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## TWO CASES OF COOPERATIVE BREEDING IN EURASIAN HOBBIES

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**KEY WORDS:** *Eurasian Hobby*; *Falco subbuteo*; *cooperative behavior*; *polyandry*; *polygamy*.

Polygamy is a common mating system in birds (Alcock 1993), and it can involve either polygyny (a male breeding with two or more females) or polyandry (a female

breeding with two or more males). A recent review of literature shows that group breeding has been documented in 42 species of diurnal raptors (Kimball et al. 2003). Furthermore, these authors suggest that cooperative breeding is more common in terms of the number of species and in frequency than the available data indicate. In addition, they reported that 21 species of raptors showed polyandrous behavior and four other species may be polyandrous.

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Polyandry may occur by extra-pair copulations (EPCs) or be a result of two or more males breeding and maintaining a bond with one female. The first case is not commonly known in most species of raptors, in part, because the reported frequencies of mixed paternity based on DNA fingerprinting analyses are scanty (e.g., Korpimäki et al. 1996, Rohner 1997, Marks et al. 1999). The second case involves cooperative breeding behavior between two or more males and one female. Males may be related or not and the number of males that copulate with a female varies between species and sometimes only one male of the group copulates (Kimball et al. 2003).

Polygamy has been rarely documented in Eurasian Hobbies (*Falco subbuteo*). Chapman (1999) found that a stray third bird, which could have been a yearling, would consort occasionally with an established pair. Bijlsma (1980) found that out of 26 migratory arrivals of hobbies in the Netherlands, seven involved single birds, 14 involved pairs, and five a "trio" of hobbies. It is unknown whether these trios became cooperatively breeding groups or not. Cramp and Simmons (1980) described a case in which two males accompanied a female when inspecting a nest. Here, we describe two different cases of cooperative breeding by hobbies in the North of Spain.

In 2000, we begun monitoring hobbies in Bizkaia, Northern Spain, and 41 pairs were found. In 2001, two of these territories were occupied by pairs, but were occupied by trios in 2002. One territory was located in a large pine (*Pinus radiata*) plantation in Muskiz and the other was in a large eucalyptus (*Eucalyptus globulus*) plantation in Derio.

The pair at Muskiz bred in a pine situated in the middle of the plantation in 2001 and they produced two fledglings. In 2002, we found the nest located only 5 m away from the previous year's nest. On 4 August 2002, we witnessed three hobbies flying together for 5 hr at the pine plantation territory. One hobby (the female) was obviously larger than the other two (the males); these size differences were evident, mainly when the falcons were flying together (Chapman 1999). The female and one male were then aged as 3+ yr and the other male was a second-year bird (Forsman 1997). They, together, mobbed two Common Buzzards (*Buteo buteo*). Later, one of the males captured a passerine and passed it to the female, who ate it while flying near the two males. Afterwards, the female and one of the males perched on the top of the trees close to the nest. Thirty minutes later, the other male approached and flew over the perched falcons. Then the two males left together, while the female went to the nest.

On 10 August, we observed one hobby 1 km away from the nest carrying a Common Swift (*Apus apus*). This falcon approached the nest after perching in a pine to pluck the bird. Two hours later, we saw one of the males trying to hunt another swift, then join the female and mob three different Common Buzzards. On 11 August, the three hobbies attacked an Eurasian Eagle-Owl (*Bubo*

*bubo*) that was 20 m from the nest. On 31 August, two chicks were flying, but always stayed close to the nest during a 5 hr period, while the female and the two males perched near the chicks. The three adult hobbies never showed signs of aggression between themselves.

In the territory at Derio in 2001, we observed a pair of hobbies, but could not find the nest because of the dense tree canopy. In 2002, we spent 3 d searching for the nest. On the first 2 d (27 and 28 July), we saw three hobbies flying together, one adult female (larger) and two males. We could not see the tail feathers of the males clearly, so we could not determine their ages (Forsman 1997). On the second day, the falcons flew together for a period of 5 hr. On the third day (1 August), under a persistent rain, we saw only one hobby and found the nest in a eucalyptus tree in the middle of the plantation. On 3 August, we climbed to the nest and found it empty, and did not see any hobbies while we were there. As we were leaving the plantation, we saw a Booted Eagle (*Hieraetus pennatus*) flying above, and the three hobbies attacked it. The falcons chased the eagle for more than 1 km, and then returned to the plantation.

Based on our observations, we could not distinguish whether these trios represented polyandrous breeding or helping behavior. It is possible that the second males in the Bizkaia trios could have been yearlings born in the same territories, who returned and then helped to defend the territory. By helping, these yearlings could gain experience that would prove useful in their third calendar year, when male hobbies usually reach sexual maturity. Most second-year hobbies behave as floaters (Chapman 1999), and they are strongly philopatric, as shown by the fact that they return from their wintering areas to within a mean of 10 km from their natal sites (Chapman 1999), which could lead to helping behavior. The age of the second male at the pine plantation nest was consistent with the interpretation that this bird was a helper. The benefits of the helping behavior for the adult pair were not clear (Donazar 1993). In the two trios monitored, reproductive success was relatively low (one of two nests fledged a total of two young), but this sample was extremely small.

RESUMEN.—En el año 2000 comenzamos un estudio sobre el alcotán europeo (*Falco subbuteo*) en Bizkaia, Norte de España. Localizamos 41 territorios. Un año después se controlaron varias parejas, a las que se realizó un estrecho seguimiento. En el año 2002 continuamos el seguimiento y encontramos que en dos de los territorios controlados un año antes, había trios poliándricos, es decir, dos machos y una hembra compartiendo las labores de defensa de territorio y reproducción. Realizando un seguimiento más exhaustivo, comprobamos que los dos machos de cada territorio participaban en la ceba y expulsaban ferozmente a cualquier intruso que se acercase al nido. En una de las parejas pudimos comprobar que la hembra y uno de los machos eran individuos adultos,

mientras que el otro era un ejemplar nacido el año anterior, por lo que sospechamos que podría ser un pollo de la pareja que colabora con sus progenitores para sacar adelante la nidada y, de esta forma, va cogiendo experiencia mientras llega a la madurez sexual que se produce un año después.

[Traducción de los autores]

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## FOOD HABITS OF PEREGRINE FALCONS IN KENTUCKY

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**KEY WORDS:** *Peregrine Falcon*; *Falco peregrinus*; *food habits*; *human-made habitat*; *Kentucky*; *monitoring*.

Many studies on Peregrine Falcons (*Falco peregrinus*) include observations of prey taken (White et al. 2002). As a consequence of the Peregrine Falcon's cosmopolitan distribution and adaptability, inferences derived from food habit studies often are limited to the study area in which they were conducted (Ratcliffe 1993, Schneider and Wilden 1994, Rejt 2001, Serra et al. 2001). In the Midwestern United States, a large proportion (0.70) of

the restored Peregrine Falcon population occupies structurally similar human-made breeding locations (Tordoff et al. 2001); however, land use adjacent to these breeding locations often is variable and may be reflected in the diet of the birds. For example, in Kentucky, three pairs of Peregrine Falcons occupy human-made breeding locations including bridges and power plants. Land use adjacent to the breeding locations varies from predominantly urban at one breeding location to predominantly rural at the other two breeding locations.

Food-habits data from this population would be useful in enhancing our understanding of prey use among habitat types within the region, monitoring potential expo-

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