

African hornbills: keystone species threatened by habitat loss, hunting and international trade

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Africa is home to 23 of the world's 54 hornbill species, including the largest members of the family, the ground hornbills. None of Africa's hornbills are currently considered to be at significant risk of extinction by IUCN, and none are listed under the Convention on International Trade in Endangered Species (CITES). However, there is evidence for serious declines of African forest hornbills due to habitat loss and fragmentation, and to unsustainable exploitation for bushmeat. In addition, this paper documents a previously unreported international trade involving importation of African hornbills and their parts into the United States. In the absence of CITES reporting requirements, it is difficult to estimate the magnitude of this trade, but it appears to represent an additional threat to African hornbills, particularly large forest-dwelling species of the genera *Bycanistes* and *Ceratogymna*. Given this international trade, and other known threats to African forest-dwelling hornbills, the status of these species is in urgent need of review.

Introduction

Hornbills are among the world's most recognisable birds, with many species exhibiting large body size, spectacular enlarged casques, striking black-and-white plumage, and loud, far-carrying calls. Many hornbills inhabit forest environments, where they qualify as keystone species, due to their role as important seed dispersers (Whitney *et al.* 1998, Whitney and Smith 1998, Holbrook and Smith 2000, Kemp 2001). The larger species utilise extensive home ranges, and are thus sensitive indicators of environmental degradation (Kemp 1995). Hornbills are important resources for indigenous peoples from West Africa to New Guinea, as food items and as sources of feathers, beaks and other parts used in cultural activities (Kemp 2001).

Threats to the survival of large hornbill species in Asia have long been recognised. Many of these species are island endemics from the Philippine and Malaysian archipelagos, whose restricted ranges make them particularly vulnerable to habitat destruction and hunting pressure (Kemp 2001). Five species of Asian hornbills were placed on the first CITES lists in 1975, and all species in the Asian genera *Aceros*, *Buceros*, *Anorrhinus*, *Anthracoceros* and *Penelopides* were listed on either Appendix I or Appendix II by 1992.

In contrast, none of the 23 African hornbill species are listed on any of the CITES appendices, and none are currently listed as Vulnerable, Threatened or Endangered by IUCN (nomenclature of African hornbills in this paper follows Kemp 2001 and Dickinson 2003). Only two African species, the Yellow-casqued Hornbill (*Ceratogymna elata*) and the Brown-cheeked Hornbill (*Bycanistes cylindricus*) are classified as Near-threatened by IUCN, the lowest 'at-risk' category (IUCN 2004).

This lack of conservation concern probably reflects the fact that all African hornbills are continental species with extensive geographic ranges. Kemp (2001: p.484) concluded 'In Africa, hornbill species have suffered only local declines or extinctions.' These 'local' effects may extend to entire countries; for example, the near or complete extinction of the Black-casqued Hornbill (*Ceratogymna atrata*) in Nigeria (Fry *et al.* 1988, Kemp 1995). Despite the lack of international listings, several African hornbill species have been placed on national endangered fauna lists, in recognition of population declines. For example, the Southern Ground Hornbill (*Bucorvus leadbeateri*) is listed as Vulnerable in South Africa, Swaziland and Lesotho (Barnes 2000).

Threats to African hornbills

Two principal threats to African Hornbills have been previously identified: hunting and habitat loss (Fry *et al.* 1988, Kemp 1995).

Hunting

Hunting has been highlighted as a significant threat to four large species of West African forest hornbills: the Brown-cheeked Hornbill, Yellow-casqued Hornbill, Black-casqued Hornbill, and Black-and-white-casqued Hornbill (*Bycanistes subcylindricus*) (BirdLife International 2000, Kemp 2001). Interestingly, hunting has not been considered to be a major threat to the two largest hornbills of all, the terrestrial Northern Ground Hornbill (*Bucorvus abyssinicus*) and the Southern Ground Hornbill. Both these species were protected by traditional hunting taboos in many parts of Africa

(Kemp 1995). These taboos appear to be weakening, as recent work in Burkina Faso documents elimination of Northern Ground Hornbills from many areas, primarily due to hunting (Thiollay 2006).

