

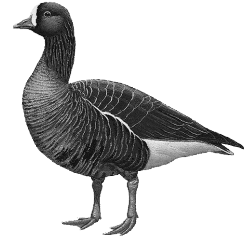
LESSER WHITE-FRONTED GOOSE

Anser erythropus

Critical —

Endangered —

Vulnerable A1a,c,d; A2b,c,d



This species has suffered a rapid population reduction in its key breeding population in Russia, estimated at a c.20–40% decline in the last 10 years, which qualifies it as Vulnerable. Equivalent declines are predicted to continue over the next 10 years. The small Fennoscandian population has undergone a severe historical decline.

DISTRIBUTION The Lesser White-fronted Goose (see Remarks 1) breeds around the interface of the taiga and tundra zones of northern Eurasia, from Arctic Europe to north-eastern Siberia (Russia), and it winters primarily in south-eastern Europe, around the Black and Caspian seas, on the lower Euphrates in Iraq, and in the lowlands of eastern and southern China (Cramp and Simmons 1977, Madge and Burn 1988, Madsen 1996).

Outside Asian region In Europe, it has suffered a contraction of its breeding range to northern Fennoscandia (Norway and Finland, with a re-introduced population in Sweden) and the area from the White Sea to the Ural/Yamal in Russia (Madsen 1996, Lorentsen *et al.* 1999). European and west Asian breeding birds winter around the Black and Caspian Seas, mainly in Azerbaijan (Madsen 1996). Small numbers occur on passage or in winter in Greece, Turkey, Hungary, Romania and Bulgaria (Munteanu *et al.* 1991, Madsen 1996, Aarvak *et al.* 1997, Lorentsen *et al.* 1998, Petkov *et al.* 1999), and there are important staging areas in Kazakhstan, Estonia, Lithuania and Poland (Madsen 1996, Tolvanen 1998, Tolvanen *et al.* 1999).

Asian region The species breeds in north-east Russia, and it is recorded outside the breeding season from Japan, South Korea, mainland China, Taiwan, Pakistan, India and Myanmar, with unconfirmed reports from Bangladesh. It has not so far been recorded from Mongolia or North Korea, but it is very likely that birds pass through on migration (Nowak 1970, Tomek 1999, A. Bräunlich *in litt.* 2000). Most of the Asian population is believed to winter in wetlands in south-east China, principally in the lower Yangtze basin.

■ **EASTERN RUSSIA** It breeds mainly within the forest zone north of the Arctic Circle and in the tall-shrub tundra belt, and the northern and eastern limits of its breeding range in eastern Russia therefore correspond to the northern and eastern boundaries of the wooded tundra zone, but the southern limits have not yet been determined; after breeding, birds migrate north to Arctic coastal lakes to moult (AVA). It still breeds on the southern Taymyr peninsula in Krasnoyarsk (Lorentsen *et al.* 1999). In Yakutia, it is now confined to a few small scattered breeding areas in remote regions with little human disturbance, usually around the upper reaches of small streams: most of the known breeding localities are in north-eastern Yakutia, in the Kolyma, Indigirka and Yana basins, but further west it persists in the upper Tyung river and in basin of the Olenek, Linda and Khorunka rivers (Degtyarev and Perfil'ev 1996). It is evidently absent from most of the Chukotsk Peninsula (Portenko 1972), where it has recently been found to nest occasionally and to moult in the Anadyr' basin (A. V. Kondrat'ev *in litt.* 1997), but otherwise it has not been found to the east of the upper Tanyurer river (Kishchinskiy *et al.* 1983). It is not known to have bred in the Chaun lowlands in Chukotsk, but it was common there on autumn migration (Krechmar *et al.* 1991). It has also occurred on migration in Irkutsk, Kamchatka, Khabarovsk, Amur, Primorye and Sakhalin island. There is no definite evidence that its range has changed in eastern Russia, mainly because it was not fully documented in the past, but there is considerable evidence that its

population has declined, which, together with intensifying human activities in large river valleys, suggests that its range must have become reduced and fragmented (Andreev 1997). Records (by province) are as follows:

■ **Taymyr** sources of the **Nizhnyaya Taymyra river**, near Taymyr lake, considerable concentrations of moulting geese, undated (Sdobnikov 1959 in Rogacheva 1992); near **Novaya river mouth**, a few seen in the scrub tundra subzone, undated (Scalon 1938 in Rogacheva 1992); **Verkhnyaya Taymyra river**, 10% of the migratory geese arriving in 1966 being this species (Borzhonov 1968 in Rogacheva 1992); upper **Pyasina river**, common, undated (Krechmar 1966 in Rogacheva 1992); **Tareya river** basin, considerable concentrations of moulting geese in the arctic tundra, undated (Krechmar 1966 in Rogacheva 1992); **Yenisey estuary**, near Tolsky Nos, western Taymyr, very rare in scrub tundra in 1932 (Scalon 1938 in Rogacheva 1992); near **Dudypta river mouth**, rare, undated (Rogacheva 1992); **Khantayskoye lake** basin, common migrant, undated (Syroechkovski 1961 in Rogacheva 1992), possibly breeding (Rogacheva 1992);

■ **Krasnoyarsk** near **Purinskiye lakes**, 27% of the migratory geese arriving in 1967 being this species (Borzhonov 1968 in Rogacheva 1992); **Kotuy river**, eastern Taymyr peninsula, very common in 1933, particularly in the forest-tundra zone where it was the most numerous goose and only bred in open woodlands, and especially numerous on the lower reaches of the river where it also moulted in large flocks, but it had become uncommon there by the mid-1960s (Scalon 1938 in Rogacheva 1992, Rogacheva 1988), with two single birds with flocks of Bean Geese *Anser fabalis* at the latitudes of Chirinda and Yessey, June 1983 (Volkov 1988 in Rogacheva 1992); near **Pyasino lake**, common, undated (Krechmar 1966 in Rogacheva 1992); near **Dudinka**, western Taymyr, rare in 1932 (Scalon 1938 in Rogacheva 1992); near **Norilskiye lakes**, rare in open woodlands, undated (Krechmar 1963, 1966 in Rogacheva 1992), possibly breeding (Rogacheva 1992); near the Yenisey river, east of **Nikol'sk** (Nikolskoye), breeding confirmed in forest-tundra, flocks of 25–30 on migration in August–September 1956 (Rogacheva 1959 and Rogacheva *et al.* 1983 in Rogacheva 1992); **Putorana mountains**, breeding, undated (Michurin and Mironenko 1968 in Rogacheva 1992), considered likely to breed in substantial numbers on the eastern slopes of the Putorana plateau, but probably not breeding in the central part of the plateau (Rogacheva 1992); near **Angutikha**, rare migrant, undated (Rogacheva and Vakhrushev 1983 in Rogacheva 1992);

■ **Irkutsk Irkutsk**, February 1894 (specimen in FMNH);

■ **Yakutia Lena delta**, uncommon breeding species and migrant, undated (Labutin *et al.* 1985); **Khroma–Indigirka tundra**, common breeding species, 3.4 birds found per 10 km over a 512 km route, June 1962 (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997); **Indigirka delta**, uncommon moulting species, undated (Uspenskiy *et al.* 1962); **Agafonova** (Agafonovskie lakes), East Siberian Sea coast, moulting flock of 12 birds, August 1995 (AVA); **Bol'shaya Ercha river** (Urcha river), Ulakhan-Sis, right side of the Indigirka valley, 10 broods counted along a 250 km stretch of the upper part of the river, August 1988 (Degtyarev and Perfil'ev 1996), 27 birds counted along a 185 km stretch of river, June–July 1989 (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997); **Kolyma delta**, collected, May 1905, uncommon migrant in the early 1980s (AVA); upper **Kon'kovaya river**, broods found, 1980 and 1986 (Krechmar *et al.* 1991); **Alazeya valley**, collected, June 1905, common breeding species between **Andryushkino** village and the Yulyuibut river in the 1960s (Vorob'ev 1967); upper **Ankudinka river**, 730 birds, 1970s (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997); lower **Berezovka river**, right-side tributary of the Kolyma river, 1983 (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997); **Srednekolym'sk** village, Kolyma valley, common migrant in 1960s (Krivosheev 1963, Krechmar *et al.* 1978); lower **Kamenka river**, right-side tributary of the Kolyma river, 1.1 birds found per 10 km, 1981 (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997); middle reaches of the **Adycha river**, Yana drainage, breeding, undated (Bunge 1887); upper **Ozhogina river**, Kolyma drainage, breeding pairs and nests, 1987 and 1988 (Labutin and Perfil'ev 1991a); upper **Tyung**

river (Tiung river), left-side tributary of the Viluy river, moulting and possibly breeding, with 27 birds counted along a 185 km stretch of river, June–July 1989 (Labutin 1992); foothills of the **Momskiy range** (Moma range), Indigirka drainage, common breeding species in the forest zone, undated (Mikhel' 1935); near **Zyryanka** (Zyrianka village), Kolyma valley, common migrant in 1960s (Krivosheev 1963, Krechmar *et al.* 1978);

