

# Threatened Birds of Asia:

## The BirdLife International Red Data Book

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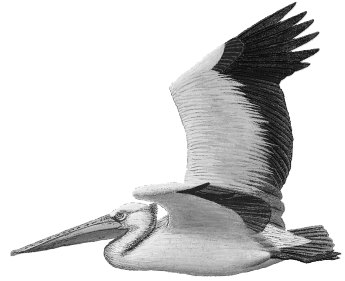
## SPOT-BILLED PELICAN

### *Pelecanus philippensis*

Critical  —

Endangered  —

Vulnerable  A1c,d,e; C1



*This species underwent a rapid decline in the recent past. Its small population continues to decline, although at a reduced rate, as a result of widespread degradation and exploitation of wetlands and colonies. It therefore qualifies as Vulnerable.*

**DISTRIBUTION** The Spot-billed Pelican (see Remarks 1) has occurred in China, Pakistan, India, Nepal, Bangladesh, Sri Lanka, Myanmar, Vietnam, Laos, Thailand, Malaysia, Cambodia, Philippines, and Indonesia, with unconfirmed reports from the Maldives (see Remarks 2), Hong Kong and Taiwan (see Remarks 3), and Singapore (see Remarks 4). The only known present-day breeding populations occur in India, Sri Lanka and Cambodia, although breeding is also suspected in Sumatra. Its status is poorly known in China (largely because of confusion with Dalmatian Pelican *Pelecanus crispus*; see Remarks 1) and Myanmar (where it nested in vast numbers until the early 1900s, but is now almost certainly extinct as a breeding species). It has disappeared from the Philippines, and is only a vagrant or occasional visitor to Bangladesh, Thailand, Laos, Vietnam and Malaysia. In the following country accounts provisional records (e.g. pelicans thought probably to be this species; apart from Dalmatian there is some risk of confusion with Great White Pelican *P. onocrotalus*) and the less site-specific records have largely been excluded.

■ **CHINA** There has been considerable confusion between this species and Dalmatian Pelican in China (see Remarks 1). Styan (1894) reported that he had “now ascertained for certain that pelicans [listed under this species] are resident with us, breeding on the morasses which border the rivers in many places” in the lower Yangtze district, although he did not give details of the evidence for this. La Touche (1925–1934) listed it for south-east Yunnan (possibly resident), the lower Yangtze (resident), Fujian (in summer, possibly resident) and Guangdong, and reported that Père David had found “this pelican” very common in China, and had procured specimens in Beijing and seen it in Mongolia; however, the birds reported from northern China and Mongolia were presumably Dalmatian Pelicans. Spot-billed has been reported from central Yunnan, Jiangsu (which included Shanghai in the 1920s), Zhejiang, Xiamen (Amoy) in Fujian, and Hainan, and described as resident in Guangdong, but less common in winter (Gee *et al.* 1926–1927). Cheng Tso-hsin (1987) noted that this species (which he listed as *P. p. philippensis*) was occasionally recorded from Shandong (Qingdao) and Hebei, but presumably the record from Hebei could have related to Dalmatian Pelican.

The available evidence indicates that a summering population existed in south-east China until the early twentieth century, possibly breeding there, or perhaps migrants from the species's breeding grounds in South and/or South-East Asia (where it nests between October and March: see Migration). There were reports of nesting in the lower Yangtze valley in Anhui and Jiangsu (Sowerby 1943), and possibly in Fujian (Caldwell and Caldwell 1931), but these were never confirmed. There are no recent records of this species in China, and any breeding colonies (or summering population) there must have been died out many years ago. However, given the regular records of this species along the coast of Vietnam, it is feasible that wandering individuals could still occur in southern China. Records of pelicans believed to be this species are listed (by province) below, but there is a possibility that some relate to

Dalmatian (particularly winter records), and that some listed for the latter (see relevant account) could be Spot-billed (see Remarks 1):

■ **Yunnan Mengzi**, immature female collected, October 1920 (Rothschild 1926), the only record in Yunnan (Yang Lan *et al.* 1995);

■ **Shandong Qingdao**, one collected, undated (Lefevre 1962; also Cheng Tso-hsin 1987);

■ **Anhui** Taiping marshes (T'ai-p'ing), south of **Wuhu**, nesting here and elsewhere "in suitable places" in the lower Yangtze valley, unspecified years (Sowerby 1943);

■ **Jiangsu** unspecified locality, undated specimen(s) in SNHMCN (Cui Zhixing *in litt.* 1998); **Tai Hu** (T'ai Hu) lake, lower Yangtze river, nesting on shores and islands, unspecified years (Sowerby 1943);

■ **Shanghai Shanghai** area, adult female collected, July 1927, with an immature female believed to have been collected from this area, undated, plus the comment "this pelican is resident in the Shanghai area" (Sowerby 1943);

■ **Zhejiang** unspecified locality, undated specimen(s) in SNHMCN (Cui Zhixing *in litt.* 1998);

■ **Fujian Mazu Dao** (Masu island, southern China; under the administration of Taipei), before 1901 (specimen in BMNH); **Fuzhou** (Foochow), July 1890 and October 1898 (two specimens in BMNH), August 1934 and July 1936 (two specimens in WUCN), "very common in summer on the sands outside the River Min", early twentieth century (La Touche 1925–1934), one purchased from Fuzhou in the 1960s (specimen in NEFUCN); **Meihua**, near Fuzhou, September 1963 (specimen in ASCN); **Fuqing** (Futsing) coast, specimen(s) collected, undated (Caldwell and Caldwell 1931); **Haikou** (Haikao) town, near Fuqing, "common" throughout the winter (unspecified years), and reported to occur during the summer and to nest on the rocks in a large colony (Caldwell and Caldwell 1931); **Xiamen** (Amoy), undated (Gee *et al.* 1926–1927); unspecified locality, undated specimen(s) in SNHMCN (Cui Zhixing *in litt.* 1998); "well inland" on the Yuen-fu river (Yuanfu river), undated (Caldwell and Caldwell 1931); Changle (Chang-loh) (not mapped: unconfirmed), Fujian, "a large bird of this description" reported to nest by local people (Caldwell and Caldwell 1931);

■ **Guangxi** near **Wuzhou** (Wuchau), one immature, August 1906 (Vaughan and Jones 1913);

■ **Guangdong Shantou** (Swatow), 1865 (one specimen in BMNH), where the birds "remain in the bay all the summer, and may be seen perched on the fishing stakes or rows of posts which support the fishermen's nets in certain parts of the bay", early twentieth century (La Touche 1925–1934); Donghai Dao (Tan-hai Island), **Zhanjiang bay** (Kouang-tchéou Wan), female collected, September 1933, some pelicans occurring annually in September–October in the channel between this island and the mainland (Jabouille 1935);

■ **Hainan Haikou** (Hoihow), north Hainan, adult collected (as *manillensis*), undated (Hartlaub 1898; also Styan 1893b, Ogilvie-Grant 1900a, Hachisuka 1939a).

■ **PAKISTAN** Although listed as resident in west Pakistan (Ali and Ripley 1968–1998) or a winter visitor (Ripley 1982), there are no reliable twentieth-century records, and indeed there is some uncertainty whether the species ever migrated into Sind; Roberts (1991–1992) deleted it from the Pakistan list. It was certainly encountered neither by Ticehurst (1922–1924) during several years around 1920, nor by K. R. Eates in a 40-year span of fieldwork in Sind (Roberts 1991–1992). Its occurrence in the country therefore rests entirely on the testimony of Hume (1872–1873), who claimed to see many *crispus* in Punjab and Sind between November 1871 and February 1872, along with "a few, and only a few" *philippensis*. He provided no description or locality details, nor has a specimen been traced, but the record is re-affirmed by his later (footnote to Butler 1875–1877) claim to have "obtained this species in Sindh (where, however, *P. crispus* Bruch, is much commoner)"; this statement seems unequivocal, but is treated here

as not fully proven. A published record of three in the Indus delta, November 1967 (Mountfort and Poore 1968), is not listed here because of the likely confusion (perhaps nomenclatural; see Remarks 1) with Dalmatian Pelican, which is a common visitor to that area.

■ **INDIA** This species has occurred almost throughout India, being known from the states of Andhra Pradesh, Assam, Bihar, Delhi, Gujarat (see Remarks 1), Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Orissa, Punjab, Rajasthan (see Remarks 1), Tamil Nadu, Uttar Pradesh and West Bengal (Ali and Ripley 1968–1998, Scott and Rose 1989, Perennou *et al.* 1990, Perennou and Mundkur 1991, 1992, Mundkur and Taylor 1993), although breeding takes place only in Andhra Pradesh, Assam, Karnataka and Tamil Nadu. There are unconfirmed reports from Arunachal Pradesh (see Remarks 5) and the Nicobar islands (see Remarks 6).

■ **Haryana** Records are from: **Rohtak district**, undated (Whistler ms); **Sultanpur National Park**, winter 1969–1970 (Ganguli 1975).

■ **Delhi** Recent sightings from this state are perhaps most likely to involve Dalmatian Pelican (see Distribution under that species). Records are from: **Delhi**, previously regular at Delhi Zoo, undated (Bhatia and Desai 1971); **Okhla**, three, March 1988 (P. J. Hines *in litt.* 1998).

■ **Rajasthan** There is a real problem of mistaken identity in some of records, primarily owing to confusion with Dalmatian Pelican (Remarks 1). In particular, records from Sareri dam (not mapped), where 224 were counted in January 1988, and Abhaysagar (untraced), where 32 were counted in January 1990 (Johnson *et al.* 1993), are possibly more likely to refer to the latter species. Other records are from: **Keoladeo National Park**, Bharatpur, undated (Abdulali and Pandey 1978), 10, c.1975 (Sankhala 1990), six, January 1986 (Gawn 1987), 1988 (Anon. 1993b), the species is reported to have bred (Scott 1989, Anon. 1993b), although there has been no direct confirmation of this (A. R. Rahmani *in litt.* 1999); **Sambhar lake**, undated (A. O. Hume, footnote to Butler 1875–1877), with unspecified numbers observed in November 1982 by Gole (1984), who stated merely that 1,000 pelicans were present, including both Spot-billed and Great White; near **Lalsot**, mid-way between Sawai Madhopur and Dasoa, one, January 1987 (G. Ouweneel *in litt.* 1999); **Kota district**, listed (Vyas 1992), but not seen in recent years (Parasharya in press).

■ **Gujarat** Several records initially published or reported as “Spot-billed Pelican” or “*P. philippensis*” are here referred to Dalmatian Pelican given recent evidence that many (at least recent) Gujarat records of Spot-billed are the result of mistaken identity or taxonomic and nomenclatural confusion with Dalmatian (Parasharya in press; see Remarks 1). The following records remain: **Deesa** (Disa), birds shot here “during the rains” being identified as Spot-billed Pelican on account of their small size and greyness, pre-1888 (Barnes 1888–1891), and the earlier undated reports of Butler (1875–1877) from northern Gujarat were also very probably correct; **Lakhota lake**, Jamnagar, a single bird amongst a few Dalmatian Pelicans, January 1999 (Parasharya in press); **Khambhat** (Cambay), c.40 (with “brown wings” and thus unlikely to be *crispus*) at a salt-water jheel, October 1934 (H. Abdulali in Whistler ms).

■ **Uttar Pradesh** The species is a rare visitor to scattered areas within the state, with very few confirmed recent records: **Corbett National Park**, seen on the lake and Ramganga river, undated (Lamba 1987), undated (Grewal and Sahgal 1995); **Dudwa National Park**, apparently occasional, undated (Javed and Rahmani 1998); **Gorakhpur district**, 1909–1911 (Osmaston 1913); **Lucknow**, pre-1881 (Reid 1887), undated (Jesse 1902–1903).

■ **Madhya Pradesh** Small numbers visit scattered wetlands in the state: **National Chambal Sanctuary**, between Chakarnagar and Bhare, 53, February 1994 (Sharma *et al.* 1995); **Morena district**, undated (Saxena 1998); **Karera Bustard Sanctuary**, at Dihaila jheel, one, November 1982, up to two occasionally, 1982–1987 (Rahmani 1987c, 1992a), 20, 1987 (van der Ven

1987); **Madhav** (Shivpuri) **National Park**, at Chandpata lake (Sakhya Sagar), 39 in January 1987, 26 in January 1988 (Scott 1989, Johnson *et al.* 1993).

■ **Maharashtra** The species is an uncommon non-breeding visitor to the state with records as follows: Mukhti tank (tank = water storage pond, reservoir), near **Dhule**, eight, May 1881 (Davidson 1882); **Mulshi lake**, occasional, undated (Mahabal and Lamba 1987); **Khadakwasla**, occasional, undated (Mahabal and Lamba 1987); **Bhatghar**, occasional, undated (Mahabal and Lamba 1987); rare in the Deccan, where only one was seen at **Pandharpur**, September 1878 (Davidson and Wenden 1878; also E. A. Butler 1881).

■ **Karnataka** Birds from breeding populations in the state wander widely, turning up at most suitable wetlands with some regularity (SS). The following records have been traced: **Belgaum**, one immature, November 1880 (E. A. Butler 1881); Gajjagalli, in the **Dharwad** area, two, February 2000 (Uttangi 2000); **Sule Kere tank**, 250, April 1995 (Anon. 1993b), unsuccessful breeding attempt by 13 birds with three nests, 1995 (K. Manu, R. Kumar and A. J. Urfi verbally 1995); Kaggaladu, 9 km north-west of **Sira**, small numbers roosting in a stork/heron colony, 1990s (Ahmed 1999); **Madure Kere tank**, one, January 1996 (AWC data per T. Mundkur *in litt.* 1998); **Dodda Gubbi tank**, one, reportedly the first for a decade at this site, 1990s (Andheria 1999); **Hoskote tank**, 13, 1991 (SS), two, January 1998 (Anon. 1998); **Kunigal Dodda Kere**, one, January 1996 (AWC data per T. Mundkur *in litt.* 1998); **Yellamallappa Shetty tank**, one, January 1998 (Pittie 1998), 70 in 1999 (J. N. Prasad verbally 1999); **Kokkare Bellur** (Rudrakshipura), small colony discovered, April 1976 (Neginhal 1976, 1977b), 185 nests, 1979 (Sridhar 1992), 40–45 nests, August 1981 (V. J. Rajan *in litt.* 1988), 168 nests, 367, undated (Sanjay 1993), 131 in January 1989 (Johnson *et al.* 1993), 60 nests, 1991 (Talukdar 1999), 124 in January 1991 (Johnson *et al.* 1993), 300–350, March 1995 (S. Sridhar and A. K. Chakravarthy *in litt.* 1995); **Nelligudda tank**, March 1986 (George 1994); **Bolare Koppalu**, unspecified numbers, 1995 (S. Sridhar and A. K. Chakravarthy *in litt.* 1995); **Kanva reservoir**, unspecified numbers, 1995 (S. Sridhar and A. K. Chakravarthy *in litt.* 1995); **Channapatna tank**, two, 1989 (SS); **Maddur tank**, 12, January 1992 (AWC data per T. Mundkur *in litt.* 1998), 50, 1995 (SS), three in 1996 (AWC data per T. Mundkur *in litt.* 1998); **Tailur tank**, c.50, April 1976 (Neginhal 1976), two, January 1992 (Anon. 1993b); **Guntlukere**, 1995 (S. Sridhar and A. K. Chakravarthy *in litt.* 1995); **Malavalli tank**, two, January 1992 (AWC data per T. Mundkur *in litt.* 1998); **Byramangala reservoir**, three, January 1996 (AWC data per T. Mundkur *in litt.* 1998), two, January 1998 (Pittie 1998); **Marehalli tank**, 1995 (S. Sridhar and A. K. Chakravarthy *in litt.* 1995); **Bilikeri** (Belikere tank), 90, July 1996 (Rama 1996); in and around **Mysore**, Dlawai Kere, “a flotilla”, 1992 (Neginhal 1977b, 1997), **Karanji tank**, unspecified numbers, 1992 (Neginhal 1997), 30, February 1995 (A. J. Urfi verbally 1995), more than 100, 1995 (Anon. 1993b), apparently five nests in 1995 (K. Manu, Rajkumar and A. J. Urfi verbally 1995), and **Kukkarahalli tank** (University of Mysore), active colony in 1995 (Rajkumar 1996, Neginhal 1997b), 10 nests, 25 birds, 1997 (K. Manu verbally 1997), at least 100, also 1997 (AWC data per T. Mundkur *in litt.* 1998).

■ **Andhra Pradesh** The species previously nested on the banks of the Godavari, December 1882 (BMNH egg data), presumably near its delta, where colonies survive today. Foraging birds travel widely from this population centre, turning up regularly at many wetlands in the region. Records are from: **Kakrapally creek**, 36 in January 1991 (Johnson *et al.* 1993); Northern Circars, between **Chicacole** and Berhampore, breeding, undated (“Vagrant” 1868); **Vizagapatam** (Vishakhapatnam, Vizakapattinam), one, undated (specimen in BNHS, Abdulali 1968–1996) and Kondakarla, June 1944 (specimen in BNHS); **Coringa Wildlife Sanctuary**, undated (Anon. 1993b); **Kolleru lake**, a major feeding ground for the pelicans, 1946–1964 (Neelakantan 1949, Guttler 1979) and Kolleru plicanry (sometimes called Aredu-Sarapalle or Kolamaru), 1946 (Neelakantan 1949, see Remarks 2), c.3,000, January 1960 (Gee 1960), the colony disappearing around 1970 (Perennou and Santharam 1990); **Telineelapuram**, **Srikakulam district**, 60 nests, 1991 (K. M. Rao verbally 1993); **Krishna** (Kistna) **estuary**,

colony found, c.1990 (Perennou and Santharam 1990); **Uppalapadu**, Guntur district, one, January 1999 (Rao and Kumar 2000); Buchupalle, **Cuddapah district**, several hundred nests, March 1890 (Campbell 1902), but now vanished (SS); **Nelapattu tank**, Srikakulam district, 382 in January 1988 (V. J. Rajan *in litt.* 1988, Perennou and Santharam 1990), 863 in 1989 (Johnson *et al.* 1993), 100, undated (Nagulu and Rao 1990), 253 in 1990 (Johnson *et al.* 1993), 382, undated (V. Nagulu and J. Prashanth verbally 1994), 379 in January 1996 (AWC data *per* T. Mundkur *in litt.* 1998), 795 adults and 120 juveniles in March 1997 (Philip *et al.* 1998), c.350–400 in December 1997 (Pittie 1998); **Ethirpattu**, previously bred (SS), one, January 1988 (Perennou and Santharam 1990), and at Vedurapattu (apparently the same site: SS), six, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Pulicat lake**, 27, January 1988 (Perennou and Santharam 1990), February and March 1989 (BNHS ringing data), 274 in January 1990, 177 in January 1991 (Johnson *et al.* 1993), 346, 1992 (Rao and Mohapatra 1993), 21, August–September 1994 (Philip 1995), 500, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998), 95, January 1998 (Anon. 1998); **Sulluru marshes**, 21 in January 1988 (Johnson *et al.* 1993); **Tada**, undated (Whistler and Kinnear 1931–1937).

■ **Kerala** The species is a rare visitor to the state with records as follows: **Kole wetlands**, 12, January 1993 (in Talukdar 1999), an occasional migrant (Ravindran 1995), including Adat, one, January 1993 (Nameer 1993); **Akkulam**, undated (Nair 1994); **Trivandrum**, three, undated (Ferguson and Bourdillon 1903–1904).

