

Action and Theory: Discovering Life

ACTION

With an adult height of 4–5 feet, the whooping crane is North America's tallest native bird. The cranes, with white bodies, black wing tips, and red-capped heads on long, elegant necks, are beautiful. The whooping crane is also one of the continent's most famous endangered species, with fewer than thirty birds remaining before people rallied to save it. Even so, after more than fifty years of intensive scientific effort on the cranes' behalf, it is still unclear whether whoopers will survive in the wild.

In the early 1800s, John James Audubon observed the arrival of a family of 20–30 birds at their southern wintering ground and painted an adult male for *The Birds of America*, which he published in 1827. At that time, the birds' breeding grounds probably ranged from the Hudson Bay westward across Canada, to as far south as the current states of Nebraska and Iowa. Their wintering

grounds lay along the east coast, from New Jersey to Florida, on the Gulf of Mexico, and as far southwest as central Mexico.

By 1900, the conversion of western North America from wilderness to farmland and ranches had destroyed much of the cranes' wetland habitat. In the following years, scientists observed the whoopers disappearing from their wintering grounds until only two populations were left, one migratory group on the Texas Gulf coast and one nonmigratory flock in Louisiana. In 1936, a scientist with the U.S. Bureau of Biological Survey (the forerunner of the U.S. Fish and Wildlife Service) recommended that the Texas habitat be purchased as a wildlife refuge. Thus, the U.S. government became active in whooping crane preservation efforts with its establishment of the Aransas National Wildlife Refuge on December 31, 1937.

During the winter of 1941, scientists counted only 22 whooping cranes, 6 of which were in Louisiana, where they died out by 1949. Biologists from the government and the National Audubon Society worked hard to preserve the Texas habitat, to try to find the northern breeding grounds of the Aransas flock, and to learn more about whoopers' natural history. In June 1954, an observer in a Canadian Forest Service helicopter returning from a fire in Wood Buffalo Park, Northwest Territories, spotted a pair of adult cranes and one juvenile bird. The last remaining breeding ground of the whooping crane had been found.

Both the Canadian and U.S. governments increased efforts to protect the Wood Buffalo and Aransas sites while scientists learned more about the birds' behavior from monitoring both refuge sites and tracking birds visually on the 2500-mile migration (see map on p. iv). In 1965, when scientists believed field work only was insufficient to increase the cranes' population significantly, they used knowledge of the birds' breeding behavior to try a captive breeding program.

Biologists had learned that most whooping cranes lay two eggs, but only one juvenile bird survives to migrate south. The scientists, with government support, decided



to remove one egg from some two-egg nests, transport the eggs to the Patuxent Research Center in Maryland (see map), and try to raise birds there. By the mid-1970s, Patuxent-raised whooping cranes were laying their own eggs through selective artificial insemination.

Because the Patuxent program proved successful, scientists decided to use similar techniques to establish a second whooping crane population in the wild. In 1975, biologists took eggs to Gray's Lake National Wildlife Refuge in Idaho, where they switched them with sandhill crane eggs. The unknowing foster parents raised both sets of chicks and led them to wintering grounds in New Mexico (see map). As the surviving whooping cranes matured, they tended to stay together. It is unknown if the whoopers recognized that they were different from their sandhill neighbors or not, but none of them has passed the first step toward a self-sustaining population by mating successfully. This group now numbers 9 whoopers.

After reviewing the success in raising whooping cranes in captivity at Patuxent and the apparent failure of the techniques used in the wild in Idaho, biologists developed a new plan for establishing a nonmigratory whooping crane population in Kissimmee Prairie, Florida (see map). In the winter of 1992, biologists took 14 juvenile whoopers, 6 hatched at Patuxent and 8 hatched at the International Crane Foundation in Wisconsin (see map), and released them in Kissimmee Prairie. At first, scientists kept the birds in a protected environment. Over the course of the winter, as the cranes adjusted to their surroundings and to each other, the biologists allowed them

to range more freely through the reserve, forcing the young cranes to become increasingly independent.

