Ethology: The Study of Animal Behavior

Animal behavior is a complex, but fascinating, subject. **Ethology**, the study of animal behavior, is a relatively new science in which exciting new discoveries are being made each year. As an ethologist, your first job is to observe animal behavior and precisely record it. The key to accurate recording is careful observation, aided by photographs, sketches, and extensive notes.

After recording a particular behavior, the ethologist tries to analyze the purpose or function of the behavior. Questions like "Why is this animal doing what it is doing?" are asked. Often the answer to these questions can be figured out from direct observation.

More complicated questions, however, often require more intensive, long-term study and experimentation. Examples of these questions include:

1. Is a particular behavior primarily learned or genetically controlled?
   For example, is a crane chick taught a threat display by its parents, or does it innately know the behavior?

2. Can a particular species' behavior change to meet the demands of a changing environment?
   As an example, if a crane species is introduced to a new food item, such as corn in an agricultural field, will it learn to exploit this new food source?

3. Do all members of a species react in the same way to the same situations?
   For example, if threatened by a predator, will a whooping crane in Florida react the same way as a whooping crane in Canada?

These questions may take years of careful observations before solid conclusions can be drawn.

By utilizing the Crane Chick Cam you will have the opportunity to work as an ethologist, assisting us in observing and recording crane behavior.

Study the "Field Guide to Crane Behavior" to become familiar with the different behaviors you will observe on the Crane Chick Cam. As a part of the activity, your teacher may divide you into small groups to observe our young Whooping Crane chicks.

Your teacher will provide you with data sheets to record your observations, which you may use for discussion. Remember to use the Field Guide as an aid while recording your crane observations.

An Introduction to Cranes

Cranes are one of the most vulnerable families of birds in the world, with eleven of the fifteen species considered threatened or endangered. The two species of cranes in North America demonstrate the range of population sizes: over half a million Sandhill Cranes live here, while fewer than 400 whooping cranes survive in the wild. Sandhill Cranes are considered to be one of the oldest known living species of bird, with fossil evidence showing Sandhill Cranes in North America almost ten million years ago. Of the seven continents, only South America and Antarctica lack cranes.

Herons, storks, and spoonbills also have long legs, necks, and bills and look similar to cranes, but are not closely related. Rather, the different families have evolved similar adaptations to a common wetland habitat. In actuality, the smaller coots, rails and limpkins are the closest relatives to cranes.

Individual and Social Behavior

Cranes pursue each other, or small prey, by running. A running crane takes one to three steps per second and may extend its wings for more speed or balance. While ungainly looking, cranes can outrun a human. All cranes can swim, but adults usually avoid it unless necessary. Chicks are active a few hours after hatching, and must swim if they are to follow their parents, since most cranes nest in wetlands.

Feathers give cranes both the ability to fly and to regulate their temperature. Made of the same material as human fingernails and hair, feathers require constant attention. A crane preens by nibbling the base of a feather and then drawing it through the bill. This is particularly true for the large flight feathers. Feathers are replaced during a seasonal molt, when old feathers are pushed out by emerging new feathers. Most species of crane are flightless during this period, and usually molt during chick-rearing. It is not unusual for flightless cranes to stay near heavy cover until they and their young can fly.

When preening, cranes smear their feathers with oil from an oil gland located on the upper side of the tail. Contrary to previous belief, the oil does not serve as waterproofing, but helps condition the feathers and may have fungicidal and antibacterial properties. Prolonged preening follows water or dust bathing.

Some Sandhill Cranes also "paint" themselves by preening mud into their feathers prior to the breeding season. Painting is an important camouflage tactic that helps sandhill cranes hide amid the brown vegetation in a springtime marsh. Siberian Cranes also paint themselves near the base of the neck as part of a breeding ritual.

Displays and Vocalizations

Cranes are aggressive birds. When fighting, they leap into the air to rake opponents with their sharp claws. This continues until one bird runs or flies away. But fighting is dangerous, so cranes have developed a complex system of warning behaviors to prevent combat.

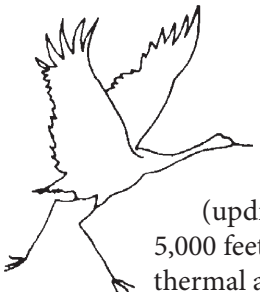
Communication with other cranes includes physical postures and vocalizations. Crouch threats, ruffle threats, drop-wing threats, and flight intention postures are some of the behaviors you may see during your visit to ICF. Most crane species use a red patch of skin on the head as a warning display. Cranes can pump extra blood to the patch, turning it a bright crimson, and then point the patch at an invader or opponent.

