Threatened Birds of Asia:
The BirdLife International Red Data Book

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RUFOUS-NECKED HORNBILL

Aceros nipalensis

Critical □ —
Endangered □ —
Vulnerable ■ A1c,d; A2c,d; C1

This large hornbill qualifies as Vulnerable because it has a small, rapidly declining population as a result of destruction of evergreen forest and hunting.

DISTRIBUTION The Rufous-necked Hornbill originally occurred in mountainous regions between eastern Nepal and Vietnam. Although it is now absent from or very rare in much of its previous range it still occurs in southern China, north-eastern India, Myanmar, Thailand, Laos and Vietnam. There are no confirmed records from Bangladesh (see Remarks 1).

■ ***CHINA*** The species is restricted to Medog county in south-east Tibet and Jinping and Mengla counties in southern Yunnan. Records are from:

■ *Tibet* **Medog county**, 850–3,000 m, recorded in 1973 and 1977, female collected at "Bengmu", near Medog town, October, year unspecified (Cheng Tso-hsin *et al*. 1983), July 1983 (specimen in ASCN);

■ *Yunnan* Mengla, **Jinping county**, male collected, 1959 (Yang Lan 1995); **Mengyuan** township, Xishuangbanna National Nature Reserve, 750 m, female collected in November 1959, two males in February 1960 and a male in January 1961 (Yang Lan 1995, Yang Lan *in litt*. 1999, specimens in KIZCN); **Mengla** township, Xishuangbanna National Nature Reserve, 600 m, male and juvenile collected in 1959, one in 1962 (probably in January), female in April 1964 and a female at Mengla Mengfen in April 1982 (Yang Lan 1995, specimens in KIZCN and ASCN).

Unconfirmed records include birds reported by local people south of Datang, Gaoligongshan region, in the past few decades, but its current status is unknown and there were no sightings during surveys in 1992–1994 (Ma Shilai *et al*. 1994). Elders at Tongluoduo village (of Jingpo ethnic group), Tongbiguan Nature Reserve, Yunnan, reported this species in January 1993, but none was found during a recent survey (Han Lianxian in Yang Lan 1995).

■ ***INDIA*** The species has been recorded in West Bengal, Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram and possibly also Nagaland and Sikkim (see Remarks 2). Although it remains moderately common in easternmost Arunachal Pradesh and Bhutan, it appears to be scarce or absent from much of the intervening country, even from apparently suitable hill forests towards the Chinese border (R. Kaul verbally 1999). An undated record of one individual at Tauli Chauki, near Khinanauli, Corbett National Park (Lamba 1987c), requires further confirmation. Records are from:

■ *West Bengal* **Rinchingpong**, "several procured", 1860s (Beavan 1865); **Rungeet**–Darjeeling, March–July 1867 (Bulger 1869); along the **Little Rungeet river**, "a number of individuals", March–July 1867 (Bulger 1869); **Darjeeling**, undated (specimens in NMS and MCML), April 1869 (male in BMNH), and nearby at "Kerseangurry" on the road to Darjeeling (probably near Kurseong), undated (Pearson 1841), and Sangur, January 1916 (male in BNHS); **Tista valley**, apparently 250 m (and thus in West Bengal although given as "Sikkim"), one egg collected, April 1876 (BMNH egg data), "a few obtained", between 1914 and 1923 (Stevens 1923–1925); **Mangpu** (given as "Poomong", and in BMNH egg data as "Mongphoo"), Chinchona Reserves, 600 m, breeding pair, May 1874 (Gammie 1875, BMNH egg data); above **Gopaldhara**, a pair, March 1922 (Stevens 1923–1925); **Nurbong**, 550 m,

March 1914 (Stevens 1923–1925); **Buxa Duar**, where one male in captivity had been trapped nearby, 1918 (Inglis *et al*. 1920), also at "Buxa", December 1925 (male in YPM) and nearby at Buxa Wildlife Sanctuary, one pair above the fort at c.1,000 m, February 1992 (Allen *et al*. 1996); Rungmook (untraced), a pair, 1922 (Stevens 1923–1925);

■ ***Arunachal Pradesh*** **Siang valley**, one, January–March 1990 (Katti *et al*. 1990, 1992); **Keegut**, "common", 1988–1994 (Singh 1994); **Mehao Wildlife Sanctuary**, along Mehao lake track, "common", 1988–1994 (Singh 1994); **Tidding saddle**, one, January 1947 (Ali and Ripley 1948); **Hayuliang** (Tezu–Hayliang), on "Hayliang road", "fairly common", 1988–1994 (Singh 1994); **Parashuram Kund**, 350 m, two, October 1997 (Singh 1999); **Kamlang Wildlife Sanctuary**, at Glao lake, "fairly common", 1988–1994 (Singh 1994b), two, January–March 1990 (Katti *et al*. 1990, 1992), also heard at 1,100 m, October 1997, and between Wakro and Glao, 1,150 m, October 1997 (Singh 1999; although see Remarks 3); **Pange**, "fairly common", 1988–1994 (Singh 1994); **Namdapha National Park**, up to 10 daily at several sites, total of c.20–25 estimated, February 1994 (Alström *et al*. 1994b), and subsequently by various observers, with records specifically from Deban, 450 m, "common", 1988–1994 (Singh 1994) and October 1997 (Singh 1999), at Hornbill Campsite, 400 m, October 1994–March 1995 (Athreya 1996), at Haldibari, two, March 1998 (Hornbuckle 1998a), at Embeong, March 1998 (Hornbuckle 1998a), and Bulbulia camp, four, April 1997 (J.-C. Kovacs *in litt*. 1998); **77-mile camp**, unspecified numbers, 1984–1986, 1987 (Ghosh 1987); **Tasser Puttu**, Subansiri area, 1,200 m, one pair, 1940–1950 (Betts 1956); **Khellong**, "common", 1988–1994 (Singh 1994); **Sessa Orchid Sanctuary**, "fairly common", 1988–1994 (Singh 1994), 950 m, two, October 1997 (Singh 1999), and a casque of a killed bird being seen in April 1999 (Choudhury 2000); in or near to **Eagle Nest Wildlife Sanctuary**, at Tipi (5 km from the park), "common", 1988–1994 (Singh 1994), and at Bompu La, 2,100 m, heard at "Bompu", April 1997 (Singh 1999), six seen at Bompu and nearby Hatinala (between Bompu and Sissini), 1,420 m, October 1999 (Choudhury 2000), also shot in 1999 at the Dichim area of Bichom, and a freshly killed bird seen at Tenga, December 1999 (Choudhury 2000);

■ ***Assam*** unspecified locality, undated (Pearson 1841); **Nameri National Park**, undated (Das 1996); **Manas National Park**, undated but presumably 1980s (Anon. 1990b, 1993a); **North Cachar Hills district**, at "Hot Springs" (apparently near Garampani: Survey of India map, 1984), June 1889 (BMNH egg data), and at Daly's Camp, North Cachar hills, May 1889 (BMNH egg data); **Hungrum** (Hungroom), North Cachar, eggs collected in March 1890, March 1897, and other sightings around that time (Baker 1894–1901, BMNH egg data);

■ ***Meghalaya*** **Khasia hills**, several nests, including one at Cherrapunji, May 1907 (Baker 1907b, Baker 1922–1930, BMNH egg data);

■ ***Manipur*** **Karong**, October–November 1950 (five specimens in FMNH, UMMZ); **Nungba**, Barail range, one male, undated (Prashad 1937);

■ ***Mizoram*** "Aigal", here assumed to be **Aizawl**, February 1904 (specimen in BNHS); **Sangau** (Sangan), Lushai hills, February 1953 (six specimens in FMNH, UMMZ).

■ ***NEPAL*** Although the species was first described from Nepal, there are few records, none with specific locality data, as follows: Nepal, c.1850 (specimens in NHMW and RMNH); **Lower hills**, undated (male in BMNH, Hodgson 1829b). Furthermore, Stevens (1923–1925) mentioned a nest apparently found in Nepal in 1922, but provided no further details. One specimen labelled "Djargali" (pre-May 1850; female in IRSNB) collected by Frank (some of whose other specimens are labelled "nipaul") might have come from the country, but the locality could not be traced.

