

PREDATORY BEHAVIOUR IN CAPTIVE WILD BUZZARDS (*Buteo buteo*)

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ABSTRACT

The predatory behaviour of wild Buzzards (*Buteo buteo*) kept in captivity while recovering from injuries caused by illegal shooting was studied.

The predatory motivation of the birds is almost fully maintained, even after several months of inhibition due to captivity and repeated feeding on dead chickens. Birds preening during the test are likely to refuse subsequently to predate, confirming that preening is a conflict pattern also in the predatory context. Buzzards probably kill their prey by suffocation or crushing, since there is no evidence of talon use; nevertheless, some vicious pecking is performed towards the prey's head. Their general predatory behaviour is much similar so that observed in Kestrels, although they belong to a different family of raptors.

INTRODUCTION

Raptors have long been studied, possibly because of their role as predators. Nevertheless, little is known about the predatory behaviour sequence used by these birds to capture their prey (Sparrowe 1972; Lamont 1986; Bednarz 1988). In fact, studies on raptors have been mainly devoted to the ecological aspects of predation (e.g. Smith *et al.* 1972; Beissinger 1983; Snyder & Kale 1983; Widén *et al.* 1987) or prey selection (Mueller 1975, 1977; Ruggiero & Cheney 1979; Ruggiero *et al.* 1979; Korpimäki 1985, 1987).

Moreover, most of those studies regarded the behaviour of members of the Falconidae, while Accipitridae species have been much less studied. The present paper aims to contribute to a deeper knowledge of the predatory behaviour of the Buzzard (*Buteo buteo*) and to compare it with that

observed in the Kestrel (*Falco tinnunculus*) (Csermely *et al.* 1989). The opportunity to study in detail the patterns and behaviour sequence displayed by these birds was provided by the important Centro Recupero Rapaci (CRR) of Parma, managed by the Italian Society for the Protection of Birds (LIPU), which rehabilitates a number of different species of wild birds of prey injured by illegal shooting or stolen from the nest for the purpose of falconry.

Investigation into the predatory ability of these birds prior to release in the wild also has an applied importance in enabling one to ascertain whether, after the long but necessary period of captivity for physical recovery, they are fit to effectively capture prey, an aspect not always taken into account when raptors are released.

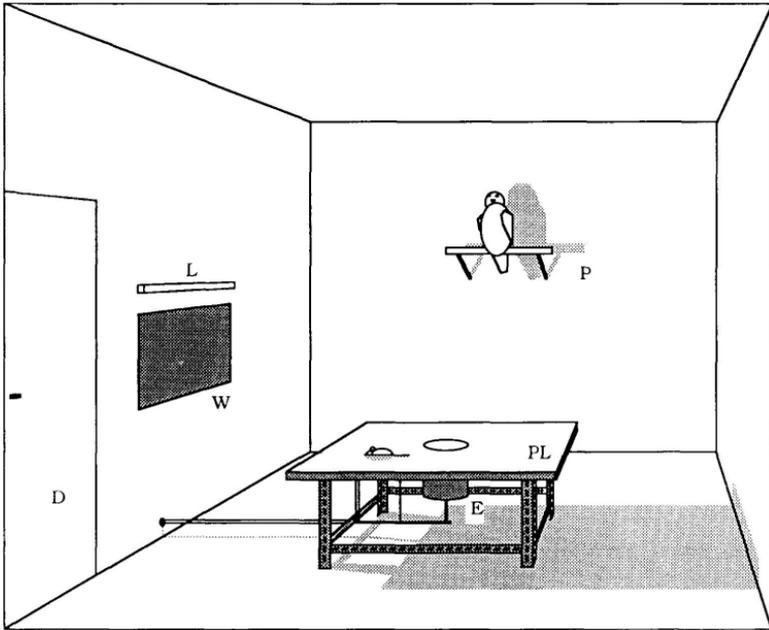
MATERIAL AND METHODS

The birds used were kept in two large pens, 9x9x4 in size, within the CRR. Both pens were equipped with several perches and water *ad libitum*. The photoperiod was always natural, the light coming through a number of windows equipped with iron bars along the side of each pen.

