J Raptor Res. 37(1):44–54

MORPHOMETRICS AND STATUS OF AYRES'S HAWK-EAGLE IN ZIMBABWE

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ABSTRACT.—We recorded information on plumage, molt, body mass, and morphology for 28 Ayres's Hawk-Eagles (*Hieraaetus ayresii*); 17 were trapped or injured in Zimbabwe between 1981–2002, the other 11 were museum specimens. Juvenile and adult birds had variable plumage coloration. Some adults of either sex had a black eye mask and others a pied appearance (a white eyebrow mark over black eye mask), while all juveniles had a pale eyebrow mark over a slate eye mask. Adult females were more heavily marked than adult males. Ayres's Hawk- Eagles in captivity started molt in August–September (N = 2, 13 molts) and changed into adult plumage at the end of their molt at 2 yr of age. The mean body mass for males was 656.2 g (N = 8) and for females 1003.0 g (N = 20). Body mass and wing length did not overlap between sexes. Of nine nests, six were on well-wooded hill slopes and three were in riparian woodland. Nests were 9–15 m above ground, situated below the canopy and nest diameters were 71–129 mm. Although Ayres's Hawk-Eagle is a rare species, it was not as scarce in Zimbabwe as some observers had claimed.

KEY WORDS: *Ayres's Hawk-Eagle*; Hieraaetus ayresii; *breeding*; *capture*; *morphology*; *plumage*; *status*; *Zimbabwe*.

MORFOMETRÍA Y ESTADO DEL ÁGUILA DE AYRES EN ZIMBABWE

RESUMEN.—Colectamos información sobre el plumaje, muda, masa corporal y morfología de 28 águilas de Ayres (*Hieraaetus ayresii*); 17 fueron atrapadas o heridas en Zimbawe entre 1981–2002, y las otras once fueron especimenes de museo. Las aves juveniles y las adultas tuvieron coloración de plumaje variable. Algunos adultos de ambos sexos tenían una mascara con un ojo negro y otros una apariencia moteada (una marca de ceja blanca sobre la mascara de ojo negro), mientras que todos los juveniles tuvieron una pálida marca de ceja sobre una mascara de ojo pizarra. Las hembras adultas estaban mas fuertemente marcadas que los machos adultos. Las águilas de Ayres en cautividad inician su muda en Agosto–Septiembre (N = 2, 13 mudas) y viran hacia su plumaje de adultos al final de su muda en el 2 año de edad. La masa corporal promedio para los machos fue 656.2 g (N = 8) y para las hembras 1003.0 g (N = 20). La masa corporal y la longitud del ala entre sexos no se sobrelapo entre sexos. De nueve nidos, seis estuvieron en pendientes de colinas bien arboladas y tres en bosques riparios. Los nidos estaban entre 9–15 m sobre el piso, situados bajo el dosel y con diámetros entre 71–129 mm. Aunque el águila de Ayres es una especie rara, esta no era tan escasa como algunos observadores han afirmado.

[Traducción de César Márquez]

Ayres's Hawk-Eagle (*Hieraaetus ayresii*), is a small, dashing raptor that is thought to be inexplicably rare throughout its range (Brown et al. 1982, del Hoyo et al. 1994, Harrison et al. 1997). We follow Amadon and Bull (1988) in using the specific name *ayresii* for this eagle. Little is known about this species (Steyn 1982, Harrison et al. 1997, Virani and Watson 1998), other than some basic description of its breeding biology, which has been reported in Kenya (Brown 1966, Dewhurst et al. 1988). Ayres's Hawk-Eagles may occur in urban areas where they commonly prey on Rock Doves (*Columba livia*; Irwin 1981, 1985, del Hoyo et al. 1994, Harrison et al. 1997), other columbids, and small birds (Lendrum 1982, Dewhurst et al. 1988). It is an aerial hunter and may spend much of the day on the wing (Clark 1999). Few nests have been found anywhere, and there are only 12 breeding

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Table 1. Body mass (g) and measurements (mm) of Ayres's Hawk-Eagles.

