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Natal dispersal and inbreeding in the Cooper's Hawk.—Dispersal data are important in understanding population ecology (Greenwood 1980, Shields 1984), but dispersal has been little studied in raptors (Belthoff and Ritchison 1989). Our 11-year study of breeding Cooper's Hawks (*Accipiter cooperii*) in Wisconsin has yielded data on natal dispersal (movement between birth place and breeding site [Greenwood 1980]) of six males and one female. We also report a grandson-grandmother mating involving one of these males. Records of inbreeding in natural populations of birds are rare, and this apparently is only the fifth record of close inbreeding in raptors (VanCamp and Henny 1975, James et al. 1987, Postupalsky 1989, Millsap and Bear 1990). We are unaware of other published data on natal dispersal and inbreeding in the Cooper's Hawk or its North American congeners.

These data are from birds marked as nestlings with U.S. Fish and Wildlife Service leg bands and, with two exceptions noted below, later trapped as breeding birds at their nests. Most of our data come from a population nesting in Waukesha County, southeastern Wisconsin (42°53′N, 88°29′W), as described in Rosenfield (1990). A "nesting area" is defined as that relatively small area (ca 800 m in diameter) within which a mated pair nests and conducts most other breeding activities in one or more years (Rosenfield 1990). A nesting area may or may not be reoccupied by the same or different adults in subsequent years (Rosenfield and Bielefeldt, unpubl. data). A "successful" nesting is one in which young reach bandable age (ca 14 days).

The fresh carcasses of males M1 and M6 (Table 1) were found on 14 July and 5 May, respectively. The nesting season for Cooper's Hawks in Wisconsin extends from mid-March into early August, and we thus assume that M1 and M6 (both at four years of age) were on or near their nesting areas when found (cf Newton 1986:256).

Males dispersed in all directions and moved an average of 12.0 km (Table 1). The female moved farther (14.4 km) than five of the six males. Although few, these data suggest that natal dispersal distances are probably greater in females, as found for other birds (Greenwood 1980), including some raptors (Newton 1986, Steenhof et al. 1984).

Male M3, the son of M2, bred successfully with his grandmother (the mother of M2) for three consecutive years (1988–1990) on the same nesting area where M2 fledged. It is difficult to determine if inbreeding depression, as noted for other species (Greenwood et al. 1978), has resulted from this mating because we do not know the familial relationship of the female to her mates in previous years on this nesting area. Nonetheless, the grandmother's mean clutch size from 1984–1987 was 4.0 eggs (range = 2–5) with earlier mates, and 3.7 eggs (range = 3–4) in 1988–1990 when mated with her grandson. In 1989, two of the three unhatched eggs in a clutch of four were infertile. In our 1980–1990 studies, this is the sole instance in which only one egg hatched from 4–5 egg clutches (N = 132).

Assuming that mean age at first breeding in Cooper's Hawks is ≥ two years (pers. obs.), we had a maximum of 43 opportunities to detect sibling or parent-offspring inbreeding at nests at which both breeders were marked and parental nesting histories were known. As noted, we detected inbreeding in three instances (7%) involving the same grandmother-grandson pair. Data from this single inbred pair at the same nesting area could conceivably inflate the observed frequency of inbreeding, yet rates are similar for separate nesting areas with ≥ one opportunities (5%, N = 22) or ≥ two opportunities (9%, N = 11) to detect inbreeding.

