

Threatened Birds of Asia:

The BirdLife International Red Data Book

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LESSER ADJUTANT

Leptoptilos javanicus

Critical —
Endangered —
Vulnerable C1

This stork qualifies as Vulnerable because it has a small, declining population as a result of habitat loss and degradation, hunting and disturbance.



DISTRIBUTION The Lesser Adjutant ranges from India (and formerly China: see Remarks 1) south through Myanmar and Thailand to Laos, Cambodia, Vietnam and Peninsular Malaysia to the Greater Sundas including Sumatra, Kalimantan, Java and Bali (Indonesia), Sabah and Sarawak (Malaysia) and Brunei (see Saikia 1995 for a mapping of past and present ranges). There are unconfirmed records from Bhutan (see Remarks 2), and it occurs as a vagrant east of Bali in the Lesser Sunda islands (Nusa Tenggara), Indonesia. Despite Hume's (1875b) assertion that the two Asian adjutants "could scarcely be confounded", errors in identification have cropped up frequently in early and recent literature (see Remarks 1 under Greater Adjutant *Leptoptilos dubius*); in the following accounts by country, therefore, provisional records (e.g. unspecified *Leptoptilos* storks), doubtful records, and the less site-specific records have largely been excluded.

■ **CHINA** This species was once probably fairly common (see Remarks 1), becoming a very rare visitor by the early twentieth century, not proven to breed (Cheng Tso-hsin 1987), and it may now be extinct. Records are as follows:

■ **Sichuan** Lepoqiao, suburb of **Chengdu city**, one captured and sent to Chengdu Zoo, October 1973 (Li Fulai *in litt.* 1997); foothills of Jinyun Shan, **Xiema** town, Beibei, Chongqing, male collected on a hillside paddy, October 1954 (Zhao Zhengjie 1995);

■ **Yunnan** unspecified locality, December 1972 (female in WUCN);

■ **Jiangxi** unspecified locality, July (year unspecified), "found by David, but whether in the extreme south or in the Yangtze valley I know not" (Styan 1891);

■ **Hainan Lingmen** (Lingmun), one, February 1868, and also on several occasions elsewhere in central Hainan, in moist paddyfields or near streams and ponds, always solitary (Swinhoe 1870b, Ogilvie-Grant 1900a), but with no records on the island since before the 1930s (Zou Fasheng *et al.* 2000).

■ **INDIA** The species was originally resident in central and north-eastern India in all well-watered and thinly populated areas (Ali and Ripley 1968–1998). While Jerdon (1862–1864) stated that the species occurred in small numbers throughout India, Barnes (1885) remarked that it had "very doubtfully been recorded from the Deccan" and that he only knew of a single specimen from "Central India". Colonies or individual nests have been found, at least historically, in Uttar Pradesh, Kerala, Tamil Nadu, Orissa, Bihar, West Bengal and Assam (Baker 1932–1935, Whistler 1935). Records are from:

■ **Punjab Harike Lake Wildlife Sanctuary**, rare winter visitor, undated (Singh 1993);

■ **Delhi Okhla**, undated (Urfi 1995);

■ **Rajasthan** unspecified localities, five, January 1990 (AWC data *per* T. Mundkur *in litt.* 1998); **Keoladeo National Park**, Bharatpur, occasional, undated (Abdulali and Pandey 1978), 150–200, March–June 1983 (V. Prakash verbally 1997), one, March 1984 (D. Griffin *in litt.* 1999), three–four, 1989 (SS), one, February 1995 (P. Alström, U. Olsson and D. Zetterström *in litt.* 1999), 1–2, November 1996, and erratically until at least February 1999 (P. Holt *in litt.* 1999, A. Holcombe *in litt.* 1999);

■ **Gujarat** unspecified localities, 12, January 1991 (AWC data *per* T. Mundkur *in litt.* 1998); **Mandvi**, Kutch, winter 1944–1945 (Ali 1954–1955);

■ **Uttar Pradesh Corbett National Park**, very rare visitor, undated (Lamba 1987); **Kaladhungi**, below Naini Tal, “very rare”, February–April 1989 (C. Salt *in litt.* 1990); **Dudwa National Park**, listed (Chandola 1978, Javed and Rahmani 1998), regularly 1–2 pairs present, recorded at Bankey taal and Kakraha taal, undated (Singh and Singh 1985), Bhadi and Churela taal (Javed 2000), with a nest found in the park, 1991–1992 (A. R. Rahmani *in litt.* 1999); **Kishanpur Wildlife Sanctuary**, at Jhaadi taal (S. Javed *in litt.* 1999), where 15 were seen in April 1991 (Rahmani and Qurieshi 1991); Baghapurva, **Bahraich district**, March 1998 (Javed 2000); **Nichloul**, Gorakhpur district, 30 together, 1909–1911 (Osmaston 1913); **Lucknow**, on the Gomati river (Goomti river), undated (Reid 1881), and at Martinière park, undated (Jesse 1902–1903); **Majhauri**, two in March 1998 (Javed 2000);

■ **Madhya Pradesh** unspecified localities, two, 1955 (Hewetson 1956), six, January 1990, six, January 1991, one, January 1992, two, January 1993 (AWC data *per* T. Mundkur *in litt.* 1998); **Morena district**, undated (Saxena 1998); **Karera Bustard Sanctuary**, at Dihaila jheel, singles, September 1985 and 1986 (Rahmani 1987c); **Bandhavgarh National Park**, November 1987 (Winkel 1987), one, January–March 1994 and at least four, February 1995 (P. Alström, U. Olsson and D. Zetterström *in litt.* 1999); **Surguja** (Sirguja), undated (Ball 1874, 1878); **Bilaspur district**, undated (D’Abreu 1931); **Kanha National Park**, up to three, August–September 1972 (Güntert and Homberger 1973), “several”, June 1986 (P. Bradbeer *in litt.* 1999); Somnapur, **Balaghat district**, January 1912 (D’Abreu 1912); between Tora and Pandari, along the Mahanadi river near **Chandarpur**, two, April 1990 (Sharma *et al.* 1995);

■ **Maharashtra Nagpur** district, undated (D’Abreu 1931); **Chandrapur** (Chanda), undated (Blanford 1871);

■ **Goa** usually found between the Zuari and Mandovi rivers, with one recently seen circling over secondary forest at the base of the Western Ghats, undated (Lainer 1999); unspecified localities, 18, January 1990 (AWC data *per* T. Mundkur *in litt.* 1998); **Chorao island**, one, January 1996, 2–3 on two dates, December 1996 (Holt 1997), at Salim Ali Sanctuary, several in the winter months, 1990s (P. Willoughby *in litt.* 1999); **Ciba Geigy Factory Reserve**, winter months, 1990s (P. Willoughby *in litt.* 1999);

■ **Karnataka Nalwar**, undated (Davidson and Wenden 1878), although this record was considered “doubtful” by E. A. Butler (1881) given the lack of specimens or other records from the region; **Dharwad district**, one, January 1994 (Uttangi 1994a); **Londa**, two, February 1938 (Koelz 1942); **Nagarhole National Park**, listed (Anon. 1987), including in the Kabini lodge area, several sightings, undated (Andheria *in press*), and at Bisalvadi waterhole, one, 1998 (Andheria *in press*);

■ **Andhra Pradesh** fewer than five sightings, unspecified localities, undated (Taher and Pittie 1989);

■ **Kerala** immediately east of **Chalakuudi** (Chalakyudi), one, February 1944 (Stonor 1946); **Periyar Sanctuary**, reported to breed (A. R. Rahmani *in litt.* 1999); southern Travancore, thus probably in the region of **Trivandrum**, undated (Ferguson and Bourdillon 1903–1904);

■ **Tamil Nadu Madras** (Chennai), pre-1846 (specimen in BMNH); **Anaimalai hills**, Kuriarkutti, 550 m, a pair, November 1933 (Ali and Whistler 1935–1937), and at Karian Shola, seen twice, January 1988 (V. J. Rajan *in litt.* 1988);

■ **Bihar Narhar**, a pair, November 1898 (Inglis 1901–1904, Dalgleish 1902); “Tirhut”, presumably at **Darbhanga**, June 1902 (female in AMNH, Inglis 1901–1904), and at Darbhanga, September 1903 (male in AMNH, Inglis 1901–1904); Hardhar taal, **Purnea**, two, March 1998 (S. Javed *in litt.* 1999); Gogabil, 33 km south-east of Katihar in **Manihari** block, 1994, and also a group of 15 at Bagharbil, 29 km south-east of Katihar, 1998 (A. Mishra *in litt.* 2000); **Bhagalpur** (diara), two, 1995, one at two sites, February 1998, one in 1999, and two in January 2001 (A. Mishra *in litt.* 2000, 2001); in and around Udhuwa Sanctuary, 11 km south-east of

Rajmahal, singles at Pataura in 1994 and 1995, at Berhale in 1995 and 1996, and two at Chand Shahaar in 1995 (A. Mishra *in litt.* 2000); **Lohardaga**, undated (Ball 1878);

■ **Orissa** unspecified localities, eight, January 1992 (AWC data *per* T. Mundkur *in litt.* 1998); **Sambalpur**, north of Mahanadi, undated (Ball 1878); **Bhitarkanika Wildlife Sanctuary**, listed (Kar 1991), breeding, around 20 seen, 1992–1993 (Pandav 1996); **Jaypur** (Jaipur), undated (Ball 1878);

■ **West Bengal Darjeeling**, pre-1895 (one in BMNH), March–April 1971 (Aarestrup *et al.* 1971); **Jaldapara Wildlife Sanctuary**, Torsa block, unspecified numbers, 1995 (Kumar 1998); **Jalpaiguri district**, undated (Inglis *et al.* 1920); **Durgarpur**, at the barrage, one, February 1969 (Gauntlett 1986); **Puruliya** (Manbhum), undated (Ball 1874); **Sundarbans National Park**, regularly seen and presumably breeding, undated (Scott 1989); Kahala (not mapped), 48 km from Maldah town, 14 nests in 1994, five nests in 1997 (Jha 1998);

■ **Arunachal Pradesh D'Ering Memorial Wildlife Sanctuary**, 1988–1994 (Singh 1994);

■ **Assam Dibru-Saikhowa National Park**, Tinsukia district, 1–5 regularly, 1992–1994 (Choudhury 1995b), nests with fledglings observed at Balajan, 1992 (Choudhury 1995b) and a total population of around 20 estimated for the reserve (Talukdar *et al.* 1995), December 1995 (Datta 1996), eight, March 1998 (Hornbuckle 1998a), at Dhola, 1–4, 1989–1994 (Saikia 1995); **Dum Duma**, Tinsukia district, 3–7, 1989–1994 (Saikia 1995); **Jamjing beel**, January 1990 (Choudhury 1992b); **Dibrugarh district**, Maran, 1–3, 1989–1994 (Saikia 1995), and Guijan, 2–10, 1989–1994 (Saikia 1995); **Bhimpoora bhil** (Bhimpara beel), Lakhimpur district, one male, December 1905 (Stevens 1914–1915); **Diju** (Dejoo), Lakhimpur district, one male, October 1908, and 24 flying west, November 1910 (Stevens 1914–1915); Khuddom, **North Lakhimpur**, Lakhimpur district, one, November 1904 (Stevens 1914–1915); **Panidihing Sanctuary**, Sibsagar district, four, January 1988 (Choudhury 1991), 4–19, 1989–1994 (Saikia 1995); **Nameri National Park**, at the wildlife camp, three, March 1998 (H. Hendriks *in litt.* 1999); Saraguri, **Sibsagar**, Sibsagar district, two pairs nesting, January 1988 (Choudhury 1991); **Majuli island**, Jorhat district, 18–41, 1989–1994 (Saikia 1995), at Kamalabari, 4–7 nests, 1989–1994 (Saikia 1995), at Bhokotiduar, 8–12 nests, 1989–1994 (Saikia 1995), at Benganaati, 2–4 nests, 1989–1994 (Saikia 1995), and at Bongoan, three nests, 1989–1994 (Saikia 1995); **Dikhomukh**, Sibsagar district, 5–12 with 9–11 nests, 1989–1994 (Saikia 1995); **Borjan**, Borajan Reserve Forest, Tinsukia district, at least three pairs, January 1993 (Choudhury 1995c); **Manas National Park**, Barpeta district, 1987 (Rahmani *et al.* 1988), 10–18 with 7–11 nests, 1989–1994 (Saikia 1995); **Rowta**, Darrang district, 1–3, 1989–1994 (Saikia 1995); **Tezpur**, Sonitpur district, 2–4, 1989–1994 (Saikia 1995); **Bokaghat**, Golaghat district, 1–3, 1991–1993 (Saikia 1995); **Orang National Park**, Darrang district, 17–28 with 25–40 nests, 1989–1994 (Saikia 1995); **Kaziranga National Park**, c.80, January 1971 (Inskipp *et al.* 1971), 59, 1991 (Saikia 1995), c.50 daily, February 1994 (Alström *et al.* 1994c), up to 10 daily, March 1996 (K. Kazmierczak *in litt.* 1998), between 17 and 40 nests at Burapahar, Bagori, Kohara and Agorotoli, 1993–1995 (Saikia 1995, Bhattacharjee *et al.* 1996); **Laokhowa** (Lowkhowa) **Wildlife Sanctuary**, Nagaon district, 36 active nests, November 1967 (Kahl 1971), 17–49 with 12–17 nests, 1989–1994 (Saikia 1995); **Rangia**, Kamrup district, 18–24, 1989–1994 (Saikia 1995); **Nalbari**, Nalbari district, 6–9, 1989–1994 (Saikia 1995); **Chakrashila Wildlife Sanctuary**, Dhubri district, unspecified numbers, June 1996 (Datta 1997), December 1997–November 1998 (*Oriental Bird Club Bull.* 32: 11); **Sareswar bheel**, Dhubri district, regular in winter, undated (Scott 1989), 2–8, 1989–1994 (Saikia 1995); **Barpeta**, Barpeta district, one, April 1980 (Halberg and Petersen 1984); **Tipkai**, Dhubri district, 1–2, 1989–1994, with one nest in 1992 (Saikia 1995); **Jengdia beel**, Kamrup district, 18–31, 1989–1994 (Saikia 1995); **Salkocha**, Dhubri district, 2–10, 1989–1992 (Saikia 1995); **Hajo** (Gorjan beel area), Kamrup district, 5–11 with 1–4 nests, 1989–1994 (Saikia 1995); **Bilasipara**, Dhubri district, 3–17, 1989–1994 (Saikia 1995), and at Florican park, seven, 1992 (Saikia 1995); **Raha**, Nalbari district, 3–10, 1989–1991 (Saikia 1995); **Agamani**, Dhubri district, 2–3, 1989–1993 (Saikia 1995);

Gauhati, Kamrup district, five, April 1999 (B. Carrick *in litt.* 1999), at North Gauhati, 6–10 with 67 nests, 1989–1994 (Saikia 1995) and at Jalukbari (university campus), 4–12, 1989–1994 (Barman 1994, Saikia 1995); **Pobitora Wildlife Sanctuary**, Nalbari district, 13–28 with 5–9 nests, 1989–1994 (Saikia 1995), 10, February 1998 (Hornbuckle 1998a); **Deeppor (Deepar) beel**, Kamrup district, present in winter, 24, January 1987 (Saikia and Bhattacharjee 1989c), four to six, 1988–1990, 17, 1990–1991, five, 1991–1992, 11, 1992–1993 (Barman *et al.* 1995), c.15, February 1994 (Alström *et al.* 1994c), 5–17, 1989–1994 (Saikia 1995); **Palasbari**, Kamrup district, January–February 1952 (two females in UMMZ), 11–14, 1989–1994 (Saikia 1995); **Gauripur**, Dhubri district, up to 20 with up to three nests, 1989–1994 (Saikia 1995); **Silai beel**, Dhubri district, one, 1989–1992 (Saikia 1995); **Fakirganj**, Dhubri district, two nests, 1993–1994 (Saikia 1995); **Loharghat**, Kamrup district, 4–6 with 3–7 nests, 1989–1994 (Saikia 1995); **North Cachar Hills district**, undated (Baker 1894–1901); Jellapur tea estate, **Cachar**, breeding, November and December 1893, 1918 and 1922 (BMNH egg data); between Lallamukh and Kalacherra, **Hailakandi**, Hailakandi district, undated (Inglis 1896–1902); Bordoibam-Bilmukh Sanctuary (unmapped), undated (Choudhury 2000c); Burhachapori Wildlife Sanctuary (unmapped), undated (Choudhury 2000c).

Assam has many more localities that have not been traced in this review (here arranged alphabetically by and within district), all records in this paragraph being from Saikia (1995) unless otherwise indicated: (*Barpeta district*) Bhella, 14–25 with 4–6 nests, 1989–1994, and nearby at Bishnupur, 3–5 nests, 1989–1995, Bohori, 4–8, 1989–1994, Dongorkuchi, 4–7 with 2–4 nests, 1989–1994, Gojia, 10–18 with 1–2 nests, 1989–1994, Hawly, 11–15, 1989–1994, Keotekuchi, 12–17 with 8–12 nests, 1989–1994, Khondokorpar, 1–2 nests, 1989–1994, Nagaon (Nowgong), 8–19 with 2–3 nests, 1989–1994, Pachim Hati (near Barpeta Satra), 4–8, 1989–1994, Patbaushi, 6–11 with 2–3 nests, 1989–1994, Senga, 12–15 with 2–3 nests, 1989–1994, Sundaridia, 4–6 with 3–5 nests, 1989–1994; (*Darrang district*) Batha beel, 6–11, 1989–1994, Dumuni creek, 6–10, 1989–1994, Hazarika para, 2–3, 1989–1994, Mongholdoi, 26 nests, 1994, Sipajhar, 7–11, 1989–1994, Tangla, 4–6, 1989–1994; (*Dhubri district*) Balajan, 12–25 with 2–4 nests, 1989–1994, Dahar beel, 2–3, 1989–1994, Dhir beel, 1–16, 1990–1994, Diplai beel, 3–9, 1989–1994, Godadahr river, three, 1992, Pukhuriparia, 7–12 with 4–7 nests, 1989–1994, Saukapar, eight, 1992, Udmari, 2–4 nests, 1989–1994; (*Golaghat district*) Dhansiri pathar, 2–4, 1990–1994, Gelabeel, 1–3, 1989–1992, Kamargoan, 2–7, 1989–1994, Methoni, 1–7, 1991–1993, Morongi, 2–4, 1990–1991, Numaligarh pathar, 1–3, 1989–1994; (*Jorhat district*) Dergoan, 8–21, 1991–1992, Janjhimukh, 6–24, 1989–1994, Rongdoi, 4–8 nests, 1989–1994, Teok Mahara, 2–5, 1991–1999 (Saikia 1995, *in litt.* 1999); (*Kamrup district*) Alikash, 2–4 nests, 1989–1994, Alikash-Singimari, 7–9, 1989–1994, Bhatapara, 13, 1991, Bhaihata Chariali, up to three nests, 1989–1994, Bherbheri beel, 11–17, 1989–1992, Bijoynagar, 13–27, 1991–1992, Bortola, 15–18, 1989–1994, and 11–15 nests, 1989–1994, Chandubi, one, 1994, Chaygoan, 2–20, 1989–1994, Dadara, 1–3 nests, 1991–1994, Gerua, 11–15, 1989–1994, Guimara, 5–8 with 5–7 nests, 1989–1994, Koniha, 9–17, 1989–1994, Kurua, 2–3, 1989–1993, Puthimari, 1–2 nests, 1989–1994, Ramdia, 2–3, 1989–1994, Sessamukh, 11–30, 1989–1994, Singimari, 3–5 nests, 1989–1994, Sualkuchi, 8–11, 1989–1994, Tihu, 3–9, 1989–1994; (*Nagaon district*) Bamunbari, 11–17 with up to 17 nests, 1989–1994, Baropujia, 9–17 nests, 1989–1994, Bebejia, 6–10, 1989–1994, Deura beel, 10–20, 1990–1994, Dharamtul, 1–2, 1989–1994, Hatichung, 6–11 with three nests, 1990–1993, Jajori, 4–12 with 5–7 nests, 1989–1994, Kaliabar Sonarigoan, 1–27 with 2–3 nests, 1989–1994, Kaliabor, 20–24 nests, 1991–1994, Na-Hawly, 2–10, 1989–1994, Pubthoria Jaysagar Doloni, up to 25 with 2–3 nests, 1989–1994, Sibani (Kukurakata), 2–3, 1991–1994, Thekeraguri, one, 1991–1993; (*Nalbari district*) Adabari, 9–12, 1989–1994, Barnadi, 11–15 with 4–7 nests, 1989–1994, Bhalukmari, 16, 1992, Bhogra Dhuligoan, 11, 1992, Borbhojia, 4–11, 1989–1994, Daulasala, 7–8 with 2–3 nests, 1989–1994, Dondua Tiniali, eight, 1991–1992, Fakir Salkata, 4–7 with 2–3 nests, 1991–1993, Jagi road, four or five regularly at the quarry, February–May, around 1946 (Betts 1947), 3–4, 1989–

1991, and three at Jagi Bhakatgoan, 1992, Jalukguti, 3–4 nests, 1989–1994, Jaysagar Pathar, 9–25 with 7–11 nests, 1989–1994, Mukalmua, 3–10 with 2–5 nests, 1989–1994, Morigaon, 1–3 nests and up to seven individuals, 1989–1994, Pathsala, 8–13, 1989–1994, Sarthebari, 12–18, 1989–1994; (*Sibsagar district*) Bhotiapar, 5–6 nests, 1992–1994, Choraguri chapori, 5–8 nests, 1989–1994, Charing, 1–3, 1989–1994, Dimow, 1–3, 1989–1994, Janji Moran Goan, 1–7, 1989–1994, Joysagar, Jerenga pathar, 1–4, 1989–1994, Pahubar, 1–4, 1989–1994, Rajmai, 2–14 with 2–4 nests, 1989–1994; (*Sonitpur district*) Bihaguri, 3–11 with 1–3 nests, 1989–1994, Bishwanath Chariali, 5–7 with 3–5 nests, 1989–1994; (*Tinsukia district*) Hakhhati Reserve Forest, 7–14 with 6–7 nests, 1989–1994, Madhabpur Tiniali, one, 1991–1994. Unknown districts are Bamanigaon, December 1949 (one in UMMZ); Marsala, four, February 1995 (J.-C. Kovacs *in litt.* 1998).

