

## ESCORTING FLIGHT AND AGONISTIC INTERACTIONS IN WINTERING NORTHERN HARRIERS

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**ABSTRACT.**—Many of the Northern Harriers (*Circus cyaneus*) that wintered on a saltwater estuary in South Carolina and on a freshwater marsh in Florida attempted to maintain areas of exclusive use. Interactions with individuals of other raptor species usually involved stooping and high-speed pursuit. Although harriers sometimes attempted to repel conspecific intruders in the same manner, most interactions with conspecifics involved escorting the bird out of the area. Harriers were robbed of their prey at both sites, and we suggest that the aggressive behavior that we observed acted to reduce the incidence of intra- and interspecific piracy.

Both breeding and non-breeding Northern Harriers (*Circus cyaneus*) establish hunting ranges during the breeding season (Craighead and Craighead 1956, Hamerstrom 1969). The hunting ranges of individual birds often overlap considerably, and harriers sometimes hunt in close proximity to one another without overt aggression (Breckenridge 1935, Craighead and Craighead 1956). Wintering harriers also establish hunting ranges, which they maintain from several days to at least several weeks (Craighead and Craighead 1956), but there are few reports of aggressive interactions at that time. Evidence is accumulating, however, that harriers are regularly and methodically pirated of their prey, both by conspecifics (Bildstein 1978), and by other species of raptors (Prairie Falcons [*Falco mexicanus*], Ridgway 1877, Merchant 1982; Rough-legged Hawks [*Buteo lagopus*], Bildstein 1978; Golden Eagles [*Aquila chrysaetos*], Collopy, pers. comm.). In Ohio, where wintering harriers were robbed 12 of the 80 times they caught prey, harriers that were unable to dislodge buteos from an area usually moved on and hunted elsewhere (Bildstein 1978). In that study, interspecific aggressive encounters consisted of stooping and high-speed pursuit, while intraspecific encounters usually involved escorting flight (i.e., flight in which one harrier followed several meters below, and usually behind, a second harrier, until the followed bird flew out of the area; cf. Balfour 1963).

In an attempt to determine the extent to which wintering Northern Harriers engage in intra- and interspecific aggressive interactions, we observed the behavior of harriers wintering in South Carolina and Florida. Here, we report our observations of frequent and predictable aggressive interactions, including escorting flight, among those harriers.

### STUDY AREA AND METHODS

As part of a larger study, one or both of us watched Northern Harriers hunting over a salt marsh in South Carolina and a freshwater marsh in Florida. The North Inlet Marsh is a 3,000-ha, high-salinity salt marsh, 6 km east of Georgetown, South Carolina. The site consists of approximately 60% *Spartina alterniflora* salt marsh; 10% mud flats, sandbars, and oyster reefs; and 30% open water (Forth 1978). The marsh and its birds were described by Christy et al. (1981). The Payne's Prairie, 3 km south of Gainesville, Florida, is a 5,600-ha basin, comprised principally of a freshwater marsh dominated by maidencane (*Panicum hemitomon*), pickerel weed (*Pontederia lanceolata*), and *Polygonum* spp. Numerous old dikes with roads on the prairie provide limited access.

We watched harriers in South Carolina on 298 occasions for a total of 105.7 h during the winters of 1979-1980, 1980-1981, 1981-1982, and 1983-1984; and in Florida on 199 occasions for a total of 146.4 h during the winters of 1982-1983 and 1983-1984. In South Carolina, we watched from a stationary 18.5-m tower in the middle of the marsh; in Florida, we watched from several locations on the prairie from a 3-m tower mounted on the back of a pick-up truck. At both study sites, we watched harriers throughout the day; individuals were watched until they flew from view or until darkness. Individual observations ranged from less than 1 min to more than 8 h. For each observation, we recorded the amount of time the bird perched, flew, and engaged in escorting flight, as well as the number of times it captured prey and interacted with other raptors. We defined "escorting flight" as flight in which two birds flew in tandem and within 50 m of one another. To be certain that one bird

TABLE 1. The rate of occurrence of escorting flight and percent of time spent in escorting flight by Northern Harriers wintering in Florida and South Carolina.

