

Age- and Sex-Biased Distribution of Northern Harriers (*Circus cyaneus*) in the North Carolina Coastal Plain

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Surprisingly little has been published concerning Northern Harriers (*Circus cyaneus*) in the Carolinas. For the most part these raptors breed north of the Carolinas, and here and elsewhere in the southeast they are primarily seasonal transients and winter visitors. Potter et al. (2006) regard Northern Harriers (hereafter “harriers”) as winter residents throughout the Carolinas, uncommon over most inland counties and common over coastal marshes and agricultural fields. There are several reports of breeding in the Carolinas, but these are sporadic isolated events. Pearson et al. (1942) documented nesting in 1936 on Hatteras Island, and Smithwick (1952) reported a nest in 1891 in Bertie County. Additionally, pairs noted in June at Cedar and Ocracoke Islands are presumed to have been nesting (F. Parnell, pers. comm.). Lee and Irvin (1988) reported on an additional nesting and summarized the known breeding status of harriers in North Carolina. In South Carolina there is a single reported 1914 nest from Caper’s Island (Post and Gauthreaux 1989). In this note I discuss a previously unreported ecological and geographical segregation by age and sex of wintering adult harriers.

Migration

Migration is protracted in both the spring and fall. It extends from February to May in the spring and from mid-August through late November (MacWhirter and Bildstein 1996) in the fall. Lee and Lee (1978) studied fall hawk migration over North Carolina’s Outer Banks between 1975 and 1977. *Accipiters* (87%) and falcons (10%) made up the bulk of September and October’s diurnal raptor migrants. Of the over 4000 migrant hawks tallied, only 1.96% were harriers. While most individuals were obviously transients, foraging as they moved southward, based on behavior some had apparently taken up winter residence by early fall. Of the individuals where plumage was noted (n=132) only 10.6% of the Outer Banks’ migrants were adult males [see discussion on plumage below] (Lee unpublished). There is also a single North Carolina report of a fall harrier migrating at sea (Lee and Horner 1989). Laurie, et al. (1981) studied autumn hawk migrations at Ft. Johnson, Charleston, South Carolina. Of 1764 raptors they recorded between early September and early November 1980, harriers made up 8.9% of their total, but they did not provide breakdowns in age or sex based on plumage.

Winter Distribution in North Carolina

Because of the extended periods of both spring and fall migration, information presented here on winter distribution is limited to observations made during the months of December and January, although the same general patterns discussed here are also apparent during the migratory seasons.

Distinguishing adult males from females and juveniles is easy because of the adult male's distinctive grayish upper and white ventral surfaces and dark wing-tips. While birds in juvenal plumages can be distinguished from adult females by their cinnamon under-parts and lack of streaking on their flanks, and while juvenile males can be told from females of any age by their smaller size, these criteria were not used in this study. Many individuals were seen at distances, in bad light, without optical aid, and from moving vehicles. All observations were of birds in flight. Thus, while a number of birds were identified as juveniles, the observations for the most part were tallied as either adult male or as female/juvenile birds.

Because of my earlier experiences on the Outer Banks where I saw mostly adult female or juvenile harriers in both migration and winter, I became surprised that adult males were much more common at inland sites in North Carolina than along the coast. This finding was based on over 100 personal random encounters of wintering harriers in eastern inland North Carolina in December and January between 1990 and 2005. In the winters of 2006–2007 and 2007–2008 I kept more complete records and encountered 49 harriers (where plumage was noted) in the inland southeastern portion of the state. These were mostly birds seen while driving to various local destinations and not on dedicated census routes. Because of the patchy nature of the habitat in relation to the roads traveled, no attempt was made to determine bird densities. The sightings were made in Bladen, Cumberland, Hoke, Johnston, Roberson, and Sampson Counties. Of the 49 sightings, 45 (91.9%) were adult males. Of the four brown-plumaged birds, one was in juvenal plumage (22 Dec. 2007, Bladen Co.). The other three were not seen well enough to determine if they were adult females or juveniles. During the same time period, random road surveys on the Outer Banks, Cedar Island, and Topsail Island (Carteret, Dare, Hyde, and Onslow Counties) yielded 37 sightings of individuals of which 34 were adult females or juveniles of unknown sex (91.9%). I was unable to determine what percentage of the non-adult males were juvenile birds.