■ **Chukotka Chaun-Palyavaam delta**, Chaun lowlands, common on autumn migration up to the end of the 1970s, but rare in recent years (Krechmar *et al.* 1991); 75 km from the source of the **Enmyvaam river**, Anadyr' highlands, brood of downy young, July 1992 (E. P. Shevchenko *in litt.* 1993); **middle Anadyr' river** floodplain and tributaries, 150 km downstream of Markovo settlement, several young birds still unable to fly and moulting flocks of up to 150 birds, early 1980s (Krechmar *et al.* 1991), moulting flocks of hundreds of birds and several broods, 1995 (A. B. Sokolov *per* A. V. Kondrat'ev *in litt.* 1997); middle reaches of the **Omolon river**, common passage migrant and occasional breeding species in the early 1970s, nest found in June 1973 (Krechmar *et al.* 1978); **Achchen lake** (Achen lake), eastern Chukotsk peninsula, brood of downy young, July 1991 (M. A. Krechmar *in litt.* 1992); upper **Tanyurer river**, undated (Kishchinskiy *et al.* 1983); **Avtatkuul' river mouth** (Avtatkool' river mouth), Anadyrskiy lagoon, 80 km south-west of Anadyr', small flocks regularly recorded at the beginning of the moulting period in July (unspecified years) (A. V. Kondrat'ev *in litt.* 1999);

■ **Koryakia Penzhina river** valley, north-west Kamtchatka, common migrant in the 1960s and 1970s (Yakhontov 1979);

■ **Kamchatka Kharchinskoye lake**, lower Kamtchatka river, 374 birds, May 1981, 88 birds, May 1982, 324 birds, May 1983 (Gerasimov and Gerasimov 1994); near **Ozernovskiy** village, migratory flocks of c.20 birds, plus three flocks of c.50 birds and a flock of c.150 birds on the lake, May 1983, 1984 and 1987 (Gerasimov 1998); **Lopatka cape**, south-west Kamtchatka, up to several hundreds on migration, undated (Gerasimov 1977);

■ **Khabarovsk Udyl' lake** (lake Udul'), migrant flock of 14 birds, May 1979 (N. D. Poyarkov *in litt.* 1999); **Goryun river mouth** (Gorin river mouth), several single birds with migratory flocks of Bean and Greater White-fronted Geese *A. albifrons*, May 1991 (N. D. Poyarkov *in litt.* 1999); **Bolon' lake**, lower Amur river, spring passage migrant, up to 5,000 birds in the 1970s (Roslyakov 1984), 80 birds, May 1980 (N. D. Poyarkov *in litt.* 1999); **Nedostupnoye lake**, 80 km north-east of Khabarovsk, left bank of the Amur, 74 birds, September 1974 (B. A. Voronov *in litt.* 1997);

■ **Amur** Amur river between **Blagoveshchensk** (Blagowestschensk) and the Little Chingan, flock of six birds, May (unspecified year) (Stegmann 1930), passage migrant on the southern Zeya-Bureya plain, near Blagoveshchensk, 5,000–8,000 in 1989 and 1990, 3,000 in 1992, 700–800 in 1995 (V. A. Dugintsov *in litt.* 1997); **Khingan** (Little Chingan), one collected, April (unspecified year) (Stegmann 1930);

■ **Primorye Khanka lake**, Khanka plain, large numbers recorded on passage in spring 1868 and 1869, when it was more numerous than other goose species (Przheval'skiy 1870 in Shul'pin 1936), but it had become rather rare by the 1920s (Shul'pin 1936), with three flocks totalling 74 birds, March–April 1964, flock of 22, October 1964 (Polivanova 1971); **Ol'ga bay**, September 1940 (specimen in ZMMGU); **Suyfun river mouth**, extreme south-west Primorye, found among birds shot by hunters, April 1985, dead bird found, April 1986 (Gorchakov 1996); **Tumen river mouth** (Tumangan river), extreme south-west Primorye, occasionally heard calling amongst migrating flocks of Greater White-fronted and Bean Geese, March–April 1970 (Shibaev 1974);

■ **Sakhalin Shmidta peninsula** (Schmidt peninsula), northern Sakhalin, 500 birds, September (presumably in 1983) (Eremin and Voronov 1984).

■ **JAPAN** This species was a regular winter visitor to Japan until the nineteenth century (Miyabayashi and Mundkur 1999), but it is now only a rare (but almost annual) visitor,

usually with flocks of Greater White-fronted Goose (Brazil 1991). Records (by island and prefecture) are as follows:

Hokkaido ■ **Rumoi**, undated (Wildlife Information Center, Hokkaido 1985); **Memambetsu** (Memanbetsu), juvenile female collected, November 1933 (Kuroda 1934b); **Kitami**, collected, November 1933 (Austin and Kuroda 1953); **Sorachi**, undated (Wildlife Information Center, Hokkaido 1985); Akkebetsu, **Nemuro**, one collected, 1874 (Kuroda 1934b; also Austin and Kuroda 1953); **Furen-ko**, seen with Bean Geese, September 1983 (Brazil 1991); near **Nemuro-gun** (Nemuro-cho), one collected, October 1891 (Yamashina 1930b), October 1934 (Austin and Kuroda 1953; juvenile female in YIO); **Zenibako**, collected, December 1901 (Austin and Kuroda 1953); **Kushiro**, undated (Wildlife Information Center, Hokkaido 1985); **Chitose**, October 1943 (Austin and Kuroda 1953); **Hakodate**, 1908 (Ogawa in Kuroda 1934b);

