

NOTES

WHOOPING CRANES CONSUME PLAINS LEOPARD FROGS AT MIGRATORY STOPOVER SITES IN NEBRASKA—Whooping cranes (*Grus americana*) currently consist of a single, wild population that migrates annually from breeding grounds at Wood Buffalo National Park, Canada, to wintering grounds on and around the Aransas National Wildlife Refuge along the Texas coast, USA (NRC 2005). This population reached a low of less than 20 individuals in 1941 (Allen 1952) but has rebounded to over 250 individuals (Chavez-Ramirez and Wehtje 2012, Gil-Weir et al. 2012). Whooping cranes migrate approximately 4,000 km each spring and autumn, traversing much of the North American Great Plains (Lewis 1995) and periodically landing along rivers, wetlands, and other shallow bodies of water for short-duration stopovers (Austin and Richert 2001).

Winter diets of whooping cranes have received moderate attention, with cranes mainly feeding on blue crabs (*Callinectes sapidus*) and clams (e.g., *Tagellus plebius*), as well as fish, snails, acorns, fruit of Carolina wolfberry (*Lycium caroliniana*), crayfish, insects, and other items (Allen 1952, Hunt and Slack 1989, Chavez-Ramirez 1996). On 4 February 2012, a whooping crane was observed consuming a gulf saltmarsh watersnake (*Nerodia clarkii clarkii*) on wintering grounds at the Aransas National Wildlife Refuge, but such uncommon items likely contribute more to diets during years with limited blue crabs, such as the winter 2011–2012 (Geluso and Harner 2013a). Little is known about diets of whooping cranes on summer breeding grounds, but adult cranes have been observed feeding on prey dominated by nymph dragonflies (*Libellula* sp. and *Aeshna* sp.; Bergeson et al. 2001). During migration, relatively little is known about diets of cranes (Lewis 1995), and most information about prey is surmised (e.g., documentation of potential prey at sites previously visited by whooping cranes; Allen 1952, Austin and Richert 2001), but animal matter likely is important (USFWS 1981). In this report we describe observations of whooping cranes feeding upon Plains leopard frogs (*Lithobates blairi*) in south-central Nebraska, adding to the scant information of prey consumed during migration.

On 29 March 2012, a whooping crane consumed a Plains leopard frog in a shallow, upland pond in northern Harlan County, Nebraska, USA (40.3100°N, 99.4431°W; 19.9 km N, 0.9 km E Orleans). The pond was situated in the bottom of a valley in an area with rolling grasslands. The area was grazed the previous year, and there was no vegetation in or along the water's edge. Eleven adult-plumaged whooping cranes were observed at the pond at 1500 hr for 30 min. Eight cranes appeared to rest while standing in about 20 cm of water. Three other individuals actively foraged in the pond. One crane detected and stabbed a frog with its beak in a manner similar to immobilizing crabs and other larger prey on win-

tering grounds (Lewis 1995). The crane proceeded to lift the frog from the water, and other cranes noticed the foraging behavior. Two other foraging cranes then pursued the individual carrying the frog. When the crane that captured the frog dropped it, another crane quickly grabbed the frog with its beak, flipped it into the air, and consumed it in a single swallow without further manipulation.

On 17 April 2012, another adult-plumaged whooping crane consumed a Plains leopard frog at the Cottonwood Federal Waterfowl Production Area in western Phelps County, Nebraska, USA (40.5455°N, 99.5892°W; 2.2 km N, 3.8 km E Bertrand). The shallow wetland habitat was partially surrounded by grazed upland grasslands at the Federal Waterfowl Production Area, and croplands dominated by center-pivot irrigation surrounded the site. Two whooping cranes were observed probing and feeding in emergent vegetation on the southwest side of the open water at 1430 hr for 15 min. One whooping crane captured a leopard frog, flipped it into the air, and consumed it quickly. At this site and the one listed above, we surveyed aquatic habitats and their surrounding edges for bullfrogs (*L. catesbeianus*). We did not detect or find evidence of adults or tadpoles in these shallow waters, confirming our identification of frogs from a distance. The plains leopard frog is the only species of spotted *Lithobates* species in the area (Ballinger et al. 2010, Fogell 2010).

