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Observations of a nest of the Black-chested Buzzard-eagle *Buteo melanoleucus* (Accipitridae) in a large urban center in southeast Brazil

Luiz Fernando Salvador-Jr.[1,2], Leonardo B. Salim[1], Marcell S. Pinheiro[3] and Marco Antonio. M. Granzinolli[4]

1. Neotropical Research. Grupo de Estudo para a Conservação da Fauna Neotropical. Rua Dona Cecília, 50/05, Serra, CEP 30220-270, Belo Horizonte, MG, Brasil. E-mail: neotropicalresearch@hotmail.com
2. Programa de Pós-Graduação em Zoologia de Vertebrados PUC-MG. Avenida Dom José Gaspar, 500, Prédio 41, Coração Eucarístico, CEP 30535-610, Belo Horizonte, MG, Brasil.
3. Programa de Pós-Graduação em Ecologia, Conservação e Manejo de Vida Silvestre UFMG. Avenida Presidente Antônio Carlos, 6627, Pampulha, CEP 31270-901, Belo Horizonte, MG, Brasil.
4. Laboratório de Ecologia de Aves, Departamento de Ecologia, Universidade de São Paulo, CEP 05508-900, São Paulo, SP, Brasil.

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RESUMO: Observações em um ninho de Águia-chilena *Buteo melanoleucus* (Accipitridae) localizado em um grande centro urbano do sudeste brasileiro. Entre junho e dezembro de 2005 foram despendidas 383 h de observações em um ninho de águia-chilena *(Buteo melanoleucus),* localizado no município de Belo Horizonte, MG, Brasil. Durante este período foram descritos aspectos relacionados ao comportamento de cópula, assistência ao ninho, aporte de presas, defesa do território, cuidado parental, desenvolvimento do filhote e dieta da espécie. Sessenta e seis cópulas ocorreram entre junho e julho, sendo realizadas sempre fora do ninho. Apesar de ambos os sexos participarem de todas as atividades relacionadas ao ciclo reprodutivo, estes exerceram papéis diferenciados durante o decorrer do mesmo, estando a fêmea associada a maior dedicação na incubação e no cuidado parental e o macho a captura da maioria das presas. O sucesso reprodutivo foi de apenas um filhote, que abandonou o ninho em definitivo com cinqüenta e seis dias de vida. Comportamento agonístico por parte dos membros do casal foi registrado frente aos pesquisadores e a três espécies de aves de rapina. A dieta da espécie foi composta principalmente por pombos domésticos, refletindo desta maneira, um acentuado oportunismo trófico na área de estudo.

PALAVRAS-CHAVE: *Buteo melanoleucus,* águia-chilena, comportamento reprodutivo, dieta, ambiente urbano.

ABSTRACT: From June to December 2005, we conducted 383 h of observations of an urban nest of Black-chested Buzzard-eagle *(Buteo melanoleucus)* located in Belo Horizonte, MG, Brazil. During this period, aspects related to copulations, nest attendance, prey deliveries, territory defense, parental care, development of the chick and diet of the species were characterized. Sixty-six copulations took place from June to July, always outside of the nest. Although both sexes participated in all activities related to the breeding season, they performed different roles during this period. The female dedicated more to incubation and parental care, while the male provided most of preys. Only one nestling was born. It left the nest definitively fifty-six days after hatching. During the investigation, the researchers and three raptor species were targets of antagonistic behavior by the Black-chested Buzzard-eagles. The diet of the species was comprised mostly of Rock Pigeons, reflecting an accentuated trophic opportunism in the study area.

KEY-WORDS: *Buteo melanoleucus,* Black-chested Buzzard-eagle, breeding behavior, diet, urban environment.

The Black-chested Buzzard-eagle *(Buteo melanoleucus)* is widely distributed throughout South America, inhabiting open areas from Tierra del Fuego to Venezuela (Ferguson-Lees and Christie 2001), extending east across the continent, reaching the south, southeast and northeast of Brazil (Sick 1997, Ferguson-Lees and Christie 2001).

In spite of its larger size in relation to the majority of the other buteonine hawks (Amadon 1963, Hiraldo *et al.* 1995, Ferguson-Lees and Christie 2001), and the fact that it is considered one of the most conspicuous raptors in the South-American continent (Jiménez and Jaksic 1990), little is known about its biology in Brazilian territory (Sick 1997, Souza 1999, Zorzin *et al.* 2007).