■ **NEPAL** This stork is a resident (and winter visitor) to lowland Nepal, particularly in the terai. It is noted at the periphery of Royal Chitwan National Park, especially on the Dhungre, Rapti, Reu, Khageri, Budhi Rapti and Narayani rivers where it breeds in some numbers, and around lakes such as Lami, Tamar and Bees Hazari Tal. Records are from: **Kanchanpur district**, 13, 1990–1992 (Suwal and Shrestha 1992a); **Royal Sukla Phanta Wildlife Reserve**, recorded occasionally in 1980 (Schaaf *et al.* 1980), with six fully fledged immatures seen on nest trees to the south of the reserve, January 1997 (*Danphe* 6, 1: 2–3), and two observed in March 1997 (Giri 1997); south of **Dhangarhi**, Mohana river, undated (Weaver 1991); **Royal Bardia National Park**, no other details (Bolton 1976b, Dinerstein 1979), one, May 1982 (Inskipp and Inskipp 1982), occasional (T. R. Giri verbally 1996, S. Basnet verbally 1996); **Nepalgunj**, February 1983 (van Riessen 1989); near **Butwal**, a pair, March 1959 (Fleming 1959), six, 1990–1992 (Suwal and Shrestha 1992a), 18, January 1993 (Nielsen 1993), one, March 1994 (Zerning and Braasch 1995), pair, March 1959 (Fleming 1959); **Kapilvastu district**, two, 1990–1992 (Suwal and Shrestha 1992a); **Nawalparasi district**, three, 1990–1992 (Suwal and Shrestha 1992a); 2 km north of **Taulihawa**, January 1978 (Cox 1982); **Tikoli** (Thikoli), nine, November 1996 (J.-C. Kovacs *in litt.* 1998); **Bees Hazari Tal** (Bissahar lake, “Biss Zar lake”), undated (Zerning and Braasch 1995), common resident (Baral 1996a), five, February 1988 (J.-C. Kovacs *in litt.* 1998), four, April 1994 (J. Day *in litt.* 1999); **Royal Chitwan National Park**, resident in the park and regularly encountered at Charara, Kasara, Chitwan Jungle Lodge, Sauraha, Meghauli, Gaida Wildlife Camp, Tiger Tops and along the Rapti river, with records including several in November 1975 (Byrne and Harris 1975), six, December 1977 (Leece 1977), one, April 1980 (Inskipp and Inskipp 1980), three, February 1981 (Hall 1981), 1–2, March–April 1982 (Turton and Speight 1982, Inskipp and Inskipp 1982, Nilsson 1982, Robson 1982), up to four daily, December 1984 (Andersen *et al.* 1986), two, March 1986 (J.-C. Kovacs *in litt.* 1998), up to nine, February 1987, and seven on nests, February 1988 (Bräunlich 1987, Sorenson 1988, J.-C. Kovacs *in litt.* 1998), two, January 1989 (Cooper and Cooper 1989), seven nests, November 1989 (Gardiner 1990), two, December 1990 (H. Hendriks *in litt.* 1999), two, February–April 1994 (Cottridge 1994, Halberg 1994, B. Carrick *in litt.* 1999, J. Day *in litt.* 1999), one, October–November 1994 (P. Schiermacker-Hansen *in litt.* 1999), up to c.20, February 1995 (P. Holland *in litt.* 1999, M. Spicer *in litt.* 1999), one, April 1996 (A. Dean *in litt.* 1999), several, including six fledged immatures, January–March 1997 (Baral 1997b, P. J. Hines *in litt.* 1998, M. Narcy *in litt.* 1999) and close to the northern park boundary between Sauraha and Tadi-Bazaar, one, February 1987 (J.-C. Kovacs *in litt.* 1998), and at an unspecified locality along the Rapti river, one, November 1993 (Eaden 1993); **Tamaspur**, four, December 1979 (Fairbank 1980), one, April 1981 (Mills and Preston 1981); **Lumbini**, up to eight, April 1993 (Baral 1993b), 11, 1999 (Suwal 1999b) and elsewhere in Rupandehi district, 10, 1990–1992 (Suwal and Shrestha 1992a); near **Hetauda** (Hetaura), one, December 1970 (Inskipp *et al.* 1971); **Parsa district**, five, 1990–1992 (Suwal and Shrestha 1992a); **Ragunthanpur**, five, one collected November 1953 and another in January 1954 (Rand

and Fleming 1957); **Sarlahi district**, one, 1990–1992 (Suwal and Shrestha 1992a); between Birtamod (Birtamore) and **Ilam**, two, March 1982 (Walinder and Sandgren 1983), and west of Birtamod, flocks of up to six seen, 1980, 1988 (Martens and Eck 1995); **Mahotari district**, two, 1990–1992 (Suwal and Shrestha 1992a); near **Garuwa**, on the Mechi river, three, February 1983 (Baker 1983); **Dhanusha district**, three, 1990–1992 (Suwal and Shrestha 1992a); edge of **Dharan forests**, one, April 1992 (Bräunlich and Oehlschlaeger 1993); Lahan, **Siraha district**, six fledged immatures, January 1997 (Baral 1997b) and in all of Siraha district, 27, 1990–1992 (Suwal and Shrestha 1992a); **Sunsari** (Sunischare), seven with four nests (Madge *et al.* 1974), January 1985 (Calladine 1985); **Sukhani**–Sunsari, April 1986 (Heath 1986) and Sukhani–Birtamore, five, March 1981 (Inskipp and Inskipp 1981a); east of and at **Janakpur**, 1976–1978 (Hall 1978); between Kosi and **Itahari**, two, April 1981 (Mills and Preston 1981), several, 1982 or 1983 (Suter 1983) and between Inaruwa and Itahari, February 1988 (J.-C. Kovacs *in litt.* 1998) and along the Lauki–Itahari road, 1976 (Dahmer 1976); **Mai valley**, undated (Halliday and McKnight 1990); **Morang district**, seven, 1990–1992 (Suwal and Shrestha 1992); **Sunsari** (Sunischare) **district**, 41, 1990–1992 (Suwal and Shrestha 1992a); **Kosi Tappu Wildlife Reserve**, one, May 1982 (Inskipp and Inskipp 1982), more than 10, February 1988 (Kovacs 1988), “several,” February 1990 (Buckton and Morris 1990), seven, December 1992 (Nielsen 1993), 15, February 1994 (B. Carrick *in litt.* 1999), one, February 1995 (P. Holland *in litt.* 1999); **Kosi barrage**, two, May 1979 (Lister 1979), 13, December 1979 (Fairbank 1980), up to 20, January–April 1981 (Hall 1981, Henriksen *et al.* 1981, Inskipp and Inskipp 1981a, Mills and Preston 1981, del Nevo and Ewins 1981, Porter *et al.* 1981), up to 10, March–May 1982 (Fairbank 1982, Robson 1982, Turton and Speight 1982, Baker 1983), five, February 1983 (Baker 1983), seven, December 1984 (Andersen *et al.* 1986), four, March 1987 (Turin *et al.* 1987), more than 10, February 1988 (Kovacs 1988), four, January 1993 (Nielsen 1993), and between Kosi barrage and Kosi Tappu Wildlife Reserve, undated (Zerning and Braasch 1995), more than 10, December 1991, and 12, January 1992 (H. S. Baral *in litt.* 1997), six, February 1993 (Turin *et al.* 1987), one, February 1993 (Fourage 1993), small numbers, February 1994 (Cottridge 1994), up to 15, 1990s (Wheeldon 1995); **Rupnagar**, occupied nest, February 1988 (Kovacs 1988); **Jhapa district**, 28, 1991 (Suwal and Shrestha 1992a); **Biratnagar**, two, February 1981 (Bowden 1979), June 1991–June 1994 (Subba 1994) and east of Biratnagar (Ratnanagar), two, February 1974 (Madge *et al.* 1974); Col Bazar (untraced), one, February 1988 (J.-C. Kovacs *in litt.* 1998); Gagan (untraced), February 1988 (J.-C. Kovacs *in litt.* 1998); Tahara (untraced unless Tarahara in Sunsari district: H. S. Baral *in litt.* 2001), six active nests, December 1982 or January 1983 (Suter 1983).

■ **BANGLADESH** The species has been recorded from Sylhet, the Chittagong Hill Tracts, Dhaka, Faridpur, Noakhali and the Sundarbans (Khulna) (Baker 1922–1930, Khan 1987) and Rashid (1967) listed it as a resident throughout the country (but see Remarks 2 under Manipur Bush-quail *Perdícula manipurensis*). It is now scarce and largely confined to the north-west and the Sundarbans. Specific records are as follows: **Meda beel**, undated (Scott 1989); **Hakaluki haor**, regular in winter, 1980s (Scott 1989); **Sylhet**, one colony from 1885 until at least 1929 (Baker 1922–1930); **Chalan beel**, occasionally (Scott 1989); **Pabna district**, one, May 1970 (Husain and Sarker 1971); **Dhaka** (Dacca), occasional visitor, c.1850 (Tytler 1854), “few” resident, undated (Husain *et al.* 1974); **Kaptai** (Karnafuli), one, November 1966 (Mountfort and Poore 1968); **Nilkamal** “Sanctuary”, May 1982 (Husain *et al.* 1983); **Sundarbans**, at Burigoalni, April 1958 (specimen in YPM), one, west Sundarbans, November 1967 (Mountfort and Poore 1968), “fairly common”, undated (Z. Hussain 1993), with “up to 25 seen on all visits to outer edge of the Sundarbans in recent years” (P. M. Thompson *in litt.* 1999); **Sonadia island** and Char Raman (untraced), unspecified numbers, November 1981 (Khan and Rahman 1982); **Teknaf peninsula**, uncommon resident, undated (Rashid and Khan 1987).

■ **SRI LANKA** The species is found in marshes and irrigation tanks (= water storage ponds) in the low-lying dry zone of the north, east and south-east. Records are as follows: **Jaffna peninsula**, one, August 1990 (*Ceylon Bird Club News* August 1990); near **Kilinochchi**, one, May 1993 (*Ceylon Bird Club News* May 1993); **Arivu Aru**, a small river entering the sea at Mannar, where the species often occurred and a stork egg (possibly a Lesser Adjutant's) was found deposited on the dried-up bed of the river, February, year unspecified (Parker 1881); **Tiriyai** (Tiriyei, Tirrai), undated (Legge 1880); **Arippu** (Aripu), undated (Legge 1880); **Trincomalee district**, undated (Legge 1880); **Wilapattu National Park**, undated (Kotagama *et al.* 1989), and "quite a few" in March 1987 (*Ceylon Bird Club News* March 1987); **Toppur** (Topoor) tank, undated (Legge 1880); **Anuradhapura**, 1992–1995 (U. Fernando *in litt.* 1997); **Somawathiya National Park**, six, May 1989 (*Ceylon Bird Club News* May 1989); Mahaweli Ganga flood plain system, here presumed to be in or near **Mahaweli Ganga Forest Reserve**, undated (Kotagama *et al.* 1989); **Nachchaduwa tank**, 1992–1995 (U. Fernando *in litt.* 1997); **Polonnaruwa**, 10, May 1992 (*Ceylon Bird Club News* May 1992); **Manampitiya**, one, undated (*Ceylon Bird Club News* December 1985); **Bendiya Villu**, 1992–1995 (U. Fernando *in litt.* 1997); **Handapan Villu**, 1992–1995 (U. Fernando *in litt.* 1997); **Wasgomuwa National Park**, one, March 1992, two, December 1992, one, May 1997, six, July 1997, 3–5, December 1998 (*Ceylon Bird Club News* March 1992, December 1992, May–June 1997, July–August 1997, December 1998); **Aralaganwila**, January 1998 (*Ceylon Bird Club News* January 1998); **Maduru Oya National Park**, breeding, undated (Kotagama *et al.* 1989), several, January 1986, several, March 1986, one, April 1988 (*Ceylon Bird Club News* January 1986, March 1986, April 1988), three in 1990, 202 (this total seems inordinately high and is possibly in error: S. W. Kotagama *in litt.* 2001) in 1991, and three in 1993 (AWC data *per* T. Mundkur *in litt.* 1998); **Gal Oya National Park**, three, July 1998 (*Ceylon Bird Club News* July 1998); Lahugala tank and Kitulana tank, in **Lahugala Kitulana Sanctuary**, undated (Kotagama *et al.* 1989); between **Pottuvil** and Kumna, April 1929 (Brown 1930); **Handapanagala**, two, May 1992, one, March 1998 (*Ceylon Bird Club News* May 1992, March 1998); Kumana lagoon, now in **Kumana Sanctuary**, before 1931 (Wait 1931); **Udawalawe**, one, April 1989, July 1991, September 1995, April 1998, two, November 1998 (*Ceylon Bird Club News* April 1989, July 1991, September 1995, April 1998, November 1998); **Tambalagama** (Tamblegam), before 1880 (Legge 1880); **Ruhuna (Yala) National Park**, undated (Phillips 1978), one, February 1986, two, in July 1986, and many subsequent records of up to 28 (*Ceylon Bird Club News* February 1986, July 1986, August 1986, December 1986, April 1987, June 1987, July 1987, February 1990, September 1990, April 1991, July 1991, August 1991, October 1991, November 1991, June 1992), and a report of 25–60 regularly at Katagamuwa tank throughout the year (I. Raheem *in litt.* 2001); **Jamburagala**, July 1995 (*Ceylon Bird Club News* July 1995); **Mahasilawe Wewa** (Mahaseelawa Wewa) heronry, two, July 1991 (*Ceylon Bird Club News* July 1991); **Bundala Lewaya**, two, December 1985, two, September 1986, five, December 1986 (*Ceylon Bird Club News* December 1985, September 1986, December 1986), three, before 1989 (Kotagama *et al.* 1989), one, January 1992, 12, May 1992, July 1998 (*Ceylon Bird Club News* January 1992, May 1992, July 1998); **Embilikala Kalapuwuwa**, three, February 1990 (*Ceylon Bird Club News* February 1990), at "Bundala to Embilikala", one in December 1986 (*Ceylon Bird Club News* December 1986) and seven in March 1990 (*Ceylon Bird Club News* March 1990); Giranduru Kotte (untraced), Divulapelessa, one, June 1990, three, July 1991 (*Ceylon Bird Club News* June 1990, July 1991); Alutgana (untraced), two, July 1990 (*Ceylon Bird Club News* August 1990); Kanthale (untraced), undated (Legge 1880); Vanni (untraced), undated (Legge 1880).

■ **MYANMAR** In the nineteenth century the Lesser Adjutant ranged throughout Myanmar (Oates 1882, 1883b), but was reduced in numbers by the 1940s, occurring primarily in the plains (Smythies 1986). Breeding populations were formerly found in Pegu (=Bago), Tenasserim (=Taninthayi) (Smythies 1986) and apparently also Magwe state (NMS egg data),

although by the mid-twentieth century the species probably only bred in Tenasserim (Smythies 1986). It has declined dramatically and is now relatively infrequently recorded as a breeding species or otherwise (see Remarks 3). Records are from: Thazi, Bhamo district, one feeding in the “Hnokkyo Et”, presumably near **Hnokkyo**, March 1937 (Smith 1942); Mahananda tank, **Shwebo district**, up to five, June 1932–August 1933 (Roseveare 1949), also seen in 1982–1983 (Luthin 1987, AWC data *per* T. Mundkur *in litt.* 1998); **Sameikkon**, one, February 1995 (S. Howe *in litt.* 1999); **Magwe**, September 1905 (two clutches in NMS); **Arakan**, “common in winter” at unspecified localities along the coast and in the yoma foothills, 1943–1945 (Christison *et al.* 1946, Smythies 1986), with nine seen along a long stretch of the Arakan coast between the Mayu estuary (near Sittwe) and the Kaleindaung estuary (southern Ramree island), February 1983 (Luthin 1984, 1987); **Toungoo**, July 1875 (specimen in BMNH); **Shwegyin** (Shwaygheen) and Kadat, Pegu, “common enough” and breeding, November 1877 (Oates 1878, BMNH egg data), and one on the Sittang river near Shwegyin, August 1923 (Smith 1942); **Thaton**, common, undated (Hume and Davison 1878); between **Moulmein** and Ye, 1874 (Hume 1874b); breeding on limestone hills near Moulmein, 1870s (Hume and Davison 1878), specifically the **Needong hills**, 40 km up the Ataran river (at the junction of Zamee and Winyeo streams), January 1877, November 1878 (Bingham 1878); **Labutta**, in the Irrawaddy (=Ayeeyarwady) delta, 5–6, August 1996 (U Aye Hlaing *per* Khin Ma Ma Thwin verbally 1997); **Kyaikkami** (=Amherst), Tenasserim, March 1877 (male in BMNH, Hume and Davison 1878); **Ngawun chaung** (=Little Tenasserim river), breeding, November 1918 (BMNH egg data), apparently in several localities along the river, including c.40 nests at **Indaw** (Hopwood 1919); **Champang**, Tenasserim, December 1903 (Riley 1938); **Bankachon** (Bankasoon), Malewun, February 1875 (Hume and Davison 1878).

■ **THAILAND** The species formerly occurred throughout the central plains and south through the peninsula to Satul (Deignan 1963, Medway and Wells 1976), a range described as “peninsular, south-western and the southern parts of central Siam” (Gyldenstolpe 1920). It survives in a few small pockets, with most records probably relating to wandering individuals (from Cambodia, Laos and Myanmar) and only a few pairs continuing to breed in the far south (P. D. Round *in litt.* 1998, Wells 1999). Records are from: **Khao Yai National Park**, two flying over, January 1979 (P. D. Round *in litt.* 1998); **Klong Luang Peng**, c.50 km east of Bangkok, February 1916 (female in BMNH); **Petriu**, on the Bangpakon river east of Bangkok, one, January, unspecified year in 1933–1938 (Meyer de Schauensee 1946); **Potaram**, male, August 1926 (Riley 1938); regular in the “Inner Gulf of Thailand”, presumably around **Samut Sakhon**, including one, July 1994 (P. D. Round *in litt.* 1998) and at Ban Kalong, Samut Sakhon, one, September 1997 (*Bird Conserv. Soc. Thailand Bull.* 15, 1 [1998]: 14–15, *Oriental Bird Club Bull.* 27 [1998]: 61–66); **Khao Ang Ru Nai Wildlife Sanctuary**, Chachoengsao province, two, November 1990 (*Oriental Bird Club Bull.* 13 [1991]: 47–52); **Khao Yoi**, Phetchaburi, two, October 1983 (P. D. Round *in litt.* 1998); near **Sriracha** (Si Racha), June 1917 (male in BMNH); **Sarahet** (Sarabet), March 1921 (two specimens in AMNH); **Prachuap Khirikhan** (=Koh Lak), November 1913 (female in BMNH), November 1914 (Gyldenstolpe 1916, female in NRM); **Bangsaphan Noi**, May 1918 (male in BMNH); **Ko Pra Thong**, Phangnga province, rare breeder (probably resident), five nests reported, February 1995 (*Bird Conserv. Soc. Thailand Bull.* 12[5]: 9), presumably the “small, apparently still-active colony” mentioned by Wells (1999); **Thung Thong Wildlife Sanctuary**, 1975 (Storer 1978); **Phangnga**, three, December 1981 (E. Mølgaard *in litt.* 1998); **Khlong Phraya Wildlife Sanctuary**, Krabi province, one, December 1988 (J. W. K. Parr *in litt.* 1999); **Pak Phanang** estuary, a few still present in late 1980s, breeding status uncertain (Scott 1989); **Ban Tha Maphrao**, Khlong Thom district, Krabi, one, 1993–1995 (Y. Meekao verbally 1995); **Ko Nakha Yai** (Ko Naka Yai), one, February 1918 (Robinson and Kloss 1918b); **Phuket**, undated (Robinson and Chasen 1936); **Thale Song Hong** (Lay Song Hong), interior of Trang, one, January 1910 (Robinson

and Kloss 1910–1911; also Morioka and Yang 1996), initially reported as Greater Adjutant but later re-identified as this species (Robinson and Kloss 1918b), and elsewhere in Trang province at Prahmon (untraced), April 1896 (Riley 1938), and at an unspecified locality, April 1916 (female in AMNH); **Thale Noi** Non-Hunting Area, probable former breeder, one, October 1975 (Storer 1977), two in March 1979, three roosted, March 1979, five, May 1980 (TISTR 1991), two in June 1979, nine in July 1979, five in May 1980 (Bubphar Amget verbally 1980), but none since (Round *et al.* 1988); **Bo Muang** (Bor Muang), Krabi, one, January 1981 (G. Hunchon verbally 1981); **Mu Ko Lanta National Park**, Ban Tha Maphrao and Ko Mai Ngaam-Bor Muang, Krabi, 2–4 present in 1994 (P. D. Round *in litt.* 1998), with fishermen reporting two present in June 1995 (*Bird Conserv. Soc. Thailand Bull.* 12[8]: 14–15, *Oriental Bird Club Bull.* 22 [1995]: 57–62); **Palian**-Langu, one, February 1986 (Scott 1989); 15 km north of **Satul**, one, October 1973 (Holmes 1973); **Chalerm Prakiat Wildlife Sanctuary** (Pa Phru, Phru Toh Daeng), Narathiwat, three, September 1987 (*Oriental Bird Club Bull.* 7 [1988]: 34–40), rare breeder, 1994–1997, with a group of four breeding pairs, March–April 1995 (*Oriental Bird Club Bull.* 22 [1995]: 57–62, Wells 1999), but apparently not subsequently (S. Thongaree *per* P. D. Round *in litt.* 1998).

■ **LAOS** Although Delacour and Jabouille (1940) mentioned that this species occurred throughout the country, there are no primary records traceable from the north (Duckworth *et al.* 1999). However, reference to flocks of “marabouts” along the Mekong between Pakxan and Vientiane (Bassene 1912) quite possibly involved this species. Records are from: between **Savannakhet** and Ban Sompoy, one for several weeks in the mid-1940s, the only one seen in two years (David-Beaulieu 1949–1950); Dong Hua Sao NBCA, Champasak province, 1–2 at **Nong Hou**, February 1996, also one at Nong Leenphom (4 km south of Nong Hou), February 1996 (Thewlis *et al.* 1998); **Xe Pian NBCA**, Chamapasak and Attapu provinces, recorded throughout the more open areas, January–March 1993, with almost daily sightings of up to five together on the Xe Kong plains, March 1993, one, May 1995 (Thewlis *et al.* 1998), and Ban Sompoy, Xe Pian NBCA, and two nests, February 1998 (Duckworth *et al.* 1999); **Dong Khanthung proposed NBCA** (see Remarks 4), Champasak province, two singles near Ban Khiam, May 1996, 42 at 10 locations (groups of 1–8), August 1996, c.20, February–March 1998, c.54, July 1998 (Round 1998, Thewlis *et al.* 1998; see Remarks 3); Nong Karj (label illegible, possibly Nong Kang) (untraced), camp 28, collected, February 1920 (male in BMNH).

■ **CAMBODIA** The species is “clearly still widely distributed” in the country (Timmins and Soriyun 1998, C. M. Poole *in litt.* 1999). Records are from: Tonle Kong (=Se Kong, Kong river), 40–80 km north-east of Stung Treng town, and thus in the region of **Siem Pang**, “uncommon” (Sun Hean *in litt.* 1997), April 1994 (Mundkur *et al.* 1995a); **Ta Veng**, one each at Trapeang Yanghoiee, Trapeang Toecrak and Trapeang Benun, May 1998 (Timmins and Soriyun 1998); **Ang Trapeang Thmor Reserve**, Banteay Meanchay, at least three, December 1998 (F. Goes verbally 1999), and 100 reported, June 1999 (C. M. Poole *in litt.* 1999); **Tonle San** (=Se San, San river), Stung Treng, two, February 1999 (C. M. Poole *in litt.* 1999), and 25, February 2000 (Goes 2000b); **Phumi Sre Kor** (Sre Khor), Stung Treng, at least six in the Trapeang Kuen-Laca area, May 1998, and one at Trapeang Laca (minor), June 1998 (Timmins and Soriyun 1998), one, February 1999 (C. M. Poole *in litt.* 1999); **Kom Mum**, one each at Viel Unchang, Trapeang Lunghatcraow and Trapeang Vielveng, June 1998 (Timmins and Soriyun 1998); **Lomphat**, one each at Viel Daybuy, Trapeang Daycrohom and Trapeang Chuck, May–June 1998 (Timmins and Soriyun 1998); Phum Thmei, **Siem Reap**, two fledglings, March 1999 (F. Goes verbally 1999); **Prek Da**, one, April 1994 (Mundkur *et al.* 1995a), c.100, March 1996, with other groups nearby (Parr *et al.* 1996), 37, May 1998 (Goes *et al.* 1998b), 16 at “Prek Da South” colony, June 1998 (Goes *et al.* 1998b), March 1999 (F. Goes verbally 1999); **Prek Toal**, c.140 pairs in area, c.1996 (Parr *et al.* 1996, Sun Hean *in litt.* 1997), 40, March–April 1997 (Ear-Dupuy *et al.* 1998), 38, January 1999 (F. Goes verbally 1999); **Stoeng Sangke**, Battambang

province, four, December 1997, three, June 1998 (F. Goes verbally 1998); **Prek Preah Dam Chheu**, c.100, March 1996 (Parr *et al.* 1996); **Kompong Chikreng** (Chikreng) district, Siem Reap, 14, April 1994 (Mundkur *et al.* 1995a), “uncommon” (Sun Hean *in litt.* 1997); eastern **Kaoh Nhek** district, Mondulkiri province, several, June 2000 (R. J. Timmins *in litt.* 2000); **Sotr Nikam district**, four, April 1994 (Mundkur *et al.* 1995a); **Tonle Sap lake**, where 3–4 waterbird colonies containing unspecified numbers of this species were recorded in 1992 and 1994 (Archibald 1992, Mundkur *et al.* 1995a), a single individual was seen at the southern end, June 1993 (Carr 1993), 11 were counted in December 1992 (Scott 1992), and 10 in April 1994 (Mundkur *et al.* 1995a); between **Stung Chikreng** and Moat Khla, Siem Reap, eight, March 1999 (F. Goes verbally 1999), and 17 on the Stung Chikreng, February 2000 (*Cambodia Bird News* 4 [2000]: 34–38); **Moat Khla**, a large waterbird colony 50 km south-east of Siem Reap town, “rare” (Sun Hean *in litt.* 1997); **Prek Kal**, three in company with Greater Adjutant (several unidentified stork nests observed), April 1994 (Mundkur *et al.* 1995a); Keo Sema district, **Mondolkiri**, one, April 1994 (Mundkur *et al.* 1995a); **Boeng Chhma**, Kompong Thom province, 23, April 1994 (Mundkur *et al.* 1995a), two seen just east of the mouth of the Stung Stoung, February 1996 (Parr *et al.* 1996); **Kampong Svay district**, one, April 1994 (Mundkur *et al.* 1995a); near **Kandieng district**, Pursat, two, April 1994 (Mundkur *et al.* 1995a); Veal Anh Chan, in or near **Baray district**, 87 amongst large numbers of other waterbirds, May 1999 (Veasna 1999); **Stung Chinit**, c.15 km south-east of Kompong Thom, one, August 1997 (W. J. M. Verheugt *in litt.* 1998); at Chhnuk Tru, one, June 1993 (Carr 1993), this being close to **Kampong Chhnang**, where the species was reported in March 1998 (F. Goes verbally 1999); **Tonle Sap river**, between Phnom Penh and Tonle Sap lake, one, December 1992 (Scott 1992); **Koh Kong**, two, April 1994 (Mundkur *et al.* 1995a) and Tnal Krabei, Prek Kaoh Pao estuary, 5 km south of Koh Kong town, “some”, April 1944 (Engelbach 1952); **Pich Nil**, Koh Kong province, one, March 1999 (*Cambodia Bird News* 3: 39–43); **Bassac marshes**, one, December 1992 (Scott 1992); **Veal Renh**, two, October 1998, five, January 1999 (F. Goes and C. M. Poole *in litt.* 1999); **Stoeng Kampong Smach**, 10, April 1994 (Mundkur *et al.* 1995a), up to eight, December 1997 (Goes *et al.* 1998b); **Prey Nup district**, Sihanoukville (= Kompong Som), four, April 1994 (Mundkur *et al.* 1995a), one, December 1997, two, October 1998 (F. Goes verbally 1999); **Bokor National Park**, two, April 1998 (Goes *et al.* 1998a) and three on the north-western boundary, December 1999 (*Cambodia Bird News* 4 [2000]: 34–38); **Ream National Park**, Kompong Saom, “uncommon” (Sun Hean *in litt.* 1997), 1–2, December 1997, March 1998 (Goes *et al.* 1998a), 1–6, October 1998–April 1999 (C. M. Poole *in litt.* 1999).