■ **Tamil Nadu** This state hosts another breeding population with individuals wandering widely, especially in the non-breeding season, and visiting most suitable wetlands. Records are from: **Karikili Waterfowl Refuge**, small numbers, undated (Anon. 1993b); **Vedanthangal tank** (Vedanthangal Sanctuary), up to 50, 1950s (Sanjeeva Raj 1956), nesting, 1983–1984 (Santharam 1984a,b, Paulraj and Gunasekaran 1988), 102 adults, April 1986 (Paulraj and Gunasekaran 1988), 152, February 1993 (Venkatraman 1996), small numbers breeding in 1990s (Venkatraman and Muthukrishnan 1993); **Kaliveli tank**, up to 100, 1984–1985 (Pieter 1987), regularly 30–200 (Scott 1989), c.200, February 1987 (Perennou and Santharam 1990), four in January 1991 (Johnson *et al.* 1993); **Pondicherry** (Puduchcheri), listed without details by Perennou *et al.* (1990), and Perennou and Mundkur (1991, 1992); **Bhavanisagar reservoir**, four, 1987 (Anon. 1993b), 14, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); Sundaka Muthur lake, c.10 km from **Coimbatore**, 22 individuals, December 1999, and apparently becoming regular over previous two years (Kumar 2000); Vettakudi tank and **Karavetti Sanctuary**, 18, 1987 (Anon. 1993b), regularly recorded, seven pairs breeding in 1994, 42 individuals in May 1996 (Relton 1998); **Point Calimere**, Tanjore district, at Great Vedaranyam Swamp, 40, 1983 (V. I. Rajan *in litt.* 1995), 74, January 1987 (van der Ven 1987), 127 in January 1988 (Johnson *et al.* 1993), 62, January 1989 (Bose *et al.* 1989), 30, January 1994 (J.-C. Kovacs *in litt.* 1998), and 200–300 still regular in winter, late 1990s (Manakadan 1999); **Madurai tank**, 150 individuals thought probably to belong to this species, April 1997 (Sathasivam 1997), and indeed unlikely to be any other pelican; **Kullur Sandai tank**, 32 in January 1987 (Anon. 1993b, Johnson *et al.* 1993); Kanjirankulam, **Ramnad district**, apparently hundreds of nests, c.1972 (Abraham 1974), 115 nests around 1990 (G. S. Sanjay verbally 1993); **Chitrangudi tank**, 934 individuals, 100 nests, January 1988 (*Wetlands and Waterfowl Newsletter* 2 [1990]: 13, Johnson *et al.* 1993), 700 in January 1989, 286 in January 1991 (Johnson *et al.* 1993); **Vembakottai tank**, 22, January 1987 (Anon. 1993b, Johnson *et al.* 1993), 157, August–September, undated (Sudhakaran *et al.* 1993); **Ariyakulam**, 50 nests, 300 birds, undated, but presumed to be the early 1990s (G. Padmanabhan verbally 1993); **Thuthukudi** (Tuticorin), three, June 1996 (Wesley 1997); **Moonradaippu**, near Palayamkottai, breeding, early 1960s (Ganguli 1964), “small colony”, c.1974 (Abraham 1974); **Koonthakulam** (Kundukulam), Nangunery Taluk, Tirunelveli district, large colony, June 1906 (Rhenius 1907), fewer than ten nests, April 1944 (Webb-Peploe 1945), 2–3 nests, 1960 (Wilkinson 1961), c.30 nests, 1982 (V. J. Rajan *in litt.* 1988), apparently 1,000 birds, 1990 (Anon. 1993b),

200 nests, 1993 (G. S. Sanjay and V. Ragunatha verbally 1993), with nesting recently shifting to partially submerged *Acacia nilotica* trees in the nearby tank but now only occurring in years of heavy monsoon (SS); **Kanyakumari district**, regularly seen on small freshwater lakes (e.g. Theroor, Vembanur and Suchindrum), May–October 1995–1997 (S. H. M. Butchart *in litt.* 2000); **Karungulam** and Sengulum, six, 1987 (van der Ven 1987, Anon. 1993b); Viragasamuthram tank (untraced), 98 in January 1990 (Johnson *et al.* 1993).

■ **Bihar** The species is a vagrant to the state, with records (none recent) as follows: **Kamla, Madhubani**, Darbhanga district, September 1899 (Inglis 1901–1904, Abdulali 1968–1996), and (possibly the same record) in Darbhanga district, undated (Dagleish 1902); **Patna**, one apparently shot on the Ganges nearby, undated (E. A. D’Abreu in Whistler ms); Garhwa road, presumably in the vicinity of **Garhwa**, October 1947 (female in FMNH).

■ **Orissa** In general there have been very few observations of this species in the state, with a surprising flush of records by AWC volunteers in 1996. These are presumably correct and thus retained here. Records are from: **Ghodahada (Ghodahad) dam**, 28, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Bhitarkanika Wildlife Sanctuary**, Cuttack district, listed (Kar 1991), 24, July–October 1992 (Pandav 1996); **Dhulianali dam**–Manpur, 13, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Chilka lake**, breeding (given as “pelicans”, but presumably this species), undated (“Vagrant” 1868), March 1981–April 1984 (Hussain *et al.* 1984), 115, undated but thought to be 1993 (Anon. 1993b), 65, January 1987 (*Oriental Bird Club Bull.* 6[1987]: 36–40, Turin *et al.* 1987), 21 in January 1989 (Johnson *et al.* 1993), at Kalijai (Sect. 6), 15, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998), at Nalaban (Nalban, Nalabana) Sanctuary, 12, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998) and at Satpada, four, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Bhetanai Haja**, two, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Ongaito lake**, four, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Kanhei nala**, 15, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Mukundadev Sagar**, 12, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Pachi Cherugu Girisola**, four, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Mari tank**, Singipur (Singpur), three, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Jagannath Sagar**, four, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Badabandha Puduni**, four, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Balimela**, 11, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998).

■ **West Bengal** Only three records have been traced: **Calcutta**, undated (Blyth 1843–1844); **Salt lakes**, undated (Anon. 1969b); **Budge Budge (Buj Buj)**, one, March 1873 (Hume 1874a).

■ **Assam** An important breeding population survives in Assam, principally along the valley of the Brahmaputra, but with a few (including recent) records from Cachar. Records are from: Dhemaji district (not mapped), at Bordoloni (250+ in November 1994), Jamjing Reserve Forest, Sengajan Reserve Forest, Siang river near Koboghat, and Sonarighat, undated (Choudhury 2000c); 1.5 km west of **Hatighuli**, small numbers nesting in two *Bombax ceiba* trees, pre-1994 (Choudhury 1995b); **Burhi beel**, near Digaltarung, one male, January 1904 (Stevens 1914–1915); **Dibru-Saikhowa National Park**, large flocks in the 1970s and 1980s, small numbers reported nesting in a *B. ceiba* tree at Churke Chapori, pre-1994, with 28 observed to the north of this area, April 1994 (Choudhury 1995b), five near Kolia and singles near Koliapani and Motapung, April 1994 (Choudhury 1995b), four at Dighali-pathar, 1994 (Choudhury 1995b), and recorded in March 1998 (Hornbuckle 1998b); Tinsukia district (not mapped), on the Lohit river near Kukuamora Reserve Forest, Sadiya, 1990s (Choudhury 2000c); **Dighali bhil**, 15, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Jamjing beel**, one, January 1990 (Choudhury 1992b); **Dibrugarh**, one female, December 1902 (Stevens 1914–1915), one, April 1997 (J.-C. Kovacs *in litt.* 1998); **Ghilamara** (pelicanry), three nests, 1990 (Talukdar 1995b); **Bhimpoora beel**, Lakhimpur district, 1901–1911 (Stevens 1914–1915), and elsewhere in Lakhimpur district at Khaboli, Pabho Reserve Forest, and many localities in Dhakuakhana subdivision, 1990s (Choudhury 2000c), also Bordoibam-Bilmukh Sanctuary,



Lakhimpur district, undated (Choudhury 2000c); **Panidihing Sanctuary**, Sibsagar district, three fresh corpses found, January 1995 (Talukdar 1999) and singles on two dates, July 1987 (Choudhury 1991), 26, January 1990 (Johnson *et al.* 1993), c.500 in January 1995 (Choudhury 2000c), and elsewhere in Sibsagar district near Rajmai, 1990s (Choudhury 2000c); **Phokolai beel**, Sibsagar district, seven, March 1987 (Choudhury 1991); **Koabari Doloni Abhayaranya** (Kuarbari Dalani), 55, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); between Gaurisagar and **Dikhomukh**, Sibsagar district, two, August 1987 (Choudhury 1991, 2000c); Majuli pelicanry, on **Majuli island**, 11 nests, 1993 (Talukdar 1995b), 14 nests, 1995–1996 (Talukdar 1999), and at many sites in the Majuli area, Jorhat district, 1990s (Choudhury 2000c); Subansiri river, below **Badati** (Boduti), “numbers”, January 1911 (Stevens 1914–1915); **Misamari beel**, Sonitpur district, 14, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998), and elsewhere in this district at Burhachapori Wildlife Sanctuary (Choudhury 2000c); **Manas National Park** (Manas Sanctuary), regularly “about a hundred”, 1950s or 1960s (Gee 1960), undated (Anon. 1969, 1993a), April 1971 (Aarestrup *et al.* 1971), apparently no recent reports; **Orang National Park** (including Orang Velajar pelicanry), Darrang district, 45 nests in 1990 (Das 1991), 39 nests in 1993, 42 nests in 1994 (Talukdar 1995b), 23 nests, 1995–1996 (Talukdar 1999); **Kaziranga National Park**, well over 1,000 pelicans, presumably this species, January 1935 (Neog 1951), “several hundreds” on one jheel, December 1950 (Gee 1960), 80, January 1971 (Inskipp 1971), 20, January 1983 (G. Ouweneel *in litt.* 1999), 600 nests in 1984–1985 at Kaladur pelicanry and c.1,500 individuals counted at Debeswari (Das 1991), apparently 2,200 in January 1990 (Johnson *et al.* 1993), over 400 individuals at Sohola, December 1993 (J. C. Kovacs *in litt.* 1998), 400–500 in 1993–1995 (Bhattacharjee *et al.* 1996), 200, February 1994 (Alström *et al.* 1994c), 516, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998), 314 nests, 1995–1996 (Talukdar 1999), c.1,000, March 1996 (Talukdar 1999), 10–15, March 1997 (H. Hendriks *in litt.* 1999), also observed at Baguri, December 1993 (J.-C. Kovacs *in litt.* 1998), and 155 nests at Kaladur pelicanry in 1990 (Das 1991); **Rupahi Pathar**, four, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Jengdia beel**, Kamrup district, two, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Pobitora** (Pabitora) **Wildlife Sanctuary**, Nagaon (Nowgong), six nests in both 1988 and 1991 (Das 1991, Talukdar 1995b, 1996), 10, February 1998 (Hornbuckle 1998b), two nests, 1995–1996 (Talukdar 1999), 11, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998); **Deepor beel** (Deepar), one, January 1993, but “very rare” at the site (Barman *et al.* 1995); **North Cachar Hills district**, undated (Baker 1894–1901), with an egg listed in a collection from the district (*J. Bombay Nat. Hist. Soc.* 7: 251) perhaps coming from nearby, towards the Brahmaputra; Hailakandi district (not mapped), one in Mahmodpur, 1963, and one near Hasiura in 1980s (Choudhury 2000c), and also in the adjacent Karimganj district, one at Angang beel, near Mohakol, 1992 (Choudhury 2000c); Bogi Dubha and Mongla Duba (untraced), 20, January 1996 (AWC data *per* T. Mundkur *in litt.* 1998).

■ **Manipur** There are few records, as follows: **Logtak lake**, almost 100, pre-1881 (Hume 1888), undated Manipur records presumably from this locality around 1930 (Higgins 1933–1934), although this site is now considered unsuitable (Scott 1989).

■ **NEPAL** The species is currently an uncommon non-breeding visitor, found regularly in only two associated localities. Records are from: **Kathmandu valley**, one, April of an unknown year (Hodgson 1829a, 1844); **Kosi Tappu Wildlife Reserve**, numerous records of small numbers (maximum seven) since at least 1989, spanning February to May, with stragglers until October (e.g. Curson and Bose 1989, Pickering 1990, Fourage 1993, *Nepal Birdwatching Club Newsletter* 2, 1 [1993]: 2, Wheeldon 1995, Zerning and Braasch 1995, Daulne and Goblet 1996, H. S. Baral *in litt.* 1997); **Kosi barrage**, numerous observations in recent years (since 1979, although none between 1986 and 1994), all in February–May, highest record of c.120, March 1996 (Davidson and Heywood 1996, *Bird Conserv. Nepal Newsletter* 5, 3 [1996]: 1–2),

otherwise fewer than 12 (e.g. Redman and Murphy 1979, Lister 1979, Mills and Preston 1981, Grimmett 1982, Turton and Speight 1982, Inskipp and Inskipp 1982, Robson 1982, Alström and Olsson 1983, Harrap 1985, Heath 1986, Buckton and Morris 1990, Cottridge 1994, Mackenzie 1994, Zerning and Braasch 1995).

■ **BANGLADESH** The species was listed by Rashid (1967) as a winter visitor to coastal regions, possibly also occurring in the north-east lowlands (but see Remarks 2 under Manipur Bush-quail *Perdica manipurensis*). This was a rather optimistic synopsis, as there have only been one or two recent non-breeding records (untraced) and the species is considered a vagrant to the country (Talukdar 1995b, P. M. Thompson *in litt.* 1997). It has been listed from the Sundarbans area (Anon. 1969), and described as a rare migrant there historically (Sarker and Sarker 1986); but no primary records have been traced, and the locality is therefore not mapped. Harvey (1990) mentioned a 1985 record from Bangladesh without locality. Records are from: **Sylhet**, a breeding colony reported, undated (Baker 1922–1930); **Faridpur** (Furreedpore), “a few” in a flock of White Pelicans, February 1878, and five flying over, April 1878 (Cripps 1878); **Kukrimukri**, undated (Khan 1982).

■ **SRI LANKA** The Spot-billed Pelican is distributed throughout the dry zone of the island wherever suitable habitat exists, such as tanks or coastal lagoons. Individuals seen in the wet zone (e.g. at Kandy lake in Kandy, or Beira lake and Colombo Zoo in Colombo) almost certainly derive from captive stock (U. Ekanayake verbally 1999); records for these sites are thus not included. Flocks visiting Bellanwila–Attidiya may also be from feral populations (S. W. Kotagama *in litt.* 2000). Records are from: **Kopay causeway**, one, March 1989 (*Ceylon Bird Club News* March 1989); **Jaffna**, 12, April 1995 (*Ceylon Bird Club News* April 1995), 3, March 1995 (*Ceylon Bird Club News* March 1995), and at unspecified localities in the Jaffna Peninsula, January 1989 (*Ceylon Bird Club News* January 1989), 40, July 1995 (*Ceylon Bird Club News* July 1995), and in the Puttur area, 100, March 1999 (*Ceylon Bird Club News* March 1999); **Giant’s Tank Sanctuary**, Talaimannar, one, January 1978 (D. Griffin *in litt.* 1999), undated (Ranasinghe 1982); **Padawia**, a large colony once present until the site apparently dried up (E. Layard in Legge 1880); **Trincomalee** area, 102, January 1995 (Hoffmann 1995); **Wilapattu National Park** (Wilpattu), Maradanmaduwa tank, 40 nests in several trees at the western edge, 1984–1986 (*Ceylon Bird Club News* May 1986), March 1987 (*Ceylon Bird Club News* March 1987), undated (Kotagama *et al.* 1989); **Pothana Wewa**, four, April 1997 (*Ceylon Bird Club News* April 1997); **Kanadarawa tank**, Mihintale, six, January 1978 (D. Griffin *in litt.* 1999); **Kirimundel**, one on a sand spit, January 1988 (*Ceylon Bird Club News* January 1988); **Somawathiya National Park**, May 1989 (*Ceylon Bird Club News* May 1989); **Habarana**, three, July 1997 (*Ceylon Bird Club News* July–August 1997); **Kala Wewa**, large flocks during the dry months, unspecified year (Munasinghe 1988), 37 in January 1991 (Johnson *et al.* 1993), July 1991 (*Ceylon Bird Club News* July 1991); **Giritale Wewa**, near Dambulla, “many”, December 1979 (S. J. M. Blaber *in litt.* 1999), presumably in this area at “Giritale”, June 1990 (*Ceylon Bird Club News* June 1990), and two at Giritale tank, August 1995 (H. Matthews *in litt.* 1999); **Katnoruwa tank**, 23 in January 1991 (Johnson *et al.* 1993); near **Sigiriya**, 20–25, January 1996 (H. Hendriks *in litt.* 1999); **Polonnaruwa**, at least 18, November 1993 (*Ceylon Bird Club News* November 1993), more than 50, January 1996 (H. Hendriks *in litt.* 1999), eight, December 1998 (*Ceylon Bird Club News* December 1998); **Kandalama tank**, near Dambulla, two, August 1995 (H. Matthews *in litt.* 1999); **Mundel–Puttala–Kalipitiya**, January 1990 (*Ceylon Bird Club News* January 1990), and almost 100, January 1997 (*Ceylon Bird Club News* January 1997), also Puttalam lagoon, undated (Kotagama *et al.* 1989), including Puttalam Chilaw freshwater area, 17, January 1995 (Hoffmann 1995); **Wasgomuwa**, February 1998 (*Ceylon Bird Club News* February 1998); **Naula reservoir**, one, September 1995; **Maduru Oya National Park**, 50, April 1988 (*Ceylon Bird Club News* April 1988), breeding population, undated (Kotagama *et al.* 1989), many,

January 1986 (*Ceylon Bird Club News* January 1986), 2,100 in January 1991 (Johnson *et al.* 1993); **Burutagolla**, 13, February 1993 (*Ceylon Bird Club News* February 1993); **Tabbowa Wewa**, 11, January 1992 (*Ceylon Bird Club News* January 1992); **Usgala Siyambalangamuwa tank**, 81 in January 1990 and eight in January 1991 (Johnson *et al.* 1993); **Ampara**, one, February 1988 (*Ceylon Bird Club News* February 1988), 15, February 1998 (*Ceylon Bird Club News* February 1998); **Gal Oya National Park**, at Senanayake Samudra, undated (Kotagama *et al.* 1989), and Ekgal Aru, undated (Ranasinghe 1982); **Lahugala tank** undated (Kotagama *et al.* 1989), 100, March 1990 (*Ceylon Bird Club News* March 1990); **Bellanwila–Attidiya marshes**, eight, February 1988 (*Ceylon Bird Club News* February 1988), two, October 1988 (*Ceylon Bird Club News* October 1988), 63, December 1989 (*Ceylon Bird Club News* December 1989), 43, January 1989 (*Ceylon Bird Club News* January 1989), December 1990 (*Ceylon Bird Club News* December 1990), several, September 1991 (*Ceylon Bird Club News* September 1991), one, January 1995 (R. Skeen *in litt.* 1999), 10, January 1996 (H. Hendriks *in litt.* 1999), October 1997 (*Ceylon Bird Club News* October 1997), three, July 1997 (*Ceylon Bird Club News* July–August 1997) and Boeaesgamuwa, on the Bellanwila side of the paddyfields, 36, October 1990 (*Ceylon Bird Club News* October 1990); **Handapanagala Wewa**, two, May 1992 (*Ceylon Bird Club News* May 1992); **Yala East National Park**, undated (Kotagama *et al.* 1989), 20, February 1992 (D. Richardson *in litt.* 1999), more than 140, December 1995 (H. Hendriks *in litt.* 1999); **Uda Walawe National Park**, small numbers, June 1988 (*Ceylon Bird Club News* June 1988), April 1993 (*Ceylon Bird Club News* April 1993), November 1998 (*Ceylon Bird Club News* November 1998), April 1998 (*Ceylon Bird Club News* April 1998); **Ruhuna (Yala) National Park**, at Mahasilawa lagoon, 50 in January 1989 and 21 in January 1991 (Johnson *et al.* 1993), at Palatupana, 40 in January 1989, and at Walas, 29 in January 1990 (Johnson *et al.* 1993), at Pilinawa, Block II, 103 in January 1991 (Johnson *et al.* 1993), 110 nests, February 1992 (*Ceylon Bird Club News* February 1992) and Kumana Sanctuary, at which breeding is reported without further details (Ranasinghe 1982), and the species is “fairly common” (Denholm and Denholm 1985), although only three were found in March 1991 (*Ceylon Bird Club News* March 1991); **Kemagala**, 250 in January 1988, 14 in January 1989 (Johnson *et al.* 1993); **Lunugamvehera**, at least 60, August 1991 (*Ceylon Bird Club News* August 1991); **Chandrika Wewa**, six, January 1989 (*Ceylon Bird Club News* January 1989); **Wilapala Wewa**, a large flock, August 1986 (*Ceylon Bird Club News* August 1986), 8–10, June 1987 (*Ceylon Bird Club News* June 1987), February 1988 (*Ceylon Bird Club News* February 1988), 16, January 1986–1988 (Kotagama *et al.* 1989), November 1991 (*Ceylon Bird Club News* November 1991), at least 20, July 1991 (*Ceylon Bird Club News* July 1991); **Tissamaharama** (Tissa, at Tissa Wewa tank), within the Tissa–Wirawila Sanctuary, 2–25, January 1998–1991 (Johnson *et al.* 1993), May 1993 (*Ceylon Bird Club News* May 1993), more than 100, December 1995 (H. Hendriks *in litt.* 1999); **Yoda Wewa tank**, 4–40 January, 1989–1991 (Johnson *et al.* 1993); **Wirawila Wewa**, within the Tissa–Wirawila Sanctuary, 10, January 1987 (Kotagama *et al.* 1989), 41 or 50, January 1989 (*Ceylon Bird Club News* January 1989, Johnson *et al.* 1993), 8–23 in January 1990–1991 (Johnson *et al.* 1993); **Uduwila tank**, near Tissamaharama, breeding, undated (Legge 1880); **Palatupana Maha Lewaya**, three, January 1988 (*Ceylon Bird Club News* January 1988), undated, but presumably in the 1990s (Wijeyeratne *et al.* 1997); **Maha Lewaya lagoon**, 450 in January 1988 (Kotagama *et al.* 1989), 1,256 in October 1995 (de Silva 1997); **Ridiyagama tank**, three in January 1987, 150 in January 1990 and five in January 1991 (Johnson *et al.* 1993); **Bundala National Park**, including “Bundala Lewaya”, occasionally in very large groups—e.g. an “unusually large number” in July 1986 (*Ceylon Bird Club News* July 1986), an “astonishing number” (c.2,000) in August 1986 (*Ceylon Bird Club News* August 1986), c.3,000 in January 1989 (Johnson *et al.* 1993) and 970 in January between 1986 and 1988 (Kotagama *et al.* 1989)—but otherwise more modestly—e.g.100, undated (*Ceylon Bird Club News* December 1985), 400, September 1986 (*Ceylon Bird Club News* September 1986), 200, February 1987 (*Ceylon Bird Club News* February 1987), 300, July 1987 (*Ceylon*

