

# Threatened Birds of Asia:

## The BirdLife International Red Data Book

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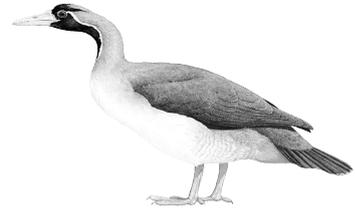
## MASKED FINFOOT

### *Heliopais personata*

Critical  —

Endangered  —

Vulnerable  A1c; A2c; C1



*This elusive species has a very small, declining population as a result of loss and degradation of wetlands and lowland forest, which qualifies it as Vulnerable.*

**DISTRIBUTION** The Masked Finfoot occurs patchily from north-east India and Bangladesh through continental South-East Asia to Vietnam. In the non-breeding season it occurs southwards to Peninsular Malaysia and Sumatra, Indonesia.

■ **INDIA** The species is a very rare breeding visitor (or possibly resident) in north-eastern states, mainly Assam. There is one unconfirmed report from the Dum Duma river, inside Dum Duma Reserve Forest, c.1988 (Choudhury 1997e), although this is later given as a confirmed record (Choudhury 2000c). Records are from:

■ **Arunachal Pradesh** **Noa Dihing river**, March 1877 (Godwin-Austen 1878a, Hume and Davison 1878, specimen in BMNH; also Ali and Ripley 1948);

■ **Assam** **Dighaltarang** (Digaltarong), near Dibru-Saikhowa National Park, June–July 1904 (Baker 1904b, BMNH egg data); **Dibrugarh**, one, November 1946–January 1947 (Ali and Ripley 1948); near **Nazirating**, on the Dibru river, one, August–September 1992 (Choudhury 1996e, 1997e); **Tingrai river**, two, undated (Abdulali 1968–1996); Upper Dihing (East Block) Reserve Forest, near **Dhekiajan**, one, 1990–1991 (Choudhury 1996e, 1997e); **Moran**, one, December 1910 (Abdulali 1968–1996, specimen in BNHS); **Nameri National Park**, one in the Bogijuli area, January 1998 (Choudhury 2000c); **North Cachar Hills district**, listed without details (Baker 1894–1901); **Chutla bhil** (Chatla haor; Kuttal; see Remarks 1), Cachar, a pair, probably breeding, June 1901 (Primrose 1902, male and female in YPM), and elsewhere in the district at Monierkhal, one, around February 1902 (Inglis 1869–1902);

■ **Manipur** unspecified localities in the north-east (not mapped) (based on a “careful description” to Hume 1888).

■ **BANGLADESH** Although Rashid (1967) listed the species for northern, eastern and coastal portions of the country, this was probably hypothetical (see Remarks 2 under Manipur Bush-quail *Perdica manipurensis*). It is described as a “resident or winter visitor” in Bangladesh (Harvey 1990) but confirmed records are few and confined to the Sundarbans region: **Sundarbans**, apparently resident in small numbers (Khan 1982, FAO 1984), at Tiger Point, one, January 1984 (Thompson *et al.* 1993), at Katka Khal, Kochikhali Tiger Reserve, two, March 1984, four, May 1986, one, February 1987 (Thompson *et al.* 1993), up to three regularly in this and surrounding areas, 1996–1999 (P. M. Thompson *in litt.* 1999), annual in 1981–1999 (S. M. A. Rashid *in litt.* 1999).

■ **MYANMAR** The species was evidently quite widely distributed and even locally common in the country at the outset of the twentieth century (Smythies 1986), but there have been very few recent sightings. There is one report of c.80 birds at Kyatthin Wildlife Sanctuary (Kye Inn), Sagaing state, in June–July of an unspecified year, probably during the 1990s (U Than Maung *per* Khin Ma Ma Thwin *in litt.* 1997). While such a number of individuals is suspiciously high, the habitat is possibly suitable for the species (see under White-winged Duck *Cairina scutulata*) and this allows for some optimism that a population may breed in the area. There is another unconfirmed record from Nawin marshes (North Nawin), where

the species was probably flushed more than once, undated (Stanford and Ticehurst 1931). Records are as follows: **Indawgyi lake**, opposite Shwegu, Bhamo district, locally reported but “not very common”, 1920–1930 (Smith 1942); Thamandauk, c.7 km up **Kaukkwe chaung**, Bhamo district, May 1923 (Smith 1942); near **Seiktha**, Katha district, one bird, March 1927 (Smith 1942); c.19 km north of **Tagaung** on a jheel near the Irrawaddy (=Aeyarwaddy) at Innet-Natsingon, May 1927 (Smith 1942); **Shan hills** (and Shan States), where undated records come from unspecified localities (Wickham 1929–1930); **Ru chaung**, Arakan, one male, March 1910 (Hopwood 1912b), presumably that mentioned from an unspecified locality in north Arakan state, in 1909 (Hopwood 1921), and stored as “Arakan Yoma” in BNHS (Abdulali 1968–1996); Ngalauk (country unspecified), here assumed to be **Ngahlauk**, June 1911 (female in AMNH); **Karenni** (Kayah state), one specimen, undated (Oates 1882, Smith *et al.* 1943–1944, Smythies 1986); **Toungoo** (Tonghoo), one, 1903 (Hopwood 1921); **Inma swamp**, July 1873 (Hume 1875a, Oates 1882), also recorded from an unspecified locality in Pye (=Promé) district, August 1921 (BMNH egg data); Zigon Forest Division, presumably near **Zigon** (although there are several candidates), eggs collected in March 1953 (BMNH egg data), this possibly being the “Zicion” (illegible) where three nestlings were collected, apparently in February 1928 (specimens in BMNH); **Shwegyin** (Shwaygheen), on a forest stream just to the west, around 1880 (Oates 1882); **Myitmaka river** (upper Hlaing river), Tharrawaddy district, at Mindu (an untraced waterbody where the river widens into a large lake: Hopwood 1921), several nests found, July–August 1920 (Hopwood 1921), July 1924 (BMNH and NMS egg data), at Upper Tanbingon, 20 km downstream from Mindu, three nests, July–August 1920 (Hopwood 1921), and at Hmetkadan, 20 km downstream from Upper Tanbingon, three nests, July–August 1920, August 1922, and heard between the last two sites, July 1933 (Hopwood 1921, Smith 1942, BMNH egg data), also probably in this area at Ngapigo, one nest, July 1920 (Smith 1942), and Gyobinsakan, one heard, July 1933 (Smith 1942); Integaw area, (=Bago), a single bird (probably male) shot on the Bwet chaung, just south of **Wadama** at the west side of the “Integaw Reserve”, March 1940 (Smith 1942); **Bassein** (Pathein), one, c.1913 (*J. Bombay Nat. Hist. Soc.* 23 [1914]: 384), this possibly the record from Sinma “on the coast west of Bassein”, undated (Smythies 1986); **Myaungmya** (Mayangmyo), Irrawaddy delta, undated specimen (Abdulali 1968–1996); **Zami river**, February 1923 (Smith 1942); **Kyaikkami** (=Amherst), March 1877 (Hume and Davison 1878); upper Tavoy river, presumably in the region of **Myitta** (“Meeta Myo”), one each in 1918 and 1919 (Hopwood 1921); **Mergui** (=Myeik), January 1874 (Hume and Davison 1878); **Thayawthadangyi** (=Elphinstone Island), Mergui archipelago, male, March 1882 (J. Anderson 1889); **Maliwun**, June 1928 (Riley 1938); **Bankachon** (Ban Kachon, Bankasoon), February 1875 (Hume and Davison 1878).

■ **THAILAND** Most records are from both coasts of the peninsula, where a sizeable population is thought to spend the non-breeding season (Wells 1999). Sightings north of the peninsula are generally of migrants, although a few might remain throughout the non-breeding season in mangroves of coastal south-east Thailand. Records are from: **Nam Mae Kok**, Chiang Mai, one caught by villagers, January 1987 (P. D. Round *in litt.* 1998); c.15 km north of **Lampang**, along the Lampang–Chiang Rai road, one adult female, November 1930 (Vijjakich 1934, Deignan 1945); **Mae Ping National Park**, Gaeng Gaw Lake, Nam Mae Ping, one, January 1996 (Groom 1998); **Phu Khieo Wildlife Sanctuary**, at Bung Mon, one male, June 1996 (*Oriental Bird Club Bull.* 25 [1997]: 61–69); **Huai Kha Khaeng Wildlife Sanctuary** (Kroeng Krai substation), one, February 1992 (*Bangkok Bird Club Bull.* 9, 7 [1992]: 11–12); **Thung Yai Naresaun Wildlife Sanctuary**, recently recorded (Phumpakapun and Kutintara 1983); **Khao Yai National Park**, one in breeding plumage photographed near the headquarters, July 1987 (D. Buckingham *in litt.* 1999); Muang Khlung, c.20 km south-east of **Chanthaburi**, May 1917 (Williamson 1918), and apparently recorded until the 1960s in the Chantaburi area (B. F.