The contact call is a soft, purring call made by adult cranes. This call alerts other cranes to the caller's whereabouts. The young have a high-pitched, peeping contact call. Chick distress calls are louder than their contact call, and parents react quickly to them. Beyond an age of about three months, chicks are able to perform the guard call, a single loud call that warns other cranes of danger.

The most significant vocalization is the "unison call." A pair gives the unison call together either to form and strengthen pair bonds or to enforce territory boundaries. In many species, the female has a two-note call while the male has a single-note call. Males of some species, such as the White-Naped Crane, Siberian Crane, and Brolga, may flex their

wings while unison calling. Members of a pair usually stand within a few feet of each other while unison calling.

A unique call made by the Grey Crowned Cranes is "booming." The birds use their gular sacs to develop resonance. The gular sacs are the small red pouches hanging below their chins. Crowned cranes also use a "quack" call to locate their mates.

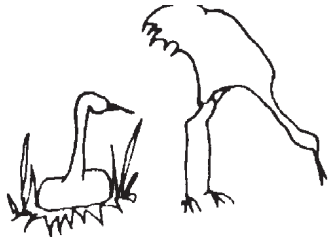


Flight and Migration

Cranes typically run into the wind to achieve the speed necessary for flight. Cranes may fly as fast as 52 m.p.h. without a helping wind during level, flapping flight. When soaring in thermals (updrafts of warm air), cranes will circle until they reach a desired altitude, usually between 3,000 and 5,000 feet. They then leave the thermal and glide forward while losing altitude. Next, they find another thermal and repeat the procedure. Some species, though, fly much higher to clear mountain ranges.

Flapping flight is an energy-intensive activity. Although soaring in thermals is slower than level flapping flight, it conserves energy. Cranes usually spend two days feeding for every day they fly during migration. Daily flights may range from a few miles in bad weather to several hundred miles if suitable stopover points are unavailable. Cranes also fly further on days when there are favorable winds. Cranes begin their migration in families or small groups. As migration progresses, however, groups join to form flocks of up to several thousand birds.

At night, migrating cranes roost at "staging areas" in water that is deep enough to cover their toes. Staging areas consist of safe roosting sites in shallow marshes or on submerged sandbars in rivers. There are usually good foraging areas within a short flight of the roosting sites. Examples of staging areas used by sandhill cranes include the Platte River (Nebraska), Jasper-Pulaski State Wildlife Area (Indiana), and the Sandhill Wildlife Demonstration Area (Wisconsin).



Nesting and Reproduction

Cranes have low reproductive capabilities. A pair will produce only one or two chicks each year, but that production will continue through most of their twenty to thirty year life-span. Their survival strategy is the opposite of short-lived animals, like rabbits or mice, with high reproductive rates. Cranes typically do not begin breeding until three to four years of age, and some species, like the Siberian Crane, may not nest until they are five to seven years old.

Cranes are territorial during the breeding season, with each pair defending an area in which it will attempt to raise young. Sandhill Cranes may nest in areas of less than five acres, but the average territory size is larger than fifty acres. Larger crane species typically have larger territories. Territories will tend to be smaller in areas of abundant food, good nesting habitat, higher population densities, and little disturbance from predators or humans.

It takes a crane pair one to seven days to build a nest. Once the female lays the eggs, the pair shares incubation duties. The "nest exchange," or switching of incubation duties, occurs about every two hours, giving both birds a chance to feed and exercise.

The time of hatching coincides with the emergence of insects that the young will feed on. This timing is particularly important for migratory cranes so the young can grow and gain enough size and strength to migrate before winter sets in. Timing of nesting is less important with non-migratory cranes.

Most species of crane lay two eggs, but usually only one chick survives. The chicks are aggressive and often fight until one is driven away from the family group or dies from lack of attention. The remaining chick then has the complete attention of both parents and has a very good chance of surviving, even when food is scarce.

Both parents feed the chicks, but the male usually feeds them first. The newly hatched chick may be offered small pieces of the egg shell. The rest of the shell may be eaten by the female or carried away and discarded. Both parents brood, or sit over, the young birds to protect them from cold and precipitation. Brooding is important, since the chick cannot control its body temperature for the first few days after hatching. The family may leave the nest a day after the second chick hatches, but return to the nest in the evening for several days. The young birds may beg for food by "bill-touching" with their parents.