As we write this in the spring of 1993, biologists are preparing to establish a third captive flock. Some juvenile cranes hatched at Patuxent and some from the International Crane Foundation are being sent to Calgary, Alberta (see map), to become the foundation of a Canadian captive breeding group. In the future, biologists may try to establish a new migratory population on breeding grounds in Canada.

There are now approximately 270 adult whooping cranes and 50 chicks in the world, including both wild and captive birds. They are descended from the one breeding population left in the wild, which breeds at Wood Buffalo Park in Canada and winters at Aransas, Texas. (The marshes of Aransas are shown on the cover.) If the restoration programs are successful in the long term, there is hope of establishing 3–4 independently reproducing whooping crane populations living free in North America.

THEORY

The story of the whooping cranes is interesting for its own sake, but we believe it also points out many of the themes vital to understanding the topics of introductory biology:

1. The process of scientific investigation includes both observation and experimentation. The techniques used by a group of biologists change over time as they learn from previous work and take advantage of new technologies. In the first monitoring of crane migration, for example, spotters along the suspected migration route counted birds as they passed through. Current monitoring can be done by radio tracking of banded birds.
2. Scientists are an integral part of society. Biologists were able to capture public attention and government support in the 1930s because the public had become reawakened to the environment through the photos of Ansel Adams and the essays of Aldo Leopold, to name only two figures of the era. It is still important to look at cultural values when studying what scientific research receives government funding, what work is done unsupported, and what, if any, work is banned.
3. The first biologists were limited to observing nature and asking questions based on their observations. By the nineteenth century, scientists could use newly developed tools and could benefit from a new mental



openness to pose many questions, which they addressed by both observations and planned experiments. The quantum leaps in biological understanding of the twentieth century arose from increasingly complex experiments that were drawn from this continuing tradition of observing, questioning, and experimenting.

4. Modern biology rests on two related themes: genetics and evolution. Genetics examines the makeup of individuals while evolution studies the flow of inheritance over many generations. Biologists are concerned that today's whooping cranes are descended from a small number of related birds, which is why they want to establish several independently reproducing populations. In the short term, if disease or other natural disaster destroys one population, even though the others are closely tied genetically, geographic separation may save them. In the long term, each population will change genetically, and the random change that marks each will be distinct from the change occurring in the other populations. The overall increase in genetic variation for the species will give the whooping crane population a better chance to adapt to diverse evolutionary pressures.
5. In order to have the best understanding of the genetic makeup of an individual or the variation within a species, we need to take advantage of recent work to view biology in the light of biochemistry. Chemistry may seem more abstract than biology, but all organisms are composed of a wondrous array of simple and complex molecules. Biologists can assess individual genetic profiles and measure overall variation for an endangered species by analyzing DNA, the complex molecules that carry inheritance from parent to offspring through the generations.
6. As our understanding of biology progresses, we see that the fields within biology are increasingly interdependent. For instance, laboratory techniques have had a profound impact on field biology. DNA fingerprinting technology is now used by scientists starting captive breeding programs for other species. They use this sensitive technique to establish matches between the least-related prospective parents, optimizing the genetic variation in offspring. Many lab researchers continue to look to biological diversity for molecules with specific behaviors. Taxol, an extremely promising anticancer drug, was originally isolated from the Pacific yew tree. (See the story of Hawaiian geese captive breeding in Chapter 22 and discussions of taxol in Chapters 7 and 41.)



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- U.S. Government and the International Crane Foundation. Various pamphlets, fact sheets, and other informational materials made available through the courtesy of the Aransas National Wildlife Refuge staff.

Further Readings

- Bergman, Charles. *Wild Echoes: Encounters with the Most Endangered Animals in North America*. New York: McGraw-Hill, 1990. An English professor and nature author, Bergman movingly writes of his experiences with the biologists who work with endangered species, as well as his encounters with the animals themselves.
- Doughty, Robin. *Return of the Whooping Crane*. Austin, TX: University of Texas Press, 1989. This comprehensive book on whoopers is recommended by the staff at Aransas National Wildlife Refuge.