

Threatened Birds of Asia:

The BirdLife International Red Data Book

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WHITE-RUMPED VULTURE

Gyps bengalensis

Critical ■ A1c,e; A2c,e

Endangered □ —

Vulnerable □ C1



This species has been upgraded to Critical because it has suffered an extremely rapid population decline, particularly across the Indian subcontinent, probably as a result of disease compounded by poisoning, pesticide use and changes in the processing of dead livestock.

DISTRIBUTION The White-rumped Vulture occurs in south-east Iran, south-east Afghanistan, east Pakistan, India, Nepal, Bhutan, Bangladesh and Myanmar. It is absent from the north Himalayas, and parts of north-east, north-west and south-west India, and Sri Lanka. It was also formerly widely distributed in South-East Asia in Thailand, Malaysia, Laos, Cambodia, Vietnam and southern China (south and west Yunnan), but it is now almost extinct in this region, although relict populations survive in a few remote areas. There is one record of a vagrant in Borneo, undated (MacKinnon and Phillipps 1993), but it is usually regarded as sedentary, being found in the lowlands: in Nepal normally below 1,000 m, but up to 1,800 m in the summer and exceptionally up to 3,100 m; in India up to 2,500 m; in Bhutan up to 1,200 m (Ali and Ripley 1968–1998, Brown and Amadon 1968, King *et al.* 1975, Hollom *et al.* 1988, Roberts 1991–1992, Boonsong and Round 1991, del Hoyo *et al.* 1994, Alström 1997, Grimmett *et al.* 1998, Satheesan 1999; see Remarks 1 for comments on the comprehensiveness of the following account).

■ **IRAN** The species was formerly distributed in the south-east (Hollom *et al.* 1988), but its present range unknown. The only post-1960 records appear to be: **Gandu (Bahu Kalat) Protected Area**, over the lower Sarbarz river, Seistan/Baluchistan, one, April 1972 (D. A. Scott *in litt.* 2000); and 25 km south-east of **Minab**, one, February 1971 (D. A. Scott *in litt.* 2000).

■ **AFGHANISTAN** Historical records are known from southern Afghanistan (St John 1889) and the species was listed for this region by Hüe and Etchécopar (1970), but the present range is not known. It may occur only as an occasional visitor (Paludan 1959), perhaps just during the summer months (Brown and Amadon 1968). Records are known from: 10 km west of **Panjaw**, July–September 1972 (Vasic 1974); the **Sukkur–Kandahar** road, 1878–1879 (St John 1889).

■ **CHINA** This species was listed for south Yunnan by Meyer de Schauensee (1984), and described as present (very rare) in the western and southern parts of Yunnan (Cheng Tso-hsin 1987). Single birds were recorded at **Menglung**, Mengla county, southern Yunnan, March 1959, and at **Mengpeng**, same county, February 1960 (Zheng Guangmei and Wang Qishan 1998).

■ **PAKISTAN** This species is found throughout the Indus plain, being widely distributed through Punjab, Sind, and the broader valleys of the North West Frontier Province, but absent from the drier mountainous areas and from the Himalayas, and less often in extensive desert tracts such as the Cholistan and Thar deserts, and west of the Hab river on the borders of Sind and Baluchistan (Roberts 1991–1992). Records are known from: **Bhalwal–Shahpur** road, undated (Roberts 1991–1992); **Changa Manga** plantation, August 2000 (A. R. Rahmani *in litt.* 2000); **Chasma barrage**, February 1996 (Showler and Davidson 1999); **Dera Ismail Khan** district, 1990s (Kylänpää 2000); **Dera Gazi Khan** district, 2000 (A. A. Khan *per P. Wood in litt.* 2000); **Dhup Shumali**, February 1996 (Showler and Davidson 1999); **Eastern Narra**, Sind, undated (Barnes 1888–1891; undated clutch Hume and Oates 1889–1890, Oates

1902); Dinga Nalla, near **Ghazi Ghat**, August 2000 (A. R. Rahmani *in litt.* 2001); **Gujranwala** district, March–October 1915 (Whistler 1916c); **Hab valley**, north of Karachi, undated (Ticehurst 1926–1927); **Hyderabad**, undated (Barnes 1888–1891), and at unspecified localities in Sind, 1960s (Holmes and Wright 1968–1969); **Khinjar lake**, undated (Roberts 1991–1992); **Kohat–Thull** road, and around Thull, February–June 1899 (Ratray 1899); **Lahore**, 1910s (Currie 1916a); **Lal Sohanra National Park**, Bahawal Pur, August 2000 (A. R. Rahmani *in litt.* 2000); **Layyah district**, 2000 (A. A. Khan *per* P. Wood *in litt.* 2000); **Leah**, August 2000 (A. R. Rahmani *in litt.* 2000; possibly the same as the following site); **Leh gorge**, April 1926 (Whistler 1930); **Murree**, Rawalpindi district, 1920s (Whistler 1930); **Muzaffargarh district**, 2000 (A. A. Khan *per* P. Wood *in litt.* 2000); **Rasul barrage**, undated (Roberts 1991–1992); **Salt range**, 1918–1947 (Waite 1948); **Taunsa barrage**, February 1996 (Showler and Davidson 1999).

■ **INDIA** This species is widely distributed in India, from the Himalayas west to Srinager, east to Arunachal Pradesh, Assam and the north-east hill states, south to the southern Western Ghats in Kerala and Tamil Nadu. Records are known from localities in the following states:

■ **Kashmir Srinagar**, undated (Bates and Lowther 1952);

■ **Himachal Pradesh Bajaura**, Kulu, November 1923 (Whistler 1926b); **Bakrota**, May–September 1915 (Whistler 1916a); **Bilaspur** district, 1991–1992 (Mahabal 1996); **Dagshai**, undated (Kelham 1909); **Dharamsala**, November 1918–July 1919 (Hingston 1921); **Hamirpur** district, 1991–1992 (Mahabal 1996); **Kangra valley** and adjacent foothills, including the lower Duala Dhar, September 1922 (Whistler 1926a), and present in the 1990s in Kangra district at, e.g., Dharamsala, Siwalik hills and Pong dam lake (J. W. den Besten *in litt.* 2001); **Majathal Wildlife Sanctuary**, November 1992–May 1993 (Mishra 1996); **Palampur**, 1985 (McGowan *et al.* 1986); Koti Station, **Simla**, undated (Dodsworth 1913); at 2,400 m on the **Triun** road, September 1922 (Whistler 1926a); **Una** district, 1991–1992 (Mahabal 1996);

■ **Punjab** unspecified locality, 1980s (Grubh 1983);

■ **Haryana Ambala**, 1983 (Ali and Grubh 1984); **Gurgaon** district, undated clutch (Oates 1902); **Kalesar Wildlife Sanctuary**, 1993–1995 (Kalsi 1998a); **Sultanpur**, 2000 (*per* S. M. Satheesan *in litt.* 2000);

■ **Delhi Dasna**, December 1981–December 1982 (Ali and Grubh 1984); **Delhi aerodrome**, December 1981–December 1982 (Ali and Grubh 1984); **Eastern Jumna Canal**, undated (Hume and Oates 1889–1890); **New Delhi**, 2000 (S. M. Satheesan *in litt.* 2000); north-west **Old Delhi**, 1967–1969 (Galushin 1971); **Timarpur**, December 1981–December 1982 (Ali and Grubh 1984); **Western Yamuna (Jumna) Canal**, undated (Hume and Oates 1889–1890); **Yamuna river**, 1967–1969 (Galushin 1971);

■ **Uttar Pradesh Agra**, 1983 (Ali and Grubh 1984) including Basai, 1980s (Satheesan 1988); **Almora**, Kumaon, December 1914 (Jones 1916); **Bareilly**, 1980s (Satheesan 1999); **Bichpuri**, Agra, undated clutch (Oates 1902); **Bijnor** district, undated (Jerdon 1871–1872); **Chupree**, Allahabad, undated clutch (Hume and Oates 1889–1890, Oates 1902); New Forest, **Corbett National Park**, 1999 (S. M. Satheesan *in litt.* 2000); **Dehra Dun**, 1990s (Mohan 1996); **Doon (Dun) valley**, undated (George 1962), also 1990s (Singh 2000); **Dudwa National Park**, 1991–1994 (Javed and Rahmani 1998); **Etawah**, undated clutch (Oates 1902); **Fategarh** (presumably on the Ganges although several other Fategarhs exist in India), undated (Hume and Oates 1889–1890); **Gazipur**, undated specimen (Abdulali 1968–1996); **Gorakhpur** district, 1910s (Osmaston 1913); **Hapur**, 1990 (Satheesan 2000c), also January 1998 (Prakash and Rahmani 2000); **Joshimath**, June–August 1977 (Reed 1980); **Kumaon**, April–June 1859 (Irby 1861); **Lucknow**, undated (Reid 1881; also undated Hume and Oates 1889–1890; also 1900s Jesse 1902–1903); **Mathura** (Mutra), undated clutches (Oates 1902); **Naini Tal** region, 1920s (Hudson 1930; also undated Kazmierczak and Singh 1998); **Rajaji National Park**, 1990s (Pandey *et al.* 1994), 2000 (*per* S. M. Satheesan *in litt.* 2000; see Rao 2000); **Ranikhet**, 1960s (Ganguli 1966); **Soraon**, Allahbad, undated clutch (Oates 1902);

■ **Rajasthan** **Bangro**, 1999 (Risebrough 1999); **Bhadasia**, 1965–1966 (Sharma 1970); **Bikaner** district, 1993–1994 (Rahmani 1996b, 1997a); **Churu** district, 1993–1994 (Rahmani 1996b, 1997a); **Deeg**, undated clutch (Oates 1902); **Fatehpur** (Futtehpur), undated clutch (Oates 1902); **Jaipur**, undated clutch (Oates 1902); **Jodhpur**, 1980s (Satheesan 1999); **Kaga**, 1965–1966 (Sharma 1970); **Keoladeo National Park**, 1999 (Prakash 1999a); **Mount Abu** (Aboo), 1870s (Butler 1875–1877), also 1993–1994 (Prakash and Singh 1995); **Ranthambore National Park** (Tiger Reserve), in the past two years (*per* S. M. Satheesan *in litt.* 2000); **Sariska Sanctuary**, 1988–1992 (Sankar *et al.* 1993), and in the past two years (*per* S. M. Satheesan *in litt.* 2000); **Sikar** district, 1993–1994 (Rahmani 1996b, 1997a); **Sitamata Wildlife Sanctuary**, “at least 200” at the Jakham dam colony, November 1998 (Lalas 1999); **Udaimandir**, 1965–1966 (Sharma 1970);

■ **Gujarat** **Ahmedabad**, undated (Hume and Oates 1889–1890), 1999 (*per* S. M. Satheesan *in litt.* 2000); **Balaram Amabji Wildlife Sanctuary**, 2000 (Rosalind 2000); **Bhavnagar**, 1980 (Prakash and Rahmani 2000); **Deesa**, undated (Barnes 1888–1891), 1876 (Hume and Oates 1889–1890); **Gir** forest (Sasan Gir), 1970–1972 (Grubh 1978) and in Gir National Park, 1999 (*per* S. M. Satheesan *in litt.* 2000); **Gondal**, undated (Lloyd 1873); **Kathiawar** (Kattiarwar), undated (Lloyd 1873; also undated clutch Oates 1902); **Lakhtar**, February 2000 (A. Mishra *in litt.* 2001); **Limree**, undated (Lloyd 1873); **Little Rann of Kutch**, 1989–1992 (Shah *et al.* 1995); **Mozda**, December 1981–January 1982 (Monga and Naoroji 1984); north of **Narmada river**, December 1981–January 1982 (Monga and Naoroji 1984); **Panch Mahals**, undated (Barnes 1888–1891); **Rajpipla**, including Dediapada, 1944–1946 (Ali 1954–1955), December 1981–January 1982 (Monga and Naoroji 1984); **Shoolpaneshwar Wildlife Sanctuary**, 1989–1992 (Desai *et al.* 1993); **Tappar**, January 2000 (Varu 2000); **Vadodara** (=Baroda), undated (Barnes 1888–1891; also undated clutch Anon. 1891; October 1995–September 1996 Padate and Sapna 1996);

■ **Madhya Pradesh** **Balaghat district**, one dying bird, April or May 2000 (B. Acharya *in litt.* 2001); **Bandhavgarh National Park**, 1986–1990 (Tyabji 1994), 1999 (*per* S. M. Satheesan *in litt.* 2000); **Gwalior**, 1980s (Satheesan 1999); **Kanara** district, 1890s (Davidson 1898a); **Kanha National Park**, November 1981 (Newton *et al.* 1986), 1999 (*per* S. M. Satheesan *in litt.* 2000); **Khurai**, Sagar district, October 2000 (*per* S. M. Satheesan *in litt.* 2000); **Kuno**, Gwalior, January–September 1938 (Ali and Whistler 1939–1940); **Mandu**, Dhar, January–September 1938 (Ali and Whistler 1939–1940); **Mathar**, Bhopal, January–September 1938 (Ali and Whistler 1939–1940); **Mhow**, 1881–1882 (Swinhoe and Barnes 1885); **Nimach** (Neemuch), 1881–1882 (Swinhoe and Barnes 1885; undated Barnes 1888–1891); **Pachmarhi**, early 1920s (Osmaston 1922); **Pench National Park**, undated (Prakash and Rahmani 2000); **Ramjeetola**, near Katangi, March 1991 (Kanoje 1996a); **Sehore**, Bhopal, 1900s (Whitehead 1911);

