

Status Specific Habitat Use in the Common Buzzard *Buteo buteo*

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ABSTRACT

A population of Common Buzzards *Buteo buteo* was studied in 1991 in a lowland area in Central Europe with respect to habitat utilization, social status and intraspecific interactions. The population consisted of adult paired birds, subadults, immatures, juveniles and transients (mostly of unknown age, here dismigrants and migrants). 36 birds were colour-marked or radio-tagged, in order to allow studies on population composition and -phenology.

In birds of different social status different habitat use was discovered. Pairs were resident and did reproduce in the area, therefore investing much energy to maintain high quality habitats. Paired Buzzards appeared to be socially dominant towards unpaired birds and transients. This dominance hierarchy could be the reason why unpaired birds and transients had to use habitats of lower quality.

INTRODUCTION

Ornithology in general and research on birds of prey in particular mostly over-estimate the breeding stock within a given population.

Non-breeders, however, make up considerable quantities in populations of longliving raptors: For the Common Buzzard in Germany up to approx. 38% of all individuals are younger than two years (a calculation based on age specific mortality rates given by Mebs 1964).

Moreover, in addition up to 50% of fully matured and paired Buzzards lay no eggs in years with poor food supply (Hohmann 1992). One has to assume that in general 25% to 30% of potential breeders do not actually reproduce (Newton *et al.* 1982; Picozzi & Weir 1974; Wittenberg 1974).

In view of this situation it appears logical that patterns of habitat-utilization are not necessarily identical for all members of a population. Habitat requirements of immature and subadult singles will substantially differ from those of paired and breeding birds, e.g. areas with unstable food resources and a lack of nesting sites are hardly acceptable for breeders but still valuable for non-breeders.

The study presented below deals with the following topics:

1. Actual composition of the individuals of a small but precisely observed population with respect to social status.
2. Utilization distribution and habitat use of individuals of different social status and its intrapopulation mechanisms.

Special consideration was given to intraspecific aspects like territoriality (territory defined as “defended area”, according to Tinbergen 1957) or social dominance hierarchy according to the fundamental studies of Picozzi & Weir (1974) or Weir & Picozzi (1975, 1983). The term “dismigration or dismigrants” will be used referring to Berndt & Winkel (1983) as an “abbreviated term for dispersion-migration; it includes dispersal and spacing” and excludes here any kind of longway flights towards special destinations further away.

STUDY AREA

The study, including trapping and marking, took place between February and December 1991 in an area of 70 km², of lowland grassland, typical of the western parts of Schleswig-Holstein, Germany, located circa 54° 22 N and 9° 19 W at an elevation of nearly NN (Figure 1). It is a landscape with only few small woods and copses, with almost the entire area being used as pasture for dairy-farming:

Potential nesting-places for Buzzards are rare but optimal feeding grounds are abundant.

For the study three different types of habitats were distinguished:

Type 1: Nesting, resting or sleeping habitats: woods or smaller copses.

Type 2: Optimal hunting habitats: pastures with high perching points and/or located close to type 1.

Type 3: Less suitable hunting habitats: pastures without or with only lower perching points and/or located far from type 1.

Figure 1. The study area (black) was located in the north of Germany.



METHODS

In winter, due to the shortage of alternative prey caused by snow cover, Buzzards were easily attracted to carrion-baited Goshawk traps and similar falling-lid traps (Kenward & Marcstrom 1983). During summer and autumn, with food being abundant, Goshawk traps and falling-lid traps apparently were too conspicuous and did not work any more. It was then possible to overcome the Buzzards' suspicion by using bow nets, which were hidden by a cover of cut off surrounding vegetation like grass (Bub 1974).

A total of 46 Common Buzzards were individually marked or recognized, 33 of them were trapped, 14 with Goshawk- or falling-lid traps, 15 with bow nets, and 4 birds with other traps.

Nine of these birds were equipped with tail-mounted transmitters (GFT, Kiel), the remaining birds were marked with patagial fixed wingtags or special tailtags (see Hohmann 1992). In addition

9 birds were individually recognized by their characteristic plumage or peculiarities of voice (hoarse). Seven nestlings were wing-tagged but only 4 of them reached the post-fledgling phase (Table 1).

Table 1. Trapping success, including recaptures and non-target species

Total of birds trapped	45
Recaptures	- 9
Rough-legged <i>B. Buteo lagopus</i>	- 2
Marsh Harrier <i>Circus aeruginosus</i>	- 1
Additional marked fledglings	+ 4
Buzzards recognized by plumage or voice	+ 9
Individually marked Common Buzzards	46

Due to the open landscape it was generally possible to discover all birds visually with binoculars. Transmitter-equipped birds allowed the study of long distance movements and observations during days of poor visibility or in cover.

