

Threatened Birds of Asia:

The BirdLife International Red Data Book

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STORM'S STORK

Ciconia stormi

Critical —

Endangered A1c; A2c; C1

Vulnerable D1



This stork qualifies as Endangered because it has a very small, very rapidly declining population, owing to destruction of lowland forest through logging, dam construction and conversion to plantations.

DISTRIBUTION Storm's Stork (see Remarks 1) has a range that extends from southern Thailand, where it is almost certainly extinct (Nakhasathien 1987a, Round 1988a), through Peninsular Malaysia (Wells 1999) to the islands of Borneo (all main political divisions) and Sumatra, Indonesia. The map reveals a fairly broad distribution throughout this Sundaic range, with exceptional concentrations of records in eastern Sabah and in and around Brunei, but with a notable dearth of them in central areas of Kalimantan (although the species is on the Mahakkam) and on Sumatra away from its eastern fringes; this may, however, merely reflect observer coverage. The map also reveals a remarkably high ratio of recent to historical records, which should not be construed as evidence of a healthy conservation status; to the contrary, the observations in question concern very small numbers of birds, in many cases possibly transients. Records are from:

■ **THAILAND Khlong Saeng Wildlife Sanctuary** on the Khlong Mon river, Surat Thani, a breeding pair, September 1986 (Nakhasathien 1987a)—an astonishing discovery, given that this was (a) the first (and, apparently, last) record for the country, (b) the first-ever properly documented breeding record, and (c) so far north (c.600 km) of the known range of the species (see map);

■ **MALAYSIA** (see Remarks 2 and 3) ■ **Peninsular Malaysia Taman Negara National Park**, Pahang, a bird identified as Woolly-necked Stork *Ciconia episcopus* at a salt-lick in June 1950 (Medway and Wells 1976) almost certainly belonged to this species, and one was definitely recorded at Kubang saltlick, April 1974 (Wells 1982), with only odd records since (Harrap 1986a), including at Sungei Tembeling, July 1996 (*Enggang* 4, 4 [1996]), March 1987 (Wells 1990c), March 1989 (N. Bostock *in litt.* 1999), Kuala Kenyam, October 1989 (*Enggang* 2, 11 [1989]), Lubok Simpon, October 1989 (*Enggang* 2, 11 [1989]); **Tumboh Forest Reserve**, Perak, March 1991 (A. C. Sebastian *in litt.* 1999); **Sitiawan**, Perak, a skull found apparently of this species, c.1934 (Chasen 1934), but patches of floodplain forest are rapidly shrinking in this area (Wells 1999); **Tekam Forest Reserve**, one over Sungai Tekam, February 1969 (Wells 1972), an area now cleared of forest (Wells 1999); **Kerau Wildlife Reserve** (Krau Wildlife Reserve), Pahang, near the Kuala Lompat clearing, February 1970, claimed by game wardens to be regular at this site (Wells 1974), with a singleton observed there in January 1987 (*Oriental Bird Club Bull.* 5 [1987]: 33–36, Wells 1990c); **Ulu Gombak Forest Reserve**, Selangor, one picked up dead (initially identified as Woolly-necked Stork) in August 1963 (Medway and Wells 1964, Wells 1972) and presumably nearby at Gombak (Ulu Gombak), upper Kelang drainage, Selangor, August 1963 (Wells 1999); **Endau-Rompin Conservation Area**, Pahang/Johor, and environs, where recorded along the lower reaches of Sungai Rompin, three in flight, March 1989 (*Enggang* 2, 4 [1989]), and near the Sembrang tributary of Sungai Endau, May 1989 (*Enggang* 2, 6 [1989]), with another record in July 1990 from the latter area (Hancock *et al.* 1992, Wells 1999), probably also the adjacent Pekan-Nenasi Forest Reserve complex (also termed “South-East Pahang Swamp Forests”: DWNPPM 1987), Pahang (see Measures

Proposed); **Tanjong Sepat**, November 1996 (*Enggang*, February–March 1997; see Remarks 3); **Benut Forest Reserve**, Johor, 1986 (Hawkins and Silvius 1986; see Remarks 3); **Panti Forest Reserve**, south Johor, January 1995 (*Oriental Bird Club Bull.* 21 [1995]: 68–73, Wells 1999), July 1997 (Lamont 1998);