■ **Maharashtra** **Ahmednagar**, 1870s (Fairbank 1876), also 1990–1995 (Kurahde 1996); **Barda hills**, undated (Dharmakumarsinhji 1955); **Belgaw**, 1879–1881 (Davidson 1882); Malabar hill, **Bombay** (Mumbai), 1980s (Grubh 1983, Houston 1990, Satheesan 1998); **Borivli**, 1924–1936 (Ali and Abdulali 1936–1939); **Chembur**, Salsette, 1924–1936 (Ali and Abdulali 1936–1939); **Darbargadh fort**, Halvad, undated (Dharmakumarsinhji 1955); **Girnar mountains**, undated (Dharmakumarsinhji 1955); **Godhbunder**, 1924–1936 (Ali and Abdulali 1936–1939); **Jaikwadi dam**, Paithan, June 1984–May 1985 (Vyawahare and Kulkarni 1986); **Khandala**, 1879–1881 (Davidson 1882); south “**Konkan**”, 1870s (Vidal 1880), undated (Hume and Oates 1889–1890); **Korakendra**, Bombay, 1986–1988 (Singh *et al.* 1996); **Mahabaleshwar**, 1879–1881 (Davidson 1882); **Mumbra**, near Thani, 1924–1936 (Ali and Abdulali 1936–1939); **Nashik** (Nassick), undated (Barnes 1888–1891); **Panshet dam**, 1980s (Gole 1988); **Panvel**, Kolaba district, undated specimen (Abdulali 1968–1996); **Pune** (Poona), 1980s (Satheesan 1999); **Satara** district, clutch collected 1870s (Davidson and Wenden 1878), undated (Hume and Oates 1889–1890); **Sihor hills**, undated (Dharmakumarsinhji 1955); **Sahyadri mountains**, 1879–1881 (Davidson 1882); **Tadoba Tiger Reserve**, 1999 (*per* S. M. Satheesan *in litt.* 2000); **western Khandesh**, 1879–1881 (Davidson 1882);

■ **Goa Canacona**, November–December 1972 (Grubh and Ali 1976), also undated (Saha and Dasgupta 1992); **Panjim**, undated (Saha and Dasgupta 1992);

■ **Karnataka** south, 1990s (Prakash and Rahmani 2000); **Bangalore**, in the 1980s (George 1994, SS); **Chikagalur**, undated (Chakravarthy and Tejasvi 1992); **Coorg**, April 1929–May 1930 (Whistler and Kinnear 1931–1937); **Londa**, north Kanara, specimen collected in 1938 (Koelz 1942); **Manzeerabad**, 1880s (Taylor 1887); **Nagarhole National Park**, February 1993 (K. D. Bishop *in litt.* 2000), January 2000 (Sarath 2000), and at the nearby Kabini river, same month (R. Saldino *in litt.* 2000); **Sandur**, early 1970s (Ghorpade 1974); near Bangalore, April 1984 (Satheesan 1990), this probably referring to the population present around a slaughterhouse at **Viswaneedam**, 15 km west of the city (Grubh 1988), but now no longer present (SS);

■ **Kerala Aramboli**, January–December 1933 (Ali and Whistler 1935–1937); **Bandipur Wildlife Sanctuary**, June 1970 (Ghorpade 1974); **Kumili**, January–December 1933 (Ali and Whistler 1935–1937); **Nemmara**, January–December 1933 (Ali and Whistler 1935–1937); **Padagiri**, January–December 1933 (Ali and Whistler 1935–1937); **Periyar Sanctuary**, 1960s (Robertson and Jackson 1992); **Wynaad** region, March–May 1881 (Davison 1883), also 1985–1988 (Zacharias and Gaston 1993); **Pirmed** (Peermade), January–December 1933 (Ali and Whistler 1935–1937); **Wadakkancheri**, January–December 1933 (Ali and Whistler 1935–1937);

■ **Tamil Nadu Ashambu hills**, January–December 1933 (Ali and Whistler 1935–1937); **Jog**, February 1940 (Ali and Whistler 1942–1943); **Mudumulai Wildlife Sanctuary**, 1994–1995 (Gokula and Vijayan 1996), and 30 birds seen, November 2000 (K. D. Bishop *in litt.* 2000); **Mysore**, December 1935 (Ali and Whistler 1942–1943); **Nilgiri hills**, March–May 1881 (Davison 1883), with recent sightings from Gudalur, Kargudi and Kotagiri (Thirumurthi and Balaji 1999); **Pondicherry** (Puduchcheri), undated male specimen (Cassin 1849); along the Kaveri river valley apparently near **Satyamangalam**, 1983–1987 (SS); **Settihalli**, December 1935 (Ali and Whistler 1942–1943);

■ **Andhra Pradesh Asifabad**, 1931–1932 (Ali and Whistler 1933–1934); **Borgampad**, 1931–1932 (Ali and Whistler 1933–1934); **Chilakaluripet** district, 1980s (Satheesan 2000a); **Coringa Wildlife Sanctuary**, 1990–1995 (Rao *et al.* 1996); **Deglur**, 1931–1932 (Ali and Whistler 1933–1934); **Hyderabad**, 1931–1932 (Ali and Whistler 1933–1934); **Kamareddi**, undated (Ali and Whistler 1933–1934); **Karimnager** (East) forest division, 1992–1995 (Nagulu *et al.* 1997); **Kaulas**, 1931–1932 (Ali and Whistler 1933–1934); **Lamasinghi**, Vizagapatam district, May 1944 (Abdulali 1945); **Mananur**, 1931–1932 (Ali and Whistler 1933–1934); **Paloncha**, 1931–1932 (Ali and Whistler 1933–1934); **Rajiv Gandhi National Park**, 1991–1995 (Rao *et al.* 1997); **Ramakapett**, undated (Ali and Whistler 1933–1934); **Utnoor**, 1931–1932 (Ali and Whistler 1933–1934); **Waltair**, May 1944 (Abdulali 1945);

■ **Orissa Bhitarkanika Wildlife Sanctuary**, 1992–1993 (Pandav 1996); **Sambalpur** north of Mahanadi, 1870s (Ball 1878); another **Sambalpur** south of Mahanadi, 1870s (Ball 1878);

■ **Bihar Barkhela**, 1950s (Ara 1953); **Bhagalpur**, 1995–2000 (A. Mishra *in litt.* 2001); **Chaibasa**, 1950s (Ara 1953); **Chotanagpur** region, 1870s (Ball 1874); **Darbhanga** district, 1890s (Inglis 1901–1904); **Goilker**, 1950s (Ara 1953); **Hazaribagh National Park**, March 1959 (Ara 1966); **Jhilruan**, 1950s (Ara 1953);

■ **West Bengal Alipur** (Alipore), south Calcutta, undated (Anon. 1941); **Barddhaman** (Bardwan), 1870s (Ball 1878); **Barrackpur**, Calcutta district, 1890s (Munn 1899); **Buxa Wildlife Sanctuary**, February–March 1992 (Allen *et al.* 1996); **Calcutta**, two specimens collected 1842 (Blyth 1849–1852), also 1980s (Satheesan 1999); **Damodar valley**, 1968–1971 (Gauntlett 1986); **Darjeeling**, undated (Matthews and Edwards 1944; also 1943–1945 Lister 1954); **Durgapur**, 1968–1971 (Gauntlett 1986); **Jalpaiguri** district, 1910s (Inglis *et al.* 1920); **Punkabarie**, 1860s (Beavan 1868); **Puruliya** (Manbhum), 1860s (Beavan 1868); **Titaghur** (seven undated clutches, Anon. 1891; also 1890s Munn 1899);

■ **Sikkim Ari**, May 1946 (Maclaren 1947a);

■ **Arunachal Pradesh Mehao**, January–April 1990 (Katti *et al.* 1992); **Namsai**, 1990s (Singh 1994); **Seijusa**, 1990s (Singh 1994); **Siang**, January–April 1990 (Katti *et al.* 1992);

■ **Assam** Assam valley, undated (Hume 1888), referring to the Brahmaputra valley in Assam in which most of the following sites are situated; **Dibrugarh**, undated (Hume 1888; also January 1986 Rao *et al.* 1989); **Dibru Saikhowa National Park**, December 2000 (R. Naoroji *in litt.* 2001); **Sadiya**, undated (Hume 1888); **East Cachar**, undated (Hume 1888); **Hylakandy** district, Cachar, 1890s (Inglis 1899); **Jaldapar National Park**, March 1994 (K. D. Bishop *in litt.* 2000); **Kamrup district** at Darangi, Krishnai and Paikan, December 2000 (R. Naoroji *in litt.* 2001); **Karrimganj**, undated (Hume 1888); **Kaziranga National Park**, 1993–1999 (Barua and Sharma 1999), 1999–2000 (R. Naoroji *in litt.* 2001, J.-M. Thiollay *in litt.* 2001); **North Cachar**, 1890s (Baker 1894–1901); **Tezpur**, November–December 1985 (Rao *et al.* 1989);

■ **North-east hill states** **Balphakram National Park**, December 2000 (R. Naoroji *in litt.* 2001); **eastern hills**, undated (Hume 1888); **Jhiri river**, undated (Hume 1888); **Khasia hills**, Meghalaya, 1886–1906 (Baker 1907b); **Manipur plateau**, undated (Hume 1888); **Noongzai-ban** in Western hills, undated (Hume 1888).

Other locations for which the states is unknown, are: **Bhurtpur**, undated clutch (Oates 1902); **Binderabund**, undated (Hume and Oates 1889–1890); **Coumair**, undated clutch (Oates 1902); **Hodul**, undated (Hume and Oates 1889–1890); **Luchmipur**, undated clutch (Oates 1902); **Puhpoondh**, undated (Hume and Oates 1889–1890).

■ **NEPAL** The White-rumped Vulture is found throughout the lowlands up to about 1,000 m, less frequently up to 1,800 m, and rarely up to 3,050 m (Inskipp and Inskipp 1991). Records are known from: **Annapurna Conservation Area**, undated (Inskipp 1989); **Bagmati river**, 1870s (Scully 1879); **Batulechar**, November 1974 (Hendricks 1982); **Biratnagar**, July and December 2000 (B. R. Subba *per A.* Mishra *in litt.* 2001); **Bishnumati river**, 1870s (Scully 1879); **Hetauda**, female collected June 1947 (Biswas 1960–1966); **Kathmandu valley**, November–December 1974 (Hendricks 1982, Inskipp and Inskipp 1991); **Khaptad National Park**, April–May 1988 (Inskipp 1988, Inskipp and Inskipp 1991); **Khare**, south of Annapurna, October–November 1985 (de Roder 1989); **Kosi**, east Nepal, 2000 (H. S. Baral *per C.* Inskipp *in litt.* 2000); **Kosi Tappu Wildlife Reserve**, undated (Inskipp 1989); **Lumle**, July–August 1973 (Woodcock and Woodcock 1976); **Mai valley** undated (Biswas 1960–1966); **Nawakot** district, 1870s (Scully 1879); **Nepal valley** March–June 1947 (Biswas 1960–1966); **Pashpati**, 1870s (Scully 1879); undated (Hume and Oates 1889–1890); **Phulchowki mountain**, undated (Inskipp 1989); **Pokhara**, July–August 1973 (Woodcock and Woodcock 1976); **Raghunathpur**, male collected early 1950s (Rand and Fleming 1957); **Royal Bardia National Park**, undated (Inskipp 1989); **Royal Chitwan National Park**, undated (Inskipp and Inskipp 1991); **Royal Sukla Phanta Wildlife Reserve**, undated (Inskipp 1989); **Shivapuri Wildlife Reserve**, undated (Inskipp 1989); **Tansen–Pokhara**, March 1959 (Fleming 1959).

■ **BHUTAN** This species has only recently been recorded from Bhutan, and it is now known from: **Deothang**, 1994–1998 (Bishop 1999); **Harachhu** valley, May 1993 (Inskipp and Inskipp 1993b); **Phuntsholing**, November 1991 (Inskipp and Inskipp 1993a), April 1993 (Inskipp and Inskipp 1993b), 1994–1998 (Bishop 1999); **Royal Manas National Park**, April 1993 (Inskipp and Inskipp 1993b); **Samdrup Jongkhar**, 1994–1998 (Bishop 1999).

■ **BANGLADESH** This species is widely distributed and known from most districts, with records from: **Aricha**, 1980s (Sarker 1983) and in January 2001 (P. M. Thompson *in litt.* 2001); **Bhairab Bazar**, February 1992 (Thompson *et al.* 1993); **Burigoalili range** including Kadamtala, Khaikhali, Kobadak, Kalachand Bazar, Shekhbari, 1982–1983 (Sarker 1987b); **Chandpai range**, February 1981 (Sarker 1987b); **Chittagong**, undated (Bates 1932–1935); **Dhaka** (Dacca), undated (Baker 1935) including Dhaka University Campus, 1975 (Sarker 1983); Sylhet, undated (Hume 1888), including Maulvi Bazar district at **Hail haor**, November

1998–November 2000 (W. Collis *in litt.* 2000); **Lalmai** area, Comilla, December 1944–July 1945 (Collins 1948); **Nalianala range** including Sutarkhali, Bozboz, Baniakhali, Kassiabad, Patharkhal, 1981–1982 (Sarker 1987b); **Pabna** district, 1968–1969 (Husain and Sarker 1971), and in October 2000 (P. M. Thompson *in litt.* 2001); **Rangpur** district, 1980s (Sarker 1983); **Srimangal**, November 2000 (P. M. Thompson *in litt.* 2001); **Sunamganj**, February 2001 (P. M. Thompson *in litt.* 2001).

