A. Johnsgard
University of Nebraska-Lincoln, pjohnsga@unlserve.unl.edu

Whooper Recount*

A close look at these endangered cranes reveals that, while their numbers are increasing, their rate of increase is actually declining

Paul A. Johnsgard

During the early 1930s, Myron Swenk of the University of Nebraska performed a detailed analysis of the records on whooping cranes during their migrations through Nebraska. The extent of the birds' wintering areas had not yet been ascertained, and their breeding grounds were completely unknown. Swenk believed that most of the cranes that survived the winter passed through the Platte Valley of Nebraska each spring on their way northward. Using information collected from correspondents, newspaper accounts, and the like, he was able to provide data on the timing and general locations of whooping crane concentrations in the state.

Unfortunately, in attempting to assess total whooping crane numbers, he accepted almost without question the sightings of large flocks of birds identified as whooping cranes, but which were most probably sandhill cranes or possibly even snow geese. This resulted in a tally of nearly 700 whooping cranes

for the spring migration period during the twenty years prior to 1933, leading Swenk to the erroneous conclusion that as many as one hundred of the birds survived into the early 1930s. In summarizing his work, Swenk reported that he could detect "no permanent diminution in numbers of the species observed in Nebraska, during the past few decades," and actually suggested that there had been a "distinct recovery of the species since 1916," when the Migratory Bird Treaty was enacted.

Swenk's findings provided a deceptive assurance to various ornithological and conservation groups, as well as to federal agencies. U.S. Fish and Wildlife Service biologists remained unaware of the cranes' perilous state, and as late as 1943 the Bird Protection Committee of the American Ornithologists' Union published a bland 1938 estimate that the whooping crane population was probably "less than 300." According to regional surveys, however, there then were only eleven resident birds in the White Lake marshes of Louisiana, two more in the coastal marshes of the same state, about twenty that wintered annually on the Texas coast, and a captive bird that had been illegally wounded in Nebraska in 1936.

Eventually, the attention given to the status of the whooping crane gave rise to highly accurate annual counts. These, in turn, led to effective conservation measures on behalf of the birds. The history of the cranes' increase in numbers over the years provided me with a unique base for the study of their population dynamics.

The establishment of a national wildlife refuge near Aransas Bay, Texas, during the winter of 1937–38 was of crucial importance to the fate of the cranes and probably saved the species from extinction. The Louisiana marsh population had declined precipitously to only six birds by the winter of 1941–

* Published in *Natural History* 91:2 (February 1982), pp. 70–75. Used by permission of the American Museum of Natural History.

42, and the large number of "whooping cranes" that had been reported almost every previous spring in Nebraska simply failed to materialize on close study. Thus, ornithologists came to the sobering realization that the Texas wintering population was essentially all that was to be found anywhere. By the winter of 1941–42, the Aransas population had dropped to an all-time low of thirteen adult birds and two young, which possibly represented no more than two or three actual breeding pairs. The fate of the whooping crane was invested in these few birds, which carried the total genetic pool of a species that had probably numbered between 1,300 and 1,400 birds some seventy–five years previously.

