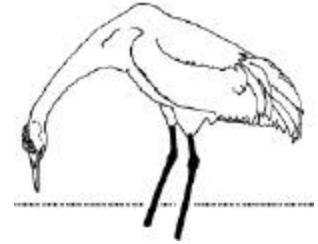


Cranes: Their Biology, Husbandry, and Conservation

Chapter 2 – General Husbandry

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Food and Drinking Water

Crane Food

Diets: Crane diets were adapted from poultry diets (Serafin 1982). Cranes consume about 4% of their body weight per day (Halibey 1979 unpublished). Commercial diets have made it more convenient and less expensive to feed a controlled diet to cranes.

There are usually three types of formulated crane diets (Tables 2.2 and 2.3). Adult cranes receive Maintenance or Breeder Diets depending on the season. Chicks are provided a Starter Diet. Most formulated crane diets are composed largely of vegetable matter and less than 10% animal matter. The Patuxent diet is 15.0% protein (Maintenance Diet) or 22.0% protein (Breeder Diet). The ICF diet is 19.4% and 20.5% protein for Maintenance and Breeder Diets. Patuxent and ICF Breeder Diets also have a higher calcium level (2.45%) than the Maintenance Diets (1.0%). Starter Diets for chicks have increased protein, calcium, and vitamin B levels (Tables 2.2 and 2.3). Chicks also need a higher calcium/phosphorus ratio in their food than non-breeding adult cranes, because of mineral demands for bone and feather growth. Begin feeding Breeder Diet two months before the anticipated egg-laying season (Russman and Putman 1980).

The type of protein in a chick diet is very important. To minimize sulphur amino acids (cystine and methionine), Starter Diets (Table 2.2) should use vegetable protein only. Chicks that are provided Starter Diets containing high proportions of sulphur amino acids develop more leg and wing abnormalities than chicks that consume diets low in sulphur amino acids (Serafin 1982). Avoid feeding animal products; especially fish, on a daily basis because they contain more sulphur amino acids than most vegetable proteins.

Egg laying Season: One or two months before cranes are expected to lay eggs, change to Breeder Diet (Table 2.2) and supply crushed oyster shell (mixed with pelleted food or in a separate container) as a calcium supplement.

Pellet Size: We recommend that crane feed, except for young chicks, should be pellets that are 5 mm in diameter and 6-15 mm long. Chicks less than 2-3 weeks old should be fed crumbles (2-5 mm diameter nuggets) and then gradually introduced to the larger pellets according to the schedule given in Chapter 5.

Food Storage: Feed should be stored at 1.7-4.4°C (35-40°F) with low humidity. It is very important that crane food be kept dry to eliminate mold and reduce bacterial growth. Storage areas should be clean and free of rodents and insects. Some ingredients in synthetic diets, especially vitamins, have a limited shelf life (Carpenter 1979). If a refrigerator is not available, store no more than a one-month supply at ambient temperature; refrigerated food can be held up to three months. Feed can be frozen for up to one year, but it will lose some of its nutritional value, may become easier to pulverize, and may acquire odors or tastes that make it less palatable. Water condenses on feedbags removed from a freezer during warm, humid weather, so allow the bags to stand separately and dry.

Crane Feeding

Place the food in a hopper feeder or an elevated bucket to reduce its accessibility to vermin and to facilitate removal of spilled food. Place the feeder in a shelter to shield it from rain, snow and sunlight. To further limit water contact, keep the feeder at least 1 m from the water supply.

Table 2.2: Feeding formulas for chicks, non-breeding adults, and breeding adults.