■ **MYANMAR** This species is resident in the west, and formerly also occurred elsewhere in the country, where its current status unknown (Robson 2000). Records are known from: **Arakan**, at Sittwe (Akyab), “a few”, undated (Blyth 1875), and generally c.1910 (Hopwood 1912; also Smythies 1986); **Bhamo**, undated (Harrington 1909); **Inya lake**, Rangoon, July 1968–July 1971 (Amstutz 1974); **Lower Pegu**, undated (Hume and Oates 1889–1890) and Upper Pegu, undated (Hume 1875a); **Maymyo**, undated (Smythies 1986); **Minbu** district, 1934–1937 (Roseveare 1952); **Mingalun**, 1929–1932 (Stanford and Ticehurst 1935a); **Myingyan** district, 1900s (Macdonald 1906); **Myitkyina** district, undated (Smythies 1986); **Nautch**, Moulmein, November 1877 (Bingham 1880); **north Chin hills**, 1913–1915 (Hopwood and Mackenzie 1917); **Nyaungshwe**, March 1983 (Sayer and U San Han 1983); **Ramhtlo**, April 1995 (Robson *et al.* 1998); **Southern Shan States**, 1890s (Rippon 1901; also undated Harrington 1909); **Tavoy** (Dawe), 1870s (Hume 1875a), undated (Oates 1882); **Tenasserim** (Taninthayi), undated (Hume and Davison 1878; also undated Harrington 1909); **Thayetmyo**, Upper Pegu, 1870s (Hume 1875a), undated specimen (Oates 1882); **Yangon** (Rangoon), 1929–1932 (Stanford and Ticehurst 1935a, Smythies 1986).

■ **THAILAND** This species was once resident throughout the country, but it is now close to extinction. Records are known from: **Bangkok**, undated (Williamson 1914), March 1918 (Williamson 1918); **Chiang Mai**, 1916 (Gyldenstolpe 1916; also 1930s Deignan 1931, 1936a); **Doi Sutep**, undated (Deignan 1931); **Huai Kha Khaeng Wildlife Sanctuary**, 5–6 at Kapook Kapieng, January 1999 (*Bird Conserv. Soc. Thailand Bull.* 16[4]: 15); **Ipoh**, undated (Glenister 1951); **Lay Song Hong**, undated specimen (Riley 1938); **Muang** district, Satul, June 1991 (Wells 1999); **Nong Hoi**, north Thailand, four specimens collected January 1938–February 1939 (Morioka and Yang 1996); **Pattani**, 1991 (Wells 1999); **Petchaburi** district, 1912–1913 (Gairdner 1914); **Phuket**, 1919 (Robinson and Kloss 1921–1924, Medway and Wells 1976); **Ranong**, February 1974 (Wells 1999); **Ratburi** district 1912–1913 (Gairdner 1914); **Thung Thong** reserve, Surat Thani, October 1976 (Wells 1999); **Tyching**, Trang, specimen collected April 1896 (Riley 1938); **Yala**, 1991 (Wells 1999).

■ **MALAYSIA** This species was once a widespread resident occurring along the full length of Peninsular Malaysia, but now only occurs very rarely as a non-breeding visitor (Wells 1999). Records are known from: north of **Alor Star**, northern Kedah, 1940s (Madoc 1947, 1951, Medway and Wells 1976, Wells 1999); **Gunung Keriang**, December 1950 (Medway and Wells 1976); **Kelantan**, undated (Chasen 1939a; also 1950 Wells 1999); Kampung Penyirang, Ulu Paka, **Kuala Terengganu**, undated (Gibson-Hill 1949, Wells 1984); **Melaka**, undated (Chasen 1939a), 1930s–1940s (Gibson-Hill 1949); **mid-Perak**, 1870s (Wells 1999); **north Perak**, undated (Chasen 1939a); **Taiping**, undated (Glenister 1951).

■ **LAOS** This species was once found throughout Laos, but it is now restricted to southern parts of Champasak and Attapu provinces in the south of the country (Thewlis *et al.* 1998). Records are known from: **Attapu province**, around 1930 (Engelbach 1932); Mekong river at **Ban Hongkhong** (Ban Hangkhon), April–May 1996 (Robson 1997, Thewlis *et al.* 1998); **Champasak province**, around 1930 (Engelbach 1932); **Dong Khanthung proposed NBCA**, February 1998 (Round 1998); **Savannakhet province**, 1940s (David-Beaulieu 1949–1950); between **Senamsai** and Ban Sompoy, December 1997 (Duckworth *et al.* 1999); **Xe Kong** plains in Xe Pian NBCA, March 1993 (Thewlis *et al.* 1995); **Xe Xou**, April–May 1996 (Thewlis *et al.*

1998, Evans *et al.* 2000); **Xiang Khouang** (Tranninh), undated (Delacour and Jabouille 1927b), also 1940s (David-Beaulieu 1944).

■ **CAMBODIA** This species was recently described as resident throughout the country (Robson 2000) but, although local people report that it used to range much more widely over the country's lowlands in the 1960s and 1970s, surviving populations are now restricted to the open dry dipterocarp areas of the north and north-east, from the province of Preah Vihear east to Mondulkiri (C. M. Poole *in litt.* 2000, R. J. Timmins *in litt.* 2001). It was present in the Mekong–Great Lake Plain in 1964 (Thomas 1964) but the only recent record from that area was an apparent wandering individual in 1993 (C. M. Poole *in litt.* 2000). Records are known from: **Kampot**, c.1960 (Thomas 1964); **Kandal**, c.1960 (Thomas 1964); in the **Kaoh Nhek** (Khonhek) area, Mondulkiri, minimum of 11 adults and two immatures, June 2000 (*Oriental Bird Club Bull.* 32 [2000]: 66–76, R. J. Timmins *in litt.* 2001); **Kompong Speu**, c.1960 (Thomas 1964); **Kompong Thom**, c.1960 (Thomas 1964); **Lomphat district**, Ratanakiri, including Lomphat road, January 1997, and elsewhere, June–July 1997 (Goes 1999a); **Oyadao district**, June 1997 (*Oriental Bird Club Bull.* 27 [1998]: 61–66, Goes 1999a); **Phlay river, Romiet stream, Srepok river, Tien stream** and **Yang Ke mountain**, all in north-east Mondulkiri, April 2000 (Long *et al.* 2000); **Siem Reap**, around 1960 (Thomas 1964).

■ **VIETNAM** This species was formerly resident in South Annam and Cochinchina (Robson 2000), but it is now almost extinct. Records are known from: **B'sré**, male collected by Björkegren in July 1938 (Eames and Ericson 1996); **Cochinchina**, 1938–1939 (Engelbach 1940); **Dran**, female collected May 1918 (Robinson and Kloss 1919a); **Ea Bung/Ea To Mor**, Dak Lak province, 1998 (Brickle *et al.* 1998); **Pleiku plateau**, 1930s (David-Beaulieu 1939); **south Annam**, 1925–1927 (Delacour *et al.* 1928).

POPULATION In South-East Asia the White-rumped Vulture was once common, but populations declined in the first half of the twentieth century, largely owing to a reduction in the supply of livestock carcasses, and also as a result of hunting and other forms of human persecution (see Threats). Declines for similar reasons appear to have occurred in at least parts of Bangladesh since the 1970s. By contrast, in the Indian subcontinent, this species was common until recently, with high population densities in many urban areas maintained by abundant supplies of livestock carcasses. Indeed, it was once considered “possibly the most abundant large bird of prey in the world” (D. C. Houston in Mundy 1985). However, in the late 1990s populations in India and Nepal (at least) crashed, with 95–100% declines reported. These rapid declines are now also occurring in Pakistan (see below).

Iran The present status of this species is unknown.

Afghanistan In the south, during the “first campaign” in 1878–1879, “numbers of this bird accompanied the army on its march, finding ample sustenance in the camels that died at every halting-place and strewed the road from Sukkur to Kandahar” (St John 1889). They disappeared in the spring of 1879, apart from an unidentified vulture, possibly this species, seen in Kandahar in March–April 1881 (St John 1889). Hüe and Etchécopar (1970) listed the species for south Afghanistan, and Paludan (1959) considered it an erratic vagrant. Its present status is unknown, but local summer movements into the country apparently occur (Brown and Amadon 1968), e.g. three were seen in a mixed flock 10 km west of Panjaw during July–September 1972 (Vasic 1974).

Pakistan This species was once common in the Indus plain, but recent widespread evidence of disease suggests that populations may be about to undergo the catastrophic crashes recorded in India in the late 1990s.

In 1899, it was common on the plains around Thull, and on the Kohat–Thull road (Ratray 1899). In the first half of the twentieth century it was reported to be “fairly common” around Murree, Rawalpindi district (although no breeding colony was known: Whistler 1930), very

common in Lahore (Currie 1916a), common in Karachi, from where it wandered into the Hab valley (Ticehurst 1926–1927), and the common vulture of Gujranwala district (Whistler 1916c). In addition, 2–3 were seen in the Leh Gorge in April 1926 (Whistler 1930). In the 1960s it was regarded as widely distributed in the plains and adjacent desert areas in Sind (Holmes and Wright 1968–1969), and since then it was reported to be spreading into additional desert areas in Sind owing to increasing settlement and agricultural development (Ali and Ripley 1968–1998, Grubh 1983). By 1991 it was considered abundant throughout the Indus plain, being widely distributed through Punjab, Sind, and the broader valleys of the North West Frontier Province, but absent from the drier mountainous areas and from the Himalayas, “although a few birds can occasionally be seen over the Murree hills”; it was “comparatively rare” in extensive desert tracts such as the Cholistan and Thar deserts, and it was “very seldom encountered” west of the Hab river on the borders of Sind and Baluchistan (Roberts 1991–1992). In Dera Ismail Khan district, North West Frontier Province, it was recorded regularly in February–July, and occasionally in August–January, but no breeding was recorded (Kylänpää 2000).

In July 2000, 165 vultures (unspecified species) were seen along 15 km of canal bank in south Punjab (D. G. Khan, Muzaffargarh and Layyah districts), none showing head-drooping behaviour, and locals reporting no unusual mortality patterns; over 500 individuals (presumed to be White-rumped Vulture) were observed on cattle carcasses in this area in June 2000 (A. A. Khan *in litt.* 2000). However, in August 2000 a total of 1,366 White-rumped Vultures were seen along 1,809 km in Punjab province, and 16.6% of 175 individuals observed at close quarters at seven sites showed head-drooping behaviour indicative of disease (Rahmani and Prakash 2000b). Three head-drooping individuals were seen in Leah; others were found at three sites in Lahore (M. A. Virani *in litt.* 2001). One of these sites (Changa Manga plantation) held a population of more than 500 birds, but “a number” were drooping their heads, and locals reported “mass deaths” in the area (M. A. Virani *in litt.* 2001). Dying individuals and local reports of vulture deaths (in the last 2–3 years during the hot months of April–July) were noted at Head Islam (near Hasil Pur), and specifically for White-rumped Vulture at Dinga Nalla (near Ghazi Ghat), and in Lal Sohanra National Park (M. A. Virani *in litt.* 2001). Overall the proportion of individuals head-drooping, and number of deaths reported, were highest in areas near the border with Rajasthan, India, and lower in the Indus River areas (Rahmani and Prakash 2000b). At Kundian forest, Mianwali district, “large-scale deaths” of vultures (unspecified species) were found in April–May 2000, although birds were reported to “have stopped dying” by August (S. M. Nasir *in litt.* 2000), and no sick-seeming individuals were observed in that month (M. A. Virani *in litt.* 2001). A similar epidemic in 1992 was reported by local people (S. M. Nasir *in litt.* 2000).

India The general abundance, until recently, of this species and other vultures in India compared to other countries in its range has been attributed to the human population’s traditional avoidance of eating beef, so cattle carcasses are abandoned and scavenged by vultures and other species (Rahmani 1998b). The smaller populations of vultures in several Asian countries, and perhaps in southern India in Kerala and parts of Tamil Nadu, may be because beef is more commonly eaten in these regions, so fewer cattle carcasses are available to the birds (Rahmani 1998b). However, in the late 1990s population declines and disease symptoms were noted throughout India, from Rajasthan in the west to Assam in the east, south to at least Maharashtra, Karnataka and Andhra Pradesh; in the southern states of Kerala and Tamil Nadu, declines from historically smaller populations may have occurred prior to the recent crashes, probably as a result of a combination of other threats (see below under Threats).

The recent vulture population declines may have commenced in the early 1990s, but they only became visible at some locations in the mid-1990s, and became particularly serious after 1997 (Satheesan 2000c). General declines of “vultures” were reported: “all over northern

India” in the late 1990s, with many newspaper reports commenting on carcasses being left uneaten because of the scarcity of vultures (Rahmani 1998b). Such declines have been noted in the following areas: north-west India, where total numbers of all vulture species “often exceeded 1,000 per 100 km” along roads between Karachi (perhaps meaning Lahore—M. A. Virani *in litt.* 2001) and Delhi in the 1980s (Thiollay 2000); Patiala, Punjab, where none was seen within 5 km of the city after mid-1997, though 5–10 have been seen again since November 1998 (N. Singh *per* A. R. Rahmani *in litt.* 1999); Sawai Madhopur, Rajasthan (Prakash and Rahmani 2000); Gir, Gujarat, where no *Gyps* vultures were observed during a visit in June 2000 (A. R. Rahmani *per* P. Wood *in litt.* 2000); elsewhere in Gujarat where “dramatic declines” occurred in the mid-1990s (Kacher 1996), and only 36 vultures were recorded along more than 800 km of roads in 1999 (Thiollay 2000); Uttar Pradesh (R. V. Singh *per* A. R. Rahmani *in litt.* 1999); New Delhi (A. R. Rahmani *in litt.* 1999, Gooders 2000, Thiollay 2000); Bangalore, Tamil Nadu (Satheesan 2000a); Madras (Satheesan 2000a); Orissa, where carcasses were abundant after a cyclone in 1999, but “not a single vulture was to be seen” (Thiollay 2000); West Bengal (Ghatak 1999); Assam, where only 30 were recorded around Gawahati in 1999, and 12–22 in a full day in Kaziranga National Park (Thiollay 2000); and Bombay, Maharashtra, where “not a single bird” was seen in two days in 1999 (Thiollay 2000) or in two days in November 2000 (K. D. Bishop *in litt.* 2000).