Although reproductive aspects of the Black-chested Buzzard-eagle have already been reported in Argentina (Travaini *et al.* 1994, De Lucca and Saggese 1995, Hiraldo *et al.* 1995, Saggese and De Lucca 2001, 2004), Chile (Housse 1926, Jiménez and Jaksic 1990, Pavez 2001) and Peru (Schoonmaker 1984), until now only Souza (1999) and Zorzin *et al.* (2007) have reported aspects of its breeding biology in Brazil.

Therefore, the present study aims to provide detailed information about the breeding behavior of a pair of Black-chested Buzzard-eagle and their nestling's development during the 2005 reproductive season in a large urban center in southeast Brazil, providing new and additional data to the investigations carried out by Sousa (1999) and Zorzin *et al.* (2007) in the country.

STUDY AREA

The study was conducted on the Serra do Curral mountain ridge in Belo Horizonte (19°55'S, 43°56'W), southeastern Brazil. Occupying an area of 335 km^2 and situated approximately 860 m above sea level (Brandão and Araújo 1992, Gomes 2005), the city is an important metropolis with approximately 2,300,000 inhabitants (IBGE 2000). Inserted in an area where the cerrado domain is predominant (Brandão and Araújo 1992), the county has, inside of this complex, other vegetation formations such as Atlantic Forest, seasonal forest, hydrophilous communities, as well as cleared and rupestrine fields (Rizzini 1963). In spite of its diversity, the native vegetation covering the region has been extensively disrupted by the continuous urban expansion, mining and industrial activities (Brandão and Araújo 1992).

Forming the city's southern limit, the Serra do Curral mountain ridge has been greatly affected by mining activity, especially on the slopes facing the county of Nova Lima. Although it is considered a natural heritage site and was elected as the symbol of Belo Horizonte, little effort has been made to preserve it.

METHODS

From June to December 2005, 383 h were spent observing the nest and its surroundings. The observations were made at different times of day and from specific sites using 10 x 25 and 10 x 50 binoculars. To characterize the nest, measurements were taken of its diameter, the branch pile thickness, and its approximate height in relation to the ground, as well as the duration of direct sunlight incidence over it. Its orientation was determined according to Travaini *et al.* (1994). Behavioral aspects related to copulations, prey deliveries, nest attendance, parental care, and territorial defense were also registered. The nestling development, the diet and interactions with other raptors present in the study area, including the juvenile Black-chested Buzzard-eagle born in the breeding season of the previous year, were also recorded. Genders were identified by the larger size of the female in comparison to the male (Housse 1926, Amadon 1982, Ferguson-Lees and Christie 2001), and confirmed by the positioning of the individuals during copulations, which were considered successful only when there was apparent contact between both cloacas. To determine the minutes spent by each sex in caring for the nest and parental care, only the visits where the moment of the individuals' arrival and departure could be detected were recorded. When in doubt about the gender of the observed individual, the spotting and identification of the other individual served as confirmation. The reproductive cycle periods were determined according to Newton (1979). In order to not cause stress and a possible abandonment of the nest by the parents as reported by Housse (1926), the visits close to its vicinities took place only after the beginning of the nestling period. The diet was determined by direct observation and collection of prey remains within the nest territory. These were classified to the smallest taxonomic category possible.

RESULTS

Nest characteristics and copulation

The nest was constructed on a plateau located at the base of a negative wall, approximately 50 m from the ground. It was composed only by dried sticks, although the Black-chested Buzzard-eagles also deposited green sprigs inside and around its edge. Measuring 160 cm in diameter and 24 in height, the structure had a shallow hatching chamber slightly unleveled in relation to the edge. Towards the west direction, during the breeding season it received direct solar light incidence for approximately seven hs a day.

From June 12 to July 29, sixty-six copulations attempts were observed. Fifty-one (75%) of them were considered successful. Forty-four (86%) couplings occurred in trees or shrubs, five (10%) on rocks, and two (4%) on the ground of the nest territory. During mating, both sexes called intensely. The female kept her wings open and the body in a horizontal position while the male, on her back, flapped his wings repeatedly as he mated with her.

Copulations preceded by the visit of the male to the nest were observed on twenty-four (47%) occasions. In nine (37%) records, some sort of nesting material was brought. Those preceded by the visit of the female were observed on sixteen (31%) occasions. In seven (44%) of these observations, some material was brought to the nest.

The last successful copulation was observed on July 29, thirty days before the birth of the nestling, when the pair was incubating.

Nest attendance, prey deliveries and parental care

Both sexes participated in all activities related to nest attendance, delivery of preys, and parental care. The in-

TABLE 1: Number of events related to nest attendance, prey deliveries and parental care during the 2005 breeding season in the Black-chested Buzzard-eagle nest. The duration of the reproductive periods are: Pre-laying (June first half to July 22), Incubation (July 23 to August 26), Nestling (August 27 to October 20) and Post-fledging (October 21 forward). In the permanency overage, consider standard deviation; both in minutes. Data between ( ) represent percentage. Ui = Unidentified individual.