		MALES				FEMALES			
	AGE	MEAN	RANGE	SD	*N*	MEAN	RANGE	SD	*N*
Mass	Juvenile	650.0	620–680	±22.36	4	988.5	950–1045	±38.74	10
	Adult	662.5	615–714	±37.94	4	1017.5	879–1150	±87.02	10
Wing	Juvenile	355.0	340–368	±10.0	8	396.7	374–420	±13.67	19
	Adult	346.0	320–360	±14.97	5	392.8	375–408	±11.17	16
Tail	Juvenile	189.4	180–198	±6.0	8	208.4	191–224	±10.3	18
	Adult	185.2	175–195	±7.29	4	210.6	196–225	±8.96	17
Tarsus	All	63.5	61–67	±2.02	13	73.8	61–80	±4.97	19
Toe	All	45.2	42–49	±1.8	12	52.0	46–56	±2.6	17
Bill	All	21.3	20–22	±1.0	9	25.4	24–31	±5.78	12
Gape	All	25.3	24–28	±1.3	12	27.9	25–32	±1.96	12

records for Zimbabwe (Irwin 1981), some of which may be questionable. There are few data on measurements and body mass (Maclean 1993), and no details on the progression of juvenal to adult plumage (Brown et al. 1982, Steyn 1982). Plumage is variable, and includes primarily light and uniformly dark color morphs (Brown 1966, Brown and Davey 1978, del Hoyo et al. 1994, Kemp and Kemp 1998), but there are few data summarizing this variation. Furthermore, it is likely that plumage variation and confusion with species such as African Hawk-Eagle (*H. spilogaster*), Booted Eagle (*H. pennatus*), and Cassin's Hawk-Eagle (*Spizaetus africanus*) have led to the Ayres's Hawk-Eagle being overlooked throughout its range (Brown 1966, Ash 1981, Clark 1999).

Here, we present new data on plumage (including molt), change of eye color, morphology, and body mass of Ayres's Hawk-Eagles in Zimbabwe. We also summarize sightings and breeding records in Zimbabwe and discuss the status of Ayres's Hawk-Eagle.

METHODS

Nine Ayres's Hawk-Eagles were captured and another eight eagles were recovered injured in Zimbabwe. Fifteen of these were weighed and 16 measured (Table 1). Mass measurement was done to the nearest 5 g. Other measurements follow Biggs et al. (1978), except for bill, which was taken as the chord from tip of bill to distal edge of the fleshy cere. Vernier calipers accurate to 0.5 mm were used to measure bill, gape, tarsus, and middle toe. Wing and tail length were measured with a wing rule accurate to 1 mm. Wing area, wing span, and mass loading follow Mendelsohn et al. (1989). The scientific literature was searched for further data (Brown and Davey 1978, Hartley 1982, Dewhurst et al. 1988, Grimes 1987, Hanmer 1997) and 11 museum specimens in the collection of the Natural History Museum of Zimbabwe (NHMZ) were examined and measured. We also introduced data (including mensural) on five specimens from South Africa provided by A.C. Kemp, and one from Zimbabwe (Transvaal Museum, TM), and 10 from the British Museum (BM). Birds were sexed on the basis of size (Table 1), males being considered the smaller birds, less than 750 g body mass and 370 mm wing length, respectively. Body mass and wing length between sexes were nonoverlapping. Where body mass was not available and wing length was close to 370 mm, measurements of tarsus (<67 mm for male) and mid-toe (<49 mm for male) were also taken into consideration.

An eagle in its juvenal plumage was classed as juvenile and as an adult after its first prebasic 1 molt (Humphrey and Parkes 1959) was completed. Eye color, plumage, and molt descriptions include the progress of two individuals in captivity from juvenile to adult. R. Hartley has kept two male and two female Ayres's Hawk- Eagles for extended periods, including a male for five and a female for ten years. Our own records of sightings were included with those of the Zimbabwe Falconers' Club (ZFC, Hartley 1993). Breeding records were provided by egg collectors and falconers. Laying dates were estimated on the basis of 45 d and 75 d for incubation and nestling periods, respectively (Steyn 1982).