The impact of bushmeat hunting on African birds is poorly understood, in contrast to abundant evidence for the severe effects of the bushmeat trade on many African forest mammals (Fa *et al.* 1995, Bowen-Jones and Pendry 1999, Maisels *et al.* 2001, Fa *et al.* 2005). Birds make up a small proportion of the bushmeat for sale in markets (Fa *et al.* 2006), but smaller carcasses like birds are often consumed by hunters or their families rather than being transported to markets (Fa and García Yuste 2001). Moreover, as larger mammals are eliminated by overhunting, hunting pressure on smaller mammals and birds continues to increase (Fa *et al.* 2000).

Hornbills are among the birds most frequently reported in African bushmeat studies. For example, the Black-casqued Hornbill was the second most frequently recorded bird in a study of bushmeat in the Cross-Sanaga Rivers region of Nigeria and Cameroon (Fa *et al.* 2006). While the Helmeted Guineafowl (*Numida meleagris*) was far more commonly taken, the estimated total extraction of Black-casqued Hornbills was still 442 per year from this region of 35 000km² (Fa *et al.* 2006). Unlike guineafowl, which occupy a variety of open habitats and have high fecundity (Urban *et al.* 1986), the Black-casqued Hornbill is a bird of primary forest, typically rears only one young per nesting attempt, and does not attempt to breed every year (Kemp 2001, Stauffer and Smith 2004). Other African hornbills reported in the bushmeat trade include the Black-and-white-casqued Hornbill (Juste *et al.* 1995) and members of the small-bodied genus *Tockus* (Thibault and Blaney 2003).

Habitat loss

Habitat fragmentation, particularly of forests, is occurring at a very high rate in Africa (Barnes 1990). Thus, it is not surprising that habitat loss and fragmentation have been highlighted as a cause for declines in African Hornbills. The large *Bucorvus*, *Bycanistes*, and *Ceratogymna* hornbills utilise very large ranges. Home range sizes of up to 260km² have been reported for Northern Ground Hornbills (Kemp 1995). Radio telemetry of the Brown-cheeked Hornbill and Black-casqued Hornbill documented mean home range sizes of 27.16km² and 28.72km², respectively (Holbrook and Smith 2000). Even this, however, does not give the full picture, since both these species made very extensive movements beyond

their home range in response to fruit scarcity, with one Brown-cheeked Hornbill travelling a minimum of 290km (Holbrook *et al.* 2002).

In a study of forest fragments in Ghana (largest fragment 330km²), both Black-casqued and Yellow-casqued Hornbills were completely absent, and the slightly smaller Brown-cheeked and Black-and-white-casqued Hornbills were very rarely recorded (Beier *et al.* 2002). The Brown-cheeked Hornbill is often the first large hornbill to disappear following logging (BirdLife International 2000). The drastic decline of Yellow-casqued Hornbills in Nigeria was attributed to forest destruction (Kemp 1995), and loss of gallery forest in the savanna zone was associated with the disappearance of the species in a protected area of Ivory Coast (Thiollay 1998). Conversion of savanna to agricultural habitats has been implicated in declines of both Northern Ground Hornbills (Thiollay 2006) and Southern Ground Hornbills (Kemp 1995).

Hunting and habitat loss, of course, often reinforce each other. Hunting pressure tends to be higher in smaller forest patches (Holbech 1996), and roads associated with logging or other extractive activities often lead to greatly increased hunting in formerly undisturbed areas (Wilkie *et al.* 2000, Thibault and Blaney 2003).