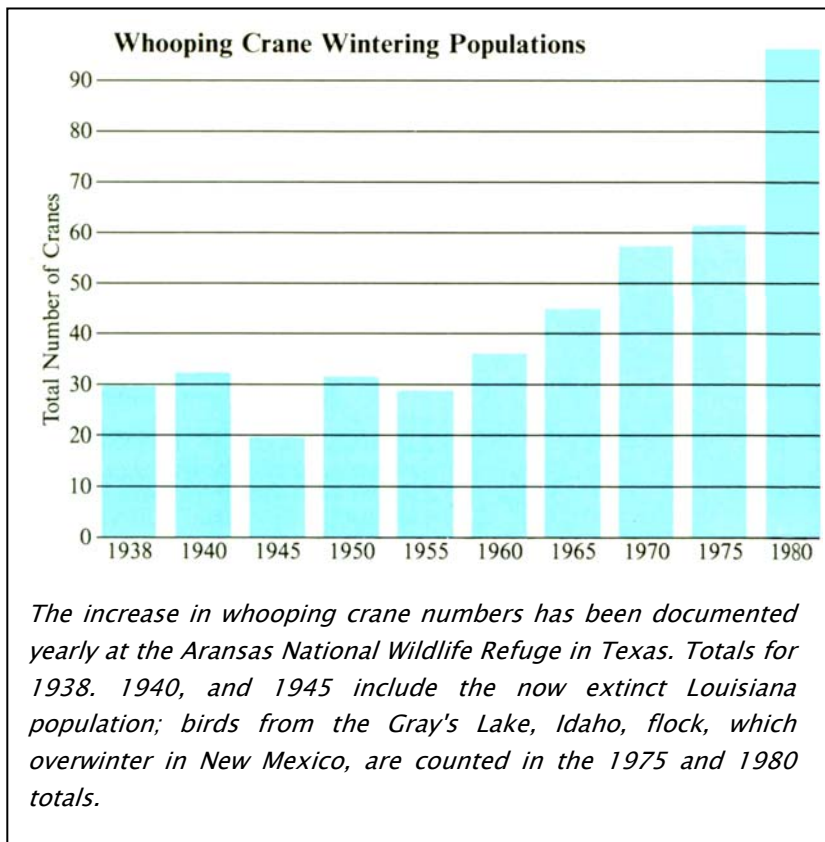
Initially, the establishment of the Aransas refuge did not seem to help the species' plight. The birds were often disturbed by activities associated with oil production in nearby San Antonio Bay, the construction of the Intracoastal Waterway through the heart of the refuge, and practice bombing on Matagorda Island by military aircraft. Nevertheless, the refuge did provide protection from illegal hunting of the birds, and detailed monitoring of their numbers was possible for the first time. This became especially important as the Louisiana flock gradually diminished. In the winter of 1949–50, the last surviving bird of that flock was captured and transferred to Aransas to join the thirty–four wild birds that had arrived that autumn. By then the wounded bird from Nebraska and a second captive whooping crane from the New Orleans zoo had also been moved to Aransas.

By the winter of 1949–50, the whooping cranes, responding well to protection, more than doubled in number. But the future of the species was by no means secure, for every year the birds had to cross the continent to and from their still–

unknown nesting grounds. Special efforts were made to locate and preserve their nesting areas. Much of this work was undertaken for the National Audubon Society by Robert Porter Allen, who doggedly searched thousands of square miles of the Canadian and Alaskan Arctic and subarctic. He began his unflagging endeavors in the fall of 1946, and for several years publicized the whooping crane story with press releases and articles. His hopes were finally realized in 1954, when a mammalogist doing a helicopter survey for the Canadian Wildlife Service accidentally discovered the cranes nesting south of Great Slave Lake, in a remote corner of Wood Buffalo National Park, Northwest Territories. (The area is probably marginal crane habitat, as the cranes' original nesting distribution had centered in the aspen and prairie parklands of southern Canada and the upper midwestern states—areas from which the birds had been eliminated early in the twentieth century.) Fortunately, this nesting area had already been placed under protection as a sanctuary for Canada's remaining herd of wood buffalo. The discovery was important because it finally settled the question of the species' remaining nesting grounds, and allowed for subsequent monitoring of its nesting biology and reproductive success.

The whooping crane population wavered erratically through the 1950s, dropping thirteen birds between the winters of 1949 and 1952, but rising to a high point of twenty–two adults and nine young birds that reached Aransas in the fall of 1958. The birds then began a slow recovery that has progressed, with few interruptions, up to the present wild population of about ninety–six birds. Since 1938, the number of adult and young birds arriving safely at Aransas has been carefully recorded and the information annually released to the press. Conducting a

complete census of the population of an endangered species at the same time every year has provided a rare opportunity to measure its annual increments and losses, and to predict some demographic characteristics that are extremely relevant to the species' chances for long-term survival.



A chronological plotting of the total number of wild whooping cranes in the Aransas flock since the establishment of the refuge, along with a parallel plotting of the number of

young birds and apparent deaths per year (based on the number of birds from the previous year's population that fail to arrive the following fall, is of special interest. The annual mortality, varying from 0 to 13 birds, has remained remarkably constant, showing no sign of increase as the population has risen since the mid-1950s. Equally surprising is that the number of young, varying from 0 to 12 per year, has also remained uniform and has shown no proportional relationship to the number of nonjuveniles in the population during the same period. Neither of these results is to be expected, for both the number of deaths and of young birds should be proportional to the population size.