In one pen (heterospecific pen) 20 Buzzards lived together with 10 individuals of different species but of similar size: Honey Buzzard (*ernis apivorus*), Marsh Harrier (*Circus aeruginosus*), Short-toed Eagle (*Circaetus gallicus*), Long-legged Buzzard (*Buteo rufinus*). In the other pen 40 Buzzards lived with only conspecifics (homospecific pen). All the birds had been fed with chicken carcasses throughout the period of their stay at the CRR. The individuals used in the tests were chosen from among those in the best physical condition.

The tests were carried out in an experimental room 4.30 x 2.60m (Fig. 1) located in the same building as the maintenance pen. The room was empty save for a 60cm long perch placed at a height of 1.80m across the shorter side of the room, and a square wooden platform (60 x 60cm) with 60cm wire legs located in the middle of the room at a distance of 2.60m from the perch. A detailed description of the apparatus and methods for introducing the prey are found elsewhere (Csermely *et al.* 1989). A window was located just in front of the platform and fitted with a one-way screen, so as to prevent the raptor from seeing the experimenter sitting behind it. The behaviour of the birds on the perch was observed indirectly, using their image reflected in a mirror located near the window but outside the room.

Figure 1: A perspective sketch of the predation room. On the left the entrance door (D), one-way window (W) and an electric lamp (L), not used during the experiment. In front of the window the platform (PL) where the mouse had to be captured, with the elevator (E) for the mouse located below it. The mirror (not shown) used by the observer to see the bird on the perch (P) was outside the room, just behind the window.



Each bird was tested only once, in order to avoid any modifications in behaviour due to repetition of the same test. A total of 27 Buzzards were used. Among these, 10 were adults and 17 juveniles. The tests were carried out in the morning, between March and July. An adult laboratory mouse (*Mus domesticus*) of Agouti phenotype was offered as prey. This mouse was the first they could approach after arrival at the CRR. The mouse was inserted manually into a hole under the platform. Fifteen minutes later it was elevated semi-automatically onto the platform by the observer (this marked the start of the observation period) but only if the Buzzard was on the perch. The mouse was unable to escape and was completely visible to the Buzzard. We kept the number of tests as low as possible compatible with procuring a significant sample, whilst at the same time sacrificing as few mice as necessary, as recommended for instance by Huntingford (1984).

The birds were offered the test-prey after four days of fasting. We wished to enhance and equalise the predatory motivation for all birds. In fact, preliminary tests carried out after only two days without food rarely caused predation. On the other hand it has already been demonstrated that hunger is correlated with prey killing in captive raptors, such as the Broad-winged

Hawk (*Buteo platypterus*), the American Kestrel (*Falco sparverius*), and Screech-owl (*Otus asio*) Mueller 1973; Marti & Hogue 1979).

The age of the birds, i.e. whether adult (AD) or juvenile (JU) was considered, but the sex was not taken into account, due to the difficulty of detecting this for certain in subadults. All the birds were experiencing captivity for the first time.

The observation session was stopped if no predation occurred after 60 minutes from the appearance of the mouse on the platform. The behaviour patterns displayed by the birds before and during predation were recorded.

RESULTS

Only 17 birds took the prey (5 AD and 12 JU) (Chi-square test, $p > 0.1$) (Table 1). The behaviour before predation can be classified as either active or non-active. Eleven birds, out of the 17 predating, remained totally inactive on the perch, showing no difference between age classes, while only two remained inactive among those that did not take the mouse. Preening, performed by eight individuals, was mostly followed by feather shaking, with a significant correlation between the two patterns (C contingency coefficient = 0.524, $p < 0.001$) (Siegel 1956). Nevertheless, preening was performed irrespective of age.