King verbally 1998); **Tha Chalaep**, Chantaburi, one collected from mudflats and mangroves, May 1937 (Deignan 1945); **Pranburi** (“Pran”), Prachuap Khirikhan, June 1928 (Riley 1938); **Ko Phangan**, May 1913 (Robinson 1915b, Robinson and Kloss 1921–1924), perhaps a migrant; **Klong Kanom**, Kanom district, Nakhon Si Thammarat, five seen along c.4 km of a mangrove-lined creek, March 1987 (Ngampongsai and Nabhitabhata 1987); **Khlong Saeng Wildlife Sanctuary**, two seen on the rising waters behind the Chiew Larn hydroelectric dam, June 1986, and two (said to be a pair), February 1987 (S. Nakhasathien *per* P. D. Round *in litt.* 1998); **Ao-Phang-nga National Park**, one seen in mangroves outside the park boundary, December 1988–January 1989 (*Oriental Bird Club Bull.* 9 [1989]: 38–44, *Bangkok Bird Club Bull.* 6, 2 [1989]: 9); Khao Khanab Nam, **Krabi**, 1–3 annually since 1987 (Parr 1988, many observers *in litt.* 1999), generally from about mid-January to early June, with records as late as mid-August in 1995, and one suggestion of possible breeding (P. D. Round *in litt.* 1998; see Breeding); **Ko Libong**, Trang province, one, March 1987 (P. Hines *in litt.* 1999); **Thaleban National Park**, single birds present on the lake by the park headquarters, February 1985, March 1985, February 1986, April 1987 (*Oriental Bird Club Bull.* 3 [1986]: 33–36, P. D. Round *in litt.* 1998), but not seen in recent years, probably owing to increased disturbance by visitors (P. D. Round *in litt.* 1998); Tarutao National Park, on **Ko Tarutao**, where recorded at two sites, Talo Udang in May 1986 and Khlong Phante Malakaa from mid-1980s onwards (Scott 1989, P. D. Round *in litt.* 1998); “Biserat, Jalor” (Jalor being an archaic term for **Yala**), “Pattani”, one, 1899 (Bonhote 1901); **Chalerm Prakiat Wildlife Sanctuary** (=Phru Toh Daeng, Pa Phru), Narathiwat, on the Mae Nam Bang Nara, 1–3, May–June 1992 (Parr *et al.* 1993a), one, March 1996, and reportedly regular according to park staff (R. J. Safford *in litt.* 1999); Khlong Hala, in **Hala-Bala Wildlife Sanctuary**, two, April 1999 (*Bird Conserv. Soc. Thailand Bull.* 16, 9 [1999]: 15).

■ **LAOS** The species has been recorded during the wet season from lowland rivers in southern provinces, where it is thought to breed (Duckworth *et al.* 1999). Records are from: **Dong Ampham NBCA**, Attapu, on the Xe Kaman, one breeding-plumage male observed at the mouth of the Houay Sinkin, 170 m, May 1997 (Davidson *et al.* 1997); **Xe Pian NBCA**, Attapu, two singles on several days on the Xe Pian, March 1993, and repeated records of at least five in two stretches of the Xe Pian downstream of Ban Phonsaat, May 1995 (Thewlis *et al.* 1998); Bolaven South-west proposed NBCA, at **Ban Houayko**, Champasak, three along the Xe Pian, April 1995 (Thewlis *et al.* 1998); Dong Khanthung proposed NBCA, one male downstream of Ban Takang, and another at **Ban Tahin**, both on the Xe Lamphao, July 1998 (Round 1998).

■ **CAMBODIA** There was an unspecified record in “Cambodia”, prior to 1894 (Delacour and Jabouille 1935), and one specimen in the possession of a Bangkok taxidermist was reportedly taken in Battambang province (Thomas 1964). More recently the species has been encountered with some regularity during the wet season in the region of Tonle Sap lake and in the north-east. Records are from: **Tonle Srepok**, Ratanakiri, one, May 1998, another nearby, downriver of Phum Sre Angkrong, June 1998 (Timmins and Soriyun 1998); **Prek Toal**, July 1998 (Goes *et al.* 1998b), another in December 1998, and subsequently heard (F. Goes verbally 1999, *in litt.* 2000) and between Baprear and Prey Chas, near Tonle Sap lake, two, July 1998, and at Pich Chikrey, west of Boeng Chhma, one breeding-plumage male, July 1998 (Goes *et al.* 1998b); **Sangke river**, Battambang, one, August 1998 (F. Goes verbally 1999); **Boeng Chhma**, July 1998 (Goes *et al.* 1998b), breeding in 1998 (Hong Chamnan verbally 1998); Botum Sakor National Park, at **Pointe Samit**, Koh Kong province, in mangroves, February 1944 (Engelbach 1948).

■ **VIETNAM** The species occurs, and probably breeds, during the wet season on rivers in the south. Records are from: **Kon Cha Rang Nature Reserve**, Gia Lai, a female observed on the

Kon river, May 1988 (Robson *et al.* 1989, Vo Quy and Nguyen Cu 1991), and another at the same site, March 1999 (Anon. 1999); **Yok Don National Park**, Dac Lac, on the Dak Ken, a few hundred metres from its confluence with the Srepok, one female, June 1997 (Le Xuan Canh *et al.* 1997); Songphan, **Phan Thiet**, Binh Thuan, male collected, 1933 (although a specimen in MNHN, presumably the same, was provisionally identified as a female and labelled as having been taken in February 1932) (Delacour and Jabouille 1935, Engelbach 1948).