*Bird Club News* July 1987), 38, undated (Hoffmann 1987), 600–700, February 1990 (*Ceylon Bird Club News* February 1990), 20, December 1991 (*Ceylon Bird Club News* December 1991), 125, May 1992 (*Ceylon Bird Club News* May 1992), 150, January 1993 (*Ceylon Bird Club News* January 1993), 53, February 1997 (*Ceylon Bird Club News* February 1997) c.200, July 1998 (*Ceylon Bird Club News* July 1998), 33, January 1998 (*Ceylon Bird Club News* January 1998); **Pallemalala Sanctuary** (at Malala Lewaya, Embilikala Kalapuwa and Embilikala Lewaya), in Bundala National Park, undated (Ranasinghe 1982), 110, undated (Hoffmann 1987), in “such large numbers it was not possible to keep a record”, September 1987 (*Ceylon Bird Club News* September 1987), 10–155 in January, 1989–1991 (Johnson *et al.* 1993), four seen March 1990 (*Ceylon Bird Club News* March 1990), seven, December 1990 (*Ceylon Bird Club News* December 1990), 17, January 1997 (*Ceylon Bird Club News* January 1997; also de Silva 1999); **Koholankalla Lewaya**, 12, undated (Hoffmann 1987), 78, January 1988 (*Ceylon Bird Club News* January 1988), 68, December 1990 (*Ceylon Bird Club News* December 1990); **Karagan Lewaya**, Hambantota, 29, undated (Hoffmann 1987), 425 in January 1987 (Johnson *et al.* 1993), 300–400, October 1992 (*Ceylon Bird Club News* October 1992), 164, January 1998 (*Ceylon Bird Club News* January 1998); **Mahasittarakala**, at least 40, May 1992 (*Ceylon Bird Club News* May 1992), 18, January 1998 (*Ceylon Bird Club News* January 1998); **Kalametya Kalapuwa Sanctuary** (Kalametya and Lunama Kalapuwa lagoons), undated (Kotagama *et al.* 1989), 60, December 1986 (*Ceylon Bird Club News* December 1986), 272 in January 1987 (Hoffmann 1987, Johnson *et al.* 1993), 78 in January 1988, seven in January 1989, 102 in January 1990 and 27 in January 1991 (Johnson *et al.* 1993), breeding colony present, June 1997, with 17 birds in January 1998 (*Ceylon Bird Club News* January 1998); **Tangalla marshes**, 5–28, January, 1989–1991 (Johnson *et al.* 1993); Pimbuettawa tank (untraced), 252 in January 1991 (Johnson *et al.* 1993); Buduruvagala (untraced), April 1998 (*Ceylon Bird Club News* April 1998); Deberagaswala (untraced), small numbers, July 1995 (*Ceylon Bird Club News* July 1995); Gunaparam (untraced), December 1882 (BMNH egg data; see Remarks 7); banks of Mahweliganga (untraced), March 1931 (BMNH egg data); Colombo Zoo (not mapped), minimum of 22 birds with some nests and full-grown nestlings, July 1994 (J. del Hoyo *in litt.* 1999), 30+ free-flying birds, January 1995 (R. Skeen *in litt.* 1999), but probably a feral population.

■ **MYANMAR** The Spot-billed Pelican once ranged widely throughout Myanmar, breeding in huge numbers in at least one area (Baker 1922–1930), but in one of the most extraordinary reversals of fortune for any Asian bird species it is no longer known to breed and seems only to occur in the country in small numbers (Smythies 1986). Records are from: near **Myitkyina**, c.10, February 1935 (Stanford and Ticehurst 1938–1939), undated (Stanford 1954); near **Chaungwa**, in the Indaw valley, “a large flock”, February 1934 (Stanford and Ticehurst 1938–1939); **Indawgyi lake** (Indawngyi), Moe Hnyin township, Kachin, six, August 1997 (Khin Ma Ma Thwin *in litt.* 1997); **Hokat jheel**, 300–400, April 1936 (Stanford and Ticehurst 1938–1939, Stanford 1954); east bank of the Irrawaddy (=Ayeyarwady) near **Sangin**, in hot weather, unspecified year (Stanford and Ticehurst 1938–1939); above the **Great Defile**, along the Irrawaddy, April 1939 (Stanford 1954), and presumably in this area, pairs or small parties on the Irrawaddy, July 1935, May–June 1936 (Stanford and Ticehurst 1938–1939); above **Kindat**, Chindwin, undated (Hopwood 1908); Mahananda tank, **Shwebo** district, single, July 1932 (Roseveare 1949); **Wetlet tank**, Shwebo district, one in July 1933, three in September 1933, one in October 1933, one in January 1934 (Roseveare 1949), several, June 1936 (Stanford 1938); **Myingyan district**, year-round, before 1906 (Macdonald 1906); **Naf river**, occasional individuals, throughout the year, 1943–1945 (Christison *et al.* 1946), and generally in Arakan, 1909–1910 (Hopwood 1912b); **Paunglin lake**, up to three, June–October, 1934–1937 (Roseveare 1952); Wethigan lake, **Minbu district**, up to three, June–October, 1934–1937 (Roseveare 1952); **Pyinmana**, “a party”, November 1939 (Smith 1942); **Toungoo**, December 1875 (specimen in NMS); **Daiktu** (Daiku), on the right bank of the Sittang river, undated

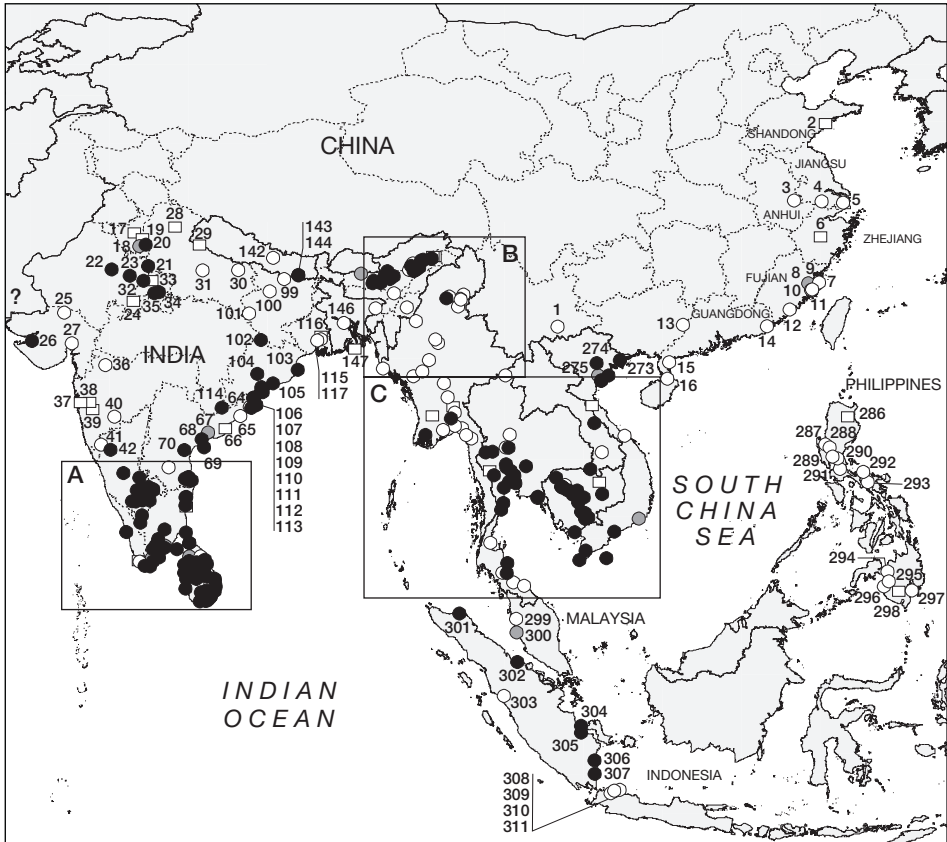
(Stanford 1954); **Shwegyin** (Shwaygheen), on the Sittang plain, at Sein Kwa (30 km due west) and downriver at Kadat, Pegu state (Bago), “millions”, November 1877 (Oates 1877, 1878), also Paungdawtha, near Shwegyin, November 1910 (Baker 1932–1935, BMNH egg data), 1935 (Stanford and Ticehurst 1935a), but not subsequently; lake between **Tharawaw** and Letpadan townships, Pegu, undated (Khin Ma Ma Thwin *in litt.* 1997); **Mohingyi Wetland Sanctuary**, Pegu, two, July and November 1997 (Khin Ma Ma Thwin *in litt.* 1997), apparently c.20–30 present annually in June–October, late 1990s (U That Htun verbally 2000) and Hpalank Kwin, north-east of Mohingyi Wetland Sanctuary, seven, 1997 (Khin Ma Ma Thwin *in litt.* 1997); **Sittang estuary**, at Theinchaung, “a number”, July 1939, and c.25 birds, July 1940 (Smith 1942); **Thaton**, c.50 collected at various localities in the area (e.g. Thainchake, Kaidaik, Cokdoh, Isar Choung, Nounghpoo, Hnekthie, Zankalee), August–November 1877 (30 specimens in BMNH, Hume and Davison 1878); **Yangon** (=Rangoon), 1874, April, pre-1895 (two specimens in BMNH); **Salween** (=Thalwin) **river**, “above Manburain”, March 1877 (male in BMNH); **Irrawaddy** (=Ayeyarwady) **delta**, 28, August 1996, and an individual collected from the same area around that time by Yangon zoo authorities (Barzen *et al.* 1996); **Kyaikhto** (“Khyketo”), collected, undated (Hume and Davison 1878).

■ **THAILAND** The species was formerly widely distributed from the marshes of the far north (Chiang Rai basin), throughout the Central Plains and along both coasts of the peninsula to the extreme south (Deignan 1963). Medway and Wells (1976) listed it for the peninsular provinces of Surat Thani, Nakhon Si Thammarat, Phatthalung, Trang and Songkhla. It has largely disappeared from its historical range, however, and is today known only from occasional migrant or wandering individuals. Two feral populations have recently become established in Bangkok and Chon Buri province (see Population). Records are from: **Chiang Saen**, Chiang Rai province, August 1914 (Gyldenstolpe 1916, specimens in NRM), but no records in May 1936, before the start of the rains (Deignan 1945) or during frequent visits since 1980, chiefly December–January (P. D. Round *in litt.* 1998); **Tha Law**, reportedly “very common” although only one pair observed, undated (Gyldenstolpe 1913); **Bung Boraphet**, Nakhon Sawan, four, May 1984 (*Oriental Bird Club Bull.* 1 [1985]: 24–28), eight in August 1988 (D. Ogle *per* P. D. Round *in litt.* 1998), one, March 1994 (P. Waithyakul *per* P. D. Round *in litt.* 1998), two, July 1997 (*Oriental Bird Club Bull.* 27 [1998]: 61–66, *Bird Conserv. Soc. Thailand Bull.* 14, 10 [1997]: 15), 6–8, February 1998 (H. Hendriks *in litt.* 1999), two, July 1998 (*Oriental Bird Club Bull.* 27 [1998]: 61–66); **Nakhon Sawan** (Paknampho), given as “Kansowan”, c.150, undated (Schomburgk 1864); **Huai Kha Khaeng Wildlife Sanctuary**, Uthai Thani, four roosting overnight in dry dipterocarp forest near Khao Nang Rum Wildlife Research Station, January 1983 (P. D. Round and U. Treesucon *in litt.* 1998), five flying over the same area, October 1987 (*Bangkok Bird Club Bull.* 4, 11 [1987]: 10–11); **Thung Yai Naresuan Wildlife Sanctuary**, Kanchanaburi/Tak provinces, one shot, August 1984 (P. D. Round *in litt.* 1998); **Bung Lahan**, Phachi district (Ayutthaya), 17 individuals flying over, November 1991 (*Bangkok Bird Club Bull.* 9, 1 [1992]: 10–11); **Khao Peng Ma** (Maa) (eastern border of Khao Yai National Park), Nakhon Ratchasima, Wang Nam Khieo district, one flying east, October 1997 (*Bird Conserv. Soc. Thailand Bull.* 15, 1 [1998]: 14–15); Darn Chang, **Suphan Buri**, one shot, September 1986 (*Bangkok Bird Club Bull.* 3, 9 [1986]: 14–15); **Sena district**, Ayutthaya, five, November 1990 (*Bangkok Bird Club Bull.* 8, 1 [1991]: 11–12); **Sai Yoke Noi**, Kanchanaburi province, reportedly a vagrant or passage migrant, unspecified records (P. D. Round *in litt.* 1998); **Wat Sadet**, Pathumthani, four, January 1994 (*Bird Conserv. Soc. Thailand Bull.* 11, 3 [1994]: 11); **Rangsit**, immediately to the north of Bangkok, two, February 1989 (*Bangkok Bird Club Bull.* 6, 5 [1989]: 11); **Ban Tha Sadet**, Suphanburi, occasional recent records (P. D. Round *in litt.* 1998); **Samut Sakhon** (Inner Gulf of Thailand), “great flocks”, end of April and beginning of May, c.1910 (Gyldenstolpe 1913), four seen during an aerial survey, October 1984 (Starks 1987), and presumably again at Phetburi in

the same month (*Oriental Bird Club Bull.* 1 [1985]: 24–28), and at Langjan, eight flying in off the sea, October 1988, with one later shot around Samut Sakhon (*Bangkok Bird Club Bull.* 5, 11 [1988]: 10); **Bang Pu**, Samut Prakan, one, February 1989 (*Bangkok Bird Club Bull.* 6, 4 [1989]: 11–12); **Ban Laem**, Wat Khao Takhrao, Phetchaburi, c.20 amongst 200 Painted Storks *Mycteria leucocephala*, September 1998 (A. Wattanayut *per* P. D. Round *in litt.* 1998, *Oriental Bird Club Bull.* 31 [2000]: 49–57), 17 in September 1999 (*Bird Conserv. Soc. Thailand Bull.* 16, 10 [1999]: 18–19); **Chanthaburi**, two perched in town, November 1993 (R. Harwood *per* P. D. Round *in litt.* 1998); **Wat Phai Lom**, five roosting with the waterbird colony, in December 1987–February 1988 (*Bangkok Bird Club Bull.* 5, 2 [1988]: 10), 11, November 1995 (Wachara Sangualsombat *per* P. D. Round *in litt.* 1998); **Khao Cha-Ngok**, Nakhon Nayok, 20 flying over in May 1999 (*Bird Conserv. Soc. Thailand Bull.* 16, 9 [1999]: 15); **Khao Sam Roi Yot National Park**, Prachuap Khirikhan, two, January–March 1988 (*Bangkok Bird Club Bull.* 5, 5 [1988]: 9), *Oriental Bird Club Bull.* 8 [1988]: 32–36); **Wa Ko**, **Prachuap Khirikhan**, two, November 1998 (*Bird Conserv. Soc. Thailand Bull.* 16, 1 [1999]: 13); **Kanduli**, Surat Thani (=Bandon), August 1918 (male in BMNH); **Pak Phanang** (at Laem Talumphuk Non-Hunting Area), Nakhon Si Thammarat, one female collected, August 1924 (P. D. Round *in litt.* 1998), and 26 present in August 1988 (Round *et al.* 1988); **Songkhla lake** (Thale Sap Non-Hunting Area), September 1913 (specimen in BMNH), “common”, undated (Robinson 1927); **Thale Noi Non-Hunting Area**, Phatthalung province, formerly common (Robinson 1927), now a rare visitor, singles in July and September 1979 (Wells 1999), June 1994 (J. W. K. Parr verbally 1996); **Singora**, undated (Williamson 1915, Robinson and Chasen 1936); **Pattani bay**, “hundreds”, 1901 (Annandale and Robinson 1903 in Wells 1999), “common”, undated (Robinson 1927).

■ **LAOS** Historical reports suggest that the species was a seasonal visitor to the Mekong, its tributaries and associated wetlands in southern Laos (Engelbach 1932). This is perhaps still the case for wandering individuals from the Cambodian population, but relatively few recent surveys have focused on the Mekong area. Records are from: Mekong lowlands (not mapped), southern provinces, groups of 4–5, June, unspecified years (Engelbach 1932); **Hin Namno NBCA**, a bird shot nearby in November 1997 (Duckworth *et al.* 1999); **Xe Don**, pairs or singles on this river and on neighbouring lakes, August, unspecified years (Engelbach 1932); **Dong Khanthung proposed NBCA**, two injured birds found pre-1997, a captive bird in Pakxe in June 1997 reputedly being one of these (Thewlis *et al.* 1998).