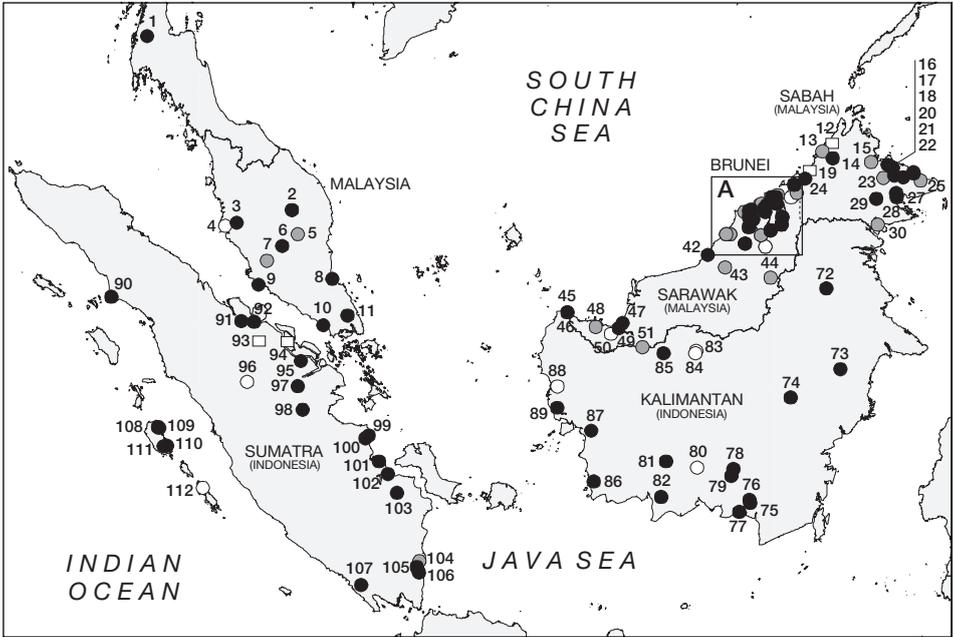
■ **Sabah Kota Belud Bird Sanctuary** and the adjacent Tempasuk plain, undated (DWNPPM 1987); **Tuaran**, pair, 1963–1964 (Gore 1968); **Kinabalu Park**, one circling at 1,600 m, over the park headquarters on Gunung Kinabalu, May 1998 (*Oriental Bird Club Bull.* 28 [1998]: 44–48, I. Mauro *in litt.* 1999; see Migration); **Labuk river**, single, August 1966 (Gore 1968); **Kabili-Sepilok Forest Reserve** (Sepilok Forest Reserve), December 1982 (Sheldon *et al.* in press), March 1984 (Smith 1984), May 1987 (Lomosse and Lomosse 1987), July 1987 (R. J. Fairbank *in litt.* 1999), 1991 (F. Verbelen *in litt.* 1999); **Sandakan bay**, July 1964 (Fogden 1965), two near Sandakan, December 1990 (T. Carlberg *in litt.* 1999), and again in 1991 (F. Verbelen *in litt.* 1999); **lower Kinabatangan river** (including Kinabatangan Wildlife Sanctuary) from Lokan Forest Reserve to Abai near the coast, March 1999, including two at Danau Abai, four at Sungai Menanggal, one at Sungai Teneggang, two at Danau Tongog, one at Sungai Koyah, seven at Batu Putih oxbow lakes (with 10 there in November 1999), three at Danau Bulat, and two at Bukit Garam (A. C. Sebastian *in litt.* 1999; see Measures Proposed), also around Sukau, three, March 1994 (T. Andersen *in litt.* 1999), 4–5, July–August 1996 (C. F. Brooks *in litt.* 1999, J. del Hoyo *in litt.* 1999, D. A. Scott *in litt.* 2000), two between there and Lahad Datu, March 1994 (T. Andersen *in litt.* 1999), three at the Wildlife Exhibition Lodge, October 1996 (O. Prévost *in litt.* 1999; for further records from this area see Sheldon *et al.* in press); **Kimanis bay**, “scarce resident”, undated (Smythies 1963, also Sheldon *et al.* in press); **Kulamba Wildlife Reserve**, apparently April 1984 (Payne 1985), December 1984 (Sheldon *et al.* in press); **Gomanton** (Gomantong caves), July 1964 (Fogden 1965), April 1981 (Sheldon *et al.* in press), October 1999 (M. Widmer *in litt.* 1999) and Gomanton–Telupid road, March 1984 (Smith 1984); **Uncle Tan’s Jungle Camp**, lower Kinabatangan river, daily, September 1991 (Verbelen 1991), seven sightings involving at least three birds, June 1998 (I. Mauro *in litt.* 1999), August 1998 (H. Hendriks *in litt.* 1999), with sightings “almost a certainty” (Bransbury 1993); **Lamag**, c.150 km from Sandakan on the Kinabatangan river, May 1902 (Ogilvie-Grant 1902, 1903, Sharpe and Chubb 1909), and above Lamag, pair, June 1965 (Gore 1968); south of **Membakut**, two, January 1985 (Sheldon *et al.* in press); **Segama river**, pair, April 1967 (Gore 1968); **Klias peninsula**, at Padas Damit Forest Reserve, February 1985 (Sheldon *et al.* in press), six seen and up to 10 reported, February 1998 (A. C. Sebastian *in litt.* 1999; see Measures Proposed), and Binsuluk Forest Reserve, one, 1998 (A. C. Sebastian *in litt.* 1999; but see Threats); **Ulu Segama Forest Reserve**, once between May 1989 and October 1990 (Lambert 1992); near **Gunung Silam**, eastern Sabah, January 1990 (Lambert 1993c); **Danum Valley Conservation Area**, June 1998 (I. Mauro *in litt.* 1999); **Wallace bay**, single bird, February 1962 (Gore 1968);

■ **Sarawak Lumut**, near Lawas (recently fledged bird, regarded as first proof of breeding in Borneo), November 1957 (Various hands 1958); **Mengalong river** (not “Labuan”, as in *Catalogue of birds in the British Museum*), north Sarawak, in or before 1876 (Ogilvie-Grant 1902, 1903); **Lawas river**, undated (Sharpe 1876–1879); **Claudetown**, Baram river, June 1896 (female in ANSP); **Marudi**, Baram river, May, 1990s (Smythies and Davison 1999); **Gunung Mulu National Park**, April 1988 (B. Briggs *in litt.* 1999), and at southern border, November 1974 (Kemp and Kemp 1976), with 1–2 along the Mulu summit trail, January 1991 (T. Carlberg *in litt.* 1999), regularly seen along rivers and even in the vicinity of the park headquarters (Bransbury 1993); **Miri**, near the mouth of the Baram river, June 1975 (Alexander-Marrack 1978); **Kuala Niah**, October 1974 (Kemp and Kemp 1976), and in Niah hinterland, one, 1965 (Harrison 1966); **Long Terawan**, Tutoh river, February 1965 (Fogden 1965); **Loagan Bunut National Park**, August 1998 (A. C. Sebastian *in litt.* 1999), and a pair of birds in January 2001 (MNS Miri Branch *in litt.* 2001); **Baram district**, nineteenth century

(*Ibis* 8, 4 [1904]: 674); **Similajau National Park**, August 1986 (Duckworth and Kelsh 1988, Duckworth *et al.* 1996); over **Ulu Pesu**, Tubau, Bintulu district, August 1964 (Fogden 1965); near **Long Tikan** on the Baram river, November 1974 (Kemp and Kemp 1976); **Tanjung Datu National Park**, small numbers recently, mainly in riverside trees along Sungai Samunsam outside the park, undated (WWF Malaysia 1998); **Samunsam Wildlife Sanctuary**, occasionally (Duckworth and Kelsh 1988), 1987 (A. C. Sebastian *in litt.* 1999), August, year unspecified (Smythies and Davison 1999); **Maludam National Park**, at Maludan, June 1990 (E. L. Bennett *in litt.* 2000); **Kuching**, at the airport, September 1964 (Fogden 1965); **Sebuyau Forest Reserve**, December 1996 and October 1997 (A. C. Sebastian *in litt.* 1999); **Simunjan river** (tributary of the Sadong), southern Sarawak, c.1900 (Ogilvie-Grant 1902, 1903); **Batu Lintang**, near Kuching, November 1957 (Various hands 1958); Gunung Gilly (untraced), November 1880 (Blasius 1882a);

