

## EGG RETRIEVAL BY THE HAWAIIAN GOOSE AFTER ATTEMPTED PREDATION BY A CAT

BRENDA J. ZAUN, U.S. Fish and Wildlife Service, Kauai National Wildlife Refuge Complex, P. O. Box 1128, Kilauea, Hawaii 96754; Brenda\_Zaun@fws.gov

WESLEY W. WEATHERS, University of California, Animal Science Dept., One Shields Avenue, Davis, California 95616-8521

The Hawaiian Goose or Nēnē (*Branta sandvicensis*), Hawaii's only extant endemic goose, was nearly extirpated by hunting, habitat loss, and depredation by introduced predators and is among the most threatened of waterfowl. By the 1950s, the wild population was estimated at only about 30 individuals (Smith 1952). Captive propagation programs, reintroductions, and continuing predator control have resulted in increased populations, particularly on Kauai. Currently, populations of the Hawaiian Goose exist on the islands of Kauai, Maui, Hawaii, and Molokai. Listed as endangered under the Endangered Species Act in 1967 (U.S. Fish and Wildlife Service 1967), Hawaii's wild population is currently estimated to be around 2000 individuals (Ann Marshall pers. comm.) Predator control is essential for the recovery of this species. Here we report an attack by a feral cat on a Hawaiian Goose nest and the first documented egg retrieval by the Hawaiian Goose.

The female goose selects a nest site that is typically concealed under shrubs. Nests are shallow, round depressions in the ground containing leaves and twigs with down lining the interior. The diameter of the typical nest averages 28 cm, and the rim is generally <5 cm above ground level (Banko et al. 1999). We positioned an infrared CCD (charge-coupled device) video camera near an active nest of a wild Hawaiian Goose in Kilauea Point National Wildlife Refuge, Kauai, Hawaii, from 26 December 2007 through 3 January 2008 to record the female's nesting behavior. In the Hawaiian Goose only the females incubate the eggs, while the male guards nearby. The camera was placed near the nest during approximately the second week of incubation. We recorded the video signal continuously with a PVR-330 digital video recorder after passing the signal through a SuperCircuits electronic time/date stamp.

On the night of 3 January 2008, a cat arrived at the nest at 21:00 and the goose immediately fled the camera's field of view (Figure 1). The cat remained at the nest site for 52 minutes, intermittently biting and pawing the three eggs in the nest. After unsuccessfully attempting to break the eggs, the cat lay down within approximately 30 cm of the nest and appeared to fall asleep. At 21:44, the female goose returned to the nest area. She and the cat scrutinized each other for about 2 minutes from a distance of approximately 60 cm. The cat then lunged toward the goose, and the goose immediately fled the camera's view again. The cat departed 6 minutes later. At 22:06 the goose returned to the nest and resumed incubation until 23:13, when the cat again approached the nest, causing the goose to retreat a second time. Using its front feet and mouth, the cat rolled 1 egg approximately 30–40 cm away from the nest. Again unsuccessful at breaking an egg, the cat departed at 23:21.

Five minutes later, the female goose returned and stood next to the nest, which now contained just two eggs. She surveyed the area for 11 minutes, walked to the displaced egg and began retrieving it by extending her head and neck over the egg and pulling it backward toward her feet by using the underside of her bill (Figure 2). After moving the egg halfway to the nest, the female turned and sat on the nest for 9 seconds before resuming egg retrieval. Using this rolling technique again, she got the egg onto the edge of the nest bowl. She then attempted to settle on the three eggs and incubate, but was unable to because of the retrieved egg's position. She stood and moved the two eggs in the nest with her bill to make room for the third egg, which she nudged into the nest cup. She then settled on the nest and incubated

## NOTES



Figure 1. Sequence of events captured by a covert infrared CCD video camera at Kilauea Point National Wildlife Refuge, Kauai, Hawaii. A, Hawaiian Goose incubating eggs on nest. B, Cat approaches nest and goose flees (goose's wing visible above and to left of egg). C, Cat attempting to depredate eggs.

but appeared nervous, watchful, and alert. We discontinued video taping at this nest the day following the cat's attack. Although the female goose continued incubating, none of the eggs hatched, and the nest was abandoned on 24 January 2008. Soon after abandonment, egg candling confirmed that the eggs were infertile.