■ **CAMBODIA** This species occurs primarily around the Tonle Sap lake as a breeding species, and throughout the Mekong floodplain as a wet-season visitor in small numbers. Away from Tonle Sap it has been recorded from Banteay Meanchay, Kandal, Takeo, Prey Veng and as far as Stung Treng (Sun Hean *et al.* 1998, C. M. Poole *in litt.* 1999). Records are from: **Ang Trapeang Thmor Reserve**, Banteay Meanchay, two, June 1998, and 16, August 1998 (Veasna 1998b), 88, January 2000 (Goes 2000b); **Stung Treng**, unspecified and undated reports (Sun Hean *et al.* 1998, C. M. Poole *in litt.* 1999); **Siem Reap**, December 1907 (male in NRM), December 1927 (specimen in BMNH), July 1938 (Eames and Ericson 1996); **Prek Da**, three pelican chicks reportedly collected from a colony and reared in Phum Prek Toal in 1994 (Mundkur *et al.* 1995a), maximum count of 1,500 adults and juveniles, March 1996 (Parr *et al.* 1996), at “Prek Da North”, up to 600 birds at colony, May 1998, falling to zero in July 1998 (Goes *et al.* 1998b), at “Prek Da South”, none in May but 80 in June 1998 (Goes *et al.* 1998b); **Prek Toal**, Battambang, 16 flying over nearby village (given as Phum Prek Toal) with “other storks”, March 1994 (Mundkur *et al.* 1995a), c.125 flying nearby (given as Prek Preah Dam Chheu), April 1994 (Mundkur *et al.* 1995a), c.500 pairs in the area (Parr *et al.* 1996, Sun Hean *in litt.* 1997), c.2,430, March–April 1997 (Ear-Dupuy *et al.* 1998); **Prek Spot**, 277, June 1998 (Goes *et al.* 1998b); **Prek Preah Dam Chheu**, 50, March 1996 (Parr *et al.* 1996), c.1,500 overhead, March 1996 (Parr *et al.* 1996); **Tonle Sap lake**, including a flock of

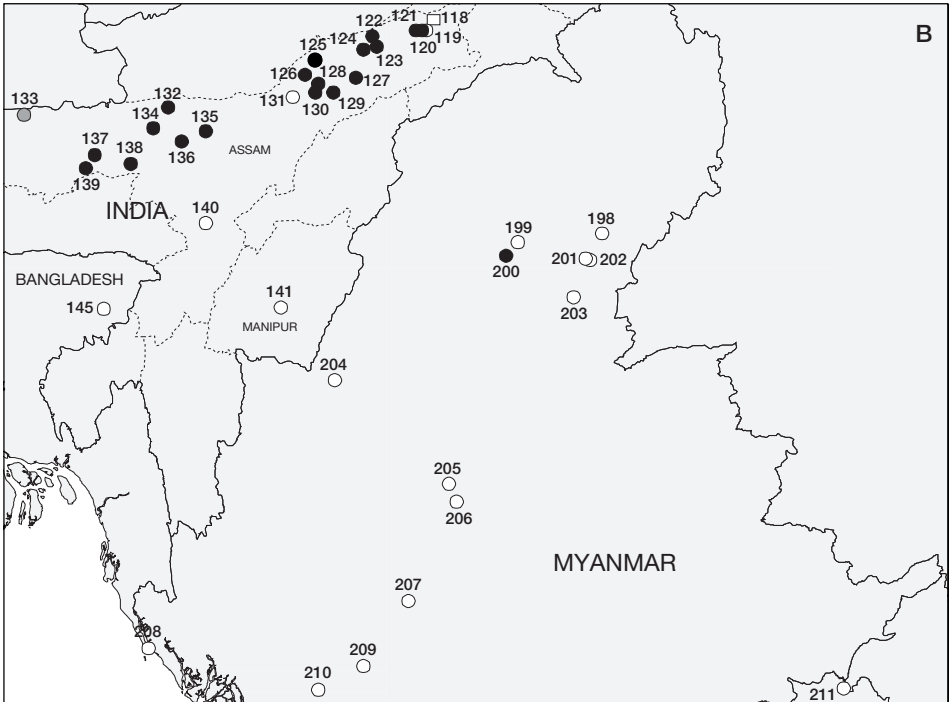
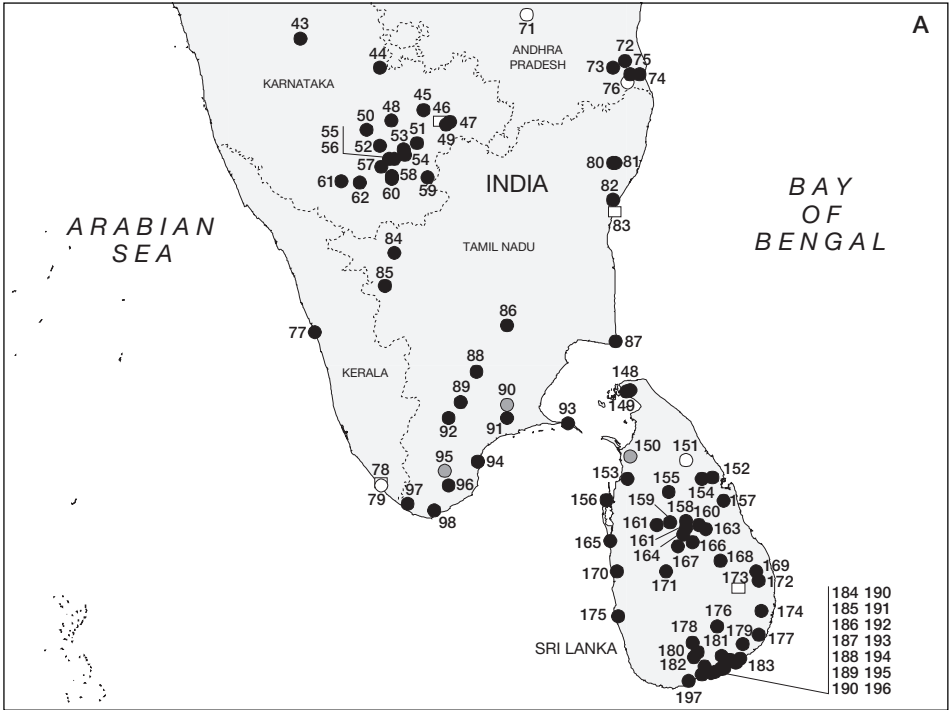


c.1,000 10 km west of the lake in Kampong Chhnang province, December 1992 (Scott 1992), 55 in flight over the north shore, December 1992 (Scott 1992), three major colonies reported without further details (Archibald 1992), at least 1,160 in the southern portion of the lake and adjacent Bassac marshes, November–December 1992 (Scott 1992), while on the lake itself c.1,470 were counted in a dense feeding flock, May 1998 (Goes *et al.* 1998b), the species ascending smaller rivers during high water (Thomas 1964); **Saang district**, Kandal, in the Mekong floodplain, two, June and October 1995, one, September 1997 (Goes 1999a); **Moat Khla**, 50 km south-west of Siem Reap town, frequent visitor, breeding suspected but unconfirmed (Sun Hean *in litt.* 1997); **Boeng Chhma**, 22 in the south-western corner of the lake and seven in the south-eastern corner, February 1996 (Parr *et al.* 1996), 993, June 1998 (Goes *et al.* 1998b); **Phnum Kraom** (Khraom), two, March 1994 (Mundkur *et al.* 1995a); **Tang Krasang river**, one, May 1999 (Veasna 1999); **Kampong Chhnang**, at Chhunuk Tru, three, April–June 1993 (Carr 1993), 106 soaring overhead in 1994 (Mundkur *et al.* 1995a), with a flock of 1,800–2,000 (including “considerable numbers of juveniles”) reported feeding in this area in April 1994 (*Oriental Bird Club Bull.* 20 [1994]: 55–61, Mundkur *et al.* 1995a) and birds reported by locals to breed on hills to the north although no colonies were observed during aerial surveys in 1994 (Mundkur *et al.* 1995a); **Basset marshes**, Kompong Speu, 3–6, September 1997, regular visitor in the wet season, 1990s (C. Poole *in litt.* 1999); **Boeng Veal Samnap**, in the four-arms plain, Kandal, 2–5, January–February 1996 (Edwards 1996), regular

**The distribution of Spot-billed Pelican *Pelecanus philippensis* (map opposite):** (1) Mengzi; (2) Qingdao; (3) Wuhu; (4) Tai Hu; (5) Shanghai; (6) unspecified locality; (7) Mazu Dao; (8) Fuzhou; (9) Meihua; (10) Fuqing; (11) Haikou; (12) Xiamen; (13) Wuzhou; (14) Shantou; (15) Zhanjiang bay; (16) Haikou; (17) Rohtak district; (18) Sultanpur National Park; (19) Delhi; (20) Okhla; (21) Keoladeo National Park; (22) Sambhar lake; (23) Lalsot; (24) Kota district; (25) Deesa; (26) Lakhota lake; (27) Khambhat; (28) Corbett National Park; (29) Dudwa National Park; (30) Gorakhpur district; (31) Lucknow; (32) National Chambal Sanctuary; (33) Morena district; (34) Karera Bustard Sanctuary; (35) Madhav National Park; (36) Dhule; (37) Mulshi lake; (38) Khadakwasla; (39) Bhatghar; (40) Pandharpur; (41) Belgaum; (42) Dharwad; (43) Sule Kere tank; (44) Sira; (45) Madure Kere tank; (46) Dodda Gubbi tank; (47) Hoskote tank; (48) Kunigal Dodda Kere; (49) Yellamallappa Shetty tank; (50) Kokkare Bellur; (51) Nelligudda tank; (52) Bolare Koppalu; (53) Kanva reservoir; (54) Channapatna tank; (55) Maddur tank; (56) Tailur tank; (57) Guntlukere; (58) Malavalli tank; (59) Byramangala reservoir; (60) Marehalli tank; (61) Bilikeri; (62) Mysore; (63) Kakarapally creek; (64) Chicacole; (65) Vizagapatam; (66) Coringa Wildlife Sanctuary; (67) Kolleru lake; (68) Srikakulam district; (69) Krishna estuary; (70) Uppalapadu; (71) Cuddapah district; (72) Nelapattu tank; (73) Ethirpattu; (74) Pulicat lake; (75) Sulluru marshes; (76) Tada; (77) Kole wetlands; (78) Akkulam; (79) Trivandrum; (80) Karikilli Waterfowl Refuge; (81) Vedantihal tank; (82) Kaliveli tank; (83) Pondicherry; (84) Bhavanisagar reservoir; (85) Coimbatore; (86) Karavetti Sanctuary; (87) Point Calimere; (88) Madurai tank; (89) Kullur Sandai tank; (90) Ramnad district; (91) Chitrangudi tank; (92) Vembakottai tank; (93) Ariyakulam; (94) Thuthukudi; (95) Moonradaippu; (96) Koonthakulam; (97) Kanyakumari district; (98) Karungulam; (99) Madhubani; (100) Patna; (101) Garhwa; (102) Ghodahada dam; (103) Bhitarkanika Wildlife Sanctuary; (104) Dhulianali dam; (105) Chilka lake; (106) Bhetanai Haja; (107) Ongaito lake; (108) Kanhei nala; (109) Mukundadev Sagar; (110) Pachi Cherugu Girisola; (111) Mari tank; (112) Jagannath Sagar; (113) Badabandha Puduni; (114) Balimela; (115) Calcutta; (116) Salt lakes; (117) Budge Budge; (118) Hatighuli; (119) Burhi beel; (120) Dibru-Saikhowa National Park; (121) Dighali beel; (122) Jamjing beel; (123) Dibrugarh; (124) Ghilamara; (125) Bhimpooora bhil; (126) Panidihing Sanctuary; (127) Phokolai beel; (128) Koabari Doloni Abhayaranya; (129) Dikhomukh; (130) Majuli island; (131) Badati; (132) Misamari beel; (133) Manas National Park; (134) Orang National Park; (135) Kaziranga National Park; (136) Rupahi Pathar; (137) Jengdia beel; (138) Pobitora Wildlife Sanctuary; (139) Deepor beel; (140) North Cachar Hills district; (141) Logtak lake; (142) Kathmandu valley; (143) Kosi Tappu Wildlife Reserve; (144) Kosi barrage; (145) Sylhet; (146) Faridpur; (147) Kukrimukri; (148) Kopay causeway; (149) Jaffna; (150) Giant's Tank Sanctuary; (151) Padawia; (152) Trincomalee; (153) Wilapattu National Park; (154) Pothana Wewa; (155) Kanadarawa tank; (156) Kirimundel; (157) Somawathiya National Park; (158) Habarana; (159) Kala Wewa; (160) Giritala Wewa; (161) Katnoruwa tank; (162) Sigiriya; (163) Polonnaruwa; (164) Kandalama tank; (165) Mundel; (166) Wasgomuwa; (167) Naula reservoir; (168) Maduru Oya National Park; (169) Burutagolla; (170) Tabbowa Wewa; (171) Uygala Siyambalangamuwa tank; (172) Ampara; (173) Gal Oya National Park; (174) Lahugala tank; (175) Bellanwila-Attidiya marshes; (176) Handapanagala Wewa; (177) Yala East National Park; (178) Uda Walawe National Park; (179) Ruhuna National Park; (180) Kemagala; (181) Lunugamvehera; (182) Chandrika Wewa; (183) Wilapala Wewa; (184) Tissamaharama; (185) Yoda Wewa tank; (186) Wirawila Wewa; (187) Uduwila tank; (188) Palatupana Maha Lewaya; (189) Maha Lewaya lagoon; (190) Ridiyagama tank; (191) Bundala National Park; (192) Pallemalala Sanctuary; (193) Koholankalla Lewaya; (194) Karagan Lewaya; (195) Mahasittarakala; (196) Kalametya Kalapuwa Sanctuary; (197) Tangalla marshes; (198) Myitkyina; (199) Chaungwa; (200) Indawgyi lake; (201) Hokat jheel; (202) Sangin; (203) Great Defile; (204) Kindat; (205) Shwebo; (206) Wetlet tank; (207) Myingyan district; (208) Naf river; (209) Paunglin lake; (210) Minbu district; (211) Pyinmana; (212) Toungoo; (213) Daiktu; (214) Shwegyin; (215) Tharawaw; (216) Mohingyi Wetland Sanctuary; (217) Sittang estuary; (218) Thaton; (219) Yangon; (220) Salween river; (221) Irrawaddy delta; (222) Kyaikhto; (223) Chiang Saen; (224) Tha Law; (225) Bung Boraphet; (226) Nakhon Sawan; (227) Huai Kha Khaeng Wildlife Sanctuary; (228) Thung Yai Naresuan Wildlife Sanctuary; (229) Ngao Lahan; (230) Khao Peng Ma; (231) Suphan Buri; (232) Sena district; (233) Sai Yoke Noi; (234) Wat Sadet; (235) Rangsit; (236) Ban Tha Sadet; (237) Samut Sakhon; (238) Bang Pu; (239) Ban Laem; (240) Chanthaburi; (241) Wat Phai Lom; (242) Khao Cha-Ngok; (243) Khao Sam Roi Yot National Park; (244) Prachuap Khirikhan; (245) Kanduli; (246) Pak Phanang; (247) Songkhla lake; (248) Thale Noi Non-Hunting Area; (249) Singora; (250) Pattani bay; (251) Hin Namno NBCA; (252) Xe Don; (253) Dong Khanthung proposed NBCA; (254) Ang Trapeang Thmor Reserve; (255) Stung Treng; (256) Siem Reap; (257) Prek Da; (258) Prek Toal; (259) Prek Spot; (260) Prek Preah Dam Chheu; (261) Tonle Sap lake; (262) Saang district; (263) Moat Khla; (264) Boeng Chhma; (265) Phnum Kraom; (266) Tang Krasang river; (267) Kampong Chhnang; (268) Basset marshes; (269) Boeng Veal Samnap; (270) Tonle Sap river; (271) Neak Leung district; (272) Bassac marshes; (273) Quang Ninh province; (274) Hanoi; (275) Xuan Thuy Nature Reserve; (276) Nghia Hung district; (277) Cua Day estuary; (278) Vu Quang Nature Reserve; (279) Hue; (280) Bac Binh district; (281) Duyen Hai district; (282) Ha Tien; (283) Ca Mau coast; (284) Nam Can; (285) Dat Mui Nature Reserve; (286) Cagayan valley; (287) Pangasinan province; (288) Anao; (289) Candaba marsh; (290) Bulacan province; (291) Laguna de Bay; (292) Camarines; (293) Bicol; (294) Lanao lake; (295) Mindanao river; (296) Ligusan marsh; (297) Gulf of Davao; (298) Buluan lake; (299) Taiping; (300) Sungai Perak; (301) Lhokseumawe; (302) Bagansiapiapi; (303) Interior Barot; (304) Tanjung Tonjorak; (305) Banyuasin delta; (306) Kuala Mesuji; (307) Way Kambas National Park; (308) Jakarta; (309) Tanjung Sedari; (310) Balubuk; (311) Muara Gembong.

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





visitor in the wet season, 1990s (C. M. Poole *in litt.* 1999), 21, January 2000 (Goes 2000b); **Tonle Sap river**, between Phnom Penh and Tonle Sap lake, 17, December 1992 (Scott 1992); **Neak Leung district** (Neak Luong), Prey Veng, from Highway 1, one, August 1997 (Goes 1999a); **Bassac marshes**, Kandal, 20, December 1992 (Scott 1992), five, September 1996 and three, September 1997 (Goes 1999a), three, February 2000 (Goes 2000b).

■ **VIETNAM** The species is a regular non-breeding visitor to coastal Vietnam (Delacour and Jabouille 1931, Pedersen *et al.* 1998). There are unconfirmed (and almost certainly erroneous) reports of a breeding colony in northern Vietnam (Fischer 1963, 1974; see Remarks 8), and there have been several inland records. The records of Dalmatian Pelican from the Red River delta are probably based on misidentifications (J. C. Eames *in litt.* 1999). Records are from: **Quang Ninh province**, 1965–1970 (Dang Huy Huynh *et al.* 1974); **Hanoi**, 40 km west of Hanoi, September 1957 (two specimens in University of Hanoi), 32 flying high over the Red River, July 1981 (Stusák and Vo Quy 1986); **Xuan Thuy Nature Reserve**, Nam Dinh, six in the main Red River channel nearby, August 1964 (Fischer 1974), up to five, August 1994 (Pedersen *et al.* 1998), four, September 1998 (*Oriental Bird Club Bull.* 29 [1999]: 51–56), two, September 1999 (A. W. Tordoff *in litt.* 2000); **Nghia Hung district**, Nam Dinh, unspecified numbers observed along the coast of Rang Dong Agricultural Enterprise, 1961 (Nguyen Cu *in litt.* 1997); **Cua Day estuary**, Hai Phong, a reported colony of c.40 pairs, undated (Fischer 1974; but see Remarks 8), four, June 1994 (Pedersen *et al.* 1998); **Vu Quang Nature Reserve**, Nghe An, listed for the reserve on the basis of remains observed in the possession of a local hunter (MacKinnon and Vu Van Dung 1992); **Hue**, Thua Thien Hue, September 1925 (specimen in BMNH); **Bac Binh district**, Thuan Hai, included in a list of species recorded in Thuan Hai province, based on a field survey in August 1976 (Truong Van La and Do Ngoc Quang 1983); **Duyen Hai district**, Tra Vinh, five, September 1993 (J. C. Eames and Nguyen

**The distribution of Spot-billed Pelican *Pelecanus philippensis* (map A opposite):** (43) Sule Kere tank; (44) Sira; (45) Madure Kere tank; (46) Dodda Gubbi tank; (47) Hoskote tank; (48) Kunigal Dodda Kere; (49) Yellamallappa Shetty tank; (50) Kakkare Bellur; (51) Nelligudda tank; (52) Bolare Koppalu; (53) Kanva reservoir; (54) Channapatna tank; (55) Maddur tank; (56) Tailur tank; (57) Guntlukere; (58) Malavalli tank; (59) Byramangala reservoir; (60) Marehalli tank; (61) Bilikeri; (62) Mysore; (71) Cuddapah district; (72) Nelapattu tank; (73) Ethirpattu; (74) Pulicat lake; (75) Sulluru marshes; (76) Tada; (77) Kole wetlands; (78) Akkulam; (79) Trivandrum; (80) Karikili Waterfowl Refuge; (81) Vedanthangal tank; (82) Kaliveli tank; (83) Pondicherry; (84) Bhavanisagar reservoir; (85) Coimbatore; (86) Karaivetti Sanctuary; (87) Point Calimere; (88) Madurai tank; (89) Kullur Sandai tank; (90) Ramnad district; (91) Chitrangudi tank; (92) Vembakottai tank; (93) Ariyakulam; (94) Thuthukudi; (95) Moonradaippu; (96) Koonthakulam; (97) Kanyakumari district; (98) Karungulam; (148) Kopay causeway; (149) Jaffna; (150) Giant's Tank Sanctuary; (151) Padawia; (152) Trincomalee; (153) Wilapattu National Park; (154) Pothana Wewa; (155) Kanadarawa tank; (156) Kirimundel; (157) Somawathiya National Park; (158) Habarana; (159) Kala Wewa; (160) Giritala Wewa; (161) Katnoruwa tank; (162) Sigiriya; (163) Polonnaruwa; (164) Kandalama tank; (165) Mundel; (166) Wasgomuwa; (167) Naula reservoir; (168) Maduru Oya National Park; (169) Burutagolla; (170) Tabbowa Wewa; (171) Usgala Siyambalangamuwa tank; (172) Ampara; (173) Gal Oya National Park; (174) Lahugala tank; (175) Bellanwila-Attidiya marshes; (176) Handapanagala Wewa; (177) Yala East National Park; (178) Uda Walawe National Park; (179) Ruhuna National Park; (180) Kemagala; (181) Lunugamvehera; (182) Chandrika Wewa; (183) Wilapala Wewa; (184) Tissamaharama; (185) Yoda Wewa tank; (186) Wirawila Wewa; (187) Uduwila tank; (188) Palatupana Maha Lewaya; (189) Maha Lewaya lagoon; (190) Ridiyagama tank; (191) Bundala National Park; (192) Pallemalala Sanctuary; (193) Koholankalla Lewaya; (194) Karagan Lewaya; (195) Mahasittarakala; (196) Kalametya Kalapuwa Sanctuary; (197) Tangalla marshes.