RESULTS

Captures and Specimens. Of 23 eagles recovered in Zimbabwe, four in South Africa, one in Zambia, and one in Kenya, 18 were juveniles (shot = 4, collisions = 5, captured = 9) and 11 were adults (shot = 5, collisions = 2, captured = 4). One female was recovered at Kalichero in northern Zambia after fighting with a European Honey Buzzard (*Pernis apivorus*) (Benson 1962). In Zimbabwe seven eagles were involved in collisions: two with vehicles, one with a power line, and four struck fences. Five eagles were captured at pigeon lofts in towns and another five were captured on farm lands just north of Harare. A juvenile male (620 g)

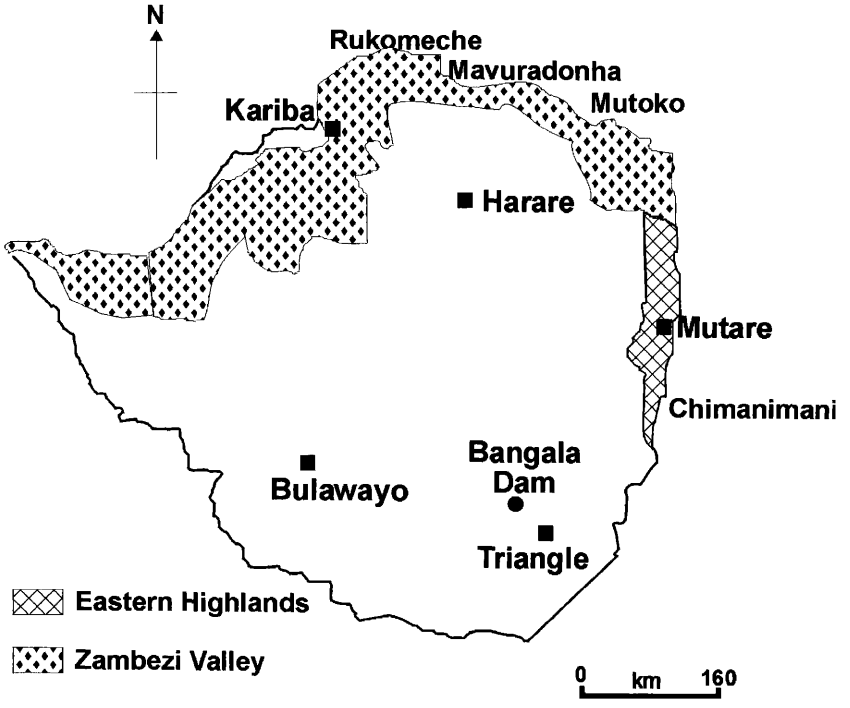

Figure 1. Locations of places mentioned in the text in Zimbabwe.

was captured after it attacked a tethered adult female Black Sparrowhawk (*Accipiter melanoleucus*, 920 g), the latter holding onto the eagle. One female was recovered in a chicken pen at Bulawayo (Hartley 1982; Fig. 1). Eight eagles were males (two adults and six juveniles) and 12 were females (two adults and 10 juveniles). Ten of these eagles were released. Six of the specimens in the NHMZ were from Zambia and one was from South Africa.

While most eagles were seen singly, sometimes they occurred in small groups. Two juveniles (male and female) were trapped in the company of pairs of adults in Harare and Bulawayo, but breeding has not yet been recorded in these towns. A juvenile female was trapped within an hour of trapping an adult male (March) near Harare, and two juvenile females were trapped (April) about an hour apart in the same general area. A juvenile male was seen with an adult (unknown sex) at a loft in Harare (January) and at Triangle (February). As Ayres's Hawk-Eagle lays mainly in April–May, these juveniles may have been independent of the adults.

Body Mass and Measurements. Based on body mass and wing length, one museum specimen was incorrectly sexed, while 10 records that were unsexed were now classified accordingly. The wing loading and wingspan of a juvenile male (Table 1) was 0.387 g/cm^2 (total wing area = 1652.67 cm^2) and 97 cm, respectively. These measurements were 90% and 78% of that recorded for females by Mendelsohn et al. (1989).