Inbreeding, if rare, is not easily detected. Newton (1986), for example, found no cases of inbreeding in a 14-year study of the European Sparrowhawk (*A. nisus*). Moreover, most reports of inbreeding probably represent a minimal estimate of its true frequency because it is usually impossible to mark all closely related individuals. We thus deem our minimal

TABLE 1
NATAL DISPERSAL OF SEVEN COOPER'S HAWKS IN WISCONSIN

Individual[a]	Year fledged	Year(s) encountered	Distance (km) and direction moved[b]	Comments
M1	1982	1986	35.2 SW	Found dead
M2	1984	1985–1990	12.8 N	M3's father
M3	1986	1988–1990	12.8 S	M2's son
M4	1986	1989–1990	2.4 NE	
M5	1987	1990	4.8 NE	F1's mate
M6	1987	1991	4.0 W	Found dead
F1	1987	1990	14.4 SW	M5's mate

[a] M = male, F = female.
[b] From hatching site to nesting area.

estimate of 7% for Cooper's Hawks to be a relatively high incidence of inbreeding. Studies of similar scope have also detected inbreeding rates of 9% in Merlins (*Falco columbarius*) (James et al. 1987) and 13% in Burrowing Owls (*Speotyto cunicularia*) (Millsap and Bear 1990). This relatively facile detection of inbreeding in Cooper's Hawks and other species of raptors warrants further study of its incidence and consequences as well as the factors that might promote or inhibit inbreeding in birds of prey.

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Adult Common Loon feeding behavior is related to food fed to chicks.—We observed adult Common Loons (*Gavia immer*) feeding their young from hatching through fledging to determine the food types fed to chicks and to relate changes in adult feeding behavior to changes in the food types fed to the young.

Study area and methods.—We studied loons on lakes 55–100 km north of Sudbury, Ontario, that varied from 5.3 to 15.7 ha in area. Summer lake pH ranged from 6.7 to 8.4. We observed loons from 50–400 m with a 20×–60× spotting scope. We studied five loon families on five lakes between 25 July and 14 September, 1983 (50 h) and recorded the parents' dive durations, their foraging success rates (proportion of dives after which they surfaced with food and fed the young), and when possible, the types of food fed to the young. Chick age was estimated by using nest dates and the size of the chicks.

We also observed adults foraging for themselves (lone adults) on five lakes between 13 June and 11 July, 1983 (10 h). Lone adults were either non-breeders or breeders from other lakes. These birds never brought food to the surface, so we could not measure their foraging success rates nor determine what they were eating. We simply recorded dive durations.

Feeding.—We saw parents feeding their chicks vegetation and fish, as well as small items that we could not identify. The amount of vegetation decreased significantly from 65% of the identifiable food items for 4–15 day-old chicks to 4% for 46–74 day-old chicks, while fish increased significantly from 35% to 96% ($\chi^2 = 42.7$, $P < 0.001$, N = 169). The percentage of feedings for which we could identify the food item increased significantly from 18% to 48% for the same age groups ($\chi^2 = 32.0$, $P < 0.001$, N = 878). Correspondingly, foraging success rates of parents decreased significantly from 70% to 27% ($\chi^2 = 86.6$, $P < 0.001$, N = 1482), while mean successful dive durations (dives after which a parent surfaced with food) increased significantly from 18.2 ± 11.3 sec to 36.9 ± 15.0 sec (t-test, $P < 0.005$, N = 369 dives).

Mean successful dive durations of parents feeding their young were shorter than mean unsuccessful dive durations (dives after which parents surfaced without food), regardless of chick age. Since we could not distinguish successful dives from unsuccessful dives for lone adults, the only way to compare dive durations of lone adults to those of parents feeding chicks was to combine successful and unsuccessful dives. The mean dive duration for lone adults (45.8 ± 18.1 sec) was only slightly, though significantly, longer than the mean combined dive duration for parents feeding the oldest chicks (42.4 ± 14.3 sec, t-test, $P < 0.03$, N = 467).

Discussion.—Parents changed their feeding behavior according to the food they were securing for the chicks. During the first 4–6 weeks, the parents made short dives and brought up small food items that were often too small to identify. Later the parents made longer dives, often bringing up fish that were large enough to identify. These relatively large fish were presumably more difficult to catch than the smaller food items, and it appeared that the foraging success rate decreased. During the prefledging period, the mean dive duration of parents feeding their young increased almost to the mean dive duration of lone adults, suggesting that the food fed to chicks approached the adult diet of fish.