■ **MALAYSIA** Although Cairns (1963) considered it largely restricted to Kedah and Perlis in Peninsular Malaysia (where he claimed to find 15 nests), it is in fact fairly widely if erratically distributed as far south as Melaka and even Singapore, but breeding has never been confirmed (Chasen 1939a, Gibson-Hill 1949b, Wells 1999; see Remarks 2). It occurs in Kedah, Kelantan, Perak, Pahang, Melaka, Johor and Selangor (Wells 1986). Records are from: **Langkawi**, where one was picked up at sea (apparently after fighting with another unidentified bird, dropping into the water and getting entangled in fishing nets), May 1941 (specimen in ZRCNUS, Madoc ms, 1950–1951; also Morioka and Yang 1996); **Sungai Merbok**, Kedah mangroves, 1993 (Gregory-Smith 1994b); a few miles downstream of **Kuala Kenarong**, on the Perak river, January 1971 (Wells 1974); **Ulu Muda dam**, Kedah, March 1988 (K. Kumar *in litt.* 1998); **Grik** (Gerik), one at Kuala Piah, May 1966 (Wells 1975), one female nearby on the Sungai Perak, June 1968 (Wells 1982), and another on the Sungai Perak some miles north-east of Grik, May 1960 (Medway and Nisbet 1968); **Kuala Sok** on the Muda river, 1940 (Madoc ms), and regular in upper reaches of this river, undated (Madoc 1950–1951); **Temengor Forest Reserve**, Hulu Perak, one on Temengor lake, a hydroelectric scheme headpond, March 1994 (Davison 1995); **Kuala Selinsing**, Perak, pairs observed in mangrove habitat, February and March 1986 (Wells 1990c); **Kuala Sepetang** (Sipitang), Perak, one male, March 1986 (Wells 1990c); **Matang Mangrove Forest Reserve**, Perak, four sightings in mangrove forests, January–February 1986 (Hawkins and Silvius 1986), with occasional undated sightings specifically at Kuala Gula (Chong 1994); **Dua Besar creek**, Pulau Pasir Hitam, Perak, female, January 1986 (record *per* M. J. Kohler *in litt.* 1998); **Taman Negara National Park**, May–June 1976 (Wells 1983), one on Sungai Tahan, February 1981 (D. Griffin *in litt.* 1999), three sightings of singles, February 1985 (Wells 1990b), January 1989 (*Enggang* 3, 1 [1990]), March 1989, March 1991 (T. Atkinson *in litt.* 1999), one breeding-condition male, May 1991 (Chong 1994), one male on Taman river, March 1992 (S. Greenfield *in litt.* 1998), one or possibly two males, April 1993 (Wartmann 1993), one male at Sungei Tukun, March 1994 (W. M. Choy *in litt.* 1998), March–May 1994 (A. Drewitt, L. Macauley and M. Rodgers *in litt.* 1999), on Sungai Relau, February 1997 (*Enggang* February–March 1997); **Cherating river**, Pahang, several records in April 1989 (Wen 1989); **Jeram Kawan**, Perak, February 1902 (specimen in BMNH); **Fraser’s Hill** (Bukit Fraser), Pahang, one migrant mist-netted at the radio tower, December 1976 (Wells 1983); **Kerau Wildlife Reserve**, at Kuala Lompat, Pahang, two seen regularly, April–May 1975 (Wells 1982), April–May 1977 (Wells 1983), June 1979 (Wells 1984), December 1985 (*Oriental Bird Club Bull.* 3 [1986]: 33–36), and on the River Kerau, June 1985 (*Oriental Bird Club Bull.* 2 [1985]: 36–40); at **Ulu Yam** Chinese temple, Selangor, female, January 1991 (W. M. Choy *in litt.* 1998), January 1993 (A. C. Sebastian *in litt.* 1999), April 1993 (Jaune 1993); **Tasik Chini**, near Sungai Pahang, regular sightings, at least until the 1990s (Bransbury 1993); **Kuala Selangor**, December 1908 (female in BMNH), occasional recent sightings (Chong 1994) and Zoo Negara, photograph of presumed migrant at zoo ponds, undated (Jaune 1993), not February 1993 (*contra* Chong 1994); Air Kuning Dam, **Bukit Chera**, Selangor, one, December 1989 (*Enggang* 3, 1 [1990]); **Ampang reservoir**, Selangor, one presumed migrant, January 1981 (Wells 1986); **Tasek Bera**, Pos Iskandar, Pahang, one, March 2000 (*Suara Enggang* May–June [2000]: 33); **Pulau Tengah**, off Port Kelang, Selangor, recent sightings (Chong 1994); **Endau-Rompin Conservation Area**, in the region of Kuala Rompin, May 1989 (K. Kumar *in litt.* 1998); **Sungai Kinchin**, Pahang, one male, May

1989 (*Enggang* 2,6 June 1989; also Prentice 1989, Wells 1990d); **Melaka**, one, undated (Hume and Davison 1878), one caught in early 1950s (K. Kumar *in litt.* 1998), one (a migrant), at Ayer Keroh ornamental lake, late February 1987 (Wells 1990c, S. M. A. Rashid *in litt.* 1999).

■ **SINGAPORE** There are recent reports from one locality: **Sungai Buloh Nature Park**, males in January and April 1999, and a female in July 1999 (S. M. A. Rashid *in litt.* 1999).

■ **INDONESIA** Records are widely scattered throughout Sumatra, but it is difficult to judge whether the species is merely a non-breeding visitor to Indonesia: dated records below are from March (3), April (4), June (1, by local report), October (2) and December (1). A record of an adult and an immature from mangroves in eastern Sumatra suggests that breeding might occur. Records are from:

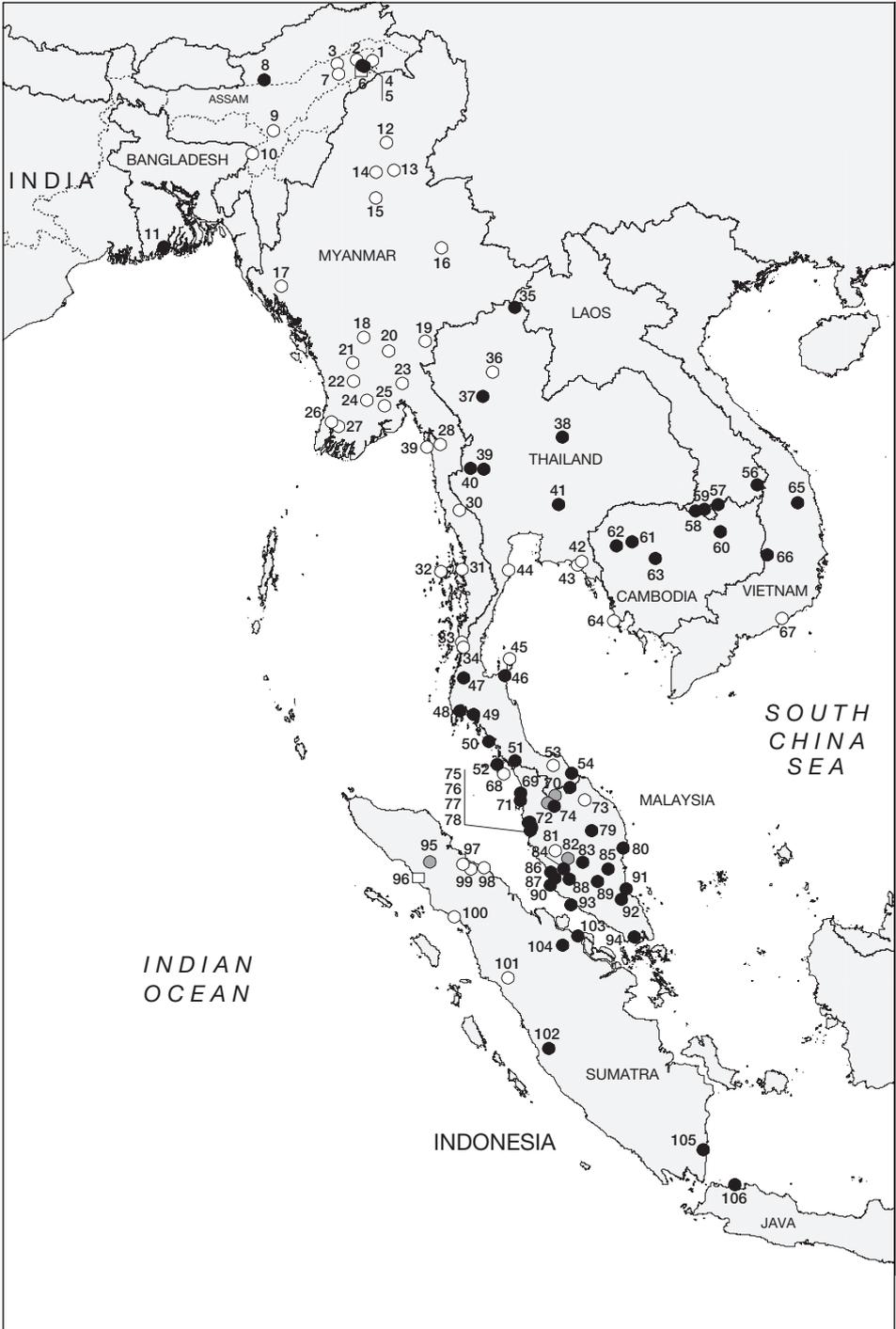
*Sumatra* ■ **Aceh Sungai Alas**, near Ketambe, 1974 and 1978 (van Marle and Voous 1988), undated reports (Holmes 1996); **Kluet extension** of Gunung Leuser National Park, undated reports where further surveys are required (Holmes 1996); ■ **North Sumatra Medan** on the Labuan river, female, March 1939 (Meyer de Schauensee and Ripley 1940), and the Medan district (Robinson and Kloss 1923, van Marle and Voous 1988); **Tanjungberingin**, Langkat (a site now converted to oil-palm plantations), December 1898 (specimen in AMNH; also Milton 1985); evidently **Deli-Serdang**, 1895 (van Marle and Voous 1988); **Muara Tapus**, near Barus, Tapanuli, April 1939 (female in ZMB; Milton 1985), this probably being the source of the record of Tapanuli in van Marle and Voous (1988); ■ **West Sumatra Gunung Ophir** district of Padang, undated (Robinson and Kloss 1923; see Remarks 3); **Kerinci-Seblat National Park** on a logging pond at Tandai, October 1994, but probably a winter migrant since not known to local people (Holden 1997); ■ **Riau Sungai Bukit Batu**, one adult and one immature at different locations in dense mangrove, October 1992 (Burn and Brickle 1992); **Siak Kecil**, one female (and a second bird reported), March 1991, and another bird nearby in April 1991 (Holmes 1996); ■ **Lampung Way Kambas National Park**, April 1983, April 1984 and (locally but accurately reported) June 1985 (Milton 1985, van Marle and Voous 1988, Parrott and Andrew 1996); Bapsumbu (untraced), undated (specimen in MCZ);

*Java* ■ **West Java Pulau Rambut Nature Reserve**, Jakarta bay, “skulking at the edge of a *Rhizophora* swamp”, March 1984 (Milton 1985).