■ ***BHUTAN*** Records are scattered throughout the country between 150 and 2,000 m (Inskipp *et al*. 1999a), as follows: **Tongsa**, a male, April 1997 (Bishop 1999a), four, April 1998 (Holt 1998, Bishop 1999a); **Namling–Yonkhala road** (part of what is sometimes called "Lingmethang road"), within Thrumshingla National Park, generally "common", c.1,600–2,200 m (Bishop

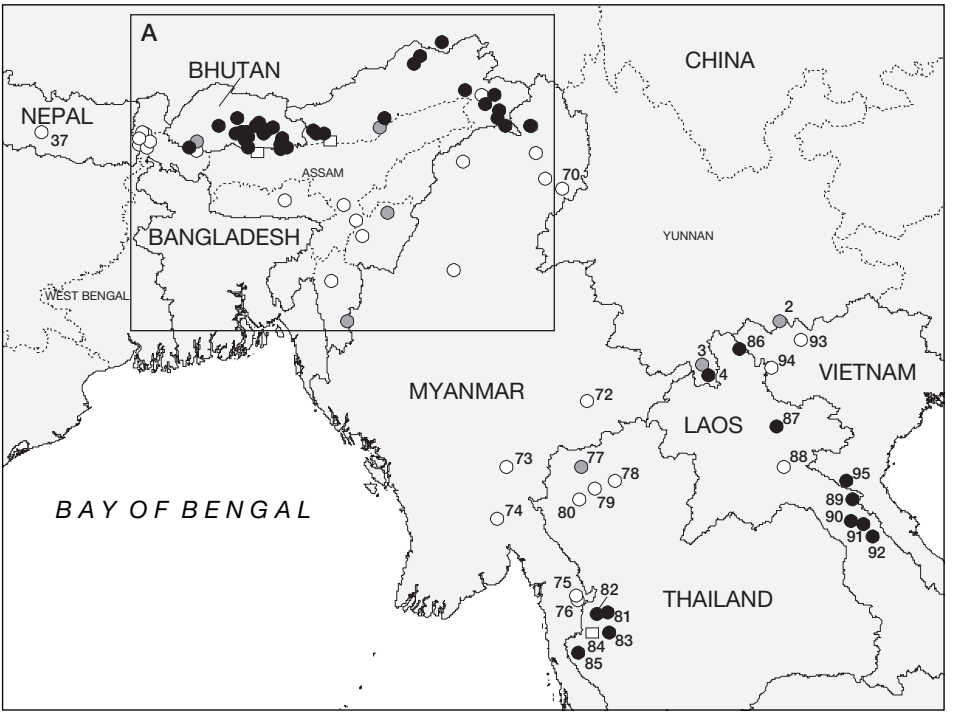
1999a), with many records over recent years (Inskipp *et al*. 2000a,b), including three at Namling, October 1991 (Inskipp and Inskipp 1993a), and three pairs there in April 1996 (Holt 1996), also two pairs along the road in October 1993 (R. Pradhan *in litt*. 1998), 14 birds, April 1995 (Bishop 1995), one pair, March 1996 (Bishop 1996), also (including a pair excavating a nest-hole and engaged in courtship display), April 1998 (Farrow 1998, Holt 1998), April 1999 (B. Carrick *in litt*. 1999) and one at Yongkhala in April 1996 (D. Fisher *in litt*. 1996), up to four in May 1996 (King 1996), up to five in April–May 1998 (Inskipp and Inskipp 1998), and one in April 1999 (Holt 1999), while a record of one pair from "near Lingmethang", 530 m, December 1995 (R. Pradhan *in litt.* 1998) is presumably from the same area; **Ada lake**, 1,300 m, one, May 1993 (Inskipp and Inskipp 1993b); **Thekpaling**, c.1,750 m, up to six pairs, February 1997, five, April 1998, and between Thekpaling (in Thrumshingla National Park) and Kheng Shingkhar (in the park's buffer zone), 1,700–1,720, up to two, April 1998 (Inskipp and Inskipp 1998, Inskipp *et al*. 2000a,b); **Korila**, one pair, April 1996 (Holt 1996), one, April 1997 (K. D. Bishop *in litt*. 1999), c.20 around 2,000 m, April 1998 (Inskipp and Inskipp 1998), three, April 1999 (Holt 1999, B. Carrick *in litt*. 1999); **Saleng**, Thrumshingla National Park, up to three in January 2000 (Inskipp *et al*. 2000a,b); Grangmong to **Mongar**, 2,000 m, at least eight, July 1995, Mongar to Yadi (Yadhi), 1,800 m, four, July 1993, and Mongar to Ngarshang, 1,900 m, 10, July 1993 (Sherub verbally 1998); **Buli** to Tali, c.1,800 m, two pairs, January 1997 (Pradhan 1997a); **Nimshong**, 1,300 m, 13 in May 1994 (Tymstra *et al*. 1996); **Wangdinala**, 1,600 m, four in May 1994 (Tymstra *et al*. 1996); up to six at **Chulungbi**, with a further individual between there and Gulibi, and up to two at **Broksar**, three at Yunidrang, and nearby six in the Yunari Chu valley, all in the buffer zone of Thrumshingla National Park, January 2000 (Inskipp *et al*. 2000a,b); **Nobji**, c.1,300, one in May 1994 (Tymstra *et al.* 1996); **Tingtibi**, by the Mangde Chu, one in May 1993 (Inskipp and Inskipp 1993b), four at 800 m, March 1995 (K. D. Bishop *in litt*. 1999), also at Tama (c.20 km from Tingtibi), on the Mangde Chu, 1,150 m, March 1967 (male in BNHS, Ali *et al.* 1996), nearby at Tamala where fairly common, 1990s (M. Wangdi *in litt*. 2000), and elsewhere in Upper Kheng, Shemgang district, 1,300–2,000 m, nine pairs, January–February 1997 (R. Pradhan *in litt*. 1998); **Batase**, c.1,450 m, 1967 (Ali *et al*. 1996); **Gonphu** (Gompu) to Panbang, Shemgang district (= Zhemgang Dzongkhag), 150–1,600 m, an estimated 33 pairs, March 1993, and Gomphu, 1,400 m, four pairs, July 1994, two pairs in March 1995 (R. Pradhan *in litt*. 1997), at "Parbang Dzokha", between Gonphu and Langdubi, 150–2,200 m, an estimated 40 pairs, April–May 1996 (R. Pradhan *in litt*. 1998), and elsewhere at unspecified localities in Shemgang district, c.1,950 m, two females, 1967 (Ali *et al.* 1996), undated (P. Spierenburg *per* C. Inskipp *in litt*. 1999); **Honey Rock**, two, March 1992 (Clements 1992); between **Wamrong** and Deothang, along the "Tashigang road", common, 1994–1997 (Bishop 1999a), and several pairs from Wamrong–**Narphang**, April 1995 (K. D. Bishop *in litt*. 1999), and also in the same area near 49 km post, c.1,900 m, one male, April or May 1966 (Ali *et al*. 1996), 1,500 m, several, March 1996 (Bishop 1996), one pair at Narphang, April 1998 (Holt 1998), and nearby at Morong (or Orong), c.1,700 m, two males, April and May 1969 (Ali *et al*. 1996), five, April 1996 (Holt 1996), 6–8, April 1998 (Bishop 1999a), two females, April 1999 (B. Carrick *in litt*. 1999); **Zurphey**, one, May 1993 (Inskipp and Inskipp 1993b); **Subrang**, 1,400 m, three, April 1993 (Inskipp and Inskipp 1993b); Gedu, **Chhukha**, c.1,850–2,100 m, 15–20, October 1968 (Ali *et al.* 1996, male in BNHS), also in this area at Ganglakha (around 43 km from Phuntsholing on the road to Thimpu), c.1,850 m, one or two collected, October 1968–January 1969 (Ali *et al.* 1996); a few kilometres above **Deothang**, c.900 m, several records, 1994–1998 (Farrow 1997, Bishop 1999a), 10, April 1998 (Holt 1998, K. D. Bishop *in litt*. 1999); **Royal Manas National Park**, five, 300–650 m, April 1993 (Inskipp and Inskipp 1993b); **Phuntsholing**, 300 m, several observations between 1994–1997 (Bishop 1999a), and Kamji, between Phuntsholing and Gedu, February 1994 (K. D. Bishop *in litt*. 1999); **Dalim**, one, 700 m, April 1993 (Inskipp and Inskipp 1993b); **Worong**, one male, April 1998 (Holt 1998); Mose (untraced), one, April 1995 (Bishop 1995); Pliznem Gaikhure (untraced), 390 m, one

pair, October 1996 (R. Pradhan *in litt*. 1998); Tchang Dang Chu (untraced), 1,100 m, up to five pairs, March 1995 (R. Pradhan *in litt*. 1998, K. D. Bishop *in litt*. 1999).

