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MATING BEHAVIOR IN THE GOLDEN EAGLE IN NON-FERTILIZATION CONTEXTS

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Gordon (1935) observed a pair of British Golden Eagles (*Aquila chrysaetos*) copulate late in the incubation period, hence long after it was necessary to fertilize eggs. Herein we report several observations of late season copulations at Golden Eagle eyries in North America, 2 observations of copulatory bouts in unusual behavioral contexts, and comments from the literature showing that this phenomenon is widespread if not well known for other birds of prey.

In species other than Golden Eagles copulatory bouts have been observed very early and very late in the breeding season. In the Ferruginous Hawk (*Buteo regalis*) Olendorff (1973) observed copulation while a pair was still on migration (spring) and Angell (1969) saw copulation in birds on territory but prior to nest repair. Mader (1979) reported copulation in the Harris' Hawk (*Parabuteo unicinctus*) with 5 week old young and Hamerstrom (1969) saw Northern Harrier (*Circus cyaneus*) copulation when their young were well fledged.

Copulatory bouts have been observed in unusual behavioral contexts. Retting (1977) reported a male Harpy Eagle (*Harpia harpyja*) attempting to copulate with the female when an observer moved down a tree limb toward the birds. Watson (1957) observed Snowy Owl (*Nyctea scandiaca*) displacement coition over 100 times during a single breeding season. Tulloch (1968) and Taylor (1973) also frequently observed displacement coition in the Snowy Owl following episodes wherein males escorted an intruder off the territories. Powers (unpub. data) observed Ferruginous Hawks perform copulation as a displacement activity in conflict situations: once when a Red-tailed Hawk (*Buteo jamaicensis*) was perched in the same tree with the pair, once when three coyotes (*Canis latrans*) were foraging nearby, once following a territorial interaction with two Swainson's Hawks (*Buteo swainsoni*), and once after the male was flushed by a human.

Observations herein were from 44 dawn-to-dusk watches at a Golden Eagle eyrie in the Sun River Valley, Montana, 1972. The bout reported below for Montana was made through observatin glass windows in a plywood blind less than 15 m away.

Of 21 copulatory bouts (Fig. 1) nearly all occurred before or after egg laying time when copulation was necessary for fertilization. Thirteen were observed or inferred (from vocalizations of hidden birds) after egg laying. Six followed hatching. The latest observed bout occurred 55 days after laying the last egg. When plotted chronologically the data suggest a bimodal distribution of timing of copulation bouts with peaks occurring at laying and hatching times. Interpretation is somewhat complicated, however, by an increase in observation days around hatching, and by the increased likelihood that an observer near the eyrie would miss a

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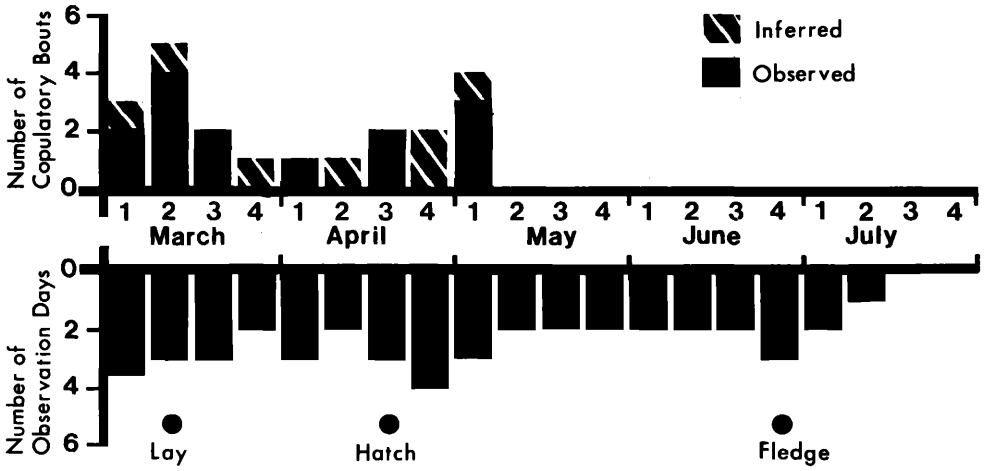

Figure 1. Chronology of copulatory bouts at a Golden Eagle eyrie in central Montana.

copulatory bout late in the season when the parent eagles were less closely tied to the nest.