Plumage. There was substantial variation within the juvenile and adult morphs, both between and within sexes (Tables 2 and 3; see photographs in Oberprieler and Cillie 2002). All juveniles and adults had an eye mask (Fig. 2). Juveniles had a pale eyebrow over a slate eye mask. Juveniles had either cream, buff or rufous nape feathers, which were streaked with dark brown or slate as stated by Brown et al. (1982). While the dark brown to slate throat and/or chest streaks extended over the shoulders like two shoulder straps in most (Hartley 1982), some individuals had almost plain colored underparts from throat to abdomen; the degree of streaking and/or blotching on the chest was not related to sex. The underwing coverts were cream, buff or rufous. The upper-wing coverts, back and rump were edged paler, giving a scaled appearance (Brown et al. 1982) that is most pronounced in the

Table 2. Plumage of juvenile Ayres's Hawk-Eagles.

	Head			
Eagles	Crown	Forehead/ Eyebrow	Eye Mask	Throat/Crop/Chest/Belly
Males				
$N = 2$	light brown	light brown	slate	light brown with slate streaks on flanks
$N = 3$	slate	cream	slate	cream-buff with slate streaks on flanks
Females				
$N = 4$	slate	buff	slate	light brown with slate streaks on flanks
$N = 3$	slate	cream	slate	light brown with fine streaks on flanks
$N = 2$	slate	cream	slate	cream with fine slate streaks

fresher plumage of younger birds, as these edges wear off and are less noticeable after a few months.

All Ayres's Hawk-Eagles, including juveniles, showed the characteristic white patches at the front base of the wings the so-called "landing lights." This characteristic is most obvious when the birds are in flight.

In captivity, the first basic molt of two individuals was almost complete, with just a few juvenile body feathers remaining, and the progression was directly into the adult plumage (as suggested by Brown et al. 1982). However, the head pattern of one eagle changed significantly by the beginning of her sixth year, from a black mask (see Fig. 2 in Hartley 1982 and photograph in Sinclair 1984) to a paler black and white pied or mottled appearance (see photograph in Hartley 1989a). Such a change was not shown by three other eagles over similar time periods. Generally, males had less streaked and blotched chests and flanks than did females. However, the head patterns of males and females overlapped from the completely black-head-mask type (illustrated in Hartley 1989b) to the white forehead-eyebrow and black-eye-mask type so that this distinction could not be used as an aid to identification of the sexes contrary to the suggestion of Brown et al. (1982). The upper wing coverts and back and rump feathers were generally

Table 3. Plumage of adult Ayres's Hawk-Eagles.

	Head			
Eagle	Crown	Forehead/ Eyebrow	Eye/Head Mask	Throat/Chest/Belly
Males				
$N = 1$	black	white/black	black head	white with few black streaks—low density
$N = 1$	black	white/white	black eye	white with black streaks—medium density
$N = 2$	black	white/black	black head	white with fine black srteaks on flanks—medium density
Females				
$N = 2$[a]	black	white/black	black head	white with black streaks and blotches
$N = 5$[b]	black	black/black	black head	white with black streaks and blotches
$N = 3$[c]	black	black/black	black head	heavily blotched black over white

[a] One captive female assumed this plumage by the end of 2 yr, but developed an eye mask by the end of 6 yr.
[b] One individual had a white eyebrow.
[c] Dark morphs.

Figure 2. Nine-yr old female Ayres's Hawk-Eagle (left) and 5-yr old male (right).

pale edged, and this 'scaled' appearance (see Brown and Davey 1978) can help to distinguish Ayres's Hawk-Eagle from the superficially similar African Hawk-Eagle. Six adult females were dark morphs (Table 3), four of these from Zambia. Two of three adult specimens from South Africa were dark morphs (A. Kemp pers. comm.).

Timing of Molt. Two captive eagles generally started their molt in August–September and had completed it by the end of March. However, one of these had started body molt (not primary, secondary or tail) by 11 May when it was captured as a juvenile (Hartley 1982). To begin body molt well before flight feather molt is usual in African raptors (Edelstam 2001).

Another 11 eagles were recorded molting, each fitting into the period August–March. However, one adult probably started earlier than August, as she had nearly completed her primary molt by the third week of September. By the end of August one eagle had molted three primaries on each wing, while four eagles were proportionately more advanced by mid-September and December respectively. Four other eagles had nearly molted (with flight feathers nearly finished) by mid-February and another by the end of March.