■ ***MYANMAR*** The species was once widely distributed in Myanmar, being recorded from the Chin hills, Katha district, Shan State, Karenni (Kayah) and Tenasserim (Taninthayi) as far south as Mulayit mountain (Blyth 1875, Hume and Davison 1878, Rippon 1901, Smythies 1986). Specimens are catalogued from "Moulmein", undated (Pearson 1841), although they probably came from the hill ranges far inland of this town and the locality is therefore not mapped. The few recent records are entirely from the far north although little ornithological exploration has been possible in much of its former range, thus: east of Fort Hertz, on the **Nogmung–Pagnamdim track**, 1,500 m, 1948 (Smythies 1949); more recently fairly common around **Putao**, January–February 1998 (B. F. King verbally 1998); near **Hpunchanhka**, Sumprabum subdivision, male, May 1933 (Stanford and Ticehurst 1938–1939, also Smythies 1949); Naga hills, west of the Hukawng valley, this referring to the **Sangpang range**, "a small flock", February 1944 (Smythies 1949); near **Shagribum**, in the "Triangle", a pair, March 1934 (Stanford and Ticehurst 1938–1939); **Laukkaung**, N'Mai Hka drainage, 1,500 m, "a flock of about eight", February 1948 and one, April 1948 (Smythies 1949); southern spur of **Pino** mountain (Pino taung), Katha district, three birds, c.750 m, September 1932 (Smith 1942); **Loi-San-Pa**, Southern Shan States, 2,100 m, 1889–1900 (Bingham and Thompson 1900); **Taho** (Taho-au), Karenni, one, February 1888 (Salvadori 1889); north-west of **Kolo** valley, Nattaung, 1,850 m, one, April 1940 (Smith 1942, Smith *et al*. 1940–1944); **Ta-ok plateau**, Tenasserim, 1,000 m, January 1924 (male in AMNH, Lowe 1933); **Mulayit** (Mount Mulayit), c.1,050 m, February 1859 (Tickell 1864, also Hume and Davison 1878), and a male taken at "Plapoo", March 1887 (Salvadori 1888b).

■ ***THAILAND*** The species once occurred in mountains along the border with Myanmar south to Kanchanaburi province (Deignan 1963, Round 1988a, Lekagul and Round 1991, Poonswad and Kemp 1993). It has largely disappeared from northern regions. Records are from: **Kiew Kor Mah**, Pai district, on the Chiang Mai/Mae Hongson watershed, February 1957 (female in YPM); **Doi Lang Ka** (Nangka, Doi Mae Tho), a group of 7–8 at Pang Meton, April 1931 (Riley 1938, Deignan 1945); **Doi Suthep-Pui National Park**, on Doi Suthep in the early 1930s (Deignan 1936a), but now likely to be extinct at this site (Round 1984, 1988a), also "Chiang Mai" (thus probably on Doi Suthep), two males, 1,400 m, February 1933 (Meyer de Schauensee 1934); **Doi Inthanon National Park** (Doi Angka), 1,300 m, April 1937 (two specimens in MCZ), apparently once "common" (Deignan 1945), but now extinct (P. D. Round *in litt*. 1998); **Mae Wong National Park**, Tak province, present in 1998 (P. D. Round *in litt*. 1998), three at Chong Yen, August 1999 (*Bird Conserv. Soc. Thailand Bull.* 16, 10 [1999]: 18–19), and "quite a few" at Khao Mokoju, November 2000 (W. Sanguansombat *per* P. D. Round *in litt*. 2000); **Umphang Wildlife Sanctuary**, 45 km south-west of Umphang, 500 m, February 1924 (three specimens in AMNH, Lowe 1933), February 1988 (D. Ogle *in litt*. 1988), one, February 1988 (*Bangkok Bird Club Bull*. 5, 3 [1988]: 11–12), three, July 1989 (*Bangkok Bird Club Bull.* 6, 9 [1989]: 10), still present in 1998 (P. D. Round *in litt*. 1998); **Huai Kha Khaeng Wildlife Sanctuary**, regular breeding in small numbers, 1990s (Chimchome *et al.* 1997, *Bird Conserv. Soc. Thailand Bull.* 15, 9 [1998]: 14–15), and seen by several observers down to the present (e.g. Mauro 1999); **Thung Yai Naresaun Wildlife Sanctuary**, recent records from higher altitudes, undated (Kemp 1995, P. D. Round *in litt*. 1998); **Khao Laem National Park**, Kanchanaburi province, several records, 1990s (Vidhidharm *et al*. 1995).

■ ***LAOS*** The species has been recorded locally in the northern mountains and thence southwards along the Annamite chain to Nakai Nam Theun NBCA. Records are from: Phou Dendin NBCA, at **Nam La**, 900–1,100 m, two, March 1996 (Thewlis *et al*. 1998); **Phou Louey NBCA**, Houaphanh, at least one pair, perhaps three or four pairs, May 1998, 1,200–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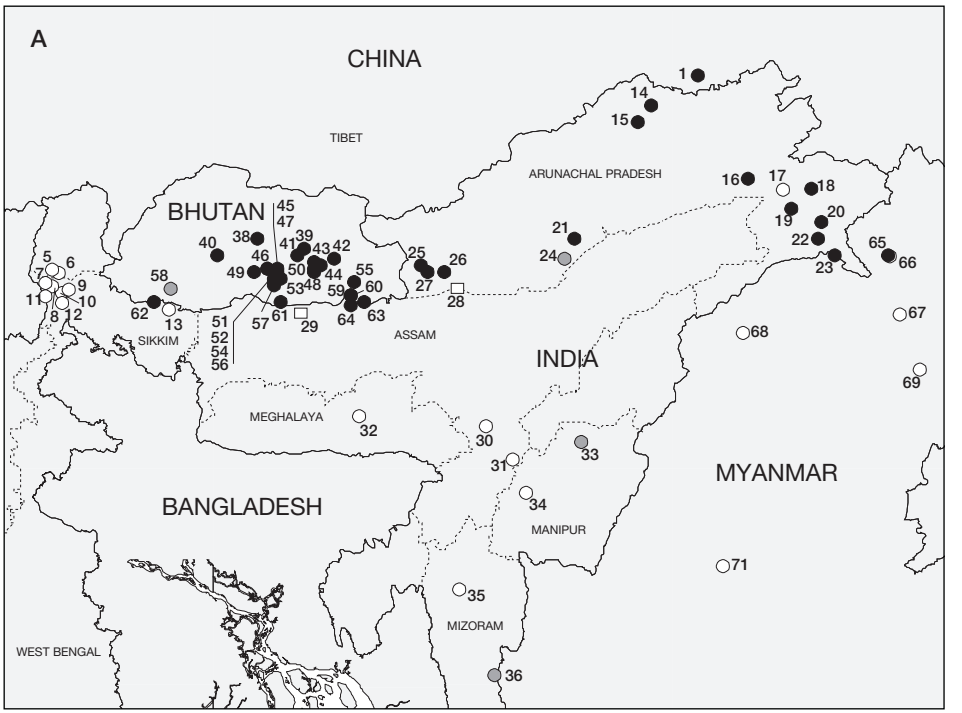
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1,700 m (Davidson 1998); **Xiang Khouang** (Xiangkhouang) province, collected near Xiang Khouang town, January 1926 and observed elsewhere in the province in the 1920s (specimen in MNHN, Delacour and Jabouille 1927b), and late 1930s to early 1940s (David-Beaulieu 1944); **Nam Theun Extension proposed NBCA**, Bolikhamxai, remains of a hunted bird found, 1996 (Thewlis *et al.* 1998); **Nam Phao**, Nakai-Nam Theun NBCA, Khammouane, early 1994 (Evans and Timmins 1998); along the abandoned logging road above **Ban Navang**, Nakai-Nam Theun NBCA, 800–1,300 m, March 1995, January–February, April–May 1996 (Thewlis *et al.* 1998), February 1997 (Tobias 1997), 2–4 seen daily on the lower portion of the logging road, January 1999 (J. W. Duckworth *in litt.* 1999); in the **Nam Mon** catchment, including the Houai Morrow valley, Nakai-Nam Theun NBCA, 700–900 m, several, early 1994 (Thewlis *et al.* 1998), March 1997 (Tobias 1997).

Unconfirmed reports include: Ban Pao Dta, where birds were said to visit hills above the village during the wet season (Showler *et al.* 1998a); and Phou Xang Khom, reported by villagers (Showler *et al.* 1998a).

■ ***VIETNAM*** The species occurs locally in the northern and central mountains (see Remarks 4). Records are from: **Mount Fan Si Pan**, Sa Pa district (Chapa), Lao Cai, around present-day Hoang Lien Nature Reserve, December 1929 (female in MNHN, Delacour 1930), one male and another in the possession of villagers, January 1939 (Eames and Ericson 1996); **Muong Moun**, Lai Chau, April 1929 (male in FMNH, Bangs and van Tyne 1931); **Pu Mat Nature Reserve**, Nghe An, three, above 1,000 m, November and December 1994 (Do Tuoc and S. P. Dawson *per* Nguyen Cu *in litt.* 1994), "small numbers" seen at four locations within the nature reserve, September–November 1998 (*Oriental Bird Club Bull.* 29 [1999]: 51–56, Round 1999), a group of 2–4 birds at 1,400 m altitude on the north-west face of Pu Mat mountain, April 1999 (Round 1999).