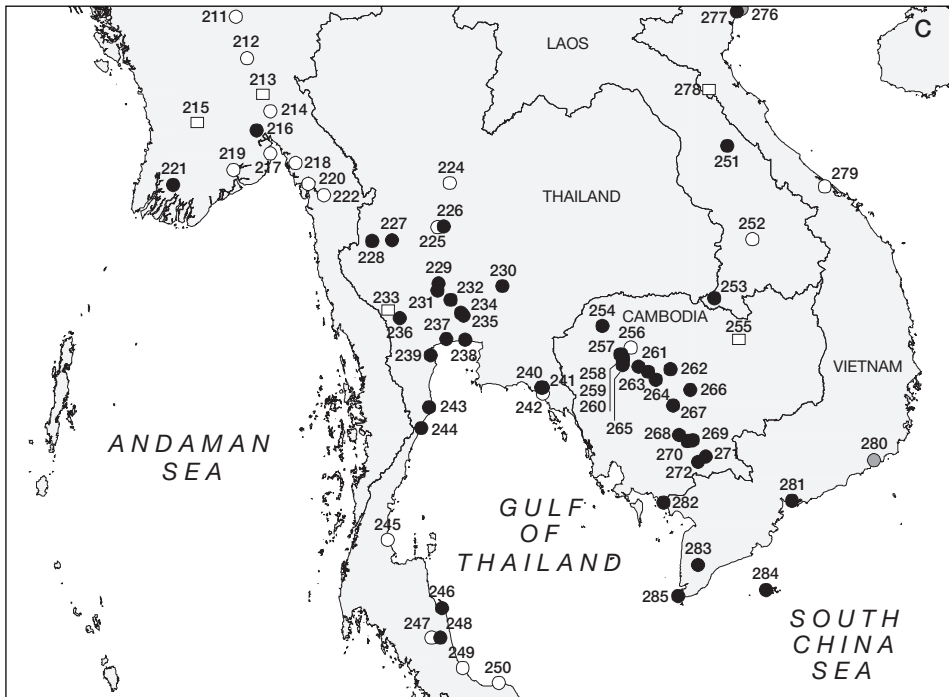
**(map B opposite):** (118) Hatighuli; (119) Burhi beel; (120) Dibru-Saikhowa National Park; (121) Dighali beel; (122) Jamjing beel; (123) Dibrughar; (124) Ghilamara; (125) Bhimpooora bhil; (126) Panidihing Sanctuary; (127) Phokolai beel; (128) Koabari Doloni Abhayaranya; (129) Dikhomukh; (130) Majuli island; (131) Badati; (132) Misamari beel; (133) Manas National Park; (134) Orang National Park; (135) Kaziranga National Park; (136) Rupahi Pathar; (137) Jengdia beel; (138) Pobitora Wildlife Sanctuary; (139) Deepor beel; (140) North Cachar Hills district; (141) Logtak lake; (145) Sylhet; (198) Myitkyina; (199) Chaungwa; (200) Indawgyi lake; (201) Hokat jheel; (202) Sangin; (203) Great Defile; (204) Kindat; (205) Shwebo; (206) Wetlet tank; (207) Myingyan district; (208) Naf river; (209) Paunglin lake; (210) Minbu district; (223) Chiang Saen.

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

Cu *in litt.* 1997); **Ha Tien**, Kien Giang, one, July 1999 (Buckton *et al.* 1999); **Ca Mau coast**, 13–14, September 1993 (J. C. Eames and Nguyen Cu *in litt.* 1997); **Nam Can**, Ca Mau, in mangrove forest, sightings in 1984 but no further details provided (Le Dien Duc 1989); **Dat Mui Nature Reserve**, Ca Mau, one, August 1999 (Buckton *et al.* 1999).

Unconfirmed records include: Tram Chim National Park, Dong Thap, January 1989 (Anon. 1993c); U Minh region, thought to be a rare, non-breeding visitor according to local reports, in 1997 (Safford *et al.* 1998).

■ **PHILIPPINES** In the early 1900s the species occurred at freshwater marshes and lakes on Luzon and Mindanao, and was locally abundant (McGregor 1904b, 1909–1910), but it has now been extirpated there. Records (by island) are as follows:



**The distribution of Spot-billed Pelican *Pelecanus philippensis* (map C):** (211) Pyinmana; (212) Toungoo; (213) Daiktu; (214) Shwegyin; (215) Tharawaw; (216) Mohingyi Wetland Sanctuary; (217) Sittang estuary; (218) Thaton; (219) Yangon; (220) Salween river; (221) Irrawaddy delta; (222) Kyaikhto; (224) Tha Law; (225) Bung Boraphet; (226) Nakhon Sawan; (227) Huai Kha Khaeng Wildlife Sanctuary; (228) Thung Yai Naresuan Wildlife Sanctuary; (229) Bung Lahora; (230) Pattani bay; (231) Suphan Buri; (232) Sena district; (233) Sai Yoke Noi; (234) Wat Sadet; (235) Rangsit; (236) Ban Tha Sadet; (237) Samut Sakhon; (238) Bang Pu; (239) Ban Laem; (240) Chanthaburi; (241) Wat Phai Lom; (242) Khao Cha-Ngok; (243) Khao Sam Roi Yot National Park; (244) Prachuap Khirikhan; (245) Kanduli; (246) Pak Phanang; (247) Songkhla lake; (248) Thale Noi Non-Hunting Area; (249) Singora; (250) Pattani bay; (251) Hin Namno NBCA; (252) Xe Don; (253) Dong Khanthung proposed NBCA; (254) Ang Trapeang Thmor Reserve; (255) Stung Treng; (256) Siem Reap; (257) Prek Da; (258) Prek Toal; (259) Prek Spot; (260) Prek Preah Dam Chheu; (261) Tonle Sap lake; (262) Saang district; (263) Moat Khla; (264) Boeng Chhma; (265) Phnum Kraom; (266) Tang Krasang river; (267) Kampong Chhnang; (268) Basset marshes; (269) Boeng Veal Samnap; (270) Tonle Sap river; (271) Neak Leung district; (272) Bassac marshes; (276) Nghia Hung district; (277) Cua Day estuary; (278) Vu Quang Nature Reserve; (279) Hue; (280) Bac Binh district; (281) Duyen Hai district; (282) Ha Tien; (283) Ca Mau coast; (284) Nam Can; (285) Dat Mui Nature Reserve.

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

*Luzon Cagayan valley*, Isabela, undated (Dickinson *et al.* 1991); **Pangasinan province**, November 1905 (specimen in USNM) and breeding reported (Dickinson *et al.* 1991); **Anao**, Tarlac, February 1904 (McGregor 1909–1910); **Candaba marsh**, abundant, early 1900s (McGregor 1909–1910); **Bulacan province**, February 1904, abundant around fish-breeding ponds in tidal marshes, i.e. on Manila Bay (McGregor 1909–1910); **Laguna de Bay**, abundant in fish-breeding ponds in tide-water marshes at certain seasons, early 1900s (McGregor 1909–1910); **Camarines** (one or other province), 1902 (female in ANSP); **Bicol** (i.e. southern Luzon), 1902 (specimen in AMNH);

*Mindanao Lanao lake*, August 1907 (two specimens in ANSP); **Mindanao river** (“Rio Grande”), Maguindanao, undated (Dickinson *et al.* 1991), this presumably being the same record as that from Cotabato (“Kotavato”), February 1930 (specimen in YIO); **Liguasan marsh**, Maguindanao, undated (Dickinson *et al.* 1991); east coast of the **Gulf of Davao**, undated (Hachisuka 1941); **Buluang lake**, Sultan Kudarat, undated (Dickinson *et al.* 1991).

■ **MALAYSIA** The species once perhaps occurred in some numbers (see under Population), with records of unidentified pelican flocks at Jeram, Selangor (Hornaday 1885 in Wells 1999), great flocks gathering between the Kelang and Bernam rivers, Selangor (Robinson 1927 in Wells 1999), some pelicans (“probably *P. philippensis*”) at Kuala Kedah in November 1907 (Robinson and Kloss 1910–1911) and one unidentified pelican at Bukit Serindit, Melaka, in July 1953, with local rumours of another seen there a year or two earlier (Bromley 1953 in Wells 1999). Old specimens or sightings are reportedly from mainland Penang (=Province Wellesley), Penang and Melaka (Malacca) (Hume 1879b, 1879–1880, Robinson and Chasen 1936), but these are best treated as provisional. The species is now (and apparently throughout the twentieth century was only ever) a vagrant and irregular visitor to the country, with records as follows: **Taiping**, Perak, one undated record, apparently “some years before” another was seen at the same locality in July 1910 (Kloss 1911; also Robinson and Chasen 1936); lower **Sungai Perak**, nine, July 1957, six, “about May” 1960 (Gee 1962).

■ **INDONESIA** The species is known only from Java and Sumatra, with contemporary records only from the latter, where a tiny and very isolated breeding population may still persist. Records are from:

*Sumatra* ■ **Aceh Lhokseumawe**, winter 1981–1982 (van Marle and Voous 1988); ■ **Riau Bagansiapiapi** region, with breeding reported in the region of Sungai Daun, August 1990 (Martínez and Elliot 1990; also Holmes 1996); ■ **West Sumatra “Interior Barat”**, 1907 (van Marle and Voous 1988); ■ **South Sumatra** between Sungai Barong and **Tanjung Tonjorak** (Tengorak), nine, including one immature, indicating possible breeding in the area, March/April 1986 (Silvius 1986, van Marle and Voous 1988), with four adults at Sungai Tonjorak, August 1985 (Danielsen and Skov 1985, 1987); **Banyuasin delta**, “small groups” including immatures (this clearly relating to the birds at Sungai Barong and Sungai Tonjorak), 1984–1986 (Silvius 1988), again “regular” there, 1988–1989, in singles, twos or threes, either feeding within 200 m of shore or roosting at high tide in *Avicennia* mangroves (Verheugt *et al.* 1993); ■ **Lampung Kuala Mesuji**, up to around 1986, when villagers ate the last 10 or so birds (Lambert 1988); **Way Kambas National Park** at Sungai Wako, February 1988 (Lambert 1988);

*Java* ■ **West Java** in and around **Jakarta**, into the 1880s (Vorderman 1882–1885); **Tanjung Sedari** (Sedari delta), found “fairly often” in August, unspecified years (Bartels 1915–1930); **Balubuk** (Muara Blubuk) and **Muara Gembong** in the Citarum delta, where it was an annual visitor between May and October, c. 1915–1930, with three individuals collected in July 1919 probably coming from this area (Bartels 1915–1930).

**POPULATION** This pelican was once common over much of Asia, with hundreds of thousands (or even “millions”) breeding in Myanmar and records spanning from Pakistan to Vietnam. At the start of the twentieth century it was considered “very common over a

very great area” (Baker 1922–1930), while at its close the world population was estimated at fewer than 13,000 individuals (Johnson *et al.* 1993, Collar *et al.* 1994; also Crivelli and Schreiber 1984), or 11,500 individuals (Rose and Scott 1997), revealing a huge decline in a relatively short period. Recent suggestions that the Cambodian population should be revised upwards suggest that this might be an underestimate, although counts made in 2000 fail to support this notion.

**China** Although it is almost certain that this species is extinct as a breeding species (if it ever bred), or non-breeding summer visitor in the country, historical reports suggest that it may once have been widespread in southern China. For example, in 1596 Li Shizhen quoted local belief in the area of Wu (southern Jiangsu province and Shanghai) that if pelicans arrive before *Xia Zhi* (about 22 June) the year would be rainy; if later than *Xia Zhi*, it would be dry (SC). This suggests that a pelican species (thus either Spot-billed or Dalmatian) was probably a late-summer migrant to the Yangtze delta in the sixteenth century (SC; see Migration). However, it is now at best an extremely rare non-breeding visitor to the country (see Distribution and Remarks 1).

**India** The Spot-billed Pelican was generally common throughout India in the nineteenth and early twentieth centuries; the north of India was visited seasonally by “vast numbers”, the majority of which were thought to breed in Myanmar (Hume and Oates 1889–1890). In Cachar it was a “regular visitor in large, sometimes immense, flocks” (Baker 1894–1901), while in upper Assam it was “commonly seen on the Brahmaputra and other large rivers” (Stevens 1914–1915). At Logtak lake in Manipur, Hume (1888) saw around 100 individuals, but mentioned that locals reported “thousands” later in the season; almost 50 years later, Higgins (1933–1934) still considered it “a fairly common visitor” to this lake. It was, meanwhile, “rather common” in Bihar (Inglis 1901–1904), or at least “fairly common during the monsoon” (Dalgleish 1902). In neighbouring Uttar Pradesh it was “common, particularly during the rains and early cold weather” around Lucknow (Jesse 1902–1903), being found “on almost any jhil, and indeed on any patch of water”, sometimes only in small numbers, but “often in vast flocks” (Reid 1887). In the Gorakhpur district, however, it only occurred in “small numbers during the rains” (Osmaston 1913). Further west in northern Gujarat, Butler (1875–1877) recorded “immense flocks” of Great White Pelicans during the cold season, adding that the Spot-billed was equally abundant. Referring to the Bombay Presidency (roughly = Gujarat, Maharashtra and portions of central India), Barnes (1885) stated that “with the exception of the Deccan, where it is somewhat rare, the Grey Pelican [= Spot-billed Pelican] is a common seasonal visitant throughout the region”. E. A. Butler (1881) described it as a “rare” winter visitor to Maharashtra. Further south, the pelicanry at Buchupalle, Andhra Pradesh, numbered “several hundred” nests in 1890 (Campbell 1902).

In the latter half of the twentieth century, the Indian population of this species was in swift decline (Neelakantan 1971, 1980, 1981). The most significant disaster was the abandonment around 1964 of the Kolleru (Aredu–Sarapelle) colony, at that time the largest known in the world (Neelakantan 1971, Guttikar 1979). The pelicanry at Buchupalle, Andhra Pradesh, also disappeared along with around 10 other major colonies nationwide (see under Threats: Habitat loss). Along the coast of Tamil Nadu only one colony was known to survive “unmolested by villagers” by the 1970s (Abraham 1974). In Madhya Pradesh, the species was “seen occasionally here and there” usually as single birds (Hewetson 1956), and it was “not common” in the Pune area, Maharashtra (Mahabal and Lamba 1987). The wetland at Logtak lake in Manipur had apparently highly degraded and was no longer suitable for the species; few waterbirds of any kind visited the area (Scott 1989). In general, the “vast numbers” of non-breeding Spot-billed Pelicans that previously spread across northern India in the wet season, all the way to Gujarat and Rajasthan, were hardly in evidence (presumably as a result of the huge seasonal influx from Myanmar coming to an end; see below), and the total Indian population was thought to be in the very low thousands (Nagulu *et al.* 1981, Johnson *et al.* 1993).

Despite this dramatic decline in pelicans visiting northern states, a breeding population survived, and even very locally thrived, in southern India (see Nagulu and Rao 1983). In January 1988, the national count of 1,820 included 961 in Ramnad district of Tamil Nadu alone, suggesting that recent population estimates for the country (“less than 2,000”) had been unduly pessimistic (*Wetlands and Waterfowl Newsletter* 2 [1990]: 13). In the 1990s a regular wintering congregation of 200–300 birds gathered at the Great Vedaranyam Swamp near Point Calimere, Tamil Nadu (Manakadan 1999). Based on the analysis of midwinter waterfowl censuses undertaken between 1987 and 1993, Perennou *et al.* (1994) stated that Nelapattu tank, Andhra Pradesh, and Kaziranga National Park, Assam, were the two most important sites in India for the species. Nevertheless, declines (or at least wide fluctuations) have taken place in the southern Indian population in recent years. Although 2,000 individuals bred at Kokkare Bellur in the 1960s, for example, numbers slumped to 330 birds in the 1990s (Subramanya and Manu 1996). The species breeds at Vedanthangal Sanctuary, Tamil Nadu, but irregularly (Raj 1956, Paulraj and Gunasekaran 1988, Santharam and Menon 1991). It is difficult to put a figure on the southern Indian population (Andhra Pradesh, Karnataka, Kerala and Tamil Nadu), but it seems likely to be in the region of 2,000–2,500 birds (SS).

During these decades of dismal fortune for the species, Assam remained a precarious stronghold (see Remarks 9). Although over 1,000 pelicans (possibly of this species) settled on sandbanks of the Brahmaputra within Kaziranga National Park in January 1935, the species was not thought to nest in the vicinity (Neog 1951). During the 1980s, however, 500–600 pairs nested in the park, the number falling to 155 pairs in 1991, then rising again to 219 pairs in 1993 (Talukdar 1995b,d, Bhattacharjee *et al.* 1996). A catastrophic breeding failure in 1994, followed by a count of only nine nests in 1994–1995, caused concerns about the future of the species in the area (Talukdar 1995d, 1999). However, these dips in success were probably the result of weak floods (Talukdar 1995b) and breeding has resumed over the last few years, with c.180 nests recorded in 1998 (Barua and Sharma 1999). Large flocks were reported in the 1970s and 1980s from Dibru-Saikhowa National Park, but by the 1990s the species was apparently rare, occurring sporadically in small groups and no longer breeding (Choudhury 1995b). Elsewhere in Assam, counts in the early 1990s indicated that around 50 pairs bred at Orang National Park, six pairs at Pobitora Wildlife Sanctuary, three pairs at Ghilamara and up to 11 pairs in the Majuli area (Talukdar 1995b). The Assamese population was at that time estimated at 1,500 birds (Talukdar 1995b), but a more recent assessment places it at “less than 3,000 with a declining trend” (Choudhury 2000c).

**Nepal** Most records are of fewer than five birds, and the record of 120 birds at Kosi Tappu Wildlife Reserve in 1996 (Davidson and Heywood 1996, *Bird Conserv. Nepal Newsletter* 5, 3 [1996]: 1–2) was quite exceptional. In recent years the numbers involved are suspected to have declined slightly (H. S. Baral *in litt.* 1998), although there is no direct evidence of this.

**Bangladesh** Mountfort (1969) stated that the species was once numerous over the rivers and jheels of Bangladesh but that by 1969 it was completely exterminated by fishermen who persecuted it for depleting fish-stocks. However, this observation may have confused Spot-billed with Great White Pelican, as the latter was much the commoner of the two in Bangladesh before its population crashed (P. M. Thompson *in litt.* 1999). The Spot-billed is listed as a rare winter visitor in the Kukrimukri area (Khan 1982), but it is in fact a vagrant to the country with very few recent records indeed (P. M. Thompson *in litt.* 1999).

**Sri Lanka** A major population of the species survives on Sri Lanka; there has been a significant decline since historical records began, but no evidence of a recent decline. Legge (1880) described flocks of “literally thousands” that collected on Kanthelai tank in 1875. Henry (1955) noted that it was still present “in fair numbers in Sri Lanka”, but thought that there was a continuing slight decline. Indeed, the fact that the entire Sri Lankan population now lies in the low thousands suggests that a substantial decline has taken place since Legge’s time. Totals of 1,092 (1986), 932 (1987), 768 (1988), 3,651 (1989), 3,010 (1991), 908 (1992),

722 (1993), 756 (1994) and 570 (1995) birds were recorded in Sri Lanka during midwinter waterfowl censuses in the 1980s and 1990s (Hoffmann 1986, 1987, 1988, 1995); however, the total population is likely to be considerably higher than these figures suggest because many wetlands were not visited during the counts. Moreover, large numbers are still occasionally recorded from single locations, e.g. c.3,000 counted at Bundala National Park in January 1989 (Johnson *et al.* 1993), and 1,256 seen there in October 1995 (de Silva 1997) suggesting that the total population might be around 5,000 (S. W. Kotagama *in litt.* 2001). In addition, small populations breed on Beira lake, in the centre of Colombo, and on Kandy lake in the centre of Kandy (S. W. Kotagama verbally 1997); however, they are all thought to be naturalised individuals from captive collections (U. Ekanayake verbally 1999).

**Myanmar** The species was considered “common” or “very common” in the nineteenth century (Blyth 1875, Oates 1878, 1882, 1883, Smythies 1986). The large number of specimens taken at that time in “Pegu” and “Lower Pegu” and now stored in museums around the world is testament to the massive population that thrived there in the late 1800s.