After a bird was located, its position was plotted on a map in a 125-m-square-grid. Square grid coordinates were entered into a computer, and grid-cell and minimum convex polygon analyses were carried out (I.A. Todd in prep., "Wildtrak" Non parametric home range analyses for Macintosh Computers, see also Doncaster 1990). The grid cell method facilitated non-parametric quantitative estimates of habitat utilization in the Buzzards' home range, for example the use of core areas (the degree of differentiation is restricted by the grid cell size).

In addition to the location any social behaviour of the observed individuals was recorded (after Weir & Picozzi 1975). Normally one bird was observed for 15 min., but occasionally observations of individual birds were extended over several hours.

In addition to the marked Buzzards between July and November also all other Buzzards - mostly transients - were recorded. A short description of plumage patterns and behaviour of these unmarked Buzzards was prepared, in order to minimize bias resulting from difficulties in identification or differences in detectability of unmarked and marked Buzzards. This method allows to obtain comparable estimates of numbers of both groups. Thus in total 65 purely visual censuses - not using transmitters - were carried out within this period. Although I did not knowingly collect data on any unmarked Buzzard more than once, it is probable that some individuals were used more than once during the study.

Age classes of trapped individuals were differentiated by moult patterns of the primaries. A normal sequential and symmetric way usually identifies first year birds in their first moult. A completely asymmetric and transilient order is typical of adult birds. Subadults probably moult with an intermediate pattern (Piechocki 1963; Bährmann 1969; Hohmann in prep.).

Age class or status specific aggressiveness towards conspecifics is here called "social dominance", defined as proportion of successful interactions to all antagonistic interactions of one group observed. It became apparent that dominance differed with status of the counterpart or target (e.g. territory holders to strange intruders or territorial neighbours).

RESULTS

Composition of the population

A total of 317 Buzzards was recorded in the study area. 85% of all records fall within the period between July and November, when total censuses were carried out. Most of these birds were

transients, which were not properly individually recognized.

As mentioned before 46 Buzzards were individually known.

Three groups of social status were assigned to these birds (Table 2):

A. Paired birds: long term residents, usually territorial all over the year.

B. Unpaired birds: residents for some weeks up to several months; none was present for the entire study period; only a minority was territorial.

C. Transients: short-term residents; generally present for one day; not territorial.

Table 2. Distribution of age and status of individually marked Buzzards.

¹⁾: yearling included

²⁾: all marked Buzzards which are recorded in the area only for some days.

Age	adult	subadult	immature	juv.	unknown
	29	1	7	5	4
Status	paired	unpaired ¹	transient ²		unknown
	25	13	5		3

territorial~92% territorial ~31%

resident ~92% resident ~23%

Despite the much higher total numbers of non-marked transients, the number of transients observed during separate census days was in general 4 times lower than that of the resident birds (Residents/census day: $\bar{x} = 13.0 \pm 3.2$; Transients/ census day: $\bar{x} = 2.9 \pm 2.6$; $n = 65$ censuses). Their occurrence varied 3.7 times more than that of the local birds and did not correlate with the locals (SPEARMAN-R-coefficient: -0.06 , $p > 0.25$, $n = 65$ censuses). Only in July and at the end of September transient Buzzards reached numbers comparable to the local Buzzards' population.

Within the groups of local Buzzards (Groups A + B) more directly comparable figures of occurrence per day were available because many of the resident birds were individually marked. The vast majority, approx. 80%, were paired birds, while only about 20% were unpaired.

In general: The more resident and the more territorial a group (paired: unpaired: transient) the higher its proportion present at a time in the area.

Social dominance hierarchy

Paired Buzzards were by far the dominant group and transients the most submissive group. This was shown by the outcome of antagonistic interactions between individuals of all social status groups (Figure 2)

Paired Buzzards seldom interacted with other pairs, even paired neighbours, due to the respected territory border of other pairs (only 5% of all interactions of paired Buzzards) .

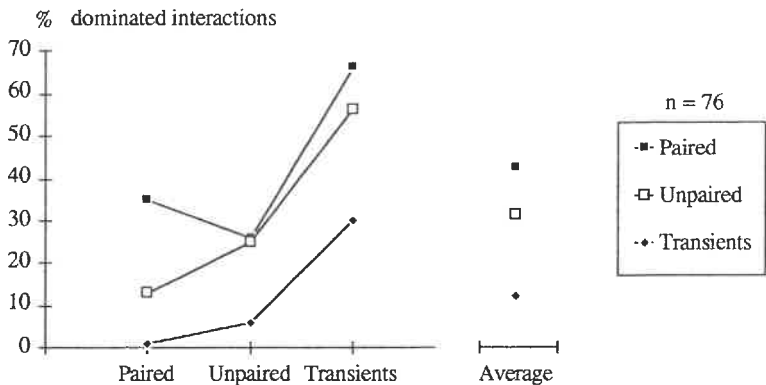
Interactions of paired birds with unpaired territorial neighbours occurred more frequently and were usually won by the paired Buzzards (35% of all interactions of paired Buzzards).