Unconfirmed records are as follows: Muong Nhe Nature Reserve, possibly November and December 1991, but no details given (Cox *et al.* 1992, Nguyen Cu 1993; see Remarks 5); Na Hang proposed nature reserve, undated (Dang Huy Huynh and Hoang Minh Khien 1993); Huong Son (Annamite) Forest, Ha Tinh province, calls heard (Timmins and Cuong 1999; but see Remarks 3).

POPULATION The Rufous-necked Hornbill does not appear to be evenly distributed throughout its range. This impression is doubtless exaggerated by the large swathes of Myanmar and southern China that have received little ornithological exploration, but its

The distribution of Rufous-necked Hornbill *Aceros nipalensis* (maps opposite): (1) Medog county; (2) Jinping county; (3) Mengyuan; (4) Mengla; (5) Rinchingpong; (6) Rungeet; (7) Little Rungeet river; (8) Darjeeling; (9) Tista valley; (10) Mangpu; (11) Gopaldhara; (12) Nurbong; (13) Buxa Duar; (14) Siang valley; (15) Keegut; (16) Mehao Wildlife Sanctuary; (17) Tidding saddle; (18) Hayuliang; (19) Parashuram Kund; (20) Kamlang Wildlife Sanctuary; (21) Pange; (22) Namdapha National Park; (23) 77-mile camp; (24) Tasser Puttu; (25) Khellong; (26) Sessa Orchid Sanctuary; (27) Eagle Nest Wildlife Sanctuary; (28) Nameri National Park; (29) Manas National Park; (30) North Cachar Hills district; (31) Hungrum; (32) Khasia hills; (33) Karong; (34) Nungba; (35) Aizawl; (36) Sangau; (37) Lower hills; (38) Tongsa; (39) Namling-Yonkhala road; (40) Ada lake; (41) Thekpaling; (42) Korila; (43) Saleng; (44) Mongar; (45) Buli; (46) Nimshong; (47) Wangdinala; (48) Chulungbi; (49) Nobji; (50) Broksar; (51) Tingtibi; (52) Batase; (53) Gonphu; (54) Honey Rock; (55) Wamrong; (56) Zurphey; (57) Subrang; (58) Chhukha; (59) Narphang; (60) Deothang; (61) Royal Manas National Park; (62) Phuntsholing; (63) Dalim; (64) Worong; (65) Nogmung-Pagnamdim track; (66) Putao; (67) Hpungchanhka; (68) Sangpang range; (69) Shagribum; (70) Laukkaung; (71) Pino; (72) Loi-San-Pa; (73) Taho; (74) Kolo; (75) Ta-ok plateau; (76) Mulayit; (77) Kiew Kor Mah; (78) Doi Lang Ka; (79) Doi Suthep-Pui National Park; (80) Doi Inthanon National Park; (81) Mae Wong National Park; (82) Umphang Wildlife Sanctuary; (83) Huai Kha Khaeng Wildlife Sanctuary; (84) Thung Yai Naresuan Wildlife Sanctuary; (85) Khao Laem National Park; (86) Nam La; (87) Phou Louey NBCA; (88) Xiang Khouang; (89) Nam Theun Extension proposed NBCA; (90) Nam Phao; (91) Ban Navang; (92) Nam Mon; (93) Mount Fan Si Pan; (94) Muong Moun; (95) Pu Mat Nature Reserve.

○ Historical (pre-1950) ◍ Fairly recent (1950–1979) ● Recent (1980–present) □ Undated

population elsewhere seems to be scattered discontinuously in isolated pockets. In some of these (e.g. Bhutan, easternmost Arunachal Pradesh, India and a small area of the central Annamites in Laos) it seems to remain fairly common, but it is elsewhere generally scarce or absent and its overall population is likely to be small.

China In Tibet the species is probably uncommon and peripheral as most habitat is too high for it. In Yunnan, it is apparently still fairly common in Xishuangbanna National Nature Reserve (Yang Lan *in litt*. 1998), but there has been no population estimate. Nevertheless, there has apparently been a substantial reduction in range and numbers in China since 1964 (Yang Lan 1995, Yang Lan *in litt*. 1998) and it now appears to be scarce and local.

India Beavan (1865) described the species as "plentiful in the interior of Sikkim" (this referring largely, if not entirely, to present-day West Bengal; see Remarks 2) while Bulger (1869) encountered "a number of individuals" both in the Little Rungeet valley, "and on the ascent thence to Darjeeling". In North Cachar Hills district, Assam, it was "by no means rare" (Baker 1894–1901) while in the Khasia hills of Meghalaya it was "a straggler only" (Baker 1907b), although breeding was recorded (see Distribution). On the basis of these reports, Ali and Ripley (1968–1998) described it as "not uncommon patchily", although "disappearing from many areas".

More recently, it has become scarce almost throughout, surviving in much reduced numbers in West Bengal (only one recent record) and Assam, having perhaps disappeared from its previous range in Meghalaya, Mizoram and Manipur. Resumption of fieldwork in these latter areas, however, may reveal its continued presence. It remains locally common in eastern Arunachal Pradesh, particularly in and around Namdapha National Park: up to 10 a day were seen in this area during February 1994 (Alström *et al*. 1994b). It is also fairly common in the Mishmi hills area of Arunachal Pradesh (Singh 1994) and near the Bhutan border around Sessa Orchid Sanctuary and Eagle Nest Wildlife Sanctuaries (Singh 1994, Choudhury 2000). No population estimate has been made for India, but it seems likely to fall in the high hundreds or low thousands.

Nepal In the nineteenth century, Tickell (1864) described the species as "by no means uncommon" in the terai of Nepal, presumably meaning further east as there are no confirmed records of the species since B. H. Hodgson collected the type specimen. Little suitable habitat apparently remains and it is therefore probably extinct in the country (C. Inskipp and T. P. Inskipp *in litt*. 1999).

Bhutan The most important single population of this species survives in Bhutan (Bishop 1999a). It is widespread and generally common in tall broadleaved evergreen forest, groups of up to seven being regularly observed (Ali *et al*. 1996, Bishop 1999a, Inskipp *et al*. 1999, 2000a,b). The number of individuals surviving in the country seems likely to be in the low thousands.

Myanmar The species has only ever been found in small numbers from Myanmar. A century ago, Bingham and Thompson (1900) considered it "rare" in the Southern Shan States, before which Salvadori (1888b) had reported only a "few individuals" at Mulayit mountain, all above 1,000 m. It remains local and uncommon (Khin Ma Ma Thwin *in litt*. 1997), and indeed the only recent confirmed records are from the far north, where it is described as "fairly common locally" (B. F. King verbally 1998). The paucity of fieldwork in Myanmar, however, leaves room for some optimism as important populations may yet be found to survive.

Thailand In the first half of the twentieth century, Meyer de Schauensee (1934) described it as a "common species" in the mountains of north Thailand, and Deignan (1945) considered it "not rare but seldom observed". On Doi Suthep in the early 1930s it was thought "uncommon" (Deignan 1936a) although later described by the same author as "fairly" common there and "common" on Doi Inthanon (Deignan 1945). It is now extinct on Doi Suthep (Round 1984), and very rare elsewhere in the country, having declined rapidly during the course of the twentieth century (P. D. Round *in litt*. 1998). The most important populations

currently survive in the western forest complex including Huai Kha Khaeng Wildlife Sanctuary and Umphang Wildlife Sanctuary. The population is estimated to be under 1,000 and still declining (Poonswad 1993).

Laos Although David-Beaulieu (1944) considered the species rather rare throughout Indochina (Laos, Vietnam, Cambodia), it was reportedly common in Xiang Khouang province early in the twentieth century (1920–1940) when flights of around five were frequently observed in the mountains of the region (Delacour and Jabouille 1927b, David-Beaulieu 1944). It was presumably less common in northern Laos in the 1920s as none was observed there by the Kelley-Roosevelts expedition (Bangs and van Tyne 1931). It is currently fairly common (population probably containing several hundred individuals) in the large area of forest remaining in and around Nakai-Nam Theun NBCA, Laos, where several groups of up to five were encountered on most days at suitable altitudes during recent visits (Tobias 1997, Evans and Timmins 1998), but recent surveys in other protected areas have not disclosed any other major population (Thewlis *et al.* 1998, Davidson 1998, Showler *et al.* 1998a).