	Starter	Maintenance	Breeder
Ground yellow corn	24.4%	38.8%	41.2%
Soybean meal (44% protein)	-	13.1%	15.0%
Soybean meal (49% protein)	31.5%	-	-
Wheat middlings	12.0%	12.6%	10.0%
Fish meal (60% protein)	-	4.0%	5.0%
Ground oats	11.5%	15.7%	7.5%
Meat and bone meal	-	5.2%	4.0%
Alfalfa meal (17% protein)	5.0%	5.2%	5.0%
Corn distillers solubles	3.0%	-	1.5%
Brewers dried yeast	2.5%	-	2.0%
Corn oil	3.3%	-	-
Dried whey	1.2%	3.2%	3.5%
Limestone	1.5%	0.5%	3.5%
Dicalcium phosphate	3.0%	0.5%	1.0%
Iodized salt	0.25%	0.5%	0.5%
Vitamin/mineral premix	0.5%	0.5%	0.5%
Composition of Formulated Diets			
Protein	23.8%	19.4%	20.5%
Metabolizable energy, kcal/kg	2689	2530	2533
Calcium	1.4%	1.0%	2.45%
Phosphorus	0.90%	0.86%	0.89%
Methionine and cystine	0.7%	-	-
Lysine	1.3%	-	-

Table 2.3: Vitamin/mineral premix for feed formulas.¹

	Starter	Breeder & Maintenance
Choline chloride 60%	40%	40%
DL-Methionine	13%	13%
Vitamin E 227	7%	
Niacin 99.5%	7%	7%
Calcium pantothenate 160	1.1%	1.1%
Vitamin B ₁₂ 300	0.5%	0.5%
Riboflavin 100	0.5%	0.5%
Vitamin A 650	0.25%	0.25%
Vitamin D ₃ 400	0.1%	0.1%
Selenium 0.8%	27%	27%
Zinc oxide 72%	3.0%	3%
Manganese oxide 60	4.5%	4.5%
E.D.D.I 79.5%	0.001%	0.001%
Biotin 1%	0.4%	0
Folic acid 10%	0.1%	0

¹ ICF custom premix. Commercial pre-mixes for turkeys or chickens are also used with manufacturer's inclusion rates followed.

Frequency of Feeding: In warm, humid climates, it is necessary to change the food daily. In temperate climates, check the food daily or at least three times a week, depending on the weather (more often when wet or snowy), and note the

amount of food consumed. Low use may indicate illness or a taste aversion. However, during warm winter days or the first days of spring some cranes stop eating for a day or more and rely on stored fat. An easy test of food use is to mound the food into a cone in the feeder and look for depressions in the cone that day or the next. Placing a favorite food also confirms whether a crane is eating. Another method is to mark the food level and determine quantitatively how much food level is reduced. Be aware, however, of spillage and consumption by wild birds. Discard wet or pulverized feed before it loses its nutritional value or becomes moldy. Completely change the food monthly and disinfect the feeder or bucket if it becomes wet.

Drinking Water

Cranes need fresh drinking water at all times. Constant flowing elevated, watering cups (Fig. 12.13) are preferred because they are thermostat, sanitary watering systems available and require a minimal of maintenance. Float-operated water troughs that automatically fill provide fresh water for extended periods and have also been used successfully. If cranes are housed in enclosures with fresh, running water, an artificial supply is not needed. Water should not flow from one crane pen to another. Clean the cups or automatic trough waters at least once a week using a stiff brush. Check the water delivery system daily to make sure it is functioning properly. Nine-liter, heavy-duty, rubber buckets placed in a secure spot can be an alternate water source. However, these buckets require more effort to keep clean and they are a greater health hazard. If used, clean daily and disinfect once or twice each month. If an individual crane stands or defecates in its water container, elevate the container so the crane can no longer do so. Buckets should always be kept on hand for use when the automatic waters fail or freeze.

In cold climates, drinking water may require heating to prevent freezing. Some automatic watering systems have built-in heaters. Flowing water may not require heating, but for buckets, a pole type water heater works well.

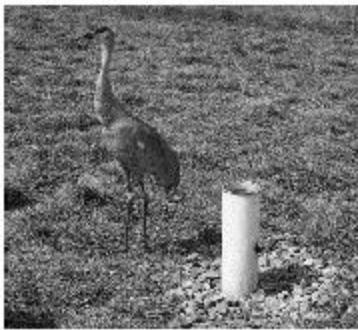


Figure 12.13. A specially fabricated stainless steel VanEs water cup (15 cm * a5 cm) and Sandhill crane. Water rises from a supply line at the base of an inverted cone, and drains through holes at water line. Each supply line has a valve accessible through the drain line. (Photo by David. H. Ellis)

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Chapter 5 – Chick Rearing

Marianne Wellington, Anne Burke, Jane. M. Nicolich, and Kathleen O’Malley

Diet

Crane chicks must be provided with a nutritionally balanced diet suitable to the needs of a rapidly growing animal with a high metabolism. Specially formulated crane chick (starter) diet should be fed from hatching (day 0) through fledging (day 70+) or until all primaries are completely grown (up to 4 or 5 months).