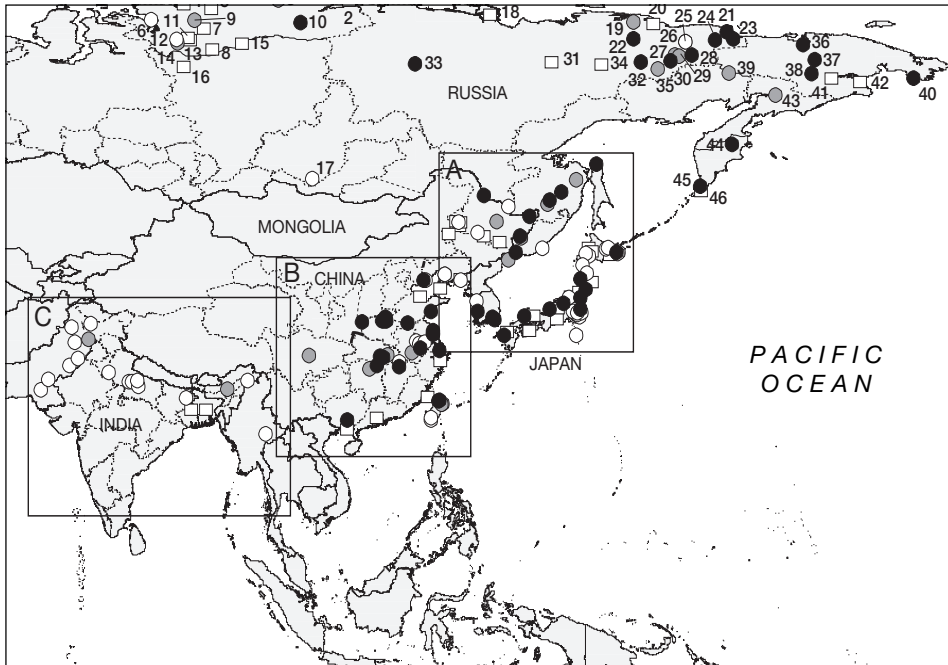
Honshu ■ **Aomori Ogawara-numa** lake, juvenile male collected, October 1916 (Kuroda 1934b; also Austin and Kuroda 1953); ■ **Iwate Tsugaruishi-gawa river mouth**, one, undated (Iwate Prefecture Government 1978); unspecified locality, November 1927 (Austin and Kuroda 1953); ■ **Miyagi Izu-numa** lake, a few annually (WBSJ Miyagi Chapter 1992), two adults, November 1984 (P. Alström, U. Olsson and D. Zetterström *in litt.* 2000); unspecified locality, one, January 1988 (WBSJ Research Division 1988 in Brazil 1991); ■ **Akita** unspecified localities, 10 birds, January 1988 (WBSJ Research Division 1988 in Brazil 1991); ■ **Yamagata** unspecified localities, winter (unspecified years) (Takano 1981); ■ **Ibaraki Mito-shi** and Higashiibaraki-gun, one juvenile seen, October–November 1993 (WBSJ 1994); **Kashima-gun**, juvenile collected, before 1913 (Kuroda 1934b; also Austin and Kuroda 1953); ■ **Saitama** Imperial duck pond (untraced), collected, February 1939 (Austin and Kuroda 1953); ■ **Chiba Tega-numa** lake, adult female collected, December 1903 (Kuroda 1934b; also Austin and Kuroda 1953), one collected, December 1935 (Kuroda 1939); **Gyotoku** (Minami-Gyotoku), juvenile collected, December 1933 (Kuroda 1934b; also Austin and Kuroda 1953); **Kazusa**, adult male collected, December 1912 (Kuroda 1934b; also Austin and Kuroda 1953); ■ **Tokyo Oota-ku**, December 1917 (WBSJ 1975); **Tama-gawa** river, Inagi-shi, one, October 1970 (WBSJ 1975); ■ **Kanagawa Yokohama**, female purchased at the market, January 1876 (Kuroda 1934b; also Austin and Kuroda 1953); ■ **Niigata Shinano-gawa** river, between Yoita-machi and Teradomari-machi, Santo-gun, vagrant, recorded in January (but not for at least 10 years) (Wild Bird Society of Nagaoka 1988); **Nishi-kanbara** (Nishikanbara-kun), October 1932 (Austin and Kuroda 1953, juvenile female in YIO); Asahi-ike pond, **Joetsu-shi** (Joetsu area), single juveniles seen, January 1988, October 1990 and January 1991 (Nakamura 1994); ■ **Toyama** unspecified localities, undated (OSJ 2000); ■ **Ishikawa** Katano duck pond, **Kaga-shi**, six, October 1998 (*Birder* 98/12), juvenile, November 1999 (Ohata and Yamamoto 2000a); ■ **Aichi** unspecified localities, winter (unspecified years) (Takano 1981); ■ **Tottori** unspecified localities, undated (OSJ 2000); ■ **Shimane Hii-gawa river mouth** (Hii-kawa river mouth), Hirata-shi, first-winter bird, February 1988 (WBSJ 1988);

Hachijo-jima island, Izu islands, one, November 1933 (Kuroda 1934b, Austin and Kuroda 1953, WBSJ 1975);

Shikoku ■ **Ehime Uwa-cho**, Higashiuwa-gun, one, November 1998 (*Birder* 99/1); ■ **Kochi** unspecified localities, winter (unspecified years) (Kuroda 1939, Takano 1981);

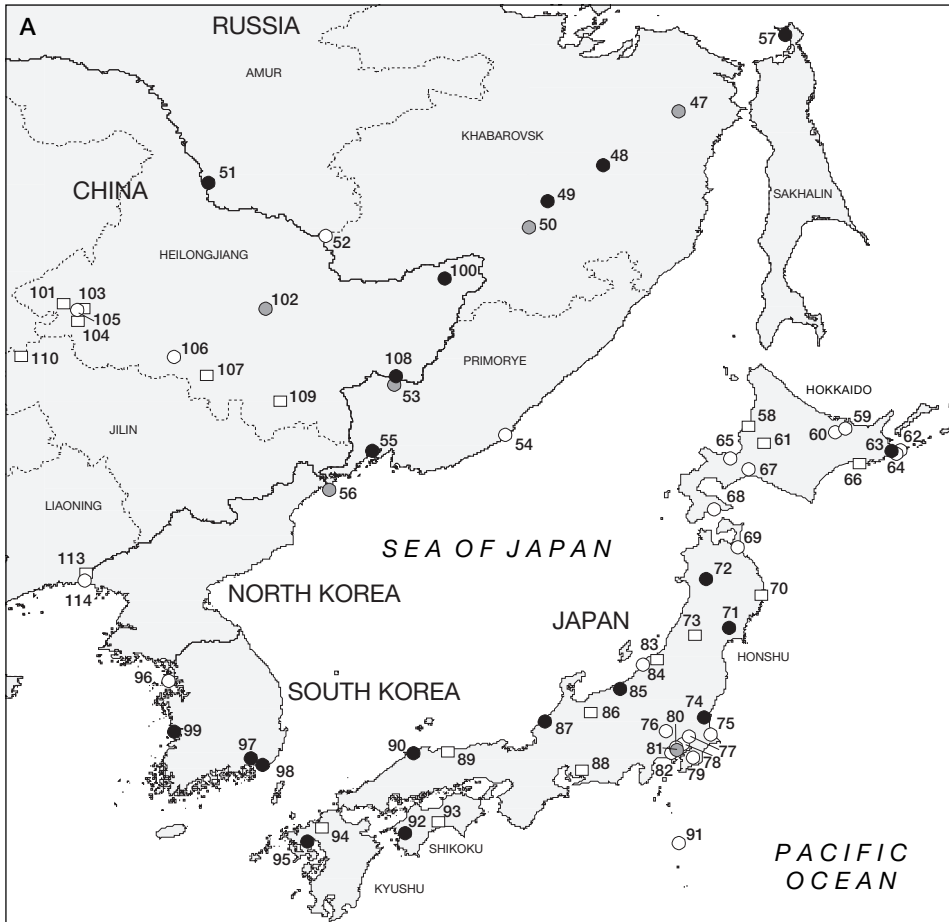
Kyushu ■ **Fukuoka** unspecified localities, winter (unspecified years) (Kuroda 1939, Takano 1981); ■ **Saga Ariake reclamation**, October 1982 (Wild Bird Society of Saga 1997).

■ **KOREA** ■ **SOUTH KOREA** This species is a very rare winter visitor to South Korea, usually seen with Greater White-fronted Geese (Lee Woo-shin *in litt.* 1998), with records (by province) as follows: ■ **Kyonggi and Seoul Puchon-gun** (Bucheon, Dasenjo, Keki district), two collected, April 1917 (Kuroda 1934b, Austin 1948, Won 1963); ■ **South Kyongsang Chunam reservoir** (Junam), one found poisoned by pesticides, February 1988, one seen, 1988, two seen, 1991 (Lee Woo-shin *in litt.* 1998); **Nakdong estuary**, one seen, January 1997 (Lee