	Pre-laying			Incubation		Nestling		Post-fledging		
	Male	Female	Ui	Male	Female	Male	Female	Male	Female	Ui
Number of visits	126	98	—	55	58	38	28	07	15	—
Permanency overage	2.5 ± 1.5	19 ± 13.4	—	38 ± 27.4	35 ± 23.3	2.5 ± 2.0	25 ± 22.5	5.0 ± 4.7	17 ± 14.9	—
Material delivery	62 (49)	43 (44)	—	02 (04)	07 (12)	—	05 (18)	—	—	—
Prey delivery	06 (40)	05 (33)	04 (27)	11 (100)	—	08 (89)	01 (11)	04 (67)	—	02 (33)
Feeding of the nestling	—	—	—	—	—	02 (22)	07 (78)	—	—	—

vestment spent by each sex, divided by each reproductive period, is shown in Table 1.

On the third day of observation (June 14), the juvenile Black-chested Buzzard-eagle born in the 2004 reproductive season attacked one of the pair members in a attempt to steal the prey held in its claws. As the juvenile raptor approached, the adult released the prey into the air and adopted a defensive position, rotating his body laterally and showing its claws as a warning sign. The prey was then taken and eaten by the juvenile raptor in the pair's territory.

From July 18th, five days before the beginning of the incubation period, the female began spending every night in the nest without interruption. The nestling period began with the birth of only one chick. Along with feeding the nestling, the adults also shaded the chick during this phase. With their back towards the sun and wings partly opened, this activity usually occurred during the hours of most intense heat and sunlight over the nest. Although present in the post-fledging period, the parents did not deliver prey directly to the young Black-chested Buzzard-eagle, leaving them at distant perches as they became increasingly intolerant with its presence.

Territory defense and interactions with other raptors

Three raptor species and humans were target of attacks interpreted as territorial interactions. Fifty-eight agonistic interactions were detected against these birds (60%), and thirty-eight (40%) directed towards the researchers (Table 2).

TABLE 2: Attacks by Black-chested Buzzard-eagle against intruders in the nest territory. Percentage values inside parentheses. * Juvenile Black-chested Buzzard-eagle born in the 2004 breeding season.

Intruders	Male	Female	Attacks
*Buteo melanoleucus**	25 (61)	16 (39)	41
Researchers	12 (32)	26 (68)	38
Coragyps atratus	10 (67)	05 (33)	15
Caracara plancus	01 (50)	01 (50)	2
Total	**48**	**48**	**96**

The juvenile Black-chested Buzzard-eagle born in the previous year was the most severely punished by the pair. It was the target of the most intense attacks by the adults, many of them involving hard body combats. Unlike the attacks against the raptors, on those directed towards the researchers, the female was much more aggressive than the male. These defensive conducts were comprised of vigorous calling and diving flights near the intruders.

In spite of their large size, the Black-chested Buzzard-eagles were severely harassed by a pair of American kestrel also residing in the nest territory, with eleven attacks against them observed during the study period.

Nestling development

The nestling demonstrated little activity during its first days of life. Twenty-eight days after its birth, it still spent most of its time lying over its tarsus. Its body was covered with white plumes and its wings with dark covert feathers and developing remiges. On the thirty-fifth day, it already had dark and pale brown feathers on the chest, abdomen and on the dorsal surface of the wings. It could support its own weight, standing up and making its self visible on the nest edge. It stretched and exercised its wings while performing small jumps. The beak and the claws were more developed in relation to the rest of its body.

At forty-three days old, it still had plumes on the top of its head, neck, ventral surface of wings and thighs. However, dark and pale brown covert feathers already covered a great part of its body. At this age, it became much more aggressive to human presence, keeping its beak open and calling to the adults. It was also capable of regulating its body temperature, since its parents no longer protected it from the sun.

Fifty days after birth, the adults stopped feeding it, compelling the chick to manipulate for itself the prey items brought to the nest. The female also stopped spend-

ing the night in the nest. The only plumes still visible were on the ventral surface of the wings, and the nestling already had the appearance of a young Black-chested Buzzard-eagle.

At fifty-six days old, the young raptor left the nest definitively. It already had a much darker plumage on its back, and the abdomen was blotched. It moved with difficulty inside the pair's territory, flapping its wings and jumping on the ground of the ridge. From this phase onward, it was forced to forage for preys in the places where its parents left them.