Though uncertain, leopard frogs might be an important prey item for whooping cranes on stopover sites due to their distribution throughout the Great Plains. Plains leopard frogs occur in freshwater habitats from southern South Dakota to central Texas (Brown 1992), and northern leopard frogs (*L. pipiens*) inhabit more northerly reaches of the migratory flyway (Stebbins 2003). Leopard frogs are important prey items for various vertebrate species because they are seasonally abundant, especially after metamorphosed froglets emigrate from aquatic habitats (Geluso and Harner 2013b). Known predators of adult and metamorphosed leopard frogs include fish (Lundgren et al. 2012), snakes (Hammerson 1982, Ernst and Ernst 2003, Geluso and Harner 2013b), amphibians (Smith 1977), mammals (Shirer and Fitch 1970), and other birds (Robinson 1957).

Whooping cranes migrate through Nebraska later in spring than most waterfowl and sandhill cranes (*G. canadensis*; Sharpe et al. 2001), possibly reflecting increased availability of vertebrate prey later in the season. Frogs and other herpetofauna are more active during late March and throughout April (Geluso and Harner 2013b) than when sandhill cranes migrate and stage along the Platte River in February and March. Herpetofauna also are active in autumn in central Nebraska (Goldowitz and Whiles 1999, Geluso and Harner 2013b) when whooping cranes migrate through the region (Sharpe et al. 2001). Frogs and other animal prey items might

be especially important during whooping crane migration when major food resources (e.g., crabs and clams) are scarce on wintering grounds, as they were in winter 2011–2012. For migratory birds, lipid and energy reserves obtained on wintering grounds and during migratory stopovers are important because their body condition affects reproductive success, egg size, and other adaptive characteristics and behaviors on breeding grounds (Drent et al. 2006).

Our observations represent some of the few published accounts of a frog species being consumed by whooping cranes along the Central Flyway. On breeding grounds in Canada a chorus frog (*Pseudacris maculata*) was purportedly fed to a young colt, but details are lacking on that observation (see Bergeson et al. 2001). On wintering grounds in Texas the Rio Grande leopard frog (*L. berlandieri*) was listed as a species with reasonable certainty of being a prey item (Allen 1952). However, amphibians do not appear to represent a significant part of whooping crane diets during winter when cranes feed mainly in tidal flats and coastal brackish waters (Chavez-Ramirez 1996). In contrast, frogs likely are an underestimated important food resource for these primarily animalivorous birds that frequent freshwater habitats during migration and on breeding grounds. Only a single observation of an unknown species of frog has been reported as prey for whooping cranes during migration (Austin and Richert 2001). However, Austin and Richert (2001) observed that frogs were the second most frequent potential animal prey available on both feeding and roost sites, besides invertebrates, during migration. Understanding whooping crane diets at stopovers sites will help resource managers promote and maintain habitats as well as dietary resources for whooping cranes migrating along the Central Flyway.