Eye Color. The eye color of recently-fledged juveniles was light gray. Six months later this had changed to pale yellow. Two juveniles had pale yellow eyes, which changed to bright yellow and yellow-orange, respectively, over the next eight months. In one year, the eye color of one eagle turned deep yellow. We noted no significant difference in eye color between the sexes (but see Brown et al. 1982).

Sightings. P. Mundy recorded 23 sightings (11 adults, six juveniles, and six not aged) of these eagles within Zimbabwe over a 12-yr period (1985–96). All adults were seen singly.

Regular sightings were made in all months of the year in the Zambezi Valley and the eastern highlands (Fig. 1; Table 4). In the Chimanimani area, P. Caldwell-Barr (pers. comm.) recorded adults (in pairs and singly) and juveniles, some attacking birds in aviaries. This suggests that Ayres's Hawk-Eagle breeds in these rugged, heavily-wooded areas in particular. By contrast, in Harare and Bulawayo, they were largely absent from May to De-

Table 4. Summary of sightings and specimens by month of Ayres's Hawk-Eagles in Zimbabwe.

AREA	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
Total rural[a]	6	6	9	8	6	5	5	12	17	12	6	15	107
Rukomeche, Kariba, Mavuradonha, Mutare and Chimanimani[b]	x	x	x	x	x	x	x	x	x	x	x	x	
Bulawayo and Harare[a,c,d]	5	9	13	4	2	1	1	4	1			1	41
Bulawayo[e]	x	x	x	x				x	x	x	x	x	

[a] Vernon (1979), Hartley (1982, 1998a), Irwin (1984, 1985), Howells (1985), Tree (1989, 1990, 1991, 1992, 1994, 1995, 1996, 1997), specimens (this study), Hartley (pers. observ.), Mundy (pers. observ.).
[b] Hartley (1982), Tree (1989), K. Hustler, R. Naisbitt, and P. Caldwell-Barr (pers. comm.).
[c] Hartley (1998b).
[d] Irwin (1984), Tree (1989, 1997), Solomon (1995).
[e] Sightings reported ($N = 598$) in Lendrum (1982).

cember. While they may nest in towns in Zimbabwe, a site has not been found, despite intensive searching for raptor nests by the ZFC and others. It is possible that Ayres's Hawk-Eagles are breeding in heavily-wooded areas relatively close to Bulawayo and Harare, as family groups (i.e., adult male and female, and juvenile) have been seen raiding lofts in these cities.

Nest Location. We report six additional nests (including an alternate site for Bangala, see Phillips 1978) to those reported in Irwin (1981) for Zimbabwe, and one for southern Zambia (Table 5). Data from four nests indicated that the structure consisted of sticks up to 45–60 cm long and 1.8–2.0 cm diameter, but generally they are much thinner and smaller. The nests tend to be small (Table 5), flat on top and deep (Brown and Davey 1978). On average they are smaller than nests of the African Hawk-Eagle which tend to be over 1 m in diameter (Steyn 1982). Nests were located in dense, mature woodland in rugged terrain or in thick, riparian habitats.

In hilly terrain the nests tend to be located on slopes overlooking ravines, four of which can be described as hidden valleys. Several of these nests have been difficult to spot, except at close range, as little as ca. 4 m for nest 4 (Table 5). Nests were placed mainly in a vertical fork or sometimes on a horizontal branch, well inside the canopy. Medium sized, smooth barked trees with heavy foliage were preferred, making nests extra difficult to locate. Nests were in trees that were generally in clumps emergent above the overall canopy of woodland. For instance, nest 1 was well concealed on the lateral branch of a *Syzygium* sp. in a clump of riparian forest on the side of a hill. Nest 4 was in a clump of big *Spirostachys africanus* that covered about 1 ha (Phillips 1978). Nest 3 was in a tall *Brachystegia glaucescens* growing in a steep gully inside the hills. However, nest 8 was in a *Julbernardia globiflora* connected with the overall canopy in an area of substantial mature woodland on a slope surrounded by relatively flat terrain.

Timing of Laying and Egg Size. In each instance a single egg was laid. A summary of breeding records (ascribed to R. Brooke) was used in Irwin (1981), and this list included four verifiable laying dates in April (reported by C. Vernon) for nest 3 and nest 5 (Phillips 1978), and one laying record for May (Hough 1950). Added to 13 breeding records observed since then, laying occurred in April ($N = 10$) and May ($N = 8$).