Thirteen days after leaving the nest, the young could already move by taking short flights throughout the extension of the ridge. Its first soaring flights were observed after twenty-three days, although the difficulty in landing was still noticeable.

Eighty days after birth, it still spent most of its time near the nest, trying out and stretching its wings even after having flown in many different modalities, heights and distances, including many diving flights over the pair's territory.

Diet analysis

During the study period, the consumption of 41 prey items was detected in the nesting territory (Table 3). Birds represented the majority of the captures, with the Rock Pigeon *(Columbia livia)* being the most common prey, corresponding to more than half of all items consumed. Preys that could not be identified also corresponded to a significant part of the consumption, while mammals represented the small fraction of the Black-chested Buzzard-eagles' diet.

Seven failed attacks were also detected. Five (71%) of them were conducted against *C. livia* and two (29%) directed towards *Falco sparverius.* Of this total, two attacks (29%) were characterized by cooperative hunting by the pair, both directed towards pigeons in flight.

DISCUSSION

The choice of an appropriate nesting site is vital for the birds' reproduction as it is responsible for sheltering eggs, adults and chicks during critical periods of the life cycle (Travaini *et al.* 1994). According to these authors, an adequate nest should offer enough protection against predators as well as providing the minimal necessary environmental conditions for its inhabitants. Positioned under a negative wall, the present nest is well protected against storms and winds, remaining shaded for a longer period than those reported by Jiménez and Jaksic (1990) in Torres del Paine, and more exposed to the solar rays than that described in Peru by Schoonmaker (1984).

Larger than the majority of the nests of this species described previously in other localities (Housse 1926, Schoonmaker 1984, Jiménez and Jaksic 1990, Hiraldo *et al.* 1995, Souza 1999, Saggese and De Lucca 2001), its large size seems to be related to its reuse throughout the years. Although the first records of its use date back to the beginning of the 1980's (C. E. A. Carvalho, unpublished data), it may have been used by the Black-chested Buzzard-eagles for much longer, as has been observed for the nests of other raptors (Bent 1938, Ferguson-Less 1951, Newton 1976).

The development of the breeding season during the dry period is in agreement with Newton (1979), who stated that in the tropics, raptors normally breed in the seasons with the lowest rainfall levels. In the present study, as well as in that conducted by Zorzin *et al.* (2007), breeding started earlier in relation to Argentina (De Lucca and Saggese 1995, Hiraldo *et al.* 1995, Saggese and De Lucca 2001) and Chile (Housse 1926, Jiménez and Jaksic, 1990, Pavez 2001), but later when compared to Peru (Schoonmaker 1984), a fact probably related to latitudinal and environmental factors acting on prey availability (Newton 1979) in each of these study areas.

The behaviors adopted by each sex during the couplings are similar to the ones described in the studies conducted by Pavez (2001) and Saggese and De Lucca (2001).

TABLE 3: Prey items consumed by Black-chested Buzzard-eagles in Belo Horizonte, MG, during the 2005 breeding season. * Preys detected by direct observation and collection of remains; ** Preys collected over cliffs within the nest territory; *** Preys detected by direct observation; **** Flesh fragment containing a dark hairy tail; Ni = Not identified.

Class	Order	Family	Species	N	%
Birds				31	75.6
	Columbiformes	Columbidae	*Columba livia**	27	65.9
	Passeriformes	Emberizidae	*Piranga flava***	01	2.4
	Strigiformes	Tytonidae	*Tyto alba***	01	2.4
	Ni birds***	—	—	02	4.9
Mammals				01	2.4
	Ni mammal****	—	—	01	2.4
Ni vertebrates***	—	—	—	09	22
Total				**41**	**100**

The copulation pattern coincides with those observed for other raptors, in which the pairs made several attempts during a long period of time (Brown 1966, Bertran and Margalida 1999), probably more than enough for the fertilization of the eggs, suggesting that they also served additional functions, such as pair bonding (Newton 1979, Petrie and Hunter 1993), to guarantee the offspring paternity (Hunter *et al.* 1992) and to serve as an indicator of the males' physical capacity and reproducibility (Tortosa and Redondo 1992). Copulations preceded by delivery of material to the nest have also been detected often for *Stephanoaetus coronatus* (Brown 1953, 1966), a species that opposite from *B. melanoleucus,* copulates in its nests. The proportion of successful copulations was the same as recorded by Bertran and Margalida (1999) for *Gypaetus barbatus* in the Spanish Pyrenees.