Serafin (1980, 1982) recommended a diet containing no more than 24% protein and 0.73% sulfur amino acids for slowing growth of hand-reared cranes and thereby reducing the risk of abnormal leg development. Higher protein levels especially animal protein, increase the incidence of leg and wing problems.

Pelleted, commercially prepared food is a convenient, reliable alternative to mixing special diets. Different feed formulas are needed for growing chicks, non-breeding adults and breeding adults (see Table 2.2). Local feed producers may be able to manufacture feed when provided the formula, or prepared crane feed may be purchased.

Food must always be recently milled (within three months), dry, intact, and free of contaminants including mold and vermin. Crumbles are fed from hatching to 2-3 weeks of age. As the chick begins eating on its own, pelleted starter ration (diameter 5 mm or 0.1875 in, 24% protein) is mixed into the crumbles. The percentage of pellets is slowly increased until the chick is eating only pellets by three to four weeks. Parent-reared chicks can be fed a mixture of crumbles and pellets from day 1.

Many zoos feed a poultry (usually turkey) starter ration augmented with insects, fish, rodents, or other protein. At Vogelpark Walsrode (Walsrode, Germany), young cranes are fed a combination of the pelleted diet and a mix similar to a “soft billed” diet (Table 5.1).

Ideally, any institution raising crane chicks will have access to a complete, balanced diet. However, if this is not feasible, or if the diet available is questionable, a standard dose of water soluble poultry vitamins and electrolytes can be added to the water. The poultry additive should be discontinued as soon as a balanced diet is available.

After fledging (day 70+) or when primaries are fully grown, chicks are taken off starter ration and put on maintainer ration (protein 15-19%).

Table 5.1 Vogelpark, Walsrode crane chick starter diet.

Ingredient	% Composition
“Insekt-futter” (Insect-feed, red) ¹	50
Beef Hearts (finely ground)	25
Quark (yogurt-like dairy product)	10
Mealworms (½quick-boiled, ½live)	10
Green feed (lettuce, other greens)	5
Yeast powder (fortified)	Trace
“Osspulvit-pulver” (calcium supplement)	Trace
Crickets (Family Gryllidae) (fresh-killed)	(5-8 per bowl)

Mix all ingredients to form a moist, but not saturated, mixture. Water can be added if too dry. Approximately 50-100 g per bird fed twice daily. Crickets are placed on top of each food bowl. Pelleted food is always provided. As the chicks grow, less of the fresh mixture is provided and that eat more pellets. After 6-8 weeks, the young birds eat only pelleted food.

¹ Type I Trocken-Weichfutter (mixture for small birds and quail) from: Claus Gmn=bH, Spezial-Futtermitt Postfact 100, 6703 Limburgerhof, Germany

Supplementary Feeding

For very young chicks that are ill or otherwise slow to learn to eat, supplementary feeding may be necessary. Of the two methods available (i.e. force feeding pellets and gavage [intubation or tube feeding a liquid diet]), gavage is preferred. Instructions for supplemental feeding and tube feeding diets are found under Veterinary Techniques. Tube feeding, unless done excessively, usually will not discourage a chick from eating on its own. In fact, for neonatal chicks, tube feeding small quantities 2-3 times a day may help stimulate their appetite while it also staves off dehydration.

Water

Fresh water should be kept constantly available and replaced daily or whenever contaminated. Non-spillable bowls must be deep enough to enable the chick to drink, but still allow it to escape should it stumble in (Figure 5.1). Standard one gallon plastic poultry water jugs with red lids work well. Shallow bowls with large, open surface area require more maintenance, because they are more easily contaminated by the chick’s droppings.