It could be the other way round if a paired male encountered an unpaired bigger female. (The term "paired" does not mean that the mates were together, so that there was no immediate numerical superiority).

Transients obviously "did not know" the boundary line of the territories of the birds of the territorial population. They therefore often moved into territories of local Buzzards, provoking interactions, which mostly ended in dominating behaviour by the territory owners (up to overt hostility) (see Weir & Picozzi 1975). However, in territories of unpaired birds transient intruders seemed more likely to be tolerated (Figure 3).

Unpaired Buzzards appeared to be intermediate dominant depending on whether territorial or

Figure 2. Interactions dominated by paired, unpaired and transient Buzzards (ordinate) towards other paired, unpaired and transient Buzzards (abscissa). Amount of each interaction unit (status x1 with status x2) set 100%.

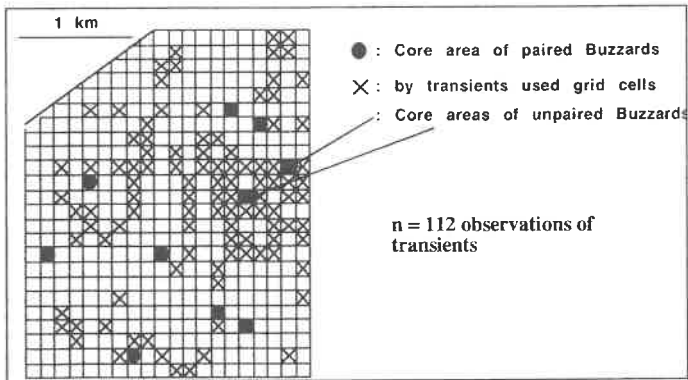


not. E.g. one radio-tagged unpaired Buzzard defended an area of approx. 100 ha but tended to extraterritorial excursions where it behaved like any other nonterritorial conspecific.

As a rule: The closer the status positions of two birds within the hierarchy the more likely an intrusion was tolerated. There is evidence that dominating paired Buzzards were able to move into other territories without being attacked except when moving into territories of other pairs.

Paired Buzzards were dominated by unpaired owners in only 3 of 14 cases of observed intrusions, whereas 7 unpaired intruders were not even tolerated once by paired owners.

Figure 3. Space utilization of transients compared with the core areas of local territorial Buzzards.



Habitat utilization

Paired Buzzards occupied high quality habitats, with (hunting) territories of type 2 being located in close vicinity to habitats of type 1 providing shelter. Their home ranges thus were equipped with the major logistic elements needed for feeding, roosting and nesting.

The few unpaired but territorial Buzzards set up their territories in areas of type 3, usually with no direct access to shelter. They therefore had to move at dusk to distant roost places, which were usually occupied by pairs. At dawn they left these extraterritorial overnight roosts usually long before sunrise. When an early departure was not possible (after heavy rain, I observed that a

subadult had to dry its feathers in the morning sun) such birds had to face hostile pursuits by territory owners.

The differences in quality of habitats used by the social groups are also reflected in the supply of home ranges with perches. In all territories of unpaired Buzzards ($n = 4$) fencing posts of only 1 m height were the only perches available. In contrast every territory claimed by pairs ($n = 8$) included posts of up to 4 m height, dead tall trees or pylons of 6 to 8 m height. For pronounced sit and wait hunters like Buzzards it has to be considered a real disadvantage, if no high perching points are available (Fitch *et al.* 1946; Janes 1985).

Transients as well as some local immatures and juveniles established no territories at all. Habitat characteristics of these non-territorial birds were similar to those areas used by territorial unpaired birds: they provided no shelter and no higher perches. The grid cell analysis supports what was expected by regarding the social dominance hierarchy: Transients were driven away more effectively from core areas used mainly by paired Buzzards (defined as areas which contain more than 50% of fixes of a bird) than from core areas used by unpaired Buzzards (Figure 3).

Due to the lack of territorial behaviour in non-territorials, and due to their lower social dominance, they appear restless and show patterns of unsettled space utilization. In terms of home range analysis this means that the total of used grid cells was smaller (actual used space) compared to the larger polygons (distance between fringe locations) even at small sample sizes (Table 3).

