

Possible scavenging behavior in Ornate Hawk-Eagle (*Spizaetus ornatus*) in Amazonas, Brazil

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ABSTRACT: We provide documentation of the first observations of interactions with carrion in the Ornate Hawk-Eagle (*Spizaetus ornatus*), a species formerly assumed only to prey on live food items. During fieldwork in RESEX Médio-Juruá reserve, in Amazonas, Brazil, in June-August 2009, images were captured by remote camera traps of an Ornate Hawk-Eagle interacting with a cattle femur, indicating possible scavenging behavior. Additionally, apparent investigatory behavior was also recorded in Slate-colored Hawk (*Buteogallus schistaceus*), a previously unrecorded behavior for the species. We suggest that additional work with camera traps monitoring carrion may reveal opportunistic scavenging to be more widespread in tropical forest raptors than has generally been assumed.

KEYWORDS: *Buteogallus schistaceus*; foraging ecology; raptors; scavenging behavior; *Spizaetus*.

INTRODUCTION

Many tropical raptors, particularly forest dwellers, are secretive and difficult to study. Remote localities, low population densities, inconspicuous behaviors, complex (and often dense) vegetation, and high diversity have led to a generally slow accumulation of basic natural history knowledge of many species (Robinson 1994; Bildstein *et al.* 1998). Raptors are highly susceptible to forest loss, perturbation, and fragmentation: disturbed habitats retain only impoverished raptor communities dominated by open habitat or generalist species (Turley *et al.* 1992).

The Ornate Hawk-Eagle (*Spizaetus ornatus*) is widespread throughout much of the lowland Neotropics, generally occurring below 1,800 m asl. It is resident from northern Mexico to southern Brazil (throughout the Amazon Basin), northern Argentina, and Paraguay (Howell & Webb 1995; Iliff 2010). BirdLife International (2012) classifies the species as 'Near-threatened' on the IUCN Red List, its primary threat being future habitat loss (Bird *et al.* 2012), although arbitrary persecution has also been recorded (Trinca *et al.* 2008).

Hawk-eagles, formerly all subsumed under *Spizaetus* (Aves: Accipitriformes) are now widely separated into *Spizaetus* (New World) and *Nisaetus* (Old World; Helbig *et al.* 2005; Haring *et al.* 2007). Despite these recent taxonomic developments, these species occupy similar ecological niches and this is reflected in their known feeding behaviors. In the Neotropics

the *Spizaetus* guild is made up of four species; Black Hawk-Eagle (*Spizaetus tyrannus*), Black-and-white Hawk-Eagle (*Spizaetus melanoleucus*), Ornate Hawk-Eagle, and Black-and-chestnut Eagle (*Spizaetus isidori*). The recorded diets of these species are varied, but their documented hunting strategies are similar and all of a sub-canopy nature (Robinson 1994; Ferguson-Lees & Christie 2001), although Black-and-white Hawk-eagle has also been recorded to hunt by diving from a great height into the canopy (Brightsmith 2002).

Feeding Ecology and Diet of Ornate Hawk-Eagle and Similar Species

Robinson (1994), groups Ornate Hawk-Eagle in a guild of seven similar species in Amazonian forest that utilize similar hunting strategies, ambushing large birds and mammals from concealed/sub-canopy perches or long-range (> 50m) attacks on congregations of birds and mammals. The other six species are: Collared Forest-Falcon (*Micrastur semitorquatus*), Bicolored Hawk (*Accipiter bicolor*), Black-and-white Hawk-Eagle, Black Hawk-Eagle, Crested Eagle (*Morphnus guianensis*), and Harpy Eagle (*Harpia harpyja*). Documented feeding ecology of Ornate Hawk-Eagles is typical of this grouping; pouncing on prey or giving a short chase (Ferguson-Lees & Christie 2001) and high speed dives, for example on herons and rallids, troops of monkeys, and a Guianan Cock-of-the-rock (*Rupicola rupicola*) lek (Trail 1987; Hilty 2003).

Recorded diet of Ornate Hawk-Eagle is widely varied in terms of species. Flatten *et al.* (1990) found, of 52 prey items at a nest studied in Guatemala, 40.4% were avian, 46.1% were mammalian, and 13.5% unidentifiable. Klein *et al.* (1988) studied a nest in Manaus, Brazil, and found, of 49 prey items; 63.5% were avian, 32.7% mammalian, and 4.1% reptiles. Supporting Robinson (1994), avian prey was of relatively large size such as cracids, macaw sp. (*Ara* sp.), and tinamous; mammals recorded included a porcupine sp. (*Coendu* sp.), opossums, and Common Squirrel Monkey (*Saimiri sciureus*). Other recorded prey items or attacks have been similar, such as Robinson (1994)—small primates, cracids, gallinules, macaw sp. (*Ara* sp.), and Pale-winged Trumpeter (*Psophia leucoptera*); Lyon & Kuhnigk (1985)—tinamous, cracids, and Gray-headed Dove (*Leptotila plumbeiceps*); Russell (1964)—Great Curassow (*Crax rubra*); Kilham (1978)—Crested Guan (*Penelope purpurascens*); Friedmann and Smith (1955)—guan sp. (*Penelope* sp.), and Acosta-Chaves *et al.* (2012) of a Long-tailed Silky-flycatcher (*Ptilogonys caudatus*). A number of other prey types have also been detected, such as Green Iguana (*Iguana iguana*; Clinton-Eitniear *et al.* 1991), a large colubrid-type snake (Robinson 1994), and unidentified snake and lizard sp. (Klein *et al.* 1988). It would appear from this diversity of recorded prey items that this species is opportunistic and generalist in its foraging niche.