The turn-taking patterns adopted by this pair during the incubation period were similar to those detected for the great majority of the raptors studied (Newton 1979). However, our results, like those obtained by Pavez (2001), show a greater contribution of the male Black-chested Buzzard-eagles in the thermoregulation and protection of the eggs than other raptor species (Brown, 1952, 1953, 1966, Matray 1974, Retting 1978, Newton 1979, Collopy 1984, Lyon and Kuhnigk 1985, Klein *et al.* 1988).

The gradual development of a distancing behavior in the parents in relation to the young throughout the post fledging period appears to be common among raptors, with their presence in the adult's territory normally tolerated until the beginning of the next breeding season (Newton 1979). According to this author, the objective of such behavior is to avoid disturbances or even possible lesions that may be caused by these birds, which are always hungry. Differing from what was reported by Brown (1966) for *S. coronatus,* we believe it may be the first effort of the adults to encourage the fledgling raptor to seek its independence and own territory. The placement of preys on cliffs far from the young and the increase in number and intensity of the aggressions by the pair against the juvenile born in the previous breeding season seem to support these hypothesis.

The interspecific territorial attacks were directed towards the two most abundant raptors in the study area, being conducted in a similar way as those described by Bustamante *et al.* (1997) for the species in Argentina. However no attacks were carried out by the parents together, as was observed in Peru by Schoonmaker (1984).

The attacks by American Kestrels against the Black-chested Buzzard-eagles seem to be associated with the predator/prey relation that exists between these two species, as observed in the present study as well as by Zorzin *et al.* (2007) in the same breeding site. Intraspecific behaviors towards adults that occasionally appeared were peaceful like those described by Saggese and De Lucca (2001) and Bustamante *et al.* (1997), but differed from those mentioned by Jiménez and Jaksic (1989), since no agonistic behavior was detected during the study. In contrast with the observations made by Bustamante *et al.* (1997) and Sousa (1999), all the contacts involving juveniles resulted in agonistic interactions.

The alert calls emitted and the attacks made by the adults against the researchers in the vicinity of the nest do not agree with the behavior reported by Housse (1926) and Jiménez and Jaksic (1990) for other pairs in Chile, as well as for five of six couples studied by Saggese and De Lucca (2001) in the Argentinean Patagonia, probably because defensive behavior varies intraspecifically according to the type of relation existent between raptors and humans in different places and regions (Newton 1979). A greater participation of the female in the attacks against humans in close proximity of the nest was also reported to *S. coronatus* (Brown 1953, 1966), *Harpia harpyja* (Retting 1978) and *Spizaetus ornatus* (Lyon and Kuhnigk 1985). It is also in agreement with the patterns normally observed for raptors that defend their nests in a vigorous manner (Newton 1979).

Both behavioral and ontogenic developments of the young of the year and the juvenile from the previous breeding season were similar to those described for the species by Pavez (2001) in Chile, Saggese and De Lucca (2001) in Argentina, and Zorzin *et al.* (2007) in southeastern Brazil.

In spite of its euryphagous feeding habits (Schlatter *et al.* 1980, Jiménez and Jaksic 1989, 1990, Hiraldo *et al.* 1995, Bustamante *et al.* 1997, Sousa 1999, Zorzin *et al.* 2007), the diet based mainly on the predation of the *C. livia* has been detected since the first investigations conducted in Belo Horizonte (Zorzin *et al.* 2007), and seems to reflect the trophic opportunism already reported for the species (Jiménez and Jaksic 1990, Pavez *et al.* 1992). Among all the prey items, the Rock Pigeon is, undoubtedly, the most conspicuous and abundant, being apparently the trophic resource responsible for allowing and supporting the reproduction of these raptors in the Serra do Curral mountain ridge over the years. The consumption of mammals and other birds, including the Common Barn Owl *(Tyto alba)* was also detected in Serra do Curral (Zorzin *et al.* 2007) and lower Rio São Francisco (Sousa 1999) breeding sites, composing the species' diet in southeastern and northeastern Brazil. The attacks against the Americam Kestrels, as well as the cooperative hunting by the parents, also reported by Zorzin *et al.* (2007), do not seem to be restricted to the study area, having also been recorded in other locations by Housse (1926) and Jiménez and Jaksic (1990).

Although inserted in a different environment, subject to anthropic pressures of many natures, such as real estate speculations, fire, vandalism, pollution, high noise levels, and seismic disturbances provoked by the use of explosives to extract iron ore in the vicinities of the nest-

ing territory, the species seems relatively well-adapted to the changes caused by the degradation of its natural habitat in Belo Horizonte, even showing many characteristics common to the wild populations.

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