Figure 5.1.
Chick feeder and water should be “non-tipable” (Photo ICF)

Because cranes are wading birds, it seems reasonable that teaching the chick to drink would be a simple matter, however, it is not. Videotapes of wild Mississippi Sandhill Cranes show the adults spend hours coaxing the chick to take its first sip, even while the chick sits in open fresh water.

Dehydration is a significant health concern when raising chicks. It reduces the desire to eat and drink and may cause the chick to act dazed and lethargic. Chicks that have been eating well may stop entirely when dehydrated. Both hand-reared and parent-reared chicks must be carefully monitored in their first week for dehydration, and receive fluids when necessary. For clinical signs associated with dehydration and treatment, see Table 5.2.

Table 5.2 Clinical Signs and Treatment of Dehydration

Dehydration	Clinical Signs	Treatment
< 5 %	Not detectable	No treatment may be required
5-6 %	Slight loss of skin elasticity. Some tenting of skin (over hocks or elsewhere). Dull appearing eyes. Tacky mucous membranes.	Subcutaneous fluids
7-9 %	Some loss of skin elasticity with distinct tenting of skin possible, but not pronounced.	Subcutaneous fluids
10-12 %	Mucous membranes dry. Chick dull and depressed. Extremities cool to the touch. Heart rate increased.	Intravenous bolus therapy and subcutaneous fluids; warmth, other supportive care (antibiotics, etc.)
12-15%	Chick extremely depressed and near death.	Intravenous fluids, warmth, antibiotics

Nutritional Support

Insufficient intake of calories leads to cachexia and emaciation. The bird will first mobilize body fat and then will catabolize muscle. Because young crane chicks do not have large fat reserves, loss of muscle tissue can occur rapidly and early in disease processes. Signs of emaciation in birds include a prominent keel and translucent skin due to lack of dermal fat (Lowenstine 1986). Crane chicks do not have well developed pectoral muscles prior to flight. Therefore, assessment of pectoral muscle mass, even though a valid technique in adult-sized cranes, is not used in chicks. Rather, the muscles surrounding the caudal, thoracic and lumbosacral spine (palpated as a soft flat mass lying between the shoulders and to the side of the dorsal processes of the anterior portion of the synsacrum) are evaluated. These muscles are depleted in the emaciated crane chick.

Daily maintenance energy requirements for the crane chick should be calculated. Approximate caloric maintenance requirement is determined by finding the basic metabolic rate (BMR), $BMR = K (W_{kg})^{0.75}$, where K equals a theoretical constant for kilocalories and W_{kg} is the bird's weight in kg (Quesenberry et al., 1989). For cranes, $K = 78$, therefore $BMR = 78(W_{kg})^{0.75}$. The daily energy requirements in kilocalories (Kcal/day) are normally at least 1.5 times the BMR.

Blood glucose levels are useful in determining the degree of nutritional depletion. Normal Florida Sandhill Crane chicks at ICF maintained blood glucose levels over 200 mg /100 mL from hatching through fledging. No critical levels have been determined in cranes, though levels as low 80 mg /100 mL have been documented in emaciated chicks. Values less than 50 mg /100 mL are considered critical in birds of prey and lead to hypoglycemic convulsions and coma (Lowenstine 1986). Immediate correction of low blood glucose is best accomplished with intravenous or subcutaneous administration of 2.5% dextrose in half-strength lactated Ringer's solution.

Any bird suffering from cachexia and emaciation should receive a thorough examination to determine the cause of the condition (disease, diet, and management problems are all possible). If the chick is failing to gain weight, supplemental feeding should be initiated. Long-term caloric and nutritional support of debilitated chicks is best accomplished with oral alimentation (tube feeding and gavage are synonyms) using a flexible rubber tube (Figure 5.16) made from a French urinary catheter (size 5 to 12 depending on the chick's age) mounted on the tip of a 5-6 0 cc syringe. Pass the tube over the tongue and down the esophagus to the level of the thoracic inlet. Palpate the neck to locate the tube and to assure that you are not in the trachea. If the tube is in the esophagus, you will palpate two cylindrical structures, the tube and the trachea. Delivering food in the trachea will be fatal for the chick.