	Number of escorting flights per hour of observation		Percent of flight time spent in escorting flight	
	South Carolina	Florida	South Carolina	Florida
Adults	0.64 (46) <sup>a</sup>	0.73 (66)	3.3	4.0
Males	0.98 (6)	0.62 (12)	1.3	4.1
Females	0.61 (40)	0.76 (54)	3.6	4.0
Immatures	1.04 (26)	1.10 (39)	6.0	9.6
Brown harriers <sup>b</sup>	0.75 (7)	1.25 (26)	7.6	2.5
All harriers	0.75 (79)	0.89 (131)	4.3	4.1

<sup>a</sup> Number of flights in parentheses.

<sup>b</sup> Immatures of both sexes or adult females.

was actively following the other, and not merely flying close behind by chance, we counted as escorting flight only those instances in which the trailing bird turned at least once to follow the course of the leading bird. During their defense of nesting territories, Australasian Harriers (*C. approximans*, Baker-Gabb 1981) engaging in escorting flight sometimes fly with their wings held in "an exaggeratedly high angle" and their tarsi "thrust straight down." In an attempt to determine whether this behavior occurs in Northern Harriers during escorting flight, we watched for "talon dragging" in South Carolina during the winter of 1983–1984.

None of the birds that we watched were marked; however, we were able to recognize many individuals by missing or damaged feathers or by distinctive plumage, together with their recurrent use of specific perches. The sizes of the hunting ranges of five of these birds, each of which was watched for at least 12 h, were determined from aerial photographs.

We recorded our observations on cassette tape recorders and transcribed them into field notes at the end of each day of observation.

## RESULTS

### AGE AND SEX OF OBSERVED BIRDS

At least 57% of the 298 birds we observed in South Carolina and 41% of the 199 birds sighted in Florida were adults. Eighty-two percent ( $n = 169$ ) of the adults in South Carolina and 52% ( $n = 81$ ) of the adults in Florida were female. Adult males were difficult to keep in view because they tended to make few turns and were less likely to "double-back" than were adult females. In 11% ( $n = 298$ ) of the observations in South Carolina and 33% ( $n = 199$ ) of the observations in Florida, we were unable to age (first-year vs. second-year or older) or sex the harrier. We recorded these individuals as brown birds (i.e., adult females or immatures of either sex).

### INTERSPECIFIC INTERACTIONS

In both South Carolina and Florida, most individuals maintained areas of exclusive use

from several hours to more than 15 days (our maximum length of continuous daily observations). In both locations, adult females appeared to occupy areas for a longer period of time than did either adult males or immatures of both sexes. All five of the harriers that we watched for at least 12 h were females. In South Carolina, exclusive areas averaged approximately 70 ha (four adult females); in Florida, one adult female maintained an area of 40 ha. On 79 occasions in South Carolina and on 131 occasions in Florida, the occupants of hunting ranges used escorting flights to expel intruders (Table 1). Occupants of hunting ranges usually approached to within 50–20 m of intruding individuals in rapid, low-altitude (usually <2 m), straight-line, flapping flight and escorted the intruder in a less-rapid flight to the edge of the exclusive area. In several instances, occupants of hunting ranges approached and stooped on individuals that had perched within their range. They continued to do so until they displaced the intruder and escorted it from the area. Except when they were eating prey, both perched and flying harriers responded to intruders. Individuals that were seen over the course of several days were predictable in their responses: they consistently met intruders at the same location and escorted them the same distance to the edge of the exclusive area. We saw no indication that harriers expelled birds only from those areas of their hunting ranges that they themselves were using at the time.

In South Carolina, harriers spent 4.3%, and in Florida, they spent 4.1% of their flight time engaged in escorting flight. Although adult females occupied hunting ranges longer than did immatures of both sexes, our observations (Table 1) indicate that, at both sites, immatures engaged in escorting flight more frequently than adults. Our observational methods, however, preclude statistical analysis of any age effect.

During 23% ( $n = 79$ ) of the escorting flights in South Carolina, and in 15% ( $n = 131$ ) of those in Florida, one or both harriers landed briefly, usually on the ground but sometimes

on a post. When one bird landed during an encounter, the second often did so as well, usually within 10–30 m of the first. When the intruder was the first bird to land, the resident usually circled over it before landing nearby. During interactions, harriers sometimes alternated perching and flying for more than 1 min, and in one case, one bird landed nine times during a single encounter. Individuals that perched during aggressive encounters remained perched for from <1 to 561 s.

During the winter of 1983–1984, we recorded eight instances of “talon dragging” during 22 escorting flights in South Carolina. In seven instances, the occupant of the home range alone dragged its talons; in one encounter, the intruder dragged its talons after the resident bird did so. On several occasions, the occupant of the home range first dragged its talons and then stooped to within <1 m of the intruder.