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**The distribution of Masked Finfoot *Heliopais personata* (map opposite):** (1) Noa Dihing river; (2) Dighaltarang; (3) Dibrugarh; (4) Nazirating; (5) Tingrai river; (6) Dhekiajan; (7) Moran; (8) Nameri National Park; (9) North Cachar Hills district; (10) Chutla bhil; (11) Sundarbans; (12) Indawgyi lake; (13) Kaukkwe chaung; (14) Seiktha; (15) Tagaung; (16) Shan hills; (17) Ru chaung; (18) Ngahlauk; (19) Karenni; (20) Toungoo; (21) Inma swamp; (22) Zigon; (23) Shwegyin; (24) Myitmaka river; (25) Wadama; (26) Bassein; (27) Myaungmya; (28) Zami river; (29) Kyaikkami; (30) Myitta; (31) Mergui; (32) Thayawthadangyi; (33) Maliwun; (34) Bankachon; (35) Nam Mae Kok; (36) Lampung; (37) Mae Ping National Park; (38) Phu Khieo Wildlife Sanctuary; (39) Huai Kha Khaeng Wildlife Sanctuary; (40) Thung Yai Naresuan Wildlife Sanctuary; (41) Khao Yai National Park; (42) Chanthaburi; (43) Tha Chalaep; (44) Pranburi; (45) Ko Phangan; (46) Klong Kanom; (47) Khlong Saeng Wildlife Sanctuary; (48) Ao-Phang-nga National Park; (49) Krabi; (50) Ko Libong; (51) Thaleban National Park; (52) Ko Tarutao; (53) Yala; (54) Chalerm Prakiat Wildlife Sanctuary; (55) Hala-Bala Wildlife Sanctuary; (56) Dong Ampham NBCA; (57) Xe Pian NBCA; (58) Ban Houayko; (59) Ban Tahin; (60) Tonle Srepok; (61) Prek Toal; (62) Sangke river; (63) Boeng Chhma; (64) Pointe Samit; (65) Kon Cha Rang Nature Reserve; (66) Yok Don National Park; (67) Phan Thiet; (68) Langkawi; (69) Sungai Merbok; (70) Kuala Kenarong; (71) Ulu Muda dam; (72) Grik; (73) Kuala Sok; (74) Temengor Forest Reserve; (75) Kuala Selinsing; (76) Kuala Sepetang; (77) Matang Mangrove Forest Reserve; (78) Dua Besar creek; (79) Taman Negara National Park; (80) Cherating river; (81) Jeram Kawan; (82) Fraser's Hill; (83) Kerau Wildlife Reserve; (84) Ulu Yam; (85) Tasik Chini; (86) Kuala Selangor; (87) Bukit Cherakah; (88) Ampang reservoir; (89) Tasek Bera; (90) Pulau Tengah; (91) Endau-Rompin Conservation Area; (92) Sungai Kinchin; (93) Melaka; (94) Sungai Buloh Nature Park; (95) Sungai Alas; (96) Kluet extension; (97) Medan; (98) Tanjungberingin; (99) Deli-Serdang; (100) Muara Tapus; (101) Gunung Ophir; (102) Kerinci-Seblat National Park; (103) Sungai Bukit Batu; (104) Siak Kecil; (105) Way Kambas National Park; (106) Pulau Rambut Nature Reserve.

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



**POPULATION** The global population is thought to be below 10,000 (Rose and Scott 1997), although the reclusive nature of the species impedes the accuracy of this estimation. It is (or at least was) probably commoner in some regions than supposed (Delacour and Jabouille 1935) but there has undoubtedly been a major decline in the latter half of the twentieth century in South-East Asia owing to the combination of habitat loss and hunting. The general dearth of recent records is a reflection of the rarity of the species and its preferred undisturbed riverine habitat (the linearity of which represents a major constraint on population size, even in pristine areas).

**India** It has always been scarce in north-east India (Ali and Ripley 1968–1998). In several years of fieldwork in North Cachar Hills district, Baker (1894–1901) failed to record it and thought it “extremely rare”. However, it was apparently easily found at Chutla bhil (Primrose 1902) and Baker (1922–1930), stated that “in some parts of Assam it was by no means uncommon”. There have been very few recent records, however, and the species is now a great rarity in the country (Choudhury 1997e). Although most suitable habitat has disappeared there are still considerable tracts of forested wetlands in Tinsukia district, Assam, whence old records of the species derive, but during almost two years of research in the 1990s it was not found, implying that it is now very rare or extinct in the area (Choudhury 1997e) and “much scarcer than [White-winged Duck] *Cairina scutulata* in the rain forests of Assam” (Choudhury 2000c). It is possible that undiscovered populations may survive in eastern Arunachal Pradesh, parts of Nagaland, Manipur or Mizoram (Choudhury 1997e), but if so they must be very small.

**Bangladesh** In the Sundarbans the species can regularly be found by “cruising creeks of 30 m or less width in the southern quarter of the forest or south-east of Mongla” (Thompson and Johnson 1996). In this area (the only known site in the country) it has been described as “scarce” (Thompson and Johnson 1996) or “fairly common” (Z. Hussain 1993), with annual sightings between 1981 and 1999, and a maximum group of five individuals in March 1994 (S. M. A. Rashid *in litt.* 1999). Given the large area of mangrove forest in the area, the population is possibly more substantial than this information suggests, but it is difficult to assess numbers owing to the secretive habits of the species (P. M. Thompson *in litt.* 1997). Extensive fieldwork in 1992–1997 resulted in no records of the species in the wetlands of north-east Bangladesh (S. M. A. Rashid *in litt.* 2000).

**Myanmar** Oates (1882, 1883) and Smythies (1986) considered the Masked Finfoot generally to be “a rare bird” in Myanmar, as did Hume (1875b) and Tickell (in Blyth 1875) in Tenasserim (Taninthayi; previously including Mon and Kayin states). This judgement was later refined to “very sparingly distributed” in Tenasserim, with only 6–8 seen in roughly a four-year period between Kyeikkami (now Mon state) and Bankachon (c.1874–1878) (Hume and Davison 1878). It was not, however, thought to be rare in northern Pegu state (Hume 1875a). Indeed Hopwood (1921) found it “very common” in this area in seasonally flooded swamps along lower reaches of the Myitmaka river (=upper Hlaing river) in Tharrawaddy district, a breeding ground of over 1,300 km<sup>2</sup> in which calling birds were heard over a linear stretch of 80 km; moreover, four nests found at Mindu lake (part of the Myitmaka river), were within a few hundred metres of each other, suggesting a high population density equating to “many hundred pairs”. Baker (1922–1930) rephrased this conclusion to indicate that the site contained “at least 500 pairs breeding during the rains”. The broader picture was less encouraging, however, as Hopwood (1921) commented that despite visiting “countless swamps, marshes and lakes... in pursuit of waterfowl and their nests” during a period of 18 years in Myanmar, he only encountered the Masked Finfoot on four other occasions. Given these facts, the species was probably extremely local even early in the twentieth century, and the Myitmaka breeding area was probably even then of great importance to the species. No concentrations to match the Myitmaka swamps have been reported subsequently and these wetlands are believed (although this needs checking) to be widely drained and disturbed

(Khin Ma Ma Thwin *in litt.* 1997). While the species now appears to be very rare in the country (Khin Ma Ma Thwin *in litt.* 1997), the extent to which this assessment reflects reduced fieldwork in recent times is unclear.

**Thailand** In south-west and peninsular Thailand the species was described as “everywhere an extremely rare bird” (Robinson and Kloss 1921–1924), and although it annually visits well-known areas of mangrove, the overall numbers involved may be very small (P. D. Round *in litt.* 1998). Mangroves in Chantaburi province apparently supported a population in the 1960s (B. F. King verbally 1998), but there are no recent records from the area. There is no current population estimate for the country, but given the rapid decline in mangrove habitat in the peninsula (see Threats) numbers are likely to be low and falling.