Untraced localities are: Boeng Aveng, 28, June 1998 (Goes *et al.* 1998b); and Mittapheap district, Sihanoukville (=Kompong Som), two, April 1994 (Mundkur *et al.* 1995a).

■ **VIETNAM** A small population of this species survives in southern regions (see Remarks 5), and there is a single historical record from northern Vietnam. Records are from: **Chieng Chang**, Lai Chau, one, April 1929 (Bangs and van Tyne 1931); **Hue**, Thua Thien Hue, early 1920s (Delacour *et al.* 1927); **Pleiku**, Gia Lai, once between 1933 and 1936 (David-Beaulieu 1939); **Chu M'lang**, Ea Sup district, Dac Lac, one, June 1997 (Le Xuan Canh *et al.* 1997), one, 1998 (Brickle *et al.* 1998); **Ya Lop** area, Dac Lac, two singles and a group of three, June 1997 (Le Xuan Canh *et al.* 1997); **Ea H'Leo river**, Dac Lac, three singles, February 1998 (Brickle *et al.* 1998); border guard station 2, **Ea Sup district**, Dac Lac, at least 10, February 1998 (Brickle *et al.* 1998); **Yok Don National Park**, Dac Lac, April 1989 (Laurie *et al.* 1989), scattered records (every third day in the field) from the western part of park, May–June 1997 (Le Xuan Canh *et al.* 1997); **Hon Quan**, Binh Phuoc, uncommon, 1929–1931 (David-Beaulieu 1932); **Cat Tien National Park**, regular in recent years and thought to breed (Morris 1988, Scott 1989, Eames *et al.* 1992), up to eight at Bau Sau (Crocodile) lake, December 1989 (Robson *et al.* 1991), 16–19, early 1991 (Robson *et al.* 1993), six, January 1999 (Nguyen Tran Vy *et al.* 1999); **An Binh**, Binh Phuoc, recorded (Delacour *et al.* 1928); **Tram Chim**

Nature Reserve, Dong Thap, 10, January 1988 (Archibald 1988), three, March 1988 (Scott 1988), between 1989 and 1993 (Anon. 1993c), listed for the site by Le Dien Duc (1989) and Eames *et al.* (1992); **An Bien**, Kien Giang, 1992 (Le Trong Trai *in litt.* 1997); **U Minh Thuong Nature Reserve**, Kien Giang, up to six, February and June 1997, but apparently “continuously present” and locally reported to breed (*Oriental Bird Club Bull.* 26 [1997]: 60–66, Safford *et al.* 1998), 2–3, April 1999 and one, August 1999 (S. T. Buckton verbally 2000); **U Minh Ha** (including Vo Doi Nature Reserve), Ca Mau, listed without details (Le Dien Duc 1989), one, February 1997 (*Oriental Bird Club Bull.* 26 [1997]: 60–66).

MALAYSIA The species occurs widely but sparsely, being more specifically coastal in the peninsula.

■ **Peninsular Malaysia** The species is essentially distributed in coastal areas of mangrove and mudflat, with the highest concentrations currently being found in the Matang Mangrove Forest Reserve, Perak, and between Pekan and Nenasi, Pahang (W. M. Choy *in litt.* 1998). Records are from: **Pasir Mas**, 30 km up the Kelantan river, one, 1968 (Wells 1999); **Kuala Besut**, Terengganu coast, one, April 1968, (Medway and Wells 1970); **Kulai**, Johor (c.29 km inland), one, August 1969 (Wells 1972, Medway and Wells 1976); **Ulu Dedap**, Perak, three, April 1998 (*Suara Enggang* September–October 1998); **Kuala Muda** (Mudu), one, October 1988 (K. Kumar *in litt.* 1997), two, February 1989 (A. C. Sebastian *in litt.* 1999); **mainland Penang** (= Province Wellesley), undated (Robinson and Chasen 1936, specimen in BMNH), “not uncommon” according to Rickett (ms a) at the mouths of rivers in mainland Penang, 1884–1887; **Penang**, undated (Medway and Wells 1976); **Juru river**, mainland Penang, “quite a number”, July, 1884–1887 (Rickett ms a); **Parit Buntar**, Perak, present in ricefields, undated (Glenister 1951); **Kuala Kurau**, Perak, one, March 1991 (W. M. Choy *in litt.* 1998); **Sangga Kecil Island Forest Reserve** (Pulau Sangga Kecil), Perak, at least five nests, February 1986 (Wells 1990c); **Telok Kertang Forest Reserve**, Matang, Ulu Sepetang, Taiping, three, March 1998 (*Suara Enggang* January–February 1999); **Kuala Sepetang**, Perak, one present on coastal mudflats, November 1989 (W. M. Choy *in litt.* 1998); **Kemanan–Dungan**, Terengganu coast, one, July 1968 (Medway and Wells 1970); **Pulau Terong**, Perak coast, unsuccessful nest, January–February 1986 (Wells 1990c); **Matang Mangrove Forest Reserve**, Perak, at Kuala Larut, 1870s (Kelham 1881–1882), two small colonies found south of Pulau Kelumpang, January–February 1986 (Hawkins and Silvius 1986), and with many recent records, mostly around Kuala Gula Sanctuary, including 1986 (Harrap 1986a, H. Hendriks *in litt.* 1999), four, March 1989 (*Enggang* 2, 4 [1989]), up to eight, March 1991 (K. Kumar *in litt.* 1997, W. M. Choy *in litt.* 1998), two, September 1993 (D. Rogers *in litt.* 1999), 37 along coast, February 1995 (K. Kumar *in litt.* 1997, I. Lewis *in litt.* 1999), 15 in six groups, October 1995 (L. Macauley *in litt.* 1999), 29, September 1996 (*Enggang* October 1996), December 1997 (*Suara Enggang* January–February 1998), 20, January 1999 (*Suara Enggang* January–February 1999); Krian ricefields, northern Perak, between Simpang Ampat and **Bagan Serai**, regular, 1950–1955 (Madoc ms, Glenister 1951), and north of Sungai Kurau, from coastal mangroves in the west to Krian in the east, undated (Medway and Wells 1976), still present (W. M. Choy *in litt.* 1998); **Telok Intan swamp forest**, until the 1980s (DWNPPM 1987); **Sungai Perak**, three nests around the estuary (Kuala Perak), 1940s (Gibson-Hill 1949b), and more recently seen at Bagan Datok, one, September 1996 (*Enggang* October 1996), and at the Sungai Perak bridge, on the Telok Inter–Setiawan road, one, March 1997 (*Suara Enggang* May–June 1997); between **Kuantan** and Pekan, Pahang, eight, July 1985 (Howes *et al.* 1986), and up to four, 1998 (*Suara Enggang* July–August 1998); **Lepar Forest Reserve** (Ulu Lepar lakes), Pahang, one, April 1992 (A. C. Sebastian *in litt.* 1999, Wells 1999); **Pekan**, one, July 1969 (Wells 1972), and nearby Pasir Panjang, Kuala Pahang, nine, April 1986 (Howes *et al.* 1986, Wells 1990c), these birds very probably stemming from the Nenasi colony (see below); **Temerloh**, on the Pahang river, regularly, 1970s (Medway and Wells 1976); “a few miles” north of

Tanjung Karang, January 1908 (Morioka and Yang 1996), and “a few miles” north of here, a small colony containing well-developed young birds in June 1935 (Madoc ms); **Genting Highlands**, Pahang, where one flew over the Pumphouse Road, 1998 or 1999 (*Suara Enggang* January–February 1999); **Kuala Selangor**, including mangrove forests to the north and south, and the nature park, many records of up to 14, some breeding, since 1981 (many observers *in litt.* 1999; also *Suara Enggang* November–December 1998); **Nenasi Forest Reserve**, at least 46 nests, September 1998 (A. C. Sebastian *in litt.* 1999); **Kapar Forest Reserve**, Selangor, undated (DWNPPM 1987); **Pulau Ketam**, Kelang islands, Selangor, 18, undated (DWNPPM 1987), seven, April 1992 (Sebastian *et al.* 1993); **Pulau Tengah**, Kelang islands, Selangor, regularly observed on mudflats to the west (Silvius *et al.* 1986, DWNPPM 1987, Bransbury 1993), 5–8, January 1990 (*Enggang* 3, 1 [1990]); over Trusan Bagan, in the middle of **Pulau Lumut**, Kelang islands, November 1957, and “rather uncommon” around Port Kelang (previously Port Swettenham), but seen soaring on several occasions (Madoc ms); **Endau-Rompin Conservation Area**, and environs, including at Kuala Rompin, Pahang, one, October 1989 (*Enggang* 2, 11 [1989]); **Sungai Sarang Buaya**, Johor, 1.6 km from the river’s mouth, five nests in two trees, March 1930 (Chasen and Kloss 1931b); **Panti Forest Reserve**, Johor, three, January 1996 (*Oriental Bird Club Bull.* 25 [1997]: 61–69); **Sungai Pulai**, Muar, Johor, nine, May 1998 (*Suara Enggang* May–June 1998: 29–30); **Tanjung Tahor**, small numbers apparently breeding, March 1983, March 1986 (Hawkins and Howes 1986); **Batu Pahat river**, Johor, two, May 1998 (*Suara Enggang* May–June 1998); from **Sungai Suloh Kecil** to Kampung Minyak, three, March 1986 (Hawkins and Howes 1986); **Benut Stateland Forest**, Johor, a few during an aerial survey, September 1983, 17 along 11 km of foreshore, March 1986 (Hawkins and Howes 1986, Hawkins and Silvius 1986, Wells 1990c), and at least 42 from Sungai Benut north to Sungai Rengit, March 1997 and March 1998 (*Suara Enggang* May–June 1998: 29–30); **Pulau Kukup**, Johor, three, March 1986 (Hawkins and Howes 1986), two, March 1991, two, February 1997 (W. M. Choy *in litt.* 1998) and in the Kukup area, four, May 1998 and December 1998 (*Suara Enggang* May–June 1998 and January–February 1999); Bentong (not mapped), Pahang, March 1891 (Morioka and Yang 1996).

■ **Sabah** The species has been reported in logged forest on flat, swampy terrain more than 10 km from major waterways (Davies and Payne 1982). It is described as resident but local (Smythies 1981, Sheldon *et al.* *in press*), with records as follows: **Pulau Balambangan**, April 1977 (Wells 1977), this presumably the source of its mention in Smythies (1981) and Sheldon *et al.* (*in press*); **Kota Belud Bird Sanctuary**, and the adjacent Tempasuk Plain, Kerah river mouth, breeding probably occurring nearby, undated (Burgess 1964), latterly a seasonal visitor (Gore 1968), with one over Tempasuk Plain, August 1981 (Sheldon *et al.* *in press*), and other occasional reports (Bransbury 1993); **Mumiang**, undated (Sheldon *et al.* *in press*); **Abai**, February 1886 (male in AMNH, Sharpe and Whitehead 1889–1890); **lower Kinabatangan river**, one, December 1992 (I. Lewis *in litt.* 1999), 1994 (Heath 1994b); **Kimani bay**, previously regular in winter in the Pimping–Membakut area, and 200–300 at Kampung Brunei, January 1960 (Smythies 1981, Smythies and Davison 1999, Sheldon *et al.* *in press*); **Kulamba**, undated (Sheldon *et al.* *in press*), up to 11, May 1999 (Smythies and Davison 1999); **Gomanton caves**, undated (Sheldon *et al.* *in press*); **Kampong Bundu**, four, December 1984 (Sheldon *et al.* *in press*); **Uncle Tan’s Jungle Camp**, prior to 1992 (F. Verbelen *per* A. C. Sebastian *in litt.* 1999); **Membakut**, undated (Sheldon *et al.* *in press*); **Nukohan**, undated (Sheldon *et al.* *in press*); **Mawau**, two, December 1984, and nearby at Lumahat undated (Sheldon *et al.* *in press*); **Klias peninsula**, where recorded at Kampung Nukohan, Kuala Penyu, March 1975 (Wells 1976), and one, December 1984 (Sheldon *et al.* *in press*), also at Padas Damit Forest Reserve, singles, May–June 1983 (Sheldon *et al.* *in press*); **Semporna** (breeding colony nearby) (Gore 1968; also Thompson 1966), and “abundant” in the channel between Semporna and Tawau, February, year unspecified (Smythies and Davison 1999); **Karindingan island**, south of Bum Bum island, Semporna, July 1956 (male in BMNH), August and November 1962 (Thompson

1966), undated (Banks 1982), birds on these islands probably breeding near Semporna (Sheldon *et al.* in press);

■ **Sarawak** Records are from: **Trusan-Sundar mangroves**, before 1940 at Sundar and Kampung Awat-Awat (Banks 1933, Smythies 1955, 1981), and again in November 1995 (A. C. Sebastian *in litt.* 1999); **Limbang mangroves**, undated (DWNPPM 1987); **Gunung Mulu National Park**, three, February 1989 (T. Carlberg *in litt.* 1999); **Tanjung Sirik** (Cape Sirik), before 1940 (Banks 1933, Smythies 1981); **Pulau Bruit** (see Measures Proposed), October 1985, with two elsewhere (Edwards *et al.* 1986, Edwards and Parish 1988); **Mukah Hills Protected Forest** (Mukah Forest Reserve), April 1996 (A. C. Sebastian *in litt.* 1999); **Bako National Park**, undated (Bransbury 1993); **Sadong river** estuary, apparently nesting, 1949 (Harrison 1950, Smythies 1981); **Sebuyau Forest Reserve**, December 1996 (A. C. Sebastian *in litt.* 1999); near Sambir and Moyan, Samarahan delta (not mapped), reportedly nesting, May 1960 (Smythies 1981).

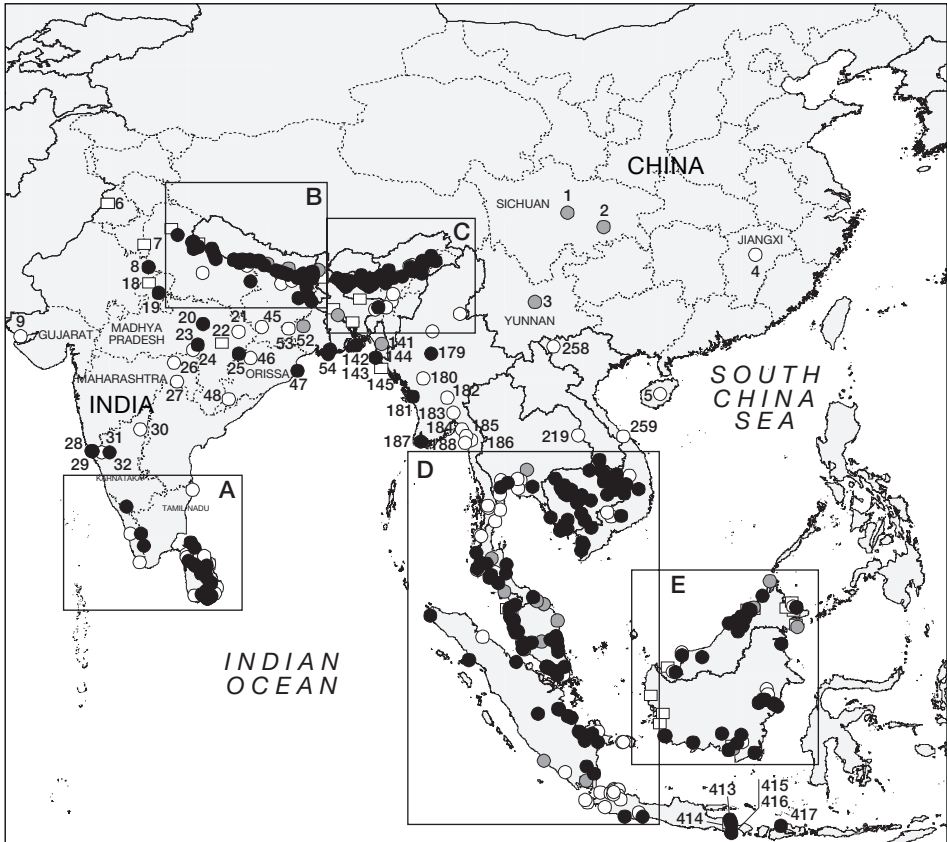
■ **SINGAPORE** There are two specimens (in BMNH) from pre-1845, possibly the undated records mentioned by Robinson and Chasen (1936); the species was also recorded nesting at unspecified localities in **Singapore** in the late 1930s, but there are apparently no subsequent records (Gibson-Hill 1950 in Wells 1999).

■ **BRUNEI** Records are from: **Brunei bay**, October and November 1986 (Mann 1988); **Muara**, one, May, 1994 (M. J. Seal Coon *in litt.* 1999); breeding reported at **Selirong Forest Reserve** up to around 1980 (Mann 1988); **lower Temburong**, two, July 1988 (Mann 1991); **Kampung Wasan** (Wasan), undated (Mann 1987), June and August–October 1987 (Mann 1988) and November 1988 (Mann 1991); **Limau Manis**, three, December 1977 (Kidd 1978); **Kampung Lamunin** (Lamunin road), undated (Mann 1987), June 1989 (Mann 1991, M. J. Seal Coon *in litt.* 1999); **Layong**, one adult, June 1980 (Vowles and Vowles 1997); Labi road, near **Seria**, undated (Mann 1987, presumably incorporating Kidd 1978, Counsell 1986), with one immature, September 1980 (Vowles and Vowles 1997), and a captive, probably local bird found at Tutong, c.1950 (Smythies 1981); **Ulu Temburong National Park**, July 1988 (Sparks undated).

■ **INDONESIA** The species is widespread in Kalimantan, Sumatra (especially along the swampy east coast) and Java, with records from many neighbouring smaller islands. Both White and Bruce (1986) and Coates and Bishop (1997) speculated that it could reach the Lesser Sundas as a vagrant, and indeed there is a record from Moyo (see below). Records are from:

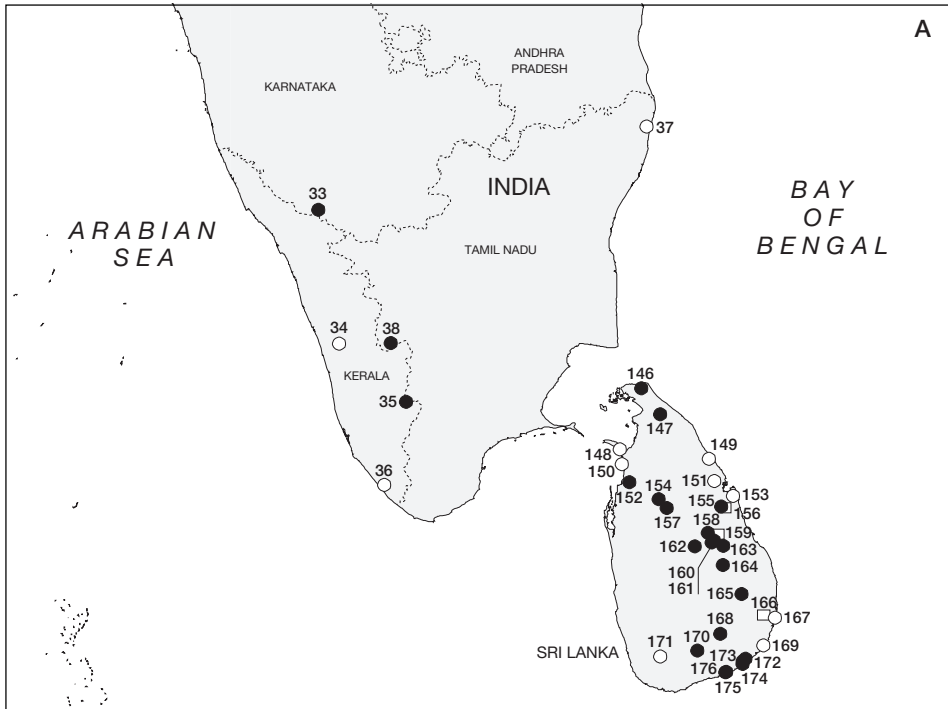
Kalimantan ■ **East Kalimantan Tarakan**, January–February 1992 (Holmes 1997); **Telen**, 1930s (Bruce 1982); **Kedang Rantan**, 1930s, (Bruce 1982); **Belajan**, 1930s (Bruce 1982); **Danau Semayang**, November 1999 (V. Nijman *in litt.* 2000); **Kotabangun**, June 1993 (S. Howe *in litt.* 1999); **Danau Jampang**, Mahakam lakes, up to 170 soaring in August 1996 (Göner in press a in Smythies and Davison 1999); between **Samarinda** and Bontang, August 1990 (Holmes 1997); **Mahakam**, 1930s (Bruce 1982) (for the colony in the Mahakam lakes region, see Measures Proposed); **Mahakam delta**, up to 29, November 1987 (Eve and Guigue 1989, Holmes 1997); ■ **South Kalimantan Danau Panggang**, January 1995 (Holmes 1997); **Rantau**, February 1916 (specimen in RMNH); **Sungai Negara basin** (Barito swamps), 56 individuals, January 1989 (van Balen and Prentice 1997, Holmes 1997), and up to 28 there in January 1995 (Smythies and Davison 1999); **Sungai Alalak** “in the Barito”, November 1978 (Holmes and Burton 1987, D. A. Holmes *in litt.* 1999); **Banjarmasin**, apparently in late 1970s (Bruce 1982); between **Pagatan** and Batulicin, June 1994 (Holmes 1997); ■ **Central Kalimantan** upper catchment of the **Sungai Sebangau**, 20 km south-west of Palangkaraya, 1993–1995 (Page *et al.* 1997); a possible breeding colony in **Tanjung Puting National Park**, in the period since c.1970 and probably breeding (bin Jalan and Galdikas 1987, Nash and Nash 1988), confirmed (at Tanjung Harapan just outside the park) in October 1988, when seven birds with four