Vietnam It was presumably uncommon in northern Vietnam in the 1920s as only one was observed (and collected) in this region by the Kelley-Roosevelts expedition (Bangs and van Tyne 1931). Recent survey work has not confirmed the presence of the species at Muong Nhe Nature Reserve (Eames and Tordoff in prep.). It was not found during recent surveys at Hoang Lien Nature Reserve and it may be extinct there because of intense hunting pressure and the clearance of forest at low elevations (Tordoff *et al.* 1999). A survey in Vu Quang Nature Reserve during July 1999 failed to locate the species, and it seems probable that its range does not extend this far south in Vietnam (Eames and Tordoff in prep.). Numbers remain unknown in Vietnam, but the species is considered to have undergone a major decline in recent decades (Nguyen Cu *in litt*. 1997), and with so few recent records the population must be very small.

ECOLOGY ***Habitat*** This is a hornbill of tall dense evergreen and semi-deciduous forest, usually in hills (Baker 1922–1930, Ali and Ripley 1968–1998, Smythies 1986, Kemp 1995, Chimchome *et al*. 1997). While Baker (1922–1930) found most nests in the Khasia hills in "large trees in evergreen but not very dense forest," they also bred occasionally "in scattered oaks on grassland". In Nakai-Nam Theun NBCA, Laos, it usually frequented evergreen fagaceous forest at mid-altitudes, sometimes visiting higher elevations where habitat is characterised by the conifer *Fokienia hodginsii* (Tobias 1997, Evans and Timmins 1998). It is generally found between 700 and 2,000 m (Smythies 1986, Kemp 1995), although it has been recorded as low as 400 m in Thailand (Deignan 1945, Poonswad *et al*. 1997), 350 m in Vietnam (BMNH label data), 150 m in Bhutan (Inskipp *et al*. 1999a) and 120 m in India (Singh 1994). In North Cachar Hills district, India, it was only thought to nest over 900 m altitude, although it occurred in the non-breeding season in the neighbouring lowlands (Baker 1894–1901). However, it appears to be most abundant at mid-altitudes. In Nakai-Nam Theun NBCA, Laos, it was usually observed between 800 and 1,800 m, although most commonly encountered above 1,500 m (Evans and Timmins 1998; but see Migration). In Thailand, nests were found between 1,000 to 1,300 m at Huai Kha Khaeng Wildlife Sanctuary (Chimchome *et al*. 1997), and the species originally occurred between 1,150 and 1,700 m on Doi Suthep (Deignan 1936a). In Yunnan, it is apparently commonest between 600 and 800 m (Yang Lan 1995), and in Tibet around 850 m (Cheng *et al*. 1983).

The species is usually found in pairs or small flocks (Deignan 1936a, Kemp 1995, Bishop 1999a), except in the breeding season when females are enclosed in tree cavities and males are often encountered foraging alone (Kemp 1995, Yang Lan *in litt*. 1998). For example, in Xishuangbanna National Nature Reserve, China, it is "solitary" (i.e. nesting) from March to May, but seen in flocks feeding on figs later in the year (Yang Lan *in litt*. 1998). The largest flock recorded, containing more than 20 individuals, was observed in Bhutan (Inskipp

and Inskipp 1998). Communal roosting has also been recorded in Bhutan: 15–20 birds were seen to swoop down in singles or small groups at dusk to a "lofty tree" (Ali *et al.* 1996). The bird collected in Medog on 10 October was in moult (Cheng *et al.* 1983).

Food In common with other *Aceros* and *Buceros* hornbills, this species forages mainly on fruit in the canopy of tall trees (Bangs and van Tyne 1931, Kemp 1995, Cheng Tso-hsin *et al.* 1983). In India it has been recorded foraging on the fruits of *Dysoxylon* and nutmegs *Myristica* (Gammie 1875, Ali and Ripley 1968–1998). The stomach of a bird collected in Bhutan contained "18 large nutmeg-like seeds, some with epicarp attached, aggregately weighing 98 g" (Ali *et al.* 1996) and these were in all likelihood presumably nutmegs *Myristica*. More recent information from Bhutan suggests that it prefers the fruit of *Persea*, *Beilschmiedia* and *Ficus* trees (R. Pradhan *in litt*. 1998). The stomach contents of a Chinese specimen from Mengla also exclusively comprised fruits, principally figs and pears (Yang Lan 1995). The only direct study of foraging preferences was conducted recently in Huai Kha Kaeng Wildlife Sanctuary, Thailand. In this area, most fruit in the diet derived from tree species of the genera *Cryptocarya*, *Beilschmiedia*, *Ficus*, *Knema* and *Horsfieldia* and of the family Meliaceae (Chimchome *et al.* 1997). Of these, the dominant items in the diet of breeding individuals were fruit of *Cryptocarya pallens* and *Ficus* (Chimchome *et al.* 1997). It is likely that, at other times of year, different species of tree provide the bulk of this hornbill's food in the area. Deignan (1936a, 1945) once observed the species feeding on the ground apparently on fallen fruit.

Although Baker (1922–1930) thought it "purely a fruit-eater", the species also devours a wide variety of animals and insects. Invertebrates including crabs, click beetles and cicadas were favoured in Huai Kha Khaeng Wildlife Sanctuary, and a remarkable total of 20 animal taxa were identified during nest watches at this site, including lizards, earthworms, frogs, fish and birds (Chimchome *et al.* 1997). This dietary diversity indicates that, at least in the breeding season, the species ranges from streams and leaf-litter on the forest floor up to the canopy in search of vertebrate and invertebrate food items. In this way it resembles most other Asian hornbills (Kemp 1995, del Hoyo *et al.* 2001).

Breeding *Season* The breeding season of this species appears to be fairly constant throughout its range. At Mengla, Xishuangbanna National Nature Reserve, male birds were encountered solitarily from March to June, presumably while their mates were incarcerated (Yang Lan *in litt*. 1998). In north-east India it tends to nest during April and May (Ali and Ripley 1968–1998), although eggs from the region have been collected between 2 March and 7 June (BMNH egg data, Gammie 1875) and Baker (1922–1930) found them breeding in February–March, then again in May–June in the Khasia hills. In Bhutan pairs have been observed in March chasing each other around tree canopies, presumably as a part of courtship behaviour (R. Pradhan *in litt*. 1998). A study in 1994 at Huai Kha Khaeng Wildlife Sanctuary, Thailand, concluded that the breeding season begins in January–February and ends in May–June (Chimchome *et al.* 1997). A female taken on Doi Inthanon, Thailand, in April had enlarged ovaries (MCZ label data).

The abundance of fruit is probably an important factor in stimulating nesting activity. In 1994, the fruiting season was particularly successful at Huai Kha Kaeng and many hornbills were breeding in the study plot; in 1995, however, the productivity of major fruit producing tree species was low and no hornbill nests could be found (Chimchome *et al.* 1997). A nest in West Bengal was sited in the trunk of a large fruiting tree, suggesting that nesting was timed so that chick feeding and fruiting would coincide (Gammie 1875), although this may have itself been coincidental. In Thailand most forest hornbills, including this one, begin nesting in the height of the dry season so that hatching is apparently synchronised with the arrival of high monsoonal rainfall (del Hoyo *et al.* 2001).

Nest site The West Bengal nest described by Gammie (1875) was placed in a *Dysoxylon* tree, 28–31 m tall, and unbranched for c.17 m. A study by Chimchome *et al.* (1997) at Huai Kha Khaeng yielded the following information regarding nest sites. The 12 nest trees found

were all tall (apparently 24–54 m although the latter figure seems remarkable), broad (70–121 cm DBH), situated on moderately steep slopes (24–38% incline), and most commonly of the genus *Syzygium* (10 out of 12 nests). Trees of this genus are scarce in hill forests of the region and are presumably preferentially sought simply because of their large size and propensity for cavity formation rather than any other factor. The actual nest holes ranged from 6 to 33 m above the ground.

The species requires large forest trees for its nest cavities (Kemp 1995). It has been contended that nests of large hornbill species are usually in living trees possibly because of microclimatic differences between cavities within living and dead wood (Kemp 1995, Chimchome *et al*. 1997). This has led to the suggestion that the use of dead sites might indicate a shortage of natural nest holes in a given area (Poonswad and Kemp 1993). However, the apparent preference for living trees might reflect unequal sampling, i.e. more nests appear to be sited in live trees simply because forests contain more live trees than dead trees (M. F. Kinnaird *in litt*. 2000). If the preference exists, it indicates a need for large living trees which is not being met in the current climate of deforestation.

Clutch size and incubation In India the species lays either one or, less often, two eggs (Gammie 1875, Baker 1922–1930, Ali and Ripley 1968–1998). At Huai Kha Khaeng, the 12 nesting attempts studied involved nine pairs, eight of which bred successfully, raising 1–2 chicks (mean = 1.33 chicks per nest) (Chimchome *et al*. 1997).