Cranes as "Flagship" Species

Biological communities are a complex web of life, incorporating all the organisms that exist in an area. In many of these communities, cranes occupy one of the upper levels of the food pyramid. Since they are dependent upon so many other species below them, biologists consider cranes to be flagship species; the health of the crane population is often a good indicator of the health of the ecosystem as a whole. By working to protect cranes, we work to protect all the other community members which may not be as conspicuous or easily recognized.

Wetlands

Most of the world's crane species rely on wetlands for their survival. Within these complex ecosystems, cranes find the necessary resources to survive.

Feeding is one of a crane's most time consuming activities. In wetlands, food is abundant in many forms: seeds, small mammals and reptiles, eggs of other birds, insects and other invertebrates, such as worms, clams, and crayfish. In addition, cranes find valuable carbohydrates in the starchy tubers growing on the roots of many wetland plants. Cranes are well-adapted to such food sources, with long beaks and necks which allow them to probe deep into the water and muck of a wetland.

The tall vegetation of a shallow marsh also helps hide cranes from predators, especially while nesting. In deeper marshes, cranes build massive nests sometimes five to six feet across and high enough that the water doesn't touch the eggs. Often a "moat" forms around the nest because the cranes use so many of the nearby plants for constructing the nest. The standing water protects the birds, as the noise of splashing will alert the parents of an approaching threat.

Many other creatures also make their homes in the wetland community. It is estimated that over one third of all threatened or endangered species in the U.S. are found in wetlands. Mammals such as beavers, muskrats, rabbits, and deer depend on the food and shelter of wetlands, as do waterfowl and other migratory birds.

Humans, too, reap many benefits from wetlands. Wetlands are known to reduce or prevent flooding and remove pollutants and sediment from surface water. Wetlands are also a source of food for humans, providing spawning grounds for about 90% of the fish and shellfish harvested in the coastal U.S.

Despite these benefits, wetlands continue to decline throughout the world. Often considered only as useless waste areas, wetlands have been drained, filled, plowed, and developed. Their seasonal nature can make them difficult to identify, and many are destroyed during dry periods when it appears they are no longer functional. Yet in most cases, dry spells of a few months to a few years are natural, and do not reduce the value of the wetland.

Wisconsin retains only about 54% of its original wetlands. Since the 1800s, almost half of the wetlands in the contiguous U.S. have been destroyed, and approximately 300,000 additional acres are lost every year. Not only does this trend threaten the plants and animals which live in wetlands, but it also threatens human communities that rely on wetland processes.

Oak Savanna

One tree that is able to survive the effects of fire is the bur oak. This tree has evolved a thick, corky bark, which insulates living tissue from the extreme heat of a wildfire. The resulting mosaic of open grown trees widely scattered over a landscape of grasses and flowers, called savanna, was once the dominant ecosystem in the lower half of the state, with over seven million acres present in 1840.

In this oak savanna setting, light conditions on the ground vary from open sun to complete shade. Both sun-loving prairie plants and shade-tolerant forest species will thrive in very close proximity. The result is an incredibly rich diversity of plant and animal life. Unfortunately, savannas are also extremely rare. Today, only 1,360 acres remain in Wisconsin.

Prairies

In addition to their reliance on wetlands, most cranes will also use upland areas for feeding. Demoiselle and Blue Cranes nest in upland areas, and show physical adaptations, such as their shorter bills, for feeding on insects and seed pods that they find there.

Prairies were common throughout the Midwest before Europeans settled here in the 1800s. Prairie communities host hundreds of species of grasses and flowers, which support many mammals, insects, and birds, including cranes.

Specifically adapted to survive the Midwest's extremes of temperature and moisture, prairie plants invest two-thirds of their growth underground. Roots may reach up to eighteen feet down in the soil to ensure that the plant will be able to find water during times of drought. This deep root system is one reason why prairie soils were resistant to erosion before being cut by the plow. Ironically, the rich soils which prairies developed made them very attractive as farmland and pasture. In Wisconsin today, only 0.1% of the original two million acres of prairie remains.

Another factor in the decline of prairies has been the disappearance of the forces that sustain them. Fires periodically swept the landscape and removed woody vegetation. Large herbivores such as bison and elk also removed young trees by grazing and browsing. Both processes served to remove above-ground vegetation and return minerals to the soil where roots could gain access to them. Removal of fire, bison, and other large herbivores from Wisconsin allowed woody vegetation like sumac, cedar, and aspen to invade the prairies.