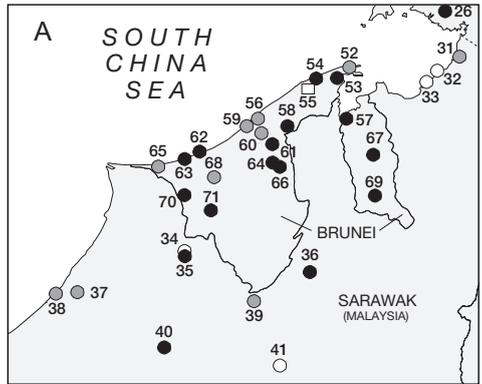
■ **BRUNEI** (where it “may be seen flying almost anywhere”: Mann 1987) **Muara**, once, 1975–1978 (Kidd 1978); **Mentiri** undated (Mann *in prep.*), in the period 1986–1988 (Mann 1988); **Berakas**, March 1989 (Mann 1991); **Tungku**, undated (Mann *in prep.*); **Tutong road**, once, 1975–1978 (Kidd 1978); **lower Temburong**, July 1989 (Mann 1991); **Wasan** (Limau Manis), with up to eight birds, 1975–1978 (Kidd 1978), two in June 1988 (Sparks undated, Mann 1991); **Tutong river**, 1952–1955 (Smythies 1955); over **Penapar** (near Merimbun lake), once, 1975–1978 (Kidd 1978); near **Lamunin** (this record first given as at Kampong Sungai Beruang), c.30 km south-west of Bandar Seri Begawan, January and July 1976 (Kidd and Beales 1977, Kidd 1978), and March 1989 (Mann 1991, M. J. Seal Coon *in litt.* 1999); **Badas**, in the period 1986–1988 (Mann 1988), May 1991 and (at the pumping station) April 1993 (M. J. Seal Coon *in litt.* 1999); **Seria forest**, April 1989 (Mann 1991); **Benutan river** (Ladan hills area) in the period 1986–1988 (Mann 1988); **Belait river**, 1952–1955 (Smythies 1955), July 1964 (Fogden 1965), 1967–1968 (when seen from the lower reaches at Badas up to the Penipir and possibly Pelir Regang tributaries, and including 12 at Sukang in February 1968) (Holmes 1969), 1975–1978 (Kidd 1978), and the Seria–Kuala Belait new road in the period 1970–1975 (Smith 1977); **Ladan hills**, September 1989 (Mann 1991); **Limbang/Temburong**, October 1986, and a captive bird at the Brunei Museum from this area, 1985–1986 (J. R. Howes *in litt.* 1999); **Bukit Puan**, four seen once, 1975–1978 (Kidd 1978); **Ulu Temburong National Park** (Ulu Temburong), June 1984 (Counsell 1986), July 1988 (Sparks undated); **Kuala Balai**, August 1995 (M. J. Seal Coon *in litt.* 1999); over the **Labi road**, once, 1975–1978 (Kidd 1978), up to four, January–March 1989 (Mann 1991); Shell Commissariat (untraced), 1974 (Smith 1977); over **Kampong Ayer** (untraced), once, 1975–1978 (Kidd 1978);

■ **INDONESIA** (see Remarks 4) **Kalimantan** ■ **East Kalimantan Bahau atas**, Kayan Mentarang National Park, February 1992 (SvB), a pair in November 1996 (Holmes 1997, V. Nijman *in litt.* 1999); **Sungai Telen**, below Muara Ancalong, possibly up to 12 birds in April 1985 (*Oriental Bird Club Bull.* 3 [1986]: 33–36, Holmes and Burton 1987); Sungai Mahakam above the lakes (including Lake Jempang), recently (Holmes 1997, Gönner *in press*), including between Lutan and Muara Ratah, two, November 1999 (V. Nijman *in litt.* 2000), and **Sungai Ratah**, two in January and three in June 1996 (R. Sözer *in litt.* 1999); ■ **Central Kalimantan** 20 km north of **Kualakapuas**, August 1997 (Holmes 1997); **Sungai Kapuas** (Anak Barito), nineteenth century (Büttikofer 1899), major tributary of Barito river, mid-1980s (Holmes and Burton 1987); **Sungai Kahayan**, Palangkaraya, mid-1980s (Holmes and Burton 1987), but not observed in 1997 (Holmes 1997); **Sungai Rungan**, tributary of the Kahayan river, Palangkaraya, mid-1980s (Holmes and Burton 1987), but not observed in 1997 (Holmes 1997); upper catchment of the **Sungai Sebangau**, 20 km south-west of Palangkaraya, 1993–1995 (Page *et al.* 1997), and near Sungei Rasau (untraced; tributary of Sebangau), c.35 km south-west of Palangkaraya, September 1999 (S. Page *in litt.* 1999); **Parit**, Cempaga river, 30 km above junction with Sampit river, June–July 1935 (Mayr 1938); **Sungai Seruyan**, 1984 (Holmes and



The distribution of Storm's Stork *Ciconia stormi*:

- (1) Khlong Saeng Wildlife Sanctuary; (2) Taman Negara National Park; (3) Tumboh Forest Reserve; (4) Sitiawan; (5) Tekam Forest Reserve; (6) Kerau Wildlife Reserve; (7) Ulu Gombak Forest Reserve; (8) Endau-Rompin Conservation Area; (9) Tanjong Sepat; (10) Benut Forest Reserve; (11) Panti Forest Reserve; (12) Kota Belud Bird Sanctuary; (13) Tuaran; (14) Kinabalu Park; (15) Labuk river; (16) Kabilii-Sepilok Forest Reserve; (17) Sandakan bay; (18) lower Kinabatangan river; (19) Kimanis bay; (20) Kulamba Wildlife Reserve; (21) Gomanton; (22) Uncle Tan's Jungle Camp; (23) Lamag; (24) Membakut; (25) Segama river; (26) Klias peninsula; (27) Ulu Segama Forest Reserve; (28) Gunung Silam; (29) Danum Valley Conservation Area; (30) Wallace bay; (31) Lumut; (32) Mengalong river; (33) Lawas river; (34) Claudetown; (35) Marudi; (36) Gunung Mulu National Park; (37) Miri; (38) Kuala Niah; (39) Long Terawan; (40) Loagan Bunut National Park; (41) Baram district; (42) Similajau National Park; (43) Ulu Pesu; (44) Long Tikan; (45) Tanjung Datu National Park; (46) Samunsang Wildlife Sanctuary; (47) Maludam National Park; (48) Kuching; (49) Sebuyau Forest Reserve; (50) Simunjan river; (51) Batu Lintang; (52) Muara; (53) Mentiri; (54) Berakas; (55) Tongku; (56) Tutong road; (57) lower Temburong; (58) Wasan; (59) Tutong river; (60) Penapar; (61) Lamunin; (62) Badas; (63) Seria; (64) Benutan river; (65) Belait river; (66) Ladan hills; (67) Temburong; (68) Bukit Puan; (69) Ulu Temburong National Park; (70) Kuala Balai; (71) Labi; (72) Bahau atas; (73) Sungai Telen; (74) Sungai Ratah; (75) Kualakapuas; (76) Sungai Kapuas; (77) Sungai Kahayan; (78) Sungai Rungan; (79) Sungai Sebangau; (80) Parit; (81) Sungai Seruyan; (82) Tanjung Puting National Park; (83) Upper Kapuas; (84) Putussibau; (85) Danau Sentarum; (86) Sungai Membuluh; (87) Gunung Palung National Park; (88) Pontianak; (89) Sungai Kubu; (90) Sungai Mukamaka; (91) Pulau Papan; (92) Dumai; (93) Siak Kecil Nature Reserve; (94) Pulau Padang; (95) Tasik Belat; (96) Gunung Salihan; (97) Kerumutan Nature Reserve; (98) Sungai Akar; (99) Air Hitam Laut; (100) Sungai Simpang Malaka; (101) Sungai Sembilang; (102) Sungai Musi; (103) Padang Sugihan Wildlife Reserve; (104) Surabaya Hilir; (105) Sungai Pegadungan; (106) Way Kambas National Park; (107) Bukit Barisan Selatan National Park; (108) Malancan; (109) Muarasikabaluan; (110) Maileppet; (111) Bat Rereiket; (112) North Pagai.
- Historical (pre-1950) ● Fairly recent (1950–1979) ● Recent (1980–present) □ Undated