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LITERATURE CITED

- Allen, R. P. 1952. The whooping crane. Research Report 3, National Audubon Society, New York, New York, USA.
- Austin, J. E., and A. L. Richert. 2001. A comprehensive review of observational and site evaluation data of migrant whooping cranes in the United States 1943–99. U.S. Fish and Wildlife Service, Grand Island, Nebraska, USA.
- Ballinger, R. E., J. D. Lynch, and G. R. Smith. 2010. Amphibian and reptiles of Nebraska. Rusty Lizard Press, Oro Valley, Arizona, USA.
- Bergeson, D. G., M. Bradley, and G. L. Holroyd. 2001. Food items and feeding rates for wild whooping crane colts in Wood Buffalo National Park. Proceedings of the Eighth North American Crane Workshop 8:36–39.
- Brown, L. E. 1992. *Rana blairi*. Catalogue of American Amphibians and Reptiles 536:1–6.
- Chavez-Ramirez, F. 1996. Food availability, foraging ecology, and energetics of whooping cranes wintering in Texas. Dissertation. Texas A & M University, College Station, USA.
- Chavez-Ramirez, F., and W. Wehtje. 2012. Potential impact of climate change scenarios on whooping crane life history. Wetlands 32:11–20.
- Drent, R. H., A. D. Fox, and J. Stahl. 2006. Travelling to breed. Journal of Ornithology 147:122–134.
- Ernst, C. H., and E. M. Ernst. 2003. Snakes of the United States and Canada. Smithsonian Institution Press, Washington D.C., USA.
- Fogell, D. D. 2010. A field guide to the amphibians and reptiles of Nebraska. Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, Lincoln, USA.
- Geluso, K., and M. J. Harner. 2013a. *Nerodia clarkii clarkii* (gulf saltmarsh watersnake): predation. Herpetological Review 44:156–157.
- Geluso, K., and M. J. Harner. 2013b. Reexamination of herpetofauna on Mormon Island, Hall County, Nebraska, with notes on natural history. Transactions of the Nebraska Academy of Sciences 33:7–20.
- Gil-Weir, K. C., W. E. Grant, R. D. Slack, H. Wang, and M. Fujiwara. 2012. Demography and population trends of whooping cranes. Journal of Field Ornithology 83:1–10.
- Goldowitz, B. S., and M. R. Whiles. 1999. Investigations of fish, amphibians and aquatic invertebrates species within the middle Platte River system. Final Report. Platte Watershed Program, University of Nebraska-Lincoln, Lincoln, USA. <http://watercenter.unl.edu/PRS/PlatteRiver-Reports/Investigations%20of%20Fish%20Amphibians.pdf>.
- Hammerson, G. A. 1982. Amphibians and reptiles in Colorado. Colorado Division of Wildlife, Denver, USA.
- Hunt, H. E., and R. D. Slack. 1989. Winter diets of whooping and sandhill cranes in south Texas. Journal of Wildlife Management 53:1150–1154.
- Lewis, J. C. 1995. Whooping crane. The Birds of North America 153:1–28.
- Lundgren, S. A., K. Geluso, and C. W. Schoenebeck. 2012. Terrestrial and semi-aquatic vertebrates in diets of largemouth bass in central Nebraska. The Prairie Naturalist 44:105–108.
- NRC (National Research Council). 2005. Endangered and threatened species of the Platte River. The National Academies Press, Washington, D.C., USA.

- Robinson, T. S. 1957. Notes on the development of a brood of Mississippi kites in Barber County, Kansas. *Transactions of the Kansas Academy of Science* 60:174–180.
- Sharpe, R. S., W. R. Silcock, and J. G. Jorgensen. 2001. *Birds of Nebraska: their distribution and temporal occurrence*. University of Nebraska Press, Lincoln, USA.
- Shirer, H. W., and H. S. Fitch. 1970. Comparison from radio-tracking of movements and denning habits of the raccoon, striped skunk, and opossum in northeastern Kansas. *Journal of Mammalogy* 51:491–503.
- Smith, A. K. 1977. Attraction of bullfrogs (*Amphibia*, *Anura*, *Ranidae*) to distress calls of immature frogs. *Journal of Herpetology* 11:234–235.
- Stebbins, R. C. 2003. *A field guide to western reptiles and amphibians*. Third edition. Houghton Mifflin Company, New York, New York, USA.
- USFWS (United States Fish and Wildlife Service). 1981. *The Platte River ecology study: special research report*. USFWS, Northern Prairie Wildlife Research Center, Jamestown, North Dakota, USA.

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