

that forage over water may have been counted incorrectly as migrants returning to shore. I witnessed successful hunting forays by a Peregrine Falcon (capturing a warbler-sized bird) and an American Kestrel (carrying a Tree Swallow [*Tachycineta bicolor*]) over water, as well as several unsuccessful attempts at avian prey by Merlins. (3) Birds migrating in rain or fog were more difficult to detect than when visibility was better. Of the seven Merlins and one Peregrine Falcon I saw flying over water during steady rainfall, all were difficult to observe and some would not have been detected at distances >300 m. (4) Finally, individuals of some species (particularly Peregrine Falcons) may have initiated crossings at Whitefish and Cape May before arriving at the ends of the peninsulas and were never observed (P. Dunne, pers. comm.).

The results of the present study strongly suggest that the tendency of a species to undertake water crossings is related to its morphology. Longer-winged species, often with pointed wings, have high aspect ratios that decrease induced drag and therefore the energetic cost of powered flight (Pennycuik 1975). Reduced cost of flight and low drag coefficients may permit long-winged species to soar in weak updrafts, and thus promote longer distance flight over water. The finding that falcons and Ospreys regularly undertake water crossings is in agreement with findings by Kerlinger et al. (1983), although the Northern Harrier was conspicuously absent from their species list from the North Atlantic Ocean. A list of raptor migrants from the island of Malta also shows that the long, narrow-winged falcons, Ospreys and kites are more likely to cross the Mediterranean Sea than are the wider-winged buteos, accipiters, eagles, and vultures (Beaman and Galea 1974). Whether this relationship is a general one can only be determined by tests at crossings of varying distances in which many species are examined. Future studies should test this relationship and investigate why water crossings are effective barriers to migration and dispersal.

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Sex ratios in broods of Cooper's Hawks.—Adult female Cooper's Hawks (*Accipiter cooperii*) are about 1.5 times as heavy as males (Brown and Amadon, *Eagles, Hawks and Falcons of the World*, McGraw-Hill, New York, New York, 1968) and in the nest the females are noticeably larger at one week of age. Meng (Ph.D. diss., Cornell Univ., Ithaca, New York, 1951) reported a virtually even sex ratio (35 males, 36 females) in 20 broods of Cooper's Hawks in New York, but he did not determine if this ratio resulted from differential mortality at either the egg or nestling stage. Lack (The Natural Regulation of Animal Numbers, Oxford Univ. Press, London, England, 1954) suggested that male raptors might have lower survival rates in the nest because larger females would be more successful in competition for food. If so, the sex ratio at conception might be biased toward males (Newton, *Population Ecology of Raptors*, Buteo Books, Vermillion, South Dakota, 1979). Newton and Marquiss (*Am. Nat.* 113:309–315, 1979) failed to find such a bias in eggs of European Sparrowhawks

TABLE 1
SEX RATIO IN BROODS OF COOPER'S HAWKS IN DIFFERENT YEARS IN WISCONSIN^a

Year	No. of broods	Total males	Total females	Males : females
1980	9	14	15	0.9:1.0
1981	16	42	24	1.8:1.0
1982	20	30	37	0.8:1.0
1983	26	51	43	1.2:1.0
Total	71	137 (53.5%)	119 (46.5%)	1.2:1.0

^a There was no significant difference in the sex ratio among years ($\chi^2 = 5.20$, $df = 3$, $P \geq 0.05$), nor did the 4-year ratio differ significantly from a hypothesized 1:1 ratio ($\chi^2 = 1.27$, $df = 1$, $P \geq 0.05$).

(*Accipiter nisus*). Here, we present data on the sex ratios of 71 broods of Cooper's Hawks observed in Wisconsin during 1980–1983.

Sexing was done at the time of banding, when the young were at least two weeks old. We determined the sex ratio in eggs from 24 of the 71 nests in which clutch size was known, all eggs hatched, and all young survived to banding age (cf. Newton and Marquiss 1979). At 13 of the 71 nests, clutch size was known but mortality occurred at the egg or early nestling stages; clutch size was not known at the remaining 34 nests.

The number of nestlings examined included 137 (53.5%) males and 119 (46.5%) females. We found no significant difference in sex ratios among years (Table 1). Therefore we pooled our data for the remaining analyses. The overall 1.2:1.0 male/female ratio is not significantly different from unity (Table 1).

Broods ranged from one to six nestlings. We suspect that many of the smaller broods resulted when larger clutches suffered losses during the egg or nestling stage, as nests with clutch sizes of four and especially five eggs were common in our study (unpubl. data). The sex ratio of small broods did not significantly differ from that of larger broods (Table 2). We found no marked surplus of either sex at laying and no significant difference between this sex ratio and that in broods with known egg or nestling mortality (Table 3). We conclude that there was no differential mortality between the sexes up to the time of banding.

TABLE 2
SEX RATIO IN DIFFERENT BROOD SIZES OF COOPER'S HAWKS IN WISCONSIN^a

Brood size	No. of broods	Total males	Total females	Males : females
1	1	1	0	
2	12	12	12	1.0:1.0
3	18	30	24	1.3:1.0
4	24	49	47	1.0:1.0
5	15	41	34	1.2:1.0
6	1	4	2	2.0:1.0

^a There was no significant difference in the sex ratio among broods of different sizes ($\chi^2 = 0.47$, $df = 3$, $P \geq 0.05$); brood sizes of 1 and 6 young were excluded from analysis because of small sample sizes.

TABLE 3
SEX RATIO IN BROODS WITH NO MORTALITY UP TO BANDING COMPARED TO THAT IN
BROODS WITH MORTALITY AT DIFFERENT STAGES^a

Brood category	No. of broods	Total males	Total females	Males : females
No mortality at egg or early nestling stage ^b	24	54	52	1.0:1.0
Mortality only at egg stage	8	15	10	1.5:1.0
Mortality only at nestling stage	5	5	6	0.8:1.0
Total	37	74 (52.1%)	68 (47.9%)	1.1:1.0

^a There was no significant difference in the sex ratio among the different categories ($\chi^2 = 0.85$, $df = 2$, $P \geq 0.05$), nor from a hypothesized 1:1 ratio ($\chi^2 = 0.26$, $df = 1$, $P \geq 0.05$).

^b Equals sex ratio in the egg.

There probably was some mortality of young during the time between banding and fledging. Snyder and Wiley (Ornithol. Monogr. 20, 1976) reported a high mortality during the late nestling stages for Cooper's Hawks in Arizona and New Mexico, and they observed cannibalism within broods, apparently as a result of food stress. They did not, however, indicate the sex of surviving nestlings and there is no evidence that nearly fledged male Cooper's Hawks have a higher mortality rate than females. Furthermore, Meng (1951) reported that in recently fledged Cooper's Hawks, the most aggressive (and probably the "hungriest") youngster, irrespective of sex, is the most effective at procuring food.

Male Cooper's Hawks do develop more rapidly than females and they leave the nest 2–4 days earlier than females (Meng 1951). This difference in development could be an adaptation to forestall any competitive advantage that larger females might possess (Newton and Marquiss 1979). Differential development, however, could occur for reasons other than intersexual competition. It might be, for example, that smaller size allows, rather than competitively compels, males to fledge sooner. Our data give no support for the existence of intersexual competition in nestling Cooper's Hawks. These results are consistent with those reported for other raptor species by Newton (1979).

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