

## LETTERS

*J. Raptor Res.* 51(4):476–479

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### SIBLICIDE, PARENTAL INFANTICIDE, AND CANNIBALISM AT A NORTHERN GOSHAWK NEST

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**KEY WORDS:** *Northern Goshawk*; *Accipiter gentilis*; *Alaska*; *brood reduction*; *cannibalism*; *infanticide*; *raptor*; *siblicide*.

Asynchronous hatching in birds provides a density-dependent system for maximizing parental reproductive success (Lack 1947, Mock 1984, Mock and Parker 1997). This mechanism allows adjustment to food shortages during the nestling season that cannot be predicted earlier, during egg-laying and incubation (Mock and Schwagmeyer 2009). Evidence of this has been found throughout the avian world and it usually manifests in some form of infanticide (i.e., killing of dependent young by conspecifics; Hrdy 1979, Mock 1984, Morandini and Ferrer 2014). Kin infanticide can occur via siblicide, resulting from overt aggression of siblings, or parental infanticide, resulting from overt aggression of a parent (Hrdy 1979, Mock 1984, Franke et al. 2013). Explanations for this behavior are often linked to a limiting resource, usually food (Hrdy 1979, Newton 1979).

In many cases, cannibalism (i.e., consumption of conspecifics) is closely linked with infanticide (Mock 1984). In obligate siblicidal species (e.g., Black Eagle [*Ichthyophaga melaniensis*]), cannibalism is relatively rare (Simmons 1988). In facultative siblicidal species, infanticide typically occurs during food shortages and the killed young often becomes a food source for the survivors, either via direct consumption or when parents feed the killed young to the survivors (Newton 1979, Bortolotti et al. 1991).

Northern Goshawks (*Accipiter gentilis*; hereafter goshawk) are typical of many asynchronously hatching bird species in that brood size can decrease during the nesting season, depending on food supply (Boal and Bacorn 1994, Estes et al. 1999). Usually, when not resulting from starvation, this manifests through facultative siblicide (Schnell 1958, Zachel 1985, Boal and Bacorn 1994, Estes et al. 1999). In most of the previously documented cases of siblicide by goshawks, cannibalism followed the siblicide when the adult female goshawk fed the killed nestling to the remaining young (Schnell 1958, Zachel 1985, Boal and

Bacorn 1994). However, in none of these cases was any infanticidal behavior exhibited by the adults. In this letter, I report a case of siblicide, apparent parental infanticide, and cannibalism at a goshawk nest in southeastern Alaska.

Southeastern Alaska includes thousands of islands and is characterized by steep, rugged topography, and coastal fjords. It is a largely forested landscape, naturally fragmented by mountainous terrain and wetlands. A cool and wet maritime climate characterizes the region. Precipitation is distributed evenly throughout the year (Harris et al. 1974, Farr and Hard 1987). The temperate rainforest of southeastern Alaska is dominated by western hemlock (*Tsuga heterophylla*) and Sitka spruce (*Picea sitchensis*), and occurs at low elevations as a mosaic with muskegs and other wetlands (Neiland 1971). The prey base available to goshawks varies across island groups in this region in relation to differences in species occurrence (Armstrong 2008, Lewis et al. 2006, MacDonald and Cook 2010). However, in general, the region provides a depauperate prey base for goshawks relative to other portions of their range (Squires and Reynolds 1997, Lewis et al. 2006).

I video-recorded goshawk nests in southeastern Alaska as part of a larger study on their breeding season diet (Lewis 2001, Lewis et al. 2006). The events video-recorded and described here occurred on Prince of Wales Island (POW; 55°44'N, 132°48'W) in the southern portion of my study area. I began recording in the early nestling stage during late May, after hatching had been confirmed, and continued until no nestlings remained in the nest. I positioned the camera so the entire nest surface was visible. I programmed the system to record from approximately 15–30 min before sunrise to 15–30 min after sunset, and recorded 1 frame/2.5 sec. The system registered time and date on each frame. Details of the video recording system are provided in Lewis et al. (2004).

On 5 June 1998, I climbed a goshawk nest tree to set up a video recording system at approximately 1200 H. When I reached the nest, I noted two nestlings lying in the center of the nest and covered them with a towel to minimize their stress while I installed the camera. Once finished with camera installation, I removed the towel when I was about

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