In response to questionnaires circulated by the Bombay Natural History Society (BNHS) and WWF, replies were “without exception, alarming”, with numerous deserted colonies and unvisited slaughterhouses reported (Thiollay 2000), and 90% of 1,920 respondents considered that vultures had declined in their area (Prakash 2000). In April–June 2000, BNHS repeated surveys carried out in 1991–1993 at 17 protected areas, three carcass dumps, and along 7,236 km of roads across north and central India: these showed a decline of at least 90% in all areas (Prakash 2000), with local extinctions in protected areas at Corbett (Uttar Pradesh), Keoladeo (Rajasthan), Gir and Little Rann of Kutch (Gujarat), Similipal (Orissa), Jaldapara and Buxa (West Bengal), and Navegaon (Maharashtra) (Rahmani and Prakash 2000a).

Locations where dead and dying vultures have been observed (see Threats: Disease) include: Keoladeo National Park, Rajasthan (both this species and Indian Vulture *Gyps indicus* [*sensu novo*: see relevant account]) (Prakash 1999a); Bangro, 66 km south-west of Keoladeo National Park, Rajasthan (Risebrough 1999); Pench National Park, Madhya Pradesh (Prakash and Rahmani 2000); Balam Amabji Wildlife Sanctuary, Gujarat (Rosalind 2000), New Delhi in December 1999 (Risebrough 1999), and “all of the vulture populations observed by the BNHS survey” (see above) in north and central India in April–June 2000 (Prakash 2000). Abundances and population trends at specific sites have been recorded in the following states.

Kashmir The species was said to be “occasional” at Srinagar in the Vale of Kashmir (Bates and Lowther 1952), but its present status is unknown.

Himachal Pradesh In the first half of the twentieth century, the species was common and breeding around Dagshai (Kelham 1909), common during April–October around Simla, breeding at 1,100 m near Koti Station, but moving to lower elevations in winter (Beavan 1868, Dodsworth 1913), common at Bakrota (Whistler 1916a), uncommon up to 1,800 m around Dharamsala (Hingston 1921), uncommon in the Kangra valley and foothills, occurring on the Lower Duala Dhar up to 2,000 m (Whistler 1926a; but see below); individuals were also sighted at 2,400 m on the Triun road in September 1922 (Whistler 1926a), and below Bajaura, Kulu, in November 1923 (Whistler 1926b). More recently, it was regarded as common in Majhatal Harsang Wildlife Sanctuary during 1992–1993 (Mishra 1996); and a common resident at Una, Hamirpur and Bilaspur districts in Siwalik Hills (Mahabal 1996). Records kept in Kangra district in the late 1990s show a steep downward trend approximating to losses of 75–90% of the population of White-rumped Vultures: thus at Dharamsala in the upper Kangra district, the maximum number seen together from any one vantage point was

120 in 1996, 130 in 1997, 80 in 1998, 82 in 1999 and 30 in 2000; and above Kangra fort in the lower Kangra district the number of the species sighted was c.100 in January 1997, 50 in January 1999, and eight in January 2001 (J. W. den Besten *in litt.* 2001). These figures cannot be regarded as statistically robust, of course, but they conform to the known trend; nevertheless, on the same three-day journey in January 2001 that the eight birds were seen at Kangra fort, White-rumped Vultures were seen on eight other occasions, totalling $31 + 8 = 39$ birds (J. W. den Besten *in litt.* 2001), a moderately encouraging number.

Punjab Since the 1960s it was reported to be spreading into desert areas owing to increasing settlement and agricultural development (Ali and Ripley 1968–1998, Grubh 1983).

Haryana This species was a very common breeder at Kalesar Wildlife Sanctuary (Kalsi 1998a), and up to 650 vultures (mainly this species) were seen at a tannery in Ambala during 1980–1981 (Ali and Grubh 1984). Indeed, it used to breed “very extensively” in the state, but in 1999 and 2000, despite journeys almost every Sunday covering 100–180 km, not a single White-rumped or “Long-billed” Vulture was seen (S. C. Sharma *in litt.* 2000).

Delhi In the early 1970s, about 400 pairs of vulture (mostly this species), equating to a breeding density of 2.7 pairs per km², were recorded in the north-western part of Old Delhi, mostly in mango gardens, and also along the Yamuna river (Galushin 1971); “large populations” of this species were found 10–20 years ago in the city (Satheesan 1999). A total of 4,500 vultures (mainly this species) were found at 24 carcass-skinning centres in Delhi in the early 1980s; an average of 2,045 individuals (maximum 4,000) were seen at Timarpur, Delhi, during December 1981–July 1982, but only 612 were seen on average (maximum 1,500) in the six months following closure of the landfill facility at this site in July 1982 (Ali and Grubh 1984); and 3,000 vultures (mainly this species) used to frequent a bone mill at Dasna, Delhi, until it was closed down in the early 1980s (Ali and Grubh 1984). The area between Delhi, Agra (Uttar Pradesh) and Bharatpur (Keoladeo National Park, Rajasthan) was estimated to hold about 15,000 White-rumped Vultures in 1990, but only about 50 were estimated to remain in 2000 (Satheesan 2000c); however, given that the same author found 28 apparently healthy individuals at India Gate, New Delhi, in April 2000, and 35 at Najaf Khan Tomb, New Delhi, in May 2000 (Satheesan 2000c), the number of remaining individuals in mid-2000 may have been somewhat larger than this estimate.

Uttar Pradesh The species was listed as a fairly common breeder at New Forest, Dehra Dun (Mohan 1996), it was the commonest vulture of the lower Garwhal region, with flocks of over 90 in the Doon (Dun) valley (Singh 2000), and it probably also accounts for the flocks of 200 vultures recorded by George (1962) in the same region (Singh 2000), where it has been recorded up to 2,150 m (Lavkumar 1956a). It was regarded as abundant in Rajaji National Park (Pandey *et al.* 1994), and at least some birds were still present in 1999 (*per* S. M. Satheesan *in litt.* 2000), with 39 there in May 2000 (Rao 2000); as many as 50–100 were counted on a journey from New Delhi to Corbett National Park, and inside the latter, in 1999 (*per* S. M. Satheesan *in litt.* 2000); “large populations” were found 10–20 years ago in the city of Bareilly (Satheesan 1999); it was a “very common” resident in Lucknow (Jesse 1902–1903), breeding there in colonies of up to 60 nests (Reid 1881); it was a common breeder at Dudwa National Park (Javed and Rahmani 1998); it was very common in Gorakhpur district (Osmaston 1913); about 3,000 vultures (mainly this species) were found at a slaughterhouse in Basai, Agra, in the early 1980s (Ali and Grubh 1984; also Satheesan 1988); and 500–2,000 were found at Hapur, near Delhi, around the same time (Ali and Grubh 1984). However, only 35 were found near Hapur in January 1998 in an area where this species was “seen in thousands a couple of years ago” (Prakash and Rahmani 2000).

Rajasthan This species was once very common around Mt Abu (Butler 1875–1877); “large numbers” were found in 1965–1966 at Bhadasia, Kaga, Udaimandir and elsewhere around Jodhpur (Sharma 1970), large populations remained at least at Jodhpur 10–20 years ago (Satheesan 1999); and it was a fairly common resident breeder in Sariska Tiger Reserve

during 1988–1992 (Sankar *et al.* 1993). Since the 1960s it was reported to be spreading into desert areas owing to increasing settlement and agricultural development (Ali and Ripley 1968–1998, Grubh 1983). By the early 1990s it was “abundant” all over the Thar desert (except in very arid areas where it was uncommon), being found on every carcass located during a study in 1993–1994, and numerous nests were found in Sikar, Churu and Bikaner districts in July–August 1993 (Rahmani 1996b). However, although “large numbers” were reported in western Rajasthan in 1999, none was found in 2000 (A. R. Rahmani *in litt.* 2000).

Recent detailed studies have been carried out in Keoladeo National Park (=Bharatpur). Here, the total population of White-rumped Vulture declined by 96% between 1985 and 1999: 1,800 individuals (62 per km²) were recorded in 1985–1986, but this had declined to 86 individuals (3 per km²) by 1998–1999 (Prakash 1999a), and just 40–47 in the months of January–May 1999, 29 in July 1999, and 16 in July 1999 (Prakash 1999b). The nesting population declined by 95% between 1985 and 1999: 353 pairs (12.2 nests per km²) were recorded in 1987–1988, falling to 150 nests in 1996–1997, 25 nests in 1997–1998, and just 20 nests (0.68 per km²) by 1998–1999 (Prakash 1999b); but none was found in 1999–2000 (Rahmani and Prakash 2000a). The success of these nests has also declined alarmingly, from 82% in 1985–1986 ($n = 244$) to zero success in 1997–1998 ($n = 25$) and 1998–1999 ($n = 20$) (Prakash 1999a). The proportion of sick individuals of this species and Indian Vulture combined rose from <5% in 1996 to 20% in December 1998, 50% in March–April 1999, 80% in June 1999 and reached 100% in July 1999 (Prakash 1999a).

Gujarat The species was once described as the “commonest vulture” of Kathiawar, breeding at Limree and Gondal (Lloyd 1873), and “very common” on the hills and plains in northern Gujarat (Butler 1875–1877). In the mid-twentieth century it was the commonest vulture in the area (Ali 1954–1955). At Gir forest, a population of about 375 individuals was found in the dry season (November to May) and 300 in the wet season (June–October) during 1970–1972 (Grubh 1978). It was uncommon in the north (Mukherjee 1995); it was occasional at Shoolpaneshwar Wildlife Sanctuary (Desai *et al.* 1993), abundant in and around Rajpipla, and common around Dediapada, Mozda, and north of the Narmada river in 1981–1982 (Monga and Naoroji 1984); and 10 were seen in a mixed-species flock near Tappar in Gujarat, in January 2000 (Varu 2000). However, at Bhavnagar “20 or more” were recorded at a bone-processing factory between 1955 and 1975, after which none was seen, and at another location in the city a flock was seen regularly until 1980 but not subsequently (Prakash and Rahmani 2000).

Madhya Pradesh The species was “the commonest vulture” and occurred “in great numbers” (Swinhoe and Barnes 1885), being “very common everywhere” in Kanara district (Davidson 1898a), and still common throughout the state in the 1950s (Hewetson 1956). It was regarded as common everywhere in Bhopal, Gwalior and Dhar districts (Ali and Whistler 1939–1940), occasional in Pachmarhi (Osmaston 1922), very common at Sehore (Whitehead 1911), resident in Bandhavgarh National Park (Tyabji 1994), and recorded as possessing “large populations” 10–20 years ago in Gwalior city (Satheesan 1999). As many as 100–120 birds were seen at Khurai, Sagar district, in October 2000 (*per* S. M. Satheesan *in litt.* 2000).

Maharashtra The species was regarded as a common resident throughout the Deccan and “South Mahratta” (E. A. Butler 1881), being “the common vulture” of south Konkan district (the Konkan being a coastal strip extending from Daman in the north to Goa in the south) (Vidal 1880, Hume and Oates 1889–1890), although very rare in western Khandesh (Dhule) (Davidson 1882). “Large numbers” were found in Saurashtra (Kathiawar) region (Dharmakumarsinhji 1955), and “large populations” occurred 10–20 years ago in Bombay and Pune (Satheesan 1999); for example, 693 were seen at Korakendra carcass-processing factory in Bombay in September 1987 (Singh *et al.* 1996). However, of the “hundreds” previously resident at this site, none is now found (Prakash and Rahmani 2000, Thiollay 2000), and in Ahmednagar city it was regarded as a “vagrant” (Kurahde 1996).

Goa The species was listed as the “commonest” vulture, being recorded at Panjim and Canacona (Saha and Dasgupta 1992). More recently the population of the state (3,700 km²) was put at around 45, but “a sharp decline in numbers has been noticed since 1995” (Lainer 1999).

Karnataka The species was once a very common resident at Manzeerabad (Taylor 1887), and frequent in Chikagalur town (Chakravarthy and Tejasvi 1992); 30–40 were recorded in a mixed-species flock feeding on an elephant carcass in Nagarhole National Park in January 2000 (Sarath 2000), but only eight were seen there in six days in November 2000 (K. D. Bishop *in litt.* 2000) and population declines have been noted during the 1990s in southern Karnataka (Prakash and Rahmani 2000). A total of 300 were seen in a mixed-species flock on carcasses near Bangalore, in April 1984 (Satheesan 1988), this presumably at the Viswaneedam slaughterhouse where an average of 237 White-rumped Vultures (maximum 376) was seen during four visits in 1984–1988 (Grubh 1988); in recent years people living near the slaughterhouse report that not a single bird has been seen (SS). Moreover, in Bangalore itself, although the species was never very common there (George 1994), it has now completely disappeared, with no birds seen since 1998 (SS).

Kerala The species was resident in the low country, occasionally foraging in the hills up to 900 m, and the commonest vulture in Travancore (=south Kerala and adjacent Tamil Nadu) and Cochin, but it was regarded as less common than elsewhere in the peninsula (Ali and Whistler 1935–1937, 1969). In the past, this species was recorded regularly at Periyar, but increasingly rarely since the 1960s, with just occasional birds wandering up from the plains, and not even an elephant carcass attracted any in February 1991 (Robertson and Jackson 1992). It was “abundant everywhere” in the Wynaad region in 1881 (Davison 1883) and still recorded there commonly at the turn of the century (Primrose 1904), but only two were seen in this area during surveys in 1985–1988 (Zacharias and Gaston 1993). Clearly, in this state, the species declined to low levels years before the current catastrophic decline.