International trade

International trade does not appear to have been previously identified as a possible threat to any African hornbill species. One explanation is the lack of data on this trade. The primary means of tracking international trade in wildlife is the CITES Trade Database, maintained by the World Conservation Monitoring Centre (<http://sea.unep-wcmc.org/citestrade/trade.cfm>). However, this database provides no information on African hornbills, since none are CITES-listed.

In the United States, the Office of Law Enforcement of the US Fish and Wildlife Service (USFWS) is responsible for enforcing federal wildlife laws and international agreements. Monitoring the importation and exportation of wildlife products is the special responsibility of USFWS Wildlife Inspectors, who work at designated ports of entry for such products. All such importations must be accompanied by a declaration stating the species that are represented in the shipment. This information is entered into a database where the records are maintained by USFWS for seven years.

From March 1999 to March 2006, 129 import declarations involving African hornbill species were processed by USFWS, involving 434 declared items (Table 1). Most importations of African hornbills were listed in the USFWS database only at the genus level, and so that is how they are

Table 1: Importations of African hornbill material into the United States (March 1999–March 2006), from the USFWS wildlife imports database. Number of declarations are shown, with declared quantities in parentheses. The category 'Carcasses' combines the following USFWS database categories: Skins, Bodies, Trophies, Dead, Skeletons and Skulls. The genera *Bycanistes* and *Ceratogymna* were combined in the trade database records, and are reported here as '*Ceratogymna*'

Genus	Live	Carcasses	Specimens	Feathers	Total	Per cent
<i>Tockus</i>	20 (164)	60 (103)	11 (28)	1 (1)	92 (296)	71% (68%)
' <i>Ceratogymna</i> '	5 (18)	14 (41)	1 (1)	1 (30)	21 (90)	16% (21%)
<i>Bucorvus</i>	9 (37)	5 (9)	1 (1)	1 (1)	16 (48)	12% (11%)
Total	34 (219)	79 (153)	13 (30)	3 (32)	129 (434)	
Per cent	26% (50%)	61% (35%)	10% (7%)	2% (7%)		

summarised here. Table 1 includes the genus *Bycanistes* under *Ceratogymna*, since that classification was used in the USFWS database, following Kemp (1995). The database has recently been updated to separate these two genera, reflecting current taxonomy (Kemp 2001, Dickinson 2003).

This figure represents a minimum estimate of the US importation of African hornbill material. Much wildlife trade is not declared, for reasons ranging from ignorance to deliberate smuggling, and undeclared wildlife products are not always detected by law enforcement. A final source of underestimation of trade is that not all wildlife products are documented at a meaningful taxonomic level. This is particularly true for species, including all African hornbills, that are not protected under either CITES or US laws (notably the Endangered Species Act and the Migratory Bird Treaty Act). Such non-protected species are often lumped into very general database categories, for example 'non-CITES birds', and are thus not detected in taxonomic analyses of trade.

Hornbill imports entered the United States from 15 African countries between 1999 and 2006 (Table 2). Four countries — Cameroon, Tanzania, South Africa and Zimbabwe — accounted for over 75% of all importations.

The declared total of 434 hornbill items probably represented at least 400 individual birds. About one-half of the declared items were live birds (Table 1). Of the 219 live bird importations, only 10 individuals (seven *Bucorvus* and three '*Ceratogymna*') were declared to be captive-bred. However, this information is not required on declaration forms for non-CITES species. If no notation of source is provided by the importer, the birds are coded in the USFWS database as wild-caught. Therefore, it is possible that some of the imported hornbills coded as wild-caught were in fact captive-bred.

The other importations were various types of remains, most of which were combined in Table 1 as 'Carcasses', for the purposes of analysis. The database categories making up 'Carcasses' were 'Skins', 'Bodies', 'Trophies', 'Dead', 'Skeletons' and 'Skulls'. Only two minor categories in the

declaration database did not imply individual remains. These were 'Feathers' and 'Specimens' (which could include tissue samples as well as whole specimens).