Burton 1987); **Tanjung Puting National Park**, early 1980s (MacKinnon 1983), up to six, May–September 1986, and probably breeding (bin Jalan and Galdikas 1987, Nash and Nash 1988), with six there (possibly gathering in the dry season), July 1996 (B. F. King verbally 1998); Tumbang Hiang (untraced; lake in south-east Borneo, probably in Central Kalimantan), where breeding in August and September 1881 (Blasius 1884a, Grabowsky 1885); ■ **West Kalimantan Upper Kapuas**, at the confluence of the Sibau river, June 1896 (Finsch 1905); **Putussibau**, “B. Kapoeas”, undated but probably before 1950 (specimen in RMNH); **Danau Sentarum**, upper Kapuas, regularly observed between 1993 and 1996 throughout the area and possibly breeding (Hood 1993, 1995, SvB); **Sungai Membuluh**, near Muara Kendawangan, January 1994 (Rusila and Enis 1995, Holmes 1997); **Gunung Palung National Park**, at Cabang Panti, 1986–1995 (Laman *et al.* 1996, Holmes 1997), and July 1998 and, adjacent to the park in the community forest area, August 1999 (E. Pollard *in litt.* 2000); **Pontianak** (type locality), January 1893, and later in 1893 (Blasius 1896); **Sungai Kubu** in the Kapuas delta, late 1992 and July 1997 (Holmes 1997, D. A. Holmes *in litt.* 1999);

Sumatra (see Remarks 5) ■ **Aceh Sungai Mukamuka**, Singkil Barat, September 1991 and on other occasions (Holmes 1996; SvB); ■ **Riau Pulau Papan**, Sungai Rokan, April 1991 (SvB); **Dumai** and adjacent Sungai Kubu, May 1980 (Holmes 1996); **Siak Kecil Nature Reserve** on the “Little Siak River”, undated (Robinson and Kloss 1923), with captive birds seen in the adjacent transmigration area (Burn and Brickle 1992, SvB); **Pulau Padang**, Riau, undated (Purwoko and Verheugt 1989); **Tasik Belat**, September 1992 (Burn and Brickle 1992); **Gunung Salihan**, June 1907 (specimen in ZMA); **Kerumutan Nature Reserve**, October 1992 (Burn and Brickle 1992); **Sungai Akar**, Seberida, Bukit Tigapuluh, September 1991 (Danielsen and Heegaard 1995a); ■ **Jambi Air Hitam Laut**, Berbak National Park, November 1992 (Burn and Brickle 1992), spring and autumn 1984 (Silvius and Verheugt 1986); **Sungai Simpang Malaka**, Berbak National Park, October 1995, possibly breeding (Holmes 1996), and at Sungai Simpang Gajah, Berbak National Park, at least one, September 1986 (A. Elliott *in litt.* 1986); ■ **South Sumatra Sungai Sembilang**, Simpangalangan river, nesting, with up to seven birds present, April–July 1989 (Kadarisman 1991, Danielsen *et al.* 1997); **Sungai Musi**, south of Pulau Sudimara, north of Palembang, February 1988 (Lambert 1988); **Padang Sugihan Wildlife Reserve**, regularly between August 1984 and June 1985 (Nash and Nash 1985), and two in May 1989 (Danielsen *et al.* 1997); ■ **Lampung** near **Surabaya Hilir** between the Seputih and Terusan rivers, October 1976 (Holmes 1977a, D. A. Holmes *in litt.* 1999); **Sungai Pegadungan**, on the border of Way Kambas National Park, halfway between Bungur village and Rasau river, February 1988 (Lambert 1988); **Way Kambas National Park**, October 1976, in an area since cleared, and elsewhere 1983–1999 (Lewis *et al.* 1989, Holmes 1996, Parrott and Andrew 1996, many observers *in litt.* 1999), including at Way Kanan, June 1999 (I. Mauro *in litt.* 1999) and November 1999 (V. Nijman *in litt.* 2000); **Bukit Barisan Selatan National Park**, at Way Canguk, 1997–1999 (Winarni 1999);

Siberut (following unconfirmed records: Whitten 1980, van Marle and Voous 1988, Holmes 1994) **Malancan**, September 1999 (Kemp 1999); between Pokai and Sikabalan (here assumed to be **Muarasikabalan**), September 1999 (Kemp 1999); **Maileppet**, October 1998 (Kemp 1999); **Bat Rereiket**, November 1999 (Kemp 1999); Simabugai (untraced), April 1999 (Kemp 1999);

North Pagai an adult and immature, December 1937 (Ripley 1944; see Remarks 6).

POPULATION The species was described as “probably one of the least numerous of all the storks in the world” (Hancock *et al.* 1992), and indeed a recent assessment placed its numbers below 1,000 individuals (Rose and Scott 1997), making it the rarest member of the family with the possible exception of Greater Adjutant *Leptoptilos dubius*.

Thailand The species was first discovered in the country in 1986 (although local reports indicate that there were at least four individuals prior to 1985); the birds in question were

apparently doomed by the effects of reservoir construction (Nakhasathien 1987a) and there is no evidence that a population survives.

Malaysia The species was listed as Malaysia's fourth most endangered animal with a population of fewer than 200 birds (Kiew *et al.* 1985). Given a reasonably large population in Sabah, however, this is perhaps an underestimate. **Peninsular Malaysia** In the 1980s the species was thought to be restricted to the Pahang catchment, with core habitat being the largely deforested floodplain of the main river (Wells 1990c). While the situation is little changed, and numbers are certainly very low and probably declining, the range of the species is now known to be more extensive as records stem from six river systems (Wells 1999). **Sabah** This species has been characterised as local and apparently decreasing in numbers (Gore 1968), or "an uncommon and local resident" (Sheldon *et al.* in press) but it is very possible, based on the determination of the importance of the lower Kinabatangan river and the Klias peninsula, that Sabah now holds the highest number of birds for any political unit within its range. It is difficult to place a figure on this population but it seems unlikely to be higher than in the low hundreds. **Sarawak** In northern Sarawak in 1876 a bird caught in a pheasant trap was not known by the native people (Ogilvie-Grant 1903), suggesting that the species might be rare in that region. Small numbers have recently been reported from scattered sites in the state, suggesting that a small but unquantified breeding population survives.

Brunei It has been described as scarce (Mann 1987), but observations in the 1970s by one observer suggested "that this stork's status in Brunei is healthy", involving nine sites and including sightings of parties of eight (once) and four (twice) (Kidd 1978). It is (or was) "fairly common" along the Tutong and Belait rivers (Smythies 1981) and was described as "still not uncommon" (see Remarks 7) on these rivers in 1967–1968, when parties of four were to be seen, with a party of 12 seen on the former (Holmes 1969).