Table 3. Space utilization of three radio-tagged unpaired Buzzards associated with territoriality.

MCP: Minimum convex polygone

	territorial	semi-territorial	non-territorial
Fixes	99	60	23
MCP (ha)	164	321	1016
Grid cells (ha)	92	98	27

DISCUSSION

Habitat selection has been regarded as a function of environmental conditions (supply) and species-specific needs (demand) (Berndt & Winkel 1983) effected by overlying interspecific competition. Intraspecific mechanisms, except referring to sexual size dimorphism, have been considered to have less importance in habitat utilization of nonregarious or nonsocial animals, as are most raptors (see Janes 1985), e.g. the Common Buzzard.

This study, however, presents evidence that the differences in habitat utilization in the Common Buzzard were strongly associated with social dominance patterns.

1. Paired adult individuals are potential breeders of the area, probably for their entire life time (Mebs 1964). Requirements for successful reproduction are unlimited access to wooded areas for nesting and longterm stable hunting areas providing enough food for the adults over the entire year and for the offspring during each breeding season. Paired adults - having more at stake - invest much energy, through high aggressiveness and maintenance of social dominance to establish and hold territories incorporating the best possible habitat features.

2. Younger (or adult but unpaired) individuals, which could not breed at present, have no need to invest the same amount of energy as paired birds into aggressiveness and maintenance of social dominance. However, areas providing enough food for a limited time seemed to be still valuable for them, despite their lack of shelter and high perching points. The costs of establishing a territory for several months in such a habitat are therefore still worthwhile.

3. Transients like vagabonding (wandering) Buzzards, dismigrants or immigrants only had a

low local interest, as they stayed in the area only for hours or days at least in 1991. Pronounced aggressiveness or the establishing and maintenance of a territory and social dominance would therefore be a waste of energy for these birds.

The observed status-specific social dominance in Buzzards represents status-specific interests, with the interests being combined from actual and future needs of the individuals. In areas with limited availability of high quality habitats one has to expect that the social status group with highest interests will exclusively and successfully make a claim of these habitats, due to their readiness to invest more energy than others (Patterson 1980).

Younger individuals as well as strangers often seemed to be reluctant to use conspicuous perches. Travellers were frequently observed sitting directly in front of a high perch without using it. Unpaired Buzzards, even when strong enough to win direct interactions with weaker paired adults (i.e. female to male), never showed any kind of conspicuous display. Paired birds showed display flights or joined mutual soaring parties while unpaired neighbours were hardly ever seen soaring high in the air. Direct physical superiority as well as experience or age seemed to be of less importance. As soon as an individual changes its status (even if by chance), it also changes its behaviour (see McCrory *et al.* 1992).

Other studies on Common Buzzards support the conclusions here presented: Sylven (1978) observed single and paired individuals defending fixed areas in winter in southern Sweden. An exclusion of wintering migrants from otherwise suitable habitats by intraspecific territoriality seemed to be obvious as well.

Newton *et al.* (1982) found that paired Buzzards in Wales claimed all areas which included sheltered habitat, while unpaired birds stayed in treeless, open areas. Weir & Picozzi (1983) studied space utilization of marked unpaired Buzzards in Scotland. These birds selected similar open habitats. The authors emphasize that good habitats with shelter were used by unpaired Buzzards only when paired territory owners disappeared. It is interesting in this context that Scottish unpaired Buzzards only claimed small territories (35 ha) only for some weeks outside the breeding season. Unpaired Buzzards in my study area maintained summer territories over several months. Their territory size was similar to the space claimed by paired Buzzards in the study area (approx. 100-150 ha).

At the site here examined, paired Buzzards were bounded by the restricted nesting habitats available. Huge areas were left over for other population groups like unpaired or transient Buzzards. These areas (type 3) obviously allow unpaired birds to establish bigger and longer lasting territories than for example in Scotland.

Lowlands, flat valleys, plains and similar habitats with few nesting sites should generally be regarded as habitats providing suitable conditions for single and migrant Buzzards due to the restricted distribution of socially dominant pairs. The social mechanisms emphasized here could be, in addition to an advantageous food supply, a further explanation for the sometimes large numbers of Buzzards in some open areas.

In winter 1991/92 none of the immigrants tended to stay for a longer period of time or even establish new territories. No remarkable influx of Scandinavian migrants occurred during autumn due to small numbers of rodents in the study area. On the other hand, it is known that during favourable previous years the winter population could surpass the summer population by far (approx. 100 to 150 Ind./100 km² in summer to 1000 Ind./100 km² in some winters) (Looft & Busche 1990). It is possible that under these conditions the order of habitat use characteristics in the Common Buzzard depending on status and dominance will change.

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