Preening was performed with a mean latency of $1296.0 + 278.5$ (SEM) seconds, but with no difference between JU and AD birds. Moreover, preening was negatively correlated (C = 0.375, $p < 0.05$) with subsequent predation. The only three Buzzards performing both preening and predation clearly showed a direct trend for the latencies, i.e. the earlier the preening time, the earlier the predation.

Some individuals were also observed to abandon perch contact with one leg, pushing this forward and closing the talons, as when taking something with the foot. On other occasions some birds performed for a certain time rhythmic vertical movements with the head. Unfortunately it was impossible to quantify the frequency and duration of these patterns.

Among the birds active during the test 12 individuals performed one or more flights within the pen. These were not correlated either with age or with eventual capture of the prey.

Table 1: The total number of birds tested and the proportion of those taking or not taking the mouse. For both groups the number of birds displaying or not the various behaviour patterns considered.

No. of birds tested	27
No. of birds preying	17
No. of birds not preying	10
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No. of birds <u>preying</u> and:	
- preening/feather shaking	2
- not preening/feather shaking	15
- moving on the perch	4
- not moving on the perch	13
- flying	7
- not flying	10
- totally inactive before predation	11
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No. of birds not preying and:	
- preening/feather shaking	6
- not preening/feather shaking	4
- moving on the perch	5
- not moving on the perch	5
- flying	5
- not flying	5
- totally inactive during the test	2
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The mouse was approached in two different ways: 1) *directly*, i.e. landing directly on the prey (Fig. 2); 2) *indirectly*, i.e. landing on the platform and then walking toward the mouse and capturing it with an extended foot. The direct approach, most often used, was recorded in 13 birds (8 JU and 5 AD), while the indirect one was performed more rarely (4 cases) and only by JU individuals.

Figure 2: The direct approach to the mouse. (Drawn from a photograph).



The capture was carried out with a mean latency of $1072.8 + 187.4$ seconds. Juvenile birds had a slightly higher latency: 1147.4 seconds against 640.4 seconds. Furthermore, even though the mouse moved freely over the platform, capture occurred invariably when it was facing away from the Buzzard, as has already been reported for other species of the same family (Brosset 1973).

Most birds (14 individuals) "blocked" the mouse with only one foot. Ingestion followed with a certain latency, a bit longer for JU birds (111.2 seconds vs 91.8 seconds). The total mean duration of ingestion was $104.2 + 12.2$ seconds (the duration of one JU bird was missed). During that interval the Buzzards always remained standing over the mouse.

It is most likely that death was caused by suffocation or by crushing, since the use of talons to pierce the mouse's body was never clearly observed. Nevertheless, pecking was most often recorded. This activity was even performed repeatedly and with a mean duration of $6.1 + 0.6$ seconds. The pecks were not given with the tip of the bill, but by slightly opening the mandibles and giving a sort of bite. It was impossible to measure the pecking strength, but it was judged seemingly higher by us when the cephalic region was targeted, which occurred most of the time. The flanks were more rarely "bitten" (4 times) and the hind quarters only once.

Prey ingestion was carried out with the birds constantly displaying a particular "ingestion" posture (Fig. 3), different from the "blocking" posture described above, and generally at the place of capture. Independently from the time taken for ingestion the Buzzards never lost contact with the mouse. The raptor stood over its prey, holding it with its head facing towards the Buzzard itself and both feet "blocking" the mouse at the centre of its body. The eventual ingestion started from the mouse's head. The feet held the prey on the ground while the bill tore off scraps of flesh. The hind part was ingested whole, and no individual left any part of the mouse uneaten.

Figure 3: The typical ingestion posture. The use of two legs for blocking the mouse on the ground is shown. (Drawn from a photograph).