Mean egg sizes for Zimbabwe were 61.22 mm (SD ± 1.41) × 49.85 mm (±1.51, $N = 6$). The mass of one egg was 74 g. An egg collected in Zambia was small at 51.3 mm × 42.9 mm (48.5 g). Steyn (1982) also reported small egg size from Zambia ($N = 3$) and we can offer no explanation for this contrast, especially as there is no apparent difference in the size of eagles between Zimbabwe and Zambia.

Hunting and Prey. Prey items seen on nests by egg collectors have all been birds, often doves (Columbidae), with the exception of one Tree Squirrel (*Paraxerus cepapi*). An adult female was seen eating a Cape Turtle Dove (*Streptopelia capicola*). A released eagle was seen hunting Rock Doves on numerous occasions. She was seen frequently soaring high (ca. 100–200 m) overhead and the Rock Doves were attacked from a vertical stoop. She also took a Green Pigeon (*Treron calva*) chick. She remained in the area for 20 wk and was seen nearly every day. Also, we saw an adult female stoop through the canopy of miombo woodland at

Table 5 Nest site characteristics for Ayres's Hawk-Eagle.

Site (Year)	Tree (Nest Lining)	Habitat	Height Above Ground in m	Nest Diameter in cm (cup)	Nest Depth in cm
1 Nyazura[a] (1950)		riparian (*Syzygium* sp.)			
2 Domboshawa (1959)	*Brachystegia glaucescens*	miombo on domed inselberg			
3 Mtoko (1969, 1970, 1985)	*B. glaucescens* (*Diplorhynchus condylocarpon*)	miombo in ravine—hidden valley in hill range	15	129 (37)	58
4 Mtoko (1972, 1974, 1975, 1980, 1981, 1982, 1993)	*Brachystegia glaucescens* (*D. condylocarpon* and *Tarenna supra-axillaris*)	miombo in ravine—hidden valley in hill range	13	71 (23)	99
5 Bangala[b] (1976, 1977)	*Spirostachys africana* (*S. africana*)	heavily wooded ravine on kopje	9	90 (21)	90
6 Bangala (1990, 1991)	*S. africana*	steep slope on kopje			
7 Mudzi, Mtoko (1987)	*S. africana*	heavily wooded ravine—hidden valley in hill range			
8 Umfurudzi (1976)		riparian			
9 Matusadona (1991)		hillslope in gorge—riparian			
10 Choma, Zambia (1981)	*Julbernardia globiflora* (*Brachystegia* sp.)	miombo on slight slope	11	78 (26)	32
11 Eagle Hill[c] Kenya (1950–73)	*Mabaya abyssinica, Ficus* spp. and *Croton megalocarpus*	heavily wooded on hillslope	13	120	60
12 Embu district[d] Kenya (1966–73)	*C. megalocarpus*	heavily wooded			
13 Nairobi[e] (1985, 1986)	*Eucalyptus* sp. (*Eucalyptus* and *Tecomaria capensis*)	plantation in urban gardens	25	60 × 80	45
14 Kibale[f] Uganda (1997)		evergreen forest	32	125	75

[a] Hough 1950.
[b] Phillips 1978.
[c] Brown (1952, 1953).
[d] Brown and Davey (1978).
[e] Dewhurst et al. (1988).
[f] Seavy (2000).

the top of the Chizarira escarpment and nearly snatch a Black-eyed Bulbul (*Pycnonotus barbatus*). All of the eagles captured and shot were frequenting Rock Dove lofts, with the exception of eagles hunting other doves. In captivity, these eagles show a distinct preference for doves, Rock Doves, and small birds, and do not seem to favor mammals such as squirrels (recorded as prey by Brown and Davey 1978).