A simple chronological graph, although of interest, fails to provide a statistical estimate of the life history characteristics that are most needed by biologists. Instead, estimates of annual mortality rates and of recruitment rates, or annual additions of juveniles into the population, are needed. Fortunately, these statistics can be calculated from the population data that have been accumulated since 1938. Robert Porter Allen assembled this information for the wild populations in Louisiana and Texas during the period from 1938 to 1948, and data for the subsequent years from Aransas were assembled, although never carefully analyzed, by the U.S. Fish and Wildlife Service.

I have assembled these figures for the 43-year period from 1938 through 1980, and have subjected them to various kinds of analysis. During this period, 220 young and 1,437 postjuvenile birds have appeared on the wintering grounds. This works out to an annual recruitment rate of 13.3 percent. (This is not exactly the same as the birthrate, of course, since the loss of eggs, chicks, and juveniles prior to arrival at Aransas is

excluded.) The recruitment rate provides an estimate of the rate of maximum annual population increase. One hundred fifty-four birds that had been counted in any given year failed to arrive the following fall and can be considered mortalities. The deaths of these postjuvenile birds, when considered relative to the collective population of surviving postjuveniles, indicate an overall relative mortality rate of 9.7 percent for the 43-year period. Subtracting the annual mortality rate from the annual recruitment rate provides the actual annual rate of population increase: 3.6 percent. Such a rate of increase, which is comparable to that of many human populations, results in a theoretical population doubling time of 19.2 years. Indeed, the wild population has essentially doubled twice in the nearly fifty years since the establishment of the Aransas refuge.

An annual mortality statistic of 9.7 percent for postjuveniles also allows for an estimate of life expectancy in the population. If this mortality rate is typical of all older age classes, the expected life span for a crane that has survived to reach Aransas is approximately ten years. Furthermore, more than 5 percent of the postjuvenile population might statistically be expected to reach the age of twenty-five years, and a few might even survive to forty years. (Whooping cranes have been known to live for forty years in captivity, but too few have yet been banded to judge whether such ages might actually be attained in the wild.)

This estimated life span surprised ornithologists, who are inclined to believe that most wild birds have a much higher annual mortality rate and a shorter life expectancy. Discussing the plight of the whooping crane in the 1950s, James Greenway of the American Museum of Natural History took the position that the species' survival would be a "miracle," as he assumed

that its first-year mortality rate might be as high as 80 to 90 percent, and perhaps as high as 50 to 75 percent in later years. Obviously, if that were true the species would have died out long ago. Instead, the whooping crane is a species that has evolved a pattern of survival based on a potentially long life span, permanent pair bonding, and prolonged biparental care of only one or two young.

One important factor in the life history of the whooping crane is still uncertain: the length of time to sexual maturity and initial nesting. By the time they are two years old, whooping cranes attain their adult plumage, and some two-year-olds have been observed displaying; but it is generally believed that initial nesting probably does not occur in wild birds until the whoopers are at least five years old. The evolutionary wisdom of restricting breeding attempts to the oldest and most experienced age classes probably relates to competition among adults for highly limited nesting sites, the extremely large territorial requirements of nesting pairs, and the high demands on the parents for guarding the nest and young during the relatively long (four-month) period of incubation and fledging. The subsequent migration of some 2,300 miles from the Canadian subarctic to the Gulf Coast is an additional stress, and thus it is in the best interest of the species to restrict nesting efforts to those individuals that have already survived for several years and have both the physical strength and experience necessary to breed under these difficult conditions. Probably less than half of the adult-plumaged birds in the population at any one time actually represent breeding birds, with the remainder consisting of subadults, widowed birds that have not found new mates, and perhaps some birds too old to breed. Alien estimated that only half the spring migrant popu-

lation of whooping cranes represented potential breeding pairs; this figure was later supported by studies on the Canadian nesting grounds, where it was found that somewhat less than half the birds that summered in the Sass River area of Wood Buffalo National Park were actually nesting.

