

Aggressive behaviour in Montagu's harrier *Circus pygargus* during the courtship period

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Abstract: Aggressive behaviour of Montagu's harrier was observed during the pre-laying period in the 1992–1995 seasons on the calcareous marshes of Chełm in Eastern Poland. In total, 435 flights performed by 24 pairs of individually marked harriers were analysed. All flights were performed in relation to the territory of defence. Males performed 61% of aggressive interactions while females performed 39%. Intraspecific and interspecific aggression comprising direct attacks (58%), escorts (13%), pursuits (28%) and “mirror behaviour” (1%) were described for the first time. Interspecific aggressive behaviour occurred only near territory boundaries. The main intruders were marsh harriers *Circus aeruginosus* breeding on the same marshes. Occasionally, harriers attacked curlews *Numenius arquata*, short-eared owls *Asio flammeus*, magpies *Pica pica*, hooded crows *Corvus corone cornix*, common buzzards *Buteo buteo* or hobbies *Falco subbuteo*. Four cases of communal mobbing were observed. Three to five males from the neighbourhood attacked the intruders together. Intraspecific aggressive behaviour was observed in the pair territory, near the boundary or at a distance of up to 100 m from the defended area. Aggressive interactions performed by both sexes were more frequent towards birds of the same sex. Females defended their territories more aggressively against females. Similarly, males were more aggressive against males. All cases of aggressive behaviour were observed near harrier territories. Aggressive relations between birds outside breeding territories or when foraging around marshes were not observed.

Key words: Montagu's harrier, birds of prey, aggressive behaviour.

Introduction

Birds of prey are aggressive during the whole of the breeding cycle. However, intra- and interspecific aggressive behaviour is most evident in the time of the pre-laying period. In this period birds start to occupy breeding territories and vigorously defend their boundaries against intruders (CRAMP & SIMMONS, 1980; CLARKE, 1996). Montagu's harrier *Circus pygargus* (L., 1758) is known as a species less aggressive in comparison to other birds of prey (GLUTZ et al., 1971). However, their inter- and intraspecific behaviour during the time of courtship is spectacular. Aggressive behaviour among this species of harrier occurs inside or close to harrier territories (PANDOLFI & PINO D'ASTORE, 1992), while in foraging areas aggression was not recorded. Defence of territory is the main function of this behaviour but the second aspect of aggressive behaviour may be in a courtship context (SIMMONS, 1988). An aggressive mate is probably perceived as the owner of “good genes”. This male is capable of caring for the female in the period from laying of the first egg until the start of hunting after hatching of the chicks when the female depends on the male for food.

Semi-colonial breeding in Montagu's harrier decreases aggressive behaviour between birds and the in-

dividual cost of defence in mobbing behaviour (ARROYO et al., 2001). However, the high density of territories increases the risk of extra-pair copulation. Therefore, aggressive behaviour between birds of the same sex increases, especially between males. In this situation males are more aggressive toward males than females (MOUGEOT et al., 2001).

The aim of this work was (i) to show the forms of aggressive behaviour in Montagu's harrier during the courtship period, (ii) to describe the main direction of bird aggression inside the territory, and (iii) to explain their behavioural context.

Material and methods

Montagu's Harriers were observed from 1992 to 1995 on calcareous marshes near Chełm (E Poland). Field observations were carried out in the “Bagno Serebryskie” nature reserve (51°10' N, 23°37' E). The marsh landscape of the reserve is dominated by the sedge community *Cladietum marisci* where harriers built their nests. Birds (24 pairs) were caught, ringed and individually marked with the use of colour wing tags (KOCHERT et al., 1983). Wing tags did not modify the birds' behaviour. One bird received only one mark on its wing, which fell off by itself after 1–2 months due to corrosion of the staple. Birds were marked just after their arrival in the breeding area. Harriers were caught

in special ornithological nets, using the eagle owl *Bubo bubo* (L., 1758) as a decoy (BUSSE, 1991). Observations were performed near territories from distances of 100–200 m, with the use of 10 × 50 binoculars. Observations were conducted from the time of the arrival of adults to breeding sites until the start of egg laying (from the end of April to the end of May). Every day harriers were observed from 8.00 a.m. to sunset. The total time of observations was 768 h. The following behaviour was monitored during the time of the observations: time and number of pursuits for intruders; time and number of direct attacks; time and number of attacks; and the nesting area was estimated by the maximum convex polygon method.