In common with most forest hornbills the female is blocked into the nest hole where she stays for around four months, sustained by food provided by her mate (Kemp 1995, del Hoyo *et al*. 2001). The entire breeding cycle takes around 125 days, with females emerging from incarceration slightly before (but apparently always on the same day) as the chick (Chimchome *et al*. 1997). The material used for plastering the nest entrance consists of semi-digested "vegetable tissue, cells, fibres, oil globules" (A. O. Hume, footnote to Gammie 1875). The female (and later the nestlings) defecates through the cavity entrance resulting in a mound of droppings at the base of the nest tree (A. O. Hume, footnote to Gammie 1875), behaviour clearly designed to maintain nest hygiene (del Hoyo *et al*. 2001).

Migration Little is known of movements undertaken by this species (see Kemp 1995), although the available evidence suggests that some populations make seasonal movements between forested areas (Timmins and Evans 1996) and probably also non-seasonal movements in response to variations in the abundance of fruiting trees. For example, fieldwork at the same sites in Nakai-Nam Theun NBCA, Laos, in May 1994 (Evans and Timmins 1998) and May 1997 (Tobias 1997) revealed that in the first season it was common above 1,500 m but in the second it was common between 800 and 1,300 m, and apparently absent above 1,500 m. Furthermore, at Huai Kha Khaeng, several pairs nested in fairly close proximity in 1994 while fruit was plentiful in the area, but none could be found the following year (Chimchome *et al*. 1997). These facts suggest that populations appear and disappear in response to irregular fruiting patterns. In general, altitudinal and lateral wandering is most frequent in the non-breeding season: in North Cachar Hills district, for example, nesting always took place above 900 m, while in the non-breeding season the species occurred "right down to the plains" (Baker 1894–1901).

THREATS The Rufous-necked Hornbill is primarily threatened by the pervasive combination of habitat loss and hunting. Human population growth and encroachment of forested land have proceeded apace in recent years, characterised by habitat degradation and increased hunting pressure even in protected areas (see, e.g., Cox *et al*. 1992, Round 1984, 1985, IUCN 1997). Its susceptibility to these factors is manifest in its disappearance from many suitable areas in which it once widely occurred, chiefly regions of Nepal, Thailand and Vietnam (Poonswad and Kemp 1993). Individual threats are dealt with separately in the following sections.

Hunting and trade This species is hunted intensively almost throughout its range, especially in China (Yang Lan *in litt*. 1998), Thailand (Round 1984, 1985), Laos (Thewlis *et al.* 1998, Duckworth *et al*. 1999) and Vietnam (Worth *et al*. 1994, Nguyen Cu *in litt*. 1997). The hunter is generally seeking food, but the bird's casque is also sold or kept as a trophy, adding further incentive. The label of a Rufous-necked Hornbill specimen (in BMNH) from Vietnam asserts that it had "flesh good to eat". Indeed, the meat of this and other large hornbills is considered a delicacy in many areas of South-East Asia (Nguyen Cu 1993, Tobias 1997) and in Vietnam, Laos and Thailand the species has consequently become extremely rare in all but the most remote regions (Lambert *et al*. 1994, Round 1984, 1985, Thewlis *et al.* 1998). Another factor exacerbates this misfortune: hornbills are long-lived birds, recruiting few offspring each year, and hunting pressure can thus significantly deplete numbers in a short period of time (Round 1988a, Kemp 1995, Bennett *et al*. 1997, Bennett 1998, Thewlis *et al*. 1998). *China* The species is generally absent in the vicinity of human settlements as a result of hunting pressure (Yang Lan *in litt*. 1998). In Medog, Tibet, for example, local people take chicks from nests (Yin Binggao and Liu Wulin 1993). *India* Hornbill casques are used in tribal head-dresses in some parts of north-east India and the birds are shot to provide these (R. Kaul verbally 1999). Adult hornbills have long been hunted for food in West Bengal, while their nests are often robbed and the contents consumed: the Lepchas (of West Bengal) and Nepalese apparently "eat both the old and the young of the *Aceros* [in this case specifically referring to *A. nipalensis*], and pronounce them to be rather good eating" (Gammie 1875). One Rufous-necked Hornbill nest found in West Bengal in the nineteenth century had, for example, been plundered "every season for many years past" (Gammie 1875). Similarly, nests in the Khasia hills, Meghalaya, were regularly robbed by Naga people (Baker 1922–1930). Hunting birds is currently a "popular sport" in the state (K. Kazmierczak *in litt*. 1999), these pressures perhaps explaining the lack of recent records of this species in the area. Locals in Arunachal Pradesh also hunt hornbills enthusiastically (see Choudhury 2000), a factor that has undoubtedly reduced its populations in all but the most remote areas. *Bhutan* Hunting is thankfully a very minor threat owing to the Buddhist traditions of the majority of residents (R. Pradhan *in litt*. 1998), and it is quite probably this factor that underlies the unusually densely packed population of the species in Bhutan. *Nepal* In Gammie's (1875) day the Nepalese were apparently fond of eating adults and nestlings of this species, a predilection that can hardly have prolonged its membership of the country's avifauna. Shakya (1995) listed several pressures on birds in Nepal, including capture of galliforms for cock fighting, selling of bird parts for medicinal purposes and trading of cagebirds; he pointed out that hornbill body parts were used for traditional cures. *Bangladesh* Hornbills are often killed for their trophies, which are believed to cure "some unknown diseases" (Sarker 1989). *Myanmar* Little is known about current hunting practices in the country, but it is thought that levels of persecution and poaching are high (U Tun Yin 1954), especially in many mountainous areas, owing to the hunting lifestyles of hill-tribesmen (B. F. King verbally 1998). Furthermore, hornbill bills are used in tribal head-dresses in northern Myanmar and the birds are shot to provide these (B. F. King verbally 1998). Trade in live and dead wildlife in general is "exceptionally high" in Myanmar (Das 2000), a factor certainly deleterious to populations this species. *Thailand* This species is perhaps the most threatened hornbill in the country since its range in the north and west overlaps almost exactly with that of the Hmong and Karen ethnic minorities (hill tribes) whose traditional lifestyles of intensive hunting and shifting cultivation are particularly damaging to wildlife (Round 1984, 1985, 1988a). Moreover, Round (1985) stated that "the most immediate threat facing hornbill populations in Thailand is hunting". As an illustration of this fact, five species (including Rufous-necked Hornbill) used to occur on Doi Suthep, two of them commonly (Deignan 1945), but these have all disappeared from the mountain's (and indeed the region's) forests apparently as a result of hunting by rural people (Round 1984). Even in protected areas hunting is rife in the country. Round (1988a) stated that "patrolling of forests in parks or sanctuaries is, at present, the

exception rather than the rule, so that the poaching problem in Thailand's protected areas is almost entirely out of control". The result of this is that "national parks and wildlife sanctuaries offer no more than partial protection from hunting", and activity "so frequent and widespread that a species' occurrence in a number of protected areas does not necessarily guarantee its security" (Round 1988a). *Laos* Hunting is a common and widespread practice in Laos for a variety of cultural and economic reasons (Thewlis *et al.* 1998) and populations of all large and conspicuous species have declined precipitously as a result. Hornbills in general are the only evergreen forest birds not specifically associated with rivers that are in clear decline in Laos, this clearly being a result of hunting as suitable habitat remains extensive (Duckworth *et al*. 1999). Direct evidence of persecution was found in Nakai-Nam Theun NBCA where the species was often approachable and clearly a prime target for hunters judging by the frequency with which identifiable remains were encountered along paths through forest (Thewlis *et al*. 1998). Around Phou Louey NBCA, high levels of hunting were thought to be a major cause for concern over the long-term survival of this species in the area (Davidson 1998). *Vietnam* A similar situation has developed in Vietnam (Nguyen Cu *in litt*. 1998). The Ministry of Forestry (1991) noted that "levels of hunting in Vietnam are horrible… Most forests, even in nature reserves, are almost hunted out..." For these reasons, hunting threatens the declining hornbill population in the Annamite chain on both sides of the Lao-Viet border (Cox *et al*. 1992, Thewlis *et al*. 1998). There have been no recent records from Hoang Lien Nature Reserve and the species may be extinct there partly due to intense hunting pressure (Tordoff *et al*. 1999; see equivalent section under Wood Snipe *Gallinago nemoricola*).