The distribution of Lesser White-fronted Goose *Anser erythropus*: (1) Nizhnyaya Taymyra river; (2) Novaya river mouth; (3) Verkhnyaya Taymyra river; (4) Pyasina river; (5) Tareya river; (6) Yenisey estuary; (7) Dudypta river mouth; (8) Khantayskoye lake; (9) Purinskiye lakes; (10) Kotuy river; (11) Pyasino lake; (12) Dudinka; (13) Noril'skiye lakes; (14) Nikol'sk; (15) Putorana mountains; (16) Angutikha; (17) Irkutsk; (18) Lena delta; (19) Khroma-Indigirka tundra; (20) Indigirka delta; (21) Agafonova; (22) Bol'shaya Ercha river; (23) Kolyma delta; (24) Kon'kovaya river; (25) Alazeya valley; (26) Andryushkino; (27) Ankudinka river; (28) Berezovka river; (29) Srednekolym'sk; (30) Kamenka river; (31) Adycha river; (32) Ozhogina river; (33) Tyung river; (34) Mom'skiy range; (35) Zyryan'ka; (36) Chaun-Palyavaam delta; (37) Enmyvaam river; (38) middle Anadyr' river; (39) Omolon river; (40) Achchen lake; (41) Tanyurer river; (42) Avtatkuul' river mouth; (43) Penzhina river; (44) Kharchinskoye lake; (45) Ozernovskiy; (46) Lopatka cape; (47) Udy' lake; (48) Goryun river mouth; (49) Bolon' lake; (50) Nedostupnoye lake; (51) Blagoveshchensk; (52) Khingan; (53) Khanka lake; (54) Ol'ga bay; (55) Suyfun river mouth; (56) Tumen river mouth; (57) Shrimida peninsula; (58) Rumoi; (59) Memambetsu; (60) Kitami; (61) Sorachi; (62) Nemuro; (63) Furen-ko; (64) Nemuro-gun; (65) Zenibako; (66) Kushiro; (67) Chitose; (68) Hakodate; (69) Ogawara-numa; (70) Tsugaruishi-gawa river mouth; (71) Izu-numa; (72) Akita; (73) Yamagata; (74) Mito-shi; (75) Kashima-gun; (76) Imperial duck pond; (77) Tega-numa; (78) Gyotoku; (79) Kazusa; (80) Oota-ku; (81) Tama-gawa; (82) Yokohama; (83) Shinano-gawa; (84) Nishi-kanbara; (85) Joetsu-shi; (86) Toyama; (87) Kaga-shi; (88) Aichi; (89) Tottori; (90) Hii-gawa river mouth; (91) Hachijo-jima; (92) Uwa-cho; (93) Kochi; (94) Fukuoka; (95) Ariake reclamation; (96) Puchon-gun; (97) Chunam reservoir; (98) Nakdong estuary; (99) Kum river; (100) Honghe Nature Reserve; (101) Ang'angxi; (102) Dailing; (103) Zhalong National Nature Reserve; (104) Yantongtun; (105) Lianhuan Hu; (106) Harbin; (107) Mao'ershan; (108) Xingka Hu National Nature Reserve; (109) Mudanjiang; (110) Baicheng prefecture; (111) Yingkou; (112) Liao He estuary; (113) Dandong; (114) Yalu Jiang estuary; (115) Dalian; (116) Chengdu city; (117) Qinhuangdao; (118) Beidaihe; (119) Yellow River Delta Nature Reserve; (120) Qingdao; (121) Weishan Hu; (122) Pangzhai; (123) Liuyuankou; (124) Heigangkou; (125) Madu; (126) Wantan; (127) Sanmenxia; (128) Dong Hu; (129) Chen Hu; (130) Hannan lakes; (131) Chuzhou; (132) Shijiu Hu; (133) Chenyao Hu; (134) Sheyang salt works; (135) Yanheng Nature Reserve; (136) Haifeng farm; (137) Zhenjiang; (138) Pukou; (139) Shanghai; (140) Ningbo; (141) Haitan Dao; (142) Jiujiang; (143) Poyang Hu Nature Reserve; (144) Dong Dongting Hu Nature Reserve; (145) Yuan Jiang; (146) Xijin reservoir; (147) Beibu bay; (148) Guangdong; (149) Kuantou; (150) Wuku; (151) Lanyang river; (152) Lotung; (153) Tainan; (154) Kaohsiung; (155) Nowshera; (156) Sukkur; (157) Sehwan; (158) Marala barrage; (159) Shahpur; (160) Fyzabad; (161) Bahawalpur; (162) Wular lake; (163) Sultanpur; (164) Sitapur; (165) Hardoi; (166) Fatehgarh; (167) Lucknow; (168) Karagola; (169) West Bengal; (170) Sookerating; (171) Kaziranga National Park; (172) Southern Shan States.

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



The distribution of Lesser White-fronted Goose *Anser erythropus* (map A): (47) Udyli' lake; (48) Goryun river mouth; (49) Bolon' lake; (50) Nedostupnoye lake; (51) Blagoveshchensk; (52) Khingan; (53) Khanka lake; (54) Ol'ga bay; (55) Suyfun river mouth; (56) Tumen river mouth; (57) Shmidta peninsula; (58) Rumoi; (59) Memambetsu; (60) Kitami; (61) Sorachi; (62) Nemuro; (63) Furen-ko; (64) Nemuro-gun; (65) Zenibako; (66) Kushiro; (67) Chitose; (68) Hakodate; (69) Ogawara-numa; (70) Tsugaruishi-gawa river mouth; (71) Izu-numa; (72) Akita; (73) Yamagata; (74) Mito-shi; (75) Kashima-gun; (76) Imperial duck pond; (77) Tega-numa; (78) Gyotoku; (79) Kazusa; (80) Oota-ku; (81) Tama-gawa; (82) Yokohama; (83) Shinano-gawa; (84) Nishi-kanbara; (85) Joetsu-shi; (86) Toyama; (87) Kaga-shi; (88) Aichi; (89) Tottori; (90) Hii-gawa river mouth; (91) Hachijo-jima; (92) Uwa-cho; (93) Kochi; (94) Fukuoka; (95) Ariake reclamation; (96) Puchon-gun; (97) Chunam reservoir; (98) Nakdong estuary; (99) Kum river; (100) Honghe Nature Reserve; (101) Ang'angxi; (102) Dailing; (103) Zhalong National Nature Reserve; (104) Yantongtun; (105) Lianhuan Hu; (106) Harbin; (107) Mao'ershan; (108) Xingkai Hu National Nature Reserve; (109) Mudanjiang; (110) Baicheng prefecture; (113) Dandong; (114) Yalu Jiang estuary.

(map B opposite): (111) Yingkou; (112) Liao He estuary; (113) Dandong; (114) Yalu Jiang estuary; (115) Dalian; (116) Chengdu city; (117) Qinhuangdao; (118) Beidaihe; (119) Yellow River Delta Nature Reserve; (120) Qingdao; (121) Weishan Hu; (122) Pangzhai; (123) Liuyuankou; (124) Heigangkou; (125) Madu; (126) Wantan; (127) Sanmenxia; (128) Dong Hu; (129) Chen Hu; (130) Hannan lakes; (131) Chuzhou; (132) Shijiu Hu; (133) Chenyao Hu; (134) Sheyang Salt Works; (135) Yancheng Nature Reserve; (136) Haifeng farm; (137) Zhenjiang; (138) Pukou; (139) Shanghai; (140) Ningbo; (141) Haitan Dao; (142) Jiujiang; (143) Poyang Hu Nature Reserve; (144) Dong Dongting Hu Nature Reserve; (145) Yuan Jiang; (146) Xijin reservoir; (147) Beibu bay; (148) Guangdong; (149) Kuantu; (150) Wuku; (151) Lanyang river; (152) Lotung; (153) Tainan; (154) Kaohsiung.

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



Woo-shin *in litt.* 1998); ■ **North Cholla Kum river**, one seen, December 1997 (Lee Woo-shin *in litt.* 1998).