The distribution of Lesser Adjutant *Leptoptilos javanicus* (map opposite): (1) Chengdu city; (2) Xiema; (3) Yunnan; (4) Jiangxi; (5) Lingmen; (6) Harike Lake Wildlife Sanctuary; (7) Okhla; (8) Keoladeo National Park; (9) Mandvi; (10) Corbett National Park; (11) Kaladhungi; (12) Dudwa National Park; (13) Kishanpur Wildlife Sanctuary; (14) Bahraich district; (15) Nichlaur; (16) Lucknow; (17) Majhauri; (18) Morena district; (19) Karera Bustard Sanctuary; (20) Bandhavgarh National Park; (21) Surguja; (22) Bilaspur district; (23) Kanha National Park; (24) Balaghat district; (25) Chandarpur; (26) Nagpur; (27) Chandrapur; (28) Choroa island; (29) Ciba Geigy Factory Reserve; (30) Nalwar; (31) Dharwad district; (32) Londa; (33) Nagarhole National Park; (34) Chalakudi; (35) Periyar Sanctuary; (36) Trivandrum; (37) Madras; (38) Anaimalai hills; (39) Narhar; (40) Darbhanga; (41) Purnea; (42) Manihari; (43) Bhagalpur; (44) Rajmahal; (45) Lohardaga; (46) Sambalpur; (47) Bhitarkanika Wildlife Sanctuary; (48) Jaypur; (49) Darjeeling; (50) Jaldapara Wildlife Sanctuary; (51) Jalpaiguri district; (52) Durgarpur; (53) Puruliya; (54) Sundarbans National Park; (55) D'Ering Memorial Wildlife Sanctuary; (56) Dibru-Saikhowa National Park; (57) Dum Duma; (58) Jamjing beel; (59) Dibrugarh district; (60) Bhimpooora bhil; (61) Diju; (62) North Lakhimpur; (63) Panidihing Sanctuary; (64) Nameri National Park; (65) Sibsagar; (66) Majuli island; (67) Dikhomukh; (68) Borjan; (69) Manas National Park; (70) Rowta; (71) Tezpur; (72) Bokaghat; (73) Orang National Park; (74) Kaziranga National Park; (75) Laokhowa Wildlife Sanctuary; (76) Rangia; (77) Nalbari; (78) Chakrasila Wildlife Sanctuary; (79) Sareswar bheel; (80) Barpeta; (81) Tipkai; (82) Jengdia beel; (83) Salkocha; (84) Hajo; (85) Bilasipara; (86) Raha; (87) Agamani; (88) Gauhati; (89) Pobitora Wildlife Sanctuary; (90) Deepor beel; (91) Palasbari; (92) Gauripur; (93) Silai beel; (94) Fakirganj; (95) Loharghat; (96) North Cachar Hills district; (97) Cachar; (98) Hailakandi; (99) Kanchanpur district; (100) Royal Sukla Phanta Wildlife Reserve; (101) Dhangarhi; (102) Royal Bardia National Park; (103) Nepalganj; (104) Butwal; (105) Kapilvastu district; (106) Nawalparasi district; (107) Taulihawa; (108) Tikoli; (109) Bees Hazari Tal; (110) Royal Chitwan National Park; (111) Tamaspur; (112) Lumбини; (113) Hetauda; (114) Parsa district; (115) Ragnunthanpur; (116) Sarlahi district; (117) Ilam; (118) Mahotari district; (119) Garuwa; (120) Dhanusha district; (121) Dharan forests; (122) Siraha district; (123) Sunsari; (124) Sukhani; (125) Janakpur; (126) Itahari; (127) Mai valley; (128) Morang district; (129) Sunsari district; (130) Kosi Tappu Wildlife Reserve; (131) Kosi barrage; (132) Rupnagar; (133) Jhapa district; (134) Biratnagar; (135) Meda beel; (136) Hakaluki haor; (137) Sylhet; (138) Chulan beel; (139) Pabna district; (140) Dhaka; (141) Kaptai; (142) Nilkamal; (143) Sundarbans; (144) Sonadia island; (145) Teknaf peninsula; (146) Jaffna peninsula; (147) Kilinochchi; (148) Arivu Aru; (149) Tiriyai; (150) Arippu; (151) Trincomalee district; (152) Wilapattu National Park; (153) Toppur; (154) Anuradhapura; (155) Somawathiya National Park; (156) Mahaweli Ganga Forest Reserve; (157) Nachchaduwa tank; (158) Polonnaruwa; (159) Manampitiya; (160) Bendiya Villu; (161) Handapan Villu; (162) Wasgomuwa National Park; (163) Aralaganwila; (164) Maduru Oya National Park; (165) Gal Oya National Park; (166) Lahugala Kitulana Sanctuary; (167) Pottuvil; (168) Handapanagala; (169) Kumana Sanctuary; (170) Udawalawe; (171) Tambalagama; (172) Ruhuna National Park; (173) Jamburagala; (174) Mahasilawe Wewa; (175) Bundala Lewaya; (176) Embililakala Kalapua; (177) Hnokkyo; (178) Shwebbo district; (179) Samekkon; (180) Magwe; (181) Arakan; (182) Toungoo; (183) Shwegyin; (184) Thaton; (185) Moulmein; (186) Needong hills; (187) Labutta; (188) Kyaikkami; (189) Ngawun chauung; (190) Indaw; (191) Champang; (192) Bankachon; (193) Khao Yai National Park; (194) Klong Luang Peng; (195) Petriur; (196) Potaram; (197) Samut Sakhon; (198) Khao Ang Ru Nai Wildlife Sanctuary; (199) Khao Yoi; (200) Sriracha; (201) Sarahet; (202) Prachuap Khirikhan; (203) Bangsaphan Noi; (204) Ko Pra Thong; (205) Thung Thong Wildlife Sanctuary; (206) Phangnga; (207) Khlong Phraya Wildlife Sanctuary; (208) Pak Phanang; (209) Ban Tha Maphrao; (210) Ko Nakha Yai; (211) Phuket; (212) Thale Song Hong; (213) Thale Noi; (214) Bo Muang; (215) Mu Ko Lanta National Park; (216) Palian; (217) Satul; (218) Chalerm Prakiat Wildlife Sanctuary; (219) Savannakhet; (220) Nong Hou; (221) Xe Pian NBCA; (222) Dong Khanthung proposed NBCA; (223) Siem Pang; (224) Ta Veng; (225) Ang Trapeang Thomor Reserve; (226) Tonle San; (227) Phumi Sre Kor; (228) Kom Mum; (229) Lomphat; (230) Siem Reap; (231) Prek Da; (232) Prek Toal; (233) Stoeng Sangke; (234) Prek Preah Dam Chheu; (235) Kompong Chikreng; (236) Kaoh Nhek; (237) Sotr Nikam district; (238) Tonle Sap lake; (239) Stung Chikreng; (240) Moat Khla; (241) Prek Kal; (242) Mondolkiri; (243) Boeng Chhma; (244) Kompong Svay district; (245) Kandieng district; (246) Baray district; (247) Stung Chinit; (248) Kampong Chhnang; (249) Tonle Sap river; (250) Koh Kong; (251) Pich Nil; (252) Bassac marshes; (253) Veal Renh; (254) Stoeng Kampong Smach; (255) Prey Nup district; (256) Bokor National Park; (257) Ream National Park; (258) Chieng Chang; (259) Hue; (260) Pleiku; (261) Chu M'lang; (262) Ya Lop; (263) Ea H'Leo river; (264) Ea Sup district; (265) Yok Don National Park; (266) Hon Quan; (267) Cat Tien National Park; (268) An Binh; (269) Tram Chim Nature Reserve; (270) An Bien; (271) U Minh Thuong Nature Reserve; (272) U Minh Ha; (273) Pasir Mas; (274) Kuala Besut; (275) Kulai; (276) Ulu Dedap; (277) Kuala Muda; (278) mainland Penang; (279) Penang; (280) Juru river; (281) Parit Buntar; (282) Kuala Kurau; (283) Sangga Kecil Island Forest Reserve; (284) Telok Kertang Forest Reserve; (285) Kuala Sepetang; (286) Dungan; (287) unallocated; (288) Pulau Terong; (289) Matang Mangrove Forest Reserve; (290) Bagan Serai; (291) Telok Intan swamp-forest; (292) Sungai Perak; (293) Kuantan; (294) Lepar Forest Reserve; (295) Pekan; (296) Temerloh; (297) Tanjung Karang; (298) Genting Highlands; (299) Kuala Selangor; (300) Nenasi Forest Reserve; (301) Kapar Forest Reserve; (302) Pulau Ketam; (303) Pulau Tengah; (304) Pulau Lumut; (305) Endau-Rompin Conservation Area; (306) Sungei Sarang Buaya;



- (307) Panti Forest Reserve; (308) Sungai Pulau; (309) Tanjung Tahir; (310) Batu Pahat river; (311) Sungai Suloh Kecil; (312) Benut Stateland Forest; (313) Pulau Kukup; (314) Pulau Balambangan; (315) Kota Belud Bird Sanctuary; (316) Mumiang; (317) Abai; (318) lower Kinabatangan river; (319) Kimanis bay; (320) Kulamba; (321) Gomanton caves; (322) Kampong Bundu; (323) Uncle Tan's Jungle Camp; (324) Membakut; (325) Nukohan; (326) Mawau; (327) Klias peninsula; (328) Semporna; (329) Karindingan island; (330) Trusan-Sundar mangroves; (331) Limbang mangroves; (332) Gunung Mulu National Park; (333) Tanjung Sirik; (334) Pulau Bruit; (335) Mukah Hills Protected Forest; (336) Bako National Park; (337) Sadong river; (338) Sebuyau Forest Reserve; (339) Singapore; (340) Brunei bay; (341) Muara; (342) Selirong Forest Reserve; (343) lower Temburong; (344) Kampong Wasan; (345) Limau Manis; (346) Kampong Lamunin; (347) Layong; (348) Seria; (349) Ulu Temburong National Park; (350) Tarakan; (351) Telen; (352) Kedang Rantan; (353) Belajan; (354) Danau Semayang; (355) Kotabangun; (356) Danau Jampang; (357) Samarinda; (358) Mahakam; (359) Mahakam delta; (360) Danau Panggang; (361) Rantau; (362) Sungai Negara basin; (363) Sungai Alalak; (364) Banjarmasin; (365) Pagatan; (366) Sungai Sebangau; (367) Tanjung Puting National Park; (368) Cemara Lebat; (369) Pontianak; (370) Gunung Palung National Park; (371) Sungai Pawan; (372) Muara Kendawangan; (373) Sungai Membuluh; (374) Sungai Brang; (375) Kaap Roe; (376) Bangka; (377) Lamno; (378) Singkil Barat; (379) Deli; (380) Bagansiapiapi; (381) Kualatungkal; (382) Kuala Betara; (383) Bukit Tigapuluh; (384) Sungai Batang Hari; (385) Berbak National Park; (386) Sungai Tengorak; (387) Sungsang; (388) Tanjung Selokan; (389) Padang Sugihan Wildlife Reserve; (390) Tanjung Koyan; (391) Danau Ranau; (392) Rawa Seluma; (393) Menggala; (394) Way Kambas National Park; (395) Kedaton; (396) Telukbetung; (397) Pulau Panaitan; (398) Ujung Kulon National Park; (399) Serang; (400) Pelabuhanratu bay; (401) Jakarta; (402) Bekasi; (403) Kali Tempayan; (404) Muara Wetan; (405) Muara Gembong; (406) Tanjung Sedari; (407) Telar Cileung; (408) Karawang; (409) Purwakarta; (410) Pamengpeuk; (411) Rawa Lakkok; (412) Segara Anakan; (413) Baluran National Park; (414) Alas Purwo National Park; (415) Banyuwangi; (416) Bali Barat National Park; (417) Brangkuia.

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

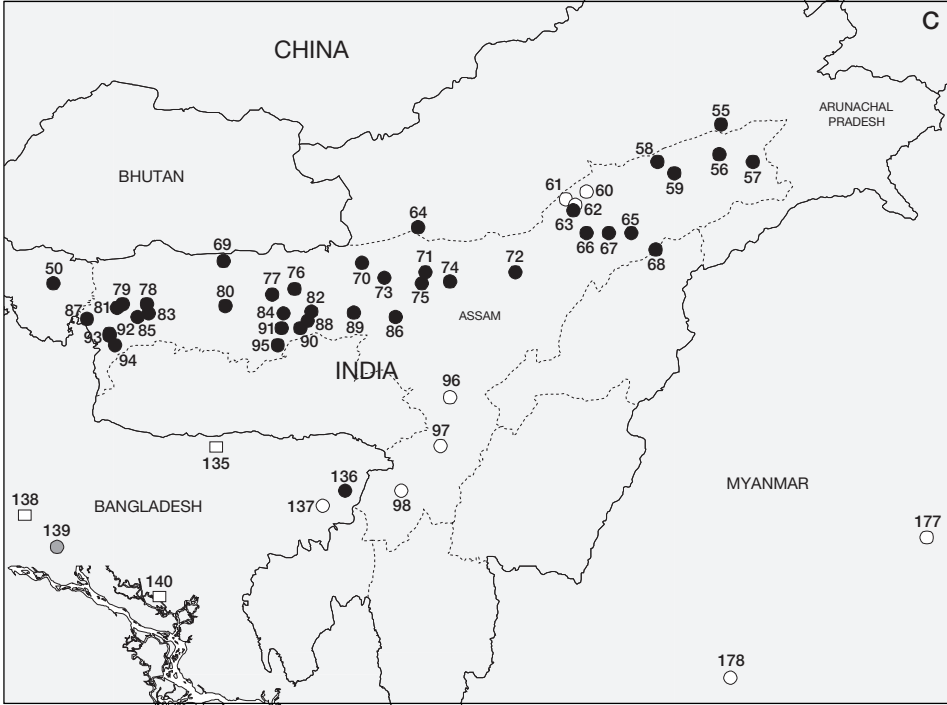
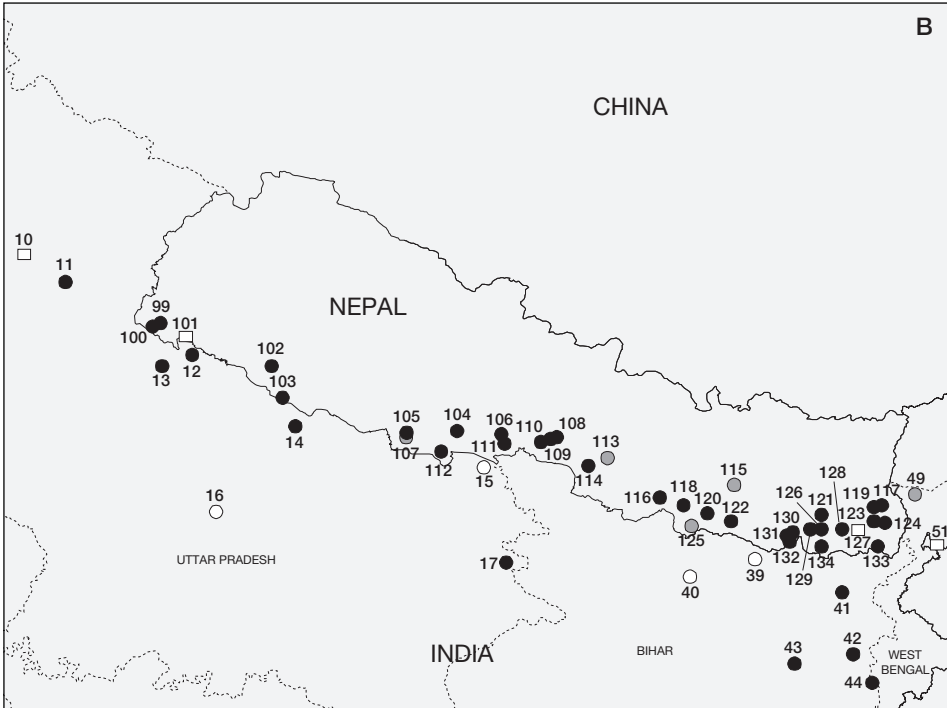


The distribution of Lesser Adjutant *Leptoptilos javanicus* (map A): (33) Nagarhole National Park; (34) Chalakudi; (35) Periyar Sanctuary; (36) Trivandrum; (37) Madras; (38) Anaimalai hills; (146) Jaffna peninsula; (147) Kilinochchi; (148) Arivu Aru; (149) Tiriyai; (150) Arippu; (151) Trincomalee district; (152) Wilapattu National Park; (153) Toppur; (154) Anuradhapura; (155) Somawathiya National Park; (156) Mahaweli Ganga Forest Reserve; (157) Nachchaduwa tank; (158) Polonnaruwa; (159) Manampitiya; (160) Bendiya Villu; (161) Handapan Villu; (162) Wasgomuwa National Park; (163) Aralaganwila; (164) Maduru Oya National Park; (165) Gal Oya National Park; (166) Lahugala Kitulana Sanctuary; (167) Pottuvil; (168) Handapanagala; (169) Kumana Sanctuary; (170) Udawalawe; (171) Tambalagama; (172) Ruhuna National Park; (173) Jamburagala; (174) Mahasilawe Wewa; (175) Bundala Lewaya; (176) Embilikala Kalapuwa.

(map B): (10) Corbett National Park; (11) Kaladhungi; (12) Dudwa National Park; (13) Kishanpur Wildlife Sanctuary; (14) Bahraich district; (15) Nichlaur; (16) Lucknow; (17) Majhaur; (39) Narhar; (40) Darbhanga; (41) Purnea; (42) Manihari; (43) Bhagalpur; (44) Rajmahal; (49) Darjeeling; (51) Jalpaiguri district; (99) Kanchanpur district; (100) Royal Sukla Phanta Wildlife Reserve; (101) Dhangadhi; (102) Royal Bardia National Park; (103) Nepalganj; (104) Butwal; (105) Kapilvastu district; (106) Nawalparasi district; (107) Tauihawa; (108) Tikoli; (109) Bees Hazari Tal; (110) Royal Chitwan National Park; (111) Tamaspur; (112) Lumbini; (113) Hetauda; (114) Parsa district; (115) Rangunathpur; (116) Sarlahi district; (117) Ilam; (118) Mahotari district; (119) Garuwa; (120) Dhanusha district; (121) Dharan forests; (122) Siraha district; (123) Sunsari; (124) Sukhani; (125) Janakpur; (126) Itahari; (127) Mai valley; (128) Morang district; (129) Sunsari district; (130) Kosi Tappu Wildlife Reserve; (131) Kosi barrage; (132) Rupnagar; (133) Jhapa district; (134) Biratnagar.

(map C): (50) Jaldapara Wildlife Sanctuary; (55) D'Ering Memorial Wildlife Sanctuary; (56) Dibru-Saikhowa National Park; (57) Dum Duma; (58) Jamjing beel; (59) Dibrugarh district; (60) Bhimpoora bhil; (61) Diju; (62) North Lakhimpur; (63) Panidihing Sanctuary; (64) Nameri National Park; (65) Sibsagar; (66) Majuli island; (67) Dikhowmukh; (68) Borjan; (69) Manas National Park; (70) Rowta; (71) Tezpur; (72) Bokaghat; (73) Orang National Park; (74) Kaziranga National Park; (75) Laokhowa Wildlife Sanctuary; (76) Rangia; (77) Nalbari; (78) Chakrasila Wildlife Sanctuary; (79) Saeswar bheel; (80) Barpeta; (81) Tipkai; (82) Jengdia beel; (83) Salkocha; (84) Hajo; (85) Bilasipara; (86) Raha; (87) Agamani; (88) Gauhati; (89) Pobitora Wildlife Sanctuary; (90) Deepor beel; (91) Palasbari; (92) Gauripur; (93) Silai beel; (94) Fakirganj; (95) Loharghat; (96) North Cachar Hills district; (97) Cachar; (98) Hailakandi; (135) Meda beel; (136) Hakaluki haor; (137) Sylhet; (138) Chalan beel; (139) Pabna district; (140) Dhaka; (177) Bhamo district; (178) Shwebo district

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



nests were discovered (Galdikas and King 1989), and one on a nest just outside the reserve boundary along the Sekonyer river, September 1989 (Wilkinson *et al.* 1991a); **Cemara Lebat**, 11 in flight, February 1995 (Holmes 1997); ■ **West Kalimantan Pontianak** (where prosecutions took place for illegally keeping the birds in the 1930s) (Bruce 1982), undated (Smythies and Davison 1999); **Gunung Palung National Park**, undated (Holmes 1997); **Sungai Pawan** near the coast, undated (Holmes and Burton 1987); **Muara Kendawangan**, January 1994 (Rusila and Enis 1995, Holmes 1997); **Sungai Membuluh**, January 1994 (Rusila and Enis 1995);

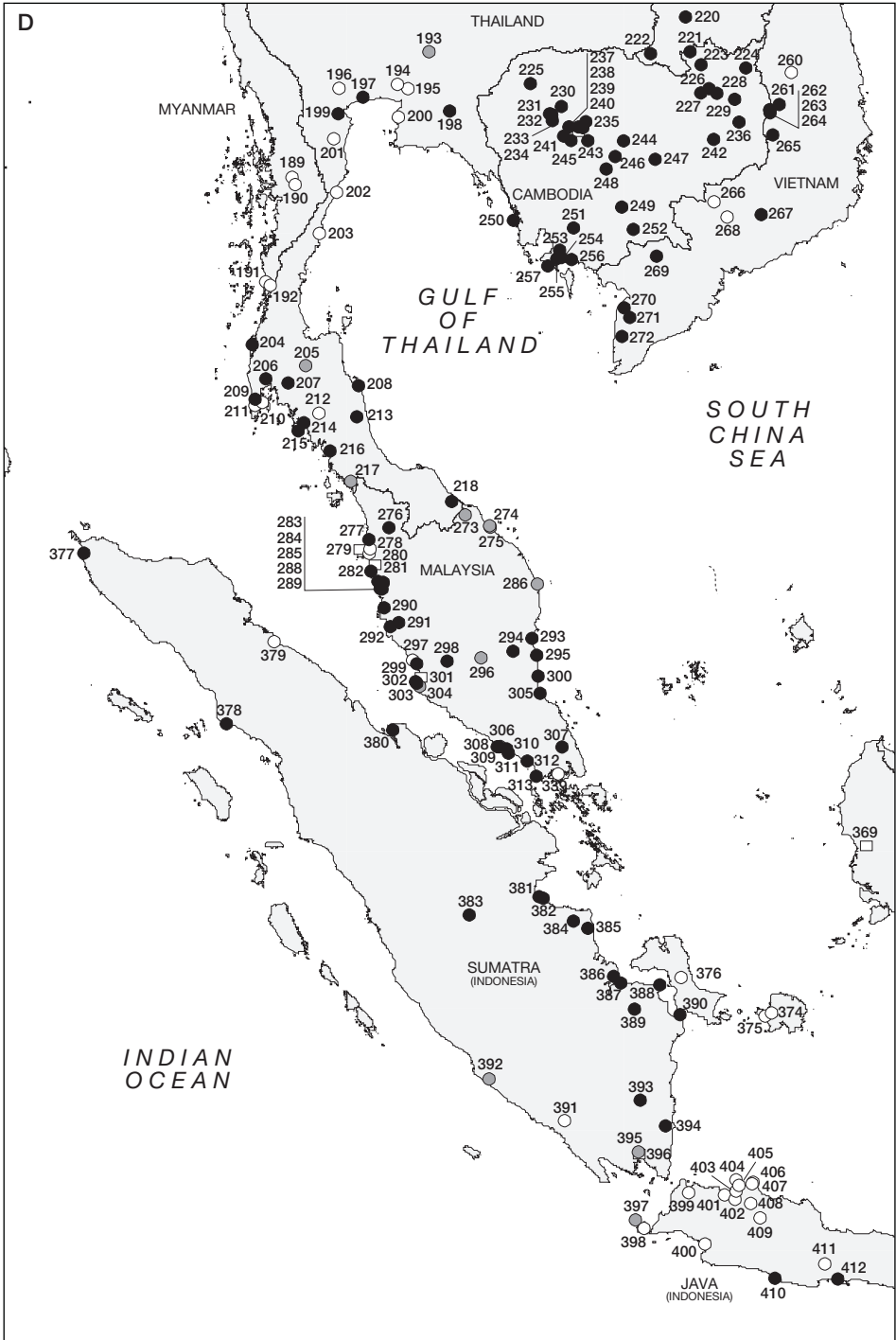
Belitung unspecified site, between 1935 and 1937 (Chasen 1937), this presumably involving the nesting record given in van Marle and Voous (1988) for May 1936, and identifiable as **Sungai Brang** (RMNH register data); **Kaap Roe**, by implication regularly, 1888 (Vorderman 1891b);

Bangka unspecified site (Bruce 1982) in June 1873 (van Marle and Voous 1988, male in RMNH);

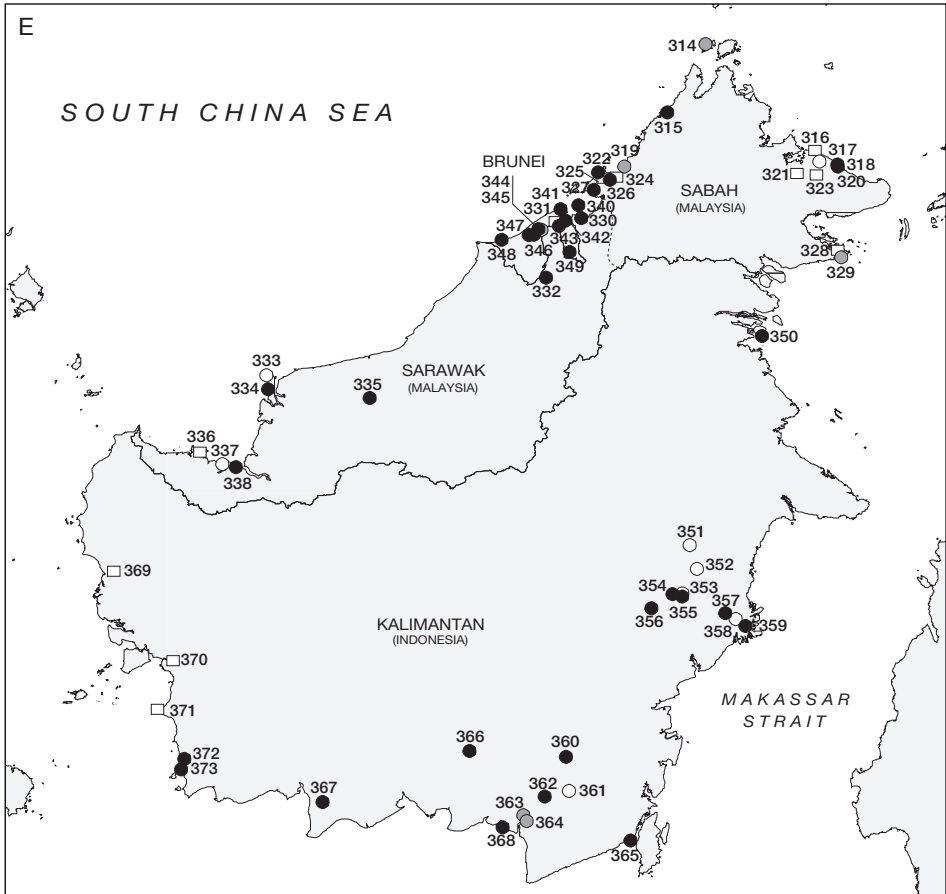
Sumatra ■ **Aceh Lamno** and adjacent Lhoknga, February 1992 (Holmes 1996); **Singkil Barat**, September 1991 (Holmes 1996); ■ **North Sumatra Deli**, 1880s (Hagen 1890, specimens in ZMA, RMNH); ■ **Riau Bagansiapiapi** region, including Sungai Daun, Pulau Berkeh and Pulau Rupa, common (total of 125–200 birds; but see Threats) in August 1990 (Holmes 1996); ■ **Jambi** between **Kualatungkal** and **Kampung Laut**, July–August 1985 (Danielsen and Skov 1985); **Kuala Betara**, west side of Sungai Betara, five, July 1985 (Danielsen and Skov 1985); over an unnamed site near **Bukit Tigapuluh**, July 1991 (Danielsen and Heegaard 1995a); **Sungai Batang Hari** and the adjacent coastal plain in Riau and Jambi, September–

The distribution of Lesser Adjutant *Leptoptilos javanicus* (map D opposite): (189) Ngawun chaung; (190) Indaw; (191) Champang; (192) Bankachon; (193) Khao Yai National Park; (194) Klong Luang Peng; (195) Petriu; (196) Potaram; (197) Samut Sakhon; (198) Khao Ang Ru Nai Wildlife Sanctuary; (199) Khao Yoi; (200) Sriracha; (201) Sarahet; (202) Prachuap Khirikhan; (203) Bangsaphan Noi; (204) Ko Pra Thong; (205) Thung Thong Wildlife Sanctuary; (206) Phangnga; (207) Khlong Phraya Wildlife Sanctuary; (208) Pak Phanang; (209) Ban Tha Maphrao; (210) Ko Nakha Yai; (211) Phuket; (212) Thale Song Hong; (213) Thale Noi; (214) Bo Muang; (215) Mu Ko Lanta National Park; (216) Palian; (217) Satul; (218) Chalerm Prakiat Wildlife Sanctuary; (220) Nong Hou; (221) Xe Pian NBCA; (222) Dong Khanthung proposed NBCA; (223) Siem Pang; (224) Ta Veng; (225) Ang Trapeang Thmor Reserve; (226) Tonle San; (227) Phumi Sre Kor; (228) Kom Mum; (229) Lomphat; (230) Siem Reap; (231) Prek Da; (232) Prek Toal; (233) Stoeng Sangke; (234) Prek Preah Dam Chheu; (235) Kompong Chikreng; (236) Kaoh Nhek; (237) Sotr Nikam district; (238) Tonle Sap lake; (239) Stung Chikreng; (240) Moat Khla; (241) Prek Kal; (242) Mondolkiri; (243) Boeng Chhma; (244) Kompong Svay district; (245) Kandieng district; (246) Baray district; (247) Stung Chinit; (248) Kampong Chhnang; (249) Tonle Sap river; (250) Koh Kong; (251) Pich Nil; (252) Bassac marshes; (253) Veal Renh; (254) Stoeng Kampong Smach; (255) Prey Nup district; (256) Bokor National Park; (257) Ream National Park; (260) Pleiku; (261) Chu M'lang; (262) Ya Lop; (263) Ea H'Leo river; (264) Ea Sup district; (265) Yok Don National Park; (266) Hon Quan; (267) Cat Tien National Park; (268) An Binh; (269) Tram Chim Nature Reserve; (270) An Bien; (271) U Minh Thuong Nature Reserve; (272) U Minh Ha; (273) Pasir Mas; (274) Kuala Besut; (275) Kulai; (276) Ulu Dedap; (277) Kuala Muda; (278) mainland Penang; (279) Penang; (280) Juru river; (281) Parit Buntar; (282) Kuala Kurau; (283) Sangga Kecil Island Forest Reserve; (284) Telok Kertang Forest Reserve; (285) Kuala Sepetang; (286) Dungan; (287) unallocated; (288) Pulau Terong; (289) Matang Mangrove Forest Reserve; (290) Bagan Serai; (291) Telok Intan swamp-forest; (292) Sungai Perak; (293) Kuantan; (294) Lepar Forest Reserve; (295) Pekan; (296) Temerloh; (297) Tanjung Karang; (298) Genting Highlands; (299) Kuala Selangor; (300) Nenasi Forest Reserve; (301) Kapar Forest Reserve; (302) Pulau Ketam; (303) Pulau Tengah; (304) Pulau Lumut; (305) Endau-Rompin Conservation Area; (306) Sungei Sarang Buaya; (307) Panti Forest Reserve; (308) Sungai Pulai; (309) Tanjung Tahor; (310) Batu Pahat river; (311) Sungai Suloh Kecil; (312) Benut Stateland Forest; (313) Pulau Kukup; (339) Singapore; (369) Pontianak; (374) Sungai Brang; (375) Kaap Roe; (376) Bangka; (377) Lamno; (378) Singkil Barat; (379) Deli; (380) Bagansiapiapi; (381) Kualatungkal; (382) Kuala Betara; (383) Bukit Tigapuluh; (384) Sungai Batang Hari; (385) Berbak National Park; (386) Sungai Tengorak; (387) Sungsang; (388) Tanjung Selokan; (389) Padang Sugihan Wildlife Reserve; (390) Tanjung Koyan; (391) Danau Ranau; (392) Rawa Seluma; (393) Menggala; (394) Way Kambas National Park; (395) Kedaton; (396) Telukbetung; (397) Pulau Panaitan; (398) Ujung Kulon National Park; (399) Serang; (400) Pelabuhanratu bay; (401) Jakarta; (402) Bekasi; (403) Kali Tempayan; (404) Muara Wetan; (405) Muara Gembong; (406) Tanjung Sedari; (407) Telar Cilesung; (408) Karawang; (409) Purwakarta; (410) Pamengpeuk; (411) Rawa Lakkok; (412) Segara Anakan.