Tamil Nadu This species was “abundant everywhere” in the Nilgiri hills (Davison 1883), “common everywhere inland” but not along sea-coasts (Baker and Inglis 1930), and still “common” in the state in the 1960s (Badshah 1968). It was resident in Mudumulai Wildlife Sanctuary (Gokula and Vijayan 1996), and used to breed in the Ashambu hills until the surrounding forest was cleared for coffee plantations (Ali and Whistler 1935–1937). In the Kaveri river valley it was very common in the period 1983–1987, breeding on tall *Terminalia arjuna* trees along the river (up to four active nests and 20 birds seen in a single visit), but in January 1999, despite a careful search, not a single bird or nest could be found (SS).

Andhra Pradesh This species was regarded as common around Hyderabad (Ali and Whistler 1933–1934), abundant in Karimnager (East) forest division (Nagulu *et al.* 1997), abundant in Rajiv Gandhi National Park (Rao *et al.* 1997), and common in Coringa Wildlife Sanctuary (Rao *et al.* 1996). However, declines have been noted in coastal districts in Andhra Pradesh, including Chilakaluripet where the species once nested but has now disappeared (Satheesan 1999).

Orissa The species was a common breeder in Bhitarkanika Wildlife Sanctuary in 1992–1993 (Pandav 1996).

Bihar “Large flocks” were found in Hazarinagh National Park (Ara 1966), and the species was a common resident in open country at Jhilruan, Goilkeria, Barkhela and Chaibassa (Ara 1953), but its present status is unknown. Near the slaughterhouse in Bhagalpur groups of 50 or more perched birds used to be a regular sight in the mid-1990s, but only 8–10 could be found in 2000 (A. Mishra *in litt.* 2001).

West Bengal It was once “very plentiful” and “universally distributed” in Calcutta district (Munn 1899), being commoner in the foothills at Punkabarie than at higher altitudes (Beavan 1868), common in Jalpaiguri district (Inglis *et al.* 1920), but only a “casual visitor from the plains” to Darjeeling (Matthews and Edwards 1944), with one or two seen on four occasions

during 1943–1945 (Lister 1954). It was an abundant resident at Durgapur and the Damodar valley during 1968–1971 (Gauntlett 1986), and “large populations” were still recorded 10–20 years ago in the city of Calcutta (Satheesan 1999). However, large numbers of birds soaring over the city are a thing of the past: groups of at most 25 birds are occasionally seen, but at present the norm is to see only single White-rumped Vultures soaring, and in field trips to places near the city it is rare to observe the species (K. Mookherjee *in litt.* 2000). The 40 ha gardens of the Tollygunge Club in Calcutta harboured at least 100 roosting birds and at least 25 nesting pairs of White-rumped Vultures in the period 1992–1999, but in 1999 several dead or dying birds were found under the trees there, and since then the site has been deserted (K. Mookherjee *in litt.* 2000). Moreover, the Indian Botanic Garden across the Ganges from Calcutta was until recently a prime roosting and nesting site for the species, which was regarded as a menace since the droppings of so many birds damaged many valuable trees; but in the past two years only a “small proportion of the earlier population” has been present (K. Mookherjee *in litt.* 2000).

Sikkim One was recorded at 1,800 m at Ari in May 1946 (Maclaren 1947a), but its present status is unknown.

Arunachal Pradesh This species was “seen quite often” at Namsai, recorded at 140–160 m at Seijusa (Singh 1994), and singles seen at 500–700 m at Siang and Mehao during January–April 1990 (Katti *et al.* 1992).

Assam This species was common from Karrimganj along the river towards Cachar, and in the eastern parts of Cachar district; in the Assam valley it was common in Dibrugarh district, but rare beyond there, although it occurred up to Sadiya (Hume 1888); it was the commonest vulture in Hylakandy district, Cachar (Inglis 1899), but rare above 900 m in North Cachar (Baker 1894–1901). It was recently regarded as a common resident in Kaziranga National Park (Barua and Sharma 1999), but a journey of several days through Assam in 1999 yielded observations of just two birds, a seriously different situation from previous visits over a 20-year period (W. L. R. Oliver verbally 1999). In November 1999 another long journey, from Gauhati airport to Kaziranga National Park, covering 239 km and involving intensive watching for raptors, resulted in records of 33 White-rumped Vultures, with only eight during a day in the central and west of the park and a further (but certainly different) eight on a second day in the eastern part of the park, so that altogether, given the high densities of wild mammals inside the park and of domestic ones outside, the numbers of vultures appeared “abnormally low” (J.-M. Thiollay *in litt.* 2001). Elsewhere in Assam numbers of White-rumped Vultures were noted to drop off, in comparison to Slender-billed Vultures, from around mid-2000 (A. Choudhury *in litt.* 2001). It is, nevertheless, moderately encouraging that fieldwork in December 2000 yielded daily records of this species, including a pair on a nest in Kaziranga, and a number of birds, mostly juveniles, in Dibru Saikhowa National Park (R. Naoroji *in litt.* 2001).

North-east hill states The species was considered common between the Jhiri river in the west to Noongzai-ban in the western hills of Manipur, but it was very rare to the east, fairly common in the Manipur plateau, and only seen once or twice in the eastern hills (Hume 1888); it was regarded as common in Khasia hills, Meghalaya (Baker 1907b). Its present status is unknown in these states.

Nepal The White-rumped Vulture was once regarded as “the common vulture of the lowlands” (Rand and Fleming 1957). It was fairly common in winter in Nawakot district, and an “exceedingly common” resident in the Nepal valley (Scully 1879); in 1947 it was the commonest vulture there, but it was reported to be scarcer in winter; it was also recorded in the Mai valley in eastern Nepal at over 2,440 m (Biswas 1960–1966). Up to 11 were seen daily migrating westwards over Khare, south of Annapurna, during October–November 1985 (de Roder 1989). In the 1990s this was the commonest vulture up to about 1,000 m, and in the Kathmandu valley at 1,370 m, less frequent up to 1,800 m (Inskipp and Inskipp 1991), but

reported as high as 2,440 m and 3,100 m in the far east in March (Stevens 1912), and up to 3,050 m at Khaptad in April–May (Inskipp 1988). Birds from the hills, and some from the Kathmandu valley, descend in winter; breeding has been recorded at Chitwan and in the Kathmandu valley (Inskipp and Inskipp 1991).

However, at Koshi Tappu Wildlife Reserve one dead individual was found during a visit in 2000, and about 15–20% of individuals (presumably including, or mainly comprising, this species) were observed showing the head-drooping behaviour noted in India (see Threats: Disease); in Royal Chitwan National Park no vultures were seen (M. A. Virani in Rahmani and Prakash 2000b). Encouragingly, in Biratnagar in the south-east as many as 30 birds were seen in July 2000, although less happily only two were seen five months later in December (B. R. Subba *per* A. Mishra *in litt.* 2001).

Bhutan The first records were three immatures in November 1991 at 150 m at Phuntsholing (Inskipp and Inskipp 1993a). In April 1993 it was again recorded at Phuntsholing, at 350 m, and in Royal Manas National Park at 250 m, and up to 10 individuals were seen at 1,200 m in the Harachhu valley (Inskipp and Inskipp 1993b). In March 1994 the species was found to be “notably common” around Phuntsholing (c.100 in total above the Teesta valley), slightly less so around Samdrup Jongkhar (in April 1995 and April 1996), with flocks of up to 50 roosting; and smaller numbers were seen at 1,300 m at Deothang (Bishop 1999, K. D. Bishop *in litt.* 2000); but in May 1998 none was seen, in May 1999 fewer than eight, and in April–May 2000 none (K. D. Bishop *in litt.* 2000).

Bangladesh The species was found to be common in the Lalmai area near Comilla during December 1944–July 1945 (Collins 1948), fairly common in all areas except the Chittagong hills (Mountford and Poore 1968), and the commonest vulture in Pabna district during 1968–1969 (Husain and Sarker 1971). In the Sundarbans region 340 individuals were estimated at four colonies during November 1981 and March 1983; populations density estimates in different areas ranged from 0.03 to 0.91 individuals per km² (Sarker 1987b). In the 1990s it was regarded as a common resident breeder in village areas (Thompson and Johnson 1996) and “locally common” throughout the country with flocks of 50–150 being seen on carcasses (Harvey 1990), e.g. individuals were recorded in a mixed-species flock of vultures east of Bhairab Bazar in February 1992 (Thompson *et al.* 1993). It was considered fairly common and widely distributed in all districts, especially in the plains and woodlands, but populations were decreasing “more rapidly than even a few years ago”; 40–50 regularly roosted at the Dhaka University campus in 1972, but only 4–5 in 1975, and none by 1979; about 150 frequented the suburbs of Dhaka, but did not breed; a colony of 20–25 bred at Aricha, “but their breeding success is very low” (Sarker 1983). Numbers are lower than in the 1980s and early 1990s, but the impression is certainly not of a dramatic collapse, rather a gradual process of deterioration (P. M. Thompson *in litt.* 2001). However, in Sylhet, near Maulvi Bazar, a group of 13–15 birds remained stable in the period November 1998–November 2000 (W. Collis *in litt.* 2000).

Myanmar This species was once widespread (Walden 1876), being found throughout the plains but less often in the higher hills, except at Maymyo where it was more frequent (Smythies 1986). It was apparently “often seen in great numbers, even in the suburbs of large towns” (Blyth 1875). Although it was “the common vulture” of the Shan States, it appeared to “leave the district in the rainy season” (Rippon 1901); it was “common throughout Tenasserim”, where “hundreds assembled round the carcasses of elephants and buffaloes” (Bingham 1880, Hume and Davison 1878). It was also common on the Sittang–Irrawaddy plain, breeding in Yangon (Rangoon) and Mingalun (Stanford and Ticehurst 1935a), fairly common in Minbu district during 1934–1937 (Roseveare 1952), common in Myingyan district (Macdonald 1906), and also common in Arakan in about 1910 (Hopwood 1912), but by the 1950s it was scarce there and appeared to be absent during May–October (Smythies 1986). Even over a century ago, although this species was “abundant” in Upper Pegu (Oates 1882) and Lower Pegu (Hume and Oates 1889–1890), E. W. Oates remarked (in Hume 1875a) that the birds never had

“anything larger than a dog to feed on”, owing to the scarcity of dead bodies of larger animals, which Hume (1875a) noted was “because the people eat them themselves”.

Forty years ago (i.e. around 1960) vultures were fairly common in the country but now they are very rare (U Khin Maung Zan verbally 2000), a view also expressed, with the word “recently”, by Sayer and U San Han (1983), indicating that the period of decline appears to have been the 1960s and 1970s. Birds were found to be uncommon around Inle lake (south-west of Taunggyi) during 1968–1971 (Amstutz 1974), and only one was seen there in December 1982, plus unidentified vultures on three other occasions (Thet Tun and Sayer 1983); one was seen at Nyaungshwe in March 1983 (Sayer and U San Han 1983). The species is now considered rare to scarce in the west, while its current status elsewhere in the country is unknown (Robson 2000). Three were recorded at 2,590 m at Ramhtlo in April 1995 (Robson *et al.* 1998). In a week in May 1998 spent travelling on the central plains between Yangon and Mandalay, up the Irrawaddy side, across and down the Sittang side, not a single vulture was seen (D. R. Wells *in litt.* 2000).

Thailand The species was once described as fairly common over the whole country (Gyldenstolpe 1916), from the plains to 1,600 m (Lekagul and Round 1991) although avoiding the more densely wooded parts (Gyldenstolpe 1920). It was “common everywhere” in Thailand, although “not extending south of Taiping, in the Malay peninsula” (Robinson and Kloss 1921–1924), and it was regarded as “common” in 1919 in Phuket (Robinson and Kloss 1921–1924, Medway and Wells 1976, Wells 1999). It nested in the early part of the twentieth century around Chiang Mai in northern Thailand (Gyldenstolpe 1916), and still in the 1930s it was “very common on the plain”, and “large numbers” roosted on Doi Sutep to at least 550 m “as well as in tall trees throughout the city” (Deignan 1931, 1936a). Vulture populations around Chiang Mai declined rapidly around the early 1960s, apparently as a result of poisoning from strychnine-laced meat put out during a campaign to reduce the number of stray dogs around the city in 1960 (Cheke 1972). A few individuals survived in surrounding areas, but by the early 1970s this species and Slender-billed Vulture *Gyps tenuirostris* (*sensu novo*: see relevant account) had disappeared; local folklore gruesomely (and of course erroneously) explained this disappearance by stating that vultures “had all gone to Vietnam to eat the corpses” (Cheke 1972).

Even though this species was still fairly common in the 1960s, within a decade it had become rare, and it in 1985 it was estimated to be on the verge of extinction (Round and Chantrasmii 1985). Up to 20 were still present at a slaughterhouse at Pattani, and nearby Yala, southern Thailand, until the late 1980s, but only adults were present in 1991 indicating no recent breeding success (Wells 1999), and the birds may now have gone (P. D. Round *in litt.* 1998). There are occasional reports in northern Thailand during the winter months, but at least some of these birds may refer to Himalayan (Griffon) Vulture *G. himalayensis*, whose occurrence has been confirmed through captures (P. D. Round *in litt.* 1998). Other recent records include four near Ranong town in February 1974, one at Thung Thong reserve (Surat Thani) in October 1976, and one in Muang district (Satul) in June 1991 (Wells 1999). The species is now close to extinction (Scott 1989, Lekagul and Round 1991), if not actually extinct as a breeding bird.