DISCUSSION

Although marked variations in plumage (Brown 1966, Ash 1981) are supported in this study, some trends noted by Brown (1966) have not been verified. Reduced white forehead and eyebrow and greater extent of buff on the forehead is not necessarily indicative of adult and juvenile males, respectively. Except for a dark-morph, adult female in Mutare (Hartley 1982), none of the adults in this study were as pale or dark as the extremes in Brown and Davey (1978) and the dark morph in Finch-Davies and Kemp (1980). Furthermore, the latter did not display the characteristic landing lights, which is most unusual. Otherwise, the nature of streaking, blotching, wing and tail patterns, and color of the soft parts was in accord with Brown et al. (1982); adult males usually much less streaked on the breast than females (Seavy 2000). It is also possible that observers mistake juvenile Ayres's Hawk-Eagles for Booted Eagles, a rare summer migrant to Zimbabwe.

Timing of molt generally accords with Steyn (1982) and Lendrum (1975) who reported September to February for birds in Bulawayo. This is also outside of the breeding period (egg-laying) and may further confirm that the peak laying period for this species is April–May, with chicks fledged by August–September. Hanmer (1997) examined an adult female captured at Nchalo in February that had probably completed the molt.

Ayres's Hawk-Eagle shows marked reversed sexual dimorphism (Newton 1979), the male being on average 65% of the mass of the female, and about 89% of female size. Brown (1966) emphasized the size difference, but presented few data, including the only record of 714 g for a male (Brown and Davey 1978), and 879 g and 940 g for females. Gape size is small (27.9 mm for female) for a raptor this size, possibly reflecting the preferred diet of small birds (Lendrum 1982, Steyn 1982). Also a specialist aerial hunter of birds, the African Peregrine Falcon (*Falco peregrinus minor*) has a gape of 30 mm (female = 700 g, Hartley 2000).

Ayres's Hawk-Eagle lays a single egg from April–May in Zimbabwe and April–July in Zambia (Steyn 1982). Therefore, several breeding records in Irwin (1981) are questionable, including a two-egg clutch. No authenticated record of a two-egg clutch for Ayres's Hawk-Eagle has been verified by any account and Brown (1966), Brown et al. (1982), Steyn (1982), and Tarboton and Allan (1984) have also questioned such records. Furthermore, a single-egg clutch collected on 25 October is outside the range of laying based on our data. However, an experienced egg collector, B. Neuby-Varty (pers. comm.), collected a single egg on 17 September from a nest located in a large tree in thick bush beside an annual stream in mountainous habitat. This may have constituted a second clutch after a nest failure (Brown 1966). An August record in Irwin (1981) from Hough (1950) was actually for a well grown chick, that was also filmed (J. Hough pers. comm.), and therefore, provides an estimated laying date of May.

In Zimbabwe nests have been found only in well-wooded areas in very rugged terrain (Phillips 1978), usually in close proximity to hills or mountains, but sometimes in riparian forest. In addition, P. Danckwerts (pers. comm.) found two occupied nests along the Kafue River in Zambia. Middleton (2000) studied a raptor community in a 200 km^2 study area of mainly flat terrain, but that included 29 km^2 of well wooded, rugged, but smaller kopjes and domed inselbergs south of Phillips' (1978) site. Despite fieldwork over eight years, no nest of Ayres's Hawk-Eagle was found, nor were birds seen. To the south-east in a 40 km^2 cluster of well wooded, rugged sandstone hills Davison (1998) studied a raptor community over two seasons and found 19 pairs of eagles, but none were Ayres's Hawk-Eagle. Despite the discovery of numerous raptor nests in the Matobo Hills over the past 40 yr by the Black Eagle Survey team, Ayres's Hawk-Eagle is regarded as a vagrant (Gargett 1990). The same applies to four other intensively-surveyed areas in well-wooded, domed inselberg terrain (R. Hartley unpubl. data). As Ayres's Hawk-Eagle soars a great deal (Clark 1999) and displays conspicuously during courtship (Brown 1966), it is unlikely that they would be overlooked during these surveys.

Generally Ayres's Hawk-Eagles have been absent from Zimbabwe towns during May–July (Table 4), while a similar pattern was noted in the Transvaal

(Tarboton and Allan 1984) and southern Botswana (Herremans 1994), where the species was absent for the winter months south of Zimbabwe (Harrison et al. 1997). A pair of Ayres's Hawk- Eagles bred in a stand of gum trees (*Eucalyptus* sp.) in Nairobi and another two pairs were also observed (Dewhurst et al. 1988). With the exception of these, plus three observations reported in this paper, all previous records in towns have been for solitary birds (Hartley 1982, Lendrum 1982, Tarboton and Allan 1984), which were probably nomads (Hartley 1998b), rather than migrants.