All statistical analyses were performed with Statistica 6.1. Analyses of behaviour were made with nonparametric statistics (Wilcoxon test). All data are presented as a mean.

Results

All cases of aggressive behaviour were observed in the harrier territories or not far from the defended areas. The nesting area defended by birds was estimated to range from 0.42 ha to 2.25 ha, averaging 1.1 ha ($n = 24$, $SD = 0.52$). In the foraging areas, 1 to 5 km from the area defended by birds, aggressive behaviour was not observed. Inter- or intraspecific aggression was observed in the pair in the areas or less than 100 m from the area boundary. All flights were performed in relation to territorial defence. Most of the 435 flights were performed by males (61%). The females performed only 39% of aggressive interactions. Aggressive behaviour comprised direct attacks (58%), escorts (13%), pursuits (28%) and 1% of “mirror behaviour” (Fig. 1). Mirror behaviour occurred on the boundary between the neighbouring territories. Two males flew along the boundary. They stopped and sat down in front of each other. After a few seconds both birds started to fly again. They hung together in the air a few metres above the marsh. They flew “bill to bill” along the boundary of their territory. This behaviour looks like hunting behaviour described in Kestrels as hovering but it was performed by birds at a low height (on average ca. 5m). Two cases of similar behaviour were observed in marsh harrier *Circus aeruginosus* (L., 1758) in the 1991 season on the same marshes. This ritual form of aggressive behaviour was observed in Montagu’s harrier very rarely (5 cases only).

Intraspecific aggression performed by both sexes was higher with birds of the same sex (Fig. 2). Females defended their territory more aggressively against females (29% of aggressive flights) than males – 10% (Wilcoxon test $z = 3.4077$, $n = 20$, $P = 0.0006$). Similarly, males were more aggressive against males (45%) than females (19%), ($z = 2.7979$, $n = 23$, $P = 0.005$).

Interspecific aggressive behaviour occurred near the territory boundaries. The main intruder species for both sexes were marsh harriers breeding in the neighbourhood. Females of Montagu’s harrier were more aggressive against males of the marsh harrier (38%) than



Fig. 1. Forms of aggressive behaviour in Montagu’s harrier.

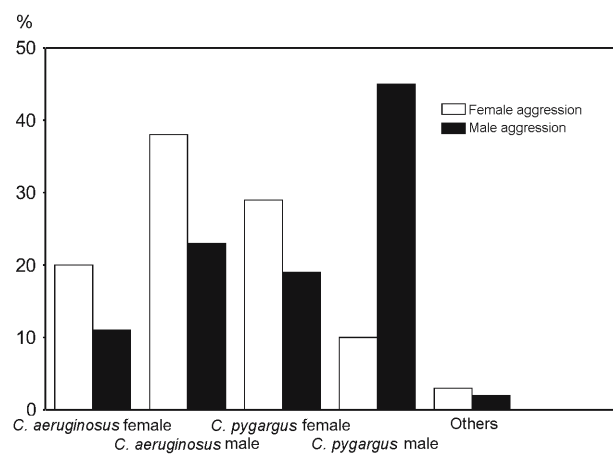


Fig. 2. Female and male aggression in Montagu’s harrier.

against females – 20% ($z = 2.39$, $n = 20$, $P = 0.016$). Similarly, male aggressive behaviour was more vigorous against males of the marsh harrier (23%) than females – 11% ($z = 3.018$, $n = 23$, $P = 0.002$).