Crane Life Cycle

The following life cycle applies to migratory crane species, such as the Whooping Crane. Circle the correct choices to complete the life cycle diagram. For answers, refer to your handouts, “Field Guide to Crane Behavior" and "An Introduction to Cranes."

1. Cranes pair together:
   a) only during the breeding season
   b) until their chick is mature
   c) for life

2. In the spring, pairs establish:
   a) a staging area
   b) a migration route
   c) a territory in a wetland

3. The incubation period for a crane egg is:
   a) 5 days
   b) 30 days
   c) 60 days

4. Incubation of the eggs is done by:
   a) the female
   b) the male
   c) both parents

5. Chicks develop quickly and leave the nest within a week. At this time, they are able to find food:
   a) on their own
   b) from their parents
   c) with the help of other chicks

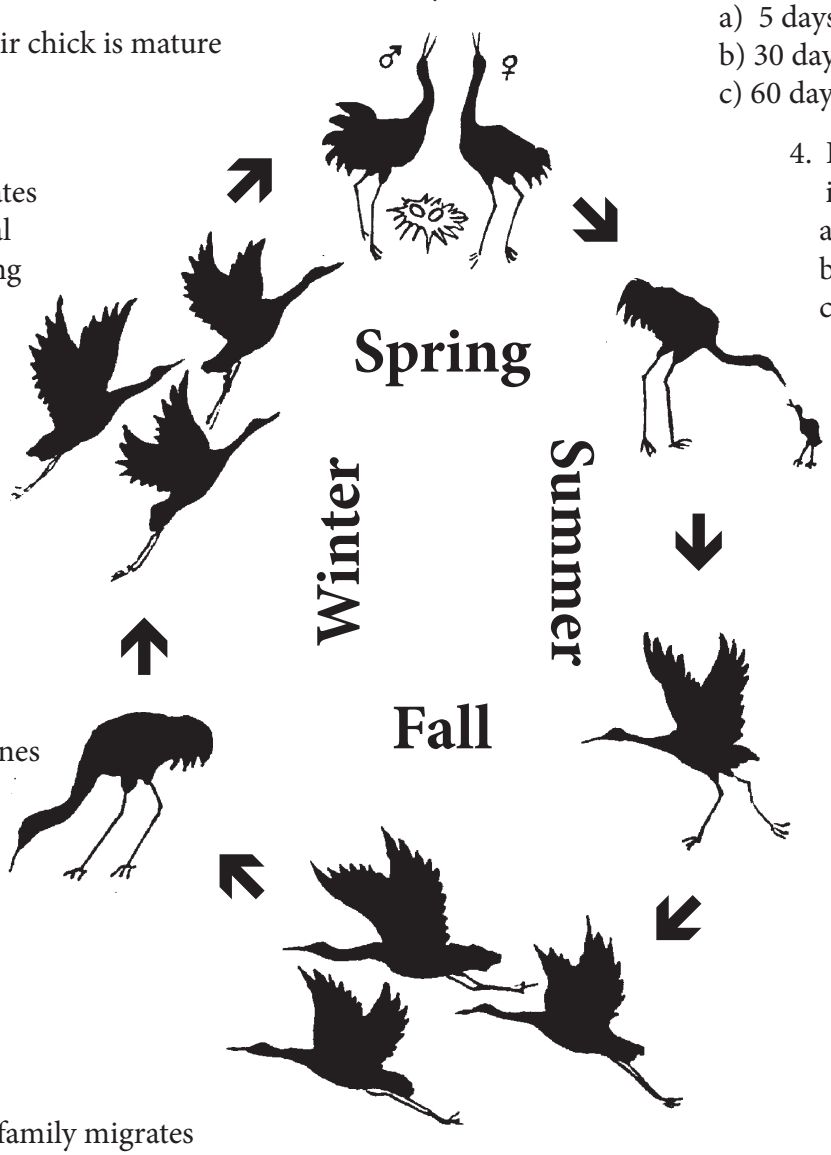
6. Shortly after the chicks hatch:
   a) chicks and parents become aggressive toward each other
   b) the adults begin molting feathers and cannot fly
   c) bachelor flocks begin invading nesting territories

7. At 3 months of age, the chick begins to:
   a) leave its parents
   b) fly
   c) breed

8. In the fall, the family migrates south with the flock. The chicks know the migration route from:
   a) following their parents
   b) instinct
   c) by observing the stars

9. All winter the cranes loaf and feed on:
   a) seeds
   b) snails
   c) insects
   d) plant roots
   e) all of the above

10. The family migrates to their traditional nesting area. Along the way, the one-year-old chick:
    a) joins a bachelor flock
    b) establishes its own territory
    c) finds a mate



Ethological Elaborations

1. We have seen that cranes are territorial and use elaborate threat displays while defending their territory. Ethologists believe that displays have evolved from maintenance activities. Examples of maintenance activities include: eating, drinking, bathing, walking, and preening. Use your "Field Guide to Crane Behavior" to find those displays that look similar to, and may have evolved from, the maintenance activities listed below.