**Malaysia** Although fairly well distributed in the country (Chasen 1939a), the species was “nowhere common” in Peninsular Malaysia even at the outset of the twentieth century (Robinson 1915b), and it remained “local and uncommon” until its close (Wells 1999).

**Laos** The species was first recorded in 1993, and has since been “found quite widely” in the Xe Kong basin and in Dong Khanthung proposed NBCA (Duckworth *et al.* 1999). Around 40 km of apparently suitable nesting habitat exists along the Xe Kaman in Dong Ampham NBCA (Davidson *et al.* 1997). It is too early to judge the size of the presumed breeding population, but it is unlikely to exceed 100–200 pairs (JAT).

**Cambodia** Until recently the Masked Finfoot was only known from two or three historical records. Fieldwork in the late 1990s around Tonle Sap lake and in Ratanakiri province suggests that small breeding populations survive in both areas, and that local people are familiar with the species (Goes *et al.* 1998b, Timmins and Soriyun 1998). Given the large area of potentially suitable habitat around Tonle Sap lake, the population in that area may be of high conservation significance: although repeated surveys have failed to locate anything but tiny numbers of individuals (C. M. Poole *in litt.* 1999), local people are familiar with the bubbling call and the species might prove more abundant than records suggest (F. Goes *in litt.* 2000).

**Vietnam** There are only three confirmed recent records and one historical record, but the population and distribution of the species remain imperfectly known (Robson *et al.* 1993). In particular, significant stretches of riverine habitat remain unsurveyed and birds might be somewhat commoner than records imply (A. W. Tordoff *in litt.* 2000).

**Indonesia** The species has been recorded in coastal and forested riverine habitat, presumably as a non-breeding visitor from continental South-East Asia (van Marle and Voous 1988). It appears to occur only in small numbers, while the Javan record is a presumed vagrant (Milton 1985). Milton (1985) gave the span of Indonesian records (accepting the park ranger’s June record) as December–June, and this is consistent with records from Thailand and Malaysia. However, a subsequent record of an adult and nearby immature in October (Burn and Brickle 1992) raises suspicions that breeding might occur, at least occasionally.

**ECOLOGY Habitat** As a largely aquatic bird, the Masked Finfoot typically lives on chiefly lowland woodland waterways, ranging from relatively fast-flowing, clear (including blackwater) rivers far inland (sometimes into the low hills) to sluggish coastal creeks, subcoastal swamp and mangrove (Oates 1883, Robinson 1915b, Robinson and Kloss 1921–1924, Smythies 1986, Wells 1990c, 1999). It has been described as a species dependent extensively on lowland mixed evergreen forest (Wells 1986), but it has also been recorded (evidently as a short-term visitor) on reservoirs, ponds and flooded mine-workings, far from forest (Wells 1999).

In India and Bangladesh it inhabits “dense, swampy forest” (Ripley 1982), such as at Chutla bhil, Assam, where a dense growth of *Barringtonia acutangula* trees and “cane” provided a secure retreat from danger, its numbers declining when this cover disappeared (Primrose 1902). In Myanmar it also frequented “flooded forest areas and vast swamps”

during the breeding season, while at other seasons it occurred in tidal creeks and small streams in or near evergreen forest (Smythies 1986). Hopwood (1912b) found it in a deep stream pool bordered, at least in part, by elephant grass. The major breeding site on the Myitmaka river was situated along a stream which flooded during the rains to form large lagoons and a huge swamp mostly between 1.5 and 4 m deep (Hopwood 1912b, 1921). In this area the species frequented inundated depressions with shrubs and tangled masses of creepers (Hopwood 1912b, 1921). In southern Laos, it occupies wide, slow-flowing stretches of river (20 m or more) with no emergent vegetation, although the banks have good cover (Thewlis *et al.* 1998), and the branches of streamside vegetation usually trail into the water, thus facilitating concealment (Round 1998a). Similarly, in Malaysia it is usually observed along the sides of slow-moving stretches of river with overhanging riparian trees, often *Eugenia grandiflora* (Chong 1994). In Cambodia, a bird was found in an undisturbed coastal waterway passing through pockets of mangroves and marshland (Engelbach 1948), and in southern Thailand one was seen in a large undisturbed channel through *Melaleuca cajuputi* swamp forest (R. J. Safford *in litt.* 1999).

On migration the species has turned up in odd places (see Migration). One female at Lampang, Thailand, was found on a “small shallow marsh” (Vijjakich 1934), a habitat that is possibly only visited on migration. It is not known to what extent the species can utilise larger waterbodies such as reservoirs which have inundated formerly suitable lowland riverine habitats (Round 1988a), but it seems likely that such ecological modifications have a deleterious impact on its populations. One at Sungai Halong, Malaysia, was the first recorded on a hydroelectric power lake (Davison 1995); but such a record cannot be taken to indicate long-term acceptance and occupancy of such waterbodies.

The Masked Finfoot is often very shy, but many individuals appear remarkably tame and conspicuous, and it is difficult to accept that the lack of records simply reflects its elusive nature (Baker 1922–1930, P. D. Round *in litt.* 1998, Timmins and Soriyun 1998). When disturbed it usually swims out of the water and retreats into nearby vegetation (Ali and Ripley 1968–1998, Smythies 1986, Wells 1999), “scrambling up steep banks when shot at, and running with unexpected rapidity into dense thickets” (Blyth 1875). Occasionally it submerges partially when suspicious, and is then easily overlooked in dense masses of floating vegetation (Hume 1875a). Robinson and Kloss (1921–1924) stated that it feeds under banks, moving through the water with the aid of its wings when alarmed, “rarely taking properly to flight”, this reminding Tickell (*per* Blyth 1875) of an alarmed Coot *Fulica atra* or Moorhen *Gallinula chloropus* “squatting along the surface of the water”. It also perches on branches and tree-trunks overhanging water (Ali and Ripley 1968–1998). Its behaviour is, in general, similar to that of the African Finfoot *Podica senegalensis* (Ali and Ripley 1968–1998). It is not clear whether it breeds in mangroves (see the Krabi breeding record under Migration).

**Food** The diet of the species is varied, consisting of insects, small fish, amphibians, crustaceans, molluscs, small reptiles, aquatic invertebrates and vegetable matter (Delacour and Jabouille 1935, Ali and Ripley 1968–1998, Chong 1994, Wells 1999). The crops of some specimens have contained shells and various insects, and one stomach contained what looked like mashed-up leaves (Hume and Davison 1878). One shot by Deignan (1945) in Thailand had been eating “small crabs and molluscs”. A captive bird provided with fish and shrimps ate them readily (Hopwood 1921).

Birds tend to swim slowly along shady riverbanks, snatching small insects from the water surface and overhanging leaves or branches (Chong 1994, Wells 1999). They have been noted catching small fish in shallow water (Chong 1994), on one occasion carrying a 15 cm fish up a steep bank and consuming it away from the water (Wells 1999). In mangroves they have been observed shuffling across exposed mudflats, picking from the surface, peering into burrows (presumably in search of crabs), or dashing out of water to capture crabs on creekside mud (Wells 1999). A migrant in Melaka, February 1987, foraged in shallow water by stirring

detritus with its feet and thus consumed 17 items in 45 minutes, one of which was a small frog (Howes 1988, Wells 1990c).

**Breeding** All confirmed reports of breeding have occurred in the monsoon, or wet season. For example, breeding has been recorded in July in Assam, north-east India (Baker 1922–1930) and July–August in the upper Hlaing river, Myanmar (Hopwood 1921), while in Bhamo district locals reported that the species nested during the rains (Smythies 1986). Similarly, two birds on the Xe Pian, Laos, seemed to be paired in May 1995, after the first rains (Thewlis *et al.* 1998). As river levels generally rise in May in Laos, Cambodia and Vietnam it is likely that the breeding season begins in this month (JAT). Three nestlings (in BMNH) labelled as having been collected in February 1928 and eggs apparently taken in March 1953 (see Distribution: Myanmar: Zigon) are intriguing. If accurately dated they suggest that the breeding season in Myanmar may be more protracted than published information suggests, and that the species might be partially resident.