Most of the late season copulation bouts were contextually similar to those occurring earlier: however, two were unusual. At 1135 on 5 May 1972 at the Montana eyrie a very large adult Golden Eagle (probably female) soared up ca 150 m west of the nest in company with the resident male. At 1140 the resident female, which had been on the nest from first light brooding 12 and 15 day old young, flew to the cliff rim above the eyrie and at 1142 protest called a long series of Shonk-Wonk notes (see Ellis 1979 for a description of calls). The female assumed the horizontal (copulatory) posture and, as the male swooped to approach her, she began calling the typical copulatory Pssa. The male lit on the female's back and perched ca 10 sec (an inordinately long time) before even starting to work his tail beneath the female's. Finally, the female broke her copulatory posture, snapped her head up and bit at the male's head as he sprang to a rock ca 1.3 m distant. After about 20 seconds the male flew to a perch ca 70 m east. The female departed from the cliff rim ca 10 sec after the male's departure.

The second unusual copulatory bout occurred 16 April 1980 at the Arizona eyrie when the eaglets were about 18 days old. In the evening of 15 April we constructed a blind ca 15 m from the eyrie. An adult was observed on the cliff after our departure at dusk, but no adult was on the nest early the next morning. At 0755 an adult (probably male) delivered food to the eyrie and appeared unalarmed by the nearby blind, but until we left at 1130 there were no additional entries. We resumed observations at 1400. Beginning at 1731 the adult female made a series of about 10 approaches toward the eyrie only to veer away before touching the rim. These approach bouts began with a segment several minutes in length wherein she soared to ca 200 m above the cliff. She then repeatedly stooped toward the eyrie and veered away, until she fell below eyrie level whereupon she flew to a slope with favorable winds and soared up again. Finally at 1807 the female touched down on the nest rim for ca 10 sec before fleeing. At 1811 the female lit on the rimrock ca 400 m from the eyrie. The male lit by the female and she lowered to a copulatory posture. The male mounted and remained for ca 9 sec. The male's side to side tail sweeping movements normally associated with copulation were readily seen as was the female's tail up posture, however, the female's copulatory vocalizations were not heard at the great distance involved. After the copulatory bout, the female performed about 25 additional stoop-veer bouts until she left the area in a long shallow flapping stoop. At 1853 the female lit on the nest rim ca 10 sec. At 1856 she lit and remained on the nest. At 1902 she began feeding eaglets. We discontinued observations shortly after 1920 while the female continued to feed the young into the dark.

In summary, birds of prey of several species have been observed copulating in contexts other than fertilization. At one Golden Eagle eyrie most of the copulatory bouts observed during a breeding season could not have served to fertilize eggs. Non-fertilization copulatory bouts likely serve some or all of the following purposes: territorial displays, a means of maintaining pair bonds or in timing reproductive readiness, and displacement activities in conflict situations.

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GOLDEN EAGLE MOBBED WHILE PREYING ON COMMON RAVEN

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The Common Raven (*Corvus corax*) has seldom been recorded as a prey item of the Golden Eagle (*Aquila chrysaetos*) although the two species regularly occur together. Olendorff (1976) reported only two ravens in over 1,000 avian prey items for the Golden Eagle. This note reports an apparent predation attempt and subsequent mobbing episode involving the two species.

At ca 1000, on 17 June 1981, while driving in the mountains of central Arizona, I approached a group of 5 ravens mobbing a Golden Eagle in the roadway. The eagle, with wings outstretched, stood on a sixth raven. The ravens made repeated rushes at the eagle, thrusting and jabbing at its wings and body. Twice during this interaction, individual ravens jumped onto the back of the eagle and tugged on back and neck plumage for several seconds. Although no feathers were dislodged during these attacks, the eagle was visibly jostled and several times had to flap its wings to maintain balance. This mobbing continued for ca 5 min until the eagle, frightened by the approach of my vehicle, left the captured raven in the roadway and flew ca 150 m into a large arroyo where it perched low, out of sight in a grove of palo-verde trees (*Cercidium* sp.). The mobbing ravens, calling loudly, followed the eagle closely and perched in the upper branches of the same palo verde grove. Two ravens took off immediately after landing near the eagle and began soaring ca 10 m above while making repeated stoops on the eagle. The other ravens remained perched in the palo verde grove and continued to call frequently. No more actual at tacks were made on the eagle and within 10 min, all 5 ravens were soaring above the eagle. The ravens then moved south until lost to view behind a low ridge. The eagle was absent when the grove was inspected ca 10 min later. The injured raven lay in the roadway ca 3 min but escaped my initial approach by crawling into a nearby bush. It was identified as a recently fledged juvenile. Later, the bird flew awkwardly across the mountain slope and was lost.

During the observation period, the ravens effectively prevented the eagle from plucking or killing the captured raven. While this observation was perhaps unusual, it suggests that mobbing behavior by the Common Raven can prevent predation on ravens by Golden Eagles.

This observation was made incidental to a study sponsored by the U.S. Fish and Wildlife Service. For helpful comments and suggestions, I wish to thank David H. and Cathy Ellis.

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