Prevett and Prevett (1973) reported retrieval of eggs displaced from nests by numerous species of ground-nesting birds, including over a dozen species of Anseriformes. The Hawaiian Goose's closest living relative is the Canada Goose (*Branta canadensis*) (Banko et al. 1999), and Paxinos et al. (2002) suggested that the Hawaiian Goose likely diverged from the Canada Goose. Duncan (1984) documented egg retrieval by the Canada Goose so it is reasonable that the Hawaiian Goose would also be capable

## NOTES



**A**



**B**



**C**

Figure 2. Hawaiian Goose retrieving egg that was removed from nest by a cat. Photos captured by a covert infrared CCD video camera at Kilauea Point National Wildlife Refuge, Kauai, Hawaii.

of this behavior. Rylander (2002) described egg-retrieval behavior as an instructive example of a fixed-action pattern. Fixed-action patterns are innate and stereotyped behaviors that vary little from performance to performance and from individual to individual. He reported that even geese raised in isolation exhibit this behavior. Experiments on Blue Snow Geese (*Anser caerulescens*) and Canada Geese by Prevett and Prevett (1973) and Duncan (1984), suggested that 1 m approaches the limit from which these species will retrieve eggs. At 30–40 cm, the displacement of the Hawaiian Goose egg was well within its congener's documented range of egg retrieval.

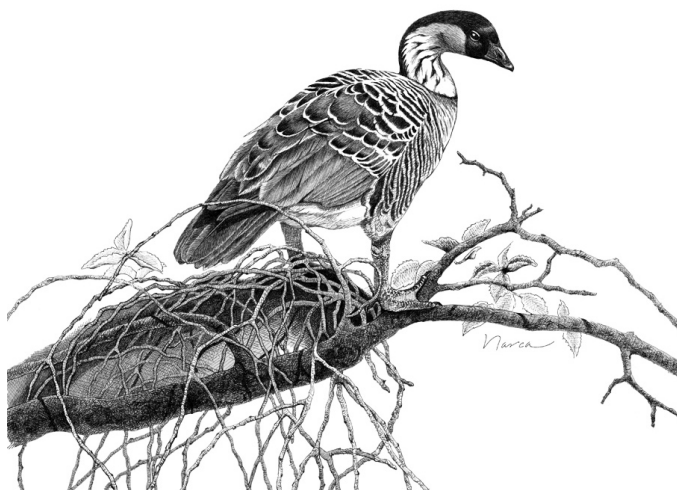
We thank Kirke King, Beth Flint, and Annie Marshall for their helpful and perceptive review and comments on the manuscript. We are grateful to Mike Hawkes, Refuge Manager, for his support of this project.

## NOTES

### LITERATURE CITED

- Banko, P. C., Black, J. M., and Banko, W. E.. 1999. Hawaiian Goose (Nene) (*Branta sandvicensis*), in *The Birds of North America* (A. Poole and F. Gill, eds.), no. 434. Birds N. Am., Philadelphia.
- Duncan, D. C. 1984. Egg retrieval by Canada Geese: Apparent interspecific retrieval and test of egg displacement. *Auk* 101:886–887.
- Paxinos, E. E., James, H. F., Olson, S. L., Sorenson, M. D., Jackson, J., and Fleischer, R. C. 2002. mtDNA from fossils reveals a radiation of Hawaiian geese recently derived from the Canada Goose (*Branta canadensis*). *Proc. Natl. Acad. Sci.* 99:1399–1404.
- Prevett, J. P., and Prevett, L. S. 1973. Egg retrieval by Blue Geese. *Auk* 90:202–204.
- Rylander, K. 2002. *The Behavior of Texas Birds: A Field Companion*. Univ. Tex. Press, Austin.
- Smith, J. D. 1952. The Hawaiian Goose (Nene) restoration program. *J. Wildlife Mgmt.* 16:1–9.
- U.S. Fish and Wildlife Service. 1967. *Endangered Species List—1967*. Federal Register 32:4001.

*Accepted 24 November 2008*



Hawaiian Goose (Nēnē)

*Sketch by Narca Moore-Craig*