■ **CHINA** ■ **MAINLAND CHINA** It is a passage and winter visitor to eastern China, recorded in Heilongjiang, Jilin, Liaoning, Sichuan, Shandong, Henan, Hubei, Anhui, Jiangsu, Shanghai, Zhejiang, Fujian, Jiangxi, Hunan and Guangxi. Significant counts have been made on passage at Xinghai Hu in Heilongjiang, and in winter near Qingdao in Shandong, near the Yellow River in Henan, at Shujiu Hu in Anhui, at Yancheng in Jiangsu, at Poyang Hu in Jiangxi and at Dong Dongting Hu in Hunan. Records (by province) are as follows:

■ **Heilongjiang Honghe Nature Reserve**, one with a flock of Greater White-fronted Geese, September 1990 (King and Jin Longrong 1992–1993); **Ang’angxi**, recorded on migration, undated (Wildlife Institute of Heilongjiang Province 1992); **Dailing**, Yichun city, 1960s (specimen in NEFUCN; also Wildlife Institute of Heilongjiang Province 1992); **Zhalong National Nature Reserve**, Qiqihar city, recorded on migration, undated (Wildlife Institute of Heilongjiang Province 1992); **Yantongtun** (Jantuntun), one collected, April (unspecified year) (Meise 1934); **Lianhuan Hu** Game Park, Dorbod Mongol autonomous county, “rare”, undated (Gao Jihong *et al.* 1995); near **Harbin**, including on the Sungari river, three collected in April

1926 and April and November 1927–1929 (Meise 1934), April 1936, April 1937, April–May 1939 (five specimens in AMNH and FMNH; also Wildlife Institute of Heilongjiang Province 1992); **Mao'ershan**, recorded on migration, undated (Wildlife Institute of Heilongjiang Province 1992); **Xingkai Hu National Nature Reserve** (Lake Khanka), 348 birds, March–April 1997 (Piao Renzhu and Li Wenfa 1998), 7,500 birds, spring 1988 (Miyabayashi and Mundkur 1999); Sanjiang plain, “rare” in **Mudanjiang** district, undated (Ma Yiqing *et al.* 1991); Yongcui (untraced), collected in September 1957 (specimen in ASCN);

■ **Jilin Baicheng prefecture**, “very rare”, undated, the only record in Jilin (Jilin Wildlife Conservation Society 1987);

■ **Liaoning Yingkou**, collected, April 1931 (Mizuno 1934; also Liaoning Ornithological Survey Team 1986); **Liao He estuary**, collected, March 1928 (Mizuno 1934); **Dandong**, recorded on migration, undated (Liaoning Ornithological Survey Team 1986); **Yalu Jiang estuary**, collected, April 1929 (Mizuno 1934); **Dalian**, recorded on migration, undated (Liaoning Ornithological Survey Team 1986);

■ **Sichuan** suburb of **Chengdu city**, December 1955 (Li Guiyuan 1995, female in SUCN);

■ **Hebei Qinhuangdao** (Chinwangtao), one collected from a flock, April 1911, and a flock of small geese seen probably of this species, April 1913 (La Touche 1920–1921); **Beidaihe**, one, March 1994, two on the “sandflats”, April 1994 (J. Thalund *in litt.* 1999);

■ **Shandong Yellow River Delta Nature Reserve**, passage migrant, undated (Zhao Yanmao and Song Chaoshu 1995); **Qingdao** coastal wetlands, mainly at the tidal flats of Jiaozhou



The distribution of Lesser White-fronted Goose *Anser erythropus* (map C): (155) Nowshera; (156) Sukkur; (157) Sehwan; (158) Marala barrage; (159) Shahpur; (160) Fyzabad; (161) Bahawalpur; (162) Wular lake; (163) Sultanpur; (164) Sitapur; (165) Hardoi; (166) Fatehgarh; (167) Lucknow; (168) Karagola; (169) West Bengal; (170) Sookerating; (171) Kaziranga National Park; (172) Southern Shan States.

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

bay, “rare”, undated (Liu Daiji *et al.* 1994), 10 birds in January 1990, 1,000 birds in January 1991 and 1,200 in January 1992 (Waterbird Specialist Group 1994); **Weishan Hu** (Nansi Hu) lake, “rare”, 1988–1991 (Feng Zhilu *et al.* 1996);

■ **Henan Pangzhai** (the old channel of the Yellow River in northern Henan), 250 birds, January 1991, 203 birds, November 1991 (Waterbird Specialist Group 1994); other sections of the Yellow River, including **Liuyuankou**, **Heigangkou**, **Madu**, **Wantan** and **Sanmenxia**, total of 1,050 birds, early 1990s (Wang Wenlin *et al.* 1998), at Heigangkou, 30 birds in January 1991, 720 birds in January 1992 and 150 birds in January 1993 (Waterbird Specialist Group 1994);

■ **Hubei Dong Hu** lake, near Wuhan, October 1959 (specimen in WUCN); **Chen Hu** lake, Wuhan lakes, 100 birds, January 1988 (Scott 1989); **Hannan lakes**, 360 birds, January 1990 (Waterbird Specialist Group 1994);

■ **Anhui Chuzhou** (Chuchow) hills, one collected and birds seen daily migrating north, often with Bean Geese, March 1922 (Kolthoff 1932); **Shijiu Hu**, 550 birds, January 1990, 680 birds, January 1991, 2,650 birds, February 1992, 1,150 birds, December 1993 (Waterbird Specialist Group 1994); **Chenyao Hu** lake, December 1960 (specimen in AUCN);

■ **Jiangsu Sheyang salt works**, Yancheng Nature Reserve, 53 birds, January 1990 (Waterbird Specialist Group 1994), three, January 1990 (Wang Hui and Du Jinjin 1993); **Yancheng Nature Reserve**, seven, January 1990, 21 birds, January 1991 (Waterbird Specialist Group 1994), two, winter 1990–1991 (Wang Hui 1991), 66 birds, December 1997 to January 1998 (Su Hualong *et al.* 1998), in the core area of Yancheng reserve, two, January 1991, 11 birds, winter 1991–1992 (Waterbird Specialist Group 1994); **Haifeng farm**, in or near to Yancheng Nature Reserve, 650 birds, January 1990 (Waterbird Specialist Group 1994); **Zhenjiang** (Chinking) mountains, between Nanjing (Nanking) and Zhenjiang city (Chinking), three flying south with a flock of Bean Geese, November 1921 (Kolthoff 1932); north of **Pukou** (Pookow), several heard in the extensive swamps, March 1921–1922 (Kolthoff 1932);

■ **Shanghai Shanghai**, winter visitor, December 1935 and December 1985 (Huang Zhengyi *et al.* 1991, two specimens in WUCN);

■ **Zhejiang Ningbo**, one collected, winter (unspecified year) (Zhuge Yang 1990);

■ **Fujian Haitan Dao** (Hantan Tao) island, winter (unspecified years) (Meyer de Schauensee 1984); Fuzhou (Foochow), small geese probably of this species reported to have been collected, c.1890 (La Touche 1892);

■ **Jiangxi Jiujiang** (Kinkiang), obtained in the market, March 1869 (Swinhoe 1871); **Poyang Hu Nature Reserve**, three, January 1986 (Kennerley 1987), 14,000 reported, January 1988 (Scott 1989, Lu Jianjian 1990), 9,790 birds, winter 1988–1989 (Miyabayashi and Mundkur 1999), 3,100 birds, November 1991 (Waterbird Specialist Group 1994);

■ **Hunan Dong Dongting Hu Nature Reserve**, collected at Yueyang, 1956 (two males in HNUCN) and Dongting Hu lake, January 1960 (two specimens in ASCN), 1,200 birds, January 1990, 675 birds, February 1991, 46 birds, December 1991 (Waterbird Specialist Group 1994), 9,000 birds, January 1991 (Liu Qide *et al.* 1995), 13,400 birds at Daxi lake and 300 birds at Xiaoxi lake, February 1997 (Iwabuchi *et al.* 1997, 1998, Miyabayashi and Mundkur 1999), c.12,000 birds, early 1998 (Shen Youhui *in litt.* 1998); **Yuan Jiang** river, December 1961 (specimen in ASCN);

■ **Guangxi Xijin reservoir**, 10 birds, January 1990 (Waterbird Specialist Group 1994); northern **Beibu bay** (Gulf of Tonkin), “very rare” winter visitor (under five records), unspecified years (Zhou Fang *et al.* 1999); Zhongdang reservoir (untraced), six, January 1991 (Waterbird Specialist Group 1994);

■ **Guangdong** unspecified localities, winter (unspecified years) (Cheng Tso-hsin 1979).

■ **TAIWAN** It is a very rare visitor, last seen in 1986, with records as follows: **Kuantu**, one, 1997 (CWBF database); **Wuku**, Taipei, one, winter 1986 (CWBF database); **Lanyang river**,

Ilan county, single birds collected, 1959 and 1971 (Wu Yung-hwa 1990); **Lotung** (Luotung), Ilan county, single birds collected, 1970 and 1972 (Fang Woei-horng *in litt.* 1998); near **Tainan**, one collected, November 1924 (Kuroda 1928, Hachisuka and Udagawa 1950–1951); **Kaohsiung**, undated (Hachisuka and Udagawa 1950–1951).