Malaysia This species was once a widespread resident occurring along the full length of the peninsula until the early part of the twentieth century, but it is now very local and sparse (Wells 1999). It was known to occur at Melaka (Chasen 1939a) “during the Japanese occupation” (Gibson-Hill 1949), and it may have occurred as far south as Singapore during the nineteenth century (Gibson-Hill 1949). In the 1930s it was still “common” in the north of the peninsula and more abundant than Red-headed Vulture *Sarcogyps calvus* (Chasen 1939a), but its southern limits were North Kedah, Kelantan and North Perak (Wells 1999). The frequency of cattle disease was reduced significantly during colonial times, and population declines began in the early twentieth century (Chasen 1939a). By the middle of the twentieth century vultures had “become virtually extinct, except in the states adjacent to the Thailand

frontier” where, in places, they were still “frequently seen”, with breeding recorded from northern Kedah, north of Alor Star (=Alor Setar, Madoc 1947, 1951; Wells 1999), but the last confirmed breeding there was at Gunung Keriang in December 1950 (Medway and Wells 1976), and by 1950–1951 it was “scarce” in Kelantan (Wells 1999). At this stage, over half a century ago, the species was already essentially dependent on slaughterhouse offal (D. R. Wells *in litt.* 2000). By 1973 it was “scarce throughout the peninsula”, apparently occurring only as a rare non-breeding visitor (Medway and Wells 1976), for example a record from Kampung Penyirang, Trengganu in June 1979 (Wells 1984).

Laos This species was once abundant in suitable habitat throughout Laos (Thewlis *et al.* 1998). In Tranninh it was found commonly (Delacour and Jabouille 1927b), and even in the mid-twentieth century it was still abundant there and also in Savannakhet province (David-Beaulieu 1944, 1949–1950). In Champasak and Attapu provinces it was common, but outnumbered by the Red-headed Vulture (Engelbach 1932). However, it is now restricted to the southern part of Champasak and Attapu provinces (Thewlis *et al.* 1998), with populations well below carrying capacity and of “miserably low” breeding output (J. W. Duckworth *in litt.* 2000), and it may soon become extinct (Thewlis *et al.* 1998).

Recent records come from: Xe Pian NBCA, where vultures were found sporadically in open habitats and agricultural areas in the northern zone, and daily on the Xe Kong plains where flocks 40–60 vultures (including this species, with a maximum of 11 positively identified) were seen on water buffalo carcasses in January 1993, 2–8 were seen daily in May 1995 (Thewlis *et al.* 1998), two in September 1996 and 6–17 between Senamsai and Ban Sompoy in December 1997 (Duckworth *et al.* 1999); the Mekong river at Ban Hongkhong (= Ban Hangkhon), Champasak province, on both the Lao and Cambodian sides, where at least one was positively identified in a party of ten vultures in April 1996 (Thewlis *et al.* 1998), and at least six in February 1997 (Robson 1997); and Xe Xou, where one was reported in February 1996 (Thewlis *et al.* 1998). Unidentified vultures were reported from Ban Hinlat in Bolaven Southwest PPA, and one (possibly this species) was seen near Ban Khiam in August 1996 (Thewlis *et al.* 1998, Evans *et al.* 2000).

Cambodia The species was once abundant in suitable habitat throughout the country, but by the 1960s it was regarded as uncommon (Thomas 1964), and it is now restricted to a few areas, with populations well below carrying capacity and of “miserably low” breeding output (J. W. Duckworth *in litt.* 2000). Recent records are known from Lumphat road in January 1997, 26 (in groups of up to 12) in June–July 1997 in Lumphat district, and one in Oyadao district in June 1997 (*Oriental Bird Club Bull.* 27 [1998]: 61–66, Goes 1999a); at least 11 out of flock of 31 vultures at Khonyek, Mondulkiri province, in June 2000 (*Oriental Bird Club Bull.* 32 [2000]: 66–76); and at carcasses in Mondulkiri province in April 1994 (Mundkur *et al.* 1995a).

Vietnam Historically, this species was abundant in suitable habitat in central and south Vietnam (J. W. Duckworth *in litt.* 2000), being very common on the Pleiku plateau (David-Beaulieu 1939), “common” in South Annam (Delacour *et al.* 1928), and “the commonest vulture” in south Vietnam, being “often seen in large groups” (Wildash 1968). It is now almost extinct (Thewlis *et al.* 1998), with only one recent record in Dak Lak province (Le Xuan Canh *et al.* 1997), but none was recorded during recent surveys in Dak Lak province in February–May 1998 (Brickle *et al.* 1998), and none was found during surveys in December 1989–March 1990 at sites throughout Vietnam (Robson *et al.* 1990).

China There are apparently no recent records (P. Alström *in litt.* 2000), and the species’s present status is unknown, but it is likely to be scarce or rare.

ECOLOGY Habitat In India, the White-rumped Vulture is found in cities, towns and villages near cultivation, and in light woodland and open areas (Grimmett *et al.* 1998). In Pakistan, it prefers cultivated areas with scattered trees and a high human population, being attracted

to towns and cities, and it occurs predominantly in the less arid plains, avoiding hill, mountainous, and extensive desert areas (Roberts 1991–1992). In south-east Iran it was found in open cultivated areas with villages and livestock (Hollom *et al.* 1988). It is gregarious all year, with groups perching for long periods around feeding areas, often with other vulture species, and roosting communally at traditional sites (Grimmett *et al.* 1998). In the Sundarbans, Bangladesh, these roosts were in trees on riverbanks (Sarker 1987b).

Food The species feeds almost entirely on carrion, mainly by scavenging at rubbish dumps and slaughterhouses, and by searching for dead animals by soaring on thermals (Grimmett *et al.* 1998). In Keoladeo National Park, India, it feeds on carcasses of frail and old cattle abandoned by villagers in the park, and also on individuals that die after getting trapped in the mud of drying marshes (Prakash 1999a). In the Sundarbans, Bangladesh, it feeds on the carcasses of cattle but also of wild boar, deer, monkeys, and occasionally tigers *Panthera tigris*, which are found floating in rivers and channels (Sarker 1987b). On average, one adult vulture eats approximately 1 kg meat per day (Sarker 1987b). A mixed-species vulture flock was reported to eat clean a carcass of a freshly dead bullock within 40 minutes (Ali and Ripley 1968–1998), and flocks of 200–400 were regularly seen cleaning carcasses in 15–20 minutes (Satheesan 1989c). In Bombay, White-rumped Vultures flew up to 25 km from roost sites to feed at a carcass-processing plant at Korakendra (Singh *et al.* 1996), but Roberts (1991–1992) estimated that individuals may travel well in excess of 300 km per day in search of food, given their effective use of thermal currents. In cities in India, high populations of vultures were formerly maintained by abundant food supplies at slaughterhouses, bone mills (where vultures are utilised to pick the bones clean before crushing, for production of tallow and glue) (Satheesan 1989b), carcass-processing factories, tanneries, and garbage dumps (Grubh 1983). In Bombay, White-rumped and (less commonly) Indian Vultures play an important cultural role in the religious Parsi (=Zoroastrian) community, who place their dead in the “Towers of Silence” on Malabar hill for the vultures to dispose of (Grubh 1983, Houston 1990, Satheesan 1998). Interspecific dominance when feeding is described in the equivalent section under Indian Vulture.

Breeding Nests are found in colonies at traditionally used sites, usually in tree-tops 2–18 m high, often near villages, roads or canals (Ali and Ripley 1968–1998, Sarker 1987b, Grimmett *et al.* 1998). Colonial nesting is the norm, with up to 15 nests in a tree, and up to 100 in a 250 m diameter circle (Hume and Oates 1889–1890). Colonies in the Sundarbans, Bangladesh, covered a large area: 2–6 km², whilst those in Pakistan numbered over 80 pairs (Roberts 1991–1992) and in fact one site has been found to hold over 1,000 nests (M. A. Virani *in litt.* 2001); colony size is generally larger in the plains than in the hills in India (Baker 1932–1935). Colonies may be used for at least 50 years consecutively (Hume and Oates 1889–1890). Large trees are generally favoured as nest and roost sites (Baker 1932–1935), including: *Shorea robusta*, *Ficus religiosa* (peepal), *Siris*, and *Pterygota alata* in the Doon valley, Uttar Pradesh (Singh 2000); *Mangifera indica*, *Tamarindus indica*, *F. religiosa*, *Azadirachata indica*, and *Dalbergia sissoo*, often in the centre of villages, in Lucknow, Uttar Pradesh (Jesse 1909); usually *D. sissoo* (shisham), also *T. indica* (tamarind) and *F. religiosa* in Agra, Rajasthan (Satheesan 1995); *Prosopis cinerea* in the Thar desert, Rajasthan (Rahmani 1996b); *Cocos nucifera* (coconut), *T. indica*, and *Ficus* in Gir forest, Gujarat (Grubh 1978); *Dalbergia paniculata* and *F. religiosa* at Ramjeetola, Madhya Pradesh (Kanoje 1996a); *M. indica* (mango) and *Bombax malabaricum* (silk cotton) in south Konkan district, Maharashtra (Hume and Oates 1889–1890); casuarina, *M. indica*, *F. religiosa*, *F. bengalensis*, *T. indica*, and palm trees in Calcutta district (Munn 1899); *Terminalia arjuna* in northern Tamil Nadu (SS). In the Punjab valley of Pakistan, *Dalbergia sissoo* (shisham) trees are critically important to the still considerable populations of this vulture (M. A. Virani *in litt.* 2001). Rarely, nests are found on buildings when suitable trees are absent, especially in desert and semi-desert areas (Satheesan 1995), and nests on cliffs are also known (Jerdon 1862–1864). For example,

in Jodhpur, the commonest nesting sites were 10–15 m high on cliffs, and the second commonest sites were 7–10 m high in *Ficus bengalensis*, although in arid areas nests were as low as 4 m because of the lower stature of the trees; less often *Azadirachata indica*, *Eugenia jambolina* (jaman) and *Tamarindus indica* were used (Sharma 1970).

Breeding peaks in September or October to March, mainly November–January, with local variations (Baker 1932–1935, Ali and Ripley 1968–1998; Grimmett *et al.* 1998). Peak breeding seasons have been noted as: March–April in Keoladeo National Park, Rajasthan (Prakash 1999a); late December to late January in Jodhpur, Rajasthan (Sharma 1979); November in Calcutta district (Munn 1899); October–January in south Konkan district, Maharashtra (Hume and Oates 1889–1890); December–January in Mhow and Neemuch in Madhya Pradesh (Swinhoe and Barnes 1885); December–January at Bhitarkanika Wildlife Sanctuary, Orissa (Pandav 1996); February–April in Travancore (=south Kerala and adjacent Tamil Nadu; Ali and Whistler 1935–1937); November–December in Lucknow, Uttar Pradesh (Reid 1881, Jesse 1902–1903); October–November for egg-laying, and March–April for fledging in the Sundarbans, Bangladesh (Sarker 1987b); November–December in Myitkyina district, Myanmar (Smythies 1986) and October–November in Gunung Keriang, Thailand (Wells 1999).

Clutch-size was one at colonies in Jodhpur, Rajasthan (Sharma 1970), and Lucknow, Uttar Pradesh (Jesse 1909), which is typical (Hume and Oates 1889–1890, Ali and Ripley 1968–1998). The incubation period is estimated as 45–52 days (Baker 1928, Brown and Amadon 1968, Sarker and Iqbal 1997), and chicks remain at the nest for 2–3 months (Sharma 1970, Brown and Amadon 1968). Fledging success of 50 nests in Jodhpur was 96% (Sharma 1970), and in the Sundarbans, Bangladesh, “most of the young fledged successfully” (Sarker 1987b). Although nesting success is (or at least was) high, clutch-sizes are small, and only 30% of the local population was found to breed each season in one study (Sharma 1970). This perhaps explains why long-lived vultures, together with albatrosses, have the lowest reproductive rates of all birds (Lack 1968). The ratio of immatures to adults was said to be 5:4 in towns (Mundy 1985).

THREATS South-East Asia In this region the decline in vulture populations, which occurred largely during the early to mid-twentieth century, was attributed to “shooting, live capture for display, and the great reduction in carrion” due to improvements in hygiene, with other possible factors being pesticides and deaths on roads (P. D. Round *in litt.* 1998). In Thailand, the main causes of the population decline were believed to be a great reduction in the availability of carrion prey, and disturbance of nest sites (Round and Chantrasmi 1985), although strychnine poisoning from laced carcasses (aimed at reducing the stray dog population) was held to be responsible for vulture declines around Chiang Mai (Cheke 1972; see Population: Thailand). Improvements in animal husbandry, and hence a reduction in the supply of carcasses, was regarded as the main cause of population declines in the Malay Peninsula (Wells 1999). Suitable breeding habitat remains widespread in Laos and adjacent countries at least, so this factor is unlikely to have played an important part in the significant population declines there (J. W. Duckworth *in litt.* 2000). In this region, the relatively slow decline of vulture populations, and the fact that Red-headed Vulture and most other large birds (e.g. adjutant storks *Leptoptilos*, Black Kite *Milvus migrans* and Brahminy Kite *Haliastur indus* in Laos at least) have exhibited comparable declines, suggests that the presumed disease which is affecting vultures in the Indian subcontinent is unlikely to be implicated (P. D. Round *in litt.* 1998, J. W. Duckworth *in litt.* 2000). Very little is known about the ecology of vultures in this region, or about the main factor limiting the remaining populations, but supply of carcasses and disturbance by humans are likely to be amongst the most important (J. W. Duckworth *in litt.* 2000). In Myanmar, declines in this species were attributed to poisoning by insecticides (Sayer and U San Han 1983).

Indian subcontinent In this region a number of threats have contributed to population declines, particularly the modernisation of slaughterhouses, poisoning of carcasses, and reduction in nesting trees around cities. However, the recent catastrophic crashes in vulture populations are most plausibly (though not provenly) explained by an as yet unidentified infectious disease factor or agent.