On the creek at Thaton, mixed flocks of Spot-billed and Great White Pelicans were sufficiently common that “for miles the water was literally white with pelicans” (Beavan 1865–1868). In 1877, Oates (1878) likewise observed “immense flocks of pelicans and adjutants” and, in seeking their colony in the forests of the Sittang plain, came across the awesome spectacle of “millions of birds” nesting in “an area about twelve miles long and five broad” (c.160 km<sup>2</sup>). Judging from his account, this region was the chief breeding stronghold of the species at that time. In 1910, “countless millions” of birds still bred over a vast area here (Baker 1932–1935). In the subsequent decade, however, this huge nesting ground vanished; Stanford (1946) declared that “the immense colonies which Oates found on the Sittang have disappeared” and Smythies (1986), in a tour down the Sittang in October 1939, “saw no signs of pelicans or adjutants whatever”. By then, the jungles of the Sittang valley had been converted into “one enormous and monotonous paddy plain” (Smythies 1986). The rapidity and completeness with which this colony was eradicated indicates the susceptibility of this species, and indeed large waterbirds in general, to agricultural expansion and development.

The species was still found all over Myanmar in the early part of the nineteenth century (Baker 1922–1930, Smythies 1986). It was, for instance, “common” in Arakan (Hopwood 1912b), and regular (sometimes in large numbers) on the upper Irrawaddy (Stanford and Ticehurst 1938–1939, Stanford 1954). Hopwood (1908) stated that it was common above Kindat and believed (apparently on scant evidence) that it bred in that district of Chindwin. It was also suspected that the birds were breeding in the Hukaung valley or in the forests fringing the upper waters of the Mali Hka, near Fort Hertz (Stanford and Ticehurst 1938–1939), or along the Irrawaddy above the Great Defile (Stanford 1954). None of these postulated colonies was found. It must be remembered that in the first half of the twentieth century, after the abandonment of the Sittang colonies, large numbers of pelicans must have been roaming around Myanmar searching for alternative nesting sites. It is possible that some of them attempted to breed at this time in northern Myanmar, but there is no confirmation of this fact. Between 1987 and 1994 not a single bird was recorded in the country (Scott and Rose 1989, Perennou *et al.* 1990, Perennou and Mundkur 1991, 1992), but some 30 individuals have been regularly recorded since 1996, indicating that a small remote breeding population might remain (Barzen *et al.* 1996, Khin Ma Ma Thwin *in litt.* 1997; see Distribution). Indeed it is reported to be still “common” in the Hukaung valley of Kachin and Sagaing provinces (U Thein Aung verbally 2000).

**Thailand** In the nineteenth century Schomburgk (1864) declared this species “by no means an uncommon bird on the coast”, and added that it could be encountered 200–300 miles (320–480 km) “up the river”, presumably referring to his sighting of a flock of 150 pelicans near Nakhon Sawan. Robinson (1927) described it as “fairly common” in the swamps of

Trang and on Lake Songkhla and Thale Noi in the peninsula. Early in the twentieth century it was common in Pattani bay and fairly numerous around Surat Thani (=Bandon) (Robinson and Kloss 1921–1924). At that time it also apparently occurred “in large numbers in suitable localities” in Thailand (Gyldenstolpe 1920), in particular on the swamps of central Thailand and in the vicinity of Samut Sakhon on the Gulf of Thailand, where large numbers assembled during the rainy season (Gyldenstolpe 1913). Although there are no confirmed breeding records (Gyldenstolpe 1920), the species is presumed to have once bred in Thailand, with colonies abandoned prior to ornithological exploration (Round 1988b): many potential breeding areas had already been lost owing to the drainage and mass conversion of floodplains to ricefields in the late nineteenth and early twentieth centuries (P. D. Round *in litt.* 1998). Alternatively, the large numbers reported might have been seasonal visitors from the huge colonies in Myanmar, and presumably Cambodia, at that time. Wherever they came from, they had all but disappeared by the middle of the twentieth century, a decline probably triggered by the loss or diminution of colonies elsewhere.

The country now only hosts wandering individuals and small groups, most likely derived from the Cambodian breeding population. The species is a rare non-breeding visitor to the “Lower Central Plains” (including the provinces of Suphanburi, Ayutthaya, Pathumthani), with small numbers being recorded almost annually at a number of sites, chiefly colonies of other roosting waterbirds (P. D. Round *in litt.* 1998). Large mangrove inlets in the vicinity of Chantaburi could support a small semi-permanent population (P. D. Round *in litt.* 1998). In addition, small, free-flying and apparently breeding populations have become established in the 1990s from escaped or released captive birds at two sites (Bangkok Zoo in central Bangkok and the Khao Khieo Open Zoo, Chon Buri province: Round 1996b, P. D. Round *in litt.* 1998).

**Laos** The species appears always to have been an uncommon visitor to Laos, although records are now less frequent than previously (Thewlis *et al.* 1998). It is possible, or indeed probable, that it once bred in Laos before it was wiped out by the spread of habitat destruction and hunting, processes that (as with Thailand) were well under way before the country was biologically explored (J. W. Duckworth *in litt.* 2000). At least one bird was still alive in captivity at Pakxe, Champasak, in 1997 (W. G. Robichaud verbally 1999), although its origin was unknown.

**Cambodia** Until recently almost nothing was known about pelican populations in Cambodia. In 1978–1979, large numbers of unspecified “pelicans” were reported by locals to be breeding in the Kamchai mountains, Kampot, in tall dipterocarp forest near Stung Tuk Chu on the western slopes of this range (Mundkur *et al.* 1995a); this colony has never been found. The species also apparently once bred in the Bassac marshes, although it currently only occurs here in the wet season (C. M. Poole *in litt.* 2000). By the mid-1990s “at least two or three breeding sites” were suspected, although there was little information on population size (Mundkur *et al.* 1995a). By 1998 the species had been found at nine waterbird breeding colonies around Tonle Sap lake, and breeding was confirmed at seven of these (Goes *et al.* 1998b). The entire breeding population in South-East Asia appears to be concentrated around this lake in the dry season (Goes *et al.* 1998b). After several years of investigation, the estimated size of this population was put at c.1,500 individuals (Perennou *et al.* 1994, Rose and Scott 1997), but this was certainly an underestimate given sightings of nearly 2,000 birds in one group on the lake (*Oriental Bird Club Bull.* 20 [1994]: 55–61, Mundkur *et al.* 1995a); the minimum population in the vicinity of Tonle Sap was thus given as 2,000–2,200 birds (Mundkur *et al.* 1995a), but more recent counts of 1,500 from Prek Toal, 1,000 from Boeng Chhma and 2,000 from Chhnuk Tru have suggested that at least 5,000 individuals occur in the area (C. M. Poole *in litt.* 1999). While there is a possibility of some overlap between counting sites, they are thought to be sufficiently far apart, and the difficulty of assessing bird numbers in the flooded forests is so considerable, that even 5,000 might well be an underestimate (C. M. Poole *in litt.* 1999). The most optimistic figure proposed for the



Cambodian population was 10,000 birds (Sun Hean *in litt.* 1997), an estimate that would almost double the known global population. The environs of Tonle Sap thus certainly supports a significant proportion of the world population, possibly up to 50% (C. M. Poole *in litt.* 1999). However, counts in the Tonle Sap region in 2000 only detected 796 Spot-billed Pelicans (Goes 2000b), and thus the best current estimate is 3,000–5,000 birds.

**Vietnam** Early this century the species was described as a casual visitor to the country (Delacour and Jabouille 1925) and it has probably never been common. Recent records involve small numbers (fewer than 20) concentrated in the Mekong and Red River deltas, and these are presumed to refer to non-breeding visitors from Cambodian colonies (Nguyen Cu *in litt.* 1997). Although breeding perhaps took place historically in Vietnam (Vo Quy 1975), there is no direct evidence to support this fact (see Remarks 8).

**Philippines** On Luzon, it used to be abundant in fish-breeding ponds in tide-water marshes in Laguna de Bay at certain seasons and in Candaba Marsh (McGregor 1909–1910), in inland waters and sometimes coastal mudflats (Dickinson *et al.* 1991). However, it has now been extirpated from the country (Collar *et al.* 1999).

**Malaysia** The irregular appearance of “prodigious numbers” of unidentified pelicans along the Melaka straits coast in the mid-nineteenth century (Maingay 1868, Hume and Davidson 1878) possibly involved this species, as did unspecified numbers at Jeram, Selangor, in June 1878 (Hornaday 1885), and “great flocks” between the Kelang and Bernam rivers, Selangor, in subsequent unspecified years (Robinson 1927). Unspecified numbers of pelicans also gathered at Kuala Kedah, including some that were “probably *P. philippensis*”, in late November 1907 (Robinson and Kloss 1910–1911). While these accounts suggest that the species might not have been uncommon in Malaysia into the first decade of the twentieth century, thereafter it proved a very rare visitor (Wells 1999).

**Indonesia** The species was once a seasonal visitor to Java, where Vorderman (1882–1885) found it around Jakarta (but many birds moving away after the eruption of Krakatau in August 1883), and Bartels (1915–1930) found it (and the Great White Pelican) an annual visitor before 1930, sometimes “encountered daily” and roosting in “large flocks”. Neither of these species currently occurs on Java, although there is one recent record of seven birds (not identified to species), April 1988, near Soekarno-Hatta airport, Jakarta (Whitten 1989). On Sumatra, small groups, including immatures, were found in the Banyuasin river delta in 1984–1986, and were confirmed as being present throughout the year by local fishermen, this possibly representing the last breeding site in Indonesia (Silvius 1988). If this is indeed the case, the species is “one of the most critically endangered in Indonesia, with perhaps no more than two dozen birds extant” (Holmes 1996). It is possible that these birds represent a remnant of a previously large population, perhaps the original source for seasonal visitors to Java early in the twentieth century.

**ECOLOGY Habitat** The species frequents a variety of deep or shallow wetlands, both man-made and natural, freshwater and saline, including marshes, lakes, rivers, estuaries, reservoirs, flooded fields, brackish lagoons, tidal creeks and along coasts (Baker 1922–1930, Henry 1955, del Hoyo *et al.* 1992, Collar *et al.* 1994). In Sri Lanka, for example, it occurs on large inland tanks and salt lagoons throughout the low-country dry zone (Whistler 1944), apparently preferring shallow water to deep (Henry 1955). In Nepal, almost all records are from a large waterbody with bare sandy islands on which the birds rest; otherwise, it is found mostly in open floodplain marshes, all subject to seasonal flooding by monsoon rains (C. Inskipp and H. S. Baral *in litt.* 1998). In Myanmar, it was previously found throughout the year along major rivers and lakes, and on the coast during the non-breeding season (Smythies 1986). In Vietnam, it has been recorded mainly in coastal regions, including inter-tidal estuarine creeks, where it roosts with gulls and shorebirds on sandflats (Pedersen *et al.* 1998), and in areas of aquaculture, paddyfields and mangrove (S. T. Buckton verbally 2000). On Java, flocks usually

roosted on mudflats and extensive marshes, less frequently and in smaller numbers on wooden fishtraps offshore, or in the upper branches of nearby trees (Bartels 1915–1930). When the Myanmar population was thriving, large numbers spent the non-breeding season as far afield as India, everywhere frequenting large lakes and rivers, various stagnant wetlands and the coast (Baker 1922–1930, Stanford and Ticehurst 1938–1939, Smythies 1986). At Tonle Sap lake, Cambodia, birds are thought to depend on streams in inundated forest and the shallow periphery of the lake for their feeding sites; small groups are generally found in the waterways while large flocks gather to feed occasionally on the open water of the main lake (Mundkur *et al.* 1995a). The species breeds in tall (sometimes short) trees or palms, usually growing alongside or partially submerged in water, but sometimes at some distance from it; in India it sometimes nests on trees amongst village houses (Baker 1932–1935, Neginhal 1976, 1977b, Subramanya and Manu 1996; see Breeding).

**Food** There appear to have been no studies of the food and feeding ecology of this pelican. It feeds mainly on fish of various sizes (possibly consuming roughly 1,000 g per day: del Hoyo *et al.* 1992), but it also occasionally consumes frogs, snakes and lizards (Baker 1922–1930, Smythies 1986). It generally feeds solitarily (del Hoyo *et al.* 1992); Bartels (1915–1930), for example, reported that, unlike the large feeding flocks of Great White Pelican that once graced Java's estuaries, the Spot-billed fished singly or in small flocks. However, in a manner similar to other pelican species, flocks occasionally feed communally, forming a line across water surfaces and driving fish towards the shallows (Smythies 1986).

**Breeding Season** Reproductive timing is linked to rainfall patterns and thus varies slightly geographically; when rainfall is inadequate, birds apparently do not breed (SS). In the Indian subcontinent nest-building tends to begin in September, eggs are laid in October and November, chicks fledge around February and colonies are vacated by May (McGregor 1909, del Hoyo *et al.* 1992, Talukdar 1995b). In Karnataka, pairs begin to nest in late October or November (S. Sridhar and A. K. Chakravarthy *in litt.* 1995) and continue until March–April (SS). Timing seems to have been similar in Myanmar, as individuals collected there in mid- and late October contained fully formed eggs, and almost all nests on 11 November contained very fresh eggs (Oates 1877a, 1878). Many juveniles were seen feeding in a Myanmar wetland in April (Stanford and Ticehurst 1938–1939). At Tonle Sap, Cambodia, breeding takes place in roughly the same time-frame: nesting activity appears to commence in October and be completed by April, with nestlings observed in villages in late March and many juveniles accompanying feeding flocks in late April (Archibald 1992, Mundkur *et al.* 1995a, Parr *et al.* 1996). The only place where the timing of breeding is reportedly different is Sri Lanka, where colonies are active in March–April (Legge 1880), or March–May (Henry 1955).

**Nest site** The availability of suitable nesting sites and nest material are crucial to this species; colonies surrounded by water are usually preferred for safety reasons, and good food supplies nearby are essential (Nagulu and Rao 1990). Several Indian colonies are sited in village trees surrounded by houses, e.g. Kokkare Bellur (Neginhal 1976, 1977b). In India, colony trees tend to be “old”, and are generally taller (usually 10–20 m), with broader girths and wider crowns, than nearby trees without nests; nesting birds usually show a strong preference for *Ficus benghalensis*, *F. religiosa* and *Tamarindus indicus*, to a lesser extent *Acacia nilotica* or *Thespesia populnea*, and infrequently use *Ficus balerica*, *Delonix allata*, *Melia dubia*, *Albizia lebek* and *Azadirachta indica* (Abraham 1974, Neginhal 1976, 1977b, Sanjay 1993, S. Sridhar and A. K. Chakravarthy *in litt.* 1995, Subramanya and Manu 1996). In Assam the species most often nests on tall old *Bombax ceiba* trees, although use of *Ficus* is also noted (Talukdar 1995b,d, Bhattacharjee *et al.* 1996).

Up to 6–12 nests have been recorded in single trees in Assam, with nests most frequently sited in “the whorls where four or more branches abut” (Talukdar 1995b). Nests at Kokkare Bellur were arranged along stout branches in the outer canopy of trees, with up to seven nests in a series; the chosen branches were invariably more than 8 cm in diameter, presumably

so that the combined weight of several nests, nestlings and adults might be supported (Subramanya and Manu 1996). Individuals tend to nest in the same place in the canopy each year, although new locations within the canopy and new trees are sometimes chosen (Subramanya and Manu 1996).

In the nineteenth century an enormous breeding colony (now destroyed) was found in Myanmar. The site was located amidst a tract of tall grassland (“elephant grass”) and forest on the east bank of the Sittang river, intersected by numerous creeks choked with drift (“inundated to the depth of ten feet in many parts from July to October or November”, when the pelicans nested) and covered with pools (Oates 1878, 1882). The forest had sparse undergrowth and the nests (3–15 per tree) were mostly sited in the canopies of wood-oil trees (*Dipterocarpus*) of “stupendous” size (up to 45 m high), where they were often placed in forks of the uppermost branches, but more usually on nearly horizontal boughs not far from the trunk; they sometimes abutted each other in a series along one branch, so that “they looked like enormous beads” (Oates 1878). In Cambodia the species still nests in flooded forest, sometimes in tall trees and at others in fairly short emergent (4–10 m) trees protruding from a 2–3 m tall shrub layer (Sun Hean *in litt.* 1997, R. J. Timmins *in litt.* 2001). Detailed descriptions of the swamp forest habitat around Tonle Sap lake are given by Mundkur *et al.* (1995a) and Parr *et al.* (1996).

In India, Spot-billed Pelicans often nest alongside Painted Storks (Abraham 1974) or Lesser Adjutant *Leptoptilos javanicus* (Whistler and Kinnear 1931–1937, Talukdar 1995b). Oates (1878) mentioned that nest trees in the Sittang colony in Myanmar were often shared with adjutants *Leptoptilos* (see under Lesser Adjutant and Greater Adjutant *L. dubius*), and in Cambodia the colonies are again mixed with adjutants and other storks (Parr *et al.* 1996).

*Nest structure* Nest construction is undertaken by both members of the pair (Nagulu 1983, Nagulu and Rao 1990). Nests in Myanmar were built entirely of twigs and small branches, without a lining, and were c.70 cm in diameter and c.44 cm deep when placed in a fork (Oates 1878). Nests in Assam were 150–210 cm in circumference (Talukdar 1995b). At one Kolleru subcolony (Aredu), nest material was in short supply and many pelicans visited the only mesophytic tree in the neighbourhood (*Pithecellobium saman*), to break off leafy twigs (Krishnan 1980).

*Clutch, incubation and success* In the Sittang colony, the clutch apparently invariably contained three eggs (Oates 1878), although there was presumably some undetected variability. In Nelapattu, India, mean clutch size was 2.4 (n=13; Nagulu 1983), with clutches of three eggs being completed in about seven days. At Kokkare Bellur, India, mean clutch size was three and a mean of 1.6 nestlings fledged per nest in 1995 (SS). Four-egg clutches have been recorded in Assam (Talukdar 1995b). Both sexes contribute to “domestic duties” during nesting (Lamba 1963) and incubation starts with the first egg (Nagulu 1983). The incubation period appears to be 30–35 days, the fledging period around four months (Nagulu 1983, del Hoyo *et al.* 1992, Talukdar 1995b). Nagulu and Rao (1990) judged that the pelicans nesting at Nelapattu had a breeding success of 73.5% “during the study period” (unspecified), although the methods for estimating this figure were not provided (further details in Nagulu 1983).

*Migration and dispersal* Ripley (1982) described the Spot-billed Pelican as largely resident in the Indian subcontinent, undertaking local non-breeding movements. Migration in the species, however, was once much more dramatic than it appears today. In Bihar and Uttar Pradesh, for example, large numbers arrived in the wet season between June and October (Reid 1887, Inglis 1901–1904), and a similar situation was reported in western India (Butler 1876, Barnes 1885). In Manipur, it appeared “at the end of the cold weather” and left “after the rains” (Higgins 1933–1934). This information fits a pattern similar to that of the Greater Adjutant (see relevant account), suggesting that large numbers of pelicans and storks visited India (and even occasionally Pakistan) in the non-breeding season, and returned to southern Myanmar to breed; some of these birds therefore covered huge distances in their seasonal

journeys. Whether movements occurred in the other direction, to Thailand, is unclear (see Population).

In Minbu district, Myanmar, pelicans were seen in the non-breeding season, between June and October, except for one record in February (Roseveare 1952). This suggests that a proportion of the population might have gone no further than northern Myanmar for the non-breeding season. Christison *et al.* (1946) apparently observed individuals all year round on the Naf river, Arakan. Individuals at Huai Kha Khaeng, Thailand, were presumed to be wandering birds or passage migrants moving between the Central Plains and the plains of Myanmar (P. D. Round and U. Treesucon *in litt.* 1998), although there is apparently no current breeding population in either of these areas. Nevertheless, repeated reports in the hills between Thailand and Myanmar suggest a regular passage of birds in this area (*Bangkok Bird Club Bull.* 4, 11 [1987]: 10–11).

More recent observations suggest that long-distance movements of birds nesting in India do not occur, and migrations are of a more local and random nature. Pelicans from the 500-year-old pelicanry at Kakkare Bellur generally only move up to 200–300 km during their post-breeding dispersal, depending on the availability of water and food; judging from ringing recoveries, they tend to disperse to within 120 km of Mysore city, a radius that encompasses around 132 lakes of various sizes, around 25% of which are known to be used by flocks of pelicans (Manu and Ramesh 1996, Neginhal 1997). In Sri Lanka pelicans are very mobile, but dispersal is generally short (Henry 1955). The species is a non-breeding visitor to Nepal, presumably from the nearby Assamese breeding grounds; it is often seen in the Kosi area between February and May, sometimes lingering until October (H. S. Baral *in litt.* 1997). However, the concentration of records here between February and May (Inskipp and Inskipp 1991) is at least partly the result of higher observer coverage at this time.