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



November 1992 (Holmes 1996); **Berbak National Park**, at Sungai Lokan, 57, September 1986, and at Sungai Simpang Gajah, three, September 1986 (A. Elliott *per* T. P. Inskipp *in litt.* 1997), one at Sungai Batanghari (specifically at 1°18' S 104°06' E), July 1999 (R. Gregory-Smith *in litt.* 1999); ■ **South Sumatra** between **Sungai Tengorak** and Telak Galas, July–August 1985 (Danielsen and Skov 1985); 15 km inland south of **Sungsang**, February 1989 (Verheugt *et al.* 1993); **Tanjung Selokan**, 30 birds in a colony of Milky Storks *Mycteria cinerea*, September



The distribution of Lesser Adjutant *Leptoptilos javanicus* (map E): (314) Pulau Balambangan; (315) Kota Belud Bird Sanctuary; (316) Mumiang; (317) Abai; (318) lower Kinabatangan river; (319) Kimanis bay; (320) Kulamba; (321) Gomanton caves; (322) Kampong Bundu; (323) Uncle Tan's Jungle Camp; (324) Membakut; (325) Nukohan; (326) Mawau; (327) Klias peninsula; (328) Semporna; (329) Karindingan island; (330) Trusan-Sundar mangroves; (331) Limbang mangroves; (332) Gunung Mulu National Park; (333) Tanjung Sirik; (334) Pulau Bruit; (335) Mukah Hills Protected Forest; (336) Bako National Park; (337) Sadong river; (338) Sebuyau Forest Reserve; (340) Brunei bay; (341) Maura; (342) Selirong Forest Reserve; (343) lower Temburong; (344) Kampong Wasan; (345) Limau Manis; (346) Kampong Lamunin; (347) Layong; (348) Seria; (349) Ulu Temburong National Park; (350) Tarakan; (351) Telen; (352) Kedang Rantan; (353) Belajan; (354) Danau Semayang; (355) Kotabangun; (356) Danau Jampang; (357) Samarinda; (358) Mahakam; (359) Mahakam delta; (360) Danau Panggang; (361) Rantau; (362) Sungai Negara basin; (363) Sungai Alalak; (364) Banjarmasin; (365) Pagatan; (366) Sungai Sebangau; (367) Tanjung Puting National Park; (368) Cemara Lebat; (369) Pontianak; (370) Gunung Palung National Park; (371) Sungai Pawan; (372) Muara Kendawangan; (373) Sungai Membuluh.

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

1988 (Danielsen *et al.* 1991a); **Padang Sugihan Wildlife Reserve**, regularly (and possibly breeding), August–November 1984 and May–June 1985 (but not seen between December and April) (Nash and Nash 1985); **Tanjung Koyan**, 30 birds in a colony of Milky Storks, September 1988 (Danielsen *et al.* 1991a); **Danau Ranau**, pre-1883 (Forbes 1885), specifically at “Djoengoe boetak” (Nicholson 1883), 515 m on BMNH label; ■ **Bengkulu Rawa Seluma**, Tais, August 1978 (Holmes 1996); ■ **Lampung** near **Menggala** (reported to breed locally), 1993–1994 (Holmes and Noor 1995); **Way Kambas National Park**, an apparent breeding colony of c.25, 6 km south of Pos Pedemaran, June 1989, with many records within the area (Parrott and Andrew 1996), still breeding, November 1999 (V. Nijman *in litt.* 2000); **Kedaton**, May 1976 (van Marle and Voous 1988); **Telukbetung**, undated (specimen in RMNH);

Java ■ **West Java Pulau Panaitan** off the west coast, September 1951 (Hoogerwerf 1952); **Ujung Kulon National Park**, 1940s (Hoogerwerf 1948a); **Serang**, one, undated (Bartels 1915–1930); in the hills near **Pelabuhanratu bay** (Wijnkoops Bay), one, undated (Bartels 1915–1930); **Jakarta** and environs, into the 1930s (Vorderman 1885, Bartels 1915–1930, Hoogerwerf and Siccama 1937–1938, Hoogerwerf 1948a), including Struiswijk, February 1906 (two specimens in RMNH); **Bekasi**, Karawang, November 1908 (van Oort 1910, female in RMNH); **Kali Tempayan**, June 1916 (specimen in RMNH), including at Telar Cabang on the Tempayan, May 1920 (pullus in RMNH); **Muara Wetan**, May 1916 (specimen in RMNH), February 1919 (Bartels 1915–1930); Citarum delta (Tjitarum delta), at **Muara Gembong**, April 1914 and March 1923 (two specimens in RMNH), undated (Bartels 1915–1930); **Tanjung Sedari**, fairly common, with a nest found near Telar Cabang Tempayan, May 1920 (Bartels 1915–1930); **Telar Cilesung**, August 1907 (specimen in RMNH); **Karawang**, once on twice, undated (Bartels 1915–1930); **Purwakarta**, two, undated (Bartels 1915–1930); **Pamengpeuk**, 14, November 1991 (D. A. Holmes *in litt.* 1999); **Rawa Lakbok**, between Banjar (“Banjumas” added in margin) and Maos, one, undated (Bartels 1915–1930); Rawa Tengerang (untraced), one, undated (Bartels 1915–1930); Tanjung Lesung (untraced), April 1993 (D. A. Holmes *in litt.* 1999); ■ **Central Java Segara Anakan**, at least 25, mid-1980s (Erftemeijer *et al.* 1988), c.20, July 1991 (Heath 1991); ■ **East Java Baluran National Park**, July 1991 (Heath 1991), January 1994 (Myers 1994), July 1994 (Tobias and Phelps 1994), September 1999 (V. Hesse *in litt.* 1999); **Alas Purwo National Park**, October 1993 (Indrawan *et al.* 1997b), and breeding (nine nests) at Sadengan, May 1999 (Grantham *in press*); east of “Tjangjaer” (untraced), at a plantation called Pasir Pogor, one, undated (Bartels 1915–1930); **Banyuwangi**, several undated records (Bruce 1982);

Bali in the west, by a hunter’s report, in or before 1911 (Stresemann 1913), with one at **Bali Barat National Park**, September 1980 (Bruce 1982), and many subsequent records in the area including one in Gilimanuk bay, July 1991 (Heath 1991), up to seven there, January 1994 (Myers 1994), seven individuals throughout the park, September 1994 (I. Lewis *in litt.* 1999), and one, March 1997 (D. R. Dann *in litt.* 1999);

Moyo (by Sumbawa) **Brangkua**, November 1988, the first record east of Bali (Johnstone *et al.* 1996).

POPULATION Although broadly distributed from India to Indonesia, the Lesser Adjutant is becoming locally scarce, rare or extinct because of habitat loss, hunting and disturbance of colonies; it was once much more abundant than at present, although in India and Myanmar a century or less ago it was “not nearly so common” as the Greater Adjutant (Baker 1922–1930). While it has not experienced such awesome declines as the latter (see relevant account), numbers have nevertheless slumped dramatically in many parts of its range (see, e.g., Smythies 1986, Bain and Humphrey 1982, Hoffmann 1984, Khan 1987, Thewlis *et al.* 1998). The global population is estimated at 5,000 birds and declining (Rose and Scott 1997), with that of South-East Asia (including Indonesia) believed to fall short of 3,500 (Hancock 1993). These total may need a slight upward revision, however, as the population of the species in Assam is thought to exceed 2,000 individuals (Choudhury 2000c).

China Although it was once perhaps much more widespread and abundant (see Remarks 3), Caldwell and Caldwell (1931) obtained very little first-hand information about the species in the early twentieth century, suggesting that it was probably already a rare bird in southern China at that time. There have been no records since 1972–1973, and it is thus likely to be extinct in China (SC).

India Early reports come from a wide scatter of localities and give the impression that the species occurred over much of the country, but usually in fairly low numbers (see Distribution). It was once “often” encountered during the rains around Lucknow, Uttar Pradesh (Reid 1881), although it was later judged “scarce” in the same region (Jesse 1902–1903). In Gorakhpur district, Uttar Pradesh, it was generally “not a common bird”, although one group of 30 was encountered around 1910 (Osmaston 1913). In Darbhanga district, Bihar, it was clearly uncommon, as Dalgleish (1902) mentioned only one record in four years around 1900. Nests probably of this species (but possibly of Greater Adjutant) were encountered in Manbhum (Puruliya), West Bengal, 1867 (Ball 1874). It is still regularly seen in the floodplains of the Ganges and other rivers in north Bihar, with some apparently breeding in Purnea in the 1990s (A. Mishra *in litt.* 2000).

It seems always to have been very rare in most of central India. In the Deccan, for example, it was a “very rare visitant” (Davidson and Wenden 1878) and it was not recorded in the protracted Hyderabad State ornithological survey (Ali and Whistler 1933–1934). In the far south it was “by no means common” in Travancore, although specimens were regularly captured at tanks in the south to supply Trivandrum Zoo (Ferguson and Bourdillon 1903–1904). A little to the north, in Londa district, Kerala, it was not common during the 1940s (Koelz 1942). Although it has regularly been sighted in the Western Ghats (e.g. Jerdon 1839–1840, Baker 1932–1935, Ali 1969), its true status and movements in this area are unclear: Baker (1932–1935) considered it a resident breeding bird there and its continued occurrence in small numbers suggests that this is probably the case, although nesting remains unconfirmed. In Goa up to 40 spend the winter months in coastal areas (P. Willoughby *in litt.* 1999), and these birds are perhaps likely to be Western Ghat breeders.

While populations appear to have been small throughout much of India, the species has always been common in Assam (Saikia and Bhattacharjee 1989a, Saikia 1995, Choudhury 2000c). This was the case in low-lying portions of eastern Assam in the late nineteenth century (J. R. Cripps in Hume 1888), and during the 1940s (Ali and Ripley 1948), although somewhat less so in North Lakhimpur district in 1905–1910 (Stevens 1914–1915). In the Hailakandi region it was locally “fairly common” (Inglis 1896–1902); Baker (1894–1901) reported that “this is the common adjutant of Cachar”. It still nests in almost all districts of the state from which it has been reported (Saikia 1995) and “can be found in any undisturbed wetland and paddyfield” (A. R. Rahmani *in litt.* 1999). In the 1990s it was “common” in Darrang district (Deka *et al.* 1996), “very common” in Kaziranga National Park, where up to 40 pairs were nesting (Bhattacharjee *et al.* 1996), and “common” in Dibru-Saikhowa National Park (Choudhury 1998), where around 20 individuals are present (Talukdar *et al.* 1995). During 1987–1989 it was estimated that there were some 400 Lesser Adjutants in Assam, with 40 nests found at Orang Wildlife Sanctuary, 11 at Manas National Park, 20 in Kaziranga National Park, 11 in the Lowkhowa reserves and 53 outside protected areas (Saikia and Bhattacharjee 1989a,b), amidst evidence that the population was declining (Bhattacharjee *et al.* 1996). However, between 1989 and 1994, 825–1,004 individuals were counted annually (Saikia 1995), estimates rising chiefly through a more intensive surveying system. Counts of 280–424 active nests were made during the same years (Saikia and Bhattacharjee 1989a, Saikia 1995). The estimated total population in Assam has risen further, now being thought to comprise at least 2,000 individuals, with a widespread breeding population of at least 1,200 birds (Choudhury 2000c). In contrast, only 180–200 individuals were encountered in the whole of India excluding Assam by mid-winter waterfowl counters in recent years (AWC

data *per* T. Mundkur *in litt.* 1998), although presumably at least several hundred more individuals went uncounted.

Sri Lanka In the nineteenth century the species was apparently fairly scarce. Legge (1880), for example, stated that it was “sparingly distributed throughout the northern forests”, “found occasionally in the north-west province”, “fairly common in the dry south-eastern district”, but “nowhere abundant”, a judgement repeated by Henry (1955). It was most often seen singly or in small parties of 3–4 (Legge 1880, Henry 1955), with no indication of any larger concentrations. Parker (1881) repeated a report of a colony of “dozens of nests” at Rukam tank in the “Eastern Province” but the details provided are insufficient to accept the identification. More recently the species was pronounced a “scarce breeding resident” with “a few pairs” in the more secluded jungles of the dry zone (Phillips 1978, Wijesinghe 1994).

Initially, there was some confusion about its breeding status in Sri Lanka. It was assumed to breed as it appeared to be resident all year, although Legge (1880) had found no nests or juveniles, concluding that “it may after all be only migratory”. Breeding was soon confirmed by Parker (1881), who found a nest found “miles from anywhere” in north-west Sri Lanka, and later by Henry (1998) who mentioned that nestlings were being brought alive to Colombo Museum from local sites. A recent population estimate suggests that approximately 200 individuals survive in Sri Lanka (AWC data *per* T. Mundkur *in litt.* 1998), possibly constituting 100 breeding pairs (Collar and Andrew 1988). The source of this total appears to be the assertion that breeding colonies in Ruhuna (Yala) National Park totalled c.100 pairs in the 1980s (van Wetten 1985 in Luthin 1987; also Hancock *et al.* 1992). This is perhaps an overestimate as the species is considered to be “quite rare” at Ruhuna National Park, with no indication of total numbers in Sri Lanka except the statement that they are “not common, restricted to isolated locations in the dry zone” (S. W. Kotagama *in litt.* 2001). Nevertheless, the fact that 25–60 (possibly occasionally over 100) have regularly been counted at Katagamuwa tank (in Ruhuna National Park) in recent years (I. Raheem *in litt.* 2001) suggests that there could be at least 50 pairs in the area.

Nepal In the nineteenth century the species was considered a scarce visitor to the Kathmandu valley (Hodgson 1829a), but its current population centres had not been visited at that time. Recent estimates of the total Nepalese population have varied from 100 birds (Baral 1993a) to as many as 500 (H. S. Baral *in litt.* 1998), and the true figure probably lies somewhere between the two, with the wetter eastern half of the country supporting higher numbers than the drier western part (Suwal and Shrestha 1992a, Baral 1996b). Although the majority of birds reside within protected areas, a significant proportion venture outside to breed, feed and rest (e.g. in Morang, Sunsari, Saptari, Kailali and Kanchanpur districts), with a minority remaining permanently outside protected areas; in all cases the population appears to be slowly declining (H. S. Baral *in litt.* 1998). Kosi barrage and Kosi Tappu Wildlife Reserve contain the largest number of individuals and highest density per unit area, with as many as 15 being recorded daily (Wheeldon 1995). In 1989, a total of 13 nests were counted along the Rapti river near Charara, 8 km west of Sauraha, Royal Chitwan National Park (H. S. Baral *in litt.* 1998). In the entire country, 29 nests with 12 fledglings were counted in 1990–1992 (Suwal and Shrestha 1992a).

Bangladesh Although it was once “fairly common” in Bangladesh, the Lesser Adjutant has more recently been classified as “uncommon” (Khan 1982) and “endangered” (Husain 1985), with populations “declining alarmingly” (Sarker and Sarker 1983). In Sylhet 15 nests were recorded in 1885, with birds still breeding at the site until at least 1929 (Baker 1922–1930); the fate of this colony is unknown but it has almost certainly disappeared. Khan (1987) reported at least one nesting pair each at Dhaka, Faridpur, Noakhali, Khulna and the Chittagong Hill Tracts prior to 1982; however, the main Chittagong and Noakhali colonies disappeared in the 1980s (Khan 1984). It is only because of the almost total elimination of large waterbirds from much of the country and thus the sheer lack of opposition that, along

with the Asian Openbill *Anastomus oscitans*, the species has been considered apparently the “commonest of the storks of Bangladesh” (Khan 1984). However, only 100 are thought to survive in the Sundarbans, with a few more in mangrove forests associated with the Naf river, and very small numbers elsewhere (Sarker *et al.* 1984, Thompson and Johnson 1996). Winter waterbird counts located fewer than 50 individuals around the country in the late 1980s and early 1990s (AWC data *per* T. Mundkur *in litt.* 1998).

Myanmar Christison *et al.* (1946) described it as “common” in Arakan in winter, contradicting Hopwood (1912b) who thought it “rather rare” in the state in 1909–1910. It was rare in the Southern Shan States (Bingham and Thompson 1900), and not as common as Greater Adjutant in Tenasserim, but nevertheless abundant around Thatone (Hume and Davison 1878). In Pegu it was resident but “not in very large numbers”, differing in these respects from the Greater Adjutant which was far more abundant and seasonal in occurrence (Oates 1882, 1883). Even at the massive, ill-fated waterbird colony in the Sittang valley it was relatively uncommon alongside vast numbers of Spot-billed Pelicans *Pelecanus philippensis* and Greater Adjutants (Oates 1878). While these accounts suggest a thinly spread population, some colonies were large, including that in the Needong hills which reportedly contained “immense numbers” of both adjutants (Bingham 1878, Baker 1922–1930). According to Smythies (1986) it was formerly common, remaining so locally until at least the 1940s. In recent years, very few records have come to light, and while this is in part a consequence of low observer coverage, it also reflects a massive decline in numbers; it is now rare with no recent breeding records (Luthin 1987).

Thailand The species was “not uncommon in suitable localities in peninsular, south-western, and the southern parts of central Siam” (Gyldenstolpe 1920). In the 1930s it was often observed “from the train window in the southern parts of peninsular Siam” (Meyer de Schauensee 1946), where it was thought to be “common throughout the area” (Robinson and Kloss 1921–1924). It has clearly declined dramatically, as fewer than 50 individuals are now thought likely to survive in the country and it is almost at vanishing point as a breeding bird (P. D. Round *in litt.* 1998, Wells 1999).

At Thale Noi, for example, villagers reported that the species was once “very common”, but it is now infrequently observed (Storer 1977). Several were reported from the site at various dates between June 1979 and May 1980 (TISTR 1991), but not subsequently (Round *et al.* 1988). It has all but disappeared from continental Thailand apart from the occasional wandering individual, presumably from Myanmar, Laos or Cambodia. However, a small breeding population persists in peninsular Thailand, albeit precariously, in Phang-nga district and Chalerm Prakiat Wildlife Sanctuary. In addition, a small number of birds are thought to be present in suitable breeding habitat (mangroves) along the coasts of Ranong and Satun (P. D. Round *in litt.* 1998). The total Thai breeding population perhaps accounts for 10–20 pairs, but this number is probably declining; at Pa Phru Wildlife Sanctuary, for example, 4–6 nests were suspected in 1994, 2–4 nests in 1995 and 1996, and no nests in 1997 (S. Thongaree *per* P. D. Round *in litt.* 1998), suggesting that the species may disappear from the site.

Laos Early reports suggest that the species was common in central and southern Laos in the nineteenth century; small numbers were found throughout Indochina (Laos/Cambodia/Vietnam), although it was abundant only in the southern half of the region (Delacour and Jabouille 1931). A reference to flocks of “marabouts” along the Mekong river between Pakxan and Vientiane (Bassene 1912) is likely to refer to this species, and in the 1920s it was frequently encountered in open forests of the southern plains of Laos (Engelbach 1932). In Savannakhet province it had become scarce by the 1940s (David-Beaulieu 1949–1950), and it is now absent throughout the country, except the extreme south where it is generally rare (Duckworth *et al.* 1999). If this trend continues it will disappear from Laos early in the twenty-first century; its main hope lies in Dong Khanthung proposed NBCA, where a breeding population of around 50 individuals appears to survive despite a complete lack of protection (Round 1998).

Cambodia In the 1920s the species was described as fairly common (Delacour 1929b) and this was apparently still the case until the 1960s (Thomas 1964). It has apparently declined substantially in subsequent decades (Scott 1992), although it is still much more numerous than the Greater Adjutant (Mundkur *et al.* 1995a). Estimation of numbers around Tonle Sap lake vary from 150 individuals in total (Mundkur *et al.* 1995a) to 200–300 (a minimum of 140 pairs) for the Prek Toal area alone, taking into account the quantity of available habitat (Parr *et al.* 1996, Sun Hean *in litt.* 1997). Although only about 20 breeding pairs were subsequently encountered by Goes *et al.* (1998b) in the Tonle Sap area, the possibility of higher numbers was not discounted given the inaccessibility of large areas of forest. Several aggregations approaching 100 individuals have occurred recently near breeding and feeding sites around Tonle Sap and at the Ang Trapeang Thmor Reserve in Banteay Meanchay province (see Distribution). Other populations in coastal and north-east Cambodia are relatively small, but apparently still significant (Barzen 1995, Timmins and Soriyun 1998, C. M. Poole *in litt.* 1999). Given the scatter of records and the size of flocks reported in different regions, it would appear that the Cambodian Lesser Adjutant population exceeds 500 and quite possibly approaches 1,000 birds.

Vietnam The species appears always to have been scarce in central and northern Vietnam, but patchily common in the south. It was described as “uncommon” at Hue (Delacour *et al.* 1927) and “very rare” in the Pleiku region (David-Beaulieu 1939). Other early twentieth-century reports of the species’s status are conflicting: in Cochinchina it was “very numerous” (Delacour and Jabouille 1925) or uncommon (David-Beaulieu 1932). By the 1980s only one “colony” was thought to survive (Collar and Andrew 1988, Hancock *et al.* 1992), but there now seem to be two, one at Cat Tien National Park (Robson *et al.* 1993) and the other in the U Minh region of the Mekong delta (Le Dien Duc 1993a, Buckton *et al.* 1999, Safford *et al.* 1998). Numbers at these two sites are very low (under 10 pairs each), but there might be scattered pairs in other regions such as Dac Lac province. The total population in Vietnam has clearly declined dramatically since the early twentieth century and now probably accounts for fewer than 50 individuals.

Malaysia Peninsular Malaysia Kelham (1881–1882) found the species “plentiful on the mud-flats at the mouths of most rivers on the west coast” in the 1870s. Forty years later the species was “not uncommon” in the tidal zone of mainland Penang and deemed “very common along the coast” of the peninsula in general (Robinson and Kloss 1910–1911). Thereafter, however, it declined markedly (see, e.g., Medway and Wells 1976): thus it was once fairly common along the Terengganu coast (Gibson-Hill 1949b) but it has been observed only infrequently in recent years (Wells 1999); and it was common along the lower Pahang river in the nineteenth century (Ridley 1892) but rare there by the mid-twentieth century (Wells 1972), with small numbers recently encountered only around the river’s mouth (Kuala Pahang) (Howes *et al.* 1986). As a measure of its rarity in Kelantan, a trapped individual was of sufficient novelty to be exhibited by villagers for a small fee in 1968 (Medway and Wells 1970, 1976).