It is also important to recognise that the import quantities stated on declarations often underestimate shipment totals. In five African hornbill importations that were examined in detail, the remains of 45 hornbills were declared, but at least 61 individuals were actually represented.

Ninety-one per cent of the 129 declared African hornbill importations were 'cleared'; that is, permitted entry into the United States without further investigation. If there was reason to believe that an import declaration was inaccurate, or if protected species were listed on the declaration, then the shipment might be held by USFWS for further analysis and possible legal action. When the identity of the wildlife species involved was in question, the shipment was sent to experts at the USFWS National Fish and Wildlife Forensics Laboratory (hereafter referred to as 'Forensics Laboratory') for identification.

Six shipments involving declared African hornbill material were sent to the Forensics Laboratory. Four additional cases analysed at the laboratory were found to contain undeclared African hornbill material (these were not included in Table 1, since they were not entered in the USFWS importations database as African hornbill).

Analyses of these 10 African hornbill cases at the Forensics Laboratory documented the remains of nine species: Black-casqued Hornbill, Yellow-casqued Hornbill, Silvery-cheeked Hornbill (*Bycanistes brevis*), Trumpeter Hornbill (*Bycanistes bucinator*), Piping Hornbill (*Bycanistes fistulator*), and African Pied Hornbill (*Tockus fasciatus*) (Table 3). All these items were in the Carcasses or Feathers categories. Import declarations that were not verified at the Forensics Laboratory listed four additional African hornbill species: Southern Ground Hornbill, Crowned Hornbill (*Tockus alboterminatus*), Eastern Yellow-billed Hornbill (*Tockus flavirostris*), and Southern Yellow-billed Hornbill (*Tockus leucomelas*). Most of these were imported as

Table 2: Importations of African hornbill material into the United States by exporting country, from the USFWS database. Number of declarations are shown, with declared quantities in parentheses. The non-African nations exporting African hornbill material into the US were Great Britain, France and Germany

Country	<i>Tockus</i>	' <i>Ceratogymna</i> '	<i>Bucorvus</i>	Total	Per cent
Botswana	1 (2)	–	–	1 (2)	1% (0.5%)
Burkina Faso	2 (4)	–	–	2 (4)	2% (1%)
Cameroon	2 (11)	12 (39)	2 (5)	16 (55)	12% (13%)
Central African Republic	1 (2)	–	–	1 (2)	1% (0.5%)
Equatorial Guinea	2 (2)	–	–	2 (2)	2% (0.5%)
Gabon	1 (1)	–	–	1 (1)	1% (0.5%)
Ghana	1 (12)	–	–	1 (12)	1% (3%)
Guinea	2 (9)	1 (8)	–	3 (17)	2% (4%)
Mozambique	1 (3)	–	–	1 (3)	1% (1%)
South Africa	16 (32)	1 (1)	2 (2)	19 (35)	15% (8%)
Tanzania	17 (132)	2 (31)	9 (37)	28 (200)	22% (46%)
Togo	1 (3)	–	–	1 (3)	1% (1%)
Uganda	–	1 (6)	–	1 (6)	1% (1%)
Zaire	2 (2)	1 (1)	–	3 (3)	2% (1%)
Zimbabwe	36 (70)	–	2 (3)	38 (73)	29% (17%)
Non-African Nations	7 (11)	3 (4)	1 (1)	11 (16)	9% (4%)
Total	92 (296)	21 (90)	16 (48)	129 (434)	

trophies or as live birds. Live birds are never sent to the Forensics Laboratory for identification, due to quarantine regulations.

The remains of 70 individual hornbills identified at the laboratory (95% of the total) were in a condition consistent with byproducts of bushmeat. Many were detached skulls that appeared to have been smoked or roasted (Figure 1). These were presumably removed from smoked whole carcasses. There were also several dried whole bodies and feathered heads. Therefore, it appears that a significant proportion of the African hornbill remains being imported into the United States ultimately originate in the bushmeat trade. Of the four non-bushmeat items, three were hornbill remains attached to African artifacts (e.g. masks), and the remaining item was a clean and professionally prepared skull that showed no evidence of smoking or other treatment typical of bushmeat.