Because some of the same roads were driven frequently both within a single winter and on subsequent winters, there is the likelihood that a number of these sightings were of the same individuals. However, there is no documentation that individual birds have site fidelity to their winter ranges in subsequent years (MacWhirter and Bildstein 1996). Wintering males in California were shown to be occupying significantly larger hunting ranges than females (*ibid.*), and it is not clear how individual harriers are using the patchy agricultural landscape in the inland North Carolina sites.

While the food preferences of wintering harriers have not been studied in North Carolina per se, the proportions of passerine birds in the diets of harriers wintering in the south is known to be higher than it is in those wintering to our north (MacWhirter and Bildstein 1996). The primary coastal foraging areas for wintering harriers are salt marshes and inter-dune areas of barrier islands. In these habitats the likely mammalian prey species are least shrews (*Cryptotis parva*), meadow voles (*Microtus pennsylvanicus*), house mice (*Mus musculus*), eastern cottontails (*Sylvilagus floridanus*), and rice rats (*Oryzomys palustris*). At inland sites most winter foraging is over fields cleared of the previous season's crops, short grass pastures, and abandoned fields in early seral stages. Small mammals associated with open agricultural lands and early successional fields in the coastal plain include southeastern shrews (*Sorex longirostris*), harvest mice (*Reithrodontomys humulus*), white-footed mice (*Peromyscus leucopus*), cotton rats (*Sigmodon hispidus*), and house mice (Lee and Clark 1982).

Of course, if all the harriers were randomly distributed during the wintering and migratory periods there would not be a 50/50 ratio of gray/brown individuals. If all nests were successful and all young-of-the-year birds survived, the ratio of gray- (adult males) to brown-plumaged (adult females and young of the year) individuals would be about 1:5. However, this is not the case. While harriers produce an average of 4.4 eggs per nest, the number of young fledged averages 1.8 birds per nest and first-year mortality is 59%. Adult annual mortality is 30% (Bildstein 1988, MacWhirter and Bildstein 1996). In that winter surveys would represent only half a year subsequent to nesting, I adjusted the annual mortality to 29.5% for first-year birds and 15% for adults to estimate that adult male-plumaged birds should represent about 21.32% of the total wintering population. A Chi-square test on the coastal birds just rejects ($P=0.0497$) the null hypothesis that the gray bird/brown bird ratio matches the predicted overall population ratio, while the inland ratio is very different from the expected ($P < 0.0001$).

Discussion

The local differential wintering habits of male and female harriers appear to be driven by a combination of morphological and behavioral differences as they relate to broad-scale landscape ecology and to responses of the local available prey base to variations in available wintering habitat of inland vs. coastal sites.

Adult males are 8–11% smaller (wing chord measurement) and weigh 29–35% less than adult females (Bildstein 1988). This size dimorphism would seemingly influence the type and size of prey items. It is known, for example, that males take more birds than females. There are additional ecological and behavioral differences in the ways the two sexes use the landscape and its resources. Males prefer habitats that are more open than those occupied by females, apparently because of prey preferences, and have smaller home ranges. Additionally, females exclude males from their preferred winter hunting habitats (Bildstein 1987, Temeles 1987). Distinct

feeding, foraging, and habitat preferences (Temeles 1986), in turn, are likely, in combination, to drive the differences responsible for wintering females to select natural coastal communities and males to use more inland agricultural sites. Based on the small percentage of adult males observed in migration along the state's Outer Banks (Lee unpublished) these same factors appear also to influence the fall migratory routes of harriers.