Habitat loss and degradation The quantity of suitable habitat available to this species is being severely reduced by shifting cultivation and logging activities. Smaller hornbill species (e.g. *Anthracoceros* and *Anorrhinus*) tend to survive well in logged forest, while larger species (e.g. *Buceros* and *Aceros*) are much less tolerant of selective logging (Johns 1986). Large hornbills usually require very broad trees in which to nest (Poonswad *et al*. 1987), and, as these are invariably the first trees to be felled commercially, they tend to suffer the effects of logging more severely, or at least more rapidly, than most species. Furthermore, viable populations of hornbills require sizeable areas of continuous forest in order to survive (Poonswad and Kemp 1993), especially when seasonal or unpredictable altitudinal movements are involved. As this applies to the Rufous-necked Hornbill (see under Migration), it is particularly susceptible to habitat destruction and fragmentation. *China* A substantial reduction and fragmentation of both range and population has occurred in China since 1964 due to loss of habitat (Yang Lan 1995, Yang Lan *in litt*. 1998). Most unprotected forests in the potential range (chiefly Yunnan) of this species have been converted into cash crop plantations, particularly of "rubber trees" (Yang Lan *in litt*. 1998). However, at Medog in Tibet the habitat has remained largely undisturbed because of the small human population there and difficulty of access to this region (Lu Xin *in litt.* 1999). *India* In West Bengal the species had already declined early in the twentieth century owing largely to deforestation: Rufous-necked Hornbills were once present in the Rungbong valley, but by the 1920s had "long since disappeared when their favourite trees had been felled" (Stevens 1923–1925). Ali (1962) failed to find the species in Sikkim in the 1960s and remarked that it was "fast disappearing from its former haunts and habitat following on the steady destruction of primeval forest" (see Remarks 2). By the end of the twentieth century, most forests in the Darjeeling region had been converted to tea plantation (R. Kaul verbally 1999) and the Rufous-necked Hornbill had disappeared with them. In the rest of north-east India, forests have dwindled because of shifting (slash-and-burn) cultivation, commercial logging, increased clearance for tea estates and the development of "monoculture forestry" (S. A. Hussain 1993, Singh 1999), factors that are causing the clearance of at least 1,000 km^2 of forest annually in the region (Choudhury 1996j). In the early 1990s, Arunachal Pradesh apparently retained "vast stretches" of primary forest cover over 61% of its total area (Kaul 1991, Bhattacharjee 1995), but this has since been devastated at an alarming rate through

commercial logging (B. F. King verbally 1998) and shifting cultivation (Katti *et al*. 1990, 1992, Singh 1999), the latter factor presumably accelerated by the doubling of the state's tribal population between 1970 and 1990 (Katti *et al*. 1992). Forest around Namdapha National Park is disappearing rapidly because of cattle-grazing and wood-cutting, while within the park certain areas have been cleared by Chakma refugees who have established settlements nearby and visit the park to collect wood and poach wildlife (Samant *et al*. 1995). For information about habitat destruction in Meghalaya see under Tawny-breasted Wren-babbler *Spelaeornis longicaudatus*, and for Manipur and Mizoram see under Hume's Pheasant *Syrmaticus humiae*. *Nepal* While the historical occurrence of the species in Nepal is commemorated by its scientific name, recent ornithological exploration has not produced any records subsequent to the nineteenth century type specimen. In conjunction with the hunting pressure discussed above, this is likely to be due to comprehensive clearance of evergreen forest at altitudes favoured by the species in east Nepal: hill slopes bordering West Bengal (the region most likely to conceal a remnant population of Rufous-necked Hornbills) have been almost entirely deforested (R. Kaul *in litt*. 1999). The country was once extensively forested but by 1979 only 42.8% was "forested land" (including areas only partially covered in trees and shrubs) (Inskipp 1989). Between 1965 and 1979, forest loss was estimated at 5.7%, mostly as a result of conversion to agriculture (Kenting 1986). Some areas have been reforested, but unfortunately often with exotic conifers or *Eucalyptus* trees (Inskipp 1989). *Bhutan* Although the rate of forest loss in the country was until recently very low (R. Pradhan *in litt*. 1998), there are indications that it may be increasing because of shifting cultivation, grazing, burning, logging, landslides and the resulting ingress of road-repair gangs who cut wood and fell trees from the roadside to supply their needs (Sherpa 1994, D. Farrow *in litt*. 2000). Plans to clear-fell large areas of "near pristine" forest in Bhutan and replace them with hardwood plantations on c.70-year rotations have been anticipated to have devastating consequences for the country's biodiversity (J. H. Dick and L. D. Bailey *in litt*. 1996); but the national forest policy offers some hope in this regard (see Measures Taken and Measures Proposed). In Thrumshingla National Park the species is threatened by shifting cultivation and the felling of large fruiting figs *Ficus* (Inskipp *et al*. 2000a,b). Forests in the park have also been cleared in small areas to make way for permanent cultivation, pastures and villages, the latter mainly in the buffer and multi-use zones (Inskipp *et al*. 2000a,b). *Myanmar* A ceasefire signed between the Yangon government and rebel groups in northern Myanmar is apparently leading to an increase in deforestation as the latter can now coordinate logging activities and trade with China in peace (*Oriental Bird Club Bull*. 21: 15–20). It is possible that this development will devastate large areas of habitat for the Rufous-necked Hornbill. An account of forest loss in Myanmar appears under Pale-capped Pigeon *Columba punicea*. *Thailand* Disastrous encroachment or gradual erosion of reserves, along with the destruction of forests by cultivation and the burning of understorey vegetation (which reduces tree species diversity, canopy height and density, and consequently bird species diversity), are all threats to be dealt with (Round and Treesucon 1986b, Round 1988a). Forest cover in the country had apparently fallen from an estimated 70–80% in the 1940s to under 30% in the 1980s; moreover, the latter figure, for various reasons, was thought to be considerably over-optimistic (Round 1988a). The major factors were thought to be "unregulated incursions by settlers and illegal loggers", along with the "very great scale of annual forest burning" throughout the country (Round 1988a). *Laos* Large areas of submontane forest remain in the Annamite chain of Laos, although shifting cultivation is making serious inroads in many regions (Duckworth *et al*. 1999). The primary concern is hunting (see above). As Nakai-Nam Theun NBCA appears to contain the largest single population of the species in South-East Asia, efforts must be made to minimise hunting and deforestation within its boundaries. Although the potential Nam Theun 2 hydropower development will not directly affect the adjacent catchment forests, it will probably promote human population increases and facilitate access to previously remote areas (IUCN 1997, Tobias *et al.* 1998). This will

undoubtedly cause substantial increases in hunting and logging activities, factors liable to reduce hornbill numbers greatly in the area. Fortunately, current indications are that the dam project will be postponed for a long period, possibly indefinitely (J. W. Duckworth *in litt*. 2000). *Vietnam* Widespread and continued destruction of forests in Vietnam (see equivalent section under Crested Argus *Rheinardia ocellata*), combined with excessive levels of hunting, have presumably led to a major reduction in the range and abundance of this species (Eames and Tordoff in prep.). Muong Nhe Nature Reserve (a possible site: see Distribution), for example, can be scrutinised as a case study of forest loss and associated pressures in Vietnam. Only 19% of its area is still covered with natural forest (Wege *et al*. 1999) and that which remains is fragmented and under increasing pressure from accidental fire and clearance for shifting cultivation (Hill *et al*. 1997). These problems are compounded by increasing population pressure: 10,000–12,000 Hmong have moved into the southern part of the nature reserve since 1989 (Hill *et al*. 1997). These kinds of problem attend all other localities for the species in Vietnam. There have been no recent records from Hoang Lien Nature Reserve and the species may be extinct there partly owing to clearance of forest at low elevations (Tordoff *et al*. 1999; see equivalent section under Wood Snipe for further details).

Trade Poaching and trapping of this species for the pet trade or wildlife trade apparently occurs in Vietnam (Nguyen Cu 1993) and Laos (Duckworth *et al*. 1999). Casques (for ornamental or perhaps medicinal use) and whole dead hornbills are sold in urban markets in Laos (Srikosamatara *et al*. 1992, Salter 1993, Showler *et al*. 1998b). Three casques of this species were seen for sale in Tachileik, on the Thai–Myanmar border, in April 1998 (Davidson 1998). However, it is likely that it is hunted first and foremost for food and the remaining casque sold incidentally, as the market value of such objects is low (Duckworth *et al*. 1999).

Natural predation *Thailand* In one season at Huai Kha Khaeng Wildlife Sanctuary, yellow-throated martens *Martes flavigula* killed one female and three chicks from two different nests while a binturong *Arctictis binturong* devoured a female from a further nest (Chimchome *et al*. 1997). In contrast, however, a decade of fieldwork focusing on other hornbill species in Khao Yai National Park only produced three records of chicks lost to yellow-throated martens (Chimchome *et al*. 1997). While these data probably reveal nothing more than variations in the abundance of mammalian carnivores, they indicate that natural predators have potentially important impacts on hornbill populations.

MEASURES TAKEN ***Legislation*** The species is listed on Appendix I of CITES. This hornbill is a nationally protected species (second class) in China, and protected in India (Schedule 1: Wildlife Act 1972), Bhutan, Myanmar (hornbills as a family are totally protected: Wildlife Act 1994) and Thailand (WARPA). In the latter country, the National Park Act (1961) and WARPA (1992) seek to address the problem of hunting and habitat destruction in protected areas: they disallow any act which changes or modifies the environment, including burning and cutting of vegetation, collecting of plants and damming of watercourses.