DISCUSSION

The results of this study show that the predatory behaviour sequence of Buzzards is barely affected by prolonged captivity. The age at the time of recovery, and consequently the amount of predatory experience as well, do not seem to have any effect. Nevertheless, some individuals refused to capture the mouse-prey, displaying, some of them repeatedly, many patterns that can be interpreted as displacement activities, e.g. preening. In fact, the

duration of such a pattern is directly related to a prolonged delay before mouse capture or, above all, its absence. The high number of birds taking the mouse without any previous movement can be related to the well-known habit of Buzzards to prey from a perch (Brown 1976; Cramp & Simmons 1980). Refusal to take has been observed also in a similar study on the Kestrel (*Falco tinnunculus*) (Csermely *et al.* 1989), although that species belongs to a different family and showed a higher frequency of successful predation. Possibly the reason for such a difference is found in the size of the test room, the same for both species, suitable for Kestrels, but somewhat smaller proportionally for Buzzards.

Comparing the capture techniques observed in that study and in the present one we found many similarities. Thus we disagree with Brosset's (1973) suggestions, after a study carried out on a smaller sample than our own, of a difference in capture technique between Falconidae and Accipitridae, claiming this as evidence of the phyletic distance between those taxa. Nevertheless, we can confirm at the same time another of Brosset's (1973) findings regarding the inhibition of predation when the prey is facing the raptor. In fact, the capture episodes we recorded were always carried out when the mouse was turned away. Possibly that posture could represent in captivity the escaping prey, and such movements are known to be a strong releasing stimulus for predation in the wild (Raeber 1949, quoted by Curio 1976). An alternative explanation is that the predator delays embarking on the predatory sequence until the mouse is facing away in order not to be seen by the prey itself. Furthermore, the two types of approach observed in this study, direct or indirect, can be related to the different feeding techniques displayed in the wild, e.g. perching or walking on the ground respectively (Brown 1976; Cramp & Simmons 1980).

The frequent use of prey-pecking is another interesting point with possible evolutionary implications. This pattern was performed by Kestrels only as a "facultative" aid to the immobilization of the mouse by the bird's feet (Csermely *et al.* 1989) and was very likely released by some movement of the prey, with the head-pecking serving as a means of inhibiting the central nervous system. Since the ratio between mouse and Buzzard size is much larger than that between mouse and Kestrel, it was expected that pecking would be almost never observed. The frequent use of it by Buzzards is possibly due to the type of prey they are adapted to capture in the wild. Although a very opportunistic raptor, preying frequently on small invertebrates such as grasshoppers and earthworms, especially in the Mediterranean region, the range of the Buzzard's prey varies from a few grams to the several hundred grams of a wild rabbit, hare, squirrel or weasel (Newton 1979; Cramp & Simmons 1980). The Kestrel has instead a much smaller upper limit of prey weight.

Our hypothesis is that a prey of such a great size is not completely immobilized by the Buzzard's foot, and the bill is then a necessary aid to that

goal. Moreover, the pecks recorded in our study were apparently much more vicious than those of the Kestrel, and often performed as a sort of true bite. The force of the peck strength against the mouse, carried out almost in a stereotypic way in our context, seems really disproportionate. That action would be an index of adaptation to deal with larger prey, being unsure of killing with just leg and foot pressure. We have no evidence of talons being used to kill the mouse, suggesting that these are used only for pinning a prey to the ground. It is probably more useful to stand in equilibrium. The talons obviously become necessary for a capture in flight, when they become a tool for killing prey, since it is almost impossible then to use foot pressure, as in the Goshawk (*Accipiter gentilis*) (Goslow 1971) and, moreover, it is also not possible to use the bill.

The more pronounced tendency of Buzzards than Kestrels to ingest the prey where the kill occurred could be an adaptation to their size. In fact, being of smaller size the Kestrel is better protected from attacks by possible predators if it leaves the ground as soon as possible. This is less important for the Buzzard, of larger size.

ACKNOWLEDGEMENTS

We are indebted to Dr. Francesco Mezzatesta, former General Secretary of LIPU, for allowing us access to the birds present at the CRR and its facilities, and to Mr. R. D. Chancellor for his useful comments on the manuscript. Gianluca Vicini made the line drawings. This research was supported by the Italian Ministero Pubblica Istruzione and Consiglio Nazionale delle Ricerche.

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