It is currently “resident and sparse to more or less common, but local” in the Thai-Malay peninsula (Wells 1999). The total of 42 between Sungai Benut and Sungai Rengit in 1997–1998 was thought to be an underestimate for Benut Reserve Forest, as areas south of Sungai Benut were not surveyed; the total for the area was thought to represent more than 1% of the global population (*Suara Enggang* May–June 1998: 29–30). A total of 128 individuals were reported during an aerial survey between Kuala Lumpur and Langkawi in August 1983, 107 between Penang and Lumut, and the rest in southern Perak and Selangor; a further 11 individuals were later seen in Johor, yielding a total of 139 along the entire west coast; given the relatively inconspicuous nature of the species (which usually roosts in trees rather than open areas) this was thought to represent a considerable underestimate of the true population (Parish and Wells 1985, Hawkins and Silvius 1986, Collar and Andrew 1988). Nevertheless,

Wells (1990a) concluded that fewer than 200 individuals survived along the west coast. This latter estimate (200) was repeated by Hancock *et al.* (1993) for the entire country, and assumed to entail around 70 breeding pairs (Collar and Andrew 1988). However, given that a fairly large colony survives on the east coast in the south-east Pahang swamp forests near Nenasi, the total population probably approaches or slightly exceeds 300 birds and constitutes well over 100 pairs. DWNPPM (1987) estimated 250–300 birds in Peninsular Malaysia. *Sarawak* A total of 42 were observed along the western coast of Sarawak in late 1985, all but two of them on Pulau Bruit (Edwards *et al.* 1986). *Sabah* The species was common along the north coast railway (Kota Kinabalu–Beaufort) during the Japanese occupation in the early 1940s when hunting was disallowed; indeed it was frequently recorded in widely scattered areas into the 1950s, becoming relatively rare shortly afterwards (Sheldon *et al.* in press). Roughly 100 birds were seen at Karindingen island in August 1962, and “large numbers” were there in November (Thompson 1966); a bird collected at the site in July 1957 was “one of a party of about one hundred” (BMNH label data). However, in the mid-1960s the species was apparently “decreasing rapidly” (Gore 1968), and recent sightings have been of far smaller groups; it is now considered an “uncommon resident” in Sabah (Sheldon *et al.* in press) and the total population is unlikely to exceed 100 individuals.

Brunei The species is “very uncommon” in Brunei, usually occurring in singles (Mann 1987).

Indonesia In the late 1980s this species was considered still to hold “viable populations” in Sumatra, Java and Kalimantan, its main stronghold being in south-east Sumatra, with a total national population of no more than 2,000 birds (Silvius 1986, Luthin 1987, Silvius and Verheugt 1989, Hancock *et al.* 1992). Nevertheless, Silvius and Verheugt (1989) went on to admit that “only small numbers” have been found in Java, while “data from Kalimantan, where it is considered rare, are scarce”.

At Deli, northern Sumatra, in the nineteenth century the species was “very common” (Hagen 1890), while in the early twentieth century it was regarded as “not rare” on the mudflats of Sumatra’s coasts (de Beaufort and de Bussy 1919). It remains common, at least in southern Sumatra (Verheugt *et al.* 1993), and seemingly throughout the swampy east-coast lowlands of the island. In October–November 1984, 634 birds were counted along the coasts of Riau, Jambi and South Sumatra provinces (Silvius and Verheugt 1986). However, in Jambi province alone, 475 birds were counted along the coast in July–August 1985, while 620 were counted in South Sumatra in the same period (Danielsen and Skov 1985, Silvius 1988). Other counts were reported in October–November 1984 in the provinces of Riau (70), Jambi (191) and South Sumatra (388); and in March–April 1986 in Jambi (152) and South Sumatra (534) (Danielsen and Skov 1985, Silvius 1988). This suggests a minimum Sumatran population of 1,000–1,500.

In Kalimantan the species was found in small numbers throughout the Sungai Negara basin, 1989, with a total of 56 counted around Danau Panggang and 28 soaring there in January 1995 (van Balen and Prentice 1997). In the Mahakam delta 29 were counted in November 1987, while at the Mahakam lakes 190 were seen soaring and a breeding population of 20 pairs was found at Danau Jempang in August 1996 (Holmes 1997). Given the size of the state, and the inaccessibility (or at least infrequent investigation) of much of its area, the total population might approach 500 individuals.

Numbers of Lesser Adjutants on Java and Bali declined dramatically during the twentieth century. Sizeable colonies were widespread according to Bartels (1915–1930), but only scattered pairs survive, almost entirely in East Java and the north-east tip of Bali (total numbers on the latter island are likely to be very small: see Bruce 1982). This population seems unlikely to exceed 50–100 individuals.

ECOLOGY Habitat The Lesser Adjutant is an inhabitant of fresh- and saltwater wetlands, including riverbeds, floodplains, flooded fields and marshes, swamps, forest pools, lakes

and paddyfields (especially in monsoon months), sandy islands, extensive areas of wet seepage, and less frequently of drier grasslands and pasture; from Bangladesh to Indonesia it is particularly closely associated with coastal mangroves and associated mudflats (Robinson and Kloss 1921–1924, Baker 1932–1935, Ripley 1982, Wells 1986, 1999, Hancock *et al.* 1992, del Hoyo *et al.* 1992, Saikia 1995, U Aye Hlaing *per* Khin Ma Ma Thwin *in litt.* 1997, H. S. Baral *in litt.* 1998, P. M. Thompson *in litt.* 1999). While it is thus generally considered a more coastal bird than the Greater Adjutant, and less closely associated with man (Hancock *et al.* 1992, del Hoyo *et al.* 1992), in many areas it lives far inland, and in some cases close to habitation (Saikia 1995).

In Dibru-Saikhowa National Park, Assam, the two species of adjutant occur side-by-side but apparently the smaller (Lesser) tends to frequent marshes, wet paddyfields and the edges of wetlands whilst the larger (Greater) is found mainly on the dry sandy riverside grasslands (chapories) (Choudhury 1995b). Elsewhere in the Brahmaputra valley of Assam the Lesser Adjutant has been found to inhabit wetlands, paddyfields, fallow agricultural land, marshes, wet grasslands and patches of water hyacinth *Eichhornia crassipes*; in aquatic habitats, the optimal water depth for foraging appeared to be around 35 cm (Saikia 1995). From November to January the species was most often encountered on wetland habitats (61–67% of encounters), during July and August (corresponding to the flood period) it favoured paddyfields (72–74% of encounters), while use of fallow agricultural land peaked in February and April; water hyacinth patches were often visited between September and November, while wet grasslands were most often visited during May, June and September and marshes during May, June and August (Saikia 1995). The results of this research indicated that habitat use by the species in Assam (and potentially elsewhere) is flexible and seasonal, a factor to be considered when planning conservation strategies; unlike the Greater Adjutant, it does not visit waste disposal sites (Saikia 1995; see Food).

In Sri Lanka its favoured locales were described as the “lonely marshes, tanks, swamps, banks of rivers and even small water holes in the depths of wild and unfrequented jungle” (Legge 1880). As most inland populations in Bangladesh have been eradicated, it is now mainly seen feeding on exposed mud and in grassy areas on the edge of coastal mangrove forest (P. M. Thompson *in litt.* 1999). In Xe Pian NBCA, Laos, it was closely associated with drying riverbeds and the numerous seasonal pools which shrank as the dry season progressed from November onwards, while none was seen within continuous semi-evergreen forest; birds tended to avoid wetlands regularly visited by people (Thewlis *et al.* 1998). In Cambodia it is seen in “freshwater wetlands, water-holes in lowland deciduous forests, coastal plains and inter-tidal mudflats” (Mundkur *et al.* 1995a), plus seasonally flooded riverine grasslands and pools in dry dipterocarp forest (Sun Hean *in litt.* 1997). It has been observed feeding in the company of Woolly-necked Storks *Ciconia episcopus* on freshly burnt grassland and ricefields near the Cambodian coast (Mundkur *et al.* 1995a). In the Mekong delta of Vietnam it inhabits semi-natural swamp forest dominated by *Melaleuca cajuputi* in the U Minh region (Buckton *et al.* 1999), and occurs erratically in seasonally flooded grassland at Tram Chim National Park (see Distribution). Elsewhere in Vietnam, the seasonally flooded swamp forests where it occurs at Cat Tien National Park comprise stands of *Hydrocarpus anthelmintica* and *Ficus benjamina* (Thai Van Trung 1988, Robson *et al.* 1991). In Thailand the species seems to avoid the interior of peat swamp forest and is chiefly found around the open margins, where scattered tall trees remain among marshland, and in *Melaleuca* swamp forests (P. D. Round *in litt.* 1998).

In Indonesia the Lesser Adjutant is found in areas of mudflats and mangroves on Sumatra, either on the open shoreline or in open country behind the mangroves, occasionally on “lebaks” (backswamps along river floodplains), inland swamps and ricefields, sometimes far inland (Silvius and Verheugt 1986, 1989, Verheugt *et al.* 1993). In Borneo it was “generally seen only where the plains are of very great extent” (Sharpe and Whitehead 1889–1890), the

latter presumably only referring to inland observations. Birds in Sabah have been seen feeding on coral sand and reefs, and sometimes in the vicinity of fish-traps (Thompson 1966), but most recent Bornean records are from coastal mangrove swamps. On Java, birds were observed foraging entirely on exposed estuarine mud, while Milky Storks usually fed nearby in shallow water (Bartels 1915–1930).

Inland populations feed diurnally, usually roosting during the night high in a large tree; birds tend to leave roost sites 30–60 minutes after sunrise, often dispersing individually or as pairs, and less commonly as flocks (P. K. Saikia *in litt.* 1998). In coastal areas, however, they retreat at high tide to roost in mangroves or other large bare trees and sometimes feed nocturnally (Thompson 1966, Parish and Wells 1985, Danielsen and Skov 1985). They sometimes use conspicuous perches in wetlands, such as trees and telegraph poles, possibly to scan for potential prey (Hancock *et al.* 1992). Individuals often soar, sometimes at great heights, during the heat of the day. They are sometimes pugnacious, and a captive bird was recorded killing another individual, and even a jackal *Canis aureus*, with its beak (Ferguson and Bourdillon 1903–1904).

Food Birds usually feed solitarily, well scattered over foraging sites; three or four individuals often forage in the same area but usually 10–100 m apart (Saikia 1995), often around 50 m apart (del Hoyo *et al.* 1992). Fourteen different behaviours associated with feeding were listed by Saikia (1995), of which probing, pecking, tactile groping and jabbing account for specific foraging actions. Prey is either detected visually or by touch as the bill is probed up to two-thirds deep into the soft substrate (Saikia 1995). In Sumatra birds were noted to forage by walking and probing, the bill being pushed into mud and retracted rapidly (Silvius 1988). In some cases, the head and even most of the neck can be inserted into mud when foraging (del Hoyo *et al.* 1992). After capturing large prey items, particularly frogs, fish and reptiles (and occasionally molluscs), individuals raise their head, manoeuvre prey into alignment, then quickly swallow it with a rapid backward jerk of the head (Saikia 1995). Unidentified adjutants have been noted eating gravel on riverine sandbanks, presumably to aid digestion (Schomburgk 1864), although this observation has not been repeated.

In the Brahmaputra valley individuals tended to forage more successfully in thinly vegetated wetlands than in large open-water sites; in the latter they usually selected peripheral areas where the water was shallow and held clumps of floating and emergent vegetation (Saikia 1995). In south-east Sumatra the species was observed foraging on mudflats and judged perhaps to be less dependent on fishing stakes than other large shorebirds (Danielsen and Skov 1985). A group of 13 was once seen following a ploughing tractor on a cassava estate in Sumatra (van Marle and Voous 1988).

Unlike its sympatric congener (see Food under Greater Adjutant), the Lesser Adjutant probably depends solely on live prey items at all seasons (Baker 1922–1930, Saikia 1995, Pokharel 1998). A malodorous (and thus presumably scavenged) rat brought to offspring in the nest (Kahl 1971) gave rise to the belief that the species consumes a small amount of carrion, albeit relying less on scraps and carcasses than the Greater Adjutant (Hancock *et al.* 1992). Such reports have been considered inconclusive, or at least very rare, and recent work in Assam showed the diet to comprise live items entirely (P. K. Saikia *in litt.* 1998; although see information about captive birds below).

The diet in Assam included 37 species of fish of 13 families: Synbranchidae, Clariidae and Heteropneustidae are mainly found in marshes; Anguillidae, Cobitidae, Mustachambalidae, Glossogobidae, Siluridae and Bagridae are captured in open water; Channidae, Anabantidae and Nandidae are taken mostly from paddyfields; and Cyprinidae are taken in the latter part of the summer (Saikia 1995). Among amphibian prey, frogs were frequent (*Hoplobatrachus tigerina* was the commonest food item followed by *Rana typiensis*, *R. limnocharis* and *R. sylvanophylctis*), while toads *Bufo* were apparently not eaten (Saikia 1995). Baker (1922–1930) suggested that reptiles “probably form its staple diet,” and indeed watersnakes (principally

Xenochropsis piscator and *Atritium schislosum*) were commonly taken in marshy land, wet paddyfields and open waterbodies (Saikia 1995). Moreover, Osmaston (1913) reported two half-metre watersnakes being swallowed by an bird in Uttar Pradesh, Henry (1998) recorded snakes in the diet in Sri Lanka, and Bartels (1915–1930) watched two snakes being caught and eaten in Java. In Assam, lizards (e.g. *Calotes versicolor*) are occasionally consumed during winter; other food items included molluscs (e.g. apple snails *Pila globosa*) (Saikia 1995). Mudskippers (*Periophthalmus*) are apparently frequently taken at coastal sites, at least in Sumatra (Silvius 1988, del Hoyo *et al.* 1992). The stomachs of shot birds in Java contained seeds (probably incidentally consumed), small rodents, crabs and fish, with the latter being the most frequent (Bartels 1915–1930), or tadpoles and small fishes (Vorderman 1885), and in Sri Lanka they contained “the remains of frogs, crabs, fish and a small mammal (probably a rat)” (Legge 1880). Indeed vertebrates are regularly consumed, including a variety of other small mammals (e.g. *Bandicota indica*, *B. benghalensis*) and birds such as juvenile jacanas Jacanidae, ducks Anatidae (Saikia 1995) and chickens (Baker 1922–1930). In captivity, the species is known to consume “almost anything, including young chickens, ducks, rats and its own relatives” (Robinson and Chasen 1936). Baker (1922–1930) reported that it will “eat any living thing, including chickens, not too big to swallow”. A captive in Malaysia would regularly wait beside rat-traps: when a rodent was caught the bird waited for it to be killed by dogs, upon which it would soak the dead rat in water and consume it (Rickett ms a). Small quantities of insects are often taken (Henry 1998, Saikia 1995): captive birds are adroit at catching insects in grass (Hagen 1890), locusts are apparently eaten (Kahl 1971), and beetles have been found in the stomachs of collected birds (Bartels 1915–1930).

Nestlings are generally fed whole vertebrates (fish, frogs, etc.), either alive or freshly dead, and invertebrates (e.g. molluscs) which are regurgitated; in the Brahmaputra valley colonies, food items offered by adults to nestlings included amphibians (49%), molluscs (29%), fish (10%) and reptiles (2%) (Saikia 1995). Rotten or long dead fish or meat is apparently never offered, either in the wild or in captivity (P. K. Saikia *in litt.* 1998), the record published by Kahl (1971; see above) presumably being anomalous. Although Kahl (1971) reported that water is regularly regurgitated onto nestlings, apparently to keep them cool, Saikia (1995) never observed this and found that captive nestlings can survive 6–7 months at least without drinking water. However, A. R. Rahmani (*in litt.* 1999) has observed other Indian stork species, including Greater Adjutant, bringing water to juveniles on the nest.

Breeding The Lesser Adjutant generally nests in scattered, and usually small colonies, often admixed with other species; single nests are also recorded, perhaps increasingly as populations dwindle (Hancock *et al.* 1992, Wells 1999). The oldest reported captive individual was at least 30 years old (del Hoyo *et al.* 1992).

Season The timing of breeding events varies geographically and fluctuates annually, but tends to coincide with the beginning of the dry season. In north-east India and Nepal the main period of activity occurs in November–January (Baker 1922–1930, Saikia 1995, H. S. Baral *in litt.* 1998), although courtship begins as early as July (Kahl 1971, Saikia 1995, Choudhury 2000c). Breeding is reported in Orissa in December–February (Pandav 1996), and in southern India in February–May (Baker 1922–1930, Whistler 1944). In Sri Lanka it has occurred in February–April and September (Parker 1881, Henry 1998) and in Myanmar nesting took place in September–January (Baker 1922–1930), with most eggs found in November (Oates 1878, Bingham 1878). In Malaysia the species breeds in January–April (Robinson and Chasen 1936), or January–June (Wells 1999). In Laos, nestlings have been seen perched on the nest in February (Round 1998). Around Tonle Sap lake, Cambodia, mixed-species colonies are active from October until March, with fledglings collected in this area in March and April (Mundkur *et al.* 1995a). A chick was taken from a mixed adjutant colony near the coast in Kompong Som (=Sihanoukville) province, Cambodia, in January 1994 (Mundkur *et al.* 1995a). In Johor, Peninsular Malaysia, five nests contained one young

each in March, most of them quite recently hatched but one almost fledged (Chasen and Kloss 1931b), suggesting a breeding season between February and May (Hancock *et al.* 1992). In Indonesia eggs were obtained in May on Belitung (van Marle and Voous 1988) and nests were reported on Borneo in the same month (Smythies 1981). Nine supposedly single-egg clutches from West Java were collected in March (Hellebrekers and Hoogerwerf 1967), and a downy pullus taken in May on Java (in RMNH; Bartels 1915–1930) accords with a March laying date. In East Java the season is also supposedly February–March (Hancock *et al.* 1992), although breeding at one small colony was synchronised for hatching in mid- to late June (Grantham in press). If birds breed in Padang-Sugihan Wildlife Reserve, Sumatra, they must do so (or at least did so in 1984 and 1985) in the period May–November (see Nash and Nash 1985). In Myanmar, the Lesser Adjutant was said to begin nesting somewhat later than the Greater Adjutant (Blanford 1895–1898), but in Assam the reverse appears to be the case, with nests of the smaller species being some two weeks in advance of the larger (Hancock *et al.* 1992).

Site In Assam colonies tend to be sited in clumps of tall trees with a thick undergrowth of bamboo, but the key factor appears to be the proximity of water: colonies are generally surrounded by wetlands (6–100 cm deep), marshy land (2–50 cm deep), small or large waterholes (20–150 cm deep) and paddyfields (1–50 cm deep) (Saikia 1995). However, these wetlands often dry out during the course of the breeding cycle (Hancock *et al.* 1992, P. K. Saikia *in litt.* 1998). A large colony of both adjutants was once located high on huge limestone cliffs in Myanmar; the nests were very difficult to reach and built on stunted trees, often overhanging the river (Bingham 1878). These cliff colonies are no longer active (Smythies 1986).

In northern India the commonest tree used appears to be *Bombax ceiba*, and all nests reported in Nepal by Suwal and Shrestha (1992a) were built on this species except one that was placed in *Adina cardifolia*. At both Kosi barrage and Royal Chitwan National Park, Nepal, the bird nests on tall *B. ceiba*, in the former in tall grassland, in the latter along the edge of the Rapti river and usually without any tall grasses or understorey (H. S. Baral *in litt.* 1998). In Myanmar nests were placed at a height of c.46 m in the upper branches of huge “kanyin” *Dipterocarpus* trees at Indaw village (Hopwood 1919). Important trees for nesting in the Prek Toal colony in Cambodia are *Coccoloba anispodum*, *Barringtonia acutangula* and *Terminalia cambodiana* (Sun Hean *in litt.* 1997). The nearby colony at Prek Kal is situated in a clump of *Barringtonia* or *Xanthophyllum* trees in flooded forest near a lake (Mundkur *et al.* 1995a). In Kalimantan, breeding has been recorded in very tall *Alstonia* trees, a freshwater swamp species (Galdikas and King 1989), and this is the genus that supports the recently discovered Nenasi colony in Peninsular Malaysia (A. C. Sebastian *in litt.* 1999). In the Thai-Malay peninsula it favours tall (up to 35 m) emergents in secluded mangrove or freshwater swamp forest; nest-trees recorded here include *Intsia*, *Alstonia* and *Bruguiera* (Wells 1999). In Java a *Sterculia foetida* tree has been used (Grantham in press).

It regularly shares colonies with various other waterbirds. It once nested, for example, alongside Spot-billed Pelican and Greater Adjutant in Myanmar (Oates 1878) and still does so at the Tonle Sap colonies of Cambodia (Mundkur *et al.* 1995a).

Courtship and nest structure In Assam pair formation sometimes starts in July (c.3 months before egg-laying) with the male selecting the nest site prior to pair formation, apparently by carrying twigs to the chosen site (Saikia 1995; see Kahl 1971, 1972). Nesting material from one season sometimes does not remain to the next (Kahl 1971), although it is more usual for nests to be “used year after year for an immense period of time” (Baker 1922–1930), adults merely adding sticks to the old foundation each season (Hancock *et al.* 1992). The nest itself is a massive flat platform of sticks without any lining, usually wedged into the forks of large branches in tall trees (Baker 1932–1935, Wells 1999). Nests ($n=85$) studied by Saikia (1995) in Assam were a mean of 70 (50–84) cm long, 63 (40–84) cm wide and 12.4 (5–19) cm deep; most material used in their construction was gathered from the nest-trees themselves,

occasionally from further afield; out of 17 different varieties of plant materials used in construction, *Bombax ceiba* (18 %), *Ficus religiosa* (15 %) and bamboos (13 %) were most frequent.

Clutch size, incubation and parental care In Assam, a full clutch contains 2–4 eggs, with an average clutch size of 2.62 ($n=620$) being calculated by P. K. Saikia *in litt.* (1998). Nests in Myanmar usually contained 3–4 eggs (Bingham 1878, Hopwood 1919). In Malaysia the clutch is “said to be four, but no nest checked has contained more than a single chick” (Wells 1999). In Indonesia clutches of one egg are apparently common (Hellebrekers and Hoogerwerf 1967); however, in 1998 the number of young in nests was usually two and in one case three (Grantham *in press*).

The incubation period generally lasts 28–30 days (Hancock *et al.* 1992), during which time parental duties are shared almost equally by both adults (Saikia 1995). In Assam, one adult usually relieved the other at the nest at 11h00–13h00 and at 15h00–16h00, and on all but rainy days incubating birds regularly changed their orientation by 90° after each 15–30 minute period (occasionally remaining immobile for up to one hour) (P. K. Saikia *in litt.* 1998). After hatching, at which time the nestlings are weak and sparsely covered by thin grey down, the adults brood almost constantly for 12–14 days, the amount of time decreasing gradually after the first week, except if there is any rain before the fourteenth day after hatching, in which case brooding recommences (P. K. Saikia *in litt.* 1998). Both adults bring food to the nestlings (Hancock *et al.* 1992).

Migration In general, most evidence suggests a relatively sedentary lifestyle in this species: it undertakes nomadic movements in response to rains, but no long distance or regular migrations (Ali and Ripley 1968–1998, Ripley 1982, Hancock *et al.* 1992). It was apparently largely resident in Myanmar, while the Greater Adjutant was migratory (Oates 1882, 1883). Contradicting this view, however, Hume and Davison (1878) suggested that most birds visited Tenasserim seasonally between October and April. At Kosi barrage and Kosi Tappu Wildlife Reserve, Nepal, the population in summer is augmented by immigrants from adjacent localities (H. S. Baral *in litt.* 1998). In the Indian Deccan the species apparently occurred in the rainy season only (Davidson and Wenden 1878), although D’Abreu (1931) stated that it was resident in eastern Maharashtra. In Goa it has yet to be recorded in June–July although it is present at all other times, highest numbers gathering in the winter months (Lainer 1999). In North Cachar, Assam, it was a breeding resident (Baker 1894–1901), although further north at Diju 24 individuals were watched flying west one evening in November, suggesting that movements were occurring (Stevens 1914–1915). Hoffmann (1998) considered immigration into the Sri Lankan population possible, but there are no definite records of this and the species appears to be resident in the country. In Cambodia, most waterbirds including this one breeding near Tonle Sap disperse during the wet season, visiting wetlands across the country (C. M. Poole *in litt.* 1998); no storks of any species were recorded at Boeng Chhma (near Tonle Sap) in January 1996, strongly suggesting that all Lesser Adjutants had dispersed at this time of year (Goes 1999a). In Malaysia and Indonesia the species appears to be essentially resident, undertaking small seasonal movements (Smythies 1981, Wells 1999). It is essentially resident in Sabah, but formerly it was a seasonal migrant to the ricefields around Kota Belud, Papar and Tuaran (Gore 1968).

THREATS Originally a widespread and locally common species, the Lesser Adjutant has experienced rapid recent declines and become rare in all but a few parts of its huge range. Even though it remains considerably more numerous than the Greater Adjutant, there is now concern that the degree and types of threat throughout its range will cause further losses and fragmentation, with the burden of ultimate responsibility for the species’s survival falling on fewer and fewer nations. Despite their abundance only a century ago, large waterbirds such as this are amongst the most threatened of all Asian species.