These conclusions raise the obvious question as to the distribution of wintering male harriers in North Carolina prior to Colonial agriculture. Skinner (1928) notes the use of very open shrub and oak barrens in North Carolina's sandhills. An accompanying photograph of this habitat shows these "barrens" to be open, apparently cut over, longleaf pine wiregrass communities. Prior to the time of European contact, natural open habitats suitable for inland foraging harriers would have been limited primarily to fire-maintained longleaf pine savannas. A more detailed survey of harriers in coastal habitats during December and January is needed to determine what percentage of the wintering harriers are juvenile birds. While it is clear that the inland wintering population almost exclusively comprises adult males, the coastal population could be mostly juveniles, adult females or some combination of both. There is a general pattern in some migrant raptors and other birds for adult females, males and/or juveniles to migrate at different times or to different destinations. In Ospreys (*Pandion haliaetus*) there are male-female differences in timing of migration, distance traveled, and wintering sites, and pairs did not migrate or winter together (Martell et al. 2001). In Florida juvenile Broad-winged Hawks (*Buteo platypterus*) winter further south than adults, but this is not true for other portions of the species' wintering range (Tabb 1973). Stotz and Goodrich (1989) showed a bimodal fall migration in American Kestrels (*Falco sparverius*), with the median date of females preceding males by 11 days. Therefore it is not surprising to learn that harriers have sex/age-biased migratory behaviors and distributions. In that some harriers breed in their first year (5–23%; Hamerstrom et al. 1985, MacWhirter and Bildstein 1996), adults and juveniles wintering at different distances from nesting locations may not be as strong a tendency as in birds having a longer period of adolescence. Requesting participants and organizers of Christmas Bird Counts to record the sexes and ages (based on plumage) of wintering harriers would quickly provide a better understanding of regional distributional age and sex biases of these birds.

Despite the limits of my methodology in this survey, there is a clear, previously unreported, sexual bias in the winter distribution of adult male harriers when coastal (8.1% adult male) and inland (<90% adult male) communities are compared. There is a less than 10% overlap between adult males and females/juveniles at inland sites, and a similar bias between females/juveniles and adult males in coastal habitats. Based on information I collected in the mid-1970s it appears that a similar bias also exists in the distribution of coastal fall migrants (10.6% adult males). It is interesting that these distributional biases have not been suggested for other regions in this hawk's wintering range. A casual census of wintering harriers in

southeastern Arizona indicates less than 30% of birds I observed (N=42+; 2006–2008, pers. obs.) are in adult male plumage, a percentage approximate to what one would expect if adult males, females, and the surviving previous season's young were evenly represented.

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Fifty Years Ago in *The Chat*—December 1959

The lead article, “The Amateur and the Study of Bird Behavior” by Andrew J. Meyerriecks discussed things that are unknown about bird behavior and ways in which amateurs could contribute to knowledge about those behaviors. This article could probably be republished essentially unchanged today.

In General Field Notes, Ernest Cutts reported on species nesting in the Drum Island, SC, heron colony. Total adult population was estimated at 10,000 birds. E. Burnham Chamberlain reported that Ruddy Ducks with young had been seen at Bear Island, SC, and at the Romain Wildlife Refuge, SC, in the summer of 1959. Wendell P. Smith reported seeing a Black Rail feigning injury (taken to be evidence of breeding) in Surry County, NC, on 6 July 1959. The editor noted that in its 23 years, *The Chat* had published only two NC records and one SC record of Black Rail. John H. Grey belatedly reported June 1951 observations by Robert Paxton of Black-necked Stilts at Bodie Island, NC. The editor noted that while this was a rare observation in 1951, stilts had since become more numerous. Grey also reported a 1941 observation by Ray J. Beasely of 10–15 Common Ground-Doves on Knott’s Island, NC. George Smith detailed an observation of Sprague’s Pipit near Chapel Hill, NC, an observation that was later designated an “unaccepted sighting” by the NC Bird Records Committee. A total of 150 Wood Storks were noted at Savannah Refuge on 10 June, “the largest concentration ever noted” there. —Kent Fiala