Judging from early literature this species seems once to have been a summer migrant to southern China (SC; see Population); the influxes in question were probably of non-breeding birds (see Breeding: season), quite possibly from Cambodia. Like other large waterbirds, pelicans breeding in the Tonle Sap basin disperse in the wet season (between June and December), mostly to other areas in the country, but sometimes wandering beyond its borders (this movement is probably responsible for all other recent mainland Spot-billed Pelican records in Thailand and Vietnam) (C. M. Poole *in litt.* 1999). One small group of pelicans (almost certainly from Tonle Sap) goes further afield, visiting the Red River delta (Tonkin, north Vietnam) in August and September (Le Dien Duc 1993a, Pedersen *et al.* 1998, J. W. Duckworth *in litt.* 1999; months *contra* Scott 1989). There are two interesting hunting records far from potential feeding areas in the Annamite mountains (at Hin Namno NBCA, Laos, and Vu Quang Nature Reserve, Vietnam), suggesting that this range is sometimes used as a dispersal route (Duckworth *et al.* 1999), presumably by birds moving between Tonkin and Tonle Sap. These birds might represent a remnant population of Spot-billed Pelicans that once travelled north annually from Tonle Sap to northern Vietnam and southern China.

**THREATS** The main threats to pelican populations in general are any combination of disturbance, persecution, degradation of wetlands through drainage or pollution, entanglement in fishing equipment and decline in food supplies (Crivelli and Schreiber 1984). The decline of this species is most strongly related to the disturbance or destruction of colonies.

**Habitat loss and modification** Being dependent on wetlands for foraging and tall trees for nesting, the species has inevitably retreated in the face of the chronic twin problems of wetland conversion (through drainage, encroachment, overfishing, etc.) and woodland conversion (through logging, fire, exploitation, etc.). In South-East Asia in particular, all large waterbirds suffer, as they have for over a century, “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* Wetlands in India are under intense pressure from the

growing human population, and are increasingly encroached by industry and agriculture (Scott 1989). A few examples of site-specific or region-specific problems are given below. Waterbird populations in the Brahmaputra valley have declined owing, amongst other things, to “habitat alteration, extensive fishing, weed growth, siltation and biotic interference in the wetlands” (Saikia and Bhattacharjee 1990b). Talukdar (1995d) reported that pelicans failed to nest in 1994 at Kaziranga National Park as lack of floods in the Brahmaputra river valley failed to flush water hyacinth *Eichhornia crassipes* from the wetlands, thereby reducing the open water required by pelicans to feed. The clogging of the Kaziranga wetlands with water hyacinth is one of the major threats to pelican populations in the area (Bhattacharjee *et al.* 1996). In addition, the Brahmaputra carries an increasing silt load which, along with assorted debris, is deposited in Kaziranga, resulting in a shallowing of the wetlands and a reduction in areas suitable for foraging (Bhattacharjee *et al.* 1996). The increasing scarcity of fish resources in wetlands is also likely to be a major threat in Assam (Talukdar 1995b). Sambhar lake, Rajasthan, is increasingly threatened by siltation because of overgrazing and desertification of the surrounding landscape (Scott 1989). Pulicat lake (Andhra Pradesh and Tamil Nadu) is potentially threatened by siltation and plans to develop large-scale aquaculture, principally shrimp farming (Scott 1989, Philip 1995, Panini 1996). If these problems are not addressed the lake is in danger of “grave ecological breakdown” and would be lost as a feeding area for pelicans, with potentially disastrous results, as it is visited by those from Nelapattu colony (Panini 1996). In addition, over 30,000 people are dependent on the lake for their survival and even though the area is legally protected, current legislation is inadequate to control over-exploitation (Panini 1996). The Kole wetlands in Kerala are rapidly being converted to cultivation, construction and small-scale industry (Nameer 1993). Nearly 400 km<sup>2</sup> of the Andhra Pradesh coastline had been converted to prawn ponds by the mid-1990s, and a further 600 km<sup>2</sup> were earmarked for development, particularly around the Krishna (Kistna) estuary (Rao 1995b). Continuation of this trend will see a near-total destruction of wetland habitats near the coast of this state, several areas of which are important for this species. Additionally, the Krishna estuary is “under severe threat [from] various development activities and destruction of mangroves” (Rao 1995b). Village tanks in Karnataka are susceptible to disturbance and damage through mud-lifting for making bricks (59% of tanks) and encroaching agriculture (37% of tanks), while they are increasingly drained to make way for road and building construction (Subramanya 1990). Around the Kokkare Bellur colony, “urbanisation and industrialisation... are transforming the Pelican foraging grounds to choked reed beds” (Manu and Ramesh 1996). Partly because of industrial salt production, fresh water at the Point Calimere wetlands, Tamil Nadu, has become scarce, forcing waterbirds to leave the sanctuary and visit wetlands where they are more often hunted (Sugathan *et al.* 1985). Siltation and desiccation are affecting the ecology of the area, while collection of firewood, illegal hunting, encroachment of settlements and pollution are all threats to the wetland habitat (Scott 1989). In Kanyakumari district, Tamil Nadu, pelicans are occasionally shot for food, but the greatest threats involve drainage and siltation of lakes and their disturbance by fishermen (S. H. M. Butchart *in litt.* 2000). *Sri Lanka* The species appears to be have declined chiefly owing to the loss of safe and undisturbed breeding sites in the country (Henry 1998). Wetland habitat is also threatened throughout Sri Lanka; Hoffmann (1992) reported “continuing degradation in all important sites, either through aquaculture projects, new salterns or extension of salt production, cutting of mangroves, shooting and other human disturbance such as excessive fishing” and tourism. Even Bundala National Park, Sri Lanka’s only Ramsar site, is suffering these problems, along with changes in water level and salinity owing to drainage into the system of excessive irrigation waters (Hoffmann 1992). The sanctuary is also “acutely threatened” by a number of proposed developments in its immediate vicinity, not least the Hambantota “mega-city”: an oil refinery, a new harbour, an international airport, salt-based chemical industry, wind farms, aquaculture, hotels, etc. (Hoffmann 1998).

Other threats to the area include excavation for lime, overgrazing, feral dogs and encroachment of settlements (de Silva 1997). A number of developments proposed along the south-east coast are likely to lead to further habitat loss (Scott 1989). *Myanmar* The catastrophic collapse in numbers from extreme abundance to apparent extinction as a breeding species in Myanmar took place over the course of a few decades, and can be attributed to changes in land-use patterns, human population pressure and clearing of the nesting area for timber (Stanford and Ticehurst 1935a, Scott 1989). The development of trade in the region encouraged the clearing of the forest once inhabited by the breeding pelicans and storks, and the surrounding lowlands were converted almost entirely to rice cultivation (Stanford 1954, Smythies 1986). This process occurred throughout low-lying areas in southern Myanmar and caused the demise of large waterbird populations in the region (Scott 1989). The Irrawaddy delta area, where the species has been seen in recent years, is also almost entirely converted to rice cultivation (Khin Ma Ma Thwin *in litt.* 1997). *Thailand* The species has suffered huge losses in the country as a result of drainage and massive disturbance of remaining natural and semi-natural wetlands (Round 1988a, Round *et al.* 1988, P. D. Round *in litt.* 1998; see under White-shouldered Ibis *Pseudibis davisoni*). *Laos* Wetlands in the country have largely been settled by human populations and are used intensively for fishing, cultivation (most of the Mekong floodplain in southern Laos has been converted to rice paddy), livestock grazing and grass harvesting (Chape 1996, Thewlis *et al.* 1998, Duckworth *et al.* 1999). *Vietnam* As elsewhere, the species is threatened partly by habitat loss (Nguyen Cu *in litt.* 1997, Pedersen *et al.* 1998). *Philippines* Candaba marsh is largely converted to fishponds, other areas have been drained for agricultural purposes, and Laguna de Bay is perhaps the most polluted lake in the Philippines with toxins deriving from human, industrial and agricultural sources (Scott 1989).

**Habitat loss: colonies India** The decline of the Spot-billed Pelican in India can be attributed largely to the loss of breeding sites over the last century. At least twelve previous breeding sites have been abandoned (SS). These sites have either been permanently destroyed, as in the Kolleru area (four subcolonies), Buchupalle, Pullagoorapalle, near Ongole, Kanva, Hesarghatta, Banahalli and Moonradaippu, or pelicans have deserted the site despite the continued existence of breeding habitat and continued breeding by other waterbirds, as at Ethirpattu (SS). The main reasons for the loss of breeding sites has been the removal of preferred nesting trees, stealing of eggs, disturbance to nesting birds and reduction of local food availability (V. Nagulu and A. Rajaram verbally 1993, Subramanya 1996). One critical factor is the requirement for very large stable trees, a scarce commodity coveted by people seeking timber and fuelwood. In Assam, for example, suitable nest trees outside protected areas tend to be felled to supply match factories (Talukdar 1999). The following account illustrates various factors that impinge on colony survival and that need to be addressed if the Spot-billed Pelican is to thrive in India in the future.

One of the most significant setbacks for the species in India was the abandonment of the Kolleru colony, where more than 1,500 nests were once active (Neelakantan 1949, Gee 1960). A variety of underlying factors is thought to have precipitated this disaster, the most proximate of which relate to the destruction and disturbance of the colony itself. For instance, the *Palmyra* trees on which it was sited were felled and replaced by coconut palms, and these were kept clear of nesting pelicans by the villagers in an attempt to limit crop damage (Guttikar 1979). Furthermore, the poaching of eggs and trapping of adult pelicans for sale in nearby towns was considered “the biggest single factor for their decline and final abandonment of Kolleru” (Nagulu 1995). Less directly, a shortage of nesting material was thought to have been a problem (Krishnan 1980), as was the draining of the lakes where the pelicans fished (Gee 1960) and the indiscriminate application of pesticides in the vicinity (Guttikar 1978). At Moonradaippu, another abandoned colony, the collapse appears to have been caused by the gradual loss of trees, poaching of eggs and nestlings, and the construction of a chemical

factory nearby (A. Rajaram verbally 1993, Subramanya 1996). The pressures that eradicated these two previous nesting populations are probably relevant in varying proportions to all abandoned colonies. Alarming, they still apply to those sites still occupied in the twenty-first century.

The Kokkare Bellur colony has been the subject of intensive research in recent years and provides another useful case study of the problems, anthropological and environmental, that face Indian pelicanries and threaten to bring about their demise. In 1979 a property dispute apparently led to the felling of a large tree, eliminating the nest sites of 80 pairs in a population of about 400 birds (Sridhar 1992, Subramanya 1996; these numbers do not, however, square with the maximum number of nests otherwise reported in one tree [c.15]; see Breeding). The pelicanry was further reduced in size during 1985 “due to a fatal confusion about its ownership” (Talukdar 1999), although this is not explained. More colony trees were abandoned following disturbance in the 1990s (SS). During the breeding season, villagers climb these trees or those nearby to cut branches for domestic use or to provide their goats with fodder, and this has resulted in the abandonment of nests, even those containing nestlings (SS). Such disturbance also leads to temporarily unattended eggs or nestlings and this apparently increases predation by House Crows *Corvus splendens* and Large-billed Crows *C. macrorhynchos* (SS). The rate of branch-cutting exceeds tree growth and continually reduces the space available for nesting pelicans (Subramanya 1996). It also results in many nests being placed precariously at the end of sawn-off stumps, and several nestlings have been recorded falling from nests thus situated (Subramanya and Manu 1996). The lack of space has caused overcrowding of nests, and this in turn has led to aggression between siblings, or even the occupants of neighbouring nests (SS). It appears that chicks fall from nests during these altercations, and thus overcrowding is directly implicated in the increased mortality recorded at colonies (Lamba 1963). It should be added that a fallen nestling is ignored by its parents and usually starves or is predated (Subramanya and Manu 1996). At Kokkare Bellur, up to 100 nestlings fall from their nests each season (SS). Moreover, during the 1996–1997 breeding season, incessant rains over three weeks led to nest desertion by pelicans at Kokkare Bellur: only a few pairs bred towards the end of the season following two unsuccessful attempts (SS). These factors at least partly explain the drop in numbers at the colony from 2,000 birds in the 1960s to 330 birds in 1995 (Subramanya and Manu 1996).

Most other pelicanries in the country suffer similar problems to Kokre Bellur. Unattended nests in the Nelapattu pelicanry were predated by crows and Brahminy Kites *Haliastur indus*; in addition, eggs were sometimes dislodged from the nest when adults took flight abruptly as a result of human disturbance (Nagulu and Rao 1990). The loss of nestlings from the nest is also an important factor reducing breeding success in other colonies (Gee 1960, 1964, Lamba 1963). Two colonies in Dibru-Saikhowa National Park, Assam, were apparently abandoned “due to human disturbance” (Choudhury 1995b). Disturbance through livestock-grazing and tourism apparently led to the desertion of pelican nests at Vedanthangal Sanctuary, Tamil Nadu (Scott 1989, Venkatraman 1996). At Kaziranga National Park increased tourist disturbance apparently resulted in the pelicans shifting from the Mikimukh area of the park to nest close to Kaladuar village (Talukdar 1995b,d). The drop in breeding pairs in Kaziranga from 500 to 150–200 in the 1980s and 1990s was also attributed to a forest fire in the original colony area (Bhattacharjee *et al.* 1996). In Tamil Nadu villagers have even been recorded actively destroying colonies (e.g. Kundukulam) because of the “noise and bad odour” produced by the birds (Abraham 1974). This appears to be a problem in several colonies within villages, often the only sites where suitable trees are left standing (Subramanya 1996). *Myanmar* The loss of nest sites was probably crucial to this species’s virtual extinction from Myanmar. Most individuals chose to nest in “wood-oil trees [*Dipterocarpus*], gigantic fellows, 150 feet high and more, and with smooth branchless trunks of 80 to 100 feet” (Oates 1878); these trees provided ideal platforms until they were totally cleared from the Sittang plains,

after which the pelicans had nowhere to nest (Scott 1989). *Thailand* One of the chief constraints on larger waterbirds in Thailand appears to be the lack of undisturbed nesting habitat in the vicinity of suitable swampy feeding sites (Scott 1989).

**Disturbance and pollution** *India* Huge increases in the human population of India are causing mounting pressure on wetlands throughout the country (see Threats under Lesser Adjutant and Greater Adjutant). Talukdar (1995b) warned that “human activities near to both the nesting sites and the general feeding habitats of the pelican are major threats for the species in Assam”. In Dibru-Saikhowa National Park, Assam, Thiodan, Dieldrin and other non-biodegradable pesticides are used in winter to kill fish, doubtless with detrimental effects on wetland ecosystems (Choudhury 1995b, 1997d). This practice is probably widespread in the Brahmaputra lowlands. A survey of wetlands used by Spot-billed Pelicans in Karnataka (S. Sridhar and A. K. Chakravarthy *in litt.* 1995) found that 60% were disturbed by “large-scale unregulated fishing activities”, while small-scale activities occurred on the remainder. Fertilisers and chemicals were recorded as run-off into 33% of wetlands, domestic sewage into 22%, while agricultural development was encroaching on 30%. Around 30% of the wetlands showed signs of excessive aquatic vegetation, a feature likely to reduce their importance for pelicans (S. Sridhar and A. K. Chakravarthy *in litt.* 1995). Many foraging sites of pelicans are heavily disturbed by people, and possibly affected by industrial and domestic run-off (Rama 1996). In Karnataka 12% of village tanks studied by Subramanya (1990) were susceptible to eutrophication from human sewage. Increased salinity caused by the evaporation of sea-water near salt-based industries is also causing problems in the Point Calimere wetlands (Sugathan *et al.* 1985). Furthermore, pressure on the wetlands through exploitation by fishermen is causing much disturbance, and unless this is controlled the sanctuary has “very little chance of survival” (Sugathan *et al.* 1985). Boating and road traffic causes disturbance at Chandpata lake, Madhya Pradesh (Scott 1989). Wetland poisoning by fishermen at Panidihing Sanctuary in Assam, along with persecution of waterbirds, is reviewed in the equivalent section under Greater Adjutant, while conservation issues at Chilka lake, Orissa, are outlined in the equivalent section under Spoon-billed Sandpiper *Eurynorhynchus pygmeus*. *Nepal* Human activity at Kosi barrage and Kosi Tappu Wildlife Reserve may threaten the continued occurrence of the pelican at this site through loss of prey and disturbance (Baral 1998, Petersson 1998b). *Sri Lanka* Human disturbance (particularly as a result of fishing activity) affects several important sites for the species in the country (see, e.g., de Silva 1999). *Myanmar* Nagulu (1995) attributed the disappearance of the species from Myanmar partly to the pressures of war and insurgency, although it is not clear what factual evidence there is to support this view. Most large lakes (e.g. the lake between Tharaway and Letpadan townships) are auctioned for fishing and consequently heavily disturbed (Khin Ma Ma Thwin *in litt.* 1997). *Cambodia* Disturbance and pollution are relatively minor threats in Cambodia; further details appear in Threats under Greater Adjutant. *Vietnam* As elsewhere, the Spot-billed Pelican is threatened partly by human disturbance (Nguyen Cu *in litt.* 1997, Pedersen *et al.* 1998). An overview of conservation problems in the Red River delta area appears in Threats under Black-faced Spoonbill *Platalea minor*.

**Hunting and persecution** *China* Hunting of waterbirds is rife in China; this species (amongst many others) was reported in hunters’ bags in the Yangtze valley between 1987 and 1992 (Lu Jianjian 1993a), although it is far more likely that the Dalmatian Pelican was involved. *India* Owing to its large size, this pelican makes an easy target for hunters and is consequently shot regularly; moreover, at some feeding sites around Kokkare Bellur, pelicans quite frequently get entangled in gill-nets used in commercial fish capture (SS). One of the main reasons for the loss of Kolleru and Moonradaippu pelicanries was poaching of eggs and young by people living nearby (V. Nagulu and A. Rajaram verbally 1993). In Karnataka, hunting and trapping were apparently a problem at 41.5% of village tanks (Subramanya 1990) and more recently reported at 20% of wetlands considered important for pelicans (S. Sridhar and



A. K. Chakravathy *in litt.* 1995). Of 12 individuals recorded in 1993 at the Kole wetlands, Kerala, two were shot by poachers (Nameer 1993). At the other Indian stronghold, Assam, populations of waterbirds in the Brahmaputra valley are generally declining partly because of “extensive netting, trapping and shooting” (Saikia and Bhattacharjee 1990b). Pelican meat is sold in Assamese village markets; three pelicans were killed by hunters at Panidihing in January 1995 (Talukdar 1999). Most fishermen in Assam believe that the pelican is damaging their business by reducing fish stocks: they sometimes pour poison into wetlands to kill both birds and fish (Talukdar 1999), a practice that cannot be in the long-term interests of the fishing communities. *Nepal* Most reports of the species come from parts of Kosi barrage that lie outside the Kosi Tappu protected area, and hunting practices are increasing there (H. S. Baral *in litt.* 1998; see Threats under Lesser Adjutant). (*Sri Lanka*) An account of hunting pressure on Sri Lanka appears in Threats under Lesser Adjutant. Pelicans were being hunted within Bundala National Park at Malala Lewaya in the 1990s (de Silva 1999). *Myanmar* It is not known if hunting contributed to the loss of the species as a breeding bird in the country, but hunting and overfishing appear to be the main hindrance to its re-establishment in what suitable areas remain (Khin Ma Ma Thwin *in litt.* 1997). Its large body size makes it an easy target for hunters (Khin Ma Ma Thwin *in litt.* 1997), and hunting appears to be a considerable threat (see Threats under White-winged Duck *Cairina scutulata*). *Thailand* Direct persecution appears to be the major factor underlying the bird’s rarity in Thailand. In the nineteenth century wing-feathers were traded to China for use in the manufacture of fans (Schomburgk 1864)—this suggests a hunting threat that may have been exerted on Chinese pelican populations. Schomburgk (1864) also noted that “the Siamese eat pelicans”, a factor perhaps compounding the population crash after the increase in availability of firearms in the late nineteenth century. Large waterbirds are still routinely shot throughout the country (P. D. Round *in litt.* 1998). Individuals of this and any other large waterbird “must run the gauntlet of Thailand’s well-armed villagers, many of whom are stupidly curious as to whether they can blast any large bird out of the sky, merely for the fun of it” (Round 1988b). Moreover, people-pelican conflict may have increased with the proliferation of commercial fishponds (P. D. Round *in litt.* 1998). *Laos* Hunting in Laos is ubiquitous for a variety of cultural and economic reasons (Thewlis *et al.* 1998), and populations of all large, conspicuous birds are highly threatened as a result. *Cambodia* Although Mundkur *et al.* (1995a) quoted the collection of pelican nestlings as a potential serious threat in Cambodia, they are apparently not harvested as a food source because they are unpalatable (Sun Hean *in litt.* 1997). However, adults are reportedly poisoned and hunted, while many eggs are taken from colonies (Sun Hean *in litt.* 1997). Fishermen on Tonle Sap lake run lines and hooks across the surface of the lake to catch flying pelicans; shooting is also a problem, especially by the military (C. M. Poole *in litt.* 2000). No fewer than 3,130 eggs were reportedly collected by villagers from the Prek Toal colony in the 1995–1996 breeding season (Parr *et al.* 1996). Around 30 individuals kept in Phnom Penh zoo derive from wild colonies (C. M. Poole *in litt.* 1999). *Vietnam* As elsewhere, the species is threatened partly by hunting (Nguyen Cu *in litt.* 1997, Pedersen *et al.* 1998). *Philippines* It appears to have been extirpated from the Philippines by a combination of human disturbance, hunting, destruction of nesting and roosting areas and increased pesticide use (Collar *et al.* 1994, 1999); of these threats, shooting was regarded as the most likely to have seriously depleted the population (Gonzales and Rees 1988). *Indonesia* Vorderman (1882–1885) mentioned birds being captured in and around Jakarta, doubtless for food.