All details of nests and eggs derive from Myanmar where Hopwood (1921) found nests built on tangled branches of trees (on at least one occasion a *Barringtonia*) or shrubs in flooded forest a few inches to 3 m above the water surface, especially in “dark places under thick creepers”. One nest was a very thick heaped mass of sticks, forming a large pad with a total diameter of 37 cm within which there was a shallow egg cavity of 20 cm diameter (Hopwood 1921). The clutch size is given variously as 5–6 (Ali and Ripley 1968–1998), 5–7 (Baker 1922–1930) or 5–9 (Hopwood 1921).

**Migration** The Masked Finfoot’s movements remain poorly understood. Baker (1922–1930) suggested that there is local movement after the breeding season, when birds follow streams out of their usual swampy habitat, although this is evidently based on very few sightings and specimen records and should perhaps be discounted. Half a century later, but with a similar paucity of supporting data, Ripley (1982) concluded that it was a resident in Bangladesh, north-east India and Myanmar. It is still difficult to identify seasonal patterns of distribution in this portion of the species’s range owing to the sheer infrequency of sightings. There is some evidence, however, that inland waterways are at least partially vacated in the non-breeding season, while coastal creeks and mangrove forests tend to support non-breeding populations or resident populations augmented by immigrants from the breeding range (see Distribution).

The situation is marginally clearer-cut in South-East Asia. There is, for example, a highly seasonal pattern of occurrence in the Thai-Malay peninsula, suggesting that the species is probably a non-breeding visitor (*contra* King *et al.* 1975; see Remarks 2). Although this might relate in part to variations in detectability, the fact that long-distance migration occurs is confirmed by records of one attracted to floodlights at Fraser’s Hill, and another flying into school buildings in Melaka town (Medway and Wells 1976, Wells 1999). Furthermore, there are many incidental records during migration periods from small isolated wetlands where the species is usually absent (see Distribution).

The majority of both Thai and Malaysian records span November–July (Round 1988a), although most fall in January–June (Chong 1994) and the species is apparently absent from known sites at other times of the year. This pattern is disrupted by a record from August (Wells 1999), and observations at Kedah mangroves where it was present in March 1993, absent in July and August of the same year, and then reappeared in September (Gregory-Smith 1994b). Similarly, records in Indonesia span from October to June (see Distribution and Population). It appears that any breeding population in peninsular Thailand, Malaysia or Indonesia must be very small and heavily augmented by migrants, usually between November and July. Where these migrants breed is debatable, but the answer presumably lies in Myanmar and possibly Indochina (Laos/Cambodia/Vietnam). The fact that eggs have been collected in Myanmar in July–August neatly supports this hypothesis (but see Breeding), as do records of migrants in continental Thailand (e.g. at Mae Ping National Park, Lampang,

Chiang Mai, Huai Kha Khaeng National Park and Khao Yai National Park). One piece of anecdotal evidence suggests that individuals return to the same wintering territories year after year: on Sungai Tahan in Taman Negara they have learnt to ignore tourist boat traffic (Wells 1999).

Le Xuan Canh *et al.* (1997) stated that “without obvious reason, Masked Finfoot has been assumed to be a non-breeding visitor to [Indochina]”, and added that recent records from Laos and Vietnam in the presumed breeding season contradict this assumption and “indicate that southern Indochina is a breeding area”. In southern Laos, for example, the species is apparently a wet-season visitor (March–July; perhaps remaining until November given the arrival dates on the Thai and Malaysian non-breeding grounds), during which time it probably breeds (Davidson *et al.* 1997, Round 1998). As the dry season is so pronounced in Laos and northern Cambodia, water levels can fall short of streamside vegetation for several months of the year, resulting in a complete (Round 1998) or partial (R. J. Timmins *in litt.* 2001) lack of shelter for the species. It possibly migrates to coastal sites and other wetlands at this time (perhaps as far as Malaysia or Indonesia), returning to breed in the wet season (Round 1998). However, recent records suggest that the species might be resident around the Tonle Sap lake (*Cambodia Bird News* 4 [2000]: 56) and it has been recorded elsewhere in Indochina in March–April, at the height of the dry season when water levels are at their lowest (R. J. Timmins *in litt.* 2001). In conclusion, the picture of movements in this species is only just emerging and appears to be rather complex; it deserves further study.

**THREATS** *Habitat loss* The Masked Finfoot is at risk throughout its range from the ongoing loss of forest ponds, streamside or riverside vegetation and the increase in human disturbance in suitable wetlands; an enormous amount of suitable habitat has disappeared from its historical range (Round 1988a, Scott 1989, Collins *et al.* 1991, Nguyen Cu *in litt.* 1997). A related issue is the fact that conserving viable populations is difficult given that most protected areas are not longitudinal, and therefore only embrace limited stretches of river; moreover, slow-moving rivers and lowland waterbodies are poorly represented in national protected-area systems because of the ease with which their hinterlands are settled, logged or cultivated (Timmins and Soriyun 1998, P. D. Round *in litt.* 1998). In addition, rivers are often used to demarcate boundaries of reserves, an approach that leads to their incomplete protection (Wege *et al.* 1999).

In India the Tingrai river and the Moran area of India are now largely inhabited or under tea plantation (Choudhury 1997e), while Chutla bhil, North Cachar, had lost most of its appropriate cover even by 1901 (Primrose 1902). In Bangladesh, mangrove swamp forest in the Sundarbans is exploited for a variety of forest products including timber, pulpwood and firewood (Rashid 1993) and the species is threatened by these activities (P. M. Thompson *in litt.* 1997). Throughout South-East Asia mangrove habitats are being cleared at a dramatic rate for development and commercial products such as firewood and charcoal, and for fish farming (Silvius *et al.* 1986, Whitten *et al.* 1987b, Parr 1994b, Kushlan and Hafner 2000). Suitable mangrove and wetland areas along the Arakan and Tenasserim coasts of Myanmar have largely been and continue to be converted to agricultural and aquacultural land (Scott 1989). The huge mangrove forests and swamps of the Irrawaddy delta must once have provided important habitat for the species, but unfortunately, owing to the comprehensive deforestation and consequent erosion of the watershed, along with intensive agricultural development along the river’s length, the delta suffers extremely heavy siltation (Scott 1989). Moreover, all unprotected forests in the delta area have been converted to rice cultivation, and even mangrove forests within logging preserves (e.g. the Kyagan, Kwinbauk, Kakayen and Pynland Reserved Forests) are rapidly disappearing to be replaced by paddyfields (Scott 1989). Das (2000) noted that “the deltaic forests of the country had been completely cleared” by the mid-nineteenth century. In Thailand and elsewhere in the species’s range the area of

available coastal habitat is being reduced rapidly by massive destruction of mangrove forests to produce charcoal and create shrimp-ponds, mines, salt-pans and resettlement areas (Parr 1988, 1994b). Mangrove habitat is poorly represented in Thailand's protected areas (MacKinnon and MacKinnon 1986, Parr 1994b), and even in areas categorised as "National Reserve Forest" (which has nominal protection: see, e.g., Threats, etc., under Gurney's Pitta *Pitta gurneyi*), such as at Krabi, illegal cutting of wood is frequent for fuel, construction materials, industry, housing and aquaculture (Scott 1989). Coastal and riverine lands are also being reclaimed for industrial purposes (P. D. Round *in litt.* 1998). The area of mangrove in Thailand in 1961 was 3,679 km<sup>2</sup>, but by 1979 this had been reduced by 22% to 2,873 km<sup>2</sup> as a result of cutting for charcoal and timber and clearance for the establishment of shrimp-ponds (Klankamsorn *et al.* 1981, Scott 1989). The area of mangrove in the country is still declining at a catastrophic rate (P. D. Round *in litt.* 1999). At Ao-Phang-nga National Park most good mangrove habitat is now outside the "protected area", while that inside has become "heavily cut-over low-stature scrub" (*Bangkok Bird Club Bull.* 6, 2 [1989]: 9). In Indochina perhaps the principal threat to the species is the "constant spread of villages" into remote regions, especially as new settlements are invariably established beside rivers, and the ever-increasing number of settlements is paralleled by increases in boat traffic, disturbance and clearance of bankside vegetation (R. J. Timmins *in litt.* 2001). In Vietnam, enormous areas of humid forest have been lost this century (see Threats under Crested Argus *Rheinardia ocellata*). Habitat availability for the Masked Finfoot has consequently declined, especially as considerable stretches of potentially suitable riverine habitat are constantly eroded by forest clearance (A. W. Tordoff *in litt.* 2000). In Malaysia, the clouding of inland rivers by silt from logging operations is believed to have reduced foraging habitat, but further research is required to confirm this (Wells 1999). Despite nominal protection, the Matang Mangrove Forest Reserve is a good case study of threats in Peninsular Malaysia: mangrove wood is over-exploited despite a scheme for sustainable harvesting, wetlands are disturbed by crab-catchers and motor-boats, large areas of mangrove are reclaimed for agriculture and oil pollution is feared, all factors reducing the area or quality of habitat for the species according to DWNPPM (1987), which contains a discussion of threats to mangrove forests and wetlands in the Kuala Selangor area.