Scavenging behavior or feeding on carrion appears to be very rare in this guild of species, although there are some records of species feeding on stored prey that are likely to be at least partially decomposed. A Harpy Eagle, for example, was recorded feeding on a Brown-throated Three-toed Sloth (*Bradypus variegatus*) over a period of three days at the same site, which probably represented the first report of a non-scavenging raptor repeatedly feeding for more than two days on prey (Springer *et al.* 2011). However, it is likely that the Harpy Eagle recorded was released as part of a rehabilitation program, which poses the question whether this behavior is natural or a product of exposure to carcasses throughout the program. Such behavior also seems to be rare or unrecorded in similar species worldwide, although (African) Crowned Eagles (*Stephanoaetus coronatus*) reportedly rarely feed on carrion (although no specific example is given) and, after a kill, have been recorded to cache and re-visit food for several days (Ferguson-Lees & Christie 2001).

Herein, we report photographic evidence of investigation and interactions with carrion indicating possible scavenging behaviors of an Ornate Hawk-Eagle on cattle femurs monitored by remote camera trapping in primary lowland Amazonian rainforest in Amazonas, Brazil. Further, we also documented investigatory behavior by a single Slate-colored Hawk (*Buteogallus schistaceus*), a previously unrecorded behavior for the species.

METHODS

The femurs (Figure 1) were placed in the forest on 27 July 2009 as part of a larger study investigating nutrient cycling. Over a two month period we spread 186 femurs 150 m apart along six transects tied to trees with wire. Reconyx HP45 camera traps (Reconyx, LLP, 3600 Hwy 157, Suite 205, La Crosse, Wisconsin) were used to monitor 10 femurs for the first five weeks of their placement to record vertebrate scavengers. Despite continuous deployment, problems with batteries meant camera traps were not monitoring continuously for the five week period and a total of 217 camera-trap days were recorded (of a potential 350). Camera traps were placed 30 cm off the ground ~4 m away from the femur, set to their default trail setting; to take three photos at 1-s intervals for every detected motion. We monitored femurs near animal trails or in areas expected to achieve higher capture rates and cameras were placed at least 1 km apart to ensure a degree of independence. Areas being heavily used by local people for hunting and other forest activities were excluded from the camera trapping effort.

RESULTS

On 28 July 2009 a Reconyx HP45 camera trap captured 12 photos, from 1302-1304 h, of an adult Ornate Hawk-Eagle interacting with a cattle femur (Figure 2) at GPS coordinates 5.36692,S, 67.28954 W in the RESEX Médio-Juruá reserve, in Amazonas, Brazil. The femur had been placed in the forest the day before, on 27 July. While no actual feeding was recorded, the individual approached and interacted with the femur, placing its talons on the femur on two occasions. Figure 1 shows how little flesh there was on the bone, which may explain the absence of feeding. At 1136 h on 13 August 2009, three photos (Figure 3) were captured by a Reconyx HP45 camera trap of a single Slate-colored Hawk briefly investigating a femur site at GPS coordinates 5.37409 S, 67.28370 W. The femur had been placed in the forest 17 days previously, on 27 July.



FIGURE 1. Cattle femur (photographed one day prior to the Ornate Hawk-Eagle (*Spizaetus ornatus*) interaction).



FIGURE 2. Camera-trap images showing Ornate Hawk-Eagle (*Spizaetus ornatus*) interactions with cattle femur.



FIGURE 3. One of three camera-trap images showing Slate-colored hawk (*Buteogallus schistaceus*) investigating cattle femur site.

DISCUSSION

Across the 10 camera trap sites a total of 217 camera trap days over a five-week period recorded one Ornate Hawk-Eagle interacting with a femur (Figure 2) and one Slate-colored Hawk investigating a femur site (Figure 3). Given the lack of previous records of this behavior, it would appear that this is unlikely to be a common feeding strategy. It is important to note, however, that the bones are unlikely to have attracted scavengers for the entire duration of trapping effort as they become less attractive to scavengers as they decay (Houston 1986).

While some resident raptors such as Turkey Vultures (*Cathartes aura*) rely on olfactory senses to locate carrion (Houston 1986; McShea *et al.* 2000), no vultures were recorded at any of the femur sites. This would suggest

that the Ornate Hawk-Eagle and Slate-colored Hawk located the femurs by sight, as they were not producing strong enough olfactory clues to be discovered by other avian species which were present in the area and known to have highly acute olfactory senses. Indeed, the lack of vultures at these bones may have provided an opportunity for otherwise non-scavenging raptors to exploit carrion in the absence of specialist scavengers.

Although no feeding behavior was recorded, we believe the interactions with carrion by Ornate Hawk-Eagle to be the first records of possible scavenging behavior in the species. In the instance of the Slate-colored Hawk, where no direct contact was recorded, we believe this also to be the first recorded instance of such behavior, although it is unsafe to draw any further conclusions.

As has been elucidated from the recorded diets of Ornate Hawk-Eagle, the species is a generalist feeder and we believe opportunistic scavenging may occur more than is currently documented. Detailed documentation of prey data recorded for many forest raptor species are based primarily on prolonged nest observations, in which *all* recorded prey is assumed to be a 'kill'. Given the similarities in known feeding ecology of sub-canopy raptor guilds, it is valid to suggest that scavenging behavior may occur in a number of species that have, to date, not been recorded to do so. Whether such behavior is opportunistic, driven by stress or resource shortages or as a result of previous anthropogenic interactions with the individual or its environment, however, is open to conjecture.

As shown in previous studies and illustrated by Springer *et al.* (2011), the difficulties of studying and documenting such behaviors are clear and further research effort should be focused by monitoring of carrion by remote camera trapping. The influence of inputting extra (possibly unnatural) carrion into a forest system must be considered, however, and we recommend opportunistic or low-intensity monitoring of carcasses to better understand their role as a possible food resource for non-olfactory species.

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