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Flocking in the Hook-billed Kite

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Hawks are not generally thought of as gregarious birds, but they regularly occur in flocks in two situations: (1) when migrating (for example, *Buteo platypterus, B. swainsoni, Ictinia mississippiensis,* and *Cathartes aura*), and (2) when feeding on resources that are patchy in time and space (for example, *Falco naumanni, F. eleonorae* and other falcons that feed on insects for at least part of the year, and most vultures and other carrion-eaters). Some species typify both situations (for example, *Falco naumanni* and *Cathartes aura*). Of course, neither all migrating hawks nor all hawks utilizing patchy resources are gregarious.

The accipitrids loosely grouped together as "kites" (Brown and Amadon 1968) include a number of genera the species of which feed on insects and/or rodents and are often social even when not in migration (for example, *Elanoides, Elanus, Chelictinia,* and *Ictinia*). Flocking is an appropriate response to patchy resources but contrasts with the rather aggressively maintained territoriality of many hawk species that feed on more dispersed prey (Newton 1979). The kites mentioned above are less aggressive, in general, than many raptors that feed on birds and larger mammals. Most tropical woodland hawks are usually encountered singly or in pairs, and it was with considerable surprise that I observed members of one of these species aggregated into a soaring flock.

On 2 September 1978 Susan Hills and I watched a flock of 25 Hook-billed Kites (*Chondrohierax uncinatus*) soar up in an early-afternoon thermal from semi-wooded country southeast of San Francisco de Apure, Apure, Venezuela and disappear to the northeast. The day was typically tropical—sunny, hot, humid, and still. At first we were confused, because the flock obviously contained three different kinds of birds, but with further study we realized they were all identically shaped, with the long tail and narrowed wing base typical of *Chondrohierax*. Most of them had the vivid primary barring also characteristic of this species. Two of the birds looked black at a distance, with a single wide white bar on the tail slightly proximal to midlength. Twenty of the birds were gray beneath, the fine ventral barring obscured by distance but visible in the 20-power spotting scope through which I watched them. The gray birds had prominently barred dark and white primaries and four equally prominent tail bars, black-white-black-white from tip to base. Finally, three of the birds were distinctly brown beneath, with prominent reddish brown on the less conspicuously barred primaries and dark tail bars slightly narrower than those of the gray birds. A photograph taken with a 450-mm lens shows eight of these birds, including all three plumage types.

Although the literature does not completely clarify the plumage variation in this species, it appears that the gray birds were males and the brown ones females. All references that I examined stated that most

or all gray birds are males, most or all brown birds females. Both Friedmann (1950) and Brown and Amadon (1968) mentioned that the females' primaries are more reddish than the males', and Brown and Amadon (1968) further mentioned the females' narrower tail bars. Immatures in any plumage have more bars on the tail than do adults of the same sex or morph (Friedmann 1950, Smith and Temple 1982). Thus, the flock of 25 birds consisted of 20 light-phase adult males, 3 light-phase adult females, and 2 dark-phase adults; there were no immatures present. Not only the size of the flock but the sex and age ratios seem unusual. On the following day we saw two gray birds, presumably males, soaring together 4 km south of Ortiz, Guárico, Venezuela.

Haverschmidt (1964) stated that he had not seen the dark phase in Suriname, where it was much rarer than the light phase, although 3 of 14 Suriname specimens in the Leiden Museum were dark-phased. Brown and Amadon (1968) called the dark phase "uncommon." I have been unable to find other statements concerning the relative frequency of the morphs.

Apparently the Hook-billed Kite has not been considered a flocking bird, although it is well known as a soarer. Brown and Amadon (1968) stated that it is "encountered singly or in groups of two or three. At times it soars freely." Ridgely (1976) wrote "soars occasionally, usually not very high." It is possible that this species is more social than indicated in the literature, as it generally is not common and is not very well known. The related *Rostrhamus sociabilis*, as its name implies, is one of the more social kites, and the snails on which it feeds are, of course, patchily distributed because of their dependence on water. The tree snails on which *C. uncinatus* feeds are doubtless also patchy, and this species could respond by aggregating at food-source areas. The six nests found by Smith (1982) within 5 km of one another imply some concentration of resources. This would not entirely explain the flock described herein, however.

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Tree Swallows Cross a Polygyny Threshold

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Orians (1969) and von Haartman (1969) noted that polygyny is more widespread in passerine species whose nest sites are limited. The importance of resource distribution in influencing mating systems is now well documented. The Verner-Willson-Orians model (Verner 1964, Verner and Willson 1966, Orians 1969) emphasized that polygyny is expected when the distribution of resources is sufficiently inequitable that a female mating with an already paired male on a territory of superior quality will have reproductive success equal to or better than that of a female mating with an unpaired male occupying a territory of poorer quality. The difference between territories sufficient to favor polygyny has been termed the polygyny threshold, and a species is considered regularly polygynous when the incidence is 5% or greater (Verner and Willson 1966). Emlen and Oring (1977) added that polygyny occurs only when the operational sex ratio ("the average ratio of fertilizable females to sexually active males at any given time") deviates from unity in conjunction with some minimum degree of inequity in territory quality. Inequity in territory quality explains the occurrence of polygyny in several species, and differential food availability has been emphasized as the most important factor selecting for polygyny in these examples (Verner 1964, Willson 1966, Orians 1972, Wittenberger 1980). Male characteristics (Weatherhead and Robertson 1977, 1979) and predator defense (Elliott 1975) have also been identified as potentially important factors in the evolution and maintenance of polygyny.

I have been studying the breeding performance of two nest-box populations of Tree Swallows (*Tachycineta bicolor*). Resources are distributed in a manner that would predict the occurrence of polygyny, namely, limited nest sites in both populations in association with differential food abundance between