Disease The catastrophic population crashes of White-rumped, Indian and Slender-billed Vultures in the three years to 2000 are most likely to have been caused by a disease factor, presumed to be a virus (Risebrough 1999). Symptoms of individuals of the first two species dying in Keoladeo National Park, India, were consistent with this hypothesis: they were seen perched drowsily in trees, with the neck repeatedly slumping slowly down before being jerked back up (Prakash 1999a). Individuals remained in this sick condition for more than 30 days before falling off their perch and dying entangled in branches beneath or on the ground below, although some sick individuals could fly short distances and even feed their young (Prakash 1999a). At Balaram Ambaji Wildlife Sanctuary, Gujarat, similar head-drooping behaviour was noted in 30 individuals “stricken with malady... and close to death”, although unhygienic bathing facilities for pilgrims who visit the park was suggested to be at least partly responsible (Rosalind 2000). Head-drooping behaviour was noted in 17% of individuals of White-rumped Vultures during surveys by BNHS in April–June 2000 in north and central India (Prakash 2000). Head-drooping behaviour in apparently sick individuals was observed at numerous other sites in India, and also in Nepal and Pakistan in 2000 (see Population). It may be noteworthy that head-drooping (although it may not *always* be a sign of ill-health since it may be used as a thermo-regulatory behaviour: M. Gilbert *in litt.* 2001) is a symptom of Newcastle’s disease, a viral affliction of poultry and other birds which can also pass to humans (H. S. Baral *per C. Inskipp in litt.* 2000). The proximate causes of breeding failure of birds in the Keoladeo National Park are also most plausibly explained by a disease factor (Risebrough 1999): in 1997–1998 and 1998–1999 nesting failure resulted from (1) failure to lay eggs (20% and 60% respectively), (2) failure of eggs to hatch (20% and 10% respectively), and (3) death of young (60% and 30% respectively).

Autopsies on vultures performed so far have found “degenerative changes in the urinary tubules” in the kidneys, and whitish deposits presumed to be urates present in the heart, liver, kidney and spleen; no evidence of bacterial infection was found, so organ samples were taken for culture in an effort to detect viruses, but no results are available yet (Risebrough 1999). The progressive accumulation of uric acid (as found in the human condition commonly termed gout) may therefore explain the pattern of reproductive failure and chronic condition eventually resulting in death, as observed in vultures in Keoladeo National Park (Risebrough 1999). Seven more dead vultures from the area “had died of an infectious disease, probably a virus... the actual cause of death appeared to be dehydration caused by enteritis” (Prakash 2000). All autopsies carried out so far on vultures found dead in the wild have shown symptoms of acute enteritis, degeneration of kidney cells, and extensive visceral gout, whilst vultures which were captured as sick individuals that died in captivity did not show visceral gout (Rahmani and Prakash 2000b). A wildlife pathologist from the Zoological Society of London concluded that the available evidence strongly indicates an infectious disease to be responsible (Rahmani and Prakash 2000b). Results from attempts by the Poultry Diagnostic and Research Centre, Pune, to isolate viruses in vulture tissue have indicated the presence of a viral pathogen, and electron microscopy work at the National Virology Laboratory, Pune, has confirmed the presence of viral particles in vulture tissue samples (Rahmani and Prakash 2000b); however, it must still be stressed that such findings do not necessarily mean that the disease agent is a virus (M. A. Virani *in litt.* 2001).

Dead crows *Corvus* have also been found in Keoladeo National Park, and as this species also commonly feeds at carcasses, these deaths may also have been caused by the same disease factor (Prakash 1999a). This has potentially alarming human health implications: for example,

transmission by a mosquito vector of a virus of African origin resulted in the infection and death of both wild birds (including crows) and a number of people in the New York City region during the summer of 1999 (Risebrough 1999).

Pesticides Although the toxic effect of pesticides has been implicated in population declines of a number of raptor species (e.g. Ratcliff 1967, Hickey and Anderson 1968, Newton 1984), and this has been suggested as an explanation of the population crashes in *Gyps* vultures in the Indian region (Rahmani 1998b, Ghatak 1999, Prakash 1999a), the evidence does not suggest that this factor can be responsible for the catastrophic recent declines, although it may represent a low-level threat.

In India organochloride pesticides are used extensively in agriculture (Prakash 1999a), and this is also true in other countries in the range of the declining *Gyps* vultures (Ghatak 1999). For example, around Keoladeo National Park, India, farmers extensively used organochloride compounds such as aldrin, dieldrin, endosulfan and heptachlor; moreover, DDT has been banned for use in agriculture in India, but it is still extensively applied after being diverted from the national malaria control programme (Prakash 1999a). High levels of DDT and HCH pesticides were found in tissue samples from cattle and pig carcasses collected from areas surrounding the park, and these two pesticides (plus, in some cases, dieldrin) were found in carcass tissue samples collected in Rajasthan, Uttar Pradesh and Delhi (Ghatak 1999). Lethal levels of DDE (the main metabolite of DDT), aldrin and dieldrin were detected in the tissues of Sarus Crane *Grus antigone* and Ring Dove *Streptopelia decaocto* in Keoladeo National Park (Vijayan 1991). Breeding failure of White-rumped Vultures in the park (e.g. breakage of eggs in the nest) is consistent with pesticide contamination (Prakash 1999a). However, there is no direct evidence for significant pesticide levels in the small number of vulture tissue samples collected from the park so far (Prakash 1999a, Rahmani and Prakash 2000b).

Furthermore, it is not clear how individuals might accumulate high levels of pesticides, as they feed mainly on the carcasses of large mammals, whereas bird- or fish-eaters have generally been found to accumulate the highest organochloride levels (Newton 1979). Other raptors in the park which feed mainly on fish, amphibians and reptiles, and hence which should be more vulnerable than vultures to the effects of pesticides have not shown any drastic population declines (Prakash 1999a). For pesticide toxicity to have caused the large population declines in *Gyps* vultures, these species would have to have an unusual metabolism that led to faster organochloride accumulation rates than other raptors (Prakash 1999a). Additionally, the documented effects of pesticides on non-target species do not resemble the mortality pattern observed in vultures: pesticides cause death only when the dose is sufficiently high, and the birds normally die rapidly after exposure, whereas at lower doses, pesticides produce sublethal effects from which the birds eventually recover (Risebrough 1999). Finally, if a pesticide is responsible, the usage pattern must be new even if the compound itself is not, and it must have been introduced within a short time all over India in order to have produced the observed effects; there is no evidence for such wide-scale changes in pesticide application (Risebrough 1999).

Environmental contamination Although the pattern of vulture mortality may have occurred in response to a novel chemical derived from a non-agricultural use, the arguments against a pesticide effect (see immediately above) also apply in this case (Risebrough 1999).

Poisoning Deliberate poisoning of carcasses (e.g. with strychnine)—normally to rid a neighbourhood of scavenging predatory mammals—has been identified as a major source of mortality in other raptors (e.g. Cape Vulture *Gyps coprotheres*: Dobbs and Benson 1984), and cases have been reported for vultures in India (Satheesan 2000c) and Thailand (Cheke 1972; see South-East Asia above). It has been rumoured that a “cultural offensive” against vultures has been launched in Myanmar, involving dumped pesticides on baits, but this cannot be confirmed (D. R. Wells *in litt.* 2000). In Peninsular Malaysia, sodium arsenite

was the prevalent herbicide in rubber estates at the time that vulture populations were present but dwindling, was “a notorious killer of wandering village stock”, and hence might have led indirectly to vulture deaths (D. R. Wells *in litt.* 2000). In India, instances of strychnine poisoning were reported as long ago as 1888 in Assam (Hume 1888). Predators such as jackal *Canis aureus*, wolf *C. lupus*, leopard *Panthera pardus*, tiger and lion *P. leo*, which may attack domestic livestock, are occasionally targeted by poisoning of carcasses (Prakash 1999a). Poachers also poison wild animals to facilitate removal of hides, antlers and horns, etc. (Satheesan 2000c). Furthermore, poison is occasionally administered to domestic cattle in order to facilitate the removal of the hide: the rodenticide zinc phosphate has been used for this purpose around Keoladeo National Park, India (Prakash 1999a). Some instances occurred in Gir forest, Gujarat, India (Grubh 1974), and in Kutch, Gujarat, in May 1999 (S. M. Satheesan *in litt.* 2000); locals reported “every vulture in and around Anaimalai Hills”, Tamil Nadu, being killed by poisoned carcasses put out to kill cattle-marauding leopards between 1960 and 1980 (Kannan 1993); and about 40 died at a poisoned carcass in Rangpur district, Bangladesh, in May 1981 (Sarker 1983). However, these are relatively rare events, and mortality of vultures from this source does not seem to be a major risk and it cannot be countenanced as the cause of the recent collapse in India’s population (Prakash 1999a); furthermore, the poisons used for this purpose are acutely toxic and would be expected to kill the birds rapidly, with lower sublethal doses inducing sickness followed by recovery (Risebrough 1999), and a chronic condition that deteriorates over time (as observed by Prakash 1999a) would not be expected unless the toxic effects were reinforced through repeated exposure (Risebrough 1999). This view is nevertheless disputed (Satheesan 2000c; see Remarks 2).

Lead poisoning from gunshot used by poachers has also been suggested as a possible risk to vultures (S. M. Satheesan *in litt.* 2000).

Reduced food availability In the Sundarbans, Bangladesh, “a drastic decrease in the numbers of livestock” was reported to have affected numbers of White-rumped Vultures (Sarker 1987a). Elsewhere in Indian subcontinent, however, changes in the food supply have not occurred within the short time-period necessary to explain the rapid vulture population declines (Risebrough 1999). For instance, at Keoladeo National Park, India, during 1985–1986, vultures were found on every carcass encountered, with a mean of 80 vultures per carcass ($n = 13$) (Prakash 1999a). By 1998–1999 only 8% of 100 carcasses had vultures feeding on them, with a mean of 19 individuals (Prakash 1999a). The supply of carcasses has not changed (20–25 per month), and there has been no change in the method of carcass disposal by villagers around the park: cattle carcasses are still thrown out into the open after being skinned (Prakash 1999a). In 1999 a survey conducted around the park in Bharatpur district found that approximately 2,500 cattle die every month, which was estimated to provide sufficient food to sustain a population of 13,000 vultures (Rahmani and Prakash 2000a,b). Villagers keep fewer cattle now in northern India owing to the liberalisation of the economy, and in many areas villagers are shifting to higher-quality breeds that are well looked after and suffer lower mortality, so fewer carcasses are available to vultures (Rahmani 1998b). However, this trend is not widespread in the “cow-belt” states of northern India where vultures are commonest (Rahmani 1998b). Surveys by BNHS in north and central India in April–June 2000 (see Population) found only 5% of 192 livestock carcasses had vultures in attendance (Prakash 2000). It is noteworthy that both White-rumped Vulture individuals on which autopsies have been carried out contained abundant fat in the abdominal cavity, suggesting that they had not died of malnutrition (Risebrough 1999).

It is unlikely that competition with other vulture species for food can explain the population decline. This species feeds at carcasses communally alongside Indian Vulture; aside from the fact that both species have shown similar population declines in the Keoladeo National Park, the proportions of the two species at carcasses have not changed: 69% White-

rumped and 31% Indian Vulture in 1985–1986, compared to 63% and 37% respectively in 1998–1999 (Prakash 1999a).

Calcium deficiency Nutritional bone disease in chicks, perhaps as a result of calcium deficiencies, has been reported for Cape Vultures in southern Africa, possibly associated with declining populations of bone-crunching hyenas *Crocuta crocuta* and *Hyaena brunnea* (Evans and Piper 1981; but see Dobbs and Benson 1984). Hyena *H. hyaena* populations have also declined in India, but this is not considered to be a likely cause of the decline in vulture populations (Prakash 1999a).

Reduced nesting habitat In Keoladeo National Park, India, there has been a general decline in the number of old and mature trees available for nesting, but this is considered unlikely to explain the steep population decline observed this species (Prakash 1999a). In 1999, more than 4,000 potential nesting sites in the park were estimated, so there appeared to be no shortage (Rahmani and Prakash 2000a,b). Elsewhere, felling of trees used for roosting and nesting sites, particularly in urban areas (e.g. Agra, Rajasthan, since 1981), may have contributed to population declines (Satheesan 1999, 2000a). In the Sundarbans, Bangladesh, “most of the trees... which are suitable for nesting and roosting have been destroyed in the areas where the colonies are situated”; destruction of nesting trees, plus human disturbance, were identified as the main threats to colonies elsewhere (Sarker 1987b). In Gujarat, India, the loss of large trees for nesting was identified as a major cause of population declines in this species in the mid-1990s, with public parks in cities providing one of the few remaining sources of nesting habitat (Kacher 1996).

Nest predators In the Sundarbans, Bangladesh, nests at a low height (owing to intense competition for higher nesting sites) were found to be particularly vulnerable to egg-depredation by monitor lizards, pythons and carnivorous mammals (Sarker 1987b).

Hunting It is unlikely that direct hunting of vultures threatens them because they are regarded as unclean by people, and are not generally eaten (Rahmani 1998b). Virtually no hunting or trapping of vultures occurs in the Thar desert, Rajasthan (Rahmani 1996b). However, vulture eggs, chicks and adults were caught for food with nets, nooses and using bare hands, in a number of areas including: Guntur and Prakasam districts, Andhra Pradesh, until 1980 (K. M. Rao 1992, Satheesan 2000b); Bapne near Bombay (Satheesan 1999); villages near Sasan Gir in Gujarat (Satheesan 1999); Vishwaneedam near Bangalore (Satheesan 1999); and in Madhya Pradesh where honey gatherers collected eggs and chicks (presumably of Indian Vulture) on cliffs (Satheesan 1999, Thiollay 2000). Locally, threats may arise from the use of vulture remains as a source of “medicines”; newspaper reports have claimed that villagers have been offered up to Rs 3,000 for vulture bodies, leading to “massive vulture-hunting sprees” (Ghatak 1999), but this seems unlikely to be a widespread threat. Similarly, small numbers are apparently caught for pets or for display in circuses (S. M. Satheesan *in litt.* 2000). In Bangladesh, there is a local superstition that hanging a vulture’s head around the neck of a cow will reduce maggot infestations in wounds during the rainy season, and hence some hunting of vultures occurs for this purpose (Sarker 1983).