Indonesia Indonesia perhaps holds the bulk of the remaining world population of the species, but the number involved may well be fewer than 300 birds (Silvius and Verheugt 1989); indeed this upper limit was regarded as too optimistic (M. J. Silvius in Danielsen *et al.* 1997), although a new judgement is that 100–300 birds survive in all Indonesia (Danielsen *et al.* 1997). Numbers must have decreased dramatically over the last few decades with the shrinking of suitable forest habitat (Hancock *et al.* 1992; see Threats under Crestless Fireback *Lophura erythrophthalma*). **Kalimantan** Although still widespread, it is evidently a rare bird, rarer than previously reported (Holmes and Burton 1987, Holmes 1996). Around 1880 in south-east Borneo it was found to have a local name (*binti*) but was "not frequent" or "very rare" (Grabowsky 1885, Blasius 1896). Elsewhere, on the upper Kapuas, it was found to have the local name *karau*, derived from its call, and here it was considered exceptionally shy but not rare (Finsch 1905). A "healthy population" appears to be present in Gunung Palung National Park (Laman *et al.* 1996), and survived, at least until recently, in reasonable numbers within Tanjung Puting National Park (Nash and Nash 1988; but see Threats). Overall numbers are unknown. **Sumatra** The species is rare but widespread in primary swamp forests, the total population in a 40,000 km² study area in South Sumatra being estimated at 150 birds (Verheugt *et al.* 1993). In describing the first nest found in Sumatra (at Sembilang), Holmes (1996) reported his sources as indicating that the species was "reported common ('tens of birds') in the area", with flocks of up to seven observed. This area, the proposed Sembilang Wildlife Reserve, comprises 1,100 km² and has been guessed to hold 20–40 birds (Danielsen *et al.* 1997). On the basis that this yields one bird per 30–60 km², there may have been 48–97 birds in the remaining 2,900 km² of primary swamp forest in southern Sumatra (Danielsen *et al.* 1997).

ECOLOGY Habitat This is a species of primary dipterocarp and logged lowland (apparently extreme lowland: highest elevation usually only 240 m, although see Migration) evergreen and semi-evergreen forest and freshwater swamp forest within the Greater Sunda region; the core of this habitat appears to be floodplains of the larger rivers, since it requires creeks,

ivers, pools, trackside puddles, lakes, freshwater swamps and other damp clearings, where it forages along the shaded margins, sometimes venturing into paddyfields and other cultivated areas flooded in the wet season (Ogilvie-Grant 1903, Kemp and Kemp 1976, Medway and Wells 1976, Holmes 1977a, Kidd 1978, Smythies 1981, Davies and Payne 1982, Kadarisman 1991, Burn and Brickle 1992, Lambert 1993c, Sheldon *et al.* in press, SvB). Smythies (1955) found that the species favours Brunei's "lakes and peculiar freshwater swamps or 'loagans'" (see Remarks 8). In Central Kalimantan it was judged in one study to be restricted to large, essentially undisturbed blocks of freshwater swamp forest and peatswamp forest (Page *et al.* 1997), and work in Sumatra also resulted in its being classified as a bird of inaccessible swamp forests, although it was also admitted that information is too scant to determine if optimal habitat is riverine or swamp forest (Danielsen *et al.* 1997). However, records generally indicate that it occurs in both dry and swamp forest and is indeed in some degree tolerant of logging (see below for a caveat), so long as it has access to water margins (oxbow lakes appear to be particularly favoured), but that it might have been concentrated in swamp forest by the widespread conversion of dryland forest (A. C. Sebastian *in litt.* 1999). The species does not appear ever to use saline habitats but, as the Sumatran breeding record described below indicates (and as was the case with a 1986 Brunei record: J. R. Howes *in litt.* 1999), it readily accepts low-lying forested inland areas where rivers are bordered by mangroves and subject to tidal movements; there is also a feeding record that may have involved a saltwater area. Records from disturbed, recently burnt and logged habitats give no indication of the long-term value of such areas to the species, and until research proves otherwise it is sensible to assume that such areas are suboptimal, or at least offer only temporary benefits.

The species is usually solitary or in small groups; the largest reported concentration in recent years was 12 (Holmes 1969). It roosts, generally communally, in the crowns of very high (swamp forest) trees (Finsch 1905, Danielsen *et al.* 1997); one pair roosted on bare branches in a dead tree along a river (I. Mauro *in litt.* 1999), but another used a perch midway within the canopy of a large living fig tree (A. C. Sebastian *in litt.* 1999). Nesting habitat in southern Thailand consisted of dense lowland forest with very large trees (e.g. *Cynometra bijuga*, *Dipterocarpus*, *Ficus*, *Hopea ferrea* and *Mesua ferrea*) (Nakhasathien 1987a), while in Sumatra, a nest found 20 km inland was surrounded by 82% primary swamp forest and 17% mangrove forest within a radius of 5 km; at this nest the parents' favoured feeding area (but feeding was always done solitarily) was in primary nypa forest and swamp forest 2–3 km from the nest, on the mud bank of a small creek (Kadarisman 1991, Hancock *et al.* 1992, Danielsen *et al.* 1997).

Food The species stalks its food quietly along streamsid es in dense forest (Nakhasathien 1987a) and in boggy gaps created by (e.g.) large mammals at mineral licks, once also a former clearing maintained for gaur *Bos gaurus* (Wells 1999), foraging slowly with deliberate movements, neck retracted; the crop and stomach of one bird were exclusively packed with one species of large black earthworm, found commonly in riverbanks (Finsch 1905; also Smythies 1981). In Sabah, birds have been observed feeding on recently burnt ground (Sheldon *et al.* in press), presumably picking up invertebrates killed by or fleeing from the blaze. One bird was seen "fishing in mud shallows" in what may have been a saltwater (or at least estuarine) site, Sandakan bay (Fogden 1965). Food items, including small (10–30 g) fish, frogs, worms (10–15 cm long) and aquatic insect larvae, were brought to the two nestlings in Sumatra around five times a day in the early weeks, dropping to twice a day in the later stages of development, with significantly more visits being made after 15h00 (Kadarisman 1991, Danielsen *et al.* 1997). Other observations in Sumatra tended to support the notion that the main prey is small fish and other aquatic organisms (Danielsen *et al.* 1997); in Sabah food reported was dragonfly larvae from stagnant pools, grasshoppers and possibly crabs (Sheldon *et al.* in press). The finding that "it can frequently be seen near abattoirs, where it

feeds on cast-out offal and rotten meat” in Brunei (Vowles and Vowles 1997) seems anomalous and has not been described elsewhere.