■ **PAKISTAN** It is a very rare winter visitor, with no records since 1967. Savage (1968, C. D. W. Savage in Isakov 1970) considered it to be a rare vagrant and accidental. Only occasional stragglers are likely to reach the country, probably from the south coast of the Caspian Sea, where they occur regularly (Roberts 1991). Records are as follows: ■ **North West Frontier Province Nowshera**, Peshawar district, November 1910 (Wignall 1911); ■ **Sind Sukkur**, one, undated (James 1893; also Baker 1908); Indus river, between **Sehwan** and **Kotri**, two, November 1871 (Hume 1872–1873); ■ **Punjab** unspecified localities, 1949, 1961 (apparently six birds) and 1967 (C. D. W. Savage in Isakov 1970); Chenab river, upstream of **Marala barrage**, seen among a flock of Greylag Geese *Anser anser*, January 1962 (Roberts 1991); Jhelum river, below **Shahpur**, Sargodha district, three collected, November 1871 (Hume 1872–1873); **Fyzabad**, on the Gogra river, four, February 1911 (Plinston 1911); **Bahawalpur** division, November 1944 (Abdulali 1968–1996, specimen in BNHS).

There is one unconfirmed record from Rawalpindi, with three birds procured in Calcutta market reportedly from this area (Finn 1898b).

■ **INDIA** It is a rare winter visitor, with records (by state) as follows:

■ **Jammu and Kashmir** unspecified locality, four, 1901 (Baker 1908); **Wular lake**, apparently shot “some years” before 1907 (Ward 1906–1908);

■ **Haryana Sultanpur** (Haryana Sulthanpur), Gurgaon district, March 1870, March 1879 (three specimens in BMNH, *Stray Feathers* 8: 494–500);

■ **Uttar Pradesh Sitapur** (Seetapore), Oudh (Avadh), three, October 1859 (Irby 1861, specimen in BMNH); **Hardoi** (Hurdui), undated (Baker 1908); **Fatehgarh** (Futtehgurh), undated (Baker 1908); **Lucknow**, before 1881 (Reid 1887);

■ **Bihar Karagola** (Karaghola), on the Ganges river, near Sahibganj, Santal Parganas, two shot from a flock of eight, February 1948 (*J. Bombay Nat. Hist. Soc.* 47 [1948]: 747–748);

■ **West Bengal** unspecified locality, undated (Savage and Abdulali, in Isakov 1970);

■ **Assam Sookerating** (Sooherating), male, October 1903 (Baker 1904a, 1908); Borbeel area, Baguri, **Kaziranga National Park**, one with a flock of Bar-headed Geese *Anser indicus*, January 1968 (Mackenzie 1969 in Barua and Sharma 1999).

Unconfirmed or unspecific records include: Keoladeo National Park, Rajasthan, one apparently with Greylag Geese in 1996 (Choudhury 2000); Brahmaputra valley, Assam, three records of individuals (either this species or *Anser albifrons*) in 1965, 1966 and 1967 (Savage and Mackenzie in Isakov 1970).

■ **BANGLADESH** It has been reported to have occurred in Bangladesh (Savage and Mackenzie in Isakov 1970), perhaps based on its listing as a possible winter visitor (Rashid 1967). However, as Rashid’s (1967) list is largely hypothetical (see Remarks 2 under Manipur Bush-quail *Perdica manipurensis*) and the species is not listed for the country by other authors (e.g. Harvey 1990, Grimmett *et al.* 1998), this report is here treated as unconfirmed.

■ **MYANMAR** It is known by a single record: **Southern Shan States**, two shot, 1898 (Rippon 1901, specimen in BMNH).

POPULATION The total midwinter population of this species is probably 25,000–30,000 individuals (Madsen 1996, Tolvanen 1998). This includes 8,000–13,000 individuals in autumn in its western Palearctic range (Lorentsen *et al.* 1998) and 14,000–16,000 wintering individuals from the East Asian flyway (Miyabayashi and Mundkur 1999, I. J. Øien *in litt.* 2000), which may constitute the majority of eastern breeding birds (Aarvak *et al.* 1997). The Russian

population has declined from a former estimate of 30,000–50,000 individuals (Morozov 1995), and the Fennoscandian population has declined from more than 10,000 birds in the early twentieth century (Madsen 1996; see also Tucker and Heath 1994).

Eastern Russia The data available indicate that there has been a steady long-term decline in the numbers of this species in eastern Russia, and that a sharp decline occurred in the early 1980s, since when it has become rarer on both its breeding grounds and at migratory stopover sites (AVA).

In Krasnoyarsk, it was numerous on the lower Kotuy river in the eastern Taymyr peninsula in the 1930s, but it had become uncommon there by the mid-1960s (Scalon 1938 in Rogacheva 1988, Rogacheva 1988).

In Yakutia it was not rare before the early 1980s, but long-term census data from fixed locations on spring migration showed that a continuous decline in its numbers began in the 1960s, and that there was a sharp decline in the early 1980s (Degtyarev and Perfil'ev 1996). The total population of this species in Yakutia was estimated by extrapolation at c.3,000 birds in the mid-1990s (Degtyarev and Perfil'ev 1996). In western Yakutia, it used to be a common breeder in coastal tundra in the 1950s (Sdobnikov 1959), but it was always rare in the Lena delta (Labutin *et al.* 1985). On the middle Lena, at the mouth of the Namana river, 128 birds were counted (25.1% of all geese observed) in 1974 and 70 (20.8%) were found on the lower Aldan river in 1979, but only one individual (0.9%) was found in 1980 and not a single bird in 1981–1983 (Degtyarev *et al.* 1978, Degtyarev 1991). In the Khroma–Indigirka tundra on the upper Berelyakh river, 550 individuals (14.7%) were counted in 1961 and 400 (18.1%) in 1962 (Perfil'ev 1972). In 1960–1962 it was common on subarctic tundra between the Khroma and Indigirka rivers: in June–July 1962, 3–4 birds were recorded per 10 km on a ground transect of 515 km along the Khroma, Lapcha, Gusinaya and Berelekh rivers and the southern edge of Khromskaya bay, and this species was estimated to comprise 32.6% (n = 520) of the breeding geese population (Degtyarev and Perfil'ev 1996). In the Indigirka delta, it comprised less than 3% of the total goose population by the late 1950s (Uspenskiy *et al.* 1962), and in 1988–1989 and 1993–1995 no birds of this species were observed on a 2,740 km survey route (Degtyarev and Perfil'ev 1996). In the Indigirka basin, it regularly bred in the area from the foothills of the Momskiy mountain range north to the delta plains into which it penetrated along the hilly right bank (Mikhel' 1935); but a substantial breeding population is currently found only in the Bol'shaya Ercha basin, where 10 broods were found per 250 km of river (Degtyarev and Perfil'ev 1996). In the Kolyma basin, 2,350 birds of this species migrated over the Yasashnaya river mouth near Zyrianka town in May 1960 (37.9% of all migrating geese there) (Krivosheev 1963). Further north, on the middle reaches of the Kolyma river at Troitskoye lake, 27 birds (9.7% of all geese) were recorded in 1978, 65 (19.5%) in 1979, 10 (0.9%) in 1980, and not a single bird in 1981 and 1982; on the Berezovka river, three birds (4.2%) were seen in 1983, two (4.1%) in 1984 and 22 (5.1%) in 1985 (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997). In the early 1960s, it was quite a common breeding species in the Kon'kovaya valley (Kolyma lowlands), but 20 years later it was the rarest goose species there (Krechmar *et al.* 1991).

In Chukotka, it was numerous on migration in the Chaun delta (west Chukotka) in the early 1970s (Ostapenko 1973), and in 1975 it still comprised roughly half of the migratory goose stock, but it then declined dramatically and by the 1980s it was a very visitor to the area (Kondrat'ev 1988). In the middle Anadyr valley it was a relatively common breeding species from the 1930s until the late 1970s, but after 1982 it started to decline sharply (Krechmar *et al.* 1991). In the late 1980s, in the southern Zeya-Bureya plain in Amur, it was not as numerous as other goose species on spring migration, comprising 18–20% of all migrating geese (c.5,000–8,000 individuals of all species) (V. A. Dugintsov in Andreev 1997). In spring 1992, up to 3,000 birds occurred on migration, and 700–800 in spring 1995 (V. A. Dugintsov *in litt.* 1997). Of 12 geese shot by hunters (in the hunting season on 1–10 May) and examined in this area in 1990, ten were Greater White-fronts and two were Lesser White-

fronts, and in 1991, of 40 geese examined, 37 were Greater White-fronts, two were Bean and one was a Lesser White-front (V. A. Dugintsov *in litt.* 1997).