Control of hunting and habitat loss While hunting appears to be the greatest threat to the species, it is also the most difficult to control. Indeed, very few measures are in place (apart from the rarely enforced and frequently flaunted laws listed above) to tackle the problem of unrestrained shooting of wildlife in hill forests throughout its range. There is one interesting development, however, that might be expanded or experimented elsewhere: the governments of Laos and Vietnam are having notable success in controlling gun ownership in some regions, although least effectively in the hill tribe areas favoured by this species (J. W. Duckworth *in litt*. 1999, 2000). Similarly, there are few positive steps to report in terms of broad-scale habitat management. One of the most positive measures for the species, however, is the national forest policy of Bhutan which proposes to "ensure primarily the preservation of the environment, and only thereafter derivation of economic benefits that flow from rationally managed resources," and to maintain forests over 60% of the country (Adams 1989; see

Foreword to Inskipp *et al*. 1999a). This far-sighted approach to forestry, and the country's environmental heritage, goes some way to ensuring a secure long-term future for the species (see both Threats and Measures Proposed). In India, export of timber from forests in Arunachal Pradesh has been banned, a measure that is expected to provide some relief from commercial extraction; however, timber supplies continue to the plywood and veneer factories inside Arunachal Pradesh (R. Kaul verbally 1999).

Protected areas *China* The species occurs in Xishuangbanna National Nature Reserve (148 km^2), and possibly in Tongbiguan Nature Reserve (54 km^2), Yunnan, and Medog Nature Reserve, Tibet (100 km^2), although it is not clear whether the latter is fully established. *India* It has been recorded in two national parks: Manas (391 km^2) and Namdapha (1,985 km^2), as well as four sanctuaries: Buxa (252 km^2), Kamlang (783 km^2), Eagle Nest (217 km^2) and Sessa (100 km^2). Namdapha National Park has been proposed as a biosphere reserve (Jayal undated). *Bhutan* Its occurrence within the relatively secure Thrumshingla National Park (768 km^2) provides vital protection. *Thailand* Umphang Wildlife Sanctuary, Mae Wong National Park, and both Huai Kha Khaeng and Thung Yai Naresaun Wildlife Sanctuaries are contiguous and together are termed the "western forest complex". They are the last stronghold of the Rufous-necked Hornbill in the country and as such their preservation is extremely important. *Laos* It still occurs in very significant numbers in Nakai-Nam Theun NBCA (3,532 km^2), almost all of which is heavily forested, and it is also found in Phou Louey NBCA (1,500 km^2) and Phou Dendin NBCA (2,220 km^2) but in much smaller numbers. *Vietnam* It receives some protection in Pu Mat Nature Reserve (as well as Hoang Lien and Muong Nhe Nature Reserves [1,820 km^2], if it now occurs at either). Conservation management at Pu Mat (one of the largest remaining wilderness areas in Vietnam) is set to increase as it is the site of a major EU-funded ICDP, providing some hope that a population can survive in the country (Eames and Tordoff in prep.). Furthermore, Scott Wilson Kirkpatrick are currently implementing a major ICDP at Na Hang proposed nature reserve from where the species has been reported (A. W. Tordoff *in litt*. 2000).

MEASURES PROPOSED ***Control of hunting*** The most urgent requirement is the reduction of hunting pressure on hornbills wherever possible. Education programmes along the lines of those targeted at large waterbirds should be initiated throughout the range of this species. Attempts to highlight the importance of hornbills in the ecosystem and to persuade hunters not to shoot them should be pursued. Legal protection from hunting is advised in Laos (Duckworth *et al*. 1999).

Protected areas Long-term protection for Thrumshingla National Park in Bhutan, Namdapha National Park in India and Nakai-Nam Theun NBCA in Laos will help ensure the survival of this hornbill, these being three strongholds highlighted in the distribution section. More generally, effective control and management of natural resource exploitation in all protected areas is necessary wherever populations of this species persist (see e.g. Cox *et al*. 1992, IUCN 1997). In India, conservation measures and infrastucture at protected areas should be improved where possible, with a view to boosting their ecotourism potential and thus partially funding their protection (Athreya and Karthikeyan 1995). The proposed Barail Biosphere Reserve in Assam, including the North Cachar Hills Reserve Forest and Barail Reserve Forest, would protect a small population of this species (Choudhury 1993d) and should be established if possible. In Bhutan, the boundaries of Thrumshingla National Park should be extended east towards Yongkhala to increase the coverage of lower-altitude broadleaved forests (Inskipp and Inskipp 1998, Inskipp *et al.* 2000a,b), which might be seasonally important for this species. Some form of protection for forests in northern Myanmar, in the range of this species and several other poorly known taxa, is urgently required.

Forest management in Bhutan The Biodiversity Action Plan for Bhutan (Ministry of Agriculture 1998) has reaffirmed the commitment to maintaining "at least 60% of our land

area under forest at all times", and this has the force of law under the Forest and Nature Conservation Act of Bhutan 1995 (C. Tenzin *in litt*. 2001), within a developmental time-frame of 20 years (Planning Commission 1999). At present the total land area under forest cover is 29,000 km^2 or 72.5% of the country (Ministry of Agriculture 1998), so the area scheduled to be lost is a relatively minor 12.5% (one-eighth) of the country. However, it is not clear what percentage of the permanent forest estate will remain unlogged (presumably only that part of it inside protected areas), nor precisely what replanting specifications and logging cycle will be used in logged forest. It is to be hoped that the evident strong commitment of Bhutan to retaining so much forest cover will be matched by a commitment to developmental practices which maximise biological diversity within the commercially exploited portions of the permanent forest estate.

Research Status surveys are needed throughout the species's range to clarify its current distribution and abundance. The requirement is especially urgent in Myanmar (Khin Ma Ma Thwin *in litt*. 1997), although surveys have been called for in Vietnam, both in remaining forest patches potentially inhabited by the species and in Pu Mat Nature Reserve where an estimation of population size would be useful (Nguyen Cu *in litt*. 1997, Eames and Tordoff in prep.). In China, particular emphasis should be placed on confirming its presence in Tibet, and clarifying its range and abundance in Yunnan. With a view to population management, intensive studies should seek to investigate population density and habitat use, and thereby the potential of remaining habitats to sustain the species (P. D. Round *in litt*. 1998). These should be combined with recent data collected on their breeding biology (Chimchome *et al*. 1997) to support the establishment of new reserves or the extension of those that already exist. Monitoring programmes should be designed and implemented to track trends in population size at key sites (Duckworth *et al*. 1999).

Education Being charismatic and harmless to human interests, and suffering a variety of threats, hornbills are ideal for use in public education programmes (Duckworth *et al*. 1999).

REMARKS (1) Although it has been listed as occurring in the Chittagong Hill Tracts and possibly the surrounding lowlands of Bangladesh (Rashid 1967; also Ali and Ripley 1968–1998), this record is assumed to be hypothetical (see Remarks 2 under Manipur Bush-quail *Perdicula manipurensis*). There are thus no confirmed records from the country, and any population is in any case undoubtedly tiny, as much habitat destruction has taken place in the region (P. M. Thompson *in litt*. 1997, 2000). (2) The species has been listed for Sikkim (Ali and Ripley 1968–1998) on the basis of historical records. However, Sikkim was once a considerably larger administrative unit than it is today, extending southwards into what is now West Bengal, and it is therefore difficult to identify the exact provenance of an undated specimen (in MCZ) labelled "Sikkim" (or any other historical record from the state). While the species may have once occurred in the forested lower ranges of the state, it was not recorded by Ali (1962) and there is no confirmed record. Similarly, although it was listed for Nagaland by Ali and Ripley (1968–1998) no primary record has been traced (see Grimmett *et al*. 1998). (3) Although the short barking *pok* or *gok* call of this species is quite distinctive, Wreathed Hornbill *Aceros undulatus* gives a similar call and is difficult to rule out by vocalisation alone (see Timmins and Cuong 1999). Identification of calls should therefore be made with caution. (4) In Vietnam, the species was listed for Quang Nam province by Wikramanayake *et al*. (1997) and for Thuong Hoa and Phong Nha by Pham Nhat *et al*. (1995). Considering the location and habitat prevalent in these areas, along with the results of other recent surveys (e.g. Lambert *et al*. 1994), these records are considered inconclusive (Nguyen Cu *in litt*. 1997). Furthermore, two specimens exist in the University of Hanoi collection, but lack data (Nguyen Cu *in litt*. 1997). (5) This record perhaps refers to a skull identified (with uncertain accuracy) at Ta Tong village within the reserve, 1972 (Do Tuoc verbally 1997). Furthermore, recent surveys at Muong Nhe failed to encounter the species (Hill *et al*. 1997, Eames and Tordoff in prep.).