Breeding The fact that pairs in flight do flips, the lower bird presenting its feet to the upper, or both birds gliding at high altitudes with level wings and legs dangling (A. C. Sebastian *in litt.* 1999), suggests that some form of aerial display occurs during courtship. Display between members of a pair has been witnessed in March, Sabah (A. C. Sebastian *in litt.* 1999). Very few nests have been found, but it appears that (*contra* MacKinnon and Phillipp 1993) the species nests solitarily (Danielsen *et al.* 1997). In Thailand a nest, composed mainly of 15–60 cm dry sticks of (amongst others) Loranthaceae, Dipterocarpaceae and Rubiaceae, was found in September, 19 m up in a major fork in a 27 m high *Dipterocarpus baudii* tree on the bank of a small river; a second unoccupied nest was found 200 m away in the upper branches of a 30 m high dipterocarp (Nakhasathien 1987a). In the occupied nest, chicks (hatched in late October) were double their original size after three weeks, resembled small adults by six weeks, and were capable of short flights by 13 weeks (Nakhasathien 1987a). A bird shot in mid-November, Sarawak, had recently fledged (Various hands 1958), and another, also from November, was in immature plumage (Blasius 1882a). In Kalimantan, Grabowsky (1885) reported finding a nest made of dry twigs 5 m above the water by a lake, containing two half-feathered young on the last day of August (he collected one of these, but also took another a week later, presumably from another nest: see Blasius 1884a, also Hinkelmann and Heinze 1990). In Sumatra, a nest was found 8.3 m up in an 18 m *Rhizophora mucronata* tree over a small river at the edge of mangrove forest dominated by nypa palm *Nypa fruticans* and freshwater swamp forest dominated by *Xylocarpus granatum* trees (Kadarisman 1991, Danielsen *et al.* 1997). This nest was a notably small platform of twigs (mainly *Rhizophora*), lined with small *Xylocarpus* leaves, placed quarter-way along a stout exposed mid-storey branch within the wider shield of the tree’s outer vegetation; the position of the nest over the river allowed the faeces of the nestlings to be carried away in the water, an arrangement interpreted as an anti-predator strategy (Kadarisman 1991). In this instance at least three eggs were laid, since two young were reared and an unhatched egg was found; the young fledged by 21 July, having hatched around 20–25 May, so the breeding cycle lasted over three months, if it can be assumed that the nest was begun no later than mid-April (Kadarisman 1991, Danielsen *et al.* 1997). The Thai nest contained two chicks (Nakhasathien 1987a); two independent juveniles were found at a roosting tree in Way Kambas, June or July (Heath 1991).

Migration The species has never been considered migratory, but the evidence of records in Brunei has suggested that birds wander widely in search of suitable feeding sites, “particularly... when the weather is wetter towards the end of the year” (Kidd 1978). The record from Kinabalu at c.1,600 m was of a bird circling above the park headquarters (I. Mauro *in litt.* 1999, Sheldon *et al.* in press), almost certainly in transit (indeed, as “the lowlands were on fire at the time”, this dispersal was possibly in response to habitat loss rather than any seasonal movement). The species soars regularly, and is often to be seen with raptors on mid-morning thermals, and soaring pairs will sometimes attract conspecifics, making circling groups of up to 10 birds (A. C. Sebastian *in litt.* 1999). Transient birds have been reported in Sumatra, 20 km from the nearest typical habitat (Hancock *et al.* 1992).

THREATS **Habitat loss** The rarity of Storm’s Stork is such that it is impossible to quantify with confidence the degree of threat it faces from habitat loss, but the impact of clearance and logging can only have been negative on a species of such extreme low numbers; apart from its direct effects, logging probably has a negative impact on the aquatic food resources exploited by Storm’s Stork (Danielsen *et al.* 1997). It has been remarked that individuals may be able to survive in logged forest but not breed there (Danielsen and Heegaard 1995b). Overall, deforestation in the Sundaic lowlands—biologically one of the most diverse biomes

of the world—has proceeded at catastrophic speed in the past few decades, seriously compromising the future of the uncountable multitude of primary-forest life-forms in the region, perhaps especially that of this particular species; the destruction continues apace even inside key protected areas such as Tanjung Puting and Berbak National Parks (for an outline of the crisis, see Threats under Crestless Fireback).

In Peninsular Malaysia no “floodplain forest” is protected and the clearance of the last remnants on the lower Perak river may deprive smaller populations elsewhere of their source (Wells 1999). Forests and wetlands in the Lawas area, Sarawak, are threatened by clearance (for agriculture and by logging), pollution, poaching, road developments and transmission lines; similar problems influence the lower Baram river catchment, which has been severely damaged by shifting cultivation, logging, overfishing and busy boat traffic (DWNPPM 1987). Loagan Bunut National Park, Sarawak, is threatened by logging, intensive fishing, shifting cultivation and road development (with consequent increases in hunting and disturbance), all of which reduce the suitability of the area for Storm’s Stork (DWNPPM 1987). In 1986 Similajau National Park was surrounded by vast areas of forest (Duckworth *et al.* 1996), but these have now been entirely converted to plantations/agriculture; a return visit in 1995 failed to locate the species, and its presence in the area “might best be considered a thing of the past” (J. W. Duckworth *in litt.* 2000). In Sabah, the Sandakan–Tambisan Coastal Wetlands (including Sandakan bay and the Kinabatangan river downstream of Sukau) are moderately threatened by clearance of mangroves for wood-chips and disturbance through hunting and fishing, but these threats are not thought to be excessive (DWNPPM 1987). In the Kinabatangan lowlands in general, a stronghold for the species, the usual threats of conversion to agriculture, logging and hunting apply (DWNPPM 1987). In 1997–1998 fire destroyed 80% of Binsuluk Forest Reserve on the Klias Peninsula, Sabah, placing all the more importance on Padas Damit Forest Reserve (A. C. Sebastian *in litt.* 1999).

The situation in Indonesia is no better. Industrial-scale illegal logging within Tanjung Puting National Park, Kalimantan, was so intense in 1999 that the park chief judged that the forest would be “gone” in five years (Newman *et al.* 1999). In southern Sumatra, large-scale exploitation of coastal forests began in the mid-1970s and between 1982 and 1995 two-thirds of remaining primary swamp forest was logged, and outside the proposed Sembilang Wildlife Reserve all primary swamp forest patches were under concession (Danielsen *et al.* 1997). Padang Sugihan reserve has been overrun by local settlers, reducing its conservation importance to virtually nil (Rudyanto verbally 2000). The Pagai islands, off mainland Sumatra, have been subject to heavy logging since the 1970s, but even so the company involved was recently caught smuggling extra timber from the islands (*Down to Earth* 44: 5–6). Despite major endeavours and local wishes to preserve Siberut’s forests (see, e.g., Whitten 1980), logging and oil-palm plantation interests were reported in mid-1999 to be poised to move in on 1,000 km² of forest, with a strong possibility that freshwater swamp forest would be targeted, in the east and centre of the island (*Down to Earth* 42 [1999]: 9–10, 44 [2000]: 6–7, Kemp 1999). Further details of swamp forest loss in Sumatra appear in Threats under White-winged Duck *Cairina scutulata*. Fire in peat-swamp forest must be a major threat to this species in both Borneo and Sumatra: information on peat-swamp forest loss in the two islands is presented in Threats under Hook-billed Bulbul *Setornis criniger*.