In at least several instances, the resident bird gave Threat calls (*kek-kek-kek* . . . , Cramp and Simmons 1980:123) during the encounter. Several juvenile harriers gave Food calls (*twiss you* . . . , Cramp and Simmons 1980:124) while being escorted from the hunting range of an adult female.

Escorting flights lasted significantly longer in South Carolina ( $61.0 \pm 70.0$  s,  $n = 67$ ) than they did in Florida ( $40.1 \pm 61.3$  s,  $n = 144$ ;  $t = 2.02$ ,  $P < 0.05$ ). Seventy-six percent ( $n = 79$ ) of the escorting flights in South Carolina and 70% ( $n = 131$ ) of those in Florida ended with both birds disengaging at the border of the hunting range in low-altitude flapping flight. In some of these instances, the resident “patrolled” the border for up to several minutes, but in most cases, it returned to its perch site or to where it had been hunting before the encounter. Four percent of the escorting flights in South Carolina and 15% in Florida ended only after both birds circled up and soared close to one another before they separated. Twenty percent of the encounters in South Carolina and 15% in Florida ended with one or both of the birds perched after they had touched down several times.

#### INTERSPECIFIC INTERACTIONS

In South Carolina, harriers attacked Red-tailed Hawks (*Buteo jamaicensis*) 13 times, Peregrine Falcons (*Falco peregrinus*) twice, and a Cooper’s Hawk (*Accipiter cooperii*) once; in Florida, they initiated agonistic interactions with Red-tailed Hawks seven times. Thirteen (81%) of these interactions in South Carolina and six (86%) of those in Florida involved high-speed chasing or stooping, and in most encounters, the harrier gave Threat calls. Four (17%) of the interactions consisted of low-speed

escorting flights of Red-tailed Hawks. In 10 (43%) of the interactions, the recipient was perched when first approached by the harrier. Harriers displaced four of these birds, but sometimes only after stooping on them repeatedly for >2 min. High-speed chasing and stooping were much more common in interthan in intraspecific interactions (83% vs. 14%). Overall, interspecific interactions were less ritualized, more overtly aggressive, and more vocal than were interactions involving conspecifics.

#### PIRACY OF HARRIERS

In South Carolina, an adult female harrier that had been feeding for 6 min 3 s was dislodged from its prey by a second adult female. On two occasions in Florida, we saw perched harriers displaced from their locations on the ground, once by a Turkey Vulture (*Cathartes aura*) and once by a Red-tailed Hawk. We were unable to determine in either instance whether the perched harriers were feeding at the time. Two harriers in South Carolina and two in Florida, however, were robbed of their prey by Red-tailed Hawks. Another harrier in Florida left its prey when a Red-tailed Hawk chased it from its feeding site. Similarly, a harrier in South Carolina lost its prey when the yellow-legs (*Tringa* sp.) upon which it was feeding dropped into a creek as the harrier attempted to carry it off while being stooped on by a Bald Eagle (*Haliaeetus leucocephalus*). Ten percent of the 71 prey captured by harriers were lost as a result of successful or unsuccessful piracy attempts.

#### DISCUSSION

Escorting-flights that we observed in harriers wintering in South Carolina and Florida appeared similar to those that occur during the breeding season (cf. Balfour 1963). In both circumstances, escorting-flight apparently acts to repel intruding harriers from an area of exclusive use. Although the birds we watched sometimes thrust their tarsi straight down and dragged their talons during escorting flights, we did not see them fly with their wings held in “an exaggeratedly high angle,” as has been reported for Australasian Harriers during similar encounters (Baker-Gabb 1981). We believe that immatures engaged in escorting flights more frequently than adults (Table 1) because they were less likely to maintain hunting ranges than were adults, and consequently, were more likely to intrude into the hunting ranges of other harriers and thereby precipitate encounters. The less ritualized and more intense interspecific interactions that we saw are

similar to those seen in New York (Clark 1975) and Ohio (Bildstein 1978).

Earlier reports of intra- and interspecific piracy of harriers (Ridgway 1877; Bildstein 1978; Merchant 1982; Collopy, pers. observ.), together with our observations, suggest that, although escorting flight and overt aggressive behavior may in part prevent conspecifics and other hawks from capturing prey within a harrier's hunting range, these responses also lessen the likelihood of a harrier being robbed of its prey. If so, harriers that defend hunting ranges not only reduce the extent of exploitative competition, but also reduce the risk of interference competition.

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