With their enlarged casques, hornbill skulls are dramatic objects, and their use as curios seems to be one force driving importations of African hornbill material into the United States. Of the 74 hornbills identified at the laboratory, 69 (93%) were imported as skulls or detached heads. As noted above, most of these skulls appeared to have been removed from smoked carcasses, and were in damaged condition. Despite this, at least one importer of smoked hornbill skulls stated that they would be added to a personal non-scientific skull collection.

Cleaned skulls of African hornbill species can readily be found for sale on Internet online auction and skeleton sale

sites. Species involved include the Black-casqued Hornbill, Yellow-casqued Hornbill, Brown-cheeked Hornbill, Trumpeter Hornbill, Piping Hornbill and numerous species of *Tockus* hornbills. Since these species are not listed under the provisions of either CITES or the United States Endangered Species Act, such sales on US websites are legal and unregulated in the United States. If a US buyer makes a purchase from an overseas website, wildlife importation regulations apply, but such transactions are

Table 3. African hornbill material analysed at the National Fish and Wildlife Forensics Laboratory, March 1999–March 2006. MNI = minimum number of individuals verified

Species	MNI
<i>Bycanistes brevis</i>	1
<i>Bycanistes bucinator</i>	7
<i>Bycanistes cylindricus</i>	6
<i>Bycanistes fistulator</i>	8
<i>Bycanistes</i> sp.	10
<i>Ceratogymna atrata</i>	7
<i>Ceratogymna elata</i>	8
<i>Ceratogymna</i> sp.	9
<i>Tockus erythrorhynchus</i>	6
<i>Tockus fasciatus</i>	3
<i>Tockus nasutus</i>	1
<i>Tockus</i> sp.	2
Unidentified hornbill	6
TOTAL	74



Figure 1: A single importation of African hornbill skulls examined at the National Fish and Wildlife Forensics Laboratory. Species represented include Yellow-casqued Hornbills (top row), Black-casqued Hornbills (second row), immature and/or female *Ceratogymna* hornbills (third row), Brown-cheeked Hornbills (fourth row), and Piping Hornbills (bottom row). All skulls appeared to be smoked, as is typical for bushmeat carcasses

difficult to track, and regulations are rarely enforced. Wildlife trade on the Internet is already substantial, and is increasing rapidly (IFAW 2005). Given the enormous reach of Internet commerce, international trade in African hornbills could expand greatly if the use of their skulls as decorative objects grows in popularity.

Conclusion

In the absence of CITES trade records, it is almost impossible to assess the magnitude of the international trade in African hornbills. Clearly, however, this trade does exist, involving both live birds and remains, particularly skulls. This paper documents the declared and/or verified importation of 13 African hornbill species into the United States since 1999, representing several hundred individuals. An unknown number of undeclared importations also occur, as shown by the skulls of undocumented African hornbill species being offered for sale on Internet sites in the United States.

The existence of this trade, combined with strong evidence for declines in African hornbill populations due to hunting and habitat loss, suggests that it is time to consider increased domestic and international protection for some of these species. Based on both data from Africa and occurrence in the trade, the species most at risk appear to be the Black-casqued Hornbill, Yellow-casqued Hornbill and Brown-cheeked Hornbill, followed closely by the other large species of *Bycanistes*. Additional research on the population status and international trade in these species is urgently needed.

Acknowledgements — Craig Hoover and Linda Nakamura of the US Fish and Wildlife Service Office of Law Enforcement prepared the import declaration database summary used in this paper, and provided invaluable advice on interpreting the data. Jim Chamberlain of the National Fish and Wildlife Forensics Laboratory took the photograph in Figure 1. Barry Baker provided comments on the manuscript and located many references.

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