Only four cases of communal mobbing were observed. Three to five males together attacked the white tailed eagle *Haliaeetus albicilla* (L., 1758), the lesser spotted eagle *Aquila pomarina* (C.L. Brehm, 1831), the kestrel *Falco tinnunculus* (L., 1758) and the goshawk *Accipiter gentilis* (L., 1758). Occasionally, individual harriers attacked curlews *Numenius arquata* (L., 1758), short-eared owls *Asio flammeus* (Pontoppidan 1763), magpies *Pica pica* (L., 1758), hooded crows *Corvus corone cornix* (L., 1758), common buzzards *Buteo buteo* (L., 1758) or hobbies *Falco subbuteo* (L., 1758).

Discussion

In the pre-laying period aggressive behaviour was studied inside harriers’ territories. Defended areas were smaller than areas defended in the Italian population described by PANDOLFI & PINO D’ASTORE (1992) where the surface area defended by one pair was estimated to range from 1.5 to 6 ha. This difference probably results from the higher breeding density of

Montagu's harrier on the study area in E Poland compared to other breeding areas in Europe. In the "Bagno Serebryskie" nature reserve one of the highest breeding densities for Montagu's harrier in Europe was found (KROGULEC & LEROUX, 1994). The foraging areas of Montagu's harrier are situated a maximum of 11 km outside the nesting territories (SHIPPER, 1973; CRAMP & SIMMONS, 1980). In the foraging areas in E Poland aggressive behaviour was not observed. All aggressive flights were performed in relation to nesting territory defence. During the time of the courtship period males were more aggressive than females. These results are interesting because in Italy females were more aggressive than males during the whole of the breeding season (PANDOLFI & PINO D'ASTORE, 1992). A high activity of males at the time of pair formation, occupying territory and mate choice are reasons for the high level of aggressive activity. Semi-colonial breeding within high density territories in different aspects is described by ARROYO et al. (2001). Individual costs of nest defence in the colony are decreased but the short distance between nests or territories may increase male aggressive behaviour especially in the early stages of breeding. Nesting at high density also increases the risk of extra-pair copulation. This problem was described by MOUGEOT et al. (2001), but cases of extra-pair copulation in Montagu's harrier are rather rare (ARROYO, 1999) or absent in small populations (WIĄCEK & KOZIOL, 1997). Forms of aggressive behaviour (attacks, pursuits or escorts) were similar to those described in the literature (GLUTZ VON BLOTZHEIM et al., 1971; CRAMP & SIMMONS, 1980), but "mirror behaviour" was recorded for the first time. This rare and interesting behaviour was observed in the Montagu's harrier and the marsh harrier. Mirror behaviour is a ritual form of aggression. During the time of this display aggressive elements of behaviour were not observed. Birds did not make any calls, attacks or pursuits. This behaviour happened on the boundaries of two territories of harriers. Similarly to communal soaring described by PANDOLFI & PINO D'ASTORE (1992) mirror behaviour may be perceived as a means of stabilizing the boundary between neighbouring territories.

Intraspecific aggression was stronger towards birds of the same sex. Females of Montagu's harrier more often attacked females than males. Similar data were obtained in the Italian population of Montagu's harrier (PANDOLFI & PINO D'ASTORE, 1992) and the North American population of the Hen harrier *Circus cyaneus* (TEMELES, 1990). Females defended their territory more aggressively against bigger and stronger females than smaller males who spent more time outside the territory. Therefore, the main competitor for territory and food for a settled female is another female. Similarly, for a paired male another male is the main enemy. Each male inside the owner's territory increases the risk of extra-pair copulation. Similar results were obtained in an experimental study on the risk of extra-pair cop-

ulation in Montagu's harrier in France (MOUGEOT et al., 2001).

The main interspecific intruder for both sexes of Montagu's harrier was the marsh harrier. However, it was mostly the males of the marsh harrier that were attacked. The time of courtship in Montagu's harrier overlaps with incubation for the marsh harrier. In this period females of the marsh harrier spend more time in the nest while their males are more active.

The cases of communal mobbing observed in the studied area were rare in this population. Rare cases of this behaviour have previously been described in Montagu's harrier (CLARKE, 1996).

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