**Hunting and disturbance** The frequent habit of concealing itself in riverside vegetation rather than flying away (Hume 1875a, Thewlis *et al.* 1998) probably makes the species an easy target and thus particularly susceptible to high hunting levels. In some areas (e.g. the Xe Kaman in Laos), it is reportedly very shy (Davidson *et al.* 1997) whereas at other sites (presumably as a result of variations in levels of disturbance and hunting pressure) it is relatively tame (e.g. Krabi in Thailand and Taman Negara in Malaysia). Certainly its tendency to frequent sluggish rivers is a problem as these are also the waterways most frequently navigated by boats (J. W. Duckworth *in litt.* 1999). **India** Hunting, including live capture of young and collection of eggs, is thought to be a threat in Assam (Choudhury 2000c). **Bangladesh** Two major pressures on wildlife in the country are "direct killing, trapping and shooting" along with "habitat disturbance" (Rahman 1995). Illegal hunting is common in the Sundarbans (Scott 1989), presumably with deleterious effects on populations of this species. Previously this area was undisturbed because of the presence of dangerous fauna (tigers, crocodiles, king cobras), but now that these animals are rare it is disturbed 24 hours a day by "a large number of wood cutters, fishermen, honey collectors, wooden boats and mechanical vessels" (Sarker 1985); a full discussion of conservation difficulties in the Sundarbans is in the equivalent section under Lesser Adjutant *Leptoptilos javanicus*. **Myanmar** Early in the twentieth century, villagers in the Irrawaddy floodplain searched for the eggs of this species and collected them for consumption, although this was not thought to pose a serious threat as there appeared to be hundreds (or perhaps thousands) of pairs then breeding in inaccessible portions of the region's vast swamps (Hopwood 1921). An increased use of these waterways by fishermen and an expanding human population has presumably disturbed

the species and left fewer stretches of habitat available for breeding. *Thailand* Birds often allow a very close approach in mangrove areas and shooting is a definite threat (as it is for most waterbirds in the country: P. D. Round *in litt.* 1998); indeed a bird at Krabi was supposedly shot early in 1999 (P. D. Round *in litt.* 1999). There is also much increased use of mangroves by fishermen, leading to both incidental and direct disturbance, especially through increased use of monofilament fishing nets, and the presence of discarded nets; increased boat traffic involving both fishermen and tourists also causes some disturbance to the species (P. D. Round *in litt.* 1999). *Laos* Hunting is almost ubiquitous for a variety of cultural and economic reasons and its impact is very severe on populations of large waterbirds (Thewlis *et al.* 1998). This species has been recorded allowing an approach to c.20 m before flying into riverside cover, while others walked onto riverbanks to hide in vegetation, presenting an easy target to hunters (Thewlis *et al.* 1998). Dong Khanthung, whether established as a protected area or not, faces difficulty through increased immigration leading to agricultural development, habitat loss and hunting (“the scale and number of threats to the integrity of Dong Khanthung is increasing markedly and urgent intervention is needed to prevent the further erosion of biodiversity”) (Round 1998). *Cambodia* Young birds seen in captivity at Boeng Chhma in 1998 had apparently been taken from a nest nearby and raised as pets (Hong Chamnan verbally 1999).

**Hydropower projects** The abundance of proposals for dam developments in South-East Asia is of some concern, as the resultant reservoir habitats are much less suitable for this species than the original watercourses. The Chiew Larn dam at Khlong Saeng Wildlife Sanctuary, Thailand, certainly destroyed habitat for the species (S. Nakhasathien *per* P. D. Round *in litt.* 1999). Hydropower development threatens considerable stretches of potentially suitable habitat in Vietnam (A. W. Tordoff *in litt.* 2000), and will inundate large areas of forest along the Xe Kaman and Xe Xou in southern Laos, destroying almost all habitat suitable for Masked Finfoot (Baird 1995, Davidson *et al.* 1997). The Xe Pian–Xe Namnoy project might also affect suitable habitat for the species if it is eventually implemented (J. W. Duckworth *in litt.* 1999).

**Pollution** Many industrial and agricultural activities increase levels of water pollution, which probably reduces habitat suitability in many coastal areas (P. D. Round *in litt.* 1998). The species is probably threatened by pollution almost throughout its range, including north-east India (Choudhury 2000c; see under White-bellied Heron *Ardea insignis*) and Peninsular Malaysia (see under Milky Stork *Mycteria cinerea*).

**MEASURES TAKEN** The Masked Finfoot receives full legal protection in Myanmar (Wildlife Act 1994) and Thailand (WARPA).

**Protected areas** In India, the species has occurred in Upper Dihing (East Block) Reserve Forest, which is reportedly in the process of upgrading to wildlife sanctuary or national park status (A. Choudhury *in litt.* 1999). One individual has also been seen in Nameri National Park and its presence is suspected in Dibru-Saikhowa National Park (Choudhury 2000c). Conservation measures in the Sundarbans, Bangladesh, are outlined under Lesser Adjutant. One of the largest remaining stands of mangrove on the Arakan coast of Myanmar is included within the Wunbaik Reserved Forest (Scott 1989) but it is not known how effective this protection is or even whether the species occurs at this site. In Thailand, the main mangrove area at Krabi is classified as National Reserve Forest and can only be cut under legitimate concessions (Scott 1989); but see Threats. Tarutao National Park covers all suitable mangrove and riverine areas on Ko Tarutao (Scott 1989), and the species has also occurred in Hala-Bala Wildlife Sanctuary (433 km<sup>2</sup>). In Laos the species occurs in Dong Ampham and Xe Pian NBCAs and Dong Khanthung proposed NBCA (see Remarks 4). In Cambodia it occurs at Boeng Chhma/Moat Khla and Prek Toal, sites that are designated as core areas of the Tonle Sap Biosphere Reserve (C. M. Poole *in litt.* 1999). Pointe Samit is within Botum Sakor

National Park, but it is not clear whether the species still occurs in the area. It has been recently recorded in Kon Cha Rang Nature Reserve and Yok Don National Park, Vietnam, although it seems unlikely that these sites by themselves could support viable populations (Nguyen Cu *in litt.* 1997). Yok Don National Park itself, for example, could potentially account for c.12 pairs, although the Srepok basin within which it lies could hold many times that number (J. W. Duckworth *in litt.* 2000). Most river sightings in Malaysia are from protected and semi-protected areas; these include Kerau Wildlife Reserve (520 km<sup>2</sup>), Taman Negara (4,343 km<sup>2</sup>), Temengor Forest Reserve (which in combination with Belum Forest Reserve totals 2,000 km<sup>2</sup>) and also Endau-Rompin Conservation Area. However, although mangrove habitat is still extensive in Peninsular Malaysia, it is under grave threat (see under Lesser Adjutant and Milky Stork) and poorly protected, with only Kuala Selangor and Kuala Gula Bird Sanctuary in the Matang Mangrove Forest Reserve given partial protection (Chong 1994).

**Education** AWB undertook an ecological evaluation of the mangroves and mudflats at Krabi, Thailand, and initiated some ecotourism and educational programmes intended to benefit conservation in the area (Parr 1988). The species also features on waterbird posters in Laos (produced by WCS/CPAWM and distributed widely throughout the country), and on awareness material (posters and books) produced by the Wildlife Protection Office, Cambodia, as part of an ongoing campaign to reduce waterbird hunting (C. M. Poole *in litt.* 1999).