Aircraft strikes Mortality due to collision with aircraft has been a long-recognised hazard at airports in India (Ali and Grubh 1984, Thiollay 2000), particularly at Delhi, Bombay, Calcutta, Hyderabad, Madras, Trivandrum and Bangalore (Satheesan 1989b), with at least 15 military aircraft and several human lives being lost due to vulture strikes during 1980–1994 (Satheesan 2000a), and vultures being involved in 39% of 265 aircraft strikes recorded by Ali and Grubh (1984). Several measures have been taken to eliminate populations near to airports to reduce the hazard to aviation, including direct killing of vultures, modernising of nearby slaughterhouses, and banning of carcass dumping (Satheesan 1999, Rahmani and Prakash 2000b). More than a decade ago population declines as a result of these measures had been noted in White-rumped and Indian Vultures in a number of urban areas (Satheesan 2000a).

Power-lines Vultures are occasionally electrocuted on high-tension power-lines, especially in desert or semi-desert areas without tall trees (Satheesan 1999).

Genetic factors The effect of the factors described above may have been exacerbated by low levels of genetic diversity (Prakash 1999a) as has been found in the Cape Vulture (Wyk *et al.* 1993). No studies have investigated this in the White-rumped Vulture or in any of the other Indian species (Prakash 1999a), but given the large contiguous range (at least until recently) and dispersive abilities of vultures, this seems unlikely.

Life history The low reproductive rates and high longevity of this and other vultures (see Breeding) means that only relatively small increases in adult mortality rates can lead to rapid population declines (Houston 1987), rendering vultures vulnerable to the effects of the threats described above.

MEASURES TAKEN Given the very recent nature of the crisis in this species, conservation efforts have only recently begun. Following the results of research at Keoladeo National Park, the BNHS issued a “Vulture Alert” to the scientific community and to international conservation organisations in November 1998 to raise awareness of the population crashes (Rahmani and Prakash 2000a,b). A meeting was called in August 1999 to elucidate how widespread the problem had become, and to convene an Indian Vulture Study Group with a view to drawing up a national action plan to address the issue (Thiollay 2000, Rahmani and Prakash 2000a,b, Prakash and Rahmani 2000). In February 2000 a second meeting was held, and evidence was presented that suggested that an infectious disease, probably viral, was responsible (Rahmani and Prakash 2000b). In June 2000 the Peregrine Fund initiated an emergency “Asian Vulture Conservation Program” to determine the factors behind the population crash and to implement appropriate actions, focusing on India, Nepal and Pakistan (M. A. Virani *in litt.* 2001). In September 2000 BNHS convened a seminar with international participants to review the current situation and to develop action plans for population monitoring, captive breeding for facilitating disease investigation, and for identification of the virus responsible (Rahmani and Prakash 2000b).

Surveys and ecological research In November 1999, a study of a small colony containing eight nests of White-rumped Vultures near Bangro, 66 km south-west of Keoladeo National Park, India, was initiated by a team from BNHS (Risebrough 1999). Dead and dying individuals have already been found in this colony, indicating that similar mortality processes to those operating in the park are also occurring at this site (Risebrough 1999). In 2000, three vultures (presumably of this species) were radio-tagged at Bharatpur, and were still being tracked 50 km away (A. R. Rahmani *per* P. Wood *in litt.* 2000). In March–June 2000, BNHS carried out surveys in 17 protected areas, and along roads throughout northern India (Rahmani and Prakash 2000b; see above under Population: India).

Laboratory studies Pathological studies have been initiated at several centres in India, including the Poultry Diagnostic and Research Laboratory in Pune, India, which specialises in the investigation and diagnosis of avian diseases; progress is currently limited by the availability of fresh sample material (Rahmani and Prakash 2000a,b). BNHS has been coordinating efforts by Indian specialists, with advice from veterinary and pathology specialists from the Zoological Society of London, UK, and the US Fish and Wildlife Service (Rahmani and Prakash 2000b).

Protected areas This species breeds in numerous protected areas across its range (see Distribution).

MEASURES PROPOSED The following recommendations have been made for *Gyps* vultures in India, but they are applicable for all states in the species’ range: (1) extensive surveys are required to determine the extent of population declines; (2) widespread sampling of vulture tissue should be carried out to test pesticide levels; (3) genetic studies should be

initiated to assess levels of genetic diversity; (4) studies should be carried out to search for potential pathogens causing disease in vultures; (5) captive breeding programmes should be initiated (Prakash 1999a). In fact, this package of measures can be extended under the following headings.

Population surveys Detailed surveys are required to monitor the status of this and other species of vulture (Rahmani and Prakash 2000a). In India, BNHS is coordinating surveys and population monitoring through the Indian Bird Conservation Network, and further surveys are planned during November–December 2000 and 2001 in and around all protected areas, in conjunction with the wetland and waterfowl survey of the Salim Ali Centre for Ornithology (SACON), Coimbatore; these organisations plan to develop a simple sampling protocol surveys (Rahmani and Prakash 2000b). It has been suggested that the vast manpower available through the forest department could facilitate surveys (Rahmani and Prakash 2000b). In Nepal and Pakistan, surveys will be carried out through collaboration between the Peregrine Fund, Ornithological Society of Pakistan, and Bird Conservation Nepal (P. Wood *in litt.* 2000). The British Vulture Conservation Society is coordinating the compilation of a database of people and organisations who can contribute to monitoring vulture populations (P. Wood *in litt.* 2000).

Ecological studies Focused ecological studies will be carried out by a range of organisations (including BNHS, SACON, and the Wildlife Institute of India) at 11 sites (Keoladeo, Buxa, Kutch, Bandhavgarh, Nagarhole, Harike, Ranikhet, Kukrail, Pench, Ladakh and Kota), and the factors to be studied will include population age structure, breeding attempts, fledging success, levels of human disturbance, food availability, incidence of disease symptoms and mortality rates (Rahmani and Prakash 2000b). In Nepal, such projects will be set up at vulture colonies through collaborations between the Peregrine Fund and Bird Conservation Nepal (M. A. Virani *in litt.* 2000).

Laboratory studies Although the preliminary data suggest that an infectious disease caused by a viral agent is the likely cause of the vulture population crashes, other factors should continue to be investigated (Rahmani and Prakash 2000b). Searches are still under way to locate local laboratories that could determine cholinesterase activity levels, which are a measure of exposure to organophosphate and carbamate insecticides (Risebrough 1999). Characterisation of the disease factor would be hastened by the collaboration of additional international laboratories (Risebrough 1999). Tissue samples from vulture carcasses collected from areas other than the Keoladeo National Park are required (Risebrough 1999). Studies are required in order to identify diagnostic measures of infection other than the behavioural symptoms (head-drooping) that have already been documented (Risebrough 1999).

Further post-mortems and tissue-sample screening for vulture mortalities will be carried out through collaboration between BNHS, laboratories in India and the Zoological Society of London (P. Wood *in litt.* 2000). In Pakistan, post-mortems are being carried out on dead vultures found in Kundian forest (M. Nasir *in litt.* 2000). Further work at the Poultry Diagnostic and Research Centre, Pune, will focus on attempting to isolate and DNA-sequence the viral pathogen (Rahmani and Prakash 2000b). Identification of the virus is also being attempted at the National Virology Laboratory, Pune (Rahmani and Prakash 2000b). In Nepal healthy and sick birds will be trapped to collect blood and tissue samples for laboratory analysis in order to isolate the disease factor and to develop a vaccine (M. A. Virani *in litt.* 2000).

Captive breeding An inventory of captive populations in zoos throughout the world is required in order to determine the number of individuals and their health (Risebrough 1999). These captive individuals should be protected from exposure to recently wild-caught birds in order to prevent potential disease transmission (Risebrough 1999). Any apparently healthy captive individuals may well prove to be priceless for the conservation of these species (Risebrough 1999), because the population crashes appear to have been so catastrophic that

captive breeding may be required in order to facilitate recovery (Rahmani and Prakash 2000a). In Calcutta Zoo, resident wild *Gyps* vultures (presumably White-rumped and Slender-billed Vultures) are fed in open-air facilities (Risebrough 1999), but these populations must still be regarded as susceptible to disease transmission from adjacent populations. In India, it has been proposed that three or four government-run projects be set up to initiate captive breeding programmes with a view to providing stock for potential release, and for facilitating investigations into the disease agent; a private captive population research facility has also been proposed (Rahmani and Prakash 2000b).

In Keoladeo National Park, India, a facility has been constructed for housing captive vultures and an intensive effort is underway to capture up to 10 of the surviving individuals in nearby areas (Risebrough 1999). As the disease appears to have a long gestation period, monitoring of infected individuals will be facilitated by such measures; additionally blood samples will be taken for cell counts, antibody analysis, cholinesterase activity tests, and for determination of organochloride levels; and individuals which die will be sent for autopsy and tissue sample analysis (Rahmani and Prakash 2000a).

In Pakistan, the Peregrine Fund is in the process of building a *Gyps* Vulture holding facility where a disease-free flock will be kept securely outside their western range in the country; this will help ensure a healthy population for future re-introduction in the event of a mass die-off (M. A. Virani *in litt.* 2001).

In order to control transmission of the disease, RSPB has recommended to the UK authorities (1) a precautionary ban on issuing import/export licences for *Gyps* vultures, and (2) raising the issue of imposing a trade ban at EU and global levels with the EC and CITES (P. Wood *in litt.* 2000).

Publicity There are a number of negative consequences for human populations of the vulture population crash: an increase in the population of feral dogs scavenging on carcasses normally consumed by vultures could lead to increases in "rabies epidemics"; and the increase in the numbers of rotting carcasses could increase the incidence of anthrax and other epidemic diseases in domestic animals, and potentially in humans (Rahmani and Prakash 2000a). These negative effects are potentially powerful arguments to support the cause of vulture conservation, and should be used in attempts to publicise the issue and to encourage public and political support for conservation efforts. Additionally, advertising to encourage the public to report sick vultures to the appropriate agencies is required, in order to facilitate the collection of samples from diseased individuals (Rahmani and Prakash 2000b).

Other measures WWF-India plans to initiate vulture restaurants with controlled provision of carcasses (Thiollay 2000), despite the fact that food limitation does not appear to be an important factor contributing to the recent population declines. At remaining colonies, human disturbance should be minimised, and roosting and nesting trees should be protected (Sarker 1987b).

South-East Asia The remaining populations in this region (centred on north-east Cambodia) may be isolated from populations in the Indian subcontinent by "large swath of effectively vulture-less territory" (J. W. Duckworth *in litt.* 2000). These relict populations may become the best hope for the future White-rumped and Slender-billed Vultures, owing to the lack of carriers between the two population centres, and they require study and conservation attention (J. W. Duckworth *in litt.* 2000), particularly population monitoring and searches for disease symptoms (R. W. Risebrough and M. A. Virani *in litt.* 2000). However, in the Malay Peninsula, the management needed to avert extinction of breeders was regarded as "probably not practical" (Wells 1999).

Other vulture species The other two species of *Gyps* vulture in India (Eurasian Griffon *G. fulvus* and Himalayan Griffon *G. himalayensis*) must be considered susceptible to the disease which has affected at least White-rumped, Indian, and Slender-billed Vultures (Prakash 1999a). Furthermore, the disease could also spread to congeneric vultures in the Middle

East, Europe and Africa (Prakash 1999a). Indeed, Eurasian and Himalayan Griffons have also “declined markedly in recent years” in India (Rahmani and Prakash 2000a,b), and they have declined as winter migrants to Keoladeo National Park, Rajasthan, over the last decade, whereas resident populations of Red-headed Vulture and Egyptian Vulture *Neophron percnopterus*, both of which (unlike *Gyps* vultures) generally exploit smaller carcasses and do not feed communally, have remained stable, although breeding population sizes are small: <5 nests of each species annually between 1996 and 1999 (Prakash 1999a). The latter two species may therefore be less susceptible to disease transmission through close proximity to infected individuals at carcasses, or through consumption of food regurgitated by infected individuals (Risebrough 1999). However, declines in at least Egyptian Vultures have been reported over the last 10–20 years in Delhi, Bombay, Madras and Bangalore (Satheesan 1999).

Censuses of potentially affected populations of at least *Gyps* species should therefore be carried out, with particular attention being paid to the symptoms (e.g. head-drooping of chronically sick birds) associated with the pattern of mortality observed in India (Risebrough 1999), and such surveys should be prioritised in range states in the Middle East particularly focusing on Eurasian Griffon (R. W. Risebrough and M. A. Virani *in litt* 2000). Pakistan should be regarded as a high priority for research given that the “wavefront” of the disease is now passing through the country, and also because it is the area where White-rumped Vulture comes most into contact with Eurasian Griffon (R. W. Risebrough and M. A. Virani *in litt* 2000).

REMARKS (1) Given that the conservation crisis for this species, and also for Indian and Slender-billed Vultures, has only recently come to light, time constraints have meant that the distribution accounts presented here, while fairly comprehensive, are by no means exhaustive, and should be regarded as preliminary reviews. No mapping was possible in the time available; therefore localities are arranged alphabetically within countries or states. (2) It is certainly worth considering that the poisoning of vultures at carcasses could be, or could have been, much more widespread than has been recognised, and the supposed rarity of such events may simply reflect the rarity with which such events are recorded. At any rate, poisoning may be a plausible hypothesis for the declines of vultures in areas of southern India (e.g. Kerala) long before the current pandemic took a grip, occasionally perhaps killing birds outright but, more probably, chronically depressing reproductive output so as to cause a steady fall in overall numbers. Indeed, it might be arguable that populations stressed by background levels of toxic residues are exposed to an elevated risk of pandemic disease.