**Other India** Each year one or two pelicans are electrocuted at Kokkare Bellur when striking electricity supply lines close to the colony (S. Sridhar and A. K. Chakravathy *in litt.* 1995, SS).

**MEASURES TAKEN Legislation** The species is granted legal protection in India (Schedule IV, Wildlife Act 1972), Sri Lanka, China, Myanmar, Thailand (WARPA), Cambodia and Laos.

**Protected areas India** The species occurs in 10 protected areas in Assam: Dibru-Saikhowa, Kaziranga, Laokhowa, Manas and Orang National Parks, and Bordoibam-Bilmukh Sanctuary, Burhachapori Wildlife Sanctuary, Deepor Beel Sanctuary, Panidihing Sanctuary and Pobitora Wildlife Sanctuary. Shooting is apparently prohibited at Sambhar lake, Rajasthan (Scott 1989). Nelapattu tank is a bird sanctuary (4.5 km<sup>2</sup>) established to protect the waterbird colony (Scott 1989). In Andhra Pradesh 172.5 km<sup>2</sup> of Pulicat lake lies within the Pulicat Lake Sanctuary, while the entire portion in Tamil Nadu (60 km<sup>2</sup>) is also a protected area (Scott 1989). Other relevant protected areas are Bhitarkanika Wildlife Sanctuary, Chilka (Nalaban) Sanctuary, Corbett National Park, Coringa Wildlife Sanctuary, Dudwa National Park, Karaivetti Sanctuary, Karera Bustard Sanctuary (but see Measures Taken under Great Indian Bustard *Ardeotis nigriceps*), Madhav National Park, National Chambal Sanctuary, Point Calimere Sanctuary and Vedanthangal Sanctuary. At Chilka lake, the Indian government has provided funds for habitat improvement and the state government has drawn up a comprehensive project which includes desiltation, fisheries and tourist development and multi-disciplinary research (Trisal 1993). **Nepal** The species occurs at Kosi Tappu Wildlife Reserve. **Sri Lanka** It breeds in small numbers at Wilapattu National Park, and the lowered spill at Kadupaharaella was expected to provide ideal conditions (Kotagama 1989). It also occurs in Giant's Tank Sanctuary (39 km<sup>2</sup>) and Tissa-Wirawila Sanctuary (42 km<sup>2</sup>). Bundala National Park was declared a Ramsar Site in June 1991 (Hoffmann 1998). **Myanmar** Mohingyi Wetland Sanctuary has been established for the protection of waterfowl (Khin Ma Ma Thwin *in litt.* 1997). **Vietnam** Xuan Thuy Nature Reserve (described in Measures Taken under Black-faced Spoonbill) is a Ramsar site and a nationally recognised reserve, but integrated conservation management is apparently yet to be implemented (Nguyen Cu *in litt.* 1997, Pedersen *et al.* 1998). The species has also occurred in Dat Mui Nature Reserve (Buckton *et al.* 1999). **Cambodia** There are no functional protected areas in Cambodia; details of provisional protected area status at Tonle Sap appear under Greater Adjutant.

**Control of persecution** Details of measures in Bangladesh and Sri Lanka appear in the equivalent section under Lesser Adjutant, and in Cambodia under Greater Adjutant.

**Rehabilitation of colonies India** At Kokkare Bellur, an annual fee is paid to villagers who own nesting trees to ensure that no harm is done to the vegetation or the pelicans (Neginhal 1997). At the same site, captive rearing and rehabilitation of fallen nestlings has commenced with the involvement of local people: during 1995, 24 nestlings were raised in a nursery located within the pelicanry and nearly 50 nestlings were successfully rehabilitated to the wild in 1995–1997 (Subramanya and Manu 1996, SS). Nearly 700 saplings of trees preferred for nesting by pelicans were planted during 1995 at Kokkare Bellur, nearly 250 of which have survived (SS), and a Village Pelican Conservation Group comprising local youth and students has been formed (Subramanya and Manu 1996). Fallen pelican chicks from the Kanjirankulam pelicanry, Tamil Nadu, were traditionally cared for by local people until at least the 1970s, prompted in part by the local use of pelican “guano” to fertilise crops (Abraham 1974), a practice in decline following the advent of commercial fertilisers (SS). Nevertheless, crops irrigated from reservoirs in which large numbers of waterbirds feed apparently produce higher yields because of the nitrogen and phosphorus in bird droppings (Paulraj and Kondas 1987). This was also shown to be the case with guano from the Vedanthangal pelicanry in Tamil Nadu, which has been protected by villagers for at least two centuries and now lies within Vedanthangal Sanctuary; the build-up of guano under the colony is harvested and applied to cultivated lands that are also irrigated with enriched reservoir water, leading to high rice yields and amply repaying the protection invested by villagers (Paulraj and Kondas 1987).

**Education Cambodia** Awareness material (books and posters) have been 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).

**MEASURES PROPOSED** A concerted effort is required (particularly in Sri Lanka, India and Cambodia) to monitor population trends, safeguard remaining colonies and control hunting, habitat loss and pollution.

**Legislation** The species should be listed on Schedule I of the Indian Wildlife Act 1972 (Choudhury 2000c). Environmental legislation and institutional capacity are currently insufficient in India (indeed in any range state: see Threats under White-winged Duck) to arrest the commercial destruction of supposedly protected sites such as Pulicat lake, and both urgently need strengthening (Panini 1996).

**Protection and management of colonies** As disturbance to pelican colonies causes a reduction in breeding success and even colony abandonment, breeding sites need to be managed so that disturbance is minimised (Crivelli and Schreiber 1984). Protection of nest trees or replacement of lost nesting sites is an urgent priority (Subramanya 1996). *India* Existing colonies should be brought under state protection on a priority basis (Subramanya 1996). Protection should aim to prevent any damage to favoured nesting trees and to remove all forms of human interference or disturbance during the nesting period. Known breeding sites should be monitored regularly to assess pelican numbers and any environmental changes that might affect them (Talukdar 1999). To minimise disturbance, tourists should not be encouraged to visit the Kokkare Bellur colony (S. Sridhar and A. K. Chakravarthy *in litt.* 1995). Tourism in Kaziranga National Park should be regulated properly and a minimum distance of 200–300 m maintained between tourists and the pelicanry during the breeding season (Talukdar 1995b). Establishment of facilities for visitors to pelicanries (e.g. the provision of hides) might reduce the amount of disturbance caused, and if visitors paid a small fee this could perhaps partly offset the cost of conservation activities at breeding sites (Subramanya 1996). An intensive tree-planting programme should be undertaken using appropriate tree species (see Breeding: Site) at all pelicanries and around feeding sites to promote the establishment of future pelicanries (Nagulu and Rao 1990, Subramanya 1996). For example, the planting of *Acacia nilotica* at Nelapattu tank has partially compensated for trees lost in a cyclone (V. Nagulu verbally 1995). To reduce the gap between planting and attainment of sufficient size and stature for trees to be suitable for use by nesting pelicans, the possibility of transplanting partly grown trees (Nagulu and Rao 1990) or using artificial nest platforms (S. Sridhar verbally 1991) should be considered. Single nest platforms should first be erected and positioned in the outer canopy of preferred trees on an experimental basis; if pelicans take to these, their numbers may be increased over the years (SS). Platforms should be designed to facilitate placement of nests in clusters and to withstand the weight of nests; the platform should provide sufficient perching sites for birds and suitable landing sites for parents returning from feeding (SS). As the loss of nesting trees is tied to local requirements for timber, fuel and fodder, an alternative strategy, backed by strong social forestry practices, should be formulated to meet these requirements and reduce pressure on colony trees (Subramanya and Manu 1996). Electricity wires should be sleeved in plastic near colonies to prevent electrocutions (S. Sridhar and A. K. Chakravarthy *in litt.* 1995). Some sites might need careful translocation from villages to wetlands which can be better protected as waterbird sanctuaries (as was once planned for Koonthakulam: Scott 1989); but this should only be undertaken when conflict with people cannot be circumvented. *Myanmar* Strict protection of any remaining breeding sites is clearly a priority. *Cambodia* Details, in particular addressing the serious issue of egg collection, appear in Measures Proposed under Greater Adjutant. *Indonesia* The discovery and full protection of the last nesting colony (or colonies) in Sumatra would be extremely welcome.

**Protection and management of feeding sites** Maintenance of food supply is crucial, as it has been shown that reproductive success in at least one pelican species declines with falling

fish abundance (Anderson *et al.* 1982). Wherever possible, conflict between pelicans and local fisheries must be minimised and attempts made to maximise fish stocks in wetlands associated with colonies. Restricted or rotational use of wetlands by people would benefit the species if such a system could be organised at key sites. The problem of pesticide pollution in wetlands also needs to be addressed, especially in important feeding areas for this species (Crivelli and Schreiber 1984). *India* There is an urgent need to survey and identify key feeding sites of the species located within a 50–60 km radius of each pelicanry, with their protection to be provided by local forestry departments (SS). Major wetlands of importance to pelicans around the Kakkare Bellur colony in Karnataka should be left undisturbed by villagers, with controls on fishing, hunting, pollution and marginal agricultural development (Sridhar and Srinivasa 1992, S. Sridhar and A. K. Chakravarthy *in litt.* 1995).

**Protected areas: general India** There is an urgent need to identify priority sites, establish them as protected areas and initiate conservation activities. The Krishna estuary, Andhra Pradesh, requires protection from the onslaught of development which it faces, by upgrading suitable areas to sanctuary status (Rao 1995b). Point Calimere Sanctuary requires the minimisation of industrial impacts on habitat quality and the control of fishing, hunting and disturbance (Sugathan *et al.* 1985). Kaveli tank has been proposed as a bird sanctuary and research station (Scott 1989). Sulekere tank also needs reserve status (S. Sridhar and A. K. Chakravarthy *in litt.* 1995). The Kole wetlands of Kerala need habitat management, hunting control and reduced pesticide usage, and perhaps designation as a Ramsar site (Nameer 1993). Dihaila jheel in the (erstwhile) Karera Bustard Sanctuary might also qualify for Ramsar status, and a suite of activities, such as control of grazing and water use, acquisition by the Forestry Department and development of tourist and research facilities, has been proposed (Rahmani 1987c). *Nepal* H. S. Baral (*in litt.* 1998) recommended the extension of the existing Kosi Tappu Wildlife Reserve south to the barrage (a southward extension of c.8 km). Adjacent wetland areas are important for the conservation of the species in the country. *Sri Lanka* Hoffmann (1998) urged the protection (or better protection) of many wetland sites, including Kalametya Kalapuwa Sanctuary (enlarged to its original 1934 size), Annaivilundawa Sanctuary, Vankalai wetlands, the Sri Lankan side of Adams Bridge (preferably also the Indian side), Giant's Tank Sanctuary, Delft island, Uppu Aru lagoon, Kaithadi Kulam, Jaffna lagoon, Chundikkulam Sanctuary, Kokkilai lagoon and Arugam Kalapu; he particularly sought their more effective protection from encroachment (many of these sites are inside the pelican's historical but not current range in Sri Lanka). More frequent patrolling, stricter control of fishermen and rigid enforcement of existing laws is needed in Bundala National Park (De Silva 1997). *Thailand* Improved habitat protection for remaining wetlands and coastal sites is required, including the establishment, as wetland nature reserves, of undisturbed nesting habitat in the vicinity of suitable swampy feeding sites (Scott 1989). *Cambodia* Strict protection of pelican colonies around Tonle Sap lake is urgently required, and the complex suite of issues threatening these colonies needs to be quickly but carefully addressed (see equivalent section under Greater Adjutant). *Vietnam* Protection of relevant wetlands in the Red River and Mekong deltas is required.

**Education** It has to be said that making local people aware of the rarity or precariousness of this species seems unlikely to persuade them to change their behaviour if they perceive it to be in direct conflict with them over fish consumption or tree use, and it is important that "education" is matched by a sympathetic interest in resolving such conflicts in a satisfactory manner (something which may have long-term financial considerations). *India* Education programmes should target local people, emphasising the importance of protecting the species and its habitat, and aiming to reduce both hunting levels and damage to colony trees (Talukdar 1999). *Nepal* H. S. Baral (*in litt.* 1998) highlighted the urgent need for an effective conservation education programme to raise awareness of local people; fishing and disturbance should be minimised, and illegal trapping of birds for commercial purposes should be discouraged.

*Bangladesh* The equivalent section under Lesser Adjutant proposes an awareness programme. *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 proposes an awareness programme.

**Research** There is a need for long-term studies of the ecology of the species (virtually nothing is known of its foraging patterns and targets) so that the best management options can be illuminated; this work should continue to focus on the major colonies and their environs in India, Sri Lanka and Cambodia. A concerted programme of long-term research in these countries and certain others, using marked birds and including radio- and satellite-tracking, would lay the basis for increasingly sound decision-making in the next half-century on a range of issues affecting this species; however, a real understanding of the nature of person–pelican conflicts also requires some socio-economic study of human communities, so that a marriage of data can produce working solutions for the benefit of both parties. *Myanmar* In addition to surveying remote area where potential colonies might survive, there is a need to develop monitoring programmes (Khin Ma Ma Thwin *in litt.* 1998); the most obvious initial target is Mohingyi Wetland Sanctuary. *Thailand* Nesting success and survival at the two known feral breeding populations should be studied to determine whether management measures could optimise post-fledging survival, thereby leading to the establishment of further populations (P. D. Round *in litt.* 1998). *Cambodia* Further surveys should be conducted to clarify the existence and status of reported colonies at Chhunuk Tru and the Kamchai mountains (Mundkur *et al.* 1995a), and the species should be searched for during aerial or ground-based surveys of wetlands and waterbirds in the north (see Measures Proposed under White-shouldered Ibis and Giant Ibis *Thaumatibis gigantea*). Further details of research proposals around Tonle Sap appear under Greater Adjutant. *Vietnam* The status of the species in the Red River delta of Vietnam requires further study, and conservation measures in that area will possibly be of some benefit to this species (see Measures Proposed under Black-faced Spoonbill). The need to identify the provenance of the small numbers visiting this area would seem to justify a wing-tagging or satellite-tracking exercise.

**Captive breeding** *India* Captive rearing and rehabilitation programmes (see Subramanya and Manu 1996) of nestlings fallen from their nests should be considered at all pelicanries where such problems occur. Captive rearing and rehabilitation of nestlings born in captivity should follow the technique pioneered at Kokkare Bellur (Subramanya and Manu 1996).

**REMARKS** (1) The previous treatment of Spot-billed Pelican and Dalmatian Pelican as conspecific (*Pelecanus philippensis philippensis* and *P. p. crispus*, e.g. by Cheng Tso-hsin 1987) has unfortunately resulted in serious confusion regarding the distribution of these two forms: they were often not distinguished, and many specimens and field records involved misidentifications. Apart from a *P. philippensis* specimen from Meihua, now stored at ASCN, all other Chinese specimens listed as “*P. philippensis*” in fact prove to be *P. crispus* (SC). As it is an Indo-Malayan species, the Spot-billed Pelican should be either resident in China or a late summer (e.g. August–October, following patterns in Vietnam and Laos) visitor. Conversely, Dalmatian Pelican remains a regular winter visitor to coastal China (and rarely to Korea and Japan). It is thus probably safe to assume that summer records of “Spot-billed Pelicans” in southern China are accurate; winter records, however, are less convincing and have not been included in this account. Given this approach, the last confirmed Chinese record of the Spot-billed Pelican was in the 1960s, while there has been no summer record of pelicans in south-east China since the 1980s; it thus seems likely that the species is extinct in China as a breeding species (if it ever bred) or non-breeding visitor, and now occurs only as

a vagrant. Similarly, past literature from Pakistan and India often fails to specify the “subspecies” involved. Furthermore, the English name “Grey Pelican” was used for Dalmatian Pelican by Ali and Ripley (1968–1998) and for Spot-billed Pelican by Dharmakumarsinhji (1955), a duplication that has apparently caused serious confusion over past records in the Indian states of Gujarat and Rajasthan (Parasharya in press). While there are many records of both Dalmatian and Spot-billed Pelicans in these states, almost all recent confirmed records are of the former, suggesting that earlier errors were made as a result of taxonomic and nomenclatural changes (Parasharya in press). Most records from these states are also from the winter months, overlapping suspiciously with both the arrival of Dalmatian Pelicans and the breeding season of Spot-billed Pelican in southern India and Assam. In other words, records occur when Dalmatian Pelican is most likely to be present and when the Spot-billed Pelican is least likely to be present. (2) Two individuals were reported from the Maldives in 1962 and the species was described as a “rare visitor” with a maximum of five individuals together (Ash and Shafeeg 1994). However, there is no confirmation of these sightings (they are mapped as provisional by Grimmett *et al.* 1998) and are best treated as unconfirmed. (3) This species has been reported in the past from Hong Kong, but there are no confirmed records, and the pattern of the sightings suggests that most (if not all) were actually Dalmatian Pelicans (Chalmers 1986). The status of this species on Taiwan is also unclear, largely because of confusion with Dalmatian Pelican (see Hachisuka and Udagawa 1950–1951). A record on Mazu Dao island is listed under Fujian province, China. There is a specimen in NHMW collected on “Formosa” before 1891, but its specific identity remains to be confirmed. (4) There is an unconfirmed record of 15 birds off Ponggol point, Singapore, December 1960 (Wells 1999). (5) A bird was reported by forest guards at D’Ering Memorial Wildlife Sanctuary, Arunachal Pradesh, in January 1996 (Barman 1996). (6) There was apparently one possible sighting after a cyclone at Port Blair, Nicobar Islands, undated (Butler 1899–1900), this perhaps referring to a specimen received by Blyth (1846, 1863), from the Nicobars, although the provenance of this skin was considered doubtful by Hume (1874a). (7) This entry appears in BMNH egg data qualified once with Sri Lanka and once with Godaverri, and thus the record might be from mainland India (see Distribution: India). (8) Although Fischer (1974) gave a specific locality for this colony, he earlier (Fischer 1963) stated only that an individual in Hanoi Botanical Gardens was reported to have come from a breeding colony in the coastal zone of Ninh Binh province. It is unclear whether the specific location is based on additional information or a different interpretation of the earlier report. (9) It is perhaps worth noting that this species and the Greater Adjutant are rather unusual in that no colonies were reported from Assam until the twentieth century was well under way. It is tempting to speculate that their Assamese breeding populations are, at least partly, a product of the disaster that befell their huge shared colony far to the south in the valley of the Sittang river; while this may be the case it is impossible to prove.