**MEASURES PROPOSED** *Protected areas and wetland management* Given that populations are spread along rivers, site-specific management may be insufficient to conserve viable populations and, as such, river catchment conservation programmes need to be developed to protect sufficiently long sections of river from habitat loss and disturbance (Duckworth *et al.* 1999). Liaison with fishery community projects (e.g. the Mekong River Commission) and mangrove conservation NGOs may prove beneficial; productivity figures for fisheries which overlay key finfoot conservation sites should be made available to conservation bodies and local communities alike, with a view to conserving wetlands as natural sustainable fisheries (J. W. K. Parr *in litt.* 2000). The conservation of inland waterways requires increased general environmental awareness regarding the importance of rivers, water quality, riverine habitat protection and the development of single-species recovery programmes (J. W. K. Parr *in litt.* 2000). The problem of river conservation places added onus on key sites for the species, e.g. mangrove systems in the non-breeding season (see equivalent section under Lesser Adjutant and Milky Stork) and Tonle Sap lake, Cambodia (see under Greater Adjutant).

Adequate protection of Asian reserves is urgently required as most sites receive negligible formal management; well-protected sites such as Taman Negara provide habitat and security for the species, but legislation at most reserves is flaunted with impunity (see, e.g., Round 1988a, Berkmüller *et al.* 1995, Parr 2000). Duckworth *et al.* (1999) urged that all protected areas in Laos found to support populations of Masked Finfoot require specific management practices targeting wetland habitat, with appropriate protective measures drafted and enforced with stiff penalties for violators. This point is relevant throughout the range of the species and should be addressed wherever possible. As a general rule ridges should be used to demarcate protected areas, rather than rivers, as this approach confers greater security to riverine habitat (Wege *et al.* 1999).

The proposed Dhaleshwari, Digboi and Dum Duma-Dangori wildlife sanctuaries in Assam, India, should be established to provide possible protection for the species in Assam (Choudhury 1983, 2000c). Measures proposed in the Sundarbans of Bangladesh, are outlined under Lesser Adjutant. In Myanmar, a system of wetland reserves needs to be incorporated into the national framework of protected areas (Lwin 1995). Salter (1982) proposed that reserved forests in the Irrawaddy delta, Myanmar, should be managed to ensure sustained production of fuelwood and to provide protection for mangrove fauna and flora, measures that might benefit this species. If any breeding populations are rediscovered in the Irrawaddy

catchment, every effort should be made to confer strict protection on the site. A proposed marine national park on Lampi island in the Mergui archipelago, Myanmar, would protect an area of untouched mangrove forest (Scott 1989). This park should be protected and surveyed to assess its potential benefit to the Masked Finfoot. As the best and most extensive remaining areas of mangrove in Thailand and Malaysia are largely excluded from protected areas, increased areas of this habitat should receive protection (Kasetsart University 1987, Parr 1994b, P. D. Round *in litt.* 1998, DWNPPM 1987). In particular, Krabi mangroves and mudflats should be incorporated within the Hat Nopparat Tara National Park (Parr 1988). Ko Tarutao has been proposed as a World Heritage Site (Scott 1989). Detailed recommendations regarding mangrove protection around Kuala Selangor, and elsewhere in Peninsular Malaysia, are in DWNPPM (1987). In Vietnam, the most important stretches of habitat (riverine forest on wide rivers) are along watercourses draining westward into Laos and Cambodia in the provinces of Dac Lac, Gia Lai and Kon Tum, as these are less important for commercial boat traffic and communications than rivers that drain east; future efforts towards river conservation should be targeted at these stretches (Duckworth and Le Xuan Canh 1998). Measures proposed at Xe Pian NBCA and Dong Khanthung proposed NBCA, Laos, are outlined under Sarus Crane *Grus antigone*. In Cambodia, areas of the Tonle Sap Biosphere Reserve in which the species is found should be managed with its conservation in mind; a full discussion of conservation proposals in this area is under Greater Adjutant.

**Control of persecution** Complete year-round legal protection from hunting is required wherever possible throughout the range of this species (P. D. Round *in litt.* 1998, Duckworth *et al.* 1999). Hunting bans in protected areas need to be stringently enforced (Duckworth *et al.* 1999).

**Research** As with most species, continued monitoring of known populations and fieldwork seeking new sites is of secondary importance compared to direct conservation action at known locations supporting the species. Nevertheless, a status survey is required throughout South-East Asia to quantify its populations, clarify its breeding range and movements, assess the threats and lay the ground for an effective management strategy. An investigation of those regions of Myanmar in which breeding of large numbers was reported historically should form a primary element of this research. In addition, efforts should be made to determine whether it breeds in coastal mangroves, and its preference for natural stands of mangrove versus silvicultural mangrove plantations (monoculture) in presumed wintering areas (J. W. K. Parr *in litt.* 2000). Field investigations should attempt to clarify the relative threat posed by direct persecution and indirect disturbance (Duckworth *et al.* 1999).

In India, potential habitat for the species in Namdapha National Park and Kamlang Wildlife Sanctuary in Arunachal Pradesh, Intanki in Nagaland and Yangoupokpi-Lockchao in Manipur need to be surveyed for the species (Choudhury 1997e), as do many forest sites in north, east and south Assam (Choudhury 2000c). In Bangladesh, the size, distribution and seasonal movements of the Sundarbans population should be investigated. In Myanmar, a survey of historical and potential breeding areas during the wet season (ideally June–September) should be conducted at the earliest opportunity. This should include Kyatthin Wildlife Sanctuary, a site from which recent provisional records originate and which possibly supports an important breeding population. In Cambodia, intensive survey work around Tonle Sap lake should aim to assess the size of the breeding population, and any threats it faces. This site is certainly of international significance for the species, and may prove to be the breeding stronghold in the long term. It should be noted that survey work might be greatly facilitated in breeding areas by judiciously broadcasting tape-recordings of the bird's bubbling call, a method that is likely to elicit a vocal response from territorial individuals, thereby making them easier to census.

**Education** Education campaigns are needed throughout the species's range, particularly to highlight the importance of natural river systems (Duckworth *et al.* 1999). The critical

value of mangrove forests and natural river or lake-bank vegetation to fisheries (as spawning grounds for fish and shelter for fry) should constantly be emphasised. Awareness schemes to help conserve birds dependent on wetlands by reducing habitat alteration and hunting were proposed in Bangladesh by the Forest Department (1974) and designed by Sarker (1989). Raising awareness of this inconspicuous species and its threatened status should be made a priority among national conservation organisations; posters promoting the conservation of key sites or habitats (e.g. Tonle Sap flooded forests, Dong Khanhung proposed NBCA, the Sundarbans and mangrove forests fringing the Andaman Sea) and their key fauna (including the Masked Finfoot and emphasising its globally threatened status) should be produced (J. W. K. Parr *in litt.* 2000).

**REMARKS** (1) As the YPM specimens from “Kuttal” were taken by A. M. Primrose at dates matching his (Primrose 1902) published records from “Chutla beel”, Choudhury (2000c) was presumably mistaken in treating these as separate sites. (2) Cairns (1960) reported finding 15 finfoot nests in Malaysia (Kedah) between 1946 and 1961. He claimed that the species builds nests made of “fine sticks and lined with dried bamboo leaves” in “flat scrub jungle flooded by overflowing small streams”, often in recesses in upturned tree roots. Despite his detailed account, the lack of subsequent confirmation that they nest in the country, and the fact that his records are omitted by Wells (1999), suggests that they are best treated as unconfirmed. The only other suggestion that they might nest in the country has been consorting pairs (Medway and Wells 1976), an apparent “juvenile” observed near an adult, and a breeding-condition male (with bill-knob), all at Taman Negara (Chong 1994). In peninsular Thailand a pair with three young were apparently seen on 29 May 1992 at Khao Khanab Nam, Krabi, Thailand; given the reliability of the boatman, who took many people to see the birds, it is “difficult to doubt the record” (*Bangkok Bird Club Bull.* 9,8 [1992]: 11). However, all breeding records from the Thai-Malay peninsula should be treated as unconfirmed until conclusive evidence is provided. (3) Since this specimen cannot be traced van Marle and Voous (1988) elected to treat the record as provisional. (4) While their coverage in Laos is very impressive, NCBAs are a relatively new and as yet provisional measure with which further specific regulations must be combined; their existence does not rule out hydropower development, logging and other commercial harvests, and the outcome of unresolved and growing conflicts with these more lucrative land uses will depend on high-level political commitment to the protected-area system in the country (Berkmüller *et al.* 1995, Thewlis *et al.* 1998). Moreover, NBCA regulations have yet to be finalised (J. W. Duckworth *in litt.* 1999), and as such are currently ineffective.