Hydropower projects are also seriously detrimental to the Storm’s Stork as they tend to affect the habitat most crucial to it. In Thailand the country’s only breeding site, despite falling within Khlong Saeng Wildlife Sanctuary, was being inundated by rising flood-waters behind the Chew Larn dam at the very moment of its discovery; as a consequence, large areas of suitable habitat were eliminated and human immigration was encouraged, leading to increased disturbance and hunting (Nakhasathien 1987a, P. D. Round *in litt.* 1998). The fact that the impact assessment for this dam stated that “in regards to birds... the adverse effects of the impoundment are likely to be minor, because most birds are mobile and able to

flee away in the event of flooding” aptly illustrates the chronic ignorance of conservation issues that has prevailed in Asian development projects (Nakhasathien 1987a); lacking any suitable refuge, the species has not been seen again in Thailand (P. D. Round *in litt.* 1998).

Hunting Being a large soaring species, it is probably the target of opportunistic shooting. An individual found with both its legs broken by shot (it later died) at Ulu Gombak Forest Reserve, Malaysia, attests to this threat (Medway and Wells 1964). In Thailand the species was reported to be very difficult to shoot owing to its great shyness (which quite probably resulted from this particular pressure), and the nestlings at the only nest were captured, apparently for food (Nakhasathien 1987a). Smythies (1981) reported bluntly that “it is shot for food” on Borneo, this being a likely factor underlying its decline. Indiscriminate shooting is commonly reported at the Tempasuk plain, Sabah, despite the fact that it is classified as a bird sanctuary wherein hunting is prohibited (DWNPPM 1987). Ogilvie-Grant (1903) mentioned an individual snared by accident in a pheasant trap in Sarawak. At Sembilang, Sumatra, birds are occasionally caught by latex gatherers and incidentally caught in lizard traps by local people, who eat them; but although not considered a serious threat (Kadarisman 1991) the extent of such trapping is not known (Danielsen *et al.* 1997).

Trade Birds obtained by a West German bird park in 1988—apparently several of four obtained from Sarawak for German and Malaysian zoos at that time (Danielsen *et al.* 1997)—may have been taken from the wild illegally, indicating the existence of an international trade (Silvius and Verheugt 1989). The price of the species in aviculture apparently doubled (from S\$300 to S\$600) in one year around 1990, suggesting an alarming demand for the species (Hancock *et al.* 1992).

MEASURES TAKEN This species has been protected under Indonesian law since 1935 (Inskipp 1986); it is also a protected species in Thailand and East Malaysia (Danielsen *et al.* 1997). However, as with the Bornean Peacock-pheasant *Polyplectron schleiermacheri*, the upgrading of the taxon *stormi* to species level means that only Woolly-necked Stork *C. episcopus* is on the list of protected species, leaving *stormi* with no protection (R. Sözer *in litt.* 1999). It is currently listed on Appendix I of CITES.

Members of a single pair of the species wander widely in search of food and therefore require very large areas of undisturbed habitat. To conserve viable populations, therefore, protected areas need to be huge; moreover, occasional sightings from small reserves are of little importance.

Malaysia *Peninsular Malaysia* The species has occurred at Taman Negara National Park (4,343 km²), Kerau Wildlife Reserve (520 km²) and Endau-Rompin Park (300 km²). *Sabah* A crucial population persists in and around the Kinabatangan Wildlife Sanctuary. Protection for the lower Kinabatangan river is apparently set to increase as the Sabah state government recently declared “its commitment to fully gazette” 270 km² of forests and wetlands as a “Gift to the Earth” with wildlife sanctuary status (*Partners for Wetlands update* January–March 2000). Sightings are also reported from the Danum Valley Conservation Area (438 km²). The single sighting from Kinabalu Park presumably involved a wandering individual as there is no suitable habitat for the species within this protected area (Mauro 1999). *Sarawak* Storm’s Stork is listed as a fully protected species under state law (A. C. Sebastian *in litt.* 1999). It occurs in Gunung Mulu (528 km²), Loagan Bunut (107 km²), Tanjung Datu (14 km²) and Maludam National Parks (the latter upgraded to national park status with Dutch government support in 2000) and Samunsam Wildlife Sanctuary (60 km²). Similajau National Park is 71 km² but the forest, fronting a turtle breeding beach, is only c.1.5 km wide (Duckworth and Kelsh 1988, Duckworth *et al.* 1996), and is therefore unlikely to be appropriate for this stork (see Threats).

Indonesia *Kalimantan* The species is recorded from Kayan Mentarang (13,000 km²), Gunung Palung (1,000 km², ranging from sea-level to 1,160 m), and Tanjung Puting National

Parks (3,050 km² of lowland rainforest, freshwater and peatswamp forest and mangroves) (see bin Jalan and Galdikas 1987, Nash and Nash 1988; SvB). *Sumatra* In Riau it has occurred in Kerumutan Nature Reserve (1,200 km², mostly peatswamp forest), in Jambi at Berbak National Park (1,900 km²), and in South Sumatra at Padang Sugihan Wildlife Reserve, although this last area is now apparently destroyed (D. A. Holmes *in litt.* 1999, Rudyanto verbally 2000). In Lampung a population survives in and around Way Kambas National Park (1,300 km²). After prolonged championing, which at one time involved proposing the entire island as a Biosphere Reserve (Whitten 1980), Siberut's national park was gazetted in 1993 and finally created in 1998, covering the western part of the island, with low human numbers and largely intact forests; but see Threats (Kemp 1999).

MEASURES PROPOSED It has been pointed out that the only hope for the survival of this species is through the establishment of totally protected areas which exclude not only all forms of timber use but also hunting (Hancock *et al.* 1992; also Danielsen *et al.* 1997). Survey work is urgently needed to assess the species's habitat requirements and exact distribution and to identify critical areas for nature reserves (Silvius and Verheugt 1989); it has been speculated that the evident rarity of the species in the two large, long-established reserves of Taman Negara and Kerau, Peninsular Malaysia, may be due to suboptimal headwater habitats, and that floodplain forest is probably crucial (Wells 1999)—this needs very urgent study. Research is also needed, equally urgently, to achieve a better understanding of the management requirements of the species: such work would seem most likely to succeed through radio-telemetry work, which has the capacity to generate data on ranging and foraging behaviour of a type and of a speed that direct observation seems incapable of approaching.