Figure 5.16. Glenn Olsen tube feeding a Whooping Crane chick.
(Photo David H. Ellis).

Chicks under 10 days of age can be tube fed every 2-3 hours if necessary. For safety, start with about 3 cc for a hatchling; use larger amounts (up to 100 cc) for older chicks. Chicks weighing less than 100 g may be unable to receive 3 cc/feeding; administer the liquid diet slowly and watch responses. If the chick starts to regurgitate, stop the tube feeding, clean out the mouth, and gently stroke the neck in a downward motion. On subsequent tubings, decrease either the rate or the amount of formula to prevent further regurgitation. Because tube feeding also contributes to fluid balance, adjust total fluid therapy accordingly.

For extremely debilitated chicks of any age, Lafeber's Emeraid I is very helpful. This product contains only carbohydrates and is used for chicks too sick to digest anything else. It also helps elevate dangerously low blood glucose levels. A

second product, Emerald II, has protein, fat, and fiber for crane chicks that can tolerate more nutrition (i.e., chicks that are not affected by gastrointestinal stasis).

Another formula, known affectionately as Mother O' Malley's Crane Stew, is listed in Table 5.4 with two variations. The basic formula is used for severely debilitated adults or chicks. If a crane can benefit from complex nutrients, crane pellets are added using starter pellets for chicks or maintainer pellets for adults. The fine solids in this tube-food will give the chick's digestive system something substantial to process, and are believed to stimulate the chick's appetite and normal digestive processes better than a more easily digestible food. At Patuxent, young chicks have gained weight when fed solely on this tube feeding diet.

Severely debilitated adults should be fed the original formula (Table 5.4); however, most others can be fed one, which includes adult pellets. Several cranes at Patuxent have survived solely on this diet, and even gained weight over the course of a month.

In addition, *Lactobacillus* products (1.4 tsp/kg; 7.0 g/kg) have been given to both young and adult cranes to promote digestion and to restore normal gastrointestinal flora. However, there have been no studies in cranes documenting the effectiveness of this therapy.

Table 5.4 Mother O'Malley's Crane Stew – Basic Formula

<p>4 cups (946 ml) of warm water 2 tablespoons (30 ml) Vionate (or other vitamin powder) 4 heaping tablespoons (80-100 ml) Prosobee, Isomil, or other soy-based powdered infant formula 1/3 tube of Nutri-cal (concentrated food for debilitated animals, sold in a 4.5 oz [120 g] tube) 1/4 cup (59 ml) vegetable oil 2 cups (274 ml) dry baby cereal, preferably mixed style Water</p>
<p>Mix all ingredients in a blender (minimum 5 cup [1,200 mL] container) and process on high speed until smooth. If the formula seems too thick, add a small amount of water. Mix well before drawing up, and bring to about 21° C (70° F) or warmer before feeding. This formula can be divided into small containers and frozen for up to three months. After defrosting, the formula should be mixed thoroughly before use.</p>
<p><i>Variation 1:</i> For chicks that can benefit from complex nutrients, add 2 cups (ca 250g) crane starter pellets to the original recipe. Put the starter pellets in a 4-cup (946 mL) container, and add hot water to the top. Allow pellets to soak until fully expanded and soft (5-20 min). Place half of the pellet mixture into a 5-cup (1,200 mL) blender. Add enough water to blend the pellets easily (1-2 cups, 137-274 mL) and blend on high speed. Strain all the material through a fine sieve. Discard the solids. (This is a tedious process involving straining and constant stirring to enable the fine solids to pass through the mesh. Without this step, however, none of this food could pass through the small tube needed for young chicks.) To flush fine solids through, you may occasionally need to add more water. Once the solids are strained out, use this for the base and add the rest of the ingredients in the original formula.</p>
<p><i>Variation 2:</i> For tube feeding sick older chicks (after all primaries are grown) and sick adults, substitute adult crane pellets for the starter pellets and eliminate the straining step. This food should be thick and able to pass through a large tube, although it may block occasionally when some of the coarser solids swell.</p>

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