A great danger to these birds is, in fact, their attraction to towns where they come into frequent contact with domestic and racing Rock Doves and ultimately with the owners (Lockwood 1979, Hartley 1982, Lendrum 1982, Tarboton and Allan 1984, Herremans and Brewster 1994, Hartley et al. 1996). Some domestic pigeons are worth large sums of money. The ZFC and the Department of National Parks and Wild Life Management (DNPWLM) have established contact with the Zimbabwe Racing Pigeon Association (ZRPA) and it is vital that this be maintained. Although two of these eagles were accused of harassing poultry, these events may have been cases of mistaken intention as Ayres's Hawk-Eagle does not usually molest poultry (Hartley 1982, Lendrum 1982, Dewhurst et al. 1988). Hartley et al. (1996) reported habitat destruction as another negative impact and recommended that Ayres's Hawk-Eagle be closely monitored.

In Zimbabwe, South Africa, and Kenya, 15 females and three males were recovered in towns. The greater frequency of females is possibly a response to the size of domestic and racing Rock Doves (300–350 g), which are easily tackled and carried by the heavier females, rather than by smaller males.

That the Ayres's Hawk-Eagle lays only one egg and can produce no more than one youngster reflects some limitation to available prey. (Newton 1979). This is supported by the apparent patchiness of its nesting density, despite Brown's (1966) suggestion that its home range is ca. 25 km^2. The similar Booted Eagle occurs at much higher densities in the Cape Province of South Africa (Steyn 1982) and it produces up to two eggs (and both chicks can survive). The Booted Eagle also hunts from a stoop, but it is a generalist with birds contributing about 50% of its prey. Small mammals, reptiles (mainly lizards) and insects are also taken which may allow it to capture more prey than does the Ayres's Hawk-Eagle, and consequently it is more abundant. Another generalist, the African Hawk-Eagle, also occurs much more frequently than Ayres's Hawk-Eagles and sometimes is relatively abundant in hills during the nesting period.

Predation (Dewhurst et al. 1988) and poor breeding success (Brown 1974) have been suggested as reasons for the rarity of Ayres's Hawk-Eagle. Predation can occur frequently on raptors, including on some large eagles (Davison 1998). We suggest that predation may explain the tendency to select relatively concealed positions for nesting. Ayres's Hawk-Eagle is the smallest winter-breeding eagle, and although it sometimes shares its hill site nesting habitat with African Hawk-Eagle and other eagles, Brown (1966) recorded little antagonism between them at his Eagle Hill study site. Aggressive Peregrine (Brown 1966) and Lanner falcons (*F. biarmicus*) (Phillips 1978), on the other hand, have probably interfered with breeding success of the Ayres's Hawk-Eagle. It is also possible that this eagle owes its rarity to its role as a specialist bird predator, using its equally specialized method of attacking from a stoop. Clark (1999) contended that it is overlooked, because observers are not searching the sky. While it is clear that the Ayres's Hawk-Eagle is not as scarce as some authorities claim (Brown et al. 1982, Steyn 1982, Maclean 1993, Clark 1999), it is still a rare species.

ACKNOWLEDGMENTS

This is a contribution from the Raptor Research Programme of the ZFC, which is a joint project with the DNPWLM and The Peregrine Fund, Inc. (USA). The following contributors are gratefully acknowledged: Falcon College and Peterhouse School Falconry Clubs; A. Barnes, P. Caldwell-Barr, N. Deacon, D. Dudman, A.S. Dunkley, N. Goodwin, R. Geisswein, N. Greaves, A. Groenewald, A. Huelin, O. Mitumbili, R. Naisbitt, R.W. Querl, S. Rankine, K. Wilson (all ZFC); R. Greaves, K. Hustler, J. Hough, R.D. Jeffrey, A.C. Kemp (TM), J. Logan, J. Neuby- Varty, and D. Parkes. We thank the ZRPA who assisted in the trapping of some of the eagles. We thank W.S. Clark, A.C. Kemp, and an anonymous referee for making very helpful comments on the manuscript.

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Received 25 February 2002; accepted 22 September 2002