Malaysia Peninsular Malaysia Despite the paucity of records it seems likely that a small population survives in Taman Negara National Park; observers are urged to be vigilant for this species and to publicise any sightings. Logging camp workers at the Pekan Forest Reserve in Pahang (as well as locals 40 km inland) have reported the species there (in one case three birds), and it may turn out that this area (comprising the Pekan, Nenasi, Kedondong and Resak Forest Reserves and representing the largest remaining patch of peatswamp forest in Peninsula Malaysia) may be the last stronghold of the species in continental Asia (A. C. Sebastian *in litt.* 1999); surveys are urgently needed to establish the facts (Lesser Adjutant *Leptoptilos javanicus* has just been shown to breed at Nenasi: see relevant account). This whole complex is one of three sites in Malaysia for the UNDP/GEF-funded three-year (2000 start date) project "Conservation and sustainable use of peatswamp forest in Malaysia", and a series of specific management plans will be developed, including one for Storm's Stork (A. C. Sebastian *in litt.* 1999). Wells (1999) has lamented the current clearance of floodplain forest in the lower Perak, emphasising that this may be an unrecognised stronghold of the species: it needs to be investigated very rapidly whether an appropriate area can yet be set aside as a reserve. Wells's (1999) view that captive breeding of genuine Peninsular stock must now be a serious option forgets that without optimal habitat to which birds can be returned such an exercise would be doomed to failure. **Sabah** The population on the lower Kinabatangan river may be 3–5% of the global total, and the oxbow lakes there are evidently crucial to the species; indeed this area is regarded as holding the richest biodiversity in all Malaysia (Sebastian 1999). A proposed 270 km² wildlife sanctuary aims to conserve this whole area, which is being considered for nomination as Malaysia's second Ramsar site, and which is the subject of a WWF-Malaysia project "Partners for Wetlands" (A. C. Sebastian *in litt.* 1999). The population in the Klias peninsula (Padas Damit Forest Reserve) might well represent 1% of the global total, thereby fulfilling a key criterion for listing the area under the Ramsar Convention, and the area probably includes the most important representative of herbaceous brackish wetlands in Sabah (A. C. Sebastian *in litt.* 1999). This site is one of three in Malaysia addressed by the UNDP/GEF-funded three-year (2000 start date) project

“Conservation and sustainable use of peatswamp forest in Malaysia”, and a series of specific management plans will be developed, including one for Storm’s Stork (A. C. Sebastian *in litt.* 1999). Sarawak Loagan Bunut National Park, perhaps the only gazetted protected area in Malaysia which supports breeding Storm’s Storks, embraces the largest seasonal floodplain lake within Malaysia, and is one of three sites in Malaysia addressed by the UNDP/GEF-funded three-year (2000 start date) project “Conservation and sustainable use of peatswamp forest in Malaysia” (A. C. Sebastian *in litt.* 1999). The site has been proposed as a Ramsar site, and should be evaluated for possible extensions; furthermore, it should have a strong management body in place, particularly as the site may witness a surge of visitors as a result of the improved road access and associated development of park infrastructure and accommodation (MNS Miri Branch *in litt.* 2001). Sebuyau Forest Reserve (35 km²) has been proposed for upgrading to protected area status; it has been excluded from conversion to oil palm, and apparently “supports one of the only two remaining wild populations of orangutans in Sarawak” (A. C. Sebastian *in litt.* 1999).

Brunei It appears possible that a small but healthy population exists in the country; fieldwork is needed to confirm this, followed by an intensive programme of monitoring and management to ensure that the birds are fully catered for as the country develops.

Indonesia Kalimantan There is a proposal to create a major protected area in the Sebuku–Sembakung region of East Kalimantan, adjacent to the frontier with Sabah, and Storm’s Stork has been predicted to be present there (Momberg *et al.* 1998); the creation of this reserve is certainly of enormous value to biodiversity and needs full support. A reserve has long been proposed in the Barito Ulu area, and this should be gazetted at the earliest opportunity. Surveys are needed of the middle and upper reaches of the rivers of Central Kalimantan, notably the Waringin, Seruyan (whose lower reaches have a substantial but still unstudied lake), Mendawai, Kahayan and Kapuas, not only for the stork but also for White-shouldered Ibis *Pseudibis davisoni* and indeed the avifauna in general (Holmes 1991). Greater protection for peatswamp forest is required in Kalimantan, and for this species large, undisturbed blocks of such habitat are important, also for several other Bornean species, notably Hook-billed Bulbul and the Near Threatened Grey-breasted Babbler *Malacopteron albogulare* (Page *et al.* 1997).

Sumatra The 1991 record from Singkil in Aceh, Sumatra, is particularly significant in pointing up the key importance of the swamps of Aceh Selatan (Kluet and Singkil, perhaps also Trumon) and the Tapanuli Selatan coast (D. A. Holmes *in litt.* 1999), and these are areas to target for reservation. The following areas of Sumatra have been proposed as reserves: Singkil Barat (Riau) (450 km² of beach and swamp forest); Danau Belat (Riau) (100 km² of mostly peatswamp forest with rivers and lakes); Siak Kecil (Riau) (1,000 km² of peat swamp forest and numerous small lakes); Seberida (Riau) (1,200 km² of lowland forest, 150–830 m) (SvB). At Sembilang there is a proposal, endorsed by the governor of South Sumatra, to establish a 3,870 km² wildlife reserve, which would help safeguard the population of this species and “34 other globally endangered species of mammals and birds” (Kadarisman 1991, Danielsen *et al.* 1997).

REMARKS (1) This species was long considered conspecific with Woolly-necked Stork *Ciconia episcopus*, but the ranges of these two forms overlap in south-eastern Sumatra with no apparent interbreeding (Holmes 1977a); even if there was no overlap, these birds are so distinct in morphology that their conspecificity is plainly impossible. (2) It has been remarked that in Peninsular Malaysia only one tiny population exists on the lower Perak river (Collar *et al.* 1994), but there are no recent records from that area and the statement is in any case mistaken: the species is known from seven river systems on the Peninsula (Wells 1999). (3) These two reports, one from a muddy and rocky beach at Tanjong Sepat and one from the coastal mudflats at Benut Forest Reserve, involve sufficiently unusual habitats to regard

with suspicion, but they are accepted here on the assumption that the birds in question may have been displaced from their optimal freshwater forested habitat. (4) A record from Java in 1920, based on a specimen in MZB (MacKinnon and Phillipps 1993), in fact concerns a Woolly-necked Stork (J. H. Becking *per* SvB). (5) Holmes (1994) judged that all sight records should be deleted, pending further confirmation. A record from South Sumatra (van Marle and Voous 1988) should be deleted as the birds were not specifically identified (Holmes 1996), and a record from Kerinci-Seblat National Park at Tapan valley, December 1996 (Holden 1997), has now been withdrawn (J. Holden *per* F. Verbelen *in litt.* 1999). (6) Whether the immature bird was sufficiently young to indicate breeding on the island is not known. (7) Smythies (1955) wrote “not common” but it seems he intended “not uncommon”; Holmes (1969) may have known this when he wrote “still” in his paper. (8) Smythies (1981) defined *loagan* as an “open grassy swamp subject to periodical flooding”.