Japan It was formerly as common as the Greater White-front at the imperial preserves on the Edo river, but its numbers dwindled soon after the Meiji restoration (in the late nineteenth century), and it was considered to be a rare bird by the 1930s (Kuroda 1939).

Mainland China Styan (1891) considered it to be the most numerous goose in the Yangtze valley, but it was unknown in south-east China (La Touche 1925–1934). Sowerby (1943) stated that it was certainly not the most numerous goose on the lower Yangtze, indicating that it had probably declined there between the late nineteenth century and mid-twentieth century. However, although it has not been intensively studied in China, there have been recent counts of 1,000 or more birds on passage at Xinghai Hu in Heilongjiang, and in winter near Qingdao in Shandong, near the Yellow River in Henan, at Shijiu Hu in Anhui, at Yancheng in Jiangsu, at Poyang Hu in Jiangxi and at Dong Dongting Hu in Hunan (see Distribution). The wetlands in the Yangtze valley are clearly still an extremely important (if not the single most important) wintering area for this species, and some of the largest recent counts in the world are from Poyang Hu (reports of up to 14,000 birds in the 1980s) and Dong Dongting Hu (maximum of 13,700 birds in winter 1996–1997) (see Distribution). However, it is believed that geese and other waterfowl are declining in China: for example, Liu Zhiyong and Zhao Jinsheng (1998) noted that the numbers of waterfowl at Poyang Hu lake have declined greatly in the last 10 years, presumably mainly because of the intense hunting pressure, as wild ducks and geese were found in huge flocks in the mid-1980s but they are now sometimes “even rarer than cranes”.

South Asia There are only a few records of small numbers from Pakistan and India (see Distribution). However, Reid (1887) reported “remarkably small geese” being found in vast numbers and comparatively tame one winter near Ajgaon (presumably Ajgain in Uttar Pradesh) in India, but not subsequently, possibly indicating that this species sometimes occurred in large numbers in South Asia in the nineteenth century.

ECOLOGY Habitat The Lesser White-fronted Goose breeds mainly within the forest zone north of the Arctic Circle and in the tall-shrub tundra belt, and after breeding it migrates north to Arctic coastal lakes to moult (AVA). Its breeding habitats in Yakutia are along the lower and middle reaches of the shallow valleys of foothill streams, and on islands in the bigger rivers, where most nests have been found; in the southern tundra it prefers to nest among turf hummocks near thermocarst lakes, often bordered by steep bluffs on the shoreline (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997). Broods keep to sandy streambanks and channels near dense willows (AVA). At spring migration stopover sites on the Zeya-Bureya plains in Amur it feeds with other geese species on grain fields, which are interspersed with shallow grassy depressions and surrounded by birch and oak groves, and flies short distances between these feeding areas and roosting sites on sandspits in channels of the Amur river (AVA). It winters in open treeless tracts, including semi-arid salt steppes, meadows, pastures, and sometimes cropfields, and roosts in reedbeds and rushes or on water or the banks of lakes and rivers; it rarely visits marine waters (Cramp and Simmons 1977).

Food During the breeding season, the preferred foods are the green stems and blooms of cottongrass *Eryophorum polystachion*, followed by sedges *Carex chordoriza* and *C. stans* and horsetails and other plant species (Labutin *et al.* 1988). At migratory stopovers in the southern Zeya-Bureya plains in Amur it feeds in wheat and oat fields, where local hunters use controlled fires to toast the grains, which apparently makes them more attractive to geese (AVA). It feeds in the same fields as the Greater White-fronted Goose, but keeps in separate flocks (V. A. Dugintsov *in litt.* 1997). North of the agricultural belt, the horsetail carpets on riparian sandspits provide an attractive diet for this species on both spring and fall migrations, and it also eats willow shoots (Egorov and Krivosheev 1965, Labutin *et al.* 1988).

Breeding This species starts laying clutches by late May or early June: in 19.1% of nests found ($n=21$) between the Khroma and Indigirka rivers in 1960–1962 laying began on 1–5 June, in 33.3% of nests on 6–10 June, and in 28.6% of nests on 11–15 June (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997). The clutch size varied from 3–5 eggs (19 nests); in the northern taiga hatching occurs from the end of June to the beginning of July, and in the southern tundra by mid-July (c.7–10 days later); the average brood size in the Khroma–Indigirka area was 4.2 chicks throughout July 1962 ($n=12$), and several neighbouring broods tended to aggregate, forming flocks of up to 40 birds (Mikhel' 1935, Vorob'ev 1967). The goslings are able to fly by 12–15 August (Krechmar *et al.* 1978). In tundra habitats, non-breeding birds start to moult by 6–15 July, and in southern parts of the Khroma inlet pre-mouling flocks of 10–80 birds migrated north on 6–12 July in 1961 and 1962 (Uspenskiy *et al.* 1962). Further south, flightless non-breeding birds were seen one week earlier, on 2 July 1989 (Labutin *et al.* 1988). Moulting breeding birds were seen on the lower Khroma river from 26 July to 5 August in 1961 and 1962 (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997).

Migration The migratory routes of this species in eastern Russia were described by Labutin *et al.* (1988), but there appears to be considerable uncertainty on this subject (see also Rakhilin 1972). It can occur on the Zeya-Bureya plains in Amur as early as 20 April, but most birds arrive by 5 May, remaining there until late May; further north they migrate later than other grey geese, in a single wave (2–4 days after the “heralds” appear) arriving at the Namana river mouth on 15–20 May, at Yakutsk (64°N) on 18–26 May, at the Omolon valley (67°N) on 15–19 May, and at the Kolyma delta (69°N) by 30 May (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997). On Kamchatka, the spring migration occurred on 7–9 May (51°N) and on 12–20 May (56°N) (Gerasimov 1996, Gerasimov and Gerasimov 1997). The return migration from the Khroma and Indigirka rivers (c.72°N) occurs in the first ten days of September (Uspenskiy *et al.* 1962), and at Zhirkovo and Troitskoe lake (c.65°–66°N) by 13–25 September (Krechmar *et al.* 1978, A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997).

THREATS In Europe and Central Asia, high mortality rates in autumn and winter, particularly of juveniles, indicate that hunting on the staging and wintering grounds is the primary threat (Aarvak *et al.* 1997, Lorentsen *et al.* 1998, 1999). Habitat deterioration, as a result of land cultivation and increased water levels in the Caspian Sea, is a further threat (Madsen 1996). In the Asian part of its range, hunting also appears to be the most significant threat—with eight hunters apparently responsible for killing almost a thousand birds (3–4% of the global total!) in late October 2000—as detailed below.

Habitat loss While there have been no apparent changes to its breeding habitats in far north-east Russia (Krechmar *et al.* 1991, Andreev 1997), in China this species is probably being affected by the drainage and degradation of wetlands (see, e.g., Scott 1989, and threats under Swan Goose *Anser cygnoides* concerning Sanjiang plain in Heilongjiang). The major wintering populations at Dong Dongting Hu and other lakes in the Yangtze valley are threatened by the construction of the Three Gorges Dam, which will change the seasonal flow of water in the Yangtze River and could significantly affect the wetlands downstream of the dam (Iwabuchi *et al.* 1998; see equivalent section under Siberian Crane *Grus leucogeranus*).