This restriction of breeding potential to a relatively few birds that might be anywhere from about five to nearly forty years old is an important facet of whooping crane biology. For one thing, it means that the genetic diversity of the offspring is restricted. It might also help to explain the curious fact, noted earlier, that the number of offspring produced each year has tended to remain constant. The older and more experienced breeders are also probably less vulnerable to the usual sorts of mortality factors, such as accidents and injuries caused by hunters. Thus it is probable that many of the annual deaths are those of first-year or at least subadult birds. There seems to be a weak but positive correlation between the number of young appearing on the wintering grounds in any given year and the size of the apparent mortality during the following year or two, suggesting that after yearlings are abandoned by their parents, they are likely to suffer higher mortality rates than older birds.

When the data are broken into three approximately equal time segments, some additional information can be gleaned. During the critical early period from 1938 to 1952, the annual recruitment rate (the percentage of young in the fall population) was 17.3 percent. In the transitional period from 1953 to 1966, the recruitment rate was 15.1 percent, and during the most recent period from 1967 to 1980, it was only 10.6 percent. The mortality rates during these same three periods were 15.8 percent, 10.8 percent, and 6.7 percent, respectively, the

decline apparently reflecting improved protection and decreased mortality from hunting errors. Finally, the annual rates of increase (the annual rate of recruitment less the annual mortality rate) for the three periods have been 1.5 percent, 4.3 percent, and 3.9 percent. Thus the annual rate of increase was highest during the middle portion of the period under consideration and has diminished some since that time.

Part of this reduction can perhaps be attributed to the removal since 1967 of a moderate number of eggs from whooping crane nests for hatching elsewhere. No more than a single egg from any nest has been removed, based on the observation that wild cranes rarely manage to rear more than a single youngster whether or not two eggs are present. Between 1967 and 1974, a total of fifty such eggs were removed for rearing at the Patuxent Wildlife Research Center in Laurel, Maryland; and more recently, a similar number have been transported to Gray's Lake, Idaho, and substituted for those of greater sandhill cranes, in hopes that the sandhills would brood them and raise the young.

Current hopes for the establishment of a second, and perhaps less vulnerable, whooping crane flock rest primarily with the recent efforts at cross-fostering whooping crane chicks under sandhill crane foster parents, and within a few years we should know whether these efforts will prove successful. The experiments began in 1975, and during the first four years a total of thirteen birds fledged from forty-five eggs that were placed under foster parents. Only three of these birds were known to still be alive at two years of age, however, and thus the rate of population increase has been agonizingly slow. Added to this disappointment is the uncertainty of whether the fostered cranes will be able to find appropriate mates when

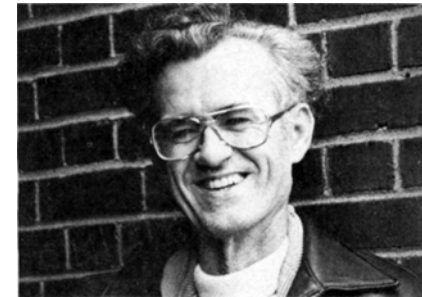
they become sexually mature or whether, if out of need or because of attachment to inappropriate parent figures, they will attempt to mate with sandhill cranes. Thus, the role of the older, wiser, and more experienced birds in the grand design for the preservation of the species becomes ever more evident; youngsters just don't seem to have what is needed to make it through these difficult times.



Note: Two photographs (for which permission has not been granted for use) appeared with the original article. Credits and captions are reproduced here:

p. 70: Entheos

p. 71: Experiments using sandhill cranes as foster parents for whooping cranes have had limited success. Here one of the surviving juvenile whoopers, center, mingles with two sandhills. (Robert P. Carr)



Paul A. Johnsgard became interested in whooping cranes after moving to Nebraska and learning of the species' past abundance in the Platte Valley. While preparing a book on crane biology, he noticed that the population dynamics of cranes are different from those of other bird groups he had studied. The whooping crane represented a unique source of data because for nearly half a century the species' entire population has been censused annually. Foundation Professor of Life Sciences at the University of Nebraska, Johnsgard is at work on several books; among them are Hummingbirds of North America, to be published by Smithsonian Institution Press, and Teton Wildlife, to be issued by Colorado Associated University Press. [p. 2]