Habitat loss and modification In general, the species is reliant on wetlands for foraging and tall trees for nesting, so the ongoing destruction of wetlands (through drainage, encroachment, overfishing, etc.) and woodlands (through logging, fire, exploitation, etc.) exerts unsupportable pressure on its population. While these threats are mentioned for certain specific sites in the following country-by-country analysis, their impact is felt almost everywhere. In South-East Asia in particular, all large waterbirds are “suffering reduction in available breeding sites through felling of trees providing nest sites and loss of foraging areas to urban and industrial development” (Kushlan and Hafner 2000).

India In Assam, one of the major population centres, loss of nesting trees is the key threat (Choudhury 2000c). The extent of suitable breeding habitat is constantly declining as tall trees are cut for commercial match production or firewood in brick factories, while wetland feeding sites are drained or developed (P. K. Saikia *in litt.* 1998). Government logging operations and the lopping of trees (particularly *Bombax ceiba*) during seed harvesting are also causing a reduction in available nesting sites (P. K. Saikia *in litt.* 1998). An account of further threats to privately owned woodlots in Assam (vital sources of nest-sites) appears in Threats under Greater Adjutant. Populations of waterbirds in the Brahmaputra valley in general are declining because of “habitat alteration, extensive fishing, weed growth, siltation and biotic interference in the wetlands” (Saikia and Bhattacharjee 1990b). The breeding population in Kaziranga National Park has apparently declined because nesting habitat was destroyed, possibly owing to “grass burning” (Bhattacharjee *et al.* 1996). Finally, about half the forest in Borajan Reserve Forest has been cleared by felling and conversion to cultivation by villagers at Pagla, a process which was particularly rampant in 1993–1994 (Choudhury 1995c). Elsewhere in India wetland habitats are being drained and altered to the detriment of wildlife; for example, Harike lake in Punjab has become clogged with water hyacinth and suffers from siltation such that there are fears that it is drying out and becoming unsuitable for wildlife (Ali *et al.* 1981, Singh 1992). Further discussion of threats to wetlands in India can be found in the equivalent section under Sarus Crane *Grus antigone* and Spot-billed Pelican.

Sri Lanka Loss of habitat is one of the major factors underlying the decline of the species in Sri Lanka (Hoffmann 1984, 1989b), with “degradation in all important sites” being accelerated by the development of “aquaculture projects, new salterns or extension of salt production, [and] cutting of mangroves” (Hoffmann 1992). Bundala Sanctuary, Sri Lanka’s only Ramsar site, is “acutely threatened by a multitude of proposed developments in its immediate vicinity (Hambantota ‘mega-city’, oil refinery, new harbour, international airport, salt-based chemical industry, wind-powered farms, prawn farms, hotels etc)” (Hoffmann 1998), as well as firewood collection, excavation for lime and overgrazing (de Silva 1997). There are also plans to establish salt-based industry at Karagan Lewaya, another important wetland site (Hoffmann 1988).

Nepal Throughout Nepal, patches of suitable habitat are becoming increasingly fragmented and isolated as wide swathes of agricultural land are developed between each wetland, forcing Lesser Adjutants to travel long distances between sites (H. S. Baral *in litt.* 1998), effectively lowering the overall population. Loss of foraging habitat and nesting trees are perhaps the main threats to the species’s survival in the country, particularly in eastern regions where the highest stork populations are found (Shakya 1995, H. S. Baral verbally 1998). At Kosi Tappu Wildlife Reserve, for example, most Lesser Adjutants (>80%) use the reserve merely as a resting place (in fact very little suitable foraging habitat is present inside the reserve) and thus the species remains essentially unprotected in the region despite the preponderance of records from protected areas (H. S. Baral *in litt.* 1998). Habitat within Royal Chitwan National Park is constantly being degraded: the tall *Bombax ceiba* trees favoured by adjutants for nest sites are lopped to feed domesticated elephants, of which there are at least 200 in the park (both government and privately owned); one elephant can consume c.200 kg of fodder a day, and the pressure on *Bombax* trees is thus considerable (H. S. Baral *in litt.* 1997). Unless efforts are

made to perpetuate the availability of a network of undisturbed marshes, wetlands and tall trees the Nepalese Lesser Adjutant population will continue to decline.

Bangladesh Wetlands are deteriorating rapidly in quality. At sites such as Chalan and Meda beels siltation is a major problem (Scott 1989); Chalan Beel was divided into “polders” in the 1970s and 1980s, and embankments were built along rivers flowing through the area; expanding cultivation blocked smaller rivers and constrained others, resulting in increased water levels, siltation and thus decreased quality of habitat for wildlife (P. M. Thompson *in litt.* 1999). According to Khan (1984), “the loss of tall nesting trees from the countryside, bad practices of clear-felling the natural forests and improving the same area with commercially desired species of wood, virtually wiped out several species [of stork]”. In particular, the destruction of nesting trees (see equivalent section under Pallas’s Fish-eagle *Haliaeetus leucoryphus*) is thought to be one of the main causes of decline in large tree-nesting species (Khan 1983b). Indeed Baker (1922–1930) mentioned a colony in Sylhet that in 1885 was surrounded by “dense virgin forest” but by 1929 was surrounded by “tea and cultivation”, the unavoidable conclusion of this process being the eradication of all large trees, and therefore all breeding Lesser Adjutants. The species only survives in any numbers amongst the mangrove swamp forests of the Sundarbans. These, however, are exploited for a variety of forest products including timber, pulpwood and firewood, and their future is by no means secure (Rashid 1993). Overfishing is another serious problem in the Sundarbans, as fish stocks are being depleted with likely knock-on effects for piscivorous species (Rashid 1993). At the root of these problems is the proliferation of people in Bangladesh: “wildlife populations have suffered very badly from the great increase in human population and destruction of natural wetland habitat in recent decades” (Scott 1989). Massive population expansion in the country into the twenty-first century (the 1990 population of 110 million people was predicted to become c.130 million by 1999, such was the rate of population growth) will undoubtedly exert huge pressure on wetlands and their resources, with potentially disastrous effects on their associated fauna (Wallace 1993).

Myanmar The large colonies that existed in the nineteenth century have been eliminated, partly by forest clearance and agricultural development (Smythies 1986). Suitable mangrove and wetland habitats along the Arakan and Tenasserim coasts have largely been and continue to be converted to agricultural land (Scott 1989). As with other South-East Asian countries the sheer pressure on wetlands from people is such that large waterbirds are struggling to survive (B. F. King verbally 1999).

Thailand Tree-cutting and fire is causing the destruction and fragmentation of lowland forests, swamp forests, *Melaleuca* forests and mangroves (P. D. Round *in litt.* 1998). In addition, wetlands are constantly being drained for conversion to agriculture while the industrialisation and urbanisation of coastal areas causes further loss of suitable habitat (Parr 1994a, P. D. Round *in litt.* 1998). At Thale Noi Non-Hunting Area, for example, habitat is threatened by the expansion of agriculture and the intensive exploitation of natural resources by a large human population (Parr 1994a). One of the chief constraints on the use of wetland areas by large waterbirds appears to be the lack of undisturbed nesting habitat in the vicinity of suitable swampy feeding sites (Round *et al.* 1988, Scott 1989). An account of threats to mangrove forests in the country (and elsewhere in South-East Asia) appears under Masked Finfoot *Heliopais personata*.

Vietnam Population declines in large waterbirds in Vietnam are attributed to over-exploitation of eggs and young, conversion of wetlands and colonies to aquaculture and agriculture, and destruction of forests and mangroves for domestic use and buildings (Kushlan and Hafner 2000). Drainage and disturbance of wetlands are primary threats. Much suitable habitat has been converted to cultivation (especially rice) or destroyed as a result of intense military activity (Humphrey and Bain 1990, Hancock *et al.* 1992). In particular, vast areas of forest and wetland have been lost since the early twentieth century, such that “freshwater

wetlands inside forest habitats are now sadly rare in Vietnam and few protected areas support representative samples” (Wege *et al.* 1999). One such area is Cat Tien National Park, which is especially important as it probably hosts one of only two Lesser Adjutant colonies in the country despite continuing threats (see under White-shouldered Ibis *Pseudibis davisoni* and Orange-necked Partridge *Arborophila davidiana*). There is also a surviving colony in the U Minh region of the Mekong delta, an area that, although partly spared wartime herbicide spraying, has suffered “severe degradation” through “fire, drainage, conversion to agriculture and hunting” (Safford *et al.* 1998); indeed, forest fires in the delta’s *Melaleuca* swamp forests in 1985 destroyed one of the last remaining colonies (Luthin 1987). The *Melaleuca* forest of U Minh Thuong Nature Reserve, the only site in the Mekong delta where the species is currently believed to breed, remains at risk from fires owing to the use of smoke for honey-gathering (Buckton *et al.* 1999). Further details of problems facing wetlands in the country appear under Sarus Crane.

Laos Wetlands are frequently settled by human populations and used for fishing, rice cultivation (most of the Mekong floodplain in southern Laos has been converted to rice paddy), livestock-grazing and grass harvesting (Thewlis *et al.* 1998). Further, the Xe Namnoy-Xe Pian Hydropower Project may affect waterflow in Xe Pian NBCA with potentially serious implications for the wetland ecosystem of the area (Thewlis *et al.* 1998). However, this project has been delayed indefinitely and might have little effect on the flow in Xe Pian NBCA as many tributaries join below the dam site (J. W. Duckworth *in litt.* 1999). If Dong Khanthung proposed NBCA is established as a protected area as planned, it faces problems from immigration leading to agricultural development, habitat loss and hunting: Round (1998) feared that “the scale and number of threats to the integrity of Dong Khanthung is increasing markedly and urgent intervention is needed to prevent the further erosion of biodiversity”.

Cambodia In general, tree-nesting waterbirds are threatened by large-scale logging and extraction of wood for fuel, which tends to eliminate the larger trees favoured as nest sites (Sun Hean *in litt.* 1997). The small coastal population is perhaps most at risk: Ream National Park, for example, is inhabited by 20,000 people, and current exploitation of natural resources is unsustainable (Goes *et al.* 1998a). A discussion of threats in the Tonle Sap area—the hub of most large waterbird populations in South-East Asia—appears in the equivalent section under Greater Adjutant.

Malaysia Although still rather extensive in Peninsular Malaysia, mangrove and mudflat habitat is constantly shrinking in the face of development and exploitation, a process to which the decline of the Lesser Adjutant can largely be attributed (Hancock *et al.* 1992). Mangrove wood is used on a local scale for firewood and construction material to build dwellings and fish-traps, apparently with little impact on most forest areas; more intrusive are large-scale agricultural (e.g. aquaculture/prawn ponds), industrial (e.g. refineries, port complexes, etc.) and urban (e.g. housing) developments (Hawkins and Howes 1986, Howes *et al.* 1986, DWNPPM 1987). Moreover, rotational cutting (without leaving any old stands) in production forests (e.g. Matang Mangrove Forest Reserve, important for this species and Milky Stork) does not meet the requirement for tall nesting trees (Verheugt 1987). An insufficient area of undisturbed forest is available for secure breeding colonies, and even where forest remains it is often of low stature as a result of timber exploitation, a process that removes the large trees required for nesting (DWNPPM 1987). Between 1960 and 1980, approximately 20% of mangrove cover was lost on the peninsula through “reclamation” by the woodchip industry, and another 20% was earmarked for possible aquaculture development (Ong Jin Eong 1982). Principal threats to the south-east Pahang swamp forests (the largest continuous area of swamp forest in Peninsular Malaysia, and including the Nenasi Reserve Forest where a sizeable colony was recently discovered) are unsustainable logging, reclamation for agricultural, industrial and urban development and disturbance from mining (DWNPPM 1987). At least 20% of mangrove trees on Pulau Kukup were destroyed to produce charcoal,

firewood and timber in the late 1980s (*Enggang* 3, 1 [1990]). The principal threats to Pulau Ketam include uncontrolled logging, while those of Kapar Forest Reserve are reclamation for agriculture and housing, and illegal timber extraction; some 12 km² are to be cleared for industrial and housing developments (DWNPPM 1987). The mangroves around Sungai Benut are designated as “stateland forest” rather than “forest reserve”, and are thus easy to convert to other uses; although the Coastal Resources Management Plan for South Johor recommended that the whole area should be designated as a Permanent Forest Reserve, this had not been undertaken up to June 1998 and the land is still being cleared (*Suara Enggang* May–June 1998), largely through reclamation for agricultural/industrial land use and increased timber exploitation (DWNPPM 1987). Other coastal areas are suffering large-scale reclamation through bunding, installation of sluices and canalisation of present watercourses to drain wetlands (DWNPPM 1987). The Kelang islands are losing habitat to uncontrolled logging, while the burgeoning human population in the Port Kelang area is likely to exert strong development pressure (DWNPPM 1987). Wetlands of the Kapar Reserve Forest are being reclaimed for housing, industry and agriculture, while timber is being illegally extracted, reducing the area’s importance to waterbirds (Interwader 1986). Despite nominal protection, the Matang Mangrove Forest Reserve (supporting very large proportions of both the Lesser Adjutant and Milky Stork populations in Peninsular Malaysia) provides a case study of general threats: mangrove wood is over-exploited despite a scheme for sustainable harvesting, wetlands are disturbed by crab-catchers and motorboats, large areas of mangrove are reclaimed for agriculture and oil pollution is feared, all factors reducing the quality or area of habitat for the species (DWNPPM 1987). A discussion of threats to mangrove forests and wetlands in the Kuala Selangor area is given by DWNPPM (1987). Mangrove and peat-swamp habitats in Sarawak are rapidly being clear-felled, usually without management as a sustainable resource, as at Mukah Forest Reserve, Trusan-Sundar and Limbang mangroves, where illegal logging is rife, aquaculture is expanding, hunting is common and riverbanks are eroded by speedboat and barge traffic (DWNPPM 1987). In Sabah the Sandakan–Tambisan coastal wetlands (where a breeding population potentially survives around Sandakan bay, Mumiang and the Kinabatangan river downstream of Sukau) are moderately threatened by clearance of mangroves for woodchips and disturbance through hunting and fishing, but these threats were not thought to be excessive 15 years ago (DWNPPM 1987). Habitat on the Tempasuk Plain is being reduced in quality and extent by overgrazing, agricultural expansion and drainage (DWNPPM 1987). Such is the scale and number of threats to coastal and riverine wetlands in Malaysia that intensive conservation action is required to ensure that populations of this species do not plummet in the decades ahead.

Indonesia In south-eastern Sumatra, populations are at risk from, amongst other things, swamp forest clearance and transmigration of people into the area (Luthin 1987, Hancock *et al.* 1992). The loss of forest (including swamp forest) is staggering in both lowland Sumatra and Kalimantan, as a result of human interference and fire (see Threats under Crestless Fireback *Lophura erythrophthalma* and Hook-billed Bulbul *Setornis criniger*); fire, for example, is known to have affected Berbak National Park, Sumatra, in 1997 (Legg and Laumonier 1999), commercial logging is devastating the forest of Tanjung Puting National Park (Newman *et al.* 1999, 2000), and Padang-Sugihan Wildlife Sanctuary has been overrun by local settlers (Rudyanto verbally 2000). The important wetland of Segara Anakan in southern Central Java has been a source of concern through steady siltation and plans for its conversion to rice (Erftemeijer *et al.* 1988).

Hunting and persecution Natural predation on the species is presumably very rare (although one individual was killed by a crocodile: Pandav 1993) but direct persecution by humans is quite frequent. It is often encountered for sale in markets, either as food or pets, and in many areas large storks are relentlessly shot or trapped (del Hoyo *et al.* 1992). *India* While many Indian peoples are traditionally inclined to a benign co-existence with wildlife, this is certainly

not universally true and attitudes may well be changing for the worse. Important sites such as Harike Lake Wildlife Sanctuary, Punjab, have long been threatened by high poaching levels (Ali *et al.* 1981, Singh 1992). Furthermore, only at relatively few sites do storks and other nesting waterbirds enjoy voluntary protection by villagers, and thus many colonies have disappeared because of chick and egg collection, and shooting of adults (see Jha 1998); in Assam, meanwhile, two ethnic groups in the area (one indigenous and one immigrant) hunt nesting storks for food and medicinal purposes (the skull and bill are apparently important in the latter case) (Saikia and Bhattacharjee 1989a,b). In general, populations of waterbirds in the Brahmaputra valley are declining partly because of “extensive netting, trapping and shooting” (Saikia and Bhattacharjee 1990b). At Panidihing Sanctuary adjutants are reportedly poisoned with Furadon and Malathion by local people; in one case an adjutant was burned while still alive as “punishment” for taking fish from the wetland (Barooah 1997; see also Boruah 1997). These reports suggest that negative attitudes towards large waterbirds might be increasing in the region. Further information relevant to this issue is presented in the equivalent sections under Spot-billed Pelican and Greater Adjutant.

Sri Lanka Half a century ago the species’s wariness was thought to have been its salvation, as “so large and meaty a bird could never survive in over-shot Sri Lanka were it not protected by constant watchfulness” (Henry 1955). However, Phillips (1963) found that “in spite of nominal protection, all the large Storks, Herons and Egrets are now being persecuted more and more outside the sanctuaries as the wilder districts are opened up and more intensive shooting by irresponsible pot-hunters takes place”, with the result that “great numbers are destroyed annually outside reserves”. Hunting pressure, although evidently once great, must have abated in the last decades of the twentieth century, as Hoffmann (1998) stated that the unavailability of firearms and ammunition owing to the security problem had reduced shooting of wildlife; some “weekend hunting” nevertheless occurs and the situation is perhaps likely to change dramatically for the worse when peace returns. In the 1990s Hoffmann (1992) noted that “shooting” remained a problem in wetland sites, and de Silva (1997) recorded poaching as a threat to Bundala Sanctuary.

Nepal Hunting is noted as among the main threats to the species in Nepal, where locals reportedly still pursue it in the terai, often to sell as meat to traders from Bihar (Shakya 1995). It is at risk whenever it frequents agricultural fields, a particularly severe threat in eastern regions (H. S. Baral verbally 1998). Shakya (1995) also reported that bills (and other body parts) of waterbirds (storks, cranes, ibises, etc.) are sold immersed in oils and used for medicinal purposes in Nepal.

Bangladesh The “direct killing, trapping and shooting of wildlife” (Rahman 1995), along with the collection or destruction of eggs and chicks, have been identified as major causes of decline in this and other waterbirds in the country (Khan 1983b, 1984, 1987).

Myanmar Despite the height of nests of this species at Indaw village, they were commonly harvested by professional climbers who drove in bamboo stakes to form a ladder up the massive trunks and collected the eggs or nestlings, either for consumption or, less frequently, as pets (Hopwood 1919). Oates (1878) found that the young were easy to rear in captivity and locals raised the species for food. Although few people carried guns even until the 1920s, at which time most birds were apparently “tame as tame” (Stanford 1954), current levels of gun ownership, persecution and poaching are apparently high (U Tun Yin 1954, Scott 1989, Rabinowitz *et al.* 1995, Saw Han 1996, Khin Ma Ma Thwin *in litt.* 1998). In the face of these pressures the Lesser Adjutant has probably disappeared from Myanmar as a breeding species, although habitat loss is perhaps the primary threat.

Thailand In most regions large waterbirds are shot and their young captured live for the pet trade or food (P. D. Round *in litt.* 1998); this species has been recorded on sale in a Bangkok market (Luthin 1987). At Chalerm Prakiat Wildlife Sanctuary, local people reported that it still regularly attempts to breed but the young are usually stolen by villagers (Round *et al.* 1988), although some recent breeding success at this site suggests that the pressure on nesting pairs may have lessened somewhat (P. D. Round *in litt.* 1998). A

further account of the extreme hunting pressure on large waterbirds in Thailand appears in Threats under Spot-billed Pelican and Greater Adjutant. *Laos* Hunting is a common and widespread practice for a variety of cultural and economic reasons (Thewlis *et al.* 1998), and populations of all large and conspicuous species have declined precipitously as a result. It is also highly likely that waterbird colonies (now non-existent in most of the country) were long ago destroyed by the plundering of eggs and chicks (J. W. Duckworth *in litt.* 1999). If Dong Khanthung proposed NBCA is established as a protected area as planned, it faces problems from immigration leading to increased levels of hunting (Round 1998). Although eggs and young are apparently not collected from the colonies in Dong Khanthung because they are situated in very tall trees, adjutants in this area are apparently sometimes hunted “for fun” and also for food, especially by soldiers, despite the fact that their flesh is reportedly unpalatable (when adult): during fieldwork in 1998, remains of several shot individuals were identified in the camps of hunters and fishermen (Round 1998). *Cambodia* The species is threatened by hunting of adults, and the collection of eggs and chicks (Mundkur *et al.* 1995a, Parr *et al.* 1996, Carr 1998). Adults are trapped and hunted for sale as food, often by stalking roosting birds at night and dazzling them with a torch or shooting them with guns, the latter being unfortunately ubiquitous; at Veal Anh Chanh, “many people” were observed looking for roosting waterbirds with flashlights at night when they can be “caught easily” (Veasna 1999). In addition, chicks are often raised and fattened for food (Parr *et al.* 1996). A total of 790 eggs and 35 chicks was reportedly collected by villagers from the Prek Toal colony in the 1995–1996 breeding season (Parr *et al.* 1996). Asked whether the harvesting was traditional and sustainable, locals replied that they “took whatever they could reach and as often as they could reach them, throughout the entire breeding season” (Carr 1998). While chicks are intensively collected at certain colonies around Tonle Sap (Mundkur *et al.* 1995a), they are apparently sometimes considered too heavy to justify collection (Parr *et al.* 1996). The market forces driving this problem are not merely local, and possibly on the increase. Middlemen travel from the cities of Battambang and Siem Reap to the Prek Toal area, often providing advance monies for waterbird chicks months before the breeding season; as in much of South-East Asia, wildlife is seen as a culinary delicacy much sought after by city dwellers (Ear-Dupuy *et al.* 1998). In particular, stork chicks are usually consumed at Khmer New Year feasts in the area, as the meat is preferred and the price is low (Ear-Dupuy *et al.* 1998). These demands drive the exploitation at Tonle Sap (see equivalent section under Greater Adjutant). *Malaysia* The breeding population has declined, and some colonies have disappeared, partly owing to the constant robbing of eggs and nestlings by local people (Hancock *et al.* 1992, Wells 1999). Pulau Kukup was thought to suffer from hunting and egg-collecting, a factor that might prevent the Lesser Adjutant from nesting in the vicinity (DWNPPM 1987). Principal threats to Pulau Ketam include heavy hunting pressure, which was responsible for the disappearance of the former heron colony (DWNPPM 1987). That adult adjutants are hunted in Peninsular Malaysia is proved by the report of a domesticated individual returning to its owner “horribly injured by shotgun pellets” (*Suara Enggang* May–June 1998: 29–30). In Sabah, the species was rapidly decreasing in the 1960s especially on the remote northern and eastern coast, “almost certainly as a result of shooting” (Gore 1968). This threat is still commonly reported at the Tempasuk plain, Sabah, despite the fact that it is a bird sanctuary where hunting is prohibited (DWNPPM 1987). *Indonesia* In south-eastern Sumatra, populations are at risk from, amongst other things, direct persecution (Luthin 1987, Hancock *et al.* 1992). Taking of eggs by locals was identified as a cause of decline as long ago as the 1930s (Hoogerwerf and Siccama 1937–1938). Individual birds are often seen for sale at local markets, either for food or as pets (Silvius and Verheugt 1989). The population in the Bagansiapiapi region is under extreme pressure, with boasts of up to 30 being shot in a day, and thus it is unlikely that a viable population can long survive (Holmes 1996); in 1990, at least 47 were killed in a day in Riau province (del Hoyo *et al.* 1992). Early in the twentieth century the species was not wary in Java, with no natural enemies

and “not persecuted” by people, at least when adult; but at colonies local people ruthlessly collected large numbers of eggs and young (Bartels 1915–1930), which presumably led to the collapse of the Javan population. In 1927, traders in Jakarta sought permission to shoot adjutants for the use of feathers in the millinery trade; this was not granted as the species was supposedly legally protected (Bartels 1915–1930).