Hunting Unsustainable levels of hunting, particularly at passage and wintering sites, is almost certainly the main cause of the decline in the numbers of this species. *Russia* In Yakutia, direct persecution by man has contributed to the species's decline, and on the lower Indigirka river moulting birds were traditionally trapped (Uspenskiy *et al.* 1962, Böme *et al.* 1965). Until recently, goose-hunting in Yakutia was practised in both spring and autumn, and in 1960–1962 hunters from the small settlement of Berelyakh (on the Khroma–Indigirka tundra) bagged 130–200 Lesser White-fronts annually, and according to an official inquiry up to 30,000–40,000 geese of all species were bagged annually in 1979–1982 (Degtyarev 1990). In the Amur region, the main threat is shooting during the spring and autumn hunting seasons,

as the hunters are unable to distinguish between this species and the Greater White-fronts (V. A. Dugintsov *in litt.* 1997). As the border-guarding regime on the Russia–China frontier has become more lax, many people now visit the Amur river valley, and the illegal shooting of geese flying between their roosting and feeding grounds is thriving in the border zone (V. A. Dugintsov *in litt.* 1997). **Mainland China** As there have been no apparent changes to the species's breeding habitats in eastern Asia, the reason for its decline is probably the excessive level of hunting in its winter quarters (Krechmar *et al.* 1991, Andreev 1997). A study of hunting pressure in the middle and lower basins of the Yangtze River in 1987–1992 estimated that c.50% of the total wintering waterfowl in this region were killed each year by local hunters, using netting, shooting and poisoning; the Lesser White-fronted Goose was one of the quarry species found in hunters' bags during the study (Lu Jianjian 1993a). In November 1960, 43% of the wildfowl hunted at Dong Dongting Hu lake in Hunan belonged to this species (Guan Guanxun *et al.* 1963). Eight poachers were arrested in Yueyang county (close to Dong Dongting Hu lake) in Hunan in October 2000, accused of killing almost 1,000 Lesser White-fronted Geese in the latter half of that month; this activity has recently increased, and the authority in Hunan claimed that they will punish poachers severely (*People's Daily* Internet edition, 4 November 2000). During an investigation by a Chinese television company (*Jiao Dian Fang Tan*) in November 1999, hundreds of "White-fronted" and Swan Geese were seen openly offered for sale in Yugan and Poyang counties in Jiangxi; at nearby Poyang Hu lake, two groups of poachers were reported to have been arrested by the Public Security Bureau (possibly in response to the presence of the TV crew) (J. Hornskov *in litt.* 1999). Liu Zhiyong and Zhao Jingsheng (1998) noted that the numbers of waterfowl at Poyang Hu lake have declined greatly in the last ten years, presumably mainly because of this intense hunting pressure. **South Asia** Hunting is a potential threat to birds wintering in South Asia. Ali (1936) commented that "no one who has visited the larger dhands or jheels in Sind [now in Pakistan] and other places in northern India during the cold weather can have failed to remark upon the magnitude of the netting operations that go on throughout this season for supplying the markets of the larger towns, both near and distant, with wildfowl of every description for the table." In Jammu and Kashmir, an estimated 4,000–8,000 geese and ducks were killed during each winter hunting season, although this was certainly an underestimate because much illegal hunting was conducted, and wildfowl populations in the state were undoubtedly suffering from these high levels of exploitation and the deterioration of wetland habitats through drainage, siltation and development (Pandit 1982).

Disturbance The great increase in cross-border visitors to the Amur river valley (see Hunting above) is leading to increased disturbance of birds resting on spits in the river (V. A. Dugintsov *in litt.* 1997).

Pollution As the main breeding areas lie in the valleys of rivers which flow at least in part through mountain regions, it is possible that this species is being affected by industrial pollution of the river water resulting from the intensive development of mining operations in these areas; at the end of the 1970s and beginning of the 1980s, pollution of the Khroma river led to a considerable impoverishment of the species diversity and abundance of aquatic life-forms in the river (Tyaptiryanov 1988).

MEASURES TAKEN In Europe and Central Asia, the Lesser White-front is protected in all key range states except Azerbaijan (Madsen 1996), and is listed on Appendix I of the CMS (Bonn Convention, for which see Boere 1991). Satellite telemetry studies have improved knowledge of its range, movements and key threats (Aarvak *et al.* 1997, Tolvanen *et al.* 1999). There is an ongoing re-introduction programme in Sweden (Madsen 1996). Public awareness materials have been produced in eight languages (Kostadinova *et al.* 1999). An international action plan was published in 1996 (Madsen 1996). Meanwhile, the following measures have already been taken in the Asian part of its range.

Legislation It is included the Russian Red Data Book (Kolosov 1983), and also the Red Data Book of Yakutia, and the spring hunting of the species has been banned in Yakutia since 1995 (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997). It is not nationally protected in mainland China, but it is protected by the wildlife laws of the following provinces and municipality: Beijing, Hebei, Liaoning, Heilongjiang, Shanxi, Hunan and Shandong (SC). It is protected by law against hunting, shooting and trapping in Pakistan (Ahmed and Ghalib 1986).

Protected areas *Russia* In Russia it is protected in the Lebedinyi Wildlife Refuge in Chukotka, and Tchaigurgino Wildlife Refuge in north-east Yakutia (A. V. Kondrat'ev *in litt.* 1997). In 1996, the "Kytalyk" nature reserve was established in the Khroma-Indigirka tundra (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997). *Mainland China* The species has occurred in many protected areas in mainland China, and most of the important known passage and wintering sites are inside nature reserves, including: Xinghai Hu in Heilongjiang, Yancheng in Jiangsu, Poyang Hu in Jiangxi and Dong Dongting Hu in Hunan (see Distribution).

MEASURES PROPOSED **Legislation** The most important single measure for the conservation of this species in Asia is the passing and enforcement of legislation in its range states to reduce the level of hunting pressure, particularly at passage and wintering sites (Krechmar 1989a). The hunting of this species should be banned in Russia, at least during the spring passage period, but hunters are unable to distinguish it from Greater White-front (see Remarks 1), so the most effective conservation measure would therefore be to ban the shooting of both species (Krechmar 1989a). It should be designated as a nationally protected species in mainland China. The enforcement of legislation to control hunting at the key wintering sites in the Yangtze valley and elsewhere in China is critical for the conservation of the Asian population of this species. Given the difficulty of distinguishing it from other geese, efforts should be made to control the hunting of all goose species. Lu Jianjian (1993a) proposed that national and local hunting regulations should be formulated in China (based on scientific studies), to control the length of the hunting season, to limit the number of hunters and the bag size of each hunter, and to ban inappropriate hunting methods such as the use of punt guns and poisons.

Protected areas and habitat management *Russia* Several more of the known breeding localities should be granted reserve status, for example the upper reaches of the Ozhogina, Tyung and Ercha rivers (A. G. Degtyarev and V. I. Perfil'ev *in litt.* 1997). Special feeding grounds should be created at the staging sites, where geese could be better protected while they are on passage (V. A. Dugintsov *in litt.* 1997). *Mainland China* Protection of the species needs to be improved on its wintering grounds, by creating new nature reserves at the sites where it concentrates (Krechmar 1989a). Lu Jianjian (1990) and MacKinnon *et al.* (1996) made specific recommendations for the conservation of many of the sites where it occurs in China. Changes to the wetlands in the Yangtze valley (see Threats) and the threatened waterbirds that occur there should be carefully monitored once the Three Gorges Dam is in operation, and appropriate efforts made to mitigate the problems that arise. *India* Pandit (1982) recommended the establishment of a network of wetland reserves and increased control on hunting of wildfowl in Jammu and Kashmir.

Research Satellite-tracking, which has already been used to study the western population of this species, could be used to determine and monitor its movements in the eastern part of its range, and possibly identify further important breeding, passage or wintering sites. Further research is required to assess its current status on the breeding grounds and at moulting sites (Krechmar 1989a). In China, populations should be surveyed and monitored at the sites where significant numbers have occurred in the past, and at other wetlands with the potential to support important populations, with the aim of improving understanding of the pressures

that the species is facing and developing appropriate conservation measures. A study should be conducted on the habitat requirements of this species at Dong Dongting Hu Nature Reserve, so that the management of this important site can be improved.

REMARKS (1) The identification of this species can be problematical, because of its similarity to the Greater White-fronted Goose *Anser albifrons*, with which it often forms mixed flocks; wild geese are often difficult to approach closely, particularly in areas where they are hunted, and observers with inadequate equipment can easily misidentify the two species (MJC, SC). The sight records listed in the Distribution section should therefore be regarded with some caution.