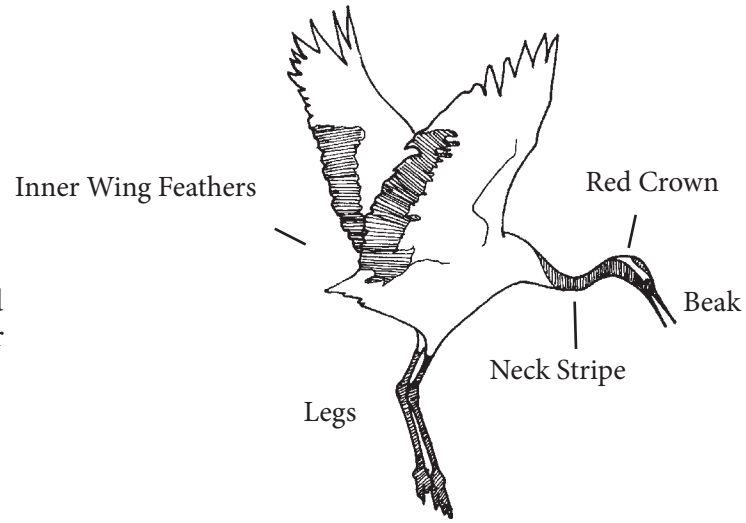
   incubating --- crouch display (EXAMPLE)

   walking ---

   preening ---

   wing flapping ---

Cranes have evolved different structures and coloration to make their displays more effective. Red-crowned cranes, for example, have long been admired for their beauty. But their beauty has a function. Their striking coloration and body structures are used in territorial and breeding displays. The diagram to the right (of a red-crowned crane) shows the structures used in display behaviors.



2. Using your Field Guide, find a display that uses each of the following structures, and describe how it is used.

   Legs (example): threat walk--slow walk with legs held up and stiff.

   Beak:

   Neck stripe:

   Inner wing feathers:

   Red crown:

3. Why do cranes use their wings in many of the displays illustrated in your Field Guide?

4. The red crown on the crane's head is used as a signal in territorial displays. How is the red crown used? Why? [Hint: think about how we use the color red in regards to traffic signals]

Bewildering Behaviors

1. Cranes use elaborate threat displays to avoid direct physical contact. Why do they usually use these threat displays instead of fighting over territorial boundaries?

2. List four other animals that are territorial and describe the "signal" or display they use to avoid conflict. (For example: People use fences and signs to establish territories and boundaries.)

   1.

   2.

   3.

   4.

3. Most ground-nesting birds, like quail, ducks, geese, and cranes, have chicks that are **precocial**. This means that upon hatching the chicks can see, have downy feathers, and strong legs so they can leave the nest. Why do you think the crane chicks are adapted to leave the nest so quickly?

4. Crane chicks also **imprint** very quickly. This means the chicks recognize the first large, moving object they see as their parent. Why is it important that precocial birds imprint very quickly? What challenges does this present to captive breeding and reintroduction?

5. Crane parents defend large wetland territories to protect their young and find food. Once the chick fledges (starts to fly) their parents become more mobile and display less territorial behaviors, even though the chick is still with them. Why?

6. All crane chicks are either brown or gray for about 3-4 months. How does this coloration benefit the chicks?

7. In many common species of birds (mallards, cardinals, etc.) males and females look strikingly different. In cranes, however, males and females look almost identical. What accounts for this difference between species?

Using the Old Cranium

Use your "Field Guide to Crane Behavior" and "An Introduction to Cranes" handouts to answer the following questions:

1. Why do some sandhill cranes "paint" mud onto their feathers?

2. Define the word "brooding." Why is it important for a newly hatched chick to be brooded?

3. What method of flight do cranes **prefer** to use for most of their migration? Why?

4. In what situation would cranes use a distraction display? Why?

5. What time of year are you most likely to hear a unison call? What is its function?

6. Why are wetlands important for cranes?

7. Name three behaviors that male and female cranes perform together.

8. What forces are important in maintaining prairie and savanna ecosystems?