Pollution India Thiodan, Dieldrin and other non-biodegradable pesticides are used in winter to kill fish in Dibru-Saikhowa National Park, Assam (and presumably much of the Brahmaputra lowlands), with detrimental effects on wetland ecosystems (Choudhury 1995b, 1997). Rice cultivation around the fringes of Deepar beel in Assam is apparently “creating fundamental problems” for the ecology of the area through habitat alteration and pesticide run-off (Saikia and Bhattacharjee 1989c). In addition, a plan to route a sewage canal from Gauhati to the lake would undoubtedly flood the aquatic system with toxins if it goes ahead (Saikia and Bhattacharjee 1989c). This lake is heavily hunted and fished both day and night, siltation is high due to ongoing peripheral deforestation, and the lake receives considerable run-off of both pesticides and fertilisers, the latter of which has promoted the invasion of the water hyacinth (Scott 1989). These pressures attend the majority of wetlands in India and reduce their value for wildlife. Further discussion of the problems posed in India by intensive pesticide use and subsequent run-off appear under Sarus Crane. *Sri Lanka* At Bundala Sanctuary water levels and salinity are being adversely affected by the inflow of excess irrigation water (Hoffmann 1992). *Nepal* Pesticide pollution is noted amongst the main threats to the species’s survival (Shakya 1995), and chemical fishing in tributaries of the Sapta-Kosi is thought to lie behind the falling number of wetland birds at Kosi Tappu Wildlife Reserve (*Oriental Bird Club Bull.* 21 [1995]: 15–20). The Dhungre river, a tributary of the Rapti river in Chitwan National Park, was poisoned by fishermen in December 1998: thousands of fish died and c.200 people were involved in collecting them; this type of incident is regular in the park area (Dahal 1998), with potentially negative effects on the Lesser Adjutant population. *Cambodia* Although waterbirds are reportedly threatened by poisoning around Tonle Sap (Sun Hean *in litt.* 1997), locals in the area are apparently reluctant to discuss the use of poisons and the impacts are therefore unclear (Parr *et al.* 1996). The use of baited rat-poison is reported (Mundkur *et al.* 1995a), the primary target being the Purple Swamphen *Porphyrio porphyrio*, which apparently damages crops; however, poison conceivably affects the whole wetland food chain (Parr *et al.* 1996). *Malaysia* Amongst the principal threats to Pulau Ketam (and other Kelang islands) is oil pollution from the Kelang estuary conurbation and the busy shipping lanes in the Straits of Melaka (DWNPPM 1987). Studies by Universiti Pertanian Malaysia have also revealed high levels of lead, manganese, iron and mercury in the Kelang estuary (Law and Singh 1986, 1987 in DWNPPM 1987). The construction of bunds at Kapar Forest Reserve is affecting the hydrology of the area and there has been pollution from industrial areas nearby (Interwader 1986). At other sites, habitat and stocks of aquatic fauna are threatened by tin mining effluent (e.g. at Telok Intan swamp forest) and uncontrolled pesticide usage (e.g. at Krian ricefields) (DWNPPM 1987). Pesticide fogging to eliminate mosquitoes at the Matang Mangrove Forest Reserve is thought to have reduced the populations of waterbirds at the site (Kushlan and Hafner 2000).

Disturbance Sri Lanka The loss of undisturbed breeding sites has been a factor in the species’s decline in Sri Lanka (Hoffmann 1984, 1989b), and “human disturbance such as excessive fishing, touristic over-visitation and the like” are factors involved in the “degradation in all important [wetland] sites” (Hoffmann 1992). De Silva (1997) noted uncontrolled access, feral dogs and encroachment by villagers as threats to Bundala Sanctuary. *Nepal* Human disturbance is amongst the main threats to the species’s survival (Shakya 1995). The number of people and domestic cattle on Kosi Tappu Wildlife Reserve is steadily increasing, along with associated disturbance, to the detriment of the environment (Pettersson 1998b). On a visit to Royal Chitwan National Park in 1997, H. S. Baral (verbally 1998) observed a house recently built close to an area where Lesser Adjutants were breeding; the fact that park

managers permitted this obvious source of disturbance to the birds spells danger for the important population in the area. **Bangladesh** The Sundarbans were previously undisturbed because of the presence of tigers, crocodiles and king cobras, but now the forest is disturbed at all times of night and day by a “large number of wood cutters, fishermen, honey collectors, wooden boats and mechanical vessels” (Sarker 1985). One of the main causes of rapid decline in the wildlife resources of Bangladesh was deemed to be “habitat disturbance” (Rahman 1995), a factor closely linked to the inexorable rise of the human population (see Threats: Habitat loss). **Myanmar** Smythies (1986) listed human disturbance amongst the factors responsible for the disappearance of nineteenth century colonies. Further details appear under Sarus Crane. **Laos** Wetlands are frequently settled by human populations in Laos and used for fishing, livestock-grazing and grass harvesting, all sources of disturbance for foraging waterbirds, especially as they are so shy owing to high hunting rates (Thewlis *et al.* 1998). **Vietnam** Wetland areas of Cat Tien National Park are (or at least were until recently) visited frequently by fishermen and this might disturb the species, especially when breeding (Nguyen Cu *in litt.* 1997). Upgrading of footpaths to motorable tracks in the park has also increased human disturbance (Atkins and Tentij 1998a). Disturbance in *Melaleuca* forest in the Mekong delta, primarily involving collection of forest products and hunting, may have contributed to a decline there, although the only area where the species regularly occurs (U Minh Thuong) is relatively well protected as a nature reserve (S. T. Buckton verbally 2000). **Cambodia** Temporary settlements during the dry season along the margins of rivers and wetlands cause considerable disturbance to large waterbirds. In Kompong Thom province, for example, around 30% of wetlands were thought to be seasonally settled by people from other regions who came to plant crops such as pulses, melons, maize and pumpkin; these areas tended to be avoided by feeding large waterbirds, a situation that looks likely to worsen as the number of settlers is increasing (Veasna 1999). One of the key threats to the main breeding population in northern Cambodia is the inexorable spread of human settlements into remote regions; this tends to proceed along rivers and involves the ploughing and cultivating of the seasonal meadows favoured by the species for foraging and nesting (R. J. Timmins *in litt.* 2001; see Threats under Giant Ibis *Thaumatibis gigantea*).

Invasive species Zoo Negara in Malaysia has introduced a Painted Stork *Mycteria leucocephala* to Kuala Selangor Nature Park without permission, raising speculations that a breeding colony of this species could compete with Lesser Adjutants (*Enggang* February–March 1997). There are, in fact, two published records of interbreeding between Painted Storks and Lesser Adjutants in captivity, and while this is unlikely in the wild, the situation is best avoided as viable offspring are produced (Hancock *et al.* 1992).

MEASURES TAKEN The species is legally protected in India, Bangladesh, Myanmar (Wildlife Act 1984), Thailand, Malaysia and Indonesia. The protected species list in Laos is currently ambiguous, and there is some disagreement whether the Lao language term used in that list refers to this stork or another (J. W. Duckworth *in litt.* 2000).

Protected areas Occurrence within protected areas is no guarantee of survival, partly because Asian reserves vary dramatically in the level of security and management which they enjoy, and also because this species wanders widely and its inclusion on park or reserve lists is often the result of its occasional visits. Small protected areas are of little importance to the species as home ranges of individual birds are very large, and extensive rural areas with low human density are often of greater value. Protected colonies are of utmost importance. **India** The species regularly occurs in Dibru-Saikhowa National Park, Kaziranga National Park (430 km²), Manas National Park (391 km²), Nameri National Park, Sundarbans National Park, Orang National Park, Bhitarkanika Wildlife Sanctuary, Bordoibam-Bilmukh Sanctuary, Deepor Beel Sanctuary, Laokhowa Wildlife Sanctuary, Panidihing Sanctuary, Pobitora Wildlife Sanctuary and D’Ering Wildlife Sanctuary. Other protected areas in which the species has

been reported recently are Keoladeo National Park (Bharatpur), Dihaila jheel in Karera Bustard Sanctuary, Jhaadi taal in Kishanpur Wildlife Sanctuary (Madhya Pradesh) and Okhla Barrage bird sanctuary. The species benefits from two small protected areas in Goa: the Salim Ali Bird Sanctuary (1.8 km²) situated on Choroa island and protecting a remnant of mangrove forest, and the Ciba-Geigy factory reserve (Lainer 1999, P. Willoughby *in litt.* 1999). *Sri Lanka* The species breeds in Ruhuna (Yala) National Park and occurs in several other protected areas; Bundala Sanctuary was declared a Ramsar site in June 1991 (Hoffmann 1998). *Nepal* It occurs in four major protected areas (Kosi Tappu Wildlife Reserve, Royal Sukla Phanta Wildlife Reserve, Royal Bardia National Park and Royal Chitwan National Park), and is also recorded at the Lumbini Sanctuary, a small private reserve. *Bangladesh* The eastern Sundarbans were (in 1975) under the administration of the Bangladesh Forest Department and controlled as a game reserve; while this means that visitors granted permits to fish or collect honey are not allowed to hunt animals, it appears that this legislation is ineffective (Hendrichs 1975). Three wildlife sanctuaries in the Sundarbans (totalling c.324 km²) have been created in which all logging is prohibited and only fishing and the collection of minor forest products are permitted (Scott 1989). Certain islands in the Naf river receive legal protection as game reserves, but this is not enforced on the ground (Rashid and Khan 1987). *Myanmar* One of the largest stands of mangrove forest on the Arakan coast is contained within Wunbaik Reserve Forest (Scott 1989), but it is not known whether this site is used by the species, nor the level of protection that it receives. *Thailand* Thale Noi has been declared a Non-Hunting Area and an assessment of socio-economics and tourism potential has been undertaken, providing baseline data on which future management proposals might be based (Parr 1994a, 1997). Although the species no longer occurs at the site, it might return with appropriate protection. Chalerm Prakiat Wildlife Sanctuary contains 80 km² of primary peat swamp forest in which the species attempts to breed, occasionally with success (Round *et al.* 1988, P. D. Round *in litt.* 1998). An estimated 568 km² (including considerable areas of mangrove and mudflat) on the eastern side of the Pak Phanang estuary has been established as the Laem Thalemphuk Non-Hunting Area (Scott 1989). *Laos* The Lesser Adjutant occurs in Dong Hua Sao and Xe Pian NBCAs as well as Dong Khanthung proposed NBCA (see Remarks 4 under Masked Finfoot). *Cambodia* The Moat Khla/Boeng Chhma and Prek Toal waterbird colonies are included in the Tonle Sap Biosphere Reserve as core areas (C. M. Poole *in litt.* 1999; but see equivalent section under Greater Adjutant). *Vietnam* The species has occurred in five protected areas: Cat Tien National Park, Yok Don National Park, Vo Doi Nature Reserve, Tram Chim National Park and U Minh Thuong Nature Reserve (see Distribution). *Peninsular Malaysia* It has occurred in Kuala Gula Sanctuary, Kuala Selangor Nature Park (3.2 km²) and the Endau-Rompin Conservation Area (300 km²). *Sabah* It has occurred at the Kinabatangan Wildlife Sanctuary (see under Storm's Stork *Ciconia stormi*) and Kota Belud Sanctuary. *Sarawak* Records come from Gunung Mulu National Park (528 km²). *Indonesia* The status of the birds in the major Milky Stork colonies on Sumatra (see Distribution) is unclear, but the sites are the subject of conservation interest and concern (see equivalent sections under Milky Stork). In Kalimantan it occurs in Tanjung Puting and Gunung Palung National Parks, in Sumatra records are from Berbak National Park, Padang-Sugihan Wildlife Reserve and Way Kambas National Park, and in Java from Ujung Kulon National Park, Alas Purwo National Park and Baluran National Park.

Education *India* Recent stork nesting surveys in unprotected areas of Assam by researchers from Gauhati University have helped to raise awareness of the importance of the species; early signs are that local people have begun to protect nesting trees, nests and birds (P. K. Saikia *in litt.* 1998). *Laos* Posters highlighting the plight of large waterbirds and an appeal to stop hunting have been distributed in southern Laos by the WCS Lao Programme, and amongst other species these feature an illustration of a *Leptoptilos* stork (W. G. Robichaud verbally 1997). *Cambodia* The species is included in awareness material (books and posters)

produced and distributed by the Wildlife Protection Office as part of an ongoing campaign to reduce waterbird exploitation (Veasna 1999, C. M. Poole *in litt.* 1999). Educational videos have also been shown to villagers, emphasising the laws prohibiting hunting and the need to conserve large waterbirds (Veasna 1999).

Habitat management In the Daulasala area (Nalbari) of India a plantation programme of nest-tree species was launched during 1993 in collaboration with the local people and the Forest Department (P. K. Saikia *in litt.* 1998). In Bangladesh the Sundarbans mangrove forest is actively managed to provide a sustainable source of timber and protect wildlife (Z. Hussain 1993). In addition, large areas of mangroves have been planted in areas susceptible to cyclone damage on the Bangladesh coast, a development that might have some benefits to the Lesser Adjutant (Wallace 1993).

Control of persecution Apart from the existence of practically unenforceable laws and minor schemes to reduce gun ownership in Indochina (see under Giant Ibis), very little has been done to prevent hunting of large waterbirds. Measures taken against the threat of egg and chick stealing at waterbird colonies in Cambodia are outlined under Greater Adjutant.

MEASURES PROPOSED This species depends on effective protection of key wetlands and waterbird colonies throughout the region. It should be carefully surveyed and given strict protection in all range states, including a ban on international and national trade via national law and an appropriate CITES listing.

Legislation The provisions of legislative measures should be widely publicised within relevant countries. *India* A complete ban on felling of suitable nest-trees that are not privately owned should be imposed. *Thailand* The Wildlife Conservation Division is responsible for publicising existing legislation, and this should be conducted more comprehensively with a view to informing villagers, police and government officials that this species, and most other wetland birds, are protected by law (Scott 1989). *Cambodia* The equivalent section under Greater Adjutant carries relevant recommendations.

Protected areas *India* Nesting colonies identified outside protected areas should be conserved if possible through declaration of specific mini-reserves and re-planting of suitable trees (P. K. Saikia *in litt.* 1998; see under Greater Adjutant). Borajan Reserve Forest should be designated as a wildlife sanctuary including the nearby Bherjan and Podumoni Reserve Forests, and enclave villages should be translocated to reduce encroachment (Choudhury 1995c). Jamjing Reserve Forest (91 km²), with wet savanna grasslands and a number of lakes, is one of the largest unprotected wetlands in Assam and should be designated as a protected area (Choudhury 1992b). The Panidihing Sanctuary should include Phokolai and Dorou beels as well as the adjoining chaporis on the Brahmaputra (Choudhury 1991). *Nepal* Protection of nesting trees and feeding habitat throughout Nepal should be given special attention wherever possible. A relatively large population occurs near Kosi barrage and Kosi marshes, an area that deserves full protection and stringent management to maintain its suitability for the species. As many of the important feeding areas are outside these reserves, however, efforts should extend to agreements with landowners to maintain suitable foraging habitat. *Sri Lanka* Suggested protective measures are given under Spot-billed Pelican. *Bangladesh* The Sundarbans contain a huge area of suitable habitat, and as such the area should receive direct protection against habitat destruction and disturbance, ideally alongside careful development of the forests as an economic resource, particularly as a tiger reserve or national park (Khan 1986a, Habib 1989, Scott 1989, Z. Hussain 1993). Wildlife and habitat conservation should be the “decisive factor in formulating management regimes” in this area (Z. Hussain 1993). A ban on the felling of any colony trees has been called for (Khan 1984), as well as direct protection of waterbird colonies (Khan 1987). Legal protection of islands in the Naf river should be enforced and adjacent areas of the Teknaf peninsula included (Rashid and Khan 1987). *Myanmar* A system of wetland reserves needs to be incorporated into the national

framework of protected areas (Lwin 1995); any remaining breeding or non-breeding populations of this stork should be a major consideration in any extension of the existing system. *Thailand* Much improved protection from fire, felling of trees and other human disturbance is needed at wildlife sanctuaries, and efforts must be made to establish suitable breeding sites around suitable wetlands (Scott 1989, P. D. Round *in litt.* 1998). *Laos* Many of the additional surveys proposed by Thewlis *et al.* (1998) have been completed, and the emphasis now must be on direct action to conserve known populations rather than further research. In this case, protected areas in southern Laos need to be established and properly managed. Suitable measures at Dong Khanthung proposed NBCA and Xe Pian NBCA are outlined under Sarus Crane. *Cambodia* An account and discussion of measures proposed around Tonle Sap appears in the equivalent section under Greater Adjutant. Protection is also required in suitable wetland areas of Kompong Thom province such as around Trapeang Rompeak (Veasna 1999; see equivalent section under White-shouldered Ibis). In Ratanakiri province, Timmins and Soriyun (1998) proposed that "safe havens" be established for large waterbirds, a scheme involving the exclusion of human activity around important foraging and roosting sites for storks, ibises and cranes, particularly in the dry season when habitat availability is most limited and birds most vulnerable to disturbance and hunting (see equivalent section under White-shouldered Ibis). This idea should be expanded to cover as many sites as possible in northern Cambodia and southern Laos (J. W. Duckworth *in litt.* 1999). *Vietnam* Although surveys have been deemed important to assess the distribution and status of this species (Eames *et al.* 1992), remaining breeding populations are known in two protected areas. Conservation action should be targeted at preserving these populations. There is currently a proposal by provincial authorities to extend Vo Doi Nature Reserve, where the species has occurred in the past, by some 70 km², which will enhance the importance of this site, and might include areas where the species still occurs (Buckton *et al.* 1999). *Malaysia* In Peninsular Malaysia, Nenas Forest Reserve (which, as a part of the south-east Pahang swamp forests, may also prove to hold the continent's last or at least best population of Storm's Stork: see relevant account) now deserves special attention to ensure that the recently discovered colony persists intact. Most importantly, a large area of totally protected forest should be established encompassing the breeding colony, and this should be surrounded by a buffer zone wherein sustainable exploitation is allowed (DWNPPM 1987). The other vital site is Matang Mangrove Forest Reserve (including Kuala Gula Sanctuary), Perak. This contains the most important area of coastal foraging habitat for the species and Milky Stork in the region, and should be protected emphasising the following management strategies: full protection of selected forest areas so that climax vegetation if re-established and maintained; strict protection of Kuala Gula Sanctuary; prohibition of large waterbird disturbance; cessation of all mangrove reclamation; maintenance and sustainable harvesting of mangrove habitat alongside mudflats (DWNPPM 1987). Pulau Kukup, Johor, with c.200 ha of mangrove forest remaining, has been proposed as a wildlife sanctuary or national park (Hawkins and Howes 1986, *Enggang* 3, 1 [1990]). Detailed recommendations at Kapar Forest Reserve and the Kuala Selangor area are in DWNPPM (1987). Pulau Bruit, Sarawak, is an extremely important unprotected site for waterbirds, and indeed is Sarawak's single most important site for waders and duck; a shoreline reserve embracing the western and northern parts of the island has been urged (Edwards *et al.* 1986, Edwards and Parish 1988). *Indonesia* Extension of the boundary of Tanjung Puting National Park, Kalimantan, to include the trees in which the species was found nesting in October 1988, has been proposed (Galdikas and King 1989). Various recommendations have been made for the management of the Sungai Negara basin, Kalimantan, but particularly relevant to the Lesser Adjutant is a suggested conservation area at Danau Panggang (van Balen and Prentice 1997).

Protected areas: management *Nepal* As it feeds largely on the wet ricefields, there is a need to involve local villagers directly in the conservation of the species (see under Sarus Crane). *Laos* Round (1998) proposed a suite of management recommendations for Dong

Khanthung, including established boundaries as an NBCA, a moratorium on human immigration, and control of hunting, wildlife trade, and infrastructural and agricultural development. *Vietnam* An ecosystem-management approach should be applied to the U Minh Thuong Nature Reserve and surrounding areas, maintaining a natural hydrology and sustainably harvesting wetland resources; peat exploitation and rice cultivation on peat substrates should be discontinued as these are inefficient land uses and cause biodiversity loss (Safford *et al.* 1998). *Cambodia* A discussion of measures needed at Tonle Sap appears under Greater Adjutant. *Malaysia* Management recommendations at Kapar Reserve Forest are in DWNPPM (1987).

Control of persecution In addition to management of key habitats within the range of this species, well enforced anti-poaching laws and reduction of disturbance at breeding and feeding sites are needed. Hunting of the species should be banned throughout, backed by strict penalties. A continuation of government policy and action with regard to control of gun ownership in southern Laos and Vietnam, along with its implementation when possible in northern Cambodia, is an urgent priority. Minimisation of hunting pressure on this species in South-East Asia is vital. Strict control of gun ownership is perhaps more achievable and effective than designating protected areas (J. W. Duckworth *in litt.* 1999).

Education There is an urgent need to increase awareness of the status of this bird, throughout its range, if it is to survive in good numbers. *India* Public education and warden training will help to create awareness within rural populations. Education and support of local people in areas where birds are breeding would be useful (A. R. Rahmani *in litt.* 1999). *Bangladesh* Rural education programmes were long ago proposed to help conserve waterbirds by reducing habitat alteration and hunting (Forest Department 1974). Further awareness campaigns were proposed by Sarker (1989) to reduce hunting and habitat destruction. Although these have not been undertaken (P. M. Thompson *in litt.* 1999), they should still be pursued in the Sundarbans area. *Thailand* An education and awareness programme is needed among local fishermen at Ko Phrathong so as to eliminate persecution and disturbance (P. D. Round *in litt.* 1998). *Cambodia* Relevant recommendations appear under Greater Adjutant. *Malaysia* Reduction of pressure on waterbird colonies relies to some extent on community awareness programmes at their periphery (see under Milky Stork).

Research A great deal of waterbird monitoring and survey work has been completed in Asia in recent years, and the emphasis must now switch to rigorous protection of known populations. Thus, while surveys and population monitoring have been proposed in India (Talukdar *et al.* 1995), Vietnam (Eames *et al.* 1992), Laos (Thewlis *et al.* 1998) and Cambodia (Mundkur *et al.* 1995a), these things are perhaps most important in Myanmar where little is known about the current distribution and status of large waterbirds. *India* A full survey should be coordinated (including the ongoing research project in Assam) through contact with local scientists, and an attempt made to clarify the status and location of breeding birds in southern India and the Western Ghats. *Nepal* A study of the effects of pesticides and other chemicals on longevity and breeding potential is needed. *Bangladesh* Survey work to provide details of distribution and conservation requirements of wetland birds in Bangladesh was deemed urgent by the Forest Department (1974). Wetlands should be surveyed to determine their current condition and the status of their fauna, and a national strategy must be developed for their conservation (Rashid 1993). *Myanmar* Myanmar has received the least recent attention of all range countries, and there are still conceivably breeding populations to be discovered. Surveys of the Irrawaddy and Sittang deltas and floodplains and the mangrove forests of Arakan and Tenasserim are needed to assess the status of the species (Khin Ma Ma Thwin *in litt.* 1997). *Laos* Thorough ground-based or aerial surveys of wetlands in the southern lowlands in both wet and dry seasons have been proposed (Thewlis *et al.* 1998), but it is now clear that Xe Pian NBCA and Dong Khanthung proposed NBCA are the most important areas for the species throughout the year and conservation action should focus on their effective protection rather

than any further surveys (J. W. Duckworth *in litt.* 1999). *Cambodia* Searches and population assessments should concentrate on northern Preah Khear, Siem Reap and Stung Treng, with further work in Koh Kong in the south (C. M. Poole *in litt.* 1999). Numbers of breeding waterbirds in the Tonle Sap colonies need to be monitored annually (Goes *et al.* 1998b). A regional wildlife research and conservation team is needed in northern Cambodia, including a training centre to increase the capacity of local officials and coordinate research, conservation and education (Veasna 1999). Research proposals around Tonle Sap appear under Greater Adjutant. *Indonesia* Further fieldwork to establish the value to the species of Danau Bitin and the Awang river swamps, Kalimantan, has been proposed (van Balen and Prentice 1997). A large colony or set of colonies is known to exist somewhere in the Mahakam lakes region, and this needs urgent investigation (D. A. Holmes *in litt.* 1999). Sriwijaya University at Palembang, Sumatra, has a proposal for a Lesser Adjutant Conservation Programme which would include censusing, ecological and socio-economic assessments and a large public awareness component, using the university's network of school teachers (Silvius and Verheugt 1989). Conservation programmes like this should be launched in other provinces in Indonesia where viable populations of Lesser Adjutant occur, and more coastal protected areas established where feasible (Silvius and Verheugt 1989).

Sustainable forest use A mangrove conservation strategy was outlined for Malaysia (but may be relevant to all mangrove areas) by Ong Jin Eong (1982). Such a strategy for the region as a whole, and for specific important sites, must be implemented rigorously to ensure the retention of the economic and biological resources of mangrove habitats.

Institutional strengthening Lack of appropriate capacity and experience in agencies responsible for conservation are chronic problems for all threatened wetland species in Asia (see under White-winged Duck *Cairina scutulata*), and calls for training and improved technical and institutional support in forest and protected-area departments have been made in Bangladesh (Rashid 1993), Myanmar (Lwin 1995) and Laos (see Remarks 3 under Crested Argus *Rheinardia ocellata*) (Thewlis *et al.* 1998), but apply in every country in Asia.

REMARKS (1) Adjutants (either this species, Greater Adjutant or both) used to be widespread and common in southern China at least seasonally; they were named *tu-qiū* ("autumn bird" or "sad bird") in *Shi Jing* ("The Book of Songs", fifth or sixth century B.C.), and regarded as a bad omen, the killing of which was occasionally actively encouraged. In the Yuan Dynasty (around twelfth century A.D.), dead adjutants were submitted to government officials as a kind of tax (SC). (2) The species has been observed close to the Bhutan but, although there are undated reports from Royal Manas National Park and Mo Chu alluvial fan (Scott 1989), these should be regarded as unconfirmed (C. Inskipp and T. P. Inskipp *in litt.* 1998). (3) Two birds were found in captivity at the Yangon Zoo and another was released into Hlawga Park, near Yangon, in 1997 (U Myint Sein *per* Khin Ma Ma Thwin *in litt.* 1997). (4) At this site, occupied nests of one or both *Leptoptilos* (seven nests in 1996) were reported by local people from the foot of the escarpment along the Thai border (Berkmüller and Vilawong 1996, Timmins and Vongkhamheng 1996, Thewlis *et al.* 1998). Unspecified adjutant nests were also reported from several sites along the base of the Sayphou Damlek mountains in the south-east (with up to seven at one locality) and from one area at the northern end of the dense Central Forest area (see Timmins and Vongkhamheng 1996). Unspecified records and those formerly claimed as Greater Adjutant probably all refer to the present species (Round 1998; see Remarks 1 and 3 under Greater Adjutant). (5) Ho Chi Minh City (= Saigon) Zoo had apparently acquired twelve new individuals between January 1993 and January 1994 (G. E. Morris *in litt